Cynthia Vodopivec
Luminant Generation Company LLC
Luminant
6555 Sierra Dr.
Irving, TX 75039

November 25, 2020

Mr. Andrew R. Wheeler, EPA Administrator
Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Mail Code 1101A

Re: Martin Lake Steam Electric Station Alternate Linder Demonstration Application

Dear Administrator Wheeler:

Luminant Generation Company LLC (Luminant) hereby submits this Alternate Liner Demonstration (ALD) application to the U.S. Environmental Protection Agency (EPA) pursuant to 40 C.F.R. § 257.71(d)(i) for the Permanent Disposal Pond 5 located at the Martin Lake Steam Electric Station near Tatum, Texas.

Enclosed is a demonstration application prepared by Golder Associates Inc. that addresses all of the criteria in 40 C.F.R. § 257.71(d)(i). As allowed by the agency, in lieu of hard copies of these documents, electronic files were submitted to Richard Huggins, Mary Jackson, Michelle Long, and Jason Mills via email. If you have any questions regarding this submittal, please contact Renee Collins at 214-875-8338 or renee.collins@luminant.com.

Sincerely,

Cynthia Vodopivec
VP - Environmental Health & Safety

Enclosure

cc: Richard Huggins
Mary Jackson
Michelle Long
Jason Mills

ALTERNATE LINER DEMONSTRATION APPLICATION

Martin Lake Steam Electric Station - PDP-5
Rusk County, Texas

Submitted to:

Luminant Generation Company LLC

Submitted by:

Golder Associates Inc.
2201 Double Creek Dr
Suite 4004
Round Rock, Texas, USA 78664
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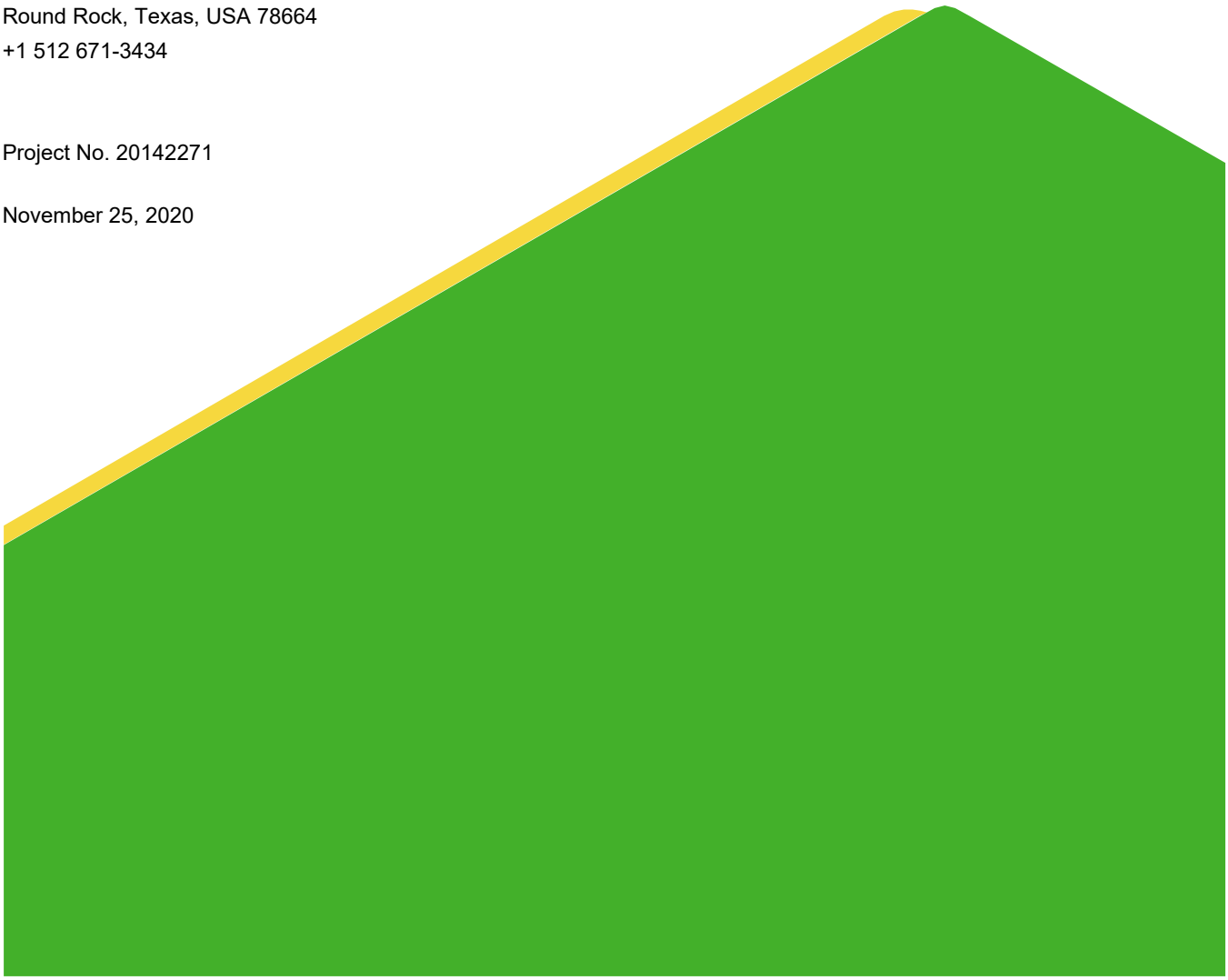
Project No. 20142271

November 25, 2020



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APPENDICES

1.0 INTRODUCTION

Pursuant to 40 C.F.R. § 257.71(d)(1)(i), Golder Associates Inc. (Golder) has prepared this Alternate Liner Demonstration (ALD) Application on behalf of Luminant Generation Company LLC (Luminant) for Permanent Disposal Pond 5 (PDP-5) located at the Martin Lake Steam Electric Station (MLSES) in Rusk County, Texas. PDP-5 is active and is considered an Existing CCR Surface Impoundment under 40 C.F.R. Part 257, Subpart D (the Coal Combustion Residuals (CCR) Rule).

PDP-5 is constructed with a compacted clay liner measuring 3 feet thick on the sides and 2 feet thick on the bottom that exhibits a hydraulic conductivity of no more than 1 X 10^{-7} cm/sec. The liner for PDP-5 is:

- Not a composite liner that meets the requirements of § 257.70(b) as specified in § 257.71(a)(1)(ii) of the CCR Rule; and
- Not an alternative composite liner that meets the requirements of § 257.70(c) as specified in § 257.71(a)(1)(iii) of the CCR Rule.

This ALD application serves as notice that Luminant intends to submit an ALD under § 257.71(d)(1)(ii) to USEPA to demonstrate that the design of the PDP-5 liner system performs equivalent to a composite liner as defined in § 257.70(b). The ALD Application was prepared in accordance with § 257.71(d)(1)(i) of USEPA's *Hazardous and Solid Waste Management System: Disposal of CCR; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments* (85 Fed. Reg. 72506 (Nov. 12, 2020)).

1.1 Facility Name and Location

The MLSES consists of three coal/lignite-fired units with a combined operating capacity of approximately 2,250 megawatts. CCRs including fly ash, bottom ash, boiler slag and scrubber gypsum are generated as part of MLSES unit operation.

The MLSES is located approximately 5 miles southeast of Tatum, Rusk County, Texas.

1.2 CCR Unit and Location

PDP-5 is located approximately 3,000 feet west of the MLSES power units:

- Latitude: 32.260304 degrees
- Longitude: -94.582816 degrees

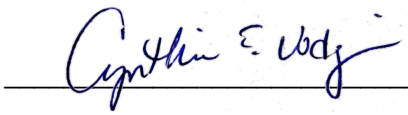
PDP-5 and adjacent areas are shown on Figure 1. PDP-5 is an above-grade surface impoundment constructed in 2010 and is surrounded by above grade earthen embankments.

PDP-5 is used to store CCRs from other MLSES CCR surface impoundments during cleaning cycles and for storage of water from large precipitation events and excess process wastewater from the MLSES scrubber gypsum and bottom ash transport systems.

2.0 OWNER'S CERTIFICATION OF COMPLIANCE WITH 40 C.F.R. 257, SUBPART D, OTHER THAN § 257.71(A)(1) - § 257.71(D)(1)(I)(A)

In accordance with 40 C.F.R. § 257.71(d)(1)(i)(A), I hereby certify that, based on my inquiry of those persons who are immediately responsible for compliance with environmental regulations for PDP-5 at the MLSES, PDP-5 is in compliance with all of the requirements contained in 40 C.F.R. Part 257, Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments other than § 257.71(a)(1). The MLSES CCR compliance website is up-to-date and contains all the necessary documentation and notification postings.

LUMINANT GENERATION COMPANY LLC



Cynthia Vodopivec
VP - Environmental Health & Safety
November 25, 2020

3.0 DOCUMENTATION SUPPORTING THE CERTIFICATION OF COMPLIANCE - § 257.71(D)(1)(I)(B)

In accordance with § 257.71(d)(1)(i)(B), documentation of PDP-5's compliance with the applicable requirements of 40 C.F.R. 257, Subpart D is presented in this section.

3.1 Documentation and Evaluation of PDP-5 Monitoring Well Network - § 257.71(d)(1)(i)(B)(1)

As specified in § 257.71(d)(1)(i)(B)(1), the monitoring well network for a CCR Unit applying for an ALD must be "sufficient to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, screening depth and other relevant factors." The suitability of the PDP-5 CCR monitoring well network is evaluated in this section. In addition, the documentation required by § 257.71(d)(1)(B)(1)(i)-(iv) is also included with this application and is described below.

A professional engineer-certified Groundwater Monitoring System Certification was completed in October 2017 for PDP-5 in accordance with the requirements of § 257.91(f) and placed in the MLSES Facility operating record (PBW, 2017a). The Groundwater Monitoring System Certification for PDP-5 is reproduced in Appendix A.

3.1.1 Local Geology and Hydrogeology

Coal ash surface impoundments have been operated in the vicinity of PDP-5 since 1979. PDP-5 was constructed in 2010 above grade and is surrounded by earthen embankments that extend approximately 10 to 15 feet above the adjacent ground surface. PDP-5 extends significantly above natural grade and represents a localized topographic high-point relative to the surrounding area. Based on this configuration, there are no upgradient monitoring wells at PDP-5.

PDP-5 is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1965). As shown on the geologic cross sections presented in Figures 2, 3, 4 and 5, surficial geology in the PDP-5 area consists of the following, starting from ground surface (PBW, 2017a):

- an upper sand unit observed on hilltops and other topographically high areas,
- an intermediate continuous clay unit that contains discontinuous, interbedded sand layers, and
- a lower unit of silt and sand that contains discontinuous packages of relatively thick, interbedded clay.

The underlying closed former surface impoundments were constructed within the upper hilltop sand unit and/or the confining intermediate clay unit below the hilltop sand unit. The uppermost aquifer at PDP-5 occurs in the lower unit of silt and sand that contains discontinuous packages of relatively thick, interbedded clay. All PDP-5 CCR monitoring wells are screened in the uppermost aquifer and the screened intervals of the wells ensure detection of potential groundwater contamination in the uppermost aquifer from PDP-5.

3.1.2 Groundwater Monitoring Prior to PDP-5 Construction and Prior to CCR Rule - § 257.71(d)(1)(i)(B)(1)(iv)

Groundwater monitoring was performed in the PDP-5 area prior to construction of PDP-5 and prior to the 2015 effective date of the CCR Rule. Twenty-seven (27) monitoring wells were historically monitored in the PDP-5 area

in accordance with Texas Commission on Environmental Quality (TCEQ) requirements for a range of constituents including aluminum, boron, manganese, selenium, sulfate, chloride, and total dissolved solids. An Affected Property Assessment Report (APAR) was prepared for the PDP-5 area in 2014 using groundwater data collected before and after PDP-5 was constructed (PBW, 2014). The APAR concluded that groundwater conditions in the PDP-5 area complied with TCEQ requirements and no groundwater response actions were required. TCEQ approved the APAR in May 2014. The May 2014 TCEQ APAR Approval Letter is reproduced in Appendix B.

3.1.3 PDP-5 Monitoring Well Network Map and Well Construction Information - § 257.71(d)(1)(i)(B)(1)(i) & § 257.71(d)(1)(i)(B)(1)(ii)

The CCR groundwater monitoring well system at PDP-5 consists of nine monitoring wells (MW-17A, MW-18A, MW-19, MW-20A, PDP-22, PDP-23, PDP-24, PDP-25, PDP-26) that are each screened in the uppermost aquifer at the Site (PBW, 2017). Monitoring wells MW-17A, MW-18A, MW-19, and MW-20A were installed as part of the 2014 APAR investigation and wells PDP-22 through PDP-26 were installed to comply with CCR Rule monitoring requirements. The wells are distributed radially along the perimeter of PDP-5 and are screened in the uppermost aquifer. The locations of the CCR monitoring wells are shown on Figure 1. Well construction information for the CCR monitoring wells is summarized in Table 1 and combined boring and well construction logs for all CCR monitoring wells are presented in Appendix C.

Groundwater monitoring has been performed using these wells in accordance with the CCR Rule since October 2015. Eight background groundwater monitoring events were performed from October 2015 to December 2016 (PBW, 2018b). Semi-annual detection monitoring has been performed since 2017.

3.1.4 Depth to Groundwater and Potentiometric Elevations - § 257.71(d)(1)(i)(B)(1)(iii)

Groundwater monitoring in accordance with the CCR Rule has been performed at PDP-5 since October 2015. Table 2 shows depth to water measurements and corresponding potentiometric surface elevations collected as part of thirteen (13) CCR monitoring events completed from October 2015 through November 2019. Figures 6 and 7 show potentiometric elevation maps for the PDP-5 area from the most recent sampling events in May 2019 and November 2019.

As described above, PDP-5 represents a localized topographic high-point relative to the surrounding area. Consistent with this topographic configuration, groundwater elevation measurements collected as part of all CCR Rule groundwater monitoring events indicate that groundwater is mounded at PDP-5, with an inferred groundwater flow direction radially outward from the unit (PBW, 2018b; PBW, 2019; PBW, 2020). Based on the direction of groundwater flow, there are no upgradient areas in the immediate vicinity of PDP-5, and all of the CCR monitoring wells are downgradient wells. As a result, the PDP-5 CCR monitoring wells are positioned to ensure detection of potential groundwater contamination in the uppermost aquifer from PDP-5.

3.1.5 Groundwater Data Evaluation Procedures - § 257.71(d)(1)(i)(B)(1)(iv)

Intrawell data evaluations, which compare new sample data to historical data at each groundwater monitoring well independently are used to statistically demonstrate groundwater compliance for PDP-5 under the CCR Rule. Intrawell data comparisons were selected for PDP-5 based on the following:

- Groundwater is mounded at PDP-5 and flows radially outward from the unit. Based on the direction of groundwater flow, there are no upgradient areas in the vicinity of PDP-5 and all of the CCR monitoring wells are downgradient wells.

- Although PDP-5 was constructed in 2010, coal ash surface impoundments have been operated in the

vicinity of PDP-5 since 1979. As a result, groundwater conditions in the vicinity of PDP-5 are influenced by the historical operations of the closed former surface impoundments in the area. Intrawell data evaluations allow for a comparison of water quality data in each well against background values established from that well's own historical water quality data, which takes into account potential effects of the closed former surface impoundments on groundwater in the area.

- Use of intrawell data evaluations complies with CCR Rule requirements as well as EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009).

3.1.6 Conclusion

The CCR groundwater monitoring well system at PDP-5 is appropriately designed "to ensure detection of any groundwater contamination resulting from the impoundment, based on direction of flow, well location, well screening depth and other relevant factors."

3.2 Documentation That PDP-5 Remains in Detection Monitoring - § 257.71(d)(1)(i)(B)(2)

As specified in § 257.71(d)(1)(i)(B)(2), documentation that the CCR surface impoundment remains in detection monitoring in accordance with § 257.94 is a precondition for any CCR Unit applying for an ALD. Groundwater detection monitoring data collected from the PDP-5 CCR monitoring well network are evaluated in this section.

3.2.1 PDP-5 Detection Monitoring Results

Groundwater monitoring is performed at PDP-5 under a Detection Monitoring Program implemented in accordance with the requirements of § 257.94. The initial detection monitoring samples were collected in September 2017 and subsequent detection monitoring samples were collected on a semi-annual basis in 2018 and 2019. The results from the 2017, 2018 and 2019 detection monitoring events were presented in the Annual Groundwater Monitoring and Corrective Action Reports for 2017, 2018 and 2019 (PBW, 2018b; Golder, 2019b; Golder, 2020b).

Data collected as part of each monitoring event are evaluated using procedures described in the Statistical Analysis Plan (PBW, 2017b) to identify statistically significant increases (SSIs) of Appendix III parameters over background concentrations. As described in Section 3.1.5, an intrawell data evaluation approach is used to compare the sample data to historical data at each groundwater monitoring well independently based on the following:

- Groundwater is mounded at PDP-5 and flows radially outward from the unit. Based on the direction of groundwater flow, there are no upgradient areas in the vicinity of PDP-5 and all of the CCR monitoring wells are downgradient wells.

- Although PDP-5 was constructed in 2010, coal ash surface impoundments have been operated in the vicinity of PDP-5 since 1979. As a result, groundwater conditions in the vicinity of PDP-5 are influenced by the historical operations of the closed former surface impoundments in the area. Intrawell data evaluations allow for a comparison of water quality data in each well against background values established from that well's own historical water quality data, which takes into account potential effects of the closed former surface impoundments on groundwater in the area.

- Use of intrawell data evaluations complies with CCR Rule requirements as well as EPA's *Unified Guidance: Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (EPA, 2009).

Table 3 shows the statistical background Appendix III constituent concentrations developed for each PDP-5 monitoring well and Table 4 summarizes the Appendix III concentrations reported in samples from the PDP-5

monitoring wells from 2017 through 2019.

Low concentrations of Appendix III constituents were reported in all wells from 2017 through 2019 as shown in Table 4 and SSIs were identified for boron and/or calcium in two wells (PDP-23 and PDP-25) during this period due to the low statistical background concentrations calculated for the constituents in these wells. In accordance with § 257.94(e)(2), Alternate Source Demonstrations (ASDs) prepared each year for PDP-5 determined that the reported SSIs were attributed to natural variation in groundwater quality and the closed former non-CCR Rule regulated coal ash surface impoundments beneath and adjacent to PDP-5 (Golder, 2019b; Golder, 2020b).

A similar ASD was prepared for PDP-5 based on the 2019 Semi-Annual Detection Monitoring Results and is reproduced in Appendix D; however, this most recent ASD has not been placed in the facility operating record since it will be included in the 2020 Annual Groundwater Monitoring and Corrective Action Report to be prepared in January 2021.

3.2.2 Conclusion

Detection monitoring performed to date at PDP-5 does not indicate evidence of a release of Appendix III constituents to groundwater. As a result, the Detection Monitoring Program continues to be performed at PDP-5 in accordance with the requirements of § 257.94.

3.3 Documentation That PDP-5 Meets the Location Restrictions - § 257.71(d)(1)(i)(B)(3)

A professional engineer-certified evaluation of PDP-5 against the location restriction criteria for existing CCR surface impoundments described in Sections 257.60 through 257.64 was completed in October 2018, placed in the MLSES Facility operating record, and posted to the facility's CCR public website (Golder, 2018). The location restriction evaluation concluded the following:

- The base of PDP-5 was determined to be > 5.0 feet above the upper limit of the uppermost aquifer, satisfying the separation criteria defined in § 257.60.
- PDP-5 was determined to not be located in wetlands as per § 257.61.
- PDP-5 was determined to not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time as per § 257.62.
- PDP-5 was determined to not be located in a Seismic Impact Zone as per § 257.63.
- PDP-5 was determined to not be located in an Unstable Area as per § 257.64.

The Location Restrictions Demonstration Report for PDP-5 is reproduced in Appendix E.

3.4 Structural Stability Assessment - § 257.71(d)(1)(i)(B)(4)

A professional engineer-certified Structural Stability Assessment report was completed in October 2016 for PDP-5 in accordance with the requirements of § 257.73(b) and § 257.73(d), placed in the MLSES Facility operating record, and posted to the facility's CCR public website (Golder, 2016a). The structural stability assessment concluded that PDP-5 complies with the structural stability requirements specified in § 257.73(d).

The Structural Stability Assessment Report for PDP-5 is reproduced in Appendix F.

The facility will complete a periodic stability assessment by October 2021 in accordance with the requirements of § 257.73(f).

3.5 Safety Factor Assessment - § 257.71(d)(1)(i)(B)(5)

A professional engineer-certified Safety Factor Assessment report was completed in October 2016 for PDP-5 in accordance with the requirements of § 257.73(b) and § 257.73(e), placed in the MLSES Facility operating record and posted to the facility's CCR public website (Golder, 2016b). The safety factor assessment concluded that the calculated factors of safety through the critical cross-sections satisfy the requirements specified in § 257.73(e).

The Safety Factor Assessment Report for PDP-5 is reproduced in Appendix G.

The facility will complete a periodic safety factor assessment by October 2021 in accordance with the requirements of § 257.73(f).

3.6 Other Supporting Documentation

3.6.1 Liner Design Criteria for Existing CCR Surface Impoundments (§ 257.71)

PDP-5 is constructed with a compacted clay liner measuring 3 feet thick on the sides and 2 feet thick on the bottom that exhibits a hydraulic conductivity of no more than 1 X 10^{-7} cm/sec.

PDP-5 liner construction documentation is discussed in Section 4 of this application.

3.6.2 Structural Integrity Criteria for Existing CCR Surface Impoundments (§ 257.73)

PDP-5 complies with the Structural Integrity Criteria for Existing CCR Surface Impoundments specified in § 257.73 as described above.

3.6.2.1 Identification Marker (§ 257.73(a)(1))

A permanent identification marker prepared in accordance with the requirements of §257.73(a)(1) has been installed at PDP-5.

3.6.2.2 Hazard Potential Classification Assessment (§ 257.73(a)(2))

A professional engineer-certified Hazard Potential Classification Assessment report was completed in October 2016 for PDP-5 in accordance with the requirements of § 257.73(a)(2), placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2016a). The hazard potential classification assessment concluded that PDP-5 is classified as a LOW hazard potential CCR surface impoundment. An Emergency Action Plan is not required for PDP-5 under § 257.73(a)(3) since PDP-5 is classified as a LOW hazard potential CCR surface impoundment. The facility will complete a periodic hazard potential classification assessment by October 2021 in accordance with the requirements of § 257.73(f)(3).

The Hazard Potential Classification Assessment Report for PDP-5 is reproduced in Appendix H.

3.6.2.3 History of Construction (§ 257.73(b) and (c))

PDP-5 was constructed in 2010 near three former coal ash surface impoundments (PDP-1, PDP-2 and PDP-3) (BM, 2016b). PDP-1 and PDP-2 began operation in 1979 and 1981, respectively, and were capped/closed in-place in 1983. PDP-3 was placed into operation in 1982 and was capped/closed in-place in 2009 prior to beginning construction of PDP-5. A fourth former coal ash surface impoundment (PDP-4) is located adjacent to

PDP-5 to the south. PDP-4 was constructed in 1982 and stopped receiving coal ash prior the 2015 effective date of the CCR Rule. PDP-4 was capped/closed in-place in 2017.

PDP-5 is constructed above grade and is surrounded by earthen embankments that extend approximately 10 to 15 feet above grade. PDP-5 is lined with a compacted clay liner measuring 3 feet thick on the sides and 2 feet thick on the bottom of the impoundment.

A professional engineer-certified History of Construction report was completed in October 2016 for PDP-5 in accordance with the requirements of § 257.73(b) and § 257.73(c), placed in the MLSES Facility operating record, and posted to the facility's CCR public website (B&M, 2016b).

The History of Construction Report for PDP-5 is reproduced in Appendix I.

3.6.3 Operating Criteria (§ 257.80, § 257.82, § 257.83)

PDP-5 complies with the Operating Criteria for Existing CCR Surface Impoundments specified in § 257.80, § 257.82, § 257.83 as described below.

3.6.3.1 Air Criteria (§ 257.80)

A professional engineer-certified Fugitive Dust Control Plan was prepared for the MLSES (including PDP-5) in accordance with the requirements of § 257.80(b) in October 2015, placed in the MLSES Facility operating record, and posted to the facility's CCR public website (Luminant, 2015). Annual fugitive dust control reports are prepared from the MLSES (including PDP-5) in accordance with the requirements of § 257.80(c), placed in the MLSES Facility operating record and posted to the facility's CCR public website.

3.6.3.2 Hydrologic and Hydraulic Capacity Requirements (§ 257.82)

A professional engineer-certified Inflow Design Flood Control System plan was completed in October 2016 for PDP-5 in accordance with the requirements of § 257.82(c), placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2016b). The inflow design flood control plan for PDP-5 adequately manages flow into the CCR unit during the 100-year flood. The facility will prepare a periodic inflow design flood control system plan in 2021 in accordance with the requirements of § 257.82(c)(4).

3.6.3.3 Inspection of CCR Surface Impoundments (§ 257.83)

PDP-5 is inspected in accordance with the requirements of § 257.83. Professional engineer-certified Annual CCR Unit Inspection reports were completed for 2015, 2017, 2018 and 2019 in accordance with the requirements of § 257.83(b), placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2016c; PBW, 2018a; Golder, 2019a; Golder, 2020a). In accordance with § 257.83(b)(4)(ii), an Annual CCR Unit Inspection Report was not prepared in 2016, since the structural stability assessment for PDP-5 was completed in 2016. The facility will upload the 2020 Annual Inspection Report by January of 2021.

The Annual CCR Unit Inspection Reports concluded that no actual or potential structural weakness of the CCR Unit were observed and no existing conditions are present that are disrupting or have the potential to disrupt the operation and safety of the CCR Unit.

3.6.4 Groundwater Monitoring and Corrective Action (§ 257.90 through § 257.98)

PDP-5 complies with the Groundwater Monitoring and Corrective Action requirements in § 257.90 through § 257.98 as described below.

3.6.4.1 Applicability (§ 257.90)

Groundwater monitoring is performed at PDP-5 as required in § 257.90 for Existing CCR Surface Impoundments. In accordance with the requirements of § 257.90(b), a groundwater monitoring system was installed, a groundwater sampling and analysis program (including statistical procedures used for evaluating groundwater monitoring data) was selected, a detection monitoring program was initiated, and groundwater monitoring data evaluation for statistically significant increases over background levels for Appendix III constituents was implemented at PDP-5 prior to October 17, 2017.

Professional engineer-certified Annual Groundwater Monitoring and Corrective Action Reports were prepared for PDP-5 for 2017, 2018 and 2019 in accordance with the requirements of § 257.90(e), placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2018b; Golder, 2019b; Golder, 2020b).

3.6.4.2 Groundwater Monitoring Systems (§ 257.91)

A CCR groundwater monitoring system has been installed at PDP-5 in accordance with the requirements of § 257.91. A professional engineer-certified Groundwater Monitoring System Certification document was completed in October 2017 for PDP-5 in accordance with the requirements of § 257.91(f), placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2017a). The PDP-5 CCR groundwater monitoring system is discussed in greater detail in Section 3.1 of this application.

3.6.4.3 Groundwater Sampling and Analysis Requirements (§ 257.93)

Groundwater monitoring is performed at PDP-5 in accordance with the requirements of § 257.93. A professional engineer-certified Statistical Analysis Plan was completed in October 2017 for PDP-5 in accordance with the requirements of § 257.93, placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2017b).

3.6.4.4 Detection Monitoring Program (§ 257.94)

A Detection Monitoring Program has been implemented at PDP-5 since 2017 in accordance with the requirements of § 257.94. The results of the PDP-5 Detection Monitoring Program for 2017, 2018 and 2019 are presented in the Annual Groundwater Monitoring and Corrective Action Reports (PBW, 2018b; Golder, 2019b; Golder, 2020b). The detection monitoring results from PDP-5 are discussed in greater detail in Section 3.2 of this application.

3.6.4.5 Assessment Monitoring Program (§257.95)

Implementation of an Assessment Monitoring Program has not been required at PDP-5 based on the detection monitoring results.

3.6.4.6 Assessment of Corrective Measures, Selection of Remedy, Implementation of Corrective Action Program (§ 257.96, § 257.97, § 257.98)

Assessment of Corrective Measures, Selection of Remedy and Implementation of Corrective Action Program has not been required at PDP-5 based on the detection monitoring results.

3.6.5 Closure and Post Closure Care (§ 257.101 through § 257.104)

PDP-5 is an active CCR Surface Impoundment. When closure of PDP-5 is necessary, PDP-5 will comply with the Closure and Post Closure Care requirements for Existing CCR Surface Impoundments specified in § 257.101 through § 257.104. Professional engineer-certified Closure and Post-Closure Plans were completed in October 2016 for PDP-5 in accordance with the requirements of § 257.102 and § 257.104, placed in the MLSES Facility operating record and posted to the facility's CCR public website (PBW, 2016d; PBW, 2016e). An alternative

closure demonstration pursuant to § 257.103(f)(1) was submitted to EPA for PDP-5 on September 29, 2020 and posted to the facility's CCR public website.

3.6.6 Recordkeeping, Notification, and Posting of Information to the Internet (§ 257.105 through § 257.107)

Luminant complies with the Recordkeeping, Notification, and Posting of Information to the Internet requirements specified in § 257.105 through § 257.107 for PDP-5. Luminant maintains a publicly accessible Internet site for PDP-5 CCR Rule information in accordance with the requirements of § 257.107.

4.0 DOCUMENTATION OF PDP-5 LINER CONSTRUCTION - § 257.71(d)(1)(i)(C)

PDP-5 is constructed with a compacted clay liner (CCL) measuring 3 feet thick on the sides and 2 feet thick on the bottom that exhibits a hydraulic conductivity of no more than 1 X 10^{-7} cm/sec. A professional engineer-certified Summary of Liner Construction Report prepared to document construction of the PDP-5 liner in accordance with the requirements of § 257.71(b) was completed in September 2016, placed in the MLSES Facility operating record and posted to the facility's CCR public website (B&M, 2016a). The Summary of Liner Construction Report for PDP-5 is reproduced in Appendix J.

A professional engineer-certified Soil and Liner Evaluation Report (SLER) was prepared to document on-site inspection, field testing and laboratory testing during construction of the PDP-5 CCL (ETTL, 2011). The format of the PDP-5 SLER was consistent with the format of soil liner evaluation reports used by the TCEQ for construction of soil liners at waste landfill sites. The conclusions of the SLER can be summarized as follows:

- The PDP-5 CCL was constructed in accordance with the technical specifications and drawings prepared for the project.

- The subgrade surface underlying the CCL was surveyed prior to placement of the first lift of CCL to document and verify proper subgrade elevations and subgrade inspections were performed prior to and during construction of the CCL. The subgrade was scarified a minimum of six inches to help provide bonding between the subgrade soils and first lift of CCL.

- All material used to construct the CCL originated from an on-site borrow source. Borrow soil proposed for the CCL was first sampled for Atterberg Limits and percent passing the No. 200 Sieve. If the liquid limit (LL) of the sample was 30 or greater, the plasticity index (PI) was 15 or greater, and at least 30% passed the No. 200 Sieve; then a moisture-density relationship test was performed in accordance with ASTM D 698. A remolded sample of the proposed liner material was then tested for hydraulic conductivity using ASTM D 5084 at 95% maximum dry density (ASTM D 698) at or above the optimum moisture content. The soil was visually monitored throughout construction to ensure that no rocks or stones larger than one inch in diameter were used in the CCL.

- The CCL was constructed in parallel, uniform lifts not exceeding nine inches loose, six inches compacted. Each lift was moisture conditioned and compacted to at least 95% of maximum dry density at or above optimum moisture content. The top of each lift was scarified prior to the placement of the next lift.

- Samples of the CCL were collected during construction and tested for Atterberg Limits and percent passing the No. 200 Sieve at a rate of at least one test per 100,000 square feet for each lift of CCL to confirm the applicable ASTM D 698 to be used for in-place moisture density testing.

- In place moisture-density tests were performed at a rate of one test per 8,000 square feet for each compacted CCL lift with a nuclear gauge calibrated daily (ASTM D 2922). Approximately 300 tests were performed per liner lift or approximately 1,200 tests for the constructed 2-foot thick bottom CCL.

- Undisturbed CCL samples were collected and subjected to hydraulic conductivity testing (ASTM D 5084) at a rate of one test per 100,000 square feet for each CCL lift. Twenty-four (24) hydraulic conductivity

tests were performed per liner lift or ninety-six (96) hydraulic conductivity tests for the constructed 2-foot thick bottom CCL.

- The top of the CCL was smooth-wheeled rolled using a smooth drum roller prior to final liner-thickness surveying. Liner thickness verification was performed by instrument survey methods at a minimum rate of one verification point per 10,000 square feet of surface area.

- The results of field observation and field and laboratory testing indicate that the CCL was constructed to minimum thicknesses of 3 feet on the sides and 2 feet on the bottom. All in-situ moisture-density tests indicated that the CCL was compacted to at least 95% of maximum dry density at or above optimum moisture content. All undisturbed CCL samples exhibited hydraulic conductivities of no more than 1 X 10^{-7} cm/sec.

A copy of the SLER is included in Appendix K.

5.0 SURFACE IMPOUNDMENT NOT LOCATED ADJACENT TO WATER BODY - § 257.71(d)(1)(i)(D)

As shown on Figure 1, PDP-5 is not located adjacent to a water body, thus the requirements of § 257.71(d)(1)(i)(D) do not apply to PDP-5.

6.0 REFERENCES

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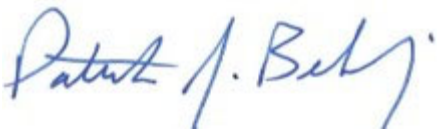
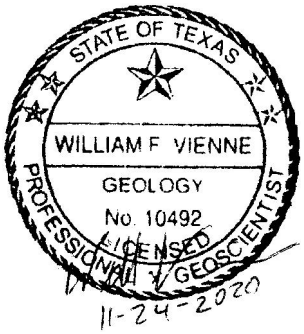
Signature Page

Golder Associates Inc.



Patrick J. Behling, P.E.
Principal Engineer

Senior Hydrogeologist



TABLES

TABLE 1
MONITORING WELL CONSTRUCTION SUMMARY
MLSES - PDP-5

Well ID	Date Installed	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Total Design Depth (ft bgs)	Casing Diameter (in)
MW-17A	10/01/08	228279	2902653	384.57	387.75	27	47	20	47	2
MW-18A	10/02/08	228860	2902563	410.89	414.44	47	67	20	67	2
MW-19	09/30/08	229492	2902142	367.98	371.33	10	25	15	25	2
MW-20A	09/30/08	228847	2901077	395.74	398.98	10	40	30	41	2
PDP-22	09/09/15	229672	2901564	383.90	386.75	35	60	25	60	2
PDP-23	09/10/15	229231	2902465	391.06	394.43	35	45	10	45	2
PDP-24	09/11/15	228132	2902782	387.06	389.73	30	40	10	40	2
PDP-25	09/11/15	227735	2901945	385.13	387.97	50	60	10	60	2
PDP-26	09/09/15	227663	2900878	394.29	397.68	39	49	10	49	2

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.

TABLE 2
GROUNDWATER ELEVATION SUMMARY
MLSES - PDP-5

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft bgs)	Water Elevation (ft amsl)
MW-17A	387.75	10/19/15	18.69	369.06
		12/14/15	17.14	370.61
		02/24/16	16.80	370.95
		04/05/16	16.46	371.29
		06/06/16	15.62	372.13
		08/09/16	16.14	371.61
		10/17/16	16.39	371.36
		12/11/16	18.17	369.58
		09/21/17	17.93	369.82
		06/13/18	17.62	370.13
		09/11/18	18.44	369.31
		05/13/19	15.09	372.66
		11/05/19	17.58	370.17
MW-18A	414.44	10/20/15	37.41	377.03
		12/14/15	35.92	378.52
		02/24/16	34.84	379.60
		04/05/16	33.88	380.56
		06/06/16	33.96	380.48
		08/09/16	33.04	381.40
		10/17/16	35.31	379.13
		12/11/16	37.46	376.98
		09/21/17	38.44	376.00
		06/13/18	37.81	376.63
		09/11/18	39.10	375.34
		05/13/19	32.21	382.23
		11/05/19	35.11	379.33
MW-19	371.33	10/20/15	12.60	358.73
		12/14/15	5.14	366.19
		02/24/16	5.56	365.77
		04/05/16	5.99	365.34
		06/06/16	5.31	366.02
		08/09/16	9.59	361.74
		10/17/16	6.81	364.52
		12/11/16	9.06	362.27
		09/21/17	6.17	365.16
		06/13/18	10.59	360.74
		09/11/18	14.24	357.09
		05/13/19	3.51	367.82
		11/05/19	7.29	364.04
MW-20A	398.98	10/20/15	25.17	373.81
		12/14/15	23.64	375.34
		02/24/16	23.44	375.54
		04/05/16	23.23	375.75
		06/06/16	22.39	376.59
		08/09/16	23.92	375.06
		10/17/16	24.47	374.51
		12/11/16	25.96	373.02
		09/21/17	25.86	373.12
		06/13/18	25.61	373.37
		09/11/18	26.80	372.18
		11/05/19	25.24	373.74
		05/13/19	21.64	377.34

TABLE 2
GROUNDWATER ELEVATION SUMMARY
MLSES - PDP-5

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft bgs)	Water Elevation (ft amsl)
PDP-22	386.75	10/20/15	34.17	352.58
		12/14/15	33.48	353.27
		02/24/16	33.09	353.66
		04/05/16	32.66	354.09
		06/06/16	33.49	353.26
		08/09/16	32.21	354.54
		10/17/16	32.59	354.16
		12/11/16	34.37	352.38
		09/21/17	33.14	353.61
		06/13/18	33.12	353.63
		09/11/18	33.86	352.89
		05/13/19	30.47	356.28
		11/05/19	32.78	353.97
PDP-23	394.43	10/20/15	23.61	370.82
		12/14/15	22.34	372.09
		02/24/16	19.94	374.49
		04/05/16	19.29	375.14
		06/06/16	18.11	376.32
		08/09/16	21.41	373.02
		10/17/16	22.51	371.92
		12/11/16	23.04	371.39
		09/21/17	23.98	370.45
		06/13/18	22.89	371.54
		09/11/18	24.69	369.74
		05/13/19	17.92	376.51
		11/05/19	23.27	371.16
PDP-24	389.73	10/20/15	25.62	364.11
		12/14/15	24.94	364.79
		02/24/16	24.76	364.97
		04/05/16	24.51	365.22
		06/06/16	23.87	365.86
		08/09/16	22.61	367.12
		10/17/16	22.08	367.65
		12/11/16	24.19	365.54
		09/21/17	23.29	366.44
		06/13/18	23.21	366.52
		09/11/18	23.62	366.11
		05/13/19	23.62	366.11
		11/05/19	25.29	364.44
PDP-25	387.97	10/20/15	13.49	374.48
		12/14/15	12.76	375.21
		02/24/16	26.84	361.13
		04/05/16	26.96	361.01
		06/06/16	26.17	361.80
		08/09/16	26.06	361.91
		10/17/16	27.83	360.14
		12/11/16	29.71	358.26
		09/21/17	28.21	359.76
		06/13/18	27.71	360.26
		09/11/18	28.94	359.03
		05/13/19	26.23	361.74
		11/05/19	25.06	362.91

TABLE 2
GROUNDWATER ELEVATION SUMMARY
MLSES - PDP-5

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft bgs)	Water Elevation (ft amsl)
PDP-26	397.68	10/20/15	31.24	366.44
		12/14/15	30.67	367.01
		02/24/16	30.11	367.57
		04/05/16	29.89	367.79
		06/06/16	29.06	368.62
		08/09/16	29.54	368.14
		10/17/16	30.57	367.11
		12/11/16	32.81	364.87
		09/21/17	32.22	365.46
		06/13/18	32.18	365.50
		09/11/18	32.90	364.78
		05/13/19	28.93	368.75
		11/05/19	32.83	364.85

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface

Table 3
Statistical Background Values for Detection Monitoring Program
MLSES - PDP 5

Sample Location	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Flouride (mg/L)	field pH (s.u.)	Sulfate (mg/L)	TDS (mg/L)
MW-17A	0.538	6.73	10.4	0.4	2.5 9.19	51.9	170
MW-18A	0.20	3.1	10.4	0.4	4.88 7.92	9.1	157
MW-19	0.782	237	57.7	0.512	4.6 8.08	672	1,380
MW-20A	0.213	25.7	12.3	0.954	3.06 8.76	148	381
PDP-22	0.411	306	32.7	1.07	4.08 8.63	216	1,780
PDP-23	0.0678	2	7.52	0.4	3.38 8.45	3.27	143
PDP-24	4.92	45.9	22.6	1.03	1.33 9.97	533	894
PDP-25	0.136	41.3	197	0.4	4.65 7.93	118	705
PDP-26	0.111	4.74	14.6	0.577	5.35 7.57	64.6	438

Table 4
Detection Monitoring Program
Appendix III Analytical Results Summary
MLSES - PDP-5

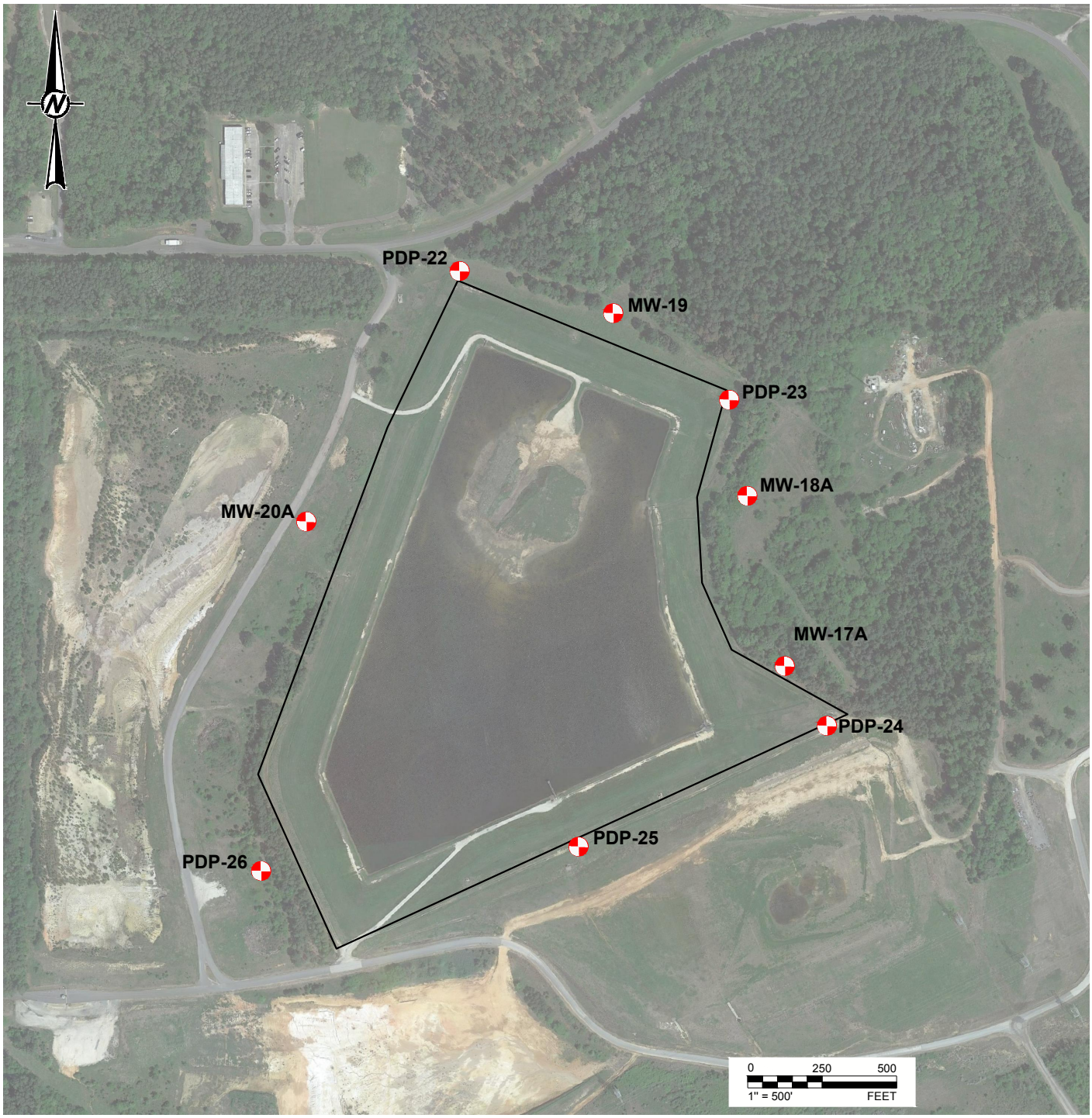
Sample Location	Date Sampled	B (mg/L)	Ca (mg/L)	Cl (mg/L)	Fl (mg/L)	field pH (s.u.)	SO_4 (mg/L)	TDS (mg/L)
MW-17A	09/22/17	0.402	3.1	8.3	<0.1	6.78	31.2	111
	06/14/18	0.485	6.48	9.16	<0.1	6.87	45.9	129
	09/11/18	0.523	5.06	8.82	0.179 J	5.03	43.1	137
	05/13/19	0.497	4.88	9.18	<0.1	6.79	44.7	145
	11/07/19	0.52	5.05	8.81	<0.100	6.44	43.9	127
MW-18A	09/21/17	0.0654	1.04	5.27	<0.1	6.94	3.23	45
	06/14/18	0.102	2	6.56	<0.1	6.92	3.48	71
	09/12/18	0.211	3.23	9.06	<0.1	5.69	4.82	150
	11/7/2018 re-sample	0.128	--	--	--	--	--	--
	05/13/19	0.117	1.01	6.17	0.138 J	6.64	3.23	73
	11/07/19	0.127	11.5	6.34	<0.100	6.23	3.67	68
MW-19	09/22/17	0.0677	2.74	5.36	<0.1	6.94	1.46 J	98
	06/14/18	0.577	133	24.4	0.216 J	6.78	328	758
	09/11/18	0.243	38	65.1	0.228 J	6.04	166	597
	11/7/2018 re-sample	--	--	5.22	--	--	--	--
	05/13/19	0.429	122	26.8	0.229 J	6.72	349	813
	11/08/19	0.529	77.8	49.3	0.189 J	6.87	310	844
MW-20A	09/22/17	0.0807	17.4	12.6	0.175 J	6.71	74.2	237
	02/21/18 re-sample	--	--	10.7	--	--	--	--
	06/13/18	0.171	24	10.9	0.672	6.72	132	250
	09/11/18	0.141	7.16	11	0.235 J	4.70	39.1	154
	05/13/19	0.239	37.4	10.2	0.731	6.81	178	328
	11/08/19	0.132	9.9	10.2	0.465	6.51	88	205
PDP-22	09/22/17	0.221	92.5	12.3	0.321 J	6.98	178	558
	06/14/18	0.115	7.78	11.8	0.239	6.63	186	491
	09/12/18	0.164	61.1	10.9	0.216 J	5.88	143	476
	05/13/19	0.158	98.2	10.1	0.303 J	6.86	184	615
	11/12/19	0.226	34.3	12.6	0.218 J	6.93	215	482

Table 4
Detection Monitoring Program
Appendix III Analytical Results Summary
MLSES - PDP-5

Sample Location	Date Sampled	B (mg/L)	Ca (mg/L)	Cl (mg/L)	Fl (mg/L)	field pH (s.u.)	SO_4 (mg/L)	TDS (mg/L)
PDP-23	09/22/17	0.0463	2.34	4.48	0.147 J	6.77	1.47 J	111
	02/21/18 re-sample	--	2.37	--	--	--	--	--
	06/13/18	0.0357	2.29	6.21	<0.1	6.82	1.26 J	98
	09/11/18	0.0760	1.96	6.38	<0.1	5.32	1.52 J	98
	11/7/2018 re-sample	0.0683	--	--	--	--	--	--
	05/13/19	0.0628	1.89	6.98	<0.1	6.68	1.28 J	103
	11/12/19	0.0675	2.14	4.98	<0.100	6.72	1.41 J	93
PDP-24	09/22/17	3.01	25.8	17.5	0.898	6.95	231	440
	06/14/18	2.71	23.9	21.1	0.629	6.82	284	481
	09/11/18	4.08	41.6	19.4	0.832	4.20	460	760
	05/13/19	3.23	23	21	0.871	6.95	300	537
	11/12/19	3	21.9	20.6	0.751	6.87	295	520
	11/12/19	2.97	22.2	20.5	0.744	6.87	300	504
PDP-25	09/22/17	0.133	36.8	130	0.157 J	6.81	89.1	481
	06/14/18	0.119	40.4	111	<0.1	6.78	73.4	439
	09/11/18	0.167	36.2	135	0.115 J	5.87	90.3	469
	11/7/2018 re-sample	0.142	--	--	--	--	--	--
	05/13/19	0.144	44.4	108	0.121 J	6.84	69	469
	11/12/19	0.184	38.6	117	<0.100	6.82	71.4	454
PDP-26	09/22/17	0.0343	2.32	5.24	0.157 J	6.84	5.88	107
	06/14/18	0.0225 J	2.93	4.8	<0.1	6.89	4.27	100
	09/12/18	0.0371	2.37	4.88	<0.1	6.07	2.66 J	107
	05/13/19	0.0528	1.9	4.59	0.217 J	6.86	2.7 J	106
	11/12/19	0.0622	2.25	4.64	0.122 J	6.77	2.1 J	102

Notes:
1. "--" - not analyzed
2. J - concentration is below sample quantitation limit; result is an estimate.

FIGURES



LEGEND

CCR MONITORING WELL

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT

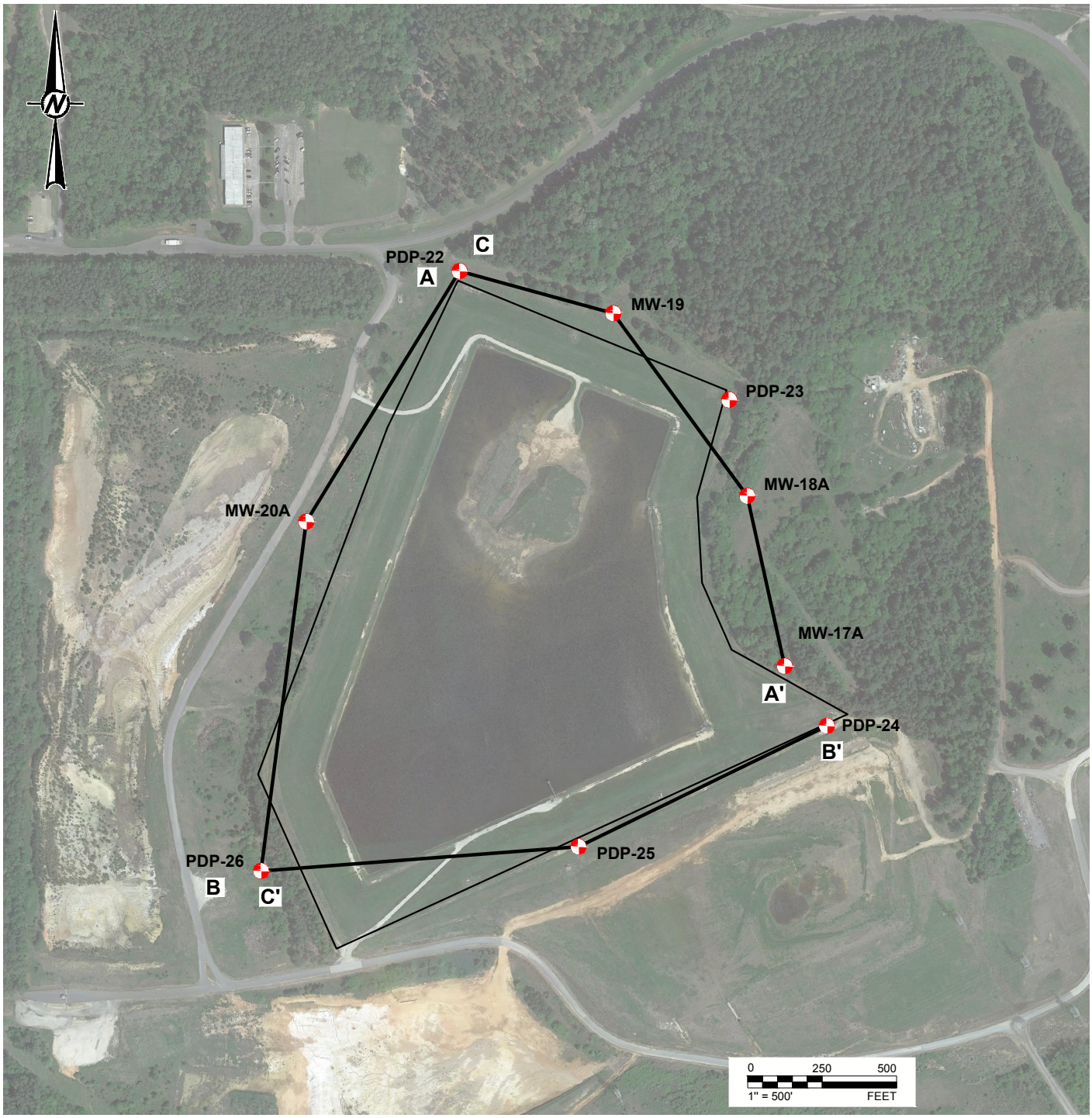
PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5
SITE MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-30
DESIGNED	AJD
PREPARED	TNB
REVIEWED	WFV
APPROVED	WFV

PROJECT NO. 20142271 | REV. 0 | FIGURE 1



LEGEND

CCR MONITORING WELL

A — A' GEOLOGIC CROSS SECTION LOCATION LINES

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT

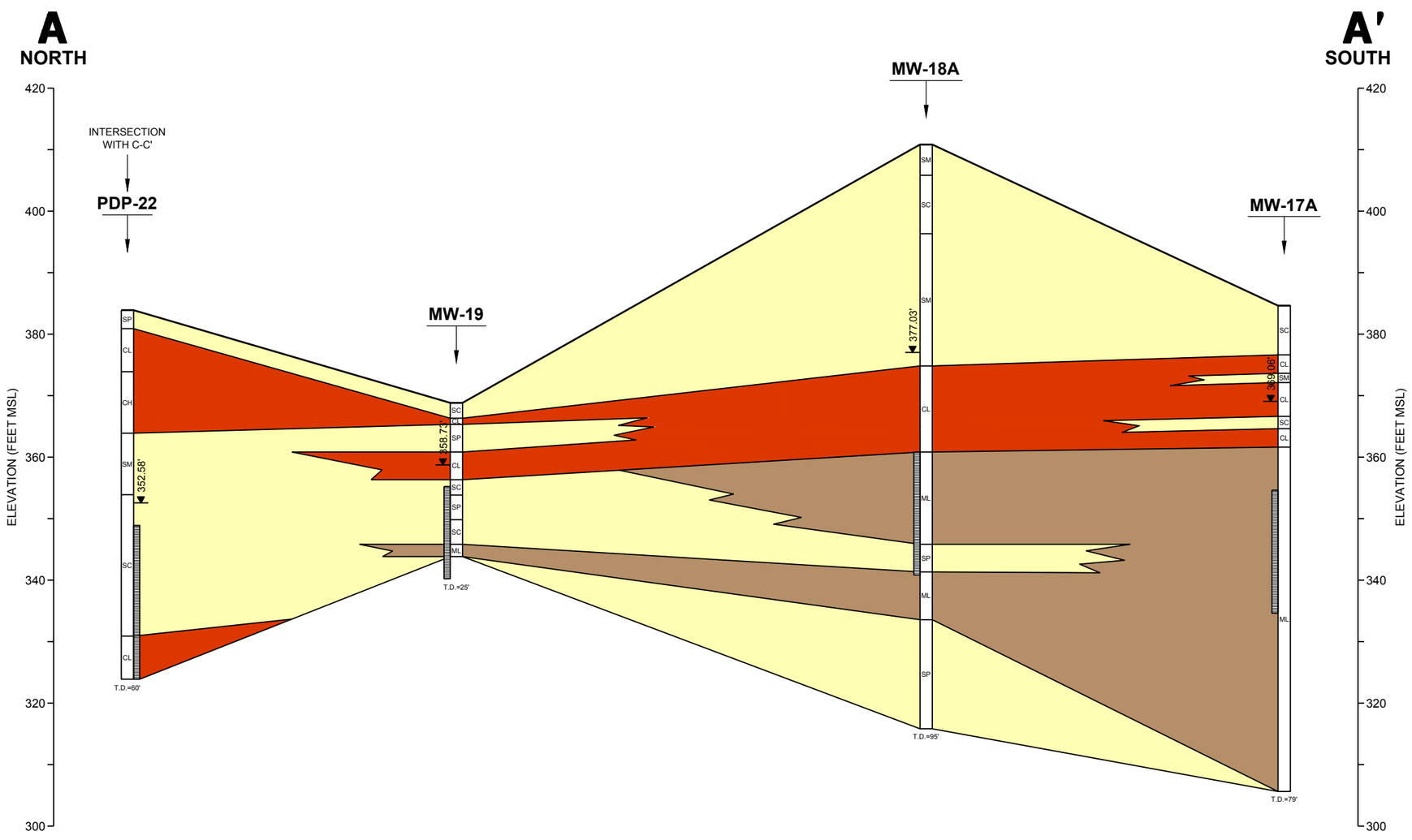
PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5
CROSS SECTION LOCATION MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-22
DESIGNED	AJD
PREPARED	PJM
REVIEWED	WFV
APPROVED	WFV

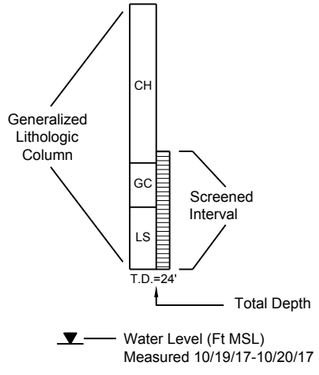
PROJECT NO. 20142271 | REV. 0 | FIGURE 2



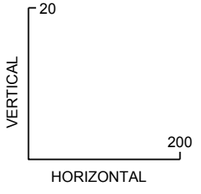
LEGEND

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



SCALE IN FEET



10x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5 AREA
GEOLOGIC CROSS SECTION - A-A' NORTH SIDE OF PDP 5

CONSULTANT
GOLDER

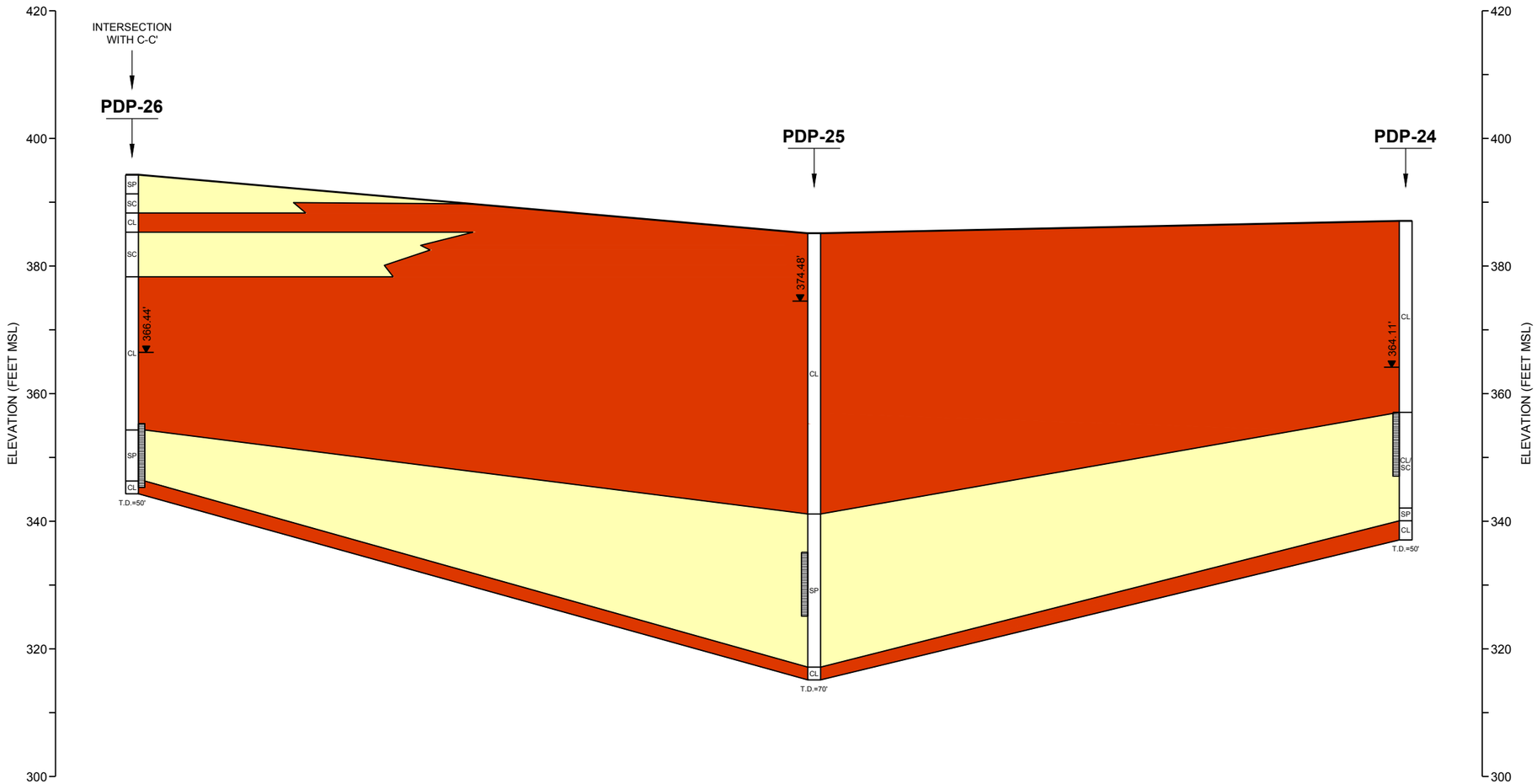
YYYY-MM-DD	2020-06-22
DESIGNED	AJD
PREPARED	PJM
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 20142271 | REV. 0 | FIGURE 3

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

B
WEST

B′
EAST



SCALE IN FEET

20 VERTICAL

200 HORIZONTAL

10x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5 AREA
GEOLOGIC CROSS SECTION - B-B' SOUTH SIDE OF PDP 5

CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-22
DESIGNED	AJD
PREPARED	PJM
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 20142271 | REV. 0 | FIGURE 4

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

1 in
0

C
NORTH

C'
SOUTH

INTERSECTION WITH A-A'

INTERSECTION WITH B-B'

PDP-22

MW-20A

PDP-26

ELEVATION (FEET MSL)

420
400
380
360
340
320

352.58'

373.81'

366.44'

T.D.=60'

T.D.=50'

SP
CL
CH
SM
SC
ML
NR

SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5 AREA
GEOLOGIC CROSS SECTION - C-C' NORTH SIDE OF PDP 5

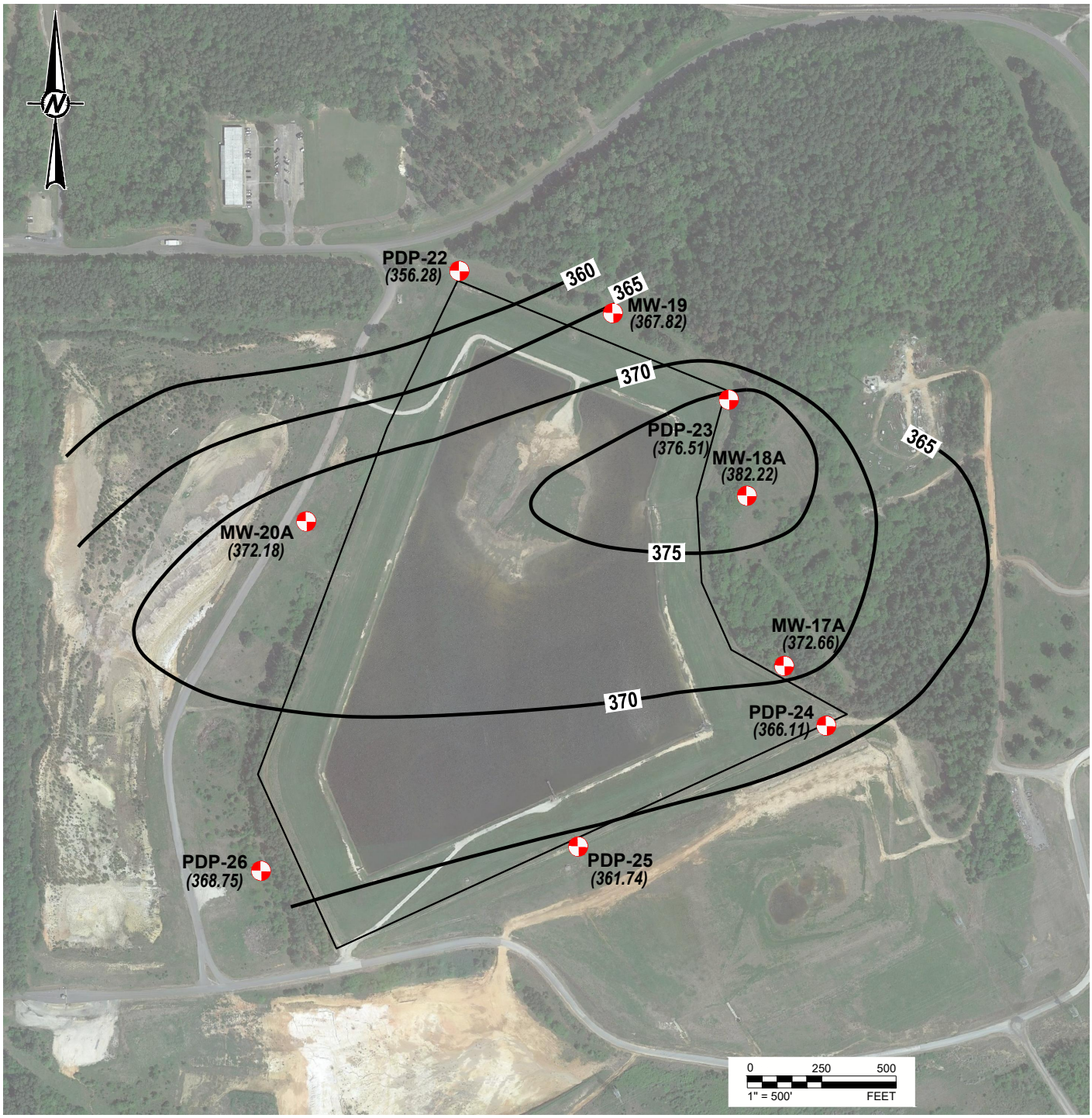
CONSULTANT
GOLDER

YYYY-MM-DD	2020-06-22
DESIGNED	AJD
PREPARED	PJM
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 20142271
REV. 0
FIGURE 5

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

Path: \\texarkana.golder.gds\data\Projects - Round Rock_2020\20142271 - Luminant\PRODUCTION\Martin Lake\ | File Name: FIG 3-5 - Cross Sections.dwg | Last Edited By: adiamond Date: 2020-06-22 Time:3:25:12 PM | Printed By: PMcBride Date: 2020-06-26 Time:7:59:31 AM



LEGEND

- CCR MONITORING WELL
- (374.34) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- 360 GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 5 FT)

NOTE(S)

1. MAY 13, 2019 WATER LEVELS USED TO CONSTRUCT POTENTIOMETRIC SURFACE CONTOURS.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/6/17.

CLIENT
LUMINANT

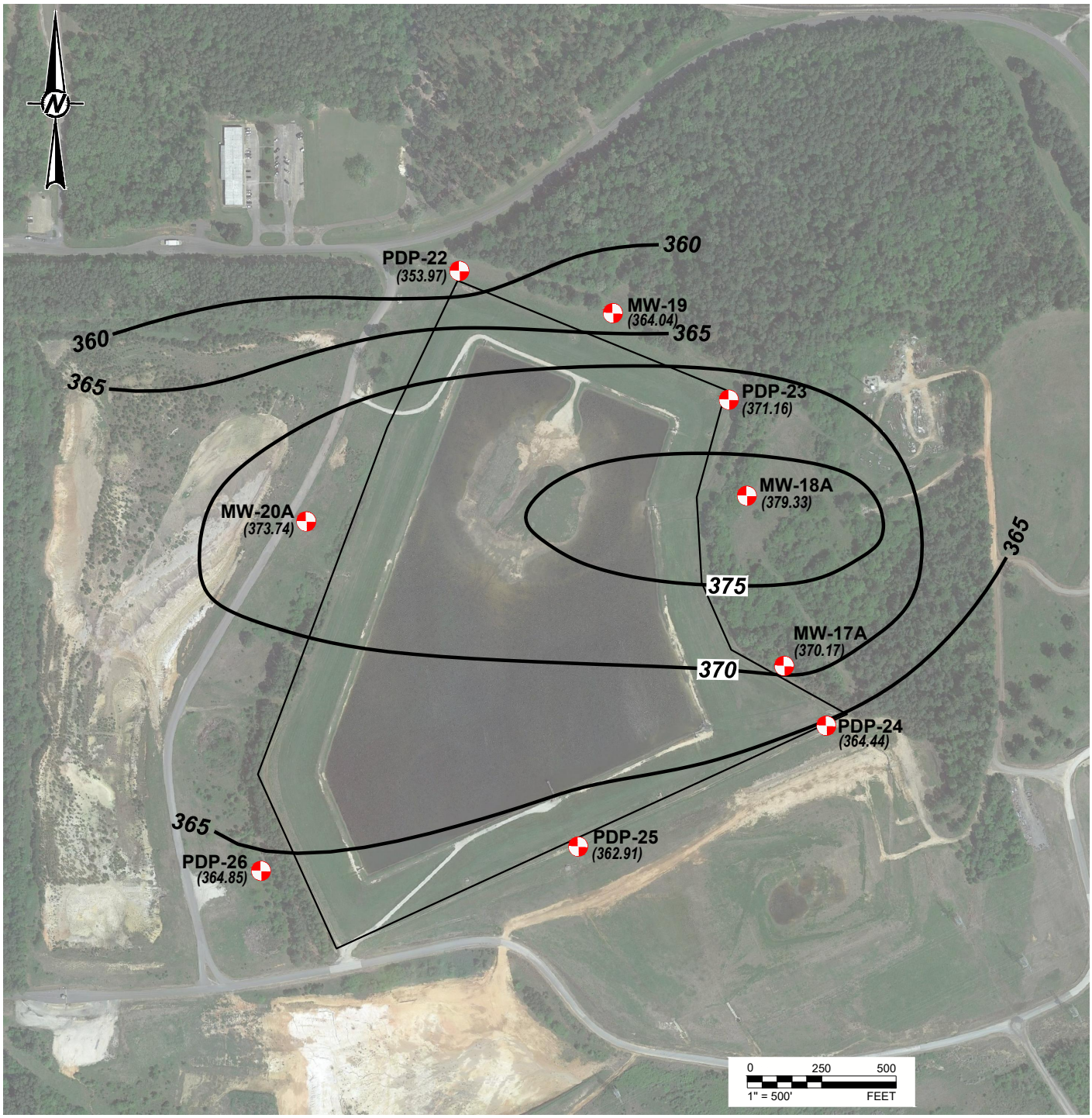
PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5
POTENTIOMETRIC SURFACE MAP
MAY 13, 2019

CONSULTANT
GOLDER

YYYY-MM-DD	2019-06-24
DESIGNED	AJD
PREPARED	AJD
REVIEWED	WFV
APPROVED	WFV

PROJECT NO.	REV.	FIGURE
20142271	0	6



LEGEND

- CCR MONITORING WELL
- (362.91) GROUNDWATER POTENTIOMETRIC SURFACE (FT MSL)
- GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR (C.I. = 5 FT)

NOTE(S)

1. NOVEMBER 5, 2019 WATER LEVELS USED TO CONSTRUCT POTENTIOMETRIC SURFACE CONTOURS.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 4/9/19.

CLIENT
LUMINANT

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

TITLE
PDP 5
POTENTIOMETRIC SURFACE MAP - NOVEMBER 5, 2019

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-30
DESIGNED	AJD
PREPARED	TNB
REVIEWED	WFV
APPROVED	WFV

PROJECT NO. 20142271 | REV. ---- | FIGURE 7

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

0 1 in

Last Edited By: adiamond Date: 2020-06-22 Time:3:06:04 PM | Printed By: PMcBride Date: 2020-06-26 Time:7:46:02 AM
Path: \\texarkana.golder.gds\data\Projects - Round Rock_2020\20142271 - Luminant\PRODUCTION\Martin Lake\ | File Name: FIG 7 - POT Surface Map-PDP 5 (November 2019).dwg

APPENDIX A

PDP-5 Groundwater Monitoring System Certification

COAL COMBUSTION RESIDUAL RULE
GROUNDWATER MONITORING SYSTEM CERTIFICATION

MARTIN LAKE STEAM ELECTRIC STATION
PERMANENT DISPOSAL POND 5
RUSK COUNTY, TEXAS

OCTOBER 16, 2017

Prepared For:

Luminant Generation Company, LLC
6555 Sierra Drive
Irving, TX 75039

Prepared By:

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, Texas 78664
Texas Engineering Firm No. 4760

October 16, 2017

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the groundwater monitoring system installed at the referenced facility has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

Patrick J. Behling, P.E.
Principal Engineer
PASTOR, BEHLING & WHEELER, LLC

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1.0 INTRODUCTION

Luminant Power (Luminant) operates the Martin Lake Steam Electric Station (MLSES) located approximately 5 miles southeast of Tatum, Rusk County, Texas (Figure 1). The MLSES consists of three coal/lignite-fired power generation units. Coal Combustion Residuals (CCRs) including fly ash, bottom ash and gypsum are generated as part of the MLSES unit operations. Currently, CCRs generated at the MLSES are transported off-site for beneficial use by third-parties or are managed by Luminant in surface impoundments located on the MLSES property or the A1 Area Landfill located approximately 2.5 miles east of the MLSES. Three CCR Units have been identified within the MLSES operations, the Ash Pond Area (the West Ash Pond (WAP) East Ash Pond (EAP), and the New Scrubber Pond), Permanent Disposal Pond 5 (PDP 5), and A1 Area Landfill. This report discusses PDP 5 (the Site). PDP 5 meets the definition of a CCR surface impoundment and is subject to groundwater monitoring system requirements of the CCR Rule.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by the EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes national minimum criteria for existing and new CCR landfills, existing and new CCR surface impoundments, and lateral expansions to landfills/impoundments. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to evaluate and certify that the groundwater monitoring system at the Site in accordance with Section 257.91 of the CCR Rule.

1.1 Description of PDP 5

PDP 5 was constructed in 2010 and is located approximately 3,000 feet west of the MLSES power units (Figure 2). It is used for emergency storm water storage and for storage of material from the ash ponds and New Scrubber Pond during cleaning cycles (BM, 2015).

Based on drawings provided by Luminant and included in the BM report, PDP 5 is lined with compacted soil measuring 3 feet thick on its sides and 2 feet thick on its bottom (BM, 2015). PDP 5 is built on top of three closed and capped landfills (PDP 1, PDP 2, and PDP 3). PDP 4, which is located adjacent to PDP 5

to the south, is also a closed and capped landfill. PDP 1 through PDP 4 are not considered regulated units under the CCR Rule.

1.2 CCR Unit Groundwater Monitoring System Requirements

Section 257.91 of the CCR Rule indicates that existing CCR landfills and surface impoundments be provided with a groundwater monitoring system that consists of sufficient wells, installed at appropriate location and depths, to yield groundwater samples from the uppermost aquifer that meet the following criteria:

- Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit; and
- Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary to ensure detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

The specific configuration of the groundwater monitoring system must be determined based on site-specific technical information that must include aquifer thickness, groundwater flow rate, groundwater flow direction (including seasonal and temporal fluctuation in groundwater flow), saturated and unsaturated geologic units and fill materials that overly the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the upmost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.

At a minimum, the monitoring system must consist of at least one upgradient and three downgradient monitoring wells, and any additional monitoring wells necessary to accurately represent the quality of the background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit. Multi-unit groundwater monitoring systems are allowed but must be equally as capable of detecting monitored constituents at the waste boundary of a CCR unit as individual groundwater monitoring wells.

Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space above the sampling depth must be sealed to prevent contamination of samples and the groundwater. There must be documentation in the operating

record of the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified engineer must have access to and must review this documentation as part of the groundwater monitoring system certification.

2.0 GROUNDWATER MONITORING SYSTEM EVALUATION

2.1 PDP 5 Groundwater Monitoring System

The CCR groundwater monitoring well system at PDP 5 consists of nine monitoring wells (MW-17A, MW-18A, MW-19, MW-20A, PDP-22, PDP-23, PDP-24, PDP-25, PDP-26) that are each screened in the uppermost aquifer at the Site. The locations of the CCR monitoring wells are shown on Figure 2. Well construction information and survey data for the CCR wells are summarized in Table 1, CCR monitoring well logs are presented in Appendix A, and photographs of the CCR wells are presented in Appendix B.

2.2 Local Geology and Hydrogeology

PDP 5 is located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1965). PBW reviewed current and historical soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions at PDP 5. Geologic cross sections were constructed using these data. Cross section locations are presented on Figure 3 and the cross sections are presented on Figures 4, 5, and 6.

The geologic units encountered during the completion of monitoring wells/soil borings in the PDP 5 Area include: (1) an upper sand unit observed on hilltops and other topographically high areas, (2) an intermediate continuous clay unit that contains discontinuous, interbedded sand layers, and (3) a lower unit of silt and sand that contains discontinuous packages of relatively thick, interbedded clay. Based on information provided by Luminant, PDP 5 is completed entirely within the upper hilltop sand unit. The uppermost aquifer at the Site occurs in the lower unit of silt and sand that contains discontinuous packages of relatively thick, interbedded clay.

2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the PDP 5 CCR monitoring well system from October 2015 to December 2016. Static water levels measured during the background monitoring period indicated water elevations ranging from 352.38 feet above mean sea level (amsl) to 381.40 feet amsl, and depths to water ranging from 5.14 feet bgs to 37.46 feet bgs (Table 2). Groundwater potentiometric surface maps based on data collected during the background monitoring period are presented in Appendix C.

Groundwater is mounded at PDP 5, with an inferred groundwater flow direction radially outward from the unit. Based on the inferred direction of groundwater flow, there are no upgradient areas in the immediate vicinity of PDP 5. All of the CCR monitoring wells, which are positioned radially around PDP 5, are downgradient wells.

2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells PDP-22, PDP-25, and PDP-26 on October 7, 2015 to evaluate groundwater linear flow velocities at the uppermost aquifer at the Site. Slug test data and time-head change plots used to calculate hydraulic conductivities and transmissivities of the uppermost aquifer are provided in Appendix D. A summary of these hydraulic properties is presented in Table 3. The average hydraulic conductivities for the wells ranged from 2.48×10^{-5} cm/sec (well PDP-22) to 1.37×10^{-4} cm/sec (well PDP-25), with a geometric mean for the test wells of 4.40×10^{-5} cm/sec.

2.5 Conclusions

The CCR groundwater monitoring well system at PDP 5 complies with Section 257.91 of the CCR Rule. This conclusion is supported by the following as described in detail in previous sections of this report:

- Nine monitoring wells are included in the CCR groundwater monitoring system. Based on the inferred direction of groundwater flow there are no upgradient areas in the immediate vicinity of PDP 5, and all of the CCR monitoring wells, which are positioned radially around PDP 5, are downgradient wells.
- Each monitoring well is screened in the uppermost aquifer at the Site. Samples collected from the downgradient wells will ensure detection of groundwater contamination in the uppermost aquifer from the CCR unit.
- The monitoring wells are constructed with appropriate well casing to maintain the integrity of the monitoring well borehole and with slotted well screens to enable collection of groundwater samples. In addition, the annular space above the well screen is appropriately sealed to prevent contamination of groundwater samples from surface sources.
- Appropriate documentation exists concerning the design, installation, and development of the monitoring wells.

3.0 REFERENCES

Barnes, Virgil E., 1965. Geologic Atlas of Texas, Tyler Sheet. Texas Bureau of Economic Geology.

Burns & McDonnell Engineering Company, Inc (BM), 2015. CCR Study for Martin Lake Steam Electric Station – Final Draft. June 2015.

Tables

TABLE 1
WELL CONSTRUCTION SUMMARY
PERMANENT DISPOSAL POND 5
MARTIN LAKE STEAM ELECTRIC STATION

Well ID	Date Installed	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length (ft)	Total Design Depth (ft bgs)	Casing Diameter (in)
MW-17A	10/01/08	228279	2902653	384.57	387.75	27	47	20	47	2
MW-18A	10/2/08	228860	2902563	410.89	414.44	47	67	20	67	2
MW-19	9/30/08	229492	2902142	367.98	371.33	10	25	15	25	2
MW-20A	9/30/08	228847	2901077	395.74	398.98	10	40	30	41	2
PDP-22	9/9/15	229672	2901564	383.90	386.75	35	60	25	60	2
PDP-23	9/10/15	229231	2902465	391.06	394.43	35	45	10	45	2
PDP-24	9/11/15	228132	2902782	387.06	389.73	30	40	10	40	2
PDP-25	9/11/15	227735	2901945	385.13	387.97	50	60	10	60	2
PDP-26	9/9/15	227663	2900878	394.29	397.68	39	49	10	49	2

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.

TABLE 2
GROUNDWATER ELEVATION SUMMARY
PERMANENT DISPOSAL POND 5
MARTIN LAKE STEAM ELECTRIC STATION

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft bgs)	Water Elevation (ft amsl)
MW-17A	387.75	10/19/15	18.69	369.06
		12/14/15	17.14	370.61
		02/24/16	16.80	370.95
		04/05/16	16.46	371.29
		06/06/16	15.62	372.13
		08/09/16	16.14	371.61
		10/17/16	16.39	371.36
		12/11/16	18.17	369.58
MW-18A	414.44	10/20/15	37.41	377.03
		12/14/15	35.92	378.52
		02/24/16	34.84	379.60
		04/05/16	33.88	380.56
		06/06/16	33.96	380.48
		08/09/16	33.04	381.40
		10/17/16	35.31	379.13
		12/11/16	37.46	376.98
MW-19	371.33	10/20/15	12.60	358.73
		12/14/15	5.14	366.19
		02/24/16	5.56	365.77
		04/05/16	5.99	365.34
		06/06/16	5.31	366.02
		08/09/16	9.59	361.74
		10/17/16	6.81	364.52
		12/11/16	9.06	362.27
MW-20A	398.98	10/20/15	25.17	373.81
		12/14/15	23.64	375.34
		02/24/16	23.44	375.54
		04/05/16	23.23	375.75
		06/06/16	22.39	376.59
		08/09/16	23.92	375.06
		10/17/16	24.47	374.51
		12/11/16	25.96	373.02
PDP-22	386.75	10/20/15	34.17	352.58
		12/14/15	33.48	353.27
		02/24/16	33.09	353.66
		04/05/16	32.66	354.09
		06/06/16	33.49	353.26
		08/09/16	32.21	354.54
		10/17/16	32.59	354.16
		12/11/16	34.37	352.38
PDP-23	394.43	10/20/15	23.61	370.82
		12/14/15	22.34	372.09
		02/24/16	19.94	374.49
		04/05/16	19.29	375.14
		06/06/16	18.11	376.32
		08/09/16	21.41	373.02
		10/17/16	22.51	371.92
		12/11/16	23.04	371.39

TABLE 2
GROUNDWATER ELEVATION SUMMARY
PERMANENT DISPOSAL POND 5
MARTIN LAKE STEAM ELECTRIC STATION

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft bgs)	Water Elevation (ft amsl)
PDP-24	389.73	10/20/15	25.62	364.11
		12/14/15	24.94	364.79
		02/24/16	24.76	364.97
		04/05/16	24.51	365.22
		06/06/16	23.87	365.86
		08/09/16	22.61	367.12
		10/17/16	22.08	367.65
		12/11/16	24.19	365.54
PDP-25	387.97	10/20/15	13.49	374.48
		12/14/15	12.76	375.21
		02/24/16	26.84	361.13
		04/05/16	26.96	361.01
		06/06/16	26.17	361.80
		08/09/16	26.06	361.91
		10/17/16	27.83	360.14
		12/11/16	29.71	358.26
PDP-26	397.68	10/20/15	31.24	366.44
		12/14/15	30.67	367.01
		02/24/16	30.11	367.57
		04/05/16	29.89	367.79
		06/06/16	29.06	368.62
		08/09/16	29.54	368.14
		10/17/16	30.57	367.11
		12/11/16	32.81	364.87
PDP-27	377.58	10/20/15	18.28	359.30
		12/14/15	7.61	369.97
		02/24/16	11.95	365.63
		04/05/16	10.27	367.31
		06/06/16	7.44	370.14
		08/09/16	17.46	360.12
		10/17/16	19.06	358.52
		12/11/16	19.78	357.80
PDP-28	368.62	10/20/15	13.68	354.94
		12/14/15	13.68	354.94
		02/24/16	10.75	357.87
		04/05/16	9.61	359.01
		06/06/16	11.74	356.88
		08/09/16	10.91	357.71
		10/17/16	12.19	356.43
		12/11/16	13.09	355.53
PDP-29	383.05	10/20/15	14.12	368.93
		12/14/15	14.06	368.99
		02/24/16	12.45	370.60
		04/05/16	10.86	372.19
		06/06/16	12.62	370.43
		08/09/16	11.24	371.81
		10/17/16	13.09	369.96
		12/11/16	14.23	368.82

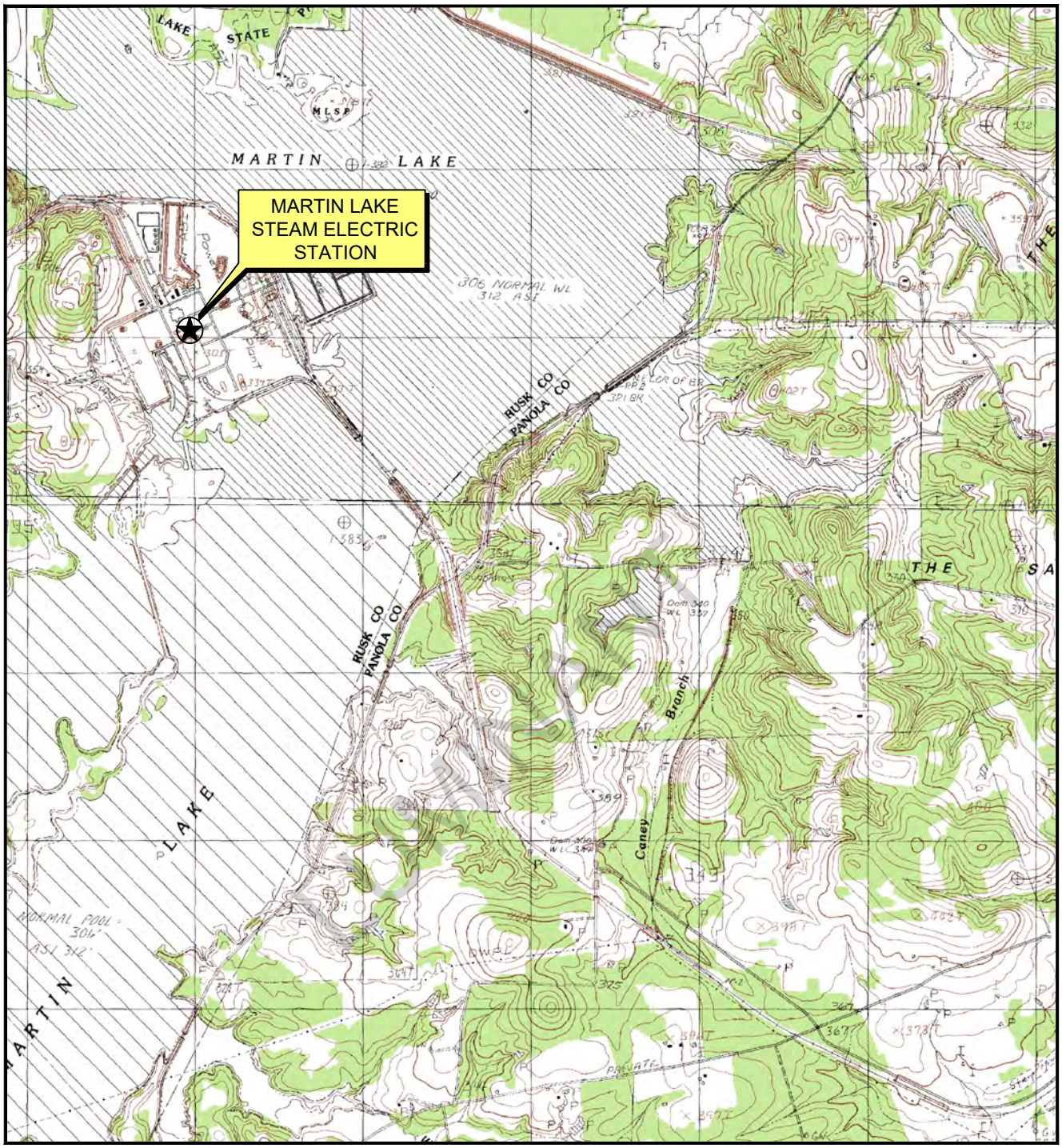
Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface

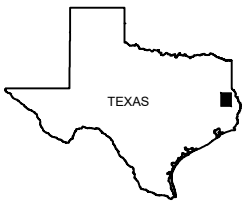
TABLE 3
SUMMARY OF AQUIFER TEST RESULTS
PERMANENT DISPOSAL POND 5
MARTIN LAKE STEAM ELECTRIC STATION

Well ID	Test Type	Aquifer Type	Analysis Method	Saturated Thickness (feet)	Results	
					T (cm^2/sec)	K (cm/sec)
PDP 5						
PDP-22	Slug-In	Unconfined	Bouwer-Rice	22.84	3.04E-02	4.36E-05
PDP-22	Slug-Out	Unconfined	Bouwer-Rice	22.84	4.16E-03	5.98E-06
				Mean	**1.73E-02**	**2.48E-05**
PDP-25	Slug-In	Confined	Bouwer-Rice	24	1.09E-01	1.49E-04
PDP-25	Slug-Out	Confined	Bouwer-Rice	24	9.05E-02	1.24E-04
				Mean	**9.99E-02**	**1.37E-04**
PDP-26	Slug-In	Confined	Bouwer-Rice	8	8.31E-03	3.41E-05
PDP-26	Slug-Out	Confined	Bouwer-Rice	8	3.95E-03	1.62E-05
				Mean	**6.13E-03**	**2.51E-05**
				Geometric Mean for All PDP 5 Tests	**2.19E-02**	**4.40E-05**

Notes:
1. Abbreviations: T - transmissivity; K - hydraulic conductivity.

Figures





QUADRANGLE LOCATION

N

Scale in Feet

0 1500 3000

SOURCE:
Base map from www.tnris.gov, Tatum, TX 7.5 min. USGS quadrangle dated 1983.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 1

PDP 5 AREA
SITE LOCATION MAP

PROJECT: 5123B	BY: AJD	REVISIONS
DATE: JUNE, 2015	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

CCR Monitoring Well

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

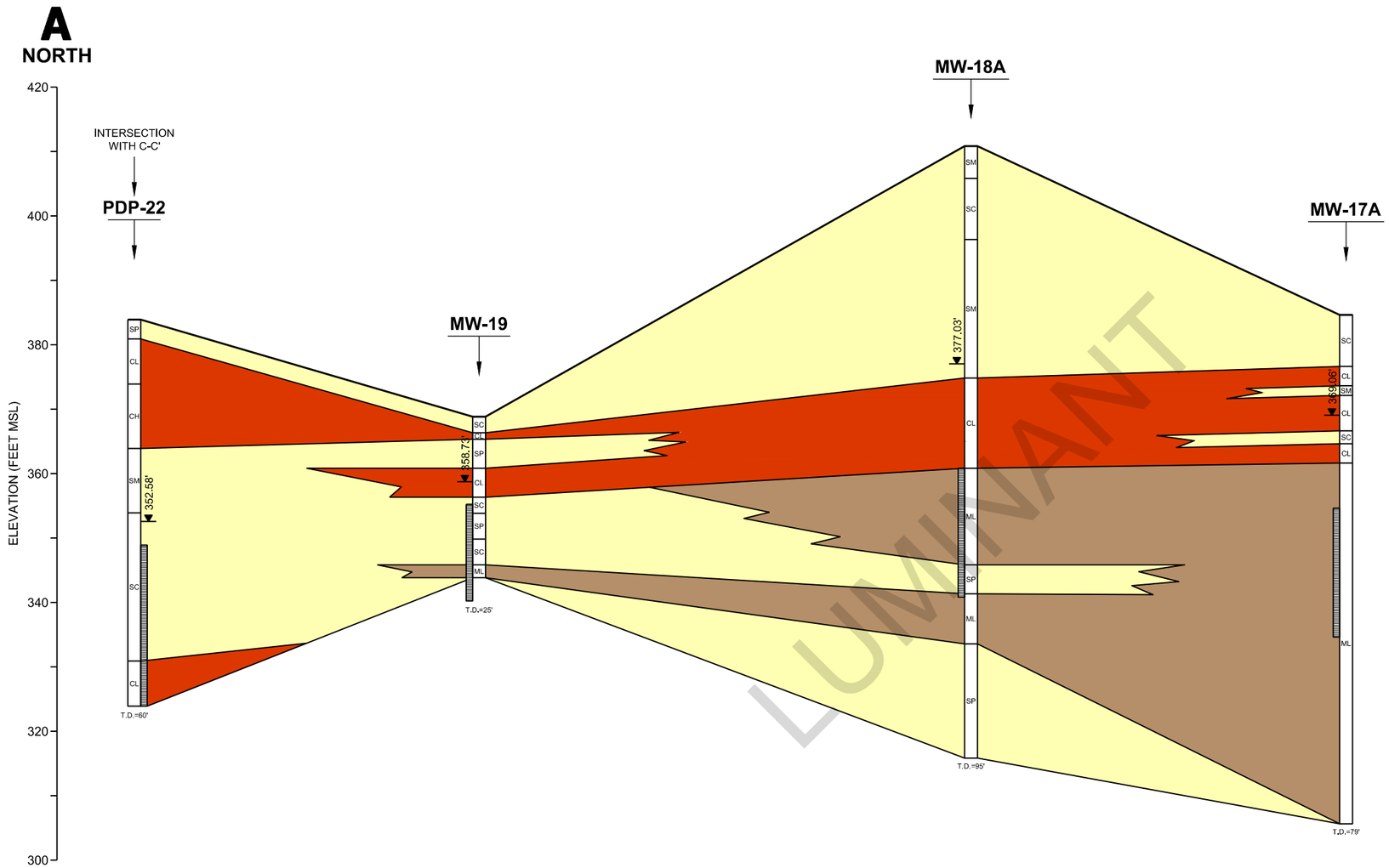
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 2

PDP 5 AREA DETAILED SITE PLAN

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

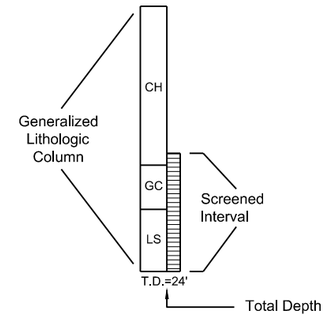
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 4

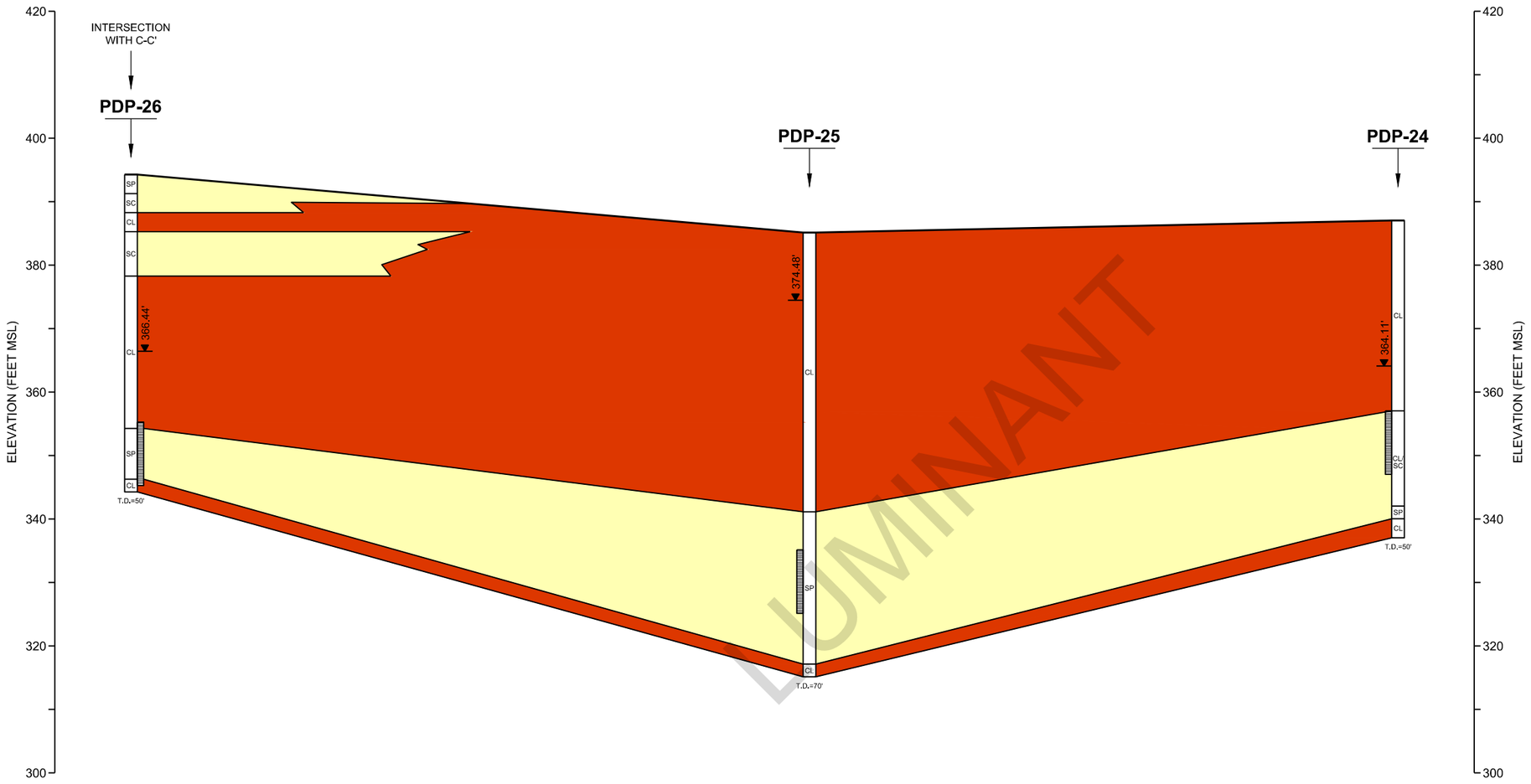
PDP 5 AREA GEOLOGIC CROSS SECTION A-A' NORTH SIDE OF PDP5

PROJECT: 5164B	AJD	REVISIONS
DATE: OCT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

B
WEST

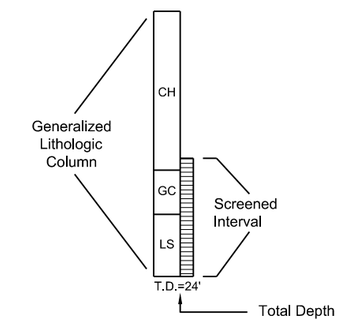
B′
EAST



EXPLANATION

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

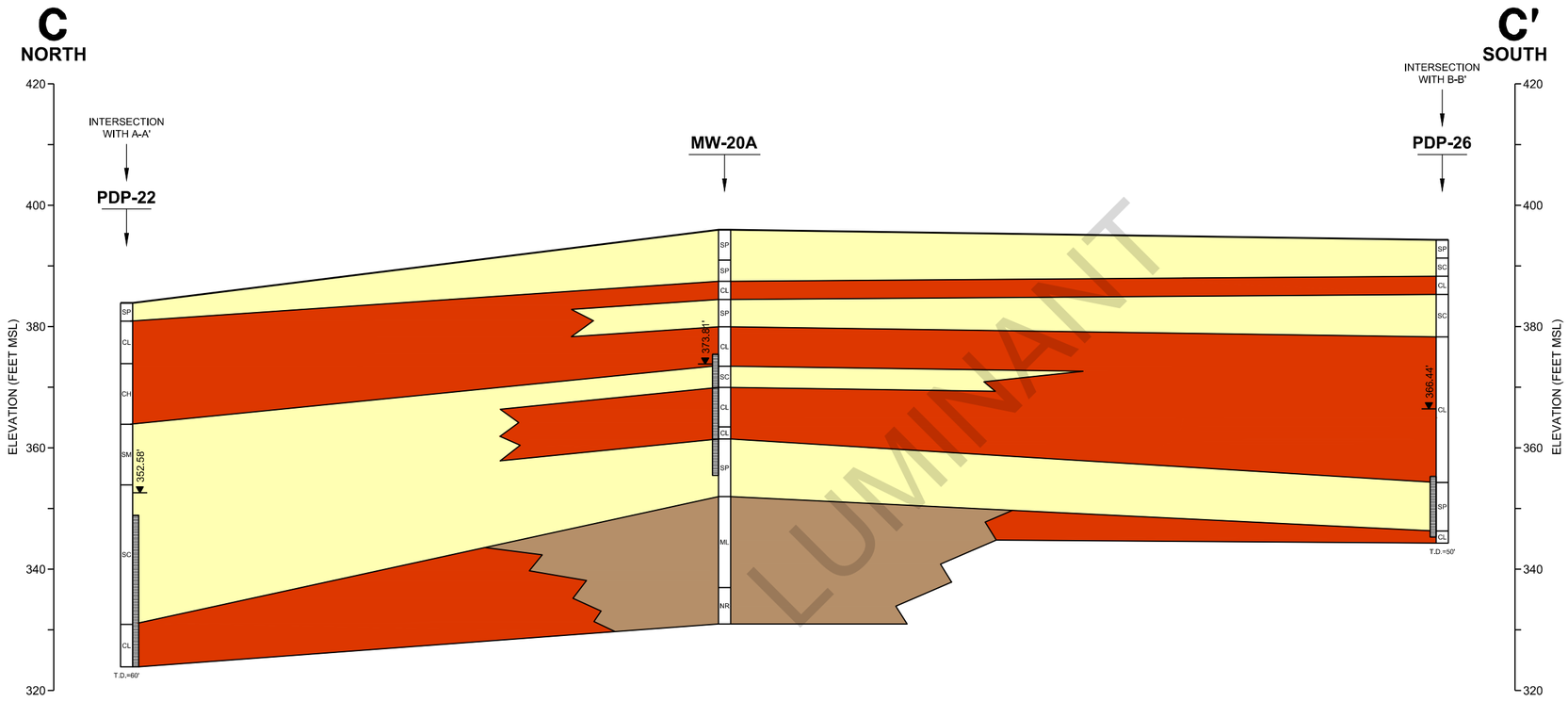
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 5

PDP 5 AREA
GEOLOGIC CROSS SECTION
B-B′ SOUTH SIDE OF PDP 5

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: OCT., 2017	CHECKED: PJB	

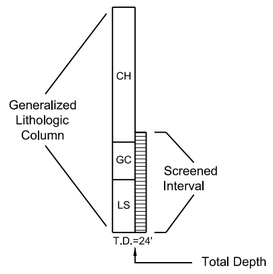
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



SCALE IN FEET

VERTICAL 20

HORIZONTAL 200

10x Vertical Exaggeration

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 6

PDP 5 AREA GEOLOGIC CROSS SECTION C-C' WEST SIDE OF PDP 5

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: OCT., 2017	CHECKED: PJB	

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Appendix A

CCR Monitoring Well Logs

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-17A
Project Name:	Martin Lake SES	Date Drilled:	October 1, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	384.63' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	387.53' msl	Depth to Water/Date:	26.62' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	360.91' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA				See MW-17B boring log for Lithologic Description		Cement/ Concrete Well Cover
					10				10.0	Bentonite Pellets to 25'
					20				20.0	30' Casing
					30				30.0	20' Screen with 2" End Cap
					40				40.0	Sand Backfill of Annular Space from 25' to 47'
					50			The boring was terminated and the well was set at 47' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	50.0	

▽

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-18A
Project Name:	Martin Lake SES	Date Drilled:	October 2, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	410.83' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	414.43' msl	Depth to Water/Date:	43.17' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	371.26' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA				See MW-18B boring log for Lithologic Description		Cement/ Concrete Well Cover
					10				10.0	Bentonite Pellets to 45'
					20				20.0	
					30				30.0	50' Casing
					40				40.0 ▽	
					50				50.0	20' Screen with 2" End Cap
					60				60.0	Sand Backfill of Annular Space from 45' to 67'
					70			The boring was terminated and the well was set at 67' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	70.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-19
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	367.84' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	371.23' msl	Depth to Water/Date:	13.89' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	357.34' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	90	CT	NA		SC		Moist, medium dense, reddish-brown, CLAYEY SAND (fine-grained SAND)		Cement/ Concrete Well Cover
						CL		Moist, soft, reddish-brown, SANDY CLAY		Bentonite Pellets to 9'
						SP		Moist, loose, reddish-brown, fine-grained SAND		
					5			-gray	5.0	13' Casing
		60				CL		Moist to wet, soft, brown, SANDY CLAY (fine-grained SAND)		
								-stiff		
					10			-light gray ▽	10.0	
		100				CL		Moist, very stiff, light gray, SILTY CLAY		
						SC		Moist, dense, gray and reddish-brown, CLAYEY SAND (fine-grained SAND) ▽	15.0	15' Screen with 2" End Cap
		70			15	SP		Wet, loose, light gray and reddish-brown, fine-grained SAND		
								-medium dense		
						SC		Wet, medium dense, light gray and reddish-brown, CLAYEY SAND (fine-grained SAND)	20.0	Sand Backfill of Annular Space from 9' to 25'
		100			20			-stringer of dense		
								-stringer of dense		
						ML		Moist, very stiff, gray CLAYEY SILT with some iron staining	25.0	
					25			The boring was terminated and the well was set at 25' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.		

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-20A
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	6850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	395.95' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	398.34' msl	Depth to Water/Date:	29.19' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	369.65' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA	10			See MW-20B boring log for Lithologic Description	10.0	Cement/ Concrete Well Cover; Bentonite Pellets to 19'; 24' Casing
					20				20.0	20' Screen with 2" End Cap
					30				30.0	Sand Backfill of Annular Space from 19' to 41'
					40			The boring was terminated and the well was set at 41' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	40.0	

Luminant

Log of Boring: PDP-22

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	60
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0			SP	(0 - 3) Fine SAND, tan, dry, very soft, small iron concretions, grass roots
4		8.0/10.0	CL	(3 - 10) Sandy CLAY, red/orange mottled, dry, firm, moderate cementation, flat to subrounded, sharp contact
8				
12		10.0/10.0	CH	(10 - 20) Silty CLAY with minor sand, dry, firm, moderate cementation, flat to subrounded, medium to high plasticity, micro laminated structure, increasing sand content with depth, transition from red/gray at 10' to tan at 20'
16				
20		10.0/10.0	SM	(20 - 28) Sandy SILT, gray and tan, dry, firm, moderate cementation, flat to subrounded, grass lense (fill), transition to gray at 26'
24				
28				(28 - 30) Silty SAND, iron-rich, dry, soft, weak cementation, subrounded, sharp contact
32		10.0/10.0	SC	(30 - 53) SAND, gray with small streaks and iron at 32', moist to wet, soft, moderate plasticity at 30', transition to low plasticity at 40', minor clay content
36				
40				
44		10.0/10.0		
48				
52		10.0/10.0	CL	(53 - 60) Silty CLAY, gray, dry, firm, moderate cementation, dry, flat, transition to very hard gray/dark gray clay at 56'
56				
60				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-60') 20/40 sand

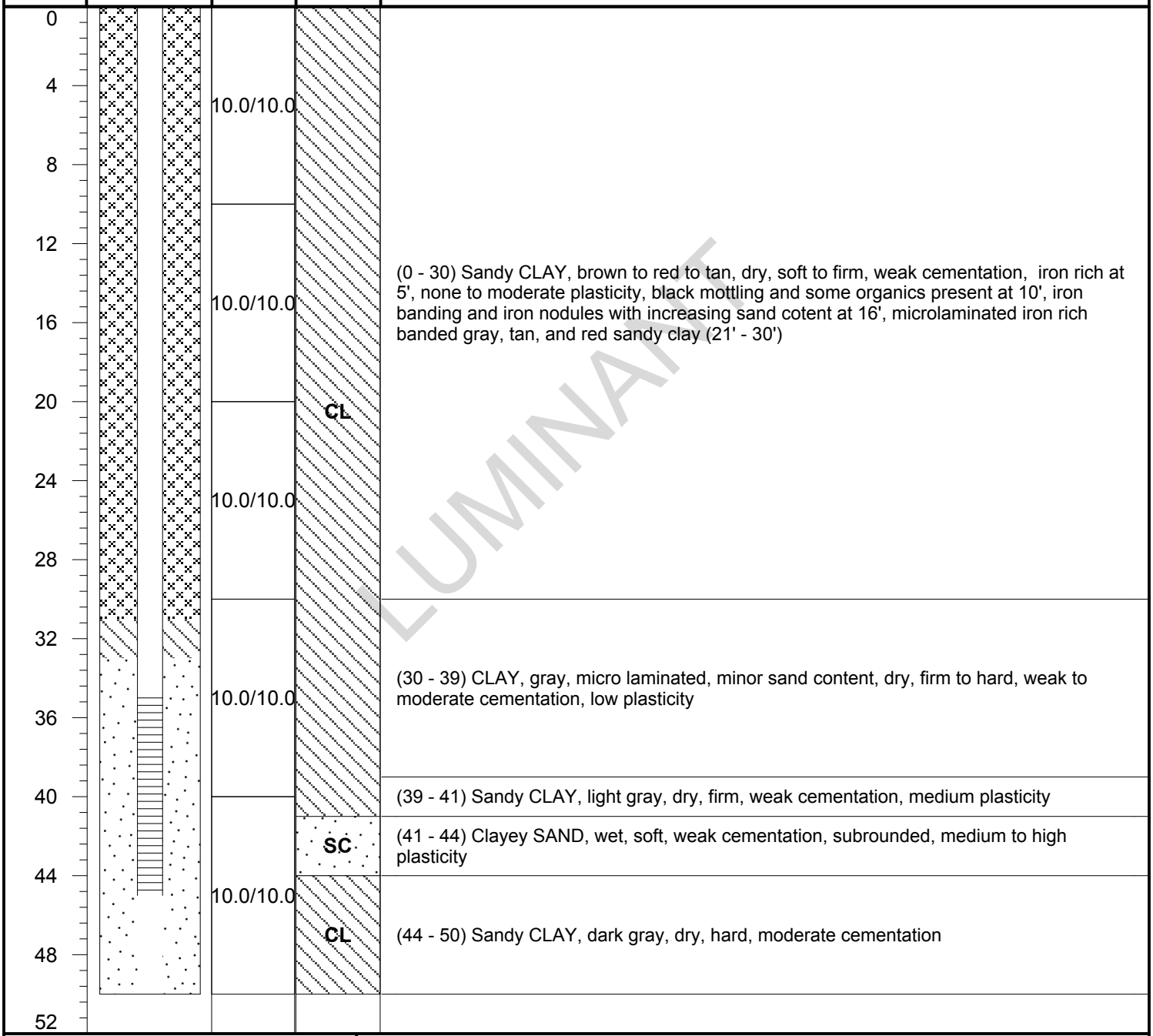
Luminant

Log of Boring: PDP-23

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/10/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

Pastor, Behling & Wheeler, LLC
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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-45) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-45') 20/40 sand

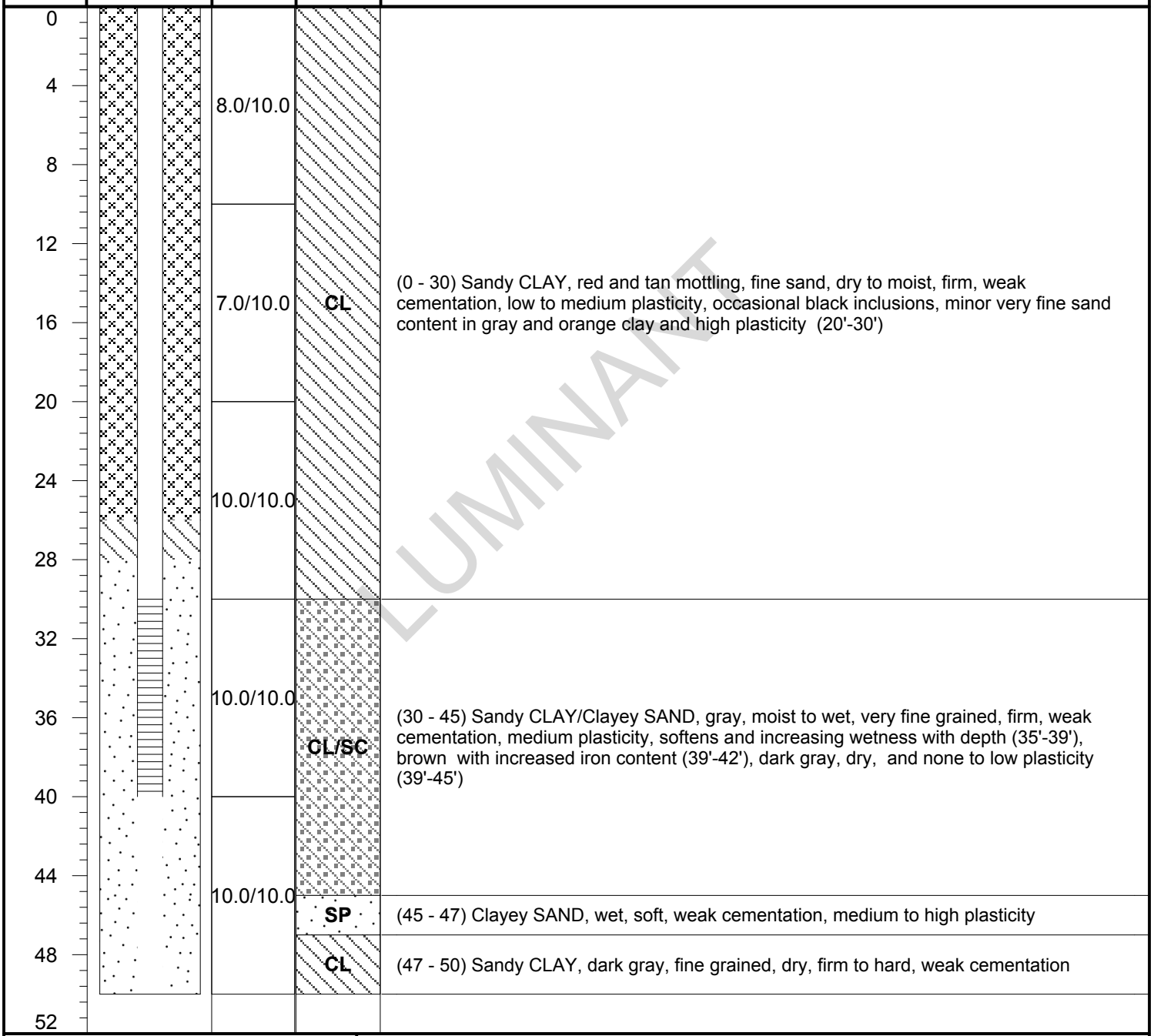
Luminant

Log of Boring: PDP-24

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



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Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-30) Casing, 2" Sch 40 FJT PVC
(30-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-26') Grout
(26'-28') Bentonite pellets
(28'-40') 20/40 sand

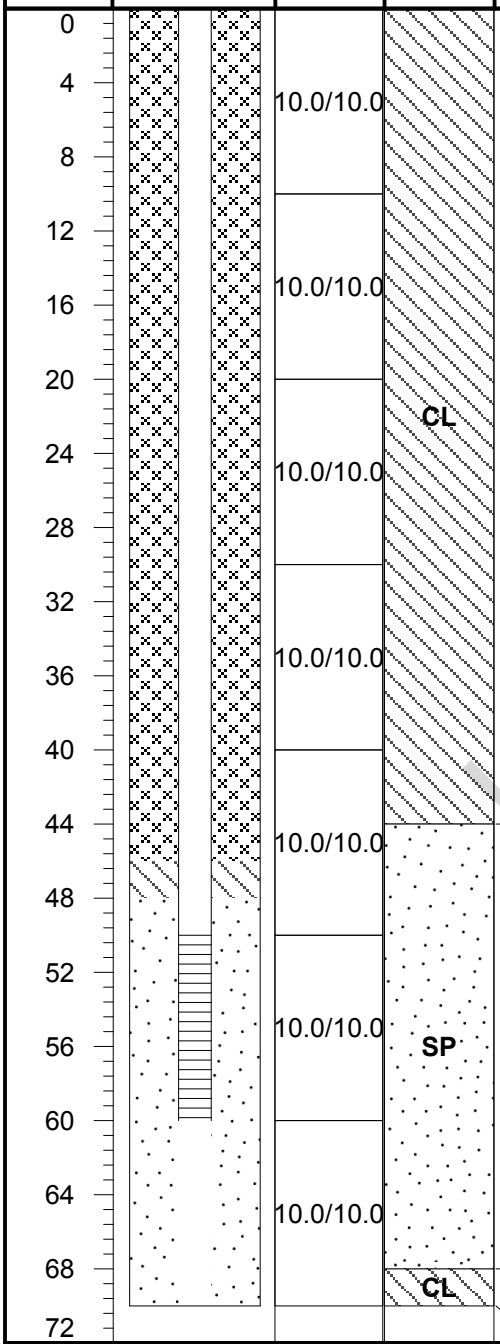
Luminant

Log of Boring: PDP-25

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	70
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description

(0 - 44) Sandy CLAY, red to gray and tan, very fine grained, dry to moist, firm, low to medium plasicity, weak to moderate cementation, micro laminated, minor organics, variable sand content with depth, high plasticity and very low sand content (22'-23'), higher sand content and high iron content with occasional subrounded pebbles (27'-30'), red, orange, tan, and gray mottling (30'-44')

(44 - 68) Clayey SAND, gray, moist, soft to firm, minor orange streaking, low plasticity, weak cementation, subrounded, minor wet and soft clay zone (62'-64')

(68 - 70) CLAY, black, minor silt, dry, very hard, moderate cementation, smooth shiny surface when fractured

PBW

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Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-50) Casing, 2" Sch 40 FJT PVC
(50-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-46') Grout
(46'-48') Bentonite pellets
(48'-60') 20/40 sand

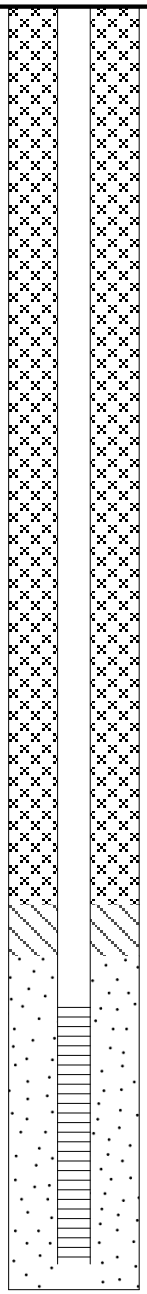
Luminant

Log of Boring: PDP-26

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0		10.0/10.0	SP	(0 - 3) SAND, tan, dry, very soft, weak cementation
4			SC	(3 - 6) Clayey SAND, dry, firm, black lignite present
8			CL	(6 - 9) CLAY with minor sand, red, moist, firm, medium plasticity, smear zone black lignite
12		10.0/10.0	SC	(9 - 16) Clayey SAND, tan, moist, soft, low plasticity, more clay content with depth
16				
20		10.0/10.0	CL	(16 - 40) CLAY, tan, micro laminated orange and gray, moist, soft, medium plasticity, dry and silty clay (19'-27'), micro laminated gray and dark gray (27'-36'), increasing sand content (30'-36'), organics layer (36.5'-37'), high iron content (39'-40')
24				
28				
32		10.0/10.0		
36				
40		10.0/10.0	SP	(40 - 48) SAND, tan, medium, moist to wet, soft, subrounded
44				
48			CL	(48 - 50) CLAY, gray, micro laminated, dry, firm, moderate cementation
52				

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Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-39) Casing, 2" Sch 40 FJT PVC
(39-49) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-35') Grout
(35'-37') Bentonite pellets
(37'-49') 20/40 sand

Appendix B

Photographs of CCR Groundwater Monitoring Wells

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Martin Lake Steam Electric Station – PDP 5 Area

Photograph 1: PDP22

Photograph 2: PDP23

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Martin Lake Steam Electric Station – PDP 5 Area

Photograph 3: PDP24

Photograph 4: PDP25

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Martin Lake Steam Electric Station – PDP 5 Area

Photograph 5: PDP26

Photograph 6: MW-17A

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Martin Lake Steam Electric Station – PDP 5 Area

Photograph 7: MW-18A

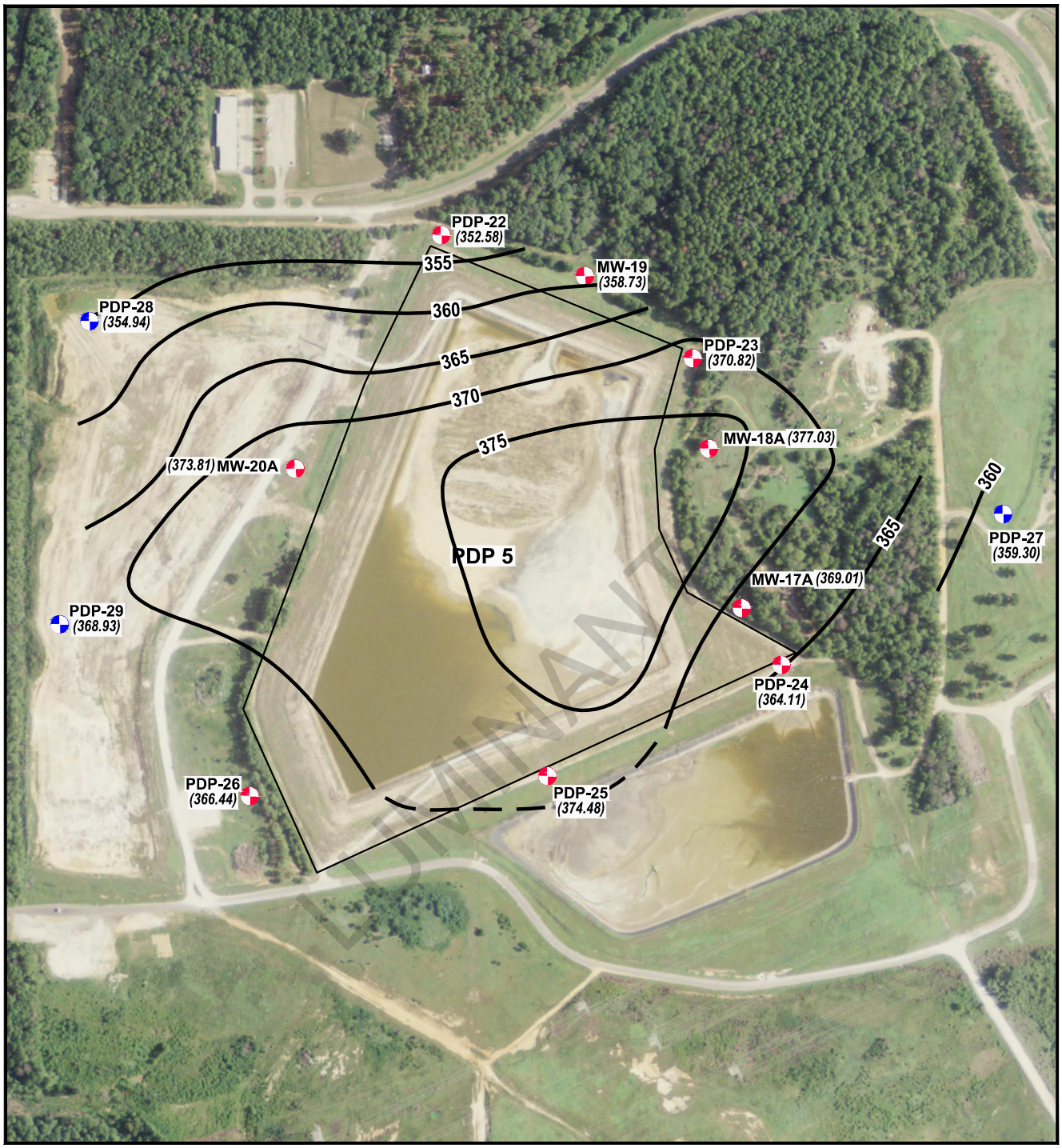
Photograph 8: MW-19

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Martin Lake Steam Electric Station – PDP 5 Area

Photograph 9: MW-20A

Appendix C

Groundwater Potentiometric Surface Maps



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 1

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP OCTOBER 20, 2015

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

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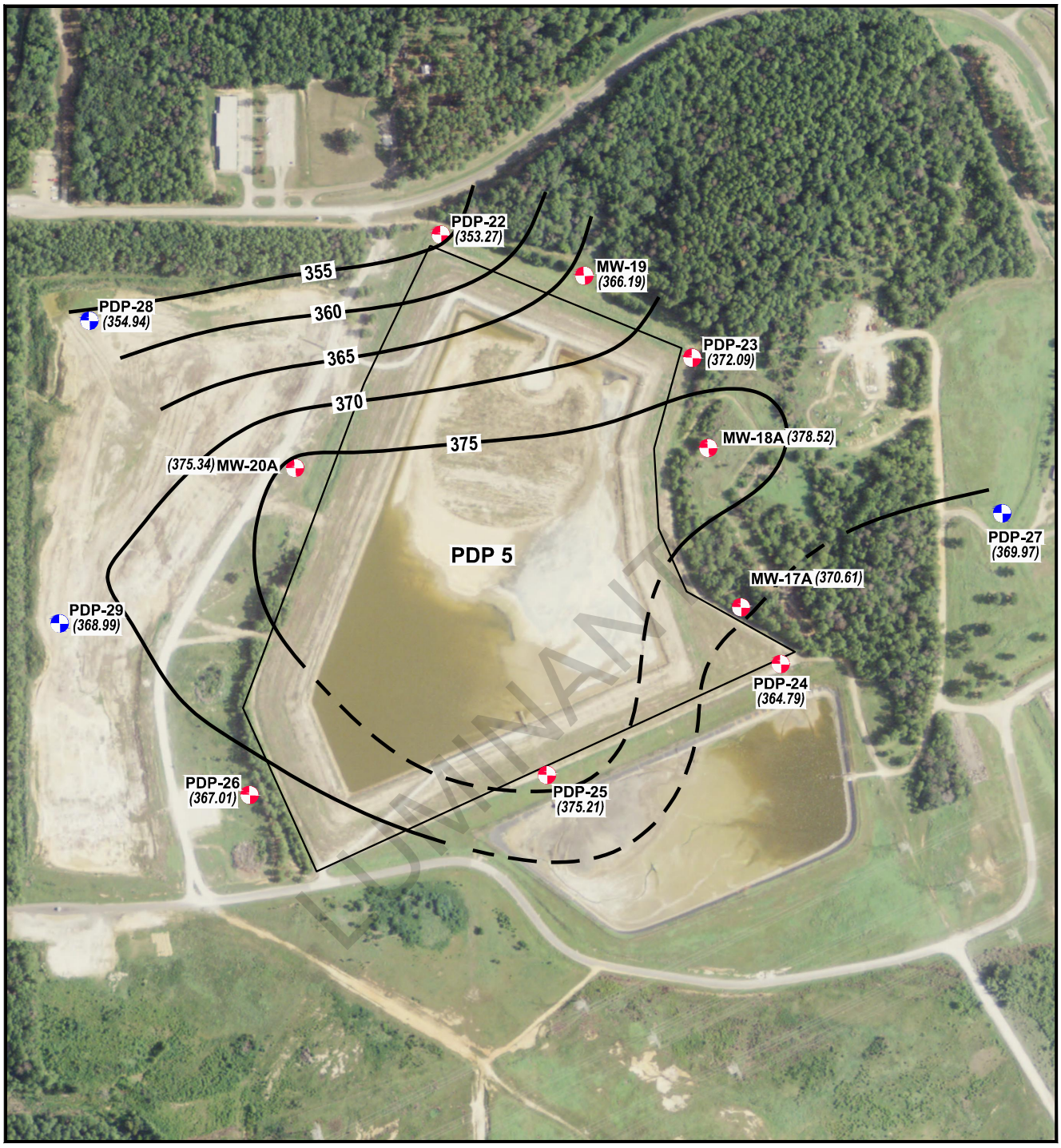


EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

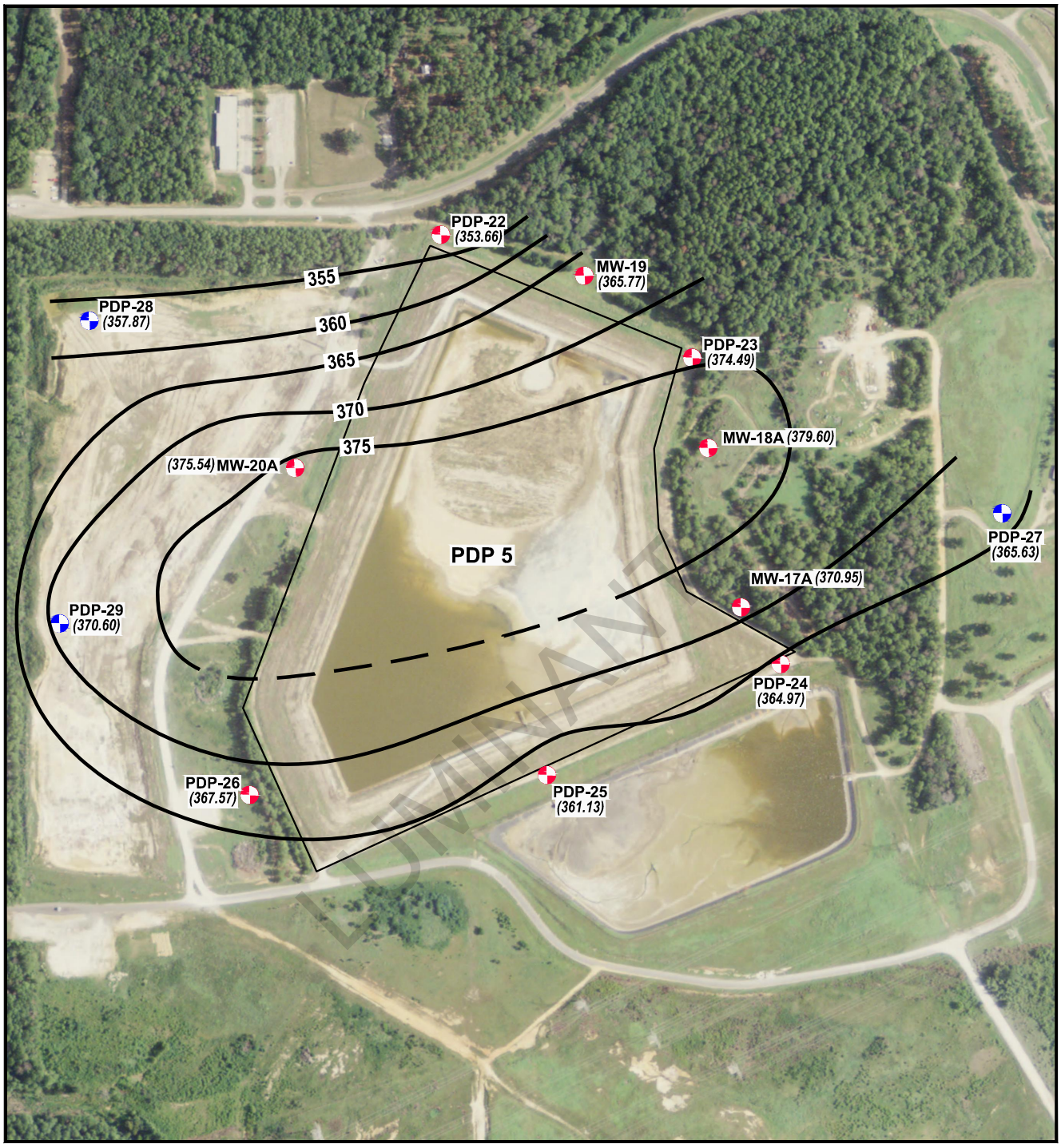
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 2

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - DEC. 14, 2015

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

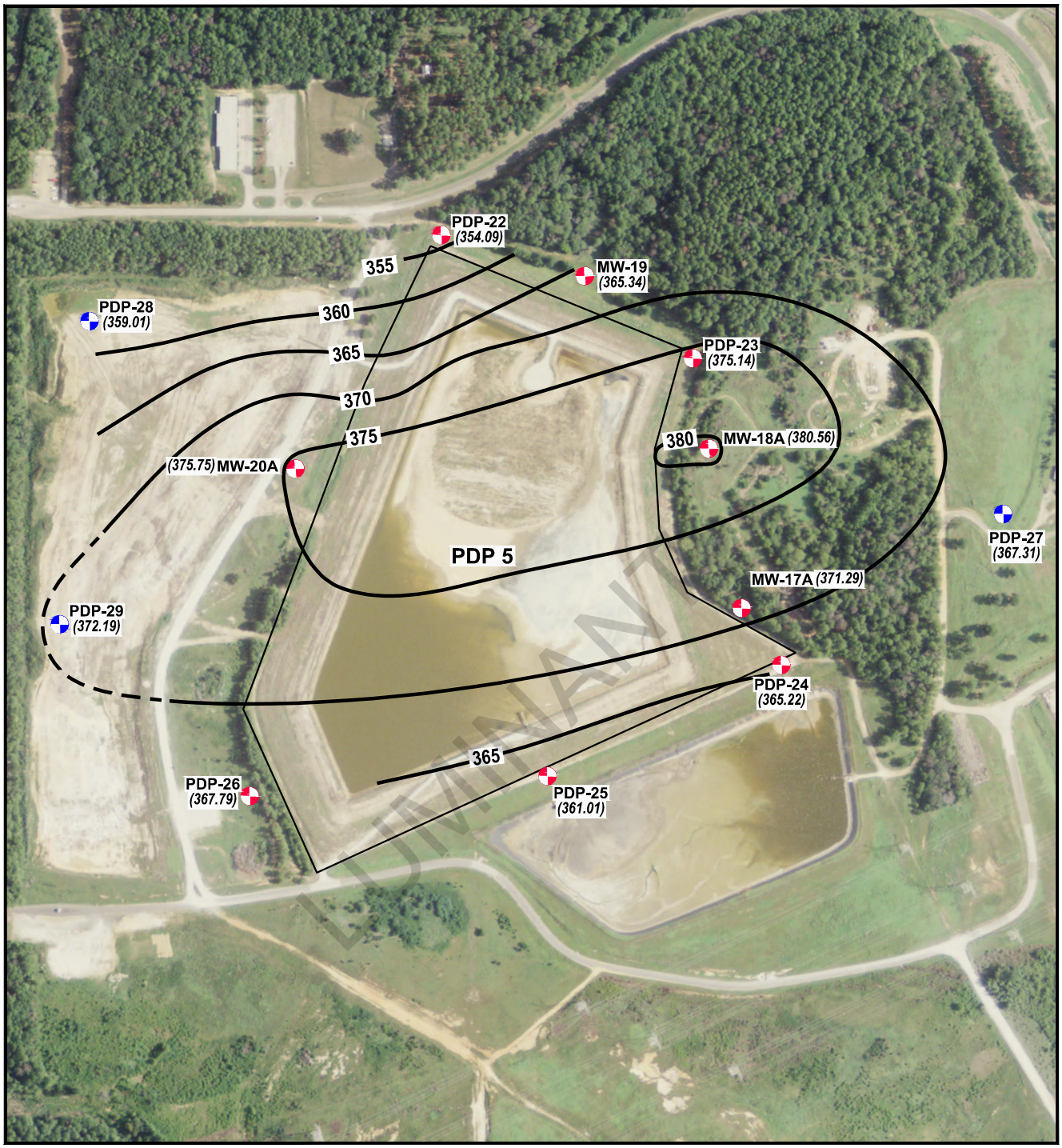
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 3

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - FEB. 24, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

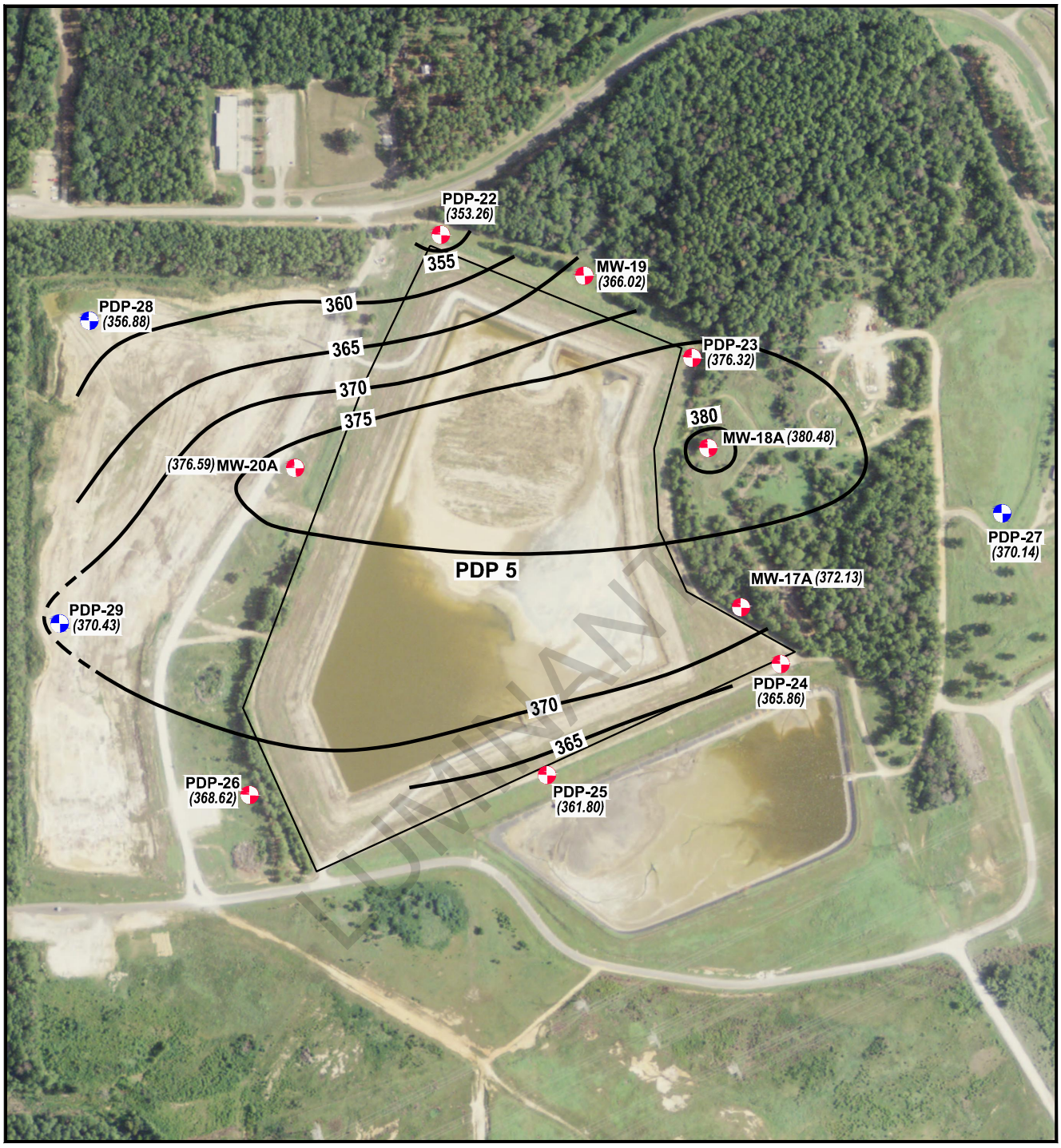
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 4

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - APRIL 5, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

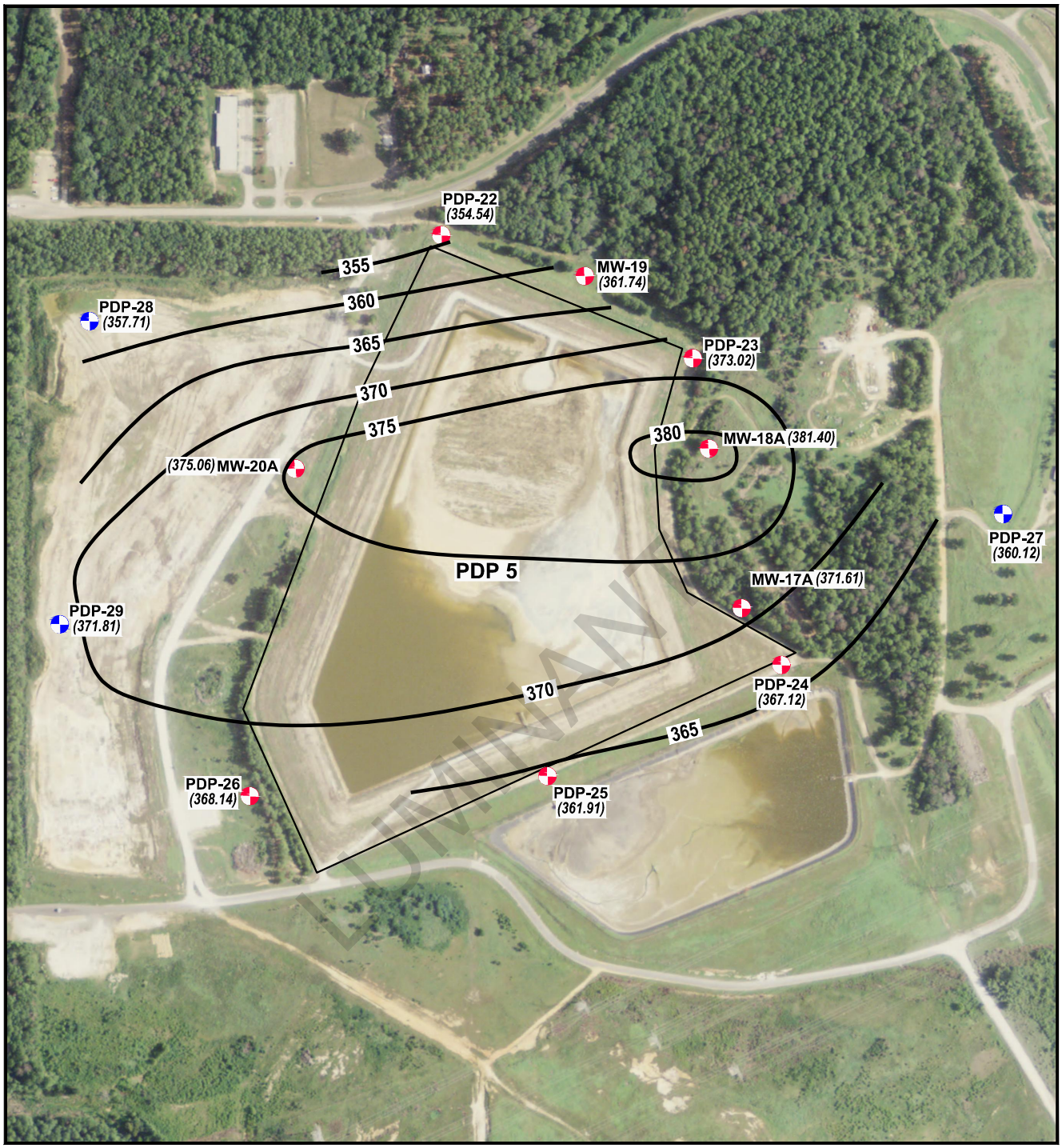
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 5

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - JUNE 6, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

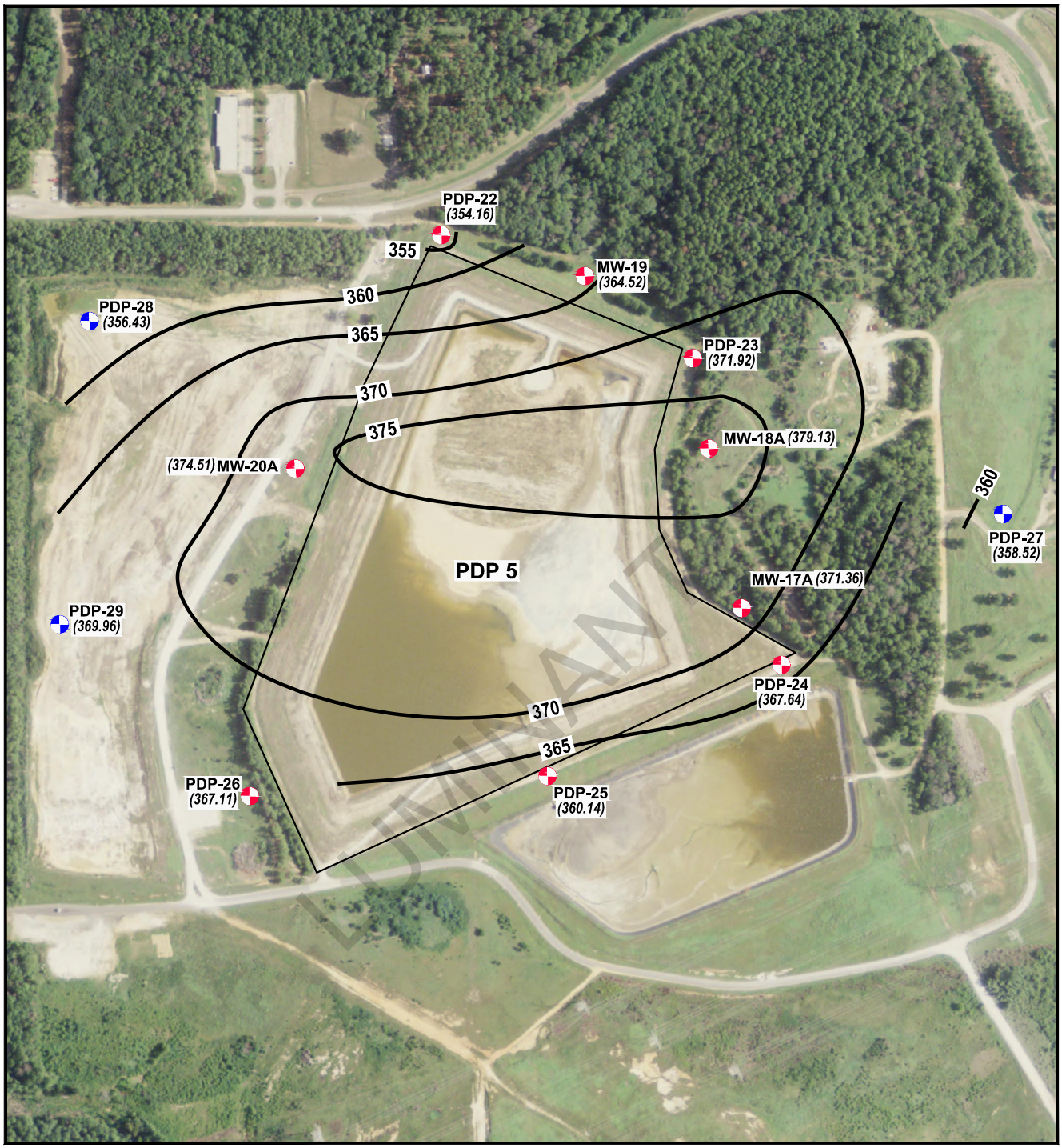
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 6

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - AUGUST 9, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

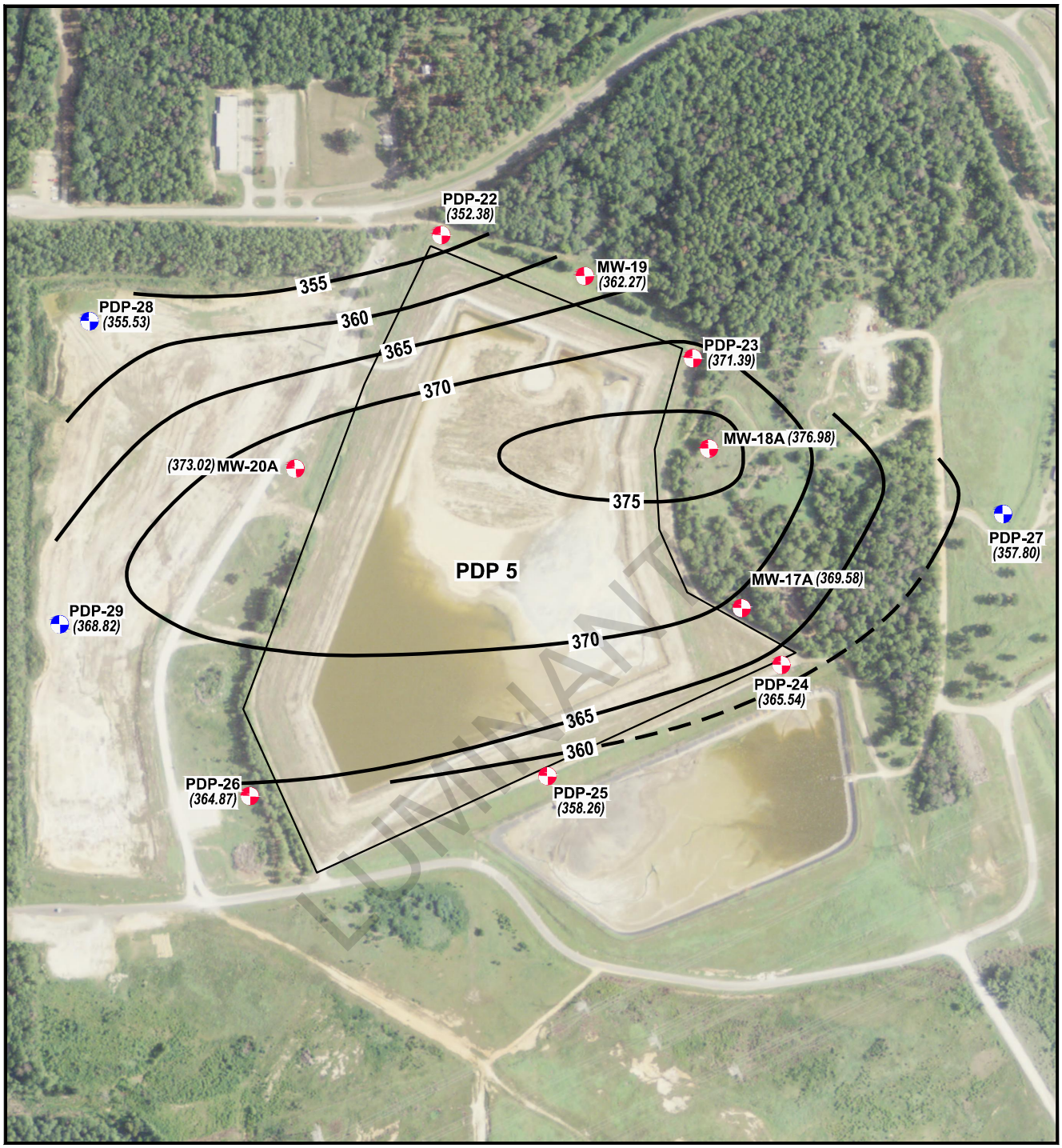
MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 7

PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - OCTOBER 17, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Non-CCR Monitoring Well Used to Further Evaluate Groundwater Flow Direction
- (374.34) Groundwater Potentiometric Surface (ft. MSL)
- — 360 — Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 8

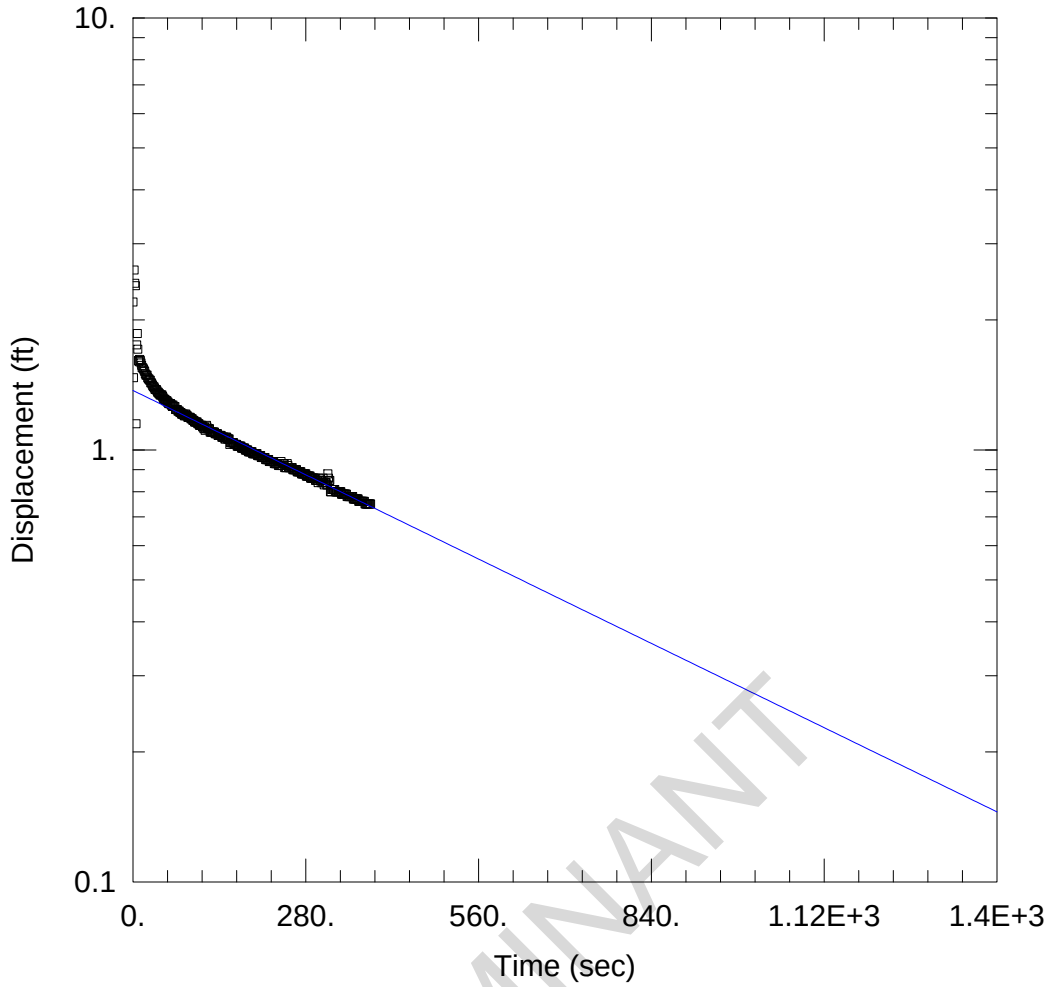
PDP 5 - GROUNDWATER ZONE A POTENTIOMETRIC SURFACE MAP - DECEMBER 11, 2016

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix D

Aquifer Test Data



PDP-22 SLUG IN

Data Set: J:\...\PDP-22 Slug In.aqt
Date: 12/16/15 Time: 10:25:03

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-22
Test Date: 10/7/15

AQUIFER DATA

Saturated Thickness: 22.84 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-22)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 14.84 ft
Casing Radius: 0.083 ft
Static Water Column Height: 22.84 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.362E-5 cm/sec
y0 = 1.373 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-22 Slug In
Date: 12/16/15
Time: 10:26:54

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/7/15
Test Well: PDP-22

AQUIFER DATA

Saturated Thickness: 22.84 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-22

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 22.84 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 14.84 ft

No. of Observations: 385

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.47	194.	0.98
2.	2.61	195.	0.98
3.	2.43	196.	0.98
4.	2.4	197.	0.98
5.	1.15	198.	0.98
6.	1.75	199.	0.98
7.	1.86	200.	0.98
8.	1.71	201.	0.98
9.	1.61	202.	0.97
10.	1.6	203.	0.97
11.	1.62	204.	0.97
12.	1.61	205.	0.97
13.	1.59	206.	0.97
14.	1.57	207.	0.97
15.	1.55	208.	0.96
16.	1.55	209.	0.96
17.	1.54	210.	0.96
18.	1.53	211.	0.96
19.	1.52	212.	0.96
20.	1.5	213.	0.96
21.	1.49	214.	0.96
22.	1.49	215.	0.95
23.	1.49	216.	0.95
24.	1.47	217.	0.95
25.	1.46	218.	0.95
26.	1.46	219.	0.95
27.	1.45	220.	0.95
28.	1.45	221.	0.94
29.	1.43	222.	0.94

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.43	223.	0.94
31.	1.42	224.	0.94
32.	1.41	225.	0.94
33.	1.4	226.	0.94
34.	1.4	227.	0.94
35.	1.39	228.	0.94
36.	1.38	229.	0.93
37.	1.38	230.	0.93
38.	1.38	231.	0.93
39.	1.37	232.	0.93
40.	1.36	233.	0.93
41.	1.36	234.	0.93
42.	1.35	235.	0.93
43.	1.35	236.	0.92
44.	1.34	237.	0.92
45.	1.34	238.	0.92
46.	1.34	239.	0.92
47.	1.34	240.	0.94
48.	1.33	241.	0.92
49.	1.32	242.	0.92
50.	1.31	243.	0.93
51.	1.31	244.	0.93
52.	1.31	245.	0.93
53.	1.3	246.	0.91
54.	1.3	247.	0.91
55.	1.3	248.	0.91
56.	1.29	249.	0.91
57.	1.29	250.	0.93
58.	1.28	251.	0.92
59.	1.28	252.	0.91
60.	1.28	253.	0.91
61.	1.28	254.	0.91
62.	1.27	255.	0.91
63.	1.27	256.	0.91
64.	1.26	257.	0.91
65.	1.27	258.	0.91
66.	1.26	259.	0.9
67.	1.26	260.	0.9
68.	1.26	261.	0.9
69.	1.24	262.	0.9
70.	1.24	263.	0.9
71.	1.24	264.	0.9
72.	1.24	265.	0.9
73.	1.23	266.	0.89
74.	1.23	267.	0.89
75.	1.23	268.	0.89
76.	1.22	269.	0.89
77.	1.22	270.	0.89
78.	1.22	271.	0.89
79.	1.21	272.	0.89
80.	1.21	273.	0.88
81.	1.21	274.	0.88
82.	1.21	275.	0.88
83.	1.2	276.	0.88
84.	1.2	277.	0.88
85.	1.21	278.	0.88
86.	1.21	279.	0.88
87.	1.2	280.	0.88
88.	1.2	281.	0.87
89.	1.19	282.	0.87
90.	1.19	283.	0.87
91.	1.19	284.	0.87
92.	1.19	285.	0.87
93.	1.19	286.	0.87
94.	1.18	287.	0.87
95.	1.18	288.	0.86

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	1.18	289.	0.86
97.	1.17	290.	0.86
98.	1.17	291.	0.86
99.	1.17	292.	0.86
100.	1.16	293.	0.86
101.	1.16	294.	0.86
102.	1.16	295.	0.86
103.	1.16	296.	0.85
104.	1.16	297.	0.85
105.	1.15	298.	0.85
106.	1.15	299.	0.85
107.	1.15	300.	0.84
108.	1.14	301.	0.85
109.	1.14	302.	0.86
110.	1.14	303.	0.85
111.	1.14	304.	0.85
112.	1.14	305.	0.84
113.	1.13	306.	0.85
114.	1.13	307.	0.84
115.	1.12	308.	0.86
116.	1.13	309.	0.84
117.	1.11	310.	0.83
118.	1.12	311.	0.84
119.	1.14	312.	0.84
120.	1.13	313.	0.84
121.	1.12	314.	0.83
122.	1.12	315.	0.83
123.	1.12	316.	0.88
124.	1.12	317.	0.86
125.	1.1	318.	0.85
126.	1.1	319.	0.85
127.	1.1	320.	0.8
128.	1.1	321.	0.8
129.	1.1	322.	0.81
130.	1.1	323.	0.81
131.	1.1	324.	0.81
132.	1.1	325.	0.81
133.	1.09	326.	0.81
134.	1.09	327.	0.81
135.	1.09	328.	0.8
136.	1.09	329.	0.8
137.	1.09	330.	0.8
138.	1.08	331.	0.8
139.	1.08	332.	0.8
140.	1.08	333.	0.8
141.	1.08	334.	0.8
142.	1.08	335.	0.8
143.	1.08	336.	0.8
144.	1.07	337.	0.8
145.	1.07	338.	0.79
146.	1.07	339.	0.79
147.	1.07	340.	0.79
148.	1.07	341.	0.79
149.	1.06	342.	0.79
150.	1.06	343.	0.79
151.	1.07	344.	0.79
152.	1.07	345.	0.79
153.	1.06	346.	0.79
154.	1.06	347.	0.78
155.	1.06	348.	0.78
156.	1.06	349.	0.78
157.	1.03	350.	0.78
158.	1.04	351.	0.78
159.	1.04	352.	0.78
160.	1.04	353.	0.78
161.	1.04	354.	0.78

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	1.04	355.	0.78
163.	1.04	356.	0.78
164.	1.03	357.	0.77
165.	1.03	358.	0.77
166.	1.03	359.	0.77
167.	1.03	360.	0.77
168.	1.03	361.	0.77
169.	1.02	362.	0.77
170.	1.02	363.	0.77
171.	1.02	364.	0.77
172.	1.02	365.	0.77
173.	1.02	366.	0.76
174.	1.02	367.	0.76
175.	1.02	368.	0.76
176.	1.01	369.	0.76
177.	1.01	370.	0.76
178.	1.01	371.	0.76
179.	1.01	372.	0.76
180.	1.01	373.	0.76
181.	1.01	374.	0.76
182.	1.	375.	0.76
183.	1.	376.	0.75
184.	1.	377.	0.75
185.	1.	378.	0.75
186.	1.	379.	0.75
187.	0.99	380.	0.75
188.	0.99	381.	0.75
189.	0.99	382.	0.75
190.	0.99	383.	0.75
191.	0.99	384.	0.75
192.	0.99	385.	0.75
193.	0.99		

SOLUTION

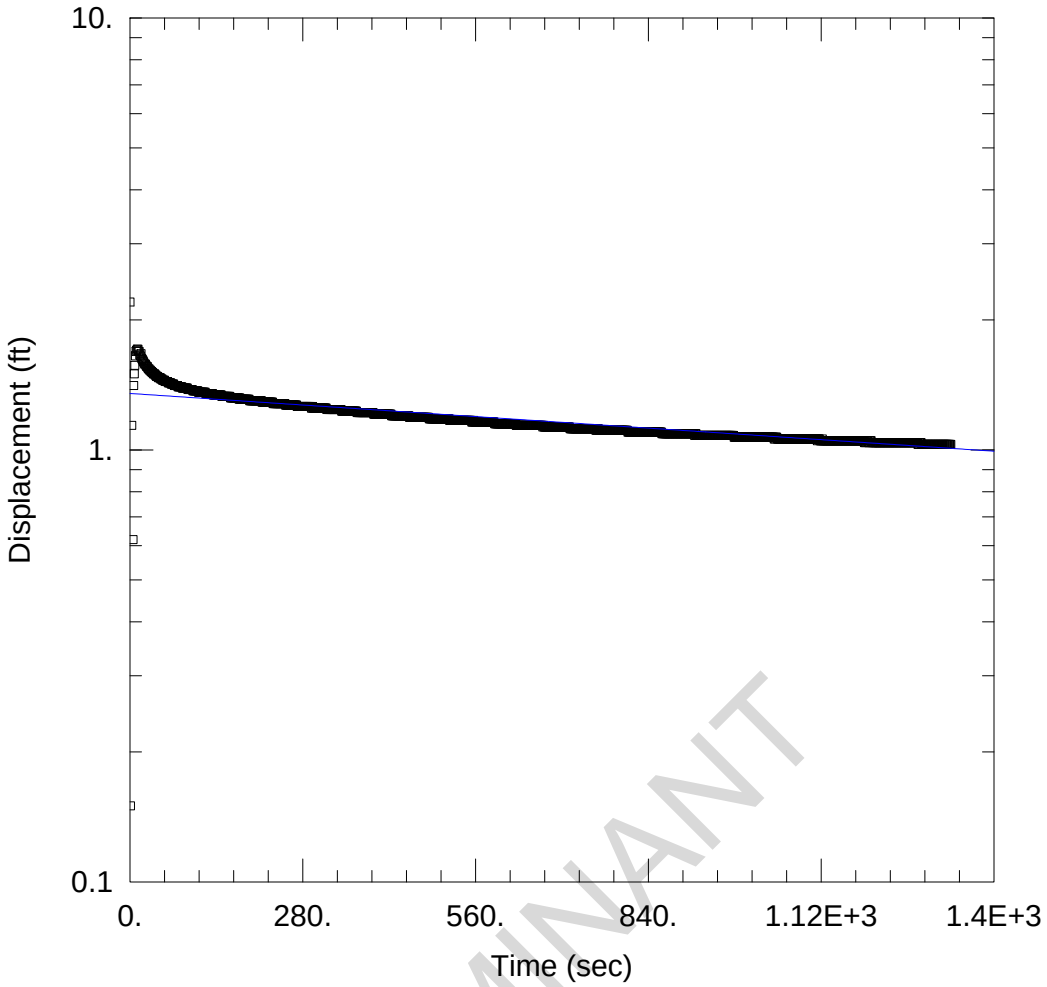
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.589

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.362E-5	cm/sec
y0	1.373	ft

$T = K*b = 0.03037$ cm²/sec



PDP-22 SLUG OUT

Data Set: J:\...\PDP-22 Slug Out.aqt
Date: 12/16/15 Time: 10:25:15

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-22
Test Date: 10/7/15

AQUIFER DATA

Saturated Thickness: 22.84 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-22)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 14.84 ft
Casing Radius: 0.083 ft
Static Water Column Height: 22.84 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 5.977E-6 cm/sec
y0 = 1.351 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-22 Slug Out
Date: 12/16/15
Time: 10:26:45

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/7/15
Test Well: PDP-22

AQUIFER DATA

Saturated Thickness: 22.84 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-22

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 22.84 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 14.84 ft

No. of Observations: 1329

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	0.15	667.	1.14
2.	0.09	668.	1.14
3.	1.14	669.	1.13
5.	0.62	670.	1.14
6.	1.41	671.	1.13
7.	1.5	672.	1.13
8.	1.57	673.	1.13
9.	1.65	674.	1.13
10.	1.69	675.	1.13
11.	1.7	676.	1.13
12.	1.71	677.	1.13
13.	1.71	678.	1.13
14.	1.69	679.	1.13
15.	1.69	680.	1.13
16.	1.66	681.	1.13
17.	1.65	682.	1.13
18.	1.67	683.	1.13
19.	1.63	684.	1.13
20.	1.62	685.	1.13
21.	1.61	686.	1.13
22.	1.6	687.	1.13
23.	1.59	688.	1.13
24.	1.58	689.	1.13
25.	1.58	690.	1.13
26.	1.57	691.	1.13
27.	1.56	692.	1.13
28.	1.56	693.	1.13
29.	1.55	694.	1.13
30.	1.54	695.	1.13

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
31.	1.54	696.	1.13
32.	1.53	697.	1.13
33.	1.53	698.	1.13
34.	1.52	699.	1.13
35.	1.52	700.	1.13
36.	1.51	701.	1.13
37.	1.51	702.	1.13
38.	1.5	703.	1.13
39.	1.5	704.	1.13
40.	1.5	705.	1.13
41.	1.49	706.	1.13
42.	1.49	707.	1.13
43.	1.48	708.	1.13
44.	1.48	709.	1.13
45.	1.48	710.	1.13
46.	1.47	711.	1.13
47.	1.47	712.	1.13
48.	1.47	713.	1.12
49.	1.47	714.	1.12
50.	1.46	715.	1.12
51.	1.46	716.	1.12
52.	1.46	717.	1.12
53.	1.45	718.	1.12
54.	1.45	719.	1.12
55.	1.45	720.	1.12
56.	1.45	721.	1.12
57.	1.44	722.	1.12
58.	1.44	723.	1.12
59.	1.44	724.	1.12
60.	1.44	725.	1.12
61.	1.44	726.	1.12
62.	1.43	727.	1.12
63.	1.43	728.	1.12
64.	1.43	729.	1.12
65.	1.43	730.	1.12
66.	1.43	731.	1.12
67.	1.42	732.	1.12
68.	1.42	733.	1.12
69.	1.42	734.	1.12
70.	1.42	735.	1.12
71.	1.42	736.	1.12
72.	1.41	737.	1.12
73.	1.41	738.	1.12
74.	1.41	739.	1.12
75.	1.41	740.	1.12
76.	1.41	741.	1.12
77.	1.41	742.	1.12
78.	1.4	743.	1.12
79.	1.4	744.	1.12
80.	1.4	745.	1.12
81.	1.4	746.	1.12
82.	1.4	747.	1.12
83.	1.4	748.	1.12
84.	1.4	749.	1.12
85.	1.39	750.	1.12
86.	1.39	751.	1.12
87.	1.39	752.	1.12
88.	1.39	753.	1.12
89.	1.39	754.	1.12
90.	1.39	755.	1.11
91.	1.39	756.	1.12
92.	1.39	757.	1.11
93.	1.39	758.	1.12
94.	1.38	759.	1.12
95.	1.38	760.	1.11
96.	1.38	761.	1.11

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
97.	1.38	762.	1.11
98.	1.38	763.	1.11
99.	1.38	764.	1.11
100.	1.38	765.	1.11
101.	1.38	766.	1.11
102.	1.37	767.	1.11
103.	1.37	768.	1.11
104.	1.37	769.	1.11
105.	1.37	770.	1.11
106.	1.37	771.	1.11
107.	1.37	772.	1.11
108.	1.37	773.	1.11
109.	1.37	774.	1.11
110.	1.37	775.	1.11
111.	1.36	776.	1.11
112.	1.36	777.	1.11
113.	1.36	778.	1.11
114.	1.36	779.	1.11
115.	1.36	780.	1.11
116.	1.36	781.	1.11
117.	1.36	782.	1.11
118.	1.36	783.	1.11
119.	1.36	784.	1.11
120.	1.36	785.	1.11
121.	1.36	786.	1.11
122.	1.36	787.	1.11
123.	1.35	788.	1.11
124.	1.35	789.	1.11
125.	1.35	790.	1.11
126.	1.35	791.	1.11
127.	1.35	792.	1.11
128.	1.35	793.	1.11
129.	1.35	794.	1.11
130.	1.35	795.	1.11
131.	1.35	796.	1.11
132.	1.35	797.	1.11
133.	1.35	798.	1.11
134.	1.35	799.	1.11
135.	1.34	800.	1.11
136.	1.34	801.	1.11
137.	1.34	802.	1.11
138.	1.34	803.	1.11
139.	1.34	804.	1.11
140.	1.34	805.	1.11
141.	1.34	806.	1.11
142.	1.34	807.	1.1
143.	1.34	808.	1.1
144.	1.34	809.	1.1
145.	1.34	810.	1.1
146.	1.34	811.	1.1
147.	1.34	812.	1.1
148.	1.34	813.	1.1
149.	1.33	814.	1.1
150.	1.33	815.	1.1
151.	1.33	816.	1.1
152.	1.33	817.	1.1
153.	1.33	818.	1.1
154.	1.33	819.	1.1
155.	1.33	820.	1.1
156.	1.33	821.	1.1
157.	1.33	822.	1.1
158.	1.33	823.	1.1
159.	1.33	824.	1.1
160.	1.33	825.	1.1
161.	1.33	826.	1.1
162.	1.33	827.	1.1

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
163.	1.32	828.	1.1
164.	1.32	829.	1.1
165.	1.32	830.	1.1
166.	1.32	831.	1.1
167.	1.32	832.	1.1
168.	1.32	833.	1.1
169.	1.32	834.	1.1
170.	1.32	835.	1.1
171.	1.32	836.	1.1
172.	1.32	837.	1.1
173.	1.32	838.	1.1
174.	1.32	839.	1.1
175.	1.32	840.	1.1
176.	1.32	841.	1.1
177.	1.31	842.	1.1
178.	1.32	843.	1.1
179.	1.31	844.	1.1
180.	1.31	845.	1.1
181.	1.31	846.	1.1
182.	1.31	847.	1.1
183.	1.31	848.	1.1
184.	1.31	849.	1.1
185.	1.31	850.	1.1
186.	1.31	851.	1.1
187.	1.31	852.	1.1
188.	1.31	853.	1.1
189.	1.31	854.	1.1
190.	1.31	855.	1.1
191.	1.31	856.	1.1
192.	1.31	857.	1.1
193.	1.31	858.	1.1
194.	1.3	859.	1.1
195.	1.3	860.	1.1
196.	1.3	861.	1.1
197.	1.3	862.	1.09
198.	1.3	863.	1.09
199.	1.3	864.	1.09
200.	1.3	865.	1.09
201.	1.3	866.	1.09
202.	1.3	867.	1.09
203.	1.3	868.	1.09
204.	1.3	869.	1.09
205.	1.3	870.	1.09
206.	1.3	871.	1.09
207.	1.3	872.	1.09
208.	1.3	873.	1.09
209.	1.3	874.	1.09
210.	1.3	875.	1.09
211.	1.3	876.	1.09
212.	1.3	877.	1.09
213.	1.3	878.	1.09
214.	1.29	879.	1.09
215.	1.29	880.	1.09
216.	1.29	881.	1.09
217.	1.29	882.	1.09
218.	1.29	883.	1.09
219.	1.29	884.	1.09
220.	1.29	885.	1.09
221.	1.29	886.	1.09
222.	1.29	887.	1.09
223.	1.29	888.	1.09
224.	1.29	889.	1.09
225.	1.29	890.	1.09
226.	1.29	891.	1.09
227.	1.29	892.	1.09
228.	1.29	893.	1.09

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
229.	1.29	894.	1.09
230.	1.29	895.	1.09
231.	1.29	896.	1.09
232.	1.28	897.	1.09
233.	1.28	898.	1.09
234.	1.28	899.	1.09
235.	1.28	900.	1.09
236.	1.28	901.	1.09
237.	1.28	902.	1.09
238.	1.28	903.	1.09
239.	1.28	904.	1.09
240.	1.28	905.	1.09
241.	1.28	906.	1.09
242.	1.28	907.	1.09
243.	1.28	908.	1.09
244.	1.28	909.	1.09
245.	1.28	910.	1.09
246.	1.28	911.	1.09
247.	1.28	912.	1.09
248.	1.28	913.	1.09
249.	1.28	914.	1.09
250.	1.28	915.	1.08
251.	1.28	916.	1.09
252.	1.27	917.	1.09
253.	1.27	918.	1.08
254.	1.27	919.	1.08
255.	1.27	920.	1.08
256.	1.27	921.	1.08
257.	1.27	922.	1.08
258.	1.27	923.	1.08
259.	1.27	924.	1.08
260.	1.27	925.	1.08
261.	1.27	926.	1.08
262.	1.27	927.	1.08
263.	1.27	928.	1.08
264.	1.27	929.	1.08
265.	1.27	930.	1.08
266.	1.27	931.	1.08
267.	1.27	932.	1.08
268.	1.27	933.	1.08
269.	1.27	934.	1.08
270.	1.27	935.	1.08
271.	1.26	936.	1.08
272.	1.26	937.	1.08
273.	1.26	938.	1.08
274.	1.26	939.	1.08
275.	1.26	940.	1.08
276.	1.26	941.	1.08
277.	1.26	942.	1.08
278.	1.26	943.	1.08
279.	1.26	944.	1.08
280.	1.26	945.	1.08
281.	1.26	946.	1.08
282.	1.26	947.	1.08
283.	1.26	948.	1.08
284.	1.26	949.	1.08
285.	1.26	950.	1.08
286.	1.26	951.	1.08
287.	1.26	952.	1.08
288.	1.26	953.	1.08
289.	1.26	954.	1.08
290.	1.26	955.	1.08
291.	1.26	956.	1.08
292.	1.26	957.	1.08
293.	1.26	958.	1.08
294.	1.25	959.	1.08

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
295.	1.25	960.	1.08
296.	1.26	961.	1.08
297.	1.25	962.	1.08
298.	1.25	963.	1.08
299.	1.25	964.	1.08
300.	1.25	965.	1.08
301.	1.25	966.	1.08
302.	1.25	967.	1.08
303.	1.25	968.	1.08
304.	1.25	969.	1.08
305.	1.25	970.	1.08
306.	1.25	971.	1.08
307.	1.25	972.	1.08
308.	1.25	973.	1.08
309.	1.25	974.	1.08
310.	1.25	975.	1.08
311.	1.25	976.	1.08
312.	1.25	977.	1.08
313.	1.25	978.	1.08
314.	1.25	979.	1.07
315.	1.25	980.	1.07
316.	1.25	981.	1.07
317.	1.25	982.	1.07
318.	1.25	983.	1.07
319.	1.24	984.	1.07
320.	1.24	985.	1.07
321.	1.24	986.	1.07
322.	1.24	987.	1.07
323.	1.24	988.	1.07
324.	1.24	989.	1.07
325.	1.24	990.	1.07
326.	1.24	991.	1.07
327.	1.24	992.	1.07
328.	1.24	993.	1.07
329.	1.24	994.	1.07
330.	1.24	995.	1.07
331.	1.24	996.	1.07
332.	1.24	997.	1.07
333.	1.24	998.	1.07
334.	1.24	999.	1.07
335.	1.24	1000.	1.07
336.	1.24	1001.	1.07
337.	1.24	1002.	1.07
338.	1.24	1003.	1.07
339.	1.24	1004.	1.07
340.	1.24	1005.	1.07
341.	1.24	1006.	1.07
342.	1.24	1007.	1.07
343.	1.23	1008.	1.07
344.	1.23	1009.	1.07
345.	1.23	1010.	1.07
346.	1.23	1011.	1.07
347.	1.23	1012.	1.07
348.	1.23	1013.	1.07
349.	1.23	1014.	1.07
350.	1.23	1015.	1.07
351.	1.23	1016.	1.07
352.	1.23	1017.	1.07
353.	1.23	1018.	1.07
354.	1.23	1019.	1.07
355.	1.23	1020.	1.07
356.	1.23	1021.	1.07
357.	1.23	1022.	1.07
358.	1.23	1023.	1.07
359.	1.23	1024.	1.07
360.	1.23	1025.	1.07

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
361.	1.23	1026.	1.07
362.	1.23	1027.	1.07
363.	1.23	1028.	1.07
364.	1.23	1029.	1.07
365.	1.23	1030.	1.07
366.	1.23	1031.	1.07
367.	1.23	1032.	1.07
368.	1.22	1033.	1.07
369.	1.22	1034.	1.07
370.	1.22	1035.	1.07
371.	1.22	1036.	1.07
372.	1.22	1037.	1.07
373.	1.22	1038.	1.07
374.	1.22	1039.	1.07
375.	1.22	1040.	1.07
376.	1.22	1041.	1.07
377.	1.22	1042.	1.07
378.	1.22	1043.	1.07
379.	1.22	1044.	1.06
380.	1.22	1045.	1.06
381.	1.22	1046.	1.07
382.	1.22	1047.	1.07
383.	1.22	1048.	1.07
384.	1.22	1049.	1.06
385.	1.22	1050.	1.06
386.	1.22	1051.	1.06
387.	1.22	1052.	1.06
388.	1.22	1053.	1.06
389.	1.22	1054.	1.06
390.	1.22	1055.	1.06
391.	1.22	1056.	1.06
392.	1.22	1057.	1.06
393.	1.22	1058.	1.06
394.	1.22	1059.	1.06
395.	1.21	1060.	1.06
396.	1.21	1061.	1.06
397.	1.21	1062.	1.06
398.	1.21	1063.	1.06
399.	1.21	1064.	1.06
400.	1.21	1065.	1.06
401.	1.21	1066.	1.06
402.	1.21	1067.	1.06
403.	1.21	1068.	1.06
404.	1.21	1069.	1.06
405.	1.21	1070.	1.06
406.	1.21	1071.	1.06
407.	1.21	1072.	1.06
408.	1.21	1073.	1.06
409.	1.21	1074.	1.06
410.	1.21	1075.	1.06
411.	1.21	1076.	1.06
412.	1.21	1077.	1.06
413.	1.21	1078.	1.06
414.	1.21	1079.	1.06
415.	1.21	1080.	1.06
416.	1.21	1081.	1.06
417.	1.21	1082.	1.06
418.	1.21	1083.	1.06
419.	1.21	1084.	1.06
420.	1.21	1085.	1.06
421.	1.21	1086.	1.06
422.	1.21	1087.	1.06
423.	1.21	1088.	1.06
424.	1.2	1089.	1.06
425.	1.2	1090.	1.06
426.	1.2	1091.	1.06

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
427.	1.2	1092.	1.06
428.	1.2	1093.	1.06
429.	1.2	1094.	1.06
430.	1.2	1095.	1.06
431.	1.2	1096.	1.06
432.	1.2	1097.	1.06
433.	1.2	1098.	1.06
434.	1.2	1099.	1.06
435.	1.2	1100.	1.06
436.	1.2	1101.	1.06
437.	1.2	1102.	1.06
438.	1.2	1103.	1.06
439.	1.2	1104.	1.06
440.	1.2	1105.	1.06
441.	1.2	1106.	1.06
442.	1.2	1107.	1.06
443.	1.2	1108.	1.06
444.	1.2	1109.	1.06
445.	1.2	1110.	1.06
446.	1.2	1111.	1.06
447.	1.2	1112.	1.06
448.	1.2	1113.	1.06
449.	1.2	1114.	1.05
450.	1.2	1115.	1.06
451.	1.2	1116.	1.06
452.	1.2	1117.	1.06
453.	1.19	1118.	1.05
454.	1.19	1119.	1.05
455.	1.19	1120.	1.05
456.	1.19	1121.	1.05
457.	1.19	1122.	1.06
458.	1.19	1123.	1.05
459.	1.19	1124.	1.05
460.	1.19	1125.	1.05
461.	1.19	1126.	1.05
462.	1.19	1127.	1.05
463.	1.19	1128.	1.05
464.	1.19	1129.	1.05
465.	1.19	1130.	1.05
466.	1.19	1131.	1.05
467.	1.19	1132.	1.05
468.	1.19	1133.	1.05
469.	1.19	1134.	1.05
470.	1.19	1135.	1.05
471.	1.19	1136.	1.05
472.	1.19	1137.	1.05
473.	1.19	1138.	1.05
474.	1.19	1139.	1.05
475.	1.19	1140.	1.05
476.	1.19	1141.	1.05
477.	1.19	1142.	1.05
478.	1.19	1143.	1.05
479.	1.19	1144.	1.05
480.	1.19	1145.	1.05
481.	1.19	1146.	1.05
482.	1.19	1147.	1.05
483.	1.19	1148.	1.05
484.	1.19	1149.	1.05
485.	1.18	1150.	1.05
486.	1.18	1151.	1.05
487.	1.18	1152.	1.05
488.	1.18	1153.	1.05
489.	1.18	1154.	1.05
490.	1.18	1155.	1.05
491.	1.18	1156.	1.05
492.	1.18	1157.	1.05

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
493.	1.18	1158.	1.05
494.	1.18	1159.	1.05
495.	1.18	1160.	1.05
496.	1.18	1161.	1.05
497.	1.18	1162.	1.05
498.	1.18	1163.	1.05
499.	1.18	1164.	1.05
500.	1.18	1165.	1.05
501.	1.18	1166.	1.05
502.	1.18	1167.	1.05
503.	1.18	1168.	1.05
504.	1.18	1169.	1.05
505.	1.18	1170.	1.05
506.	1.18	1171.	1.05
507.	1.18	1172.	1.05
508.	1.18	1173.	1.05
509.	1.18	1174.	1.05
510.	1.18	1175.	1.05
511.	1.18	1176.	1.05
512.	1.18	1177.	1.05
513.	1.18	1178.	1.05
514.	1.18	1179.	1.05
515.	1.18	1180.	1.05
516.	1.18	1181.	1.05
517.	1.18	1182.	1.05
518.	1.17	1183.	1.05
519.	1.17	1184.	1.05
520.	1.17	1185.	1.05
521.	1.17	1186.	1.05
522.	1.17	1187.	1.05
523.	1.17	1188.	1.05
524.	1.17	1189.	1.05
525.	1.17	1190.	1.04
526.	1.17	1191.	1.05
527.	1.17	1192.	1.04
528.	1.17	1193.	1.05
529.	1.17	1194.	1.05
530.	1.17	1195.	1.05
531.	1.17	1196.	1.05
532.	1.17	1197.	1.04
533.	1.17	1198.	1.04
534.	1.17	1199.	1.05
535.	1.17	1200.	1.05
536.	1.17	1201.	1.05
537.	1.17	1202.	1.04
538.	1.17	1203.	1.04
539.	1.17	1204.	1.04
540.	1.17	1205.	1.04
541.	1.17	1206.	1.04
542.	1.17	1207.	1.04
543.	1.17	1208.	1.04
544.	1.17	1209.	1.04
545.	1.17	1210.	1.04
546.	1.17	1211.	1.04
547.	1.17	1212.	1.04
548.	1.17	1213.	1.04
549.	1.17	1214.	1.04
550.	1.17	1215.	1.04
551.	1.17	1216.	1.04
552.	1.17	1217.	1.04
553.	1.17	1218.	1.04
554.	1.16	1219.	1.04
555.	1.16	1220.	1.04
556.	1.16	1221.	1.04
557.	1.17	1222.	1.04
558.	1.16	1223.	1.04

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
559.	1.16	1224.	1.04
560.	1.16	1225.	1.04
561.	1.16	1226.	1.04
562.	1.16	1227.	1.04
563.	1.16	1228.	1.04
564.	1.16	1229.	1.04
565.	1.16	1230.	1.04
566.	1.16	1231.	1.04
567.	1.16	1232.	1.04
568.	1.16	1233.	1.04
569.	1.16	1234.	1.04
570.	1.16	1235.	1.04
571.	1.16	1236.	1.04
572.	1.16	1237.	1.04
573.	1.16	1238.	1.04
574.	1.16	1239.	1.04
575.	1.16	1240.	1.04
576.	1.16	1241.	1.04
577.	1.16	1242.	1.04
578.	1.16	1243.	1.04
579.	1.16	1244.	1.04
580.	1.16	1245.	1.04
581.	1.16	1246.	1.04
582.	1.16	1247.	1.04
583.	1.16	1248.	1.04
584.	1.16	1249.	1.04
585.	1.16	1250.	1.04
586.	1.16	1251.	1.04
587.	1.16	1252.	1.04
588.	1.16	1253.	1.04
589.	1.16	1254.	1.04
590.	1.16	1255.	1.04
591.	1.15	1256.	1.04
592.	1.15	1257.	1.04
593.	1.15	1258.	1.04
594.	1.15	1259.	1.04
595.	1.15	1260.	1.04
596.	1.15	1261.	1.04
597.	1.15	1262.	1.04
598.	1.15	1263.	1.04
599.	1.15	1264.	1.04
600.	1.15	1265.	1.04
601.	1.15	1266.	1.04
602.	1.15	1267.	1.04
603.	1.15	1268.	1.04
604.	1.15	1269.	1.04
605.	1.15	1270.	1.04
606.	1.15	1271.	1.04
607.	1.15	1272.	1.04
608.	1.15	1273.	1.04
609.	1.15	1274.	1.04
610.	1.15	1275.	1.04
611.	1.15	1276.	1.04
612.	1.15	1277.	1.03
613.	1.15	1278.	1.03
614.	1.15	1279.	1.04
615.	1.15	1280.	1.04
616.	1.15	1281.	1.04
617.	1.15	1282.	1.04
618.	1.15	1283.	1.03
619.	1.15	1284.	1.03
620.	1.15	1285.	1.03
621.	1.15	1286.	1.03
622.	1.15	1287.	1.03
623.	1.15	1288.	1.03
624.	1.15	1289.	1.03

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
625.	1.15	1290.	1.03
626.	1.14	1291.	1.03
627.	1.14	1292.	1.03
628.	1.14	1293.	1.03
629.	1.14	1294.	1.03
630.	1.14	1295.	1.03
631.	1.14	1296.	1.03
632.	1.14	1297.	1.03
633.	1.14	1298.	1.03
634.	1.14	1299.	1.03
635.	1.14	1300.	1.03
636.	1.14	1301.	1.03
637.	1.14	1302.	1.03
638.	1.14	1303.	1.03
639.	1.14	1304.	1.03
640.	1.14	1305.	1.03
641.	1.14	1306.	1.03
642.	1.14	1307.	1.03
643.	1.14	1308.	1.03
644.	1.14	1309.	1.03
645.	1.14	1310.	1.03
646.	1.14	1311.	1.03
647.	1.14	1312.	1.03
648.	1.14	1313.	1.03
649.	1.14	1314.	1.03
650.	1.14	1315.	1.03
651.	1.14	1316.	1.03
652.	1.14	1317.	1.03
653.	1.14	1318.	1.03
654.	1.14	1319.	1.03
655.	1.14	1320.	1.03
656.	1.14	1321.	1.03
657.	1.14	1322.	1.03
658.	1.14	1323.	1.03
659.	1.14	1324.	1.03
660.	1.14	1325.	1.03
661.	1.14	1326.	1.03
662.	1.14	1327.	1.03
663.	1.14	1328.	1.03
664.	1.14	1329.	1.03
665.	1.14	1330.	1.03
666.	1.14		

SOLUTION

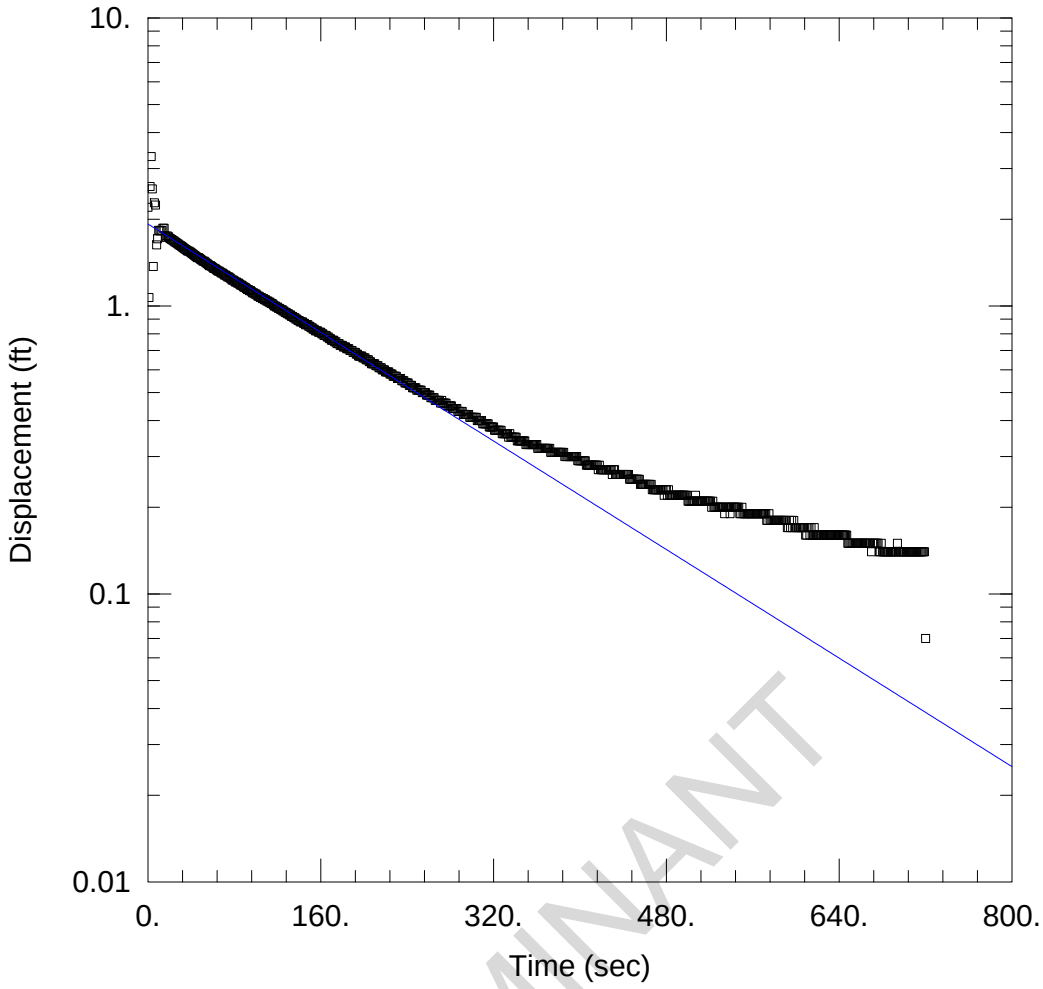
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.589

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.977E-6	cm/sec
y0	1.351	ft

$T = K*b = 0.004161$ cm²/sec



PDP-25 SLUG IN

Data Set: J:\...\PDP-25 Slug In.aqt
Date: 12/16/15 Time: 10:25:24

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-25
Test Date: 10/7/15

AQUIFER DATA

Saturated Thickness: 24. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-25)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 16. ft
Casing Radius: 0.083 ft
Static Water Column Height: 38.89 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001494 cm/sec
y0 = 1.925 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-25 Slug In
Date: 12/16/15
Time: 10:26:36

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/7/15
Test Well: PDP-25

AQUIFER DATA

Saturated Thickness: 24. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-25

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 38.89 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 16. ft

No. of Observations: 720

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.07	361.	0.32
2.	2.6	362.	0.32
3.	3.3	363.	0.32
4.	2.55	364.	0.32
5.	1.37	365.	0.32
6.	2.28	366.	0.32
7.	2.24	367.	0.32
8.	1.63	368.	0.32
9.	1.71	369.	0.32
10.	1.83	370.	0.32
11.	1.82	371.	0.32
12.	1.83	372.	0.32
13.	1.83	373.	0.31
14.	1.86	374.	0.31
15.	1.86	375.	0.31
16.	1.75	376.	0.31
17.	1.73	377.	0.31
18.	1.75	378.	0.31
19.	1.74	379.	0.31
20.	1.72	380.	0.31
21.	1.71	381.	0.31
22.	1.7	382.	0.31
23.	1.69	383.	0.31
24.	1.68	384.	0.31
25.	1.67	385.	0.31
26.	1.66	386.	0.3
27.	1.65	387.	0.3
28.	1.64	388.	0.3
29.	1.63	389.	0.3

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.62	390.	0.3
31.	1.61	391.	0.3
32.	1.6	392.	0.3
33.	1.59	393.	0.3
34.	1.58	394.	0.3
35.	1.57	395.	0.3
36.	1.56	396.	0.3
37.	1.55	397.	0.3
38.	1.55	398.	0.29
39.	1.54	399.	0.29
40.	1.53	400.	0.29
41.	1.52	401.	0.29
42.	1.51	402.	0.29
43.	1.5	403.	0.29
44.	1.49	404.	0.29
45.	1.48	405.	0.29
46.	1.47	406.	0.28
47.	1.47	407.	0.28
48.	1.46	408.	0.28
49.	1.45	409.	0.28
50.	1.44	410.	0.28
51.	1.43	411.	0.28
52.	1.43	412.	0.28
53.	1.42	413.	0.28
54.	1.41	414.	0.28
55.	1.4	415.	0.28
56.	1.39	416.	0.28
57.	1.38	417.	0.27
58.	1.38	418.	0.28
59.	1.37	419.	0.27
60.	1.36	420.	0.27
61.	1.35	421.	0.27
62.	1.35	422.	0.27
63.	1.34	423.	0.27
64.	1.33	424.	0.27
65.	1.32	425.	0.27
66.	1.32	426.	0.27
67.	1.31	427.	0.27
68.	1.3	428.	0.27
69.	1.3	429.	0.27
70.	1.29	430.	0.26
71.	1.28	431.	0.27
72.	1.28	432.	0.27
73.	1.27	433.	0.26
74.	1.26	434.	0.26
75.	1.26	435.	0.26
76.	1.25	436.	0.26
77.	1.24	437.	0.26
78.	1.23	438.	0.26
79.	1.23	439.	0.26
80.	1.22	440.	0.26
81.	1.21	441.	0.26
82.	1.21	442.	0.26
83.	1.2	443.	0.26
84.	1.2	444.	0.26
85.	1.19	445.	0.26
86.	1.18	446.	0.25
87.	1.18	447.	0.25
88.	1.17	448.	0.25
89.	1.16	449.	0.25
90.	1.16	450.	0.25
91.	1.15	451.	0.25
92.	1.14	452.	0.25
93.	1.14	453.	0.25
94.	1.13	454.	0.25
95.	1.13	455.	0.25

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	1.12	456.	0.24
97.	1.11	457.	0.24
98.	1.11	458.	0.24
99.	1.1	459.	0.24
100.	1.1	460.	0.24
101.	1.09	461.	0.24
102.	1.08	462.	0.24
103.	1.08	463.	0.24
104.	1.07	464.	0.24
105.	1.07	465.	0.24
106.	1.06	466.	0.24
107.	1.06	467.	0.23
108.	1.05	468.	0.23
109.	1.05	469.	0.23
110.	1.04	470.	0.23
111.	1.04	471.	0.23
112.	1.03	472.	0.23
113.	1.03	473.	0.23
114.	1.02	474.	0.23
115.	1.02	475.	0.23
116.	1.01	476.	0.23
117.	1.	477.	0.23
118.	1.	478.	0.22
119.	0.99	479.	0.23
120.	0.99	480.	0.23
121.	0.98	481.	0.22
122.	0.98	482.	0.23
123.	0.97	483.	0.22
124.	0.97	484.	0.22
125.	0.96	485.	0.22
126.	0.96	486.	0.22
127.	0.95	487.	0.22
128.	0.95	488.	0.22
129.	0.94	489.	0.22
130.	0.94	490.	0.22
131.	0.93	491.	0.22
132.	0.93	492.	0.22
133.	0.92	493.	0.22
134.	0.92	494.	0.22
135.	0.91	495.	0.22
136.	0.91	496.	0.22
137.	0.9	497.	0.22
138.	0.9	498.	0.22
139.	0.89	499.	0.22
140.	0.89	500.	0.21
141.	0.88	501.	0.21
142.	0.88	502.	0.21
143.	0.88	503.	0.21
144.	0.87	504.	0.21
145.	0.87	505.	0.21
146.	0.86	506.	0.21
147.	0.86	507.	0.22
148.	0.86	508.	0.21
149.	0.85	509.	0.21
150.	0.85	510.	0.21
151.	0.84	511.	0.21
152.	0.84	512.	0.21
153.	0.83	513.	0.21
154.	0.83	514.	0.21
155.	0.82	515.	0.21
156.	0.82	516.	0.21
157.	0.82	517.	0.21
158.	0.81	518.	0.21
159.	0.81	519.	0.21
160.	0.81	520.	0.21
161.	0.8	521.	0.21

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	0.8	522.	0.2
163.	0.79	523.	0.21
164.	0.79	524.	0.2
165.	0.79	525.	0.2
166.	0.78	526.	0.2
167.	0.78	527.	0.2
168.	0.77	528.	0.2
169.	0.77	529.	0.2
170.	0.76	530.	0.2
171.	0.76	531.	0.2
172.	0.76	532.	0.2
173.	0.75	533.	0.2
174.	0.75	534.	0.19
175.	0.74	535.	0.2
176.	0.74	536.	0.2
177.	0.74	537.	0.2
178.	0.73	538.	0.2
179.	0.73	539.	0.19
180.	0.73	540.	0.2
181.	0.72	541.	0.2
182.	0.72	542.	0.2
183.	0.72	543.	0.2
184.	0.71	544.	0.2
185.	0.71	545.	0.2
186.	0.71	546.	0.2
187.	0.7	547.	0.2
188.	0.7	548.	0.19
189.	0.7	549.	0.19
190.	0.69	550.	0.2
191.	0.69	551.	0.19
192.	0.69	552.	0.19
193.	0.68	553.	0.19
194.	0.68	554.	0.19
195.	0.67	555.	0.19
196.	0.67	556.	0.19
197.	0.67	557.	0.19
198.	0.67	558.	0.19
199.	0.66	559.	0.19
200.	0.66	560.	0.19
201.	0.66	561.	0.19
202.	0.65	562.	0.19
203.	0.65	563.	0.19
204.	0.65	564.	0.19
205.	0.64	565.	0.19
206.	0.64	566.	0.19
207.	0.63	567.	0.19
208.	0.63	568.	0.19
209.	0.63	569.	0.19
210.	0.63	570.	0.19
211.	0.62	571.	0.19
212.	0.62	572.	0.19
213.	0.62	573.	0.18
214.	0.61	574.	0.18
215.	0.61	575.	0.19
216.	0.61	576.	0.18
217.	0.6	577.	0.18
218.	0.6	578.	0.18
219.	0.6	579.	0.18
220.	0.59	580.	0.18
221.	0.59	581.	0.18
222.	0.59	582.	0.18
223.	0.59	583.	0.18
224.	0.58	584.	0.18
225.	0.58	585.	0.18
226.	0.58	586.	0.18
227.	0.57	587.	0.18

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
228.	0.57	588.	0.18
229.	0.57	589.	0.18
230.	0.57	590.	0.18
231.	0.56	591.	0.18
232.	0.56	592.	0.17
233.	0.56	593.	0.17
234.	0.56	594.	0.18
235.	0.55	595.	0.17
236.	0.55	596.	0.18
237.	0.55	597.	0.17
238.	0.54	598.	0.18
239.	0.54	599.	0.17
240.	0.54	600.	0.17
241.	0.54	601.	0.17
242.	0.53	602.	0.17
243.	0.53	603.	0.17
244.	0.53	604.	0.17
245.	0.52	605.	0.17
246.	0.52	606.	0.17
247.	0.52	607.	0.17
248.	0.52	608.	0.17
249.	0.51	609.	0.16
250.	0.51	610.	0.16
251.	0.51	611.	0.17
252.	0.51	612.	0.17
253.	0.51	613.	0.16
254.	0.5	614.	0.17
255.	0.5	615.	0.16
256.	0.5	616.	0.16
257.	0.5	617.	0.17
258.	0.49	618.	0.16
259.	0.49	619.	0.16
260.	0.49	620.	0.16
261.	0.49	621.	0.16
262.	0.48	622.	0.16
263.	0.48	623.	0.16
264.	0.48	624.	0.16
265.	0.48	625.	0.16
266.	0.47	626.	0.16
267.	0.47	627.	0.16
268.	0.47	628.	0.16
269.	0.47	629.	0.16
270.	0.47	630.	0.16
271.	0.46	631.	0.16
272.	0.47	632.	0.16
273.	0.46	633.	0.16
274.	0.46	634.	0.16
275.	0.46	635.	0.16
276.	0.46	636.	0.16
277.	0.45	637.	0.16
278.	0.45	638.	0.16
279.	0.45	639.	0.16
280.	0.45	640.	0.16
281.	0.45	641.	0.16
282.	0.44	642.	0.16
283.	0.44	643.	0.16
284.	0.44	644.	0.16
285.	0.44	645.	0.16
286.	0.44	646.	0.16
287.	0.43	647.	0.16
288.	0.43	648.	0.15
289.	0.43	649.	0.15
290.	0.43	650.	0.15
291.	0.43	651.	0.15
292.	0.42	652.	0.15
293.	0.42	653.	0.15

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
294.	0.42	654.	0.15
295.	0.42	655.	0.15
296.	0.42	656.	0.15
297.	0.42	657.	0.15
298.	0.41	658.	0.15
299.	0.41	659.	0.15
300.	0.41	660.	0.15
301.	0.41	661.	0.15
302.	0.41	662.	0.15
303.	0.41	663.	0.15
304.	0.41	664.	0.15
305.	0.4	665.	0.15
306.	0.4	666.	0.15
307.	0.4	667.	0.15
308.	0.4	668.	0.15
309.	0.4	669.	0.15
310.	0.39	670.	0.14
311.	0.39	671.	0.15
312.	0.39	672.	0.15
313.	0.39	673.	0.15
314.	0.39	674.	0.15
315.	0.39	675.	0.15
316.	0.38	676.	0.15
317.	0.38	677.	0.14
318.	0.38	678.	0.14
319.	0.38	679.	0.15
320.	0.38	680.	0.14
321.	0.37	681.	0.14
322.	0.37	682.	0.14
323.	0.37	683.	0.14
324.	0.37	684.	0.14
325.	0.37	685.	0.14
326.	0.37	686.	0.14
327.	0.37	687.	0.14
328.	0.36	688.	0.14
329.	0.36	689.	0.14
330.	0.36	690.	0.14
331.	0.36	691.	0.14
332.	0.36	692.	0.14
333.	0.36	693.	0.14
334.	0.35	694.	0.15
335.	0.36	695.	0.14
336.	0.35	696.	0.14
337.	0.35	697.	0.14
338.	0.35	698.	0.14
339.	0.35	699.	0.14
340.	0.35	700.	0.14
341.	0.35	701.	0.14
342.	0.34	702.	0.14
343.	0.34	703.	0.14
344.	0.34	704.	0.14
345.	0.34	705.	0.14
346.	0.34	706.	0.14
347.	0.34	707.	0.14
348.	0.34	708.	0.14
349.	0.34	709.	0.14
350.	0.33	710.	0.14
351.	0.33	711.	0.14
352.	0.33	712.	0.14
353.	0.33	713.	0.14
354.	0.33	714.	0.14
355.	0.33	715.	0.14
356.	0.33	716.	0.14
357.	0.33	717.	0.14
358.	0.33	718.	0.14
359.	0.33	719.	0.14

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
360.	0.33	720.	0.07

SOLUTION

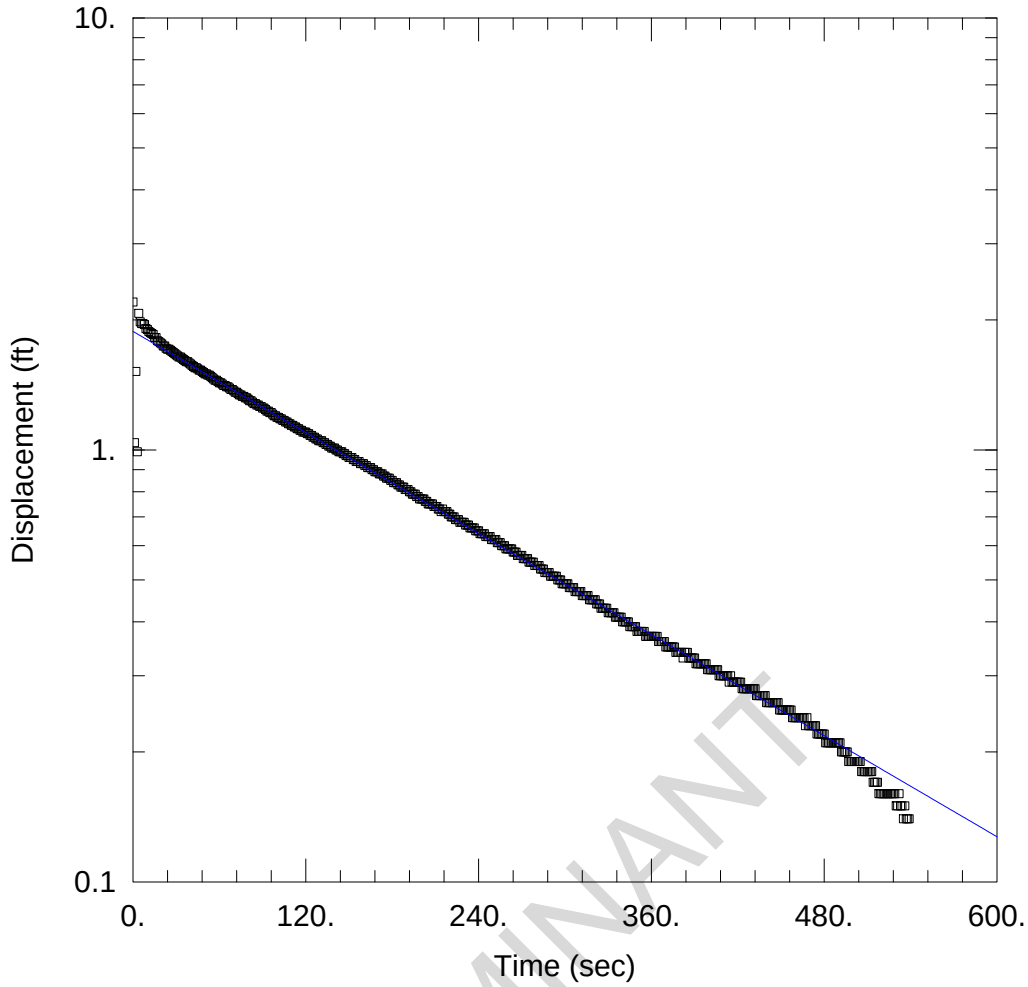
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.624

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001494	cm/sec
y0	1.925	ft

$T = K*b = 0.1093$ cm²/sec



PDP-25 SLUG OUT

Data Set: J:\...\PDP-25 Slug Out.aqt
Date: 12/16/15 Time: 10:25:32

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-25
Test Date: 10/7/15

AQUIFER DATA

Saturated Thickness: 24. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-25)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 16. ft
Casing Radius: 0.083 ft
Static Water Column Height: 38.89 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001237 cm/sec
y0 = 1.881 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-25 Slug Out
Date: 12/16/15
Time: 10:26:27

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/7/15
Test Well: PDP-25

AQUIFER DATA

Saturated Thickness: 24. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-25

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 38.89 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 10. ft
Total Well Penetration Depth: 16. ft

No. of Observations: 539

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.04	271.	0.56
2.	1.52	272.	0.56
3.	0.99	273.	0.56
4.	2.07	274.	0.56
5.	1.98	275.	0.55
6.	1.96	276.	0.55
7.	1.96	277.	0.55
8.	1.95	278.	0.55
9.	1.91	279.	0.54
10.	1.9	280.	0.54
11.	1.88	281.	0.54
12.	1.87	282.	0.54
13.	1.86	283.	0.53
14.	1.85	284.	0.53
15.	1.82	285.	0.53
16.	1.82	286.	0.52
17.	1.79	287.	0.52
18.	1.78	288.	0.52
19.	1.77	289.	0.52
20.	1.76	290.	0.51
21.	1.74	291.	0.51
22.	1.74	292.	0.51
23.	1.72	293.	0.51
24.	1.71	294.	0.51
25.	1.71	295.	0.5
26.	1.7	296.	0.5
27.	1.69	297.	0.5
28.	1.68	298.	0.49
29.	1.67	299.	0.49

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.66	300.	0.49
31.	1.65	301.	0.49
32.	1.64	302.	0.49
33.	1.64	303.	0.48
34.	1.63	304.	0.48
35.	1.62	305.	0.48
36.	1.61	306.	0.48
37.	1.6	307.	0.47
38.	1.6	308.	0.47
39.	1.59	309.	0.47
40.	1.58	310.	0.47
41.	1.57	311.	0.47
42.	1.56	312.	0.46
43.	1.55	313.	0.46
44.	1.55	314.	0.46
45.	1.54	315.	0.46
46.	1.53	316.	0.46
47.	1.53	317.	0.45
48.	1.52	318.	0.45
49.	1.51	319.	0.45
50.	1.5	320.	0.45
51.	1.5	321.	0.45
52.	1.49	322.	0.44
53.	1.49	323.	0.44
54.	1.48	324.	0.44
55.	1.47	325.	0.43
56.	1.46	326.	0.43
57.	1.45	327.	0.43
58.	1.45	328.	0.43
59.	1.44	329.	0.43
60.	1.43	330.	0.42
61.	1.43	331.	0.42
62.	1.42	332.	0.42
63.	1.41	333.	0.42
64.	1.41	334.	0.42
65.	1.4	335.	0.41
66.	1.4	336.	0.41
67.	1.39	337.	0.41
68.	1.38	338.	0.41
69.	1.38	339.	0.41
70.	1.37	340.	0.4
71.	1.36	341.	0.4
72.	1.36	342.	0.4
73.	1.35	343.	0.4
74.	1.34	344.	0.4
75.	1.34	345.	0.39
76.	1.33	346.	0.39
77.	1.33	347.	0.39
78.	1.32	348.	0.39
79.	1.32	349.	0.39
80.	1.31	350.	0.38
81.	1.3	351.	0.38
82.	1.3	352.	0.38
83.	1.29	353.	0.38
84.	1.28	354.	0.38
85.	1.28	355.	0.38
86.	1.27	356.	0.37
87.	1.27	357.	0.37
88.	1.26	358.	0.37
89.	1.26	359.	0.37
90.	1.25	360.	0.37
91.	1.25	361.	0.37
92.	1.24	362.	0.37
93.	1.23	363.	0.37
94.	1.23	364.	0.37
95.	1.22	365.	0.36

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	1.22	366.	0.36
97.	1.21	367.	0.36
98.	1.2	368.	0.36
99.	1.2	369.	0.36
100.	1.19	370.	0.35
101.	1.19	371.	0.35
102.	1.18	372.	0.35
103.	1.18	373.	0.35
104.	1.17	374.	0.35
105.	1.17	375.	0.35
106.	1.16	376.	0.35
107.	1.16	377.	0.34
108.	1.15	378.	0.34
109.	1.15	379.	0.34
110.	1.14	380.	0.34
111.	1.14	381.	0.34
112.	1.13	382.	0.33
113.	1.13	383.	0.34
114.	1.12	384.	0.34
115.	1.12	385.	0.34
116.	1.11	386.	0.33
117.	1.11	387.	0.33
118.	1.1	388.	0.33
119.	1.1	389.	0.33
120.	1.1	390.	0.33
121.	1.09	391.	0.32
122.	1.09	392.	0.32
123.	1.08	393.	0.32
124.	1.08	394.	0.32
125.	1.07	395.	0.32
126.	1.07	396.	0.32
127.	1.06	397.	0.32
128.	1.06	398.	0.32
129.	1.05	399.	0.31
130.	1.05	400.	0.31
131.	1.05	401.	0.31
132.	1.04	402.	0.31
133.	1.04	403.	0.31
134.	1.03	404.	0.31
135.	1.03	405.	0.31
136.	1.02	406.	0.31
137.	1.02	407.	0.3
138.	1.01	408.	0.3
139.	1.01	409.	0.3
140.	1.01	410.	0.3
141.	1.	411.	0.3
142.	1.	412.	0.3
143.	0.99	413.	0.3
144.	0.99	414.	0.29
145.	0.99	415.	0.3
146.	0.98	416.	0.29
147.	0.98	417.	0.29
148.	0.97	418.	0.29
149.	0.97	419.	0.29
150.	0.96	420.	0.29
151.	0.96	421.	0.29
152.	0.96	422.	0.29
153.	0.95	423.	0.28
154.	0.95	424.	0.28
155.	0.94	425.	0.28
156.	0.94	426.	0.28
157.	0.94	427.	0.28
158.	0.93	428.	0.28
159.	0.93	429.	0.28
160.	0.93	430.	0.28
161.	0.92	431.	0.28

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	0.92	432.	0.28
163.	0.91	433.	0.27
164.	0.91	434.	0.27
165.	0.91	435.	0.27
166.	0.9	436.	0.27
167.	0.9	437.	0.27
168.	0.89	438.	0.27
169.	0.89	439.	0.27
170.	0.89	440.	0.26
171.	0.88	441.	0.26
172.	0.88	442.	0.26
173.	0.88	443.	0.26
174.	0.87	444.	0.26
175.	0.87	445.	0.26
176.	0.86	446.	0.26
177.	0.86	447.	0.26
178.	0.86	448.	0.26
179.	0.85	449.	0.25
180.	0.85	450.	0.25
181.	0.84	451.	0.25
182.	0.84	452.	0.25
183.	0.84	453.	0.25
184.	0.83	454.	0.25
185.	0.83	455.	0.25
186.	0.82	456.	0.25
187.	0.82	457.	0.25
188.	0.82	458.	0.24
189.	0.81	459.	0.24
190.	0.81	460.	0.24
191.	0.81	461.	0.24
192.	0.8	462.	0.24
193.	0.8	463.	0.24
194.	0.79	464.	0.24
195.	0.79	465.	0.24
196.	0.79	466.	0.24
197.	0.78	467.	0.23
198.	0.78	468.	0.24
199.	0.77	469.	0.23
200.	0.77	470.	0.23
201.	0.77	471.	0.23
202.	0.77	472.	0.23
203.	0.76	473.	0.23
204.	0.76	474.	0.23
205.	0.75	475.	0.22
206.	0.75	476.	0.22
207.	0.75	477.	0.22
208.	0.75	478.	0.22
209.	0.74	479.	0.22
210.	0.74	480.	0.22
211.	0.74	481.	0.21
212.	0.73	482.	0.21
213.	0.73	483.	0.21
214.	0.72	484.	0.21
215.	0.73	485.	0.21
216.	0.72	486.	0.21
217.	0.72	487.	0.21
218.	0.72	488.	0.21
219.	0.71	489.	0.21
220.	0.71	490.	0.21
221.	0.7	491.	0.21
222.	0.7	492.	0.2
223.	0.7	493.	0.2
224.	0.69	494.	0.2
225.	0.69	495.	0.2
226.	0.69	496.	0.2
227.	0.68	497.	0.19

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
228.	0.68	498.	0.19
229.	0.68	499.	0.19
230.	0.68	500.	0.19
231.	0.67	501.	0.19
232.	0.67	502.	0.19
233.	0.67	503.	0.19
234.	0.66	504.	0.19
235.	0.66	505.	0.19
236.	0.66	506.	0.18
237.	0.66	507.	0.18
238.	0.65	508.	0.18
239.	0.65	509.	0.18
240.	0.65	510.	0.18
241.	0.64	511.	0.18
242.	0.64	512.	0.18
243.	0.64	513.	0.18
244.	0.64	514.	0.17
245.	0.63	515.	0.17
246.	0.63	516.	0.17
247.	0.63	517.	0.17
248.	0.63	518.	0.16
249.	0.62	519.	0.16
250.	0.62	520.	0.16
251.	0.62	521.	0.16
252.	0.62	522.	0.16
253.	0.61	523.	0.16
254.	0.61	524.	0.16
255.	0.61	525.	0.16
256.	0.6	526.	0.16
257.	0.6	527.	0.16
258.	0.6	528.	0.16
259.	0.59	529.	0.16
260.	0.59	530.	0.15
261.	0.59	531.	0.15
262.	0.59	532.	0.16
263.	0.59	533.	0.15
264.	0.58	534.	0.15
265.	0.58	535.	0.14
266.	0.58	536.	0.15
267.	0.57	537.	0.14
268.	0.57	538.	0.14
269.	0.57	539.	0.14
270.	0.57		

SOLUTION

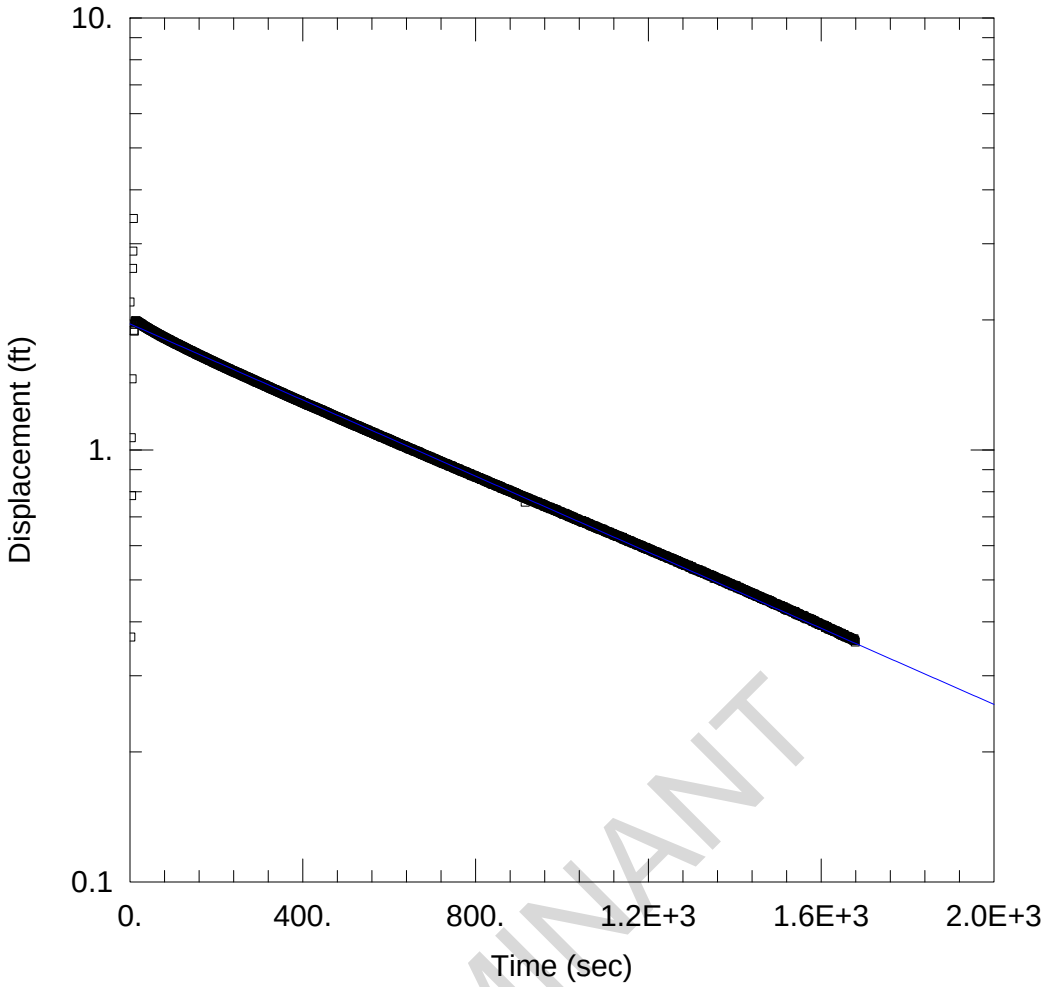
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.624

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001237	cm/sec
y0	1.881	ft

$T = K*b = 0.09046$ cm²/sec



PDP-26 SLUG IN

Data Set: J:\...\PDP-26 Slug In.aqt
Date: 12/16/15 Time: 10:25:41

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-26
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 8. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-26)

Initial Displacement: 2.2 ft Static Water Column Height: 20.02 ft
Total Well Penetration Depth: 8. ft Screen Length: 8. ft
Casing Radius: 0.083 ft Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.407E-5 cm/sec y0 = 1.958 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-26 Slug In
Date: 12/16/15
Time: 10:26:18

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/6/15
Test Well: PDP-26

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-26

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 20.02 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 8. ft
Total Well Penetration Depth: 8. ft

No. of Observations: 1678

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
2.	0.3688	841.	0.8334
3.	1.067	842.	0.833
4.	0.7836	843.	0.8319
5.	1.461	844.	0.8315
6.	2.631	845.	0.8311
7.	2.886	846.	0.8291
8.	3.433	847.	0.8298
9.	1.891	848.	0.8273
10.	1.884	849.	0.8279
11.	1.953	850.	0.8254
12.	1.979	851.	0.8269
13.	1.986	852.	0.8246
14.	1.991	853.	0.8249
15.	1.988	854.	0.8235
16.	1.984	855.	0.8228
17.	1.982	856.	0.8227
18.	1.979	857.	0.8203
19.	1.976	858.	0.8212
20.	1.973	859.	0.8192
21.	1.97	860.	0.8176
22.	1.968	861.	0.8161
23.	1.963	862.	0.8159
24.	1.96	863.	0.8155
25.	1.958	864.	0.8148
26.	1.957	865.	0.8137
27.	1.953	866.	0.8132
28.	1.95	867.	0.8137
29.	1.947	868.	0.812
30.	1.941	869.	0.8111

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
31.	1.939	870.	0.8099
32.	1.936	871.	0.8091
33.	1.934	872.	0.8103
34.	1.931	873.	0.807
35.	1.93	874.	0.8071
36.	1.926	875.	0.8072
37.	1.923	876.	0.8068
38.	1.92	877.	0.8063
39.	1.919	878.	0.8043
40.	1.915	879.	0.8035
41.	1.913	880.	0.8028
42.	1.912	881.	0.802
43.	1.908	882.	0.8017
44.	1.905	883.	0.8008
45.	1.902	884.	0.8004
46.	1.9	885.	0.7994
47.	1.897	886.	0.7985
48.	1.895	887.	0.7965
49.	1.892	888.	0.7966
50.	1.889	889.	0.7968
51.	1.888	890.	0.796
52.	1.885	891.	0.7954
53.	1.883	892.	0.7934
54.	1.881	893.	0.7912
55.	1.878	894.	0.7915
56.	1.875	895.	0.7915
57.	1.874	896.	0.79
58.	1.869	897.	0.7885
59.	1.868	898.	0.7886
60.	1.865	899.	0.7879
61.	1.863	900.	0.7865
62.	1.861	901.	0.7857
63.	1.859	902.	0.7846
64.	1.857	903.	0.7838
65.	1.853	904.	0.7839
66.	1.849	905.	0.7832
67.	1.849	906.	0.7826
68.	1.847	907.	0.7802
69.	1.845	908.	0.7813
70.	1.842	909.	0.7796
71.	1.838	910.	0.7796
72.	1.836	911.	0.7769
73.	1.835	912.	0.7783
74.	1.834	913.	0.7781
75.	1.831	914.	0.7762
76.	1.827	915.	0.7569
77.	1.825	916.	0.7759
78.	1.825	917.	0.7727
79.	1.822	918.	0.774
80.	1.818	919.	0.7726
81.	1.816	920.	0.7731
82.	1.816	921.	0.7702
83.	1.813	922.	0.7703
84.	1.811	923.	0.7707
85.	1.808	924.	0.7683
86.	1.807	925.	0.7686
87.	1.804	926.	0.7669
88.	1.8	927.	0.766
89.	1.799	928.	0.7655
90.	1.8	929.	0.7649
91.	1.795	930.	0.7656
92.	1.792	931.	0.7637
93.	1.792	932.	0.7639
94.	1.788	933.	0.763
95.	1.785	934.	0.7615
96.	1.785	935.	0.7603

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
97.	1.782	936.	0.7602
98.	1.78	937.	0.7583
99.	1.777	938.	0.7594
100.	1.777	939.	0.7584
101.	1.774	940.	0.7569
102.	1.771	941.	0.7561
103.	1.769	942.	0.7551
104.	1.768	943.	0.7539
105.	1.764	944.	0.7567
106.	1.763	945.	0.7537
107.	1.761	946.	0.7534
108.	1.758	947.	0.7518
109.	1.76	948.	0.7511
110.	1.754	949.	0.7485
111.	1.754	950.	0.7511
112.	1.754	951.	0.751
113.	1.751	952.	0.7475
114.	1.748	953.	0.7488
115.	1.745	954.	0.7487
116.	1.742	955.	0.7461
117.	1.743	956.	0.7464
118.	1.74	957.	0.7454
119.	1.736	958.	0.7457
120.	1.737	959.	0.7418
121.	1.734	960.	0.7426
122.	1.733	961.	0.7404
123.	1.73	962.	0.7424
124.	1.728	963.	0.7399
125.	1.726	964.	0.739
126.	1.724	965.	0.7395
127.	1.722	966.	0.7383
128.	1.719	967.	0.7368
129.	1.718	968.	0.7367
130.	1.716	969.	0.7368
131.	1.714	970.	0.7343
132.	1.711	971.	0.7368
133.	1.709	972.	0.7358
134.	1.707	973.	0.7353
135.	1.706	974.	0.7311
136.	1.704	975.	0.7324
137.	1.701	976.	0.7319
138.	1.698	977.	0.7316
139.	1.698	978.	0.7311
140.	1.696	979.	0.7291
141.	1.694	980.	0.7298
142.	1.692	981.	0.7298
143.	1.691	982.	0.7282
144.	1.689	983.	0.7269
145.	1.686	984.	0.7247
146.	1.684	985.	0.7255
147.	1.683	986.	0.726
148.	1.682	987.	0.7263
149.	1.679	988.	0.7234
150.	1.679	989.	0.7219
151.	1.676	990.	0.7218
152.	1.673	991.	0.7208
153.	1.67	992.	0.7204
154.	1.668	993.	0.7204
155.	1.667	994.	0.7191
156.	1.666	995.	0.7182
157.	1.663	996.	0.7171
158.	1.661	997.	0.7184
159.	1.659	998.	0.7169
160.	1.658	999.	0.7157
161.	1.657	1000.	0.7131
162.	1.655	1001.	0.7141

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
163.	1.653	1002.	0.7131
164.	1.651	1003.	0.7125
165.	1.65	1004.	0.7096
166.	1.646	1005.	0.7109
167.	1.646	1006.	0.713
168.	1.644	1007.	0.71
169.	1.64	1008.	0.71
170.	1.639	1009.	0.7106
171.	1.641	1010.	0.7075
172.	1.638	1011.	0.7074
173.	1.633	1012.	0.7068
174.	1.632	1013.	0.707
175.	1.632	1014.	0.7056
176.	1.629	1015.	0.7044
177.	1.626	1016.	0.7038
178.	1.626	1017.	0.7011
179.	1.623	1018.	0.7037
180.	1.622	1019.	0.702
181.	1.619	1020.	0.7001
182.	1.619	1021.	0.7014
183.	1.617	1022.	0.7
184.	1.613	1023.	0.6994
185.	1.614	1024.	0.6981
186.	1.611	1025.	0.6966
187.	1.611	1026.	0.6984
188.	1.609	1027.	0.6956
189.	1.607	1028.	0.6956
190.	1.604	1029.	0.6945
191.	1.603	1030.	0.6932
192.	1.6	1031.	0.6936
193.	1.598	1032.	0.6926
194.	1.599	1033.	0.6903
195.	1.596	1034.	0.6909
196.	1.594	1035.	0.6924
197.	1.591	1036.	0.6898
198.	1.59	1037.	0.6897
199.	1.588	1038.	0.6888
200.	1.588	1039.	0.6876
201.	1.585	1040.	0.6866
202.	1.583	1041.	0.6861
203.	1.582	1042.	0.6861
204.	1.58	1043.	0.6853
205.	1.578	1044.	0.6853
206.	1.578	1045.	0.6834
207.	1.575	1046.	0.686
208.	1.573	1047.	0.6818
209.	1.571	1048.	0.6818
210.	1.57	1049.	0.6807
211.	1.569	1050.	0.6808
212.	1.565	1051.	0.6796
213.	1.564	1052.	0.6814
214.	1.561	1053.	0.6815
215.	1.562	1054.	0.6791
216.	1.56	1055.	0.6784
217.	1.559	1056.	0.677
218.	1.556	1057.	0.6777
219.	1.555	1058.	0.676
220.	1.554	1059.	0.6751
221.	1.551	1060.	0.6757
222.	1.549	1061.	0.6748
223.	1.547	1062.	0.6745
224.	1.546	1063.	0.6735
225.	1.545	1064.	0.6724
226.	1.543	1065.	0.6706
227.	1.542	1066.	0.6701
228.	1.54	1067.	0.6702

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
229.	1.54	1068.	0.6696
230.	1.537	1069.	0.6689
231.	1.536	1070.	0.6662
232.	1.535	1071.	0.6686
233.	1.53	1072.	0.667
234.	1.53	1073.	0.666
235.	1.528	1074.	0.6665
236.	1.526	1075.	0.6641
237.	1.525	1076.	0.6659
238.	1.525	1077.	0.6635
239.	1.523	1078.	0.6622
240.	1.52	1079.	0.6638
241.	1.517	1080.	0.662
242.	1.518	1081.	0.6603
243.	1.516	1082.	0.6601
244.	1.514	1083.	0.659
245.	1.512	1084.	0.6603
246.	1.51	1085.	0.6582
247.	1.509	1086.	0.6581
248.	1.509	1087.	0.6559
249.	1.507	1088.	0.6577
250.	1.505	1089.	0.6556
251.	1.506	1090.	0.6557
252.	1.502	1091.	0.6563
253.	1.501	1092.	0.6535
254.	1.499	1093.	0.6536
255.	1.497	1094.	0.6552
256.	1.496	1095.	0.6535
257.	1.493	1096.	0.6518
258.	1.492	1097.	0.6513
259.	1.491	1098.	0.6515
260.	1.49	1099.	0.6498
261.	1.488	1100.	0.6493
262.	1.487	1101.	0.6479
263.	1.484	1102.	0.6474
264.	1.482	1103.	0.6471
265.	1.48	1104.	0.6461
266.	1.481	1105.	0.6469
267.	1.478	1106.	0.6443
268.	1.478	1107.	0.6457
269.	1.475	1108.	0.6435
270.	1.474	1109.	0.6427
271.	1.473	1110.	0.6447
272.	1.47	1111.	0.6419
273.	1.469	1112.	0.6419
274.	1.468	1113.	0.6404
275.	1.468	1114.	0.641
276.	1.464	1115.	0.6397
277.	1.464	1116.	0.6398
278.	1.462	1117.	0.6394
279.	1.46	1118.	0.6387
280.	1.459	1119.	0.6375
281.	1.458	1120.	0.6358
282.	1.456	1121.	0.6361
283.	1.454	1122.	0.6351
284.	1.452	1123.	0.6357
285.	1.452	1124.	0.6346
286.	1.451	1125.	0.6337
287.	1.446	1126.	0.6326
288.	1.446	1127.	0.6322
289.	1.445	1128.	0.6314
290.	1.443	1129.	0.6319
291.	1.442	1130.	0.6306
292.	1.439	1131.	0.6312
293.	1.438	1132.	0.6307
294.	1.437	1133.	0.63

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
295.	1.436	1134.	0.6293
296.	1.435	1135.	0.6287
297.	1.433	1136.	0.6277
298.	1.432	1137.	0.6257
299.	1.43	1138.	0.6271
300.	1.428	1139.	0.6264
301.	1.427	1140.	0.6274
302.	1.426	1141.	0.6239
303.	1.424	1142.	0.6225
304.	1.423	1143.	0.622
305.	1.422	1144.	0.6217
306.	1.419	1145.	0.6223
307.	1.417	1146.	0.6209
308.	1.417	1147.	0.6198
309.	1.415	1148.	0.6189
310.	1.414	1149.	0.6205
311.	1.413	1150.	0.6186
312.	1.411	1151.	0.6179
313.	1.412	1152.	0.6172
314.	1.408	1153.	0.6167
315.	1.406	1154.	0.615
316.	1.405	1155.	0.6153
317.	1.403	1156.	0.6167
318.	1.402	1157.	0.6132
319.	1.401	1158.	0.6136
320.	1.399	1159.	0.6145
321.	1.398	1160.	0.6133
322.	1.397	1161.	0.6126
323.	1.395	1162.	0.6101
324.	1.393	1163.	0.6109
325.	1.393	1164.	0.61
326.	1.389	1165.	0.6098
327.	1.389	1166.	0.6095
328.	1.387	1167.	0.6076
329.	1.386	1168.	0.6069
330.	1.385	1169.	0.6075
331.	1.382	1170.	0.6074
332.	1.382	1171.	0.6063
333.	1.38	1172.	0.6068
334.	1.379	1173.	0.6037
335.	1.378	1174.	0.6034
336.	1.377	1175.	0.6037
337.	1.375	1176.	0.6037
338.	1.373	1177.	0.6022
339.	1.373	1178.	0.6016
340.	1.371	1179.	0.6016
341.	1.369	1180.	0.6019
342.	1.368	1181.	0.6008
343.	1.365	1182.	0.6001
344.	1.365	1183.	0.6005
345.	1.363	1184.	0.5999
346.	1.363	1185.	0.5971
347.	1.36	1186.	0.5968
348.	1.36	1187.	0.5979
349.	1.359	1188.	0.5958
350.	1.356	1189.	0.5945
351.	1.355	1190.	0.5951
352.	1.355	1191.	0.5938
353.	1.353	1192.	0.594
354.	1.351	1193.	0.5917
355.	1.35	1194.	0.5947
356.	1.349	1195.	0.5938
357.	1.345	1196.	0.5915
358.	1.345	1197.	0.5907
359.	1.344	1198.	0.5907
360.	1.342	1199.	0.5884

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
361.	1.341	1200.	0.5902
362.	1.341	1201.	0.5884
363.	1.337	1202.	0.5883
364.	1.337	1203.	0.5885
365.	1.335	1204.	0.5875
366.	1.334	1205.	0.5865
367.	1.333	1206.	0.5862
368.	1.331	1207.	0.5855
369.	1.33	1208.	0.5846
370.	1.33	1209.	0.584
371.	1.327	1210.	0.5832
372.	1.326	1211.	0.583
373.	1.323	1212.	0.5816
374.	1.323	1213.	0.5808
375.	1.323	1214.	0.5816
376.	1.32	1215.	0.5814
377.	1.319	1216.	0.5807
378.	1.319	1217.	0.5787
379.	1.316	1218.	0.5793
380.	1.315	1219.	0.5783
381.	1.314	1220.	0.5796
382.	1.313	1221.	0.5772
383.	1.31	1222.	0.5766
384.	1.31	1223.	0.576
385.	1.309	1224.	0.5749
386.	1.308	1225.	0.5756
387.	1.305	1226.	0.5746
388.	1.304	1227.	0.5744
389.	1.305	1228.	0.5738
390.	1.302	1229.	0.5733
391.	1.301	1230.	0.5728
392.	1.299	1231.	0.572
393.	1.3	1232.	0.5704
394.	1.298	1233.	0.5702
395.	1.297	1234.	0.5705
396.	1.295	1235.	0.5693
397.	1.293	1236.	0.5682
398.	1.29	1237.	0.5673
399.	1.289	1238.	0.5686
400.	1.288	1239.	0.5674
401.	1.288	1240.	0.5681
402.	1.285	1241.	0.567
403.	1.285	1242.	0.5653
404.	1.283	1243.	0.566
405.	1.282	1244.	0.565
406.	1.281	1245.	0.5636
407.	1.279	1246.	0.563
408.	1.278	1247.	0.5619
409.	1.276	1248.	0.562
410.	1.276	1249.	0.562
411.	1.274	1250.	0.5623
412.	1.272	1251.	0.5606
413.	1.27	1252.	0.5612
414.	1.271	1253.	0.5597
415.	1.269	1254.	0.5595
416.	1.27	1255.	0.5592
417.	1.267	1256.	0.559
418.	1.265	1257.	0.5576
419.	1.265	1258.	0.5561
420.	1.264	1259.	0.5575
421.	1.26	1260.	0.5559
422.	1.261	1261.	0.5565
423.	1.26	1262.	0.555
424.	1.258	1263.	0.5541
425.	1.256	1264.	0.5538
426.	1.257	1265.	0.5544

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
427.	1.256	1266.	0.5538
428.	1.254	1267.	0.5525
429.	1.251	1268.	0.5496
430.	1.251	1269.	0.551
431.	1.25	1270.	0.5505
432.	1.247	1271.	0.5506
433.	1.248	1272.	0.5495
434.	1.245	1273.	0.5485
435.	1.245	1274.	0.5484
436.	1.244	1275.	0.5471
437.	1.243	1276.	0.5486
438.	1.24	1277.	0.5455
439.	1.239	1278.	0.5454
440.	1.239	1279.	0.5443
441.	1.237	1280.	0.544
442.	1.237	1281.	0.5461
443.	1.236	1282.	0.5443
444.	1.235	1283.	0.544
445.	1.232	1284.	0.5433
446.	1.232	1285.	0.5411
447.	1.231	1286.	0.5409
448.	1.229	1287.	0.541
449.	1.228	1288.	0.5401
450.	1.225	1289.	0.5416
451.	1.226	1290.	0.5402
452.	1.224	1291.	0.5397
453.	1.224	1292.	0.5392
454.	1.221	1293.	0.5403
455.	1.22	1294.	0.5386
456.	1.219	1295.	0.536
457.	1.218	1296.	0.5365
458.	1.217	1297.	0.5368
459.	1.215	1298.	0.5345
460.	1.214	1299.	0.5348
461.	1.213	1300.	0.5362
462.	1.211	1301.	0.5334
463.	1.21	1302.	0.5329
464.	1.207	1303.	0.5321
465.	1.208	1304.	0.5299
466.	1.207	1305.	0.5318
467.	1.204	1306.	0.5309
468.	1.203	1307.	0.5298
469.	1.202	1308.	0.5296
470.	1.202	1309.	0.5303
471.	1.2	1310.	0.5278
472.	1.198	1311.	0.5284
473.	1.197	1312.	0.5284
474.	1.196	1313.	0.5277
475.	1.194	1314.	0.5267
476.	1.194	1315.	0.5276
477.	1.195	1316.	0.525
478.	1.191	1317.	0.5273
479.	1.191	1318.	0.5258
480.	1.19	1319.	0.524
481.	1.188	1320.	0.5226
482.	1.188	1321.	0.5246
483.	1.186	1322.	0.5221
484.	1.185	1323.	0.5219
485.	1.183	1324.	0.5242
486.	1.181	1325.	0.5212
487.	1.181	1326.	0.5209
488.	1.182	1327.	0.5214
489.	1.177	1328.	0.5199
490.	1.176	1329.	0.5191
491.	1.176	1330.	0.5178
492.	1.174	1331.	0.5196

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
493.	1.175	1332.	0.5181
494.	1.172	1333.	0.5174
495.	1.171	1334.	0.5177
496.	1.171	1335.	0.5162
497.	1.169	1336.	0.5159
498.	1.167	1337.	0.5145
499.	1.167	1338.	0.5145
500.	1.165	1339.	0.5139
501.	1.166	1340.	0.5147
502.	1.162	1341.	0.5133
503.	1.163	1342.	0.5138
504.	1.16	1343.	0.5114
505.	1.16	1344.	0.5126
506.	1.159	1345.	0.5114
507.	1.157	1346.	0.5106
508.	1.156	1347.	0.5121
509.	1.155	1348.	0.509
510.	1.155	1349.	0.5099
511.	1.152	1350.	0.5094
512.	1.152	1351.	0.5092
513.	1.15	1352.	0.5049
514.	1.15	1353.	0.508
515.	1.146	1354.	0.5073
516.	1.147	1355.	0.5049
517.	1.145	1356.	0.5046
518.	1.145	1357.	0.5056
519.	1.143	1358.	0.5043
520.	1.143	1359.	0.5042
521.	1.14	1360.	0.5041
522.	1.141	1361.	0.503
523.	1.139	1362.	0.5027
524.	1.136	1363.	0.503
525.	1.139	1364.	0.5024
526.	1.138	1365.	0.5014
527.	1.134	1366.	0.5003
528.	1.133	1367.	0.5009
529.	1.134	1368.	0.4999
530.	1.132	1369.	0.5
531.	1.13	1370.	0.4983
532.	1.13	1371.	0.4991
533.	1.127	1372.	0.4964
534.	1.127	1373.	0.4979
535.	1.126	1374.	0.496
536.	1.124	1375.	0.4964
537.	1.124	1376.	0.4969
538.	1.123	1377.	0.4951
539.	1.12	1378.	0.4965
540.	1.12	1379.	0.4942
541.	1.119	1380.	0.4923
542.	1.118	1381.	0.4935
543.	1.116	1382.	0.4939
544.	1.116	1383.	0.4922
545.	1.116	1384.	0.492
546.	1.115	1385.	0.4911
547.	1.11	1386.	0.4912
548.	1.112	1387.	0.4889
549.	1.11	1388.	0.4895
550.	1.111	1389.	0.4894
551.	1.108	1390.	0.4896
552.	1.108	1391.	0.4892
553.	1.105	1392.	0.4878
554.	1.105	1393.	0.4869
555.	1.104	1394.	0.486
556.	1.102	1395.	0.4846
557.	1.102	1396.	0.4858
558.	1.1	1397.	0.4866

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
559.	1.1	1398.	0.4852
560.	1.098	1399.	0.4848
561.	1.097	1400.	0.484
562.	1.097	1401.	0.4835
563.	1.095	1402.	0.4831
564.	1.093	1403.	0.485
565.	1.093	1404.	0.4821
566.	1.091	1405.	0.4823
567.	1.093	1406.	0.4799
568.	1.089	1407.	0.4794
569.	1.087	1408.	0.4805
570.	1.086	1409.	0.4807
571.	1.087	1410.	0.4798
572.	1.086	1411.	0.4795
573.	1.082	1412.	0.4778
574.	1.082	1413.	0.4774
575.	1.083	1414.	0.4768
576.	1.081	1415.	0.4781
577.	1.081	1416.	0.4764
578.	1.079	1417.	0.4755
579.	1.077	1418.	0.4748
580.	1.075	1419.	0.4753
581.	1.075	1420.	0.4751
582.	1.072	1421.	0.4741
583.	1.073	1422.	0.4738
584.	1.072	1423.	0.473
585.	1.072	1424.	0.4726
586.	1.07	1425.	0.4723
587.	1.07	1426.	0.4722
588.	1.068	1427.	0.471
589.	1.068	1428.	0.4702
590.	1.066	1429.	0.4697
591.	1.065	1430.	0.4696
592.	1.064	1431.	0.4688
593.	1.064	1432.	0.4692
594.	1.062	1433.	0.4671
595.	1.061	1434.	0.4675
596.	1.06	1435.	0.4679
597.	1.06	1436.	0.4658
598.	1.059	1437.	0.4673
599.	1.057	1438.	0.4651
600.	1.055	1439.	0.4658
601.	1.055	1440.	0.4645
602.	1.056	1441.	0.463
603.	1.05	1442.	0.4637
604.	1.052	1443.	0.4646
605.	1.051	1444.	0.4625
606.	1.051	1445.	0.4624
607.	1.048	1446.	0.4619
608.	1.047	1447.	0.463
609.	1.045	1448.	0.4608
610.	1.046	1449.	0.4601
611.	1.043	1450.	0.4594
612.	1.042	1451.	0.46
613.	1.043	1452.	0.459
614.	1.041	1453.	0.4581
615.	1.04	1454.	0.4588
616.	1.039	1455.	0.4579
617.	1.037	1456.	0.4572
618.	1.037	1457.	0.4572
619.	1.034	1458.	0.4567
620.	1.033	1459.	0.4559
621.	1.034	1460.	0.4562
622.	1.033	1461.	0.4548
623.	1.031	1462.	0.4535
624.	1.031	1463.	0.4535

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
625.	1.028	1464.	0.4539
626.	1.028	1465.	0.4539
627.	1.028	1466.	0.4532
628.	1.026	1467.	0.4512
629.	1.025	1468.	0.4528
630.	1.024	1469.	0.4502
631.	1.022	1470.	0.4513
632.	1.022	1471.	0.4508
633.	1.022	1472.	0.4501
634.	1.02	1473.	0.4499
635.	1.021	1474.	0.4486
636.	1.019	1475.	0.4481
637.	1.018	1476.	0.4498
638.	1.017	1477.	0.4479
639.	1.016	1478.	0.4479
640.	1.014	1479.	0.4474
641.	1.014	1480.	0.4476
642.	1.012	1481.	0.4474
643.	1.011	1482.	0.4466
644.	1.009	1483.	0.4457
645.	1.01	1484.	0.4443
646.	1.007	1485.	0.4438
647.	1.005	1486.	0.4445
648.	1.007	1487.	0.444
649.	1.004	1488.	0.4422
650.	1.004	1489.	0.4413
651.	1.005	1490.	0.4413
652.	1.004	1491.	0.4405
653.	1.002	1492.	0.4411
654.	1.	1493.	0.4392
655.	1.001	1494.	0.4386
656.	0.9979	1495.	0.44
657.	0.9979	1496.	0.4391
658.	0.9956	1497.	0.4397
659.	0.9952	1498.	0.4387
660.	0.9949	1499.	0.4375
661.	0.9944	1500.	0.4371
662.	0.992	1501.	0.4374
663.	0.9924	1502.	0.4362
664.	0.9919	1503.	0.436
665.	0.9904	1504.	0.436
666.	0.9897	1505.	0.4355
667.	0.989	1506.	0.4358
668.	0.9884	1507.	0.4354
669.	0.9875	1508.	0.4336
670.	0.9849	1509.	0.433
671.	0.984	1510.	0.4326
672.	0.9835	1511.	0.4331
673.	0.9821	1512.	0.433
674.	0.9812	1513.	0.4328
675.	0.9804	1514.	0.4324
676.	0.9783	1515.	0.4302
677.	0.9766	1516.	0.4297
678.	0.977	1517.	0.4282
679.	0.9757	1518.	0.4309
680.	0.9756	1519.	0.4271
681.	0.9737	1520.	0.4283
682.	0.9737	1521.	0.4285
683.	0.9709	1522.	0.4255
684.	0.9721	1523.	0.4279
685.	0.9705	1524.	0.427
686.	0.9702	1525.	0.4257
687.	0.9684	1526.	0.4257
688.	0.9685	1527.	0.4255
689.	0.9655	1528.	0.4254
690.	0.9666	1529.	0.4245

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
691.	0.9645	1530.	0.4238
692.	0.964	1531.	0.4245
693.	0.9623	1532.	0.4243
694.	0.96	1533.	0.4221
695.	0.9627	1534.	0.4228
696.	0.9588	1535.	0.4215
697.	0.9609	1536.	0.4227
698.	0.9577	1537.	0.4212
699.	0.9566	1538.	0.4212
700.	0.9571	1539.	0.4224
701.	0.9554	1540.	0.4209
702.	0.9538	1541.	0.4176
703.	0.9544	1542.	0.4198
704.	0.952	1543.	0.4175
705.	0.9528	1544.	0.4172
706.	0.95	1545.	0.4181
707.	0.9504	1546.	0.4153
708.	0.9489	1547.	0.4167
709.	0.9491	1548.	0.4174
710.	0.9449	1549.	0.4148
711.	0.9464	1550.	0.416
712.	0.9441	1551.	0.4145
713.	0.9445	1552.	0.4138
714.	0.9431	1553.	0.4132
715.	0.9429	1554.	0.4137
716.	0.9408	1555.	0.4131
717.	0.939	1556.	0.4123
718.	0.9399	1557.	0.4117
719.	0.9381	1558.	0.4137
720.	0.9368	1559.	0.4122
721.	0.9377	1560.	0.4106
722.	0.9343	1561.	0.4123
723.	0.9354	1562.	0.4091
724.	0.9325	1563.	0.4096
725.	0.9335	1564.	0.4081
726.	0.9308	1565.	0.4088
727.	0.9293	1566.	0.4086
728.	0.9305	1567.	0.4064
729.	0.9305	1568.	0.4078
730.	0.9288	1569.	0.4072
731.	0.9271	1570.	0.4076
732.	0.9279	1571.	0.4066
733.	0.9257	1572.	0.4068
734.	0.9248	1573.	0.4059
735.	0.9254	1574.	0.406
736.	0.9234	1575.	0.4054
737.	0.9224	1576.	0.4045
738.	0.921	1577.	0.4042
739.	0.9198	1578.	0.405
740.	0.9185	1579.	0.4028
741.	0.9187	1580.	0.4029
742.	0.9169	1581.	0.4005
743.	0.9188	1582.	0.4012
744.	0.9175	1583.	0.4009
745.	0.9159	1584.	0.4025
746.	0.9153	1585.	0.4003
747.	0.9151	1586.	0.4
748.	0.9115	1587.	0.3995
749.	0.911	1588.	0.3978
750.	0.9099	1589.	0.3983
751.	0.9094	1590.	0.398
752.	0.9082	1591.	0.3986
753.	0.9084	1592.	0.3974
754.	0.907	1593.	0.3973
755.	0.9062	1594.	0.3974
756.	0.9048	1595.	0.3945

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
757.	0.9037	1596.	0.3957
758.	0.904	1597.	0.3946
759.	0.9023	1598.	0.3954
760.	0.9038	1599.	0.3947
761.	0.9009	1600.	0.3936
762.	0.9012	1601.	0.3931
763.	0.899	1602.	0.3931
764.	0.8964	1603.	0.3924
765.	0.8977	1604.	0.3927
766.	0.896	1605.	0.3927
767.	0.895	1606.	0.3927
768.	0.8939	1607.	0.3923
769.	0.893	1608.	0.3918
770.	0.8931	1609.	0.3907
771.	0.8923	1610.	0.3881
772.	0.8912	1611.	0.389
773.	0.8914	1612.	0.3881
774.	0.8887	1613.	0.39
775.	0.89	1614.	0.3875
776.	0.8893	1615.	0.3878
777.	0.8877	1616.	0.3865
778.	0.8866	1617.	0.3865
779.	0.8858	1618.	0.3848
780.	0.8848	1619.	0.3862
781.	0.8836	1620.	0.3847
782.	0.8825	1621.	0.3857
783.	0.8811	1622.	0.3848
784.	0.8816	1623.	0.385
785.	0.8813	1624.	0.3833
786.	0.8803	1625.	0.3841
787.	0.8794	1626.	0.3826
788.	0.879	1627.	0.3827
789.	0.8758	1628.	0.3826
790.	0.8745	1629.	0.3819
791.	0.8732	1630.	0.3811
792.	0.8739	1631.	0.3806
793.	0.8744	1632.	0.3805
794.	0.8712	1633.	0.3814
795.	0.8714	1634.	0.3804
796.	0.8711	1635.	0.3796
797.	0.8711	1636.	0.3792
798.	0.8701	1637.	0.3796
799.	0.8689	1638.	0.3791
800.	0.8667	1639.	0.3781
801.	0.8659	1640.	0.3776
802.	0.8669	1641.	0.3765
803.	0.8648	1642.	0.3761
804.	0.8632	1643.	0.3763
805.	0.8635	1644.	0.3765
806.	0.8627	1645.	0.3743
807.	0.8629	1646.	0.3737
808.	0.8624	1647.	0.3762
809.	0.8598	1648.	0.3736
810.	0.8597	1649.	0.3722
811.	0.859	1650.	0.3727
812.	0.8584	1651.	0.3733
813.	0.8551	1652.	0.3737
814.	0.855	1653.	0.3735
815.	0.8559	1654.	0.3714
816.	0.8543	1655.	0.3701
817.	0.8541	1656.	0.3704
818.	0.8534	1657.	0.3703
819.	0.8523	1658.	0.369
820.	0.8516	1659.	0.3702
821.	0.8503	1660.	0.3694
822.	0.8479	1661.	0.3691

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
823.	0.85	1662.	0.369
824.	0.8486	1663.	0.3688
825.	0.8461	1664.	0.3672
826.	0.8457	1665.	0.3669
827.	0.8465	1666.	0.3669
828.	0.8434	1667.	0.3675
829.	0.8429	1668.	0.3661
830.	0.8418	1669.	0.3654
831.	0.8415	1670.	0.3661
832.	0.841	1671.	0.3654
833.	0.8399	1672.	0.3651
834.	0.8386	1673.	0.3642
835.	0.8392	1674.	0.3634
836.	0.8371	1675.	0.3629
837.	0.8358	1676.	0.3653
838.	0.8345	1677.	0.3627
839.	0.8337	1678.	0.3618
840.	0.8343	1679.	0.3592

SOLUTION

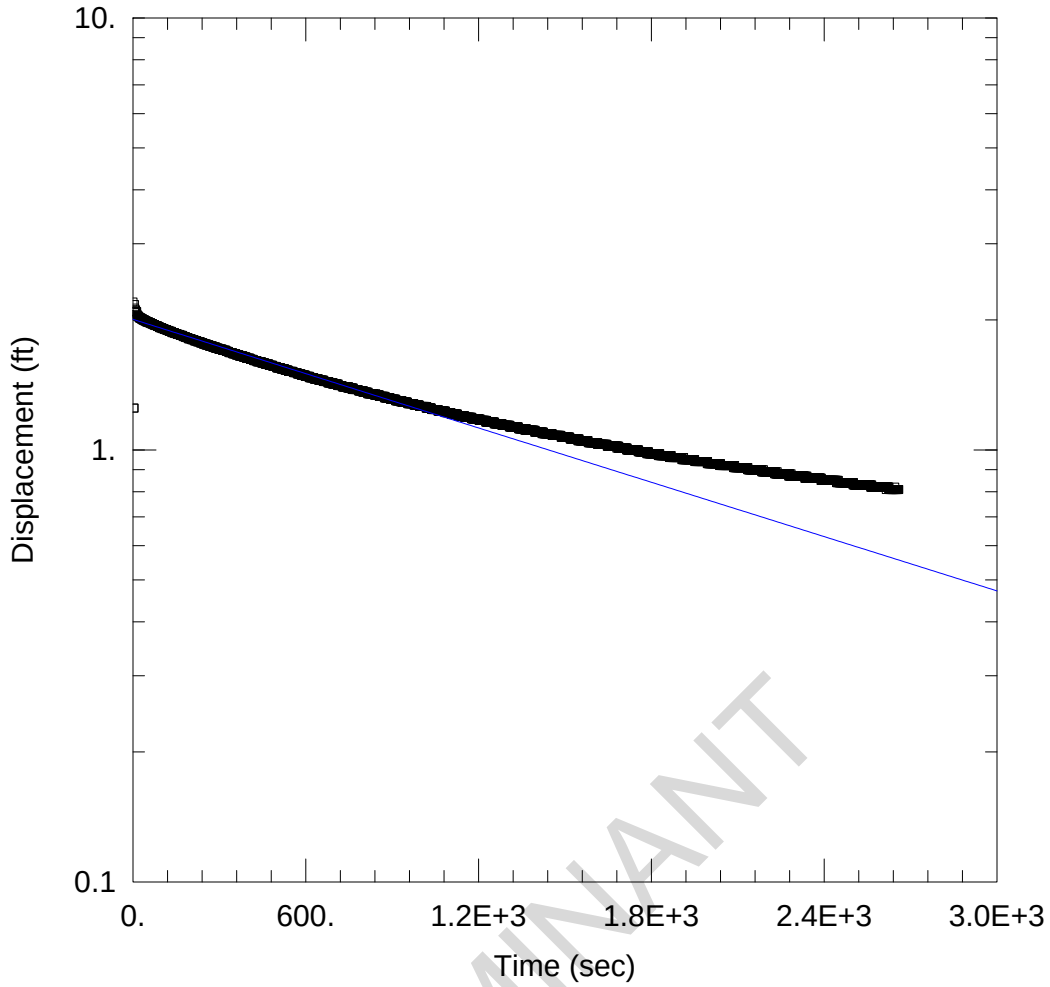
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.56

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.407E-5	cm/sec
y0	1.958	ft

$T = K*b = 0.008307$ cm²/sec



PDP-26 SLUG OUT

Data Set: J:\...\PDP-26 Slug Out.aqt
Date: 12/16/15 Time: 10:25:50

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Well: PDP-26
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 8. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PDP-26)

Initial Displacement: 2.2 ft Static Water Column Height: 20.02 ft
Total Well Penetration Depth: 8. ft Screen Length: 8. ft
Casing Radius: 0.083 ft Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.621E-5 cm/sec y0 = 2.006 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-B_Martin Lake\Slug Tests\PDP5\Aqtes
Title: PDP-26 Slug Out
Date: 12/16/15
Time: 10:26:04

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MLSES
Test Date: 10/6/15
Test Well: PDP-26

AQUIFER DATA

Saturated Thickness: 8. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: PDP-26

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 20.02 ft
Casing Radius: 0.083 ft
Well Radius: 0.27 ft
Well Skin Radius: 0.27 ft
Screen Length: 8. ft
Total Well Penetration Depth: 8. ft

No. of Observations: 2657

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
3.	1.25	1332.	1.13
4.	1.25	1333.	1.13
5.	2.17	1334.	1.13
6.	2.13	1335.	1.13
7.	2.09	1336.	1.13
8.	2.1	1337.	1.13
9.	2.11	1338.	1.13
10.	2.09	1339.	1.12
11.	2.09	1340.	1.12
12.	2.08	1341.	1.12
13.	2.09	1342.	1.12
14.	2.06	1343.	1.12
15.	2.05	1344.	1.12
16.	2.04	1345.	1.12
17.	2.04	1346.	1.12
18.	2.04	1347.	1.12
19.	2.04	1348.	1.12
20.	2.03	1349.	1.12
21.	2.03	1350.	1.12
22.	2.03	1351.	1.12
23.	2.02	1352.	1.12
24.	2.02	1353.	1.12
25.	2.02	1354.	1.12
26.	2.02	1355.	1.12
27.	2.02	1356.	1.12
28.	2.02	1357.	1.12
29.	2.01	1358.	1.12
30.	2.01	1359.	1.12
31.	2.01	1360.	1.12

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
32.	2.01	1361.	1.11
33.	2.01	1362.	1.12
34.	2.	1363.	1.12
35.	2.	1364.	1.11
36.	2.	1365.	1.12
37.	2.	1366.	1.12
38.	2.	1367.	1.11
39.	2.	1368.	1.11
40.	2.	1369.	1.11
41.	1.99	1370.	1.11
42.	1.99	1371.	1.11
43.	1.99	1372.	1.11
44.	1.99	1373.	1.11
45.	1.99	1374.	1.11
46.	1.99	1375.	1.11
47.	1.98	1376.	1.11
48.	1.98	1377.	1.11
49.	1.98	1378.	1.11
50.	1.98	1379.	1.11
51.	1.98	1380.	1.11
52.	1.98	1381.	1.11
53.	1.98	1382.	1.11
54.	1.98	1383.	1.11
55.	1.97	1384.	1.11
56.	1.97	1385.	1.11
57.	1.97	1386.	1.11
58.	1.97	1387.	1.11
59.	1.97	1388.	1.11
60.	1.97	1389.	1.11
61.	1.97	1390.	1.11
62.	1.96	1391.	1.11
63.	1.96	1392.	1.11
64.	1.96	1393.	1.11
65.	1.96	1394.	1.11
66.	1.96	1395.	1.1
67.	1.96	1396.	1.1
68.	1.96	1397.	1.11
69.	1.95	1398.	1.1
70.	1.95	1399.	1.1
71.	1.95	1400.	1.1
72.	1.95	1401.	1.1
73.	1.95	1402.	1.1
74.	1.95	1403.	1.1
75.	1.95	1404.	1.1
76.	1.94	1405.	1.1
77.	1.94	1406.	1.1
78.	1.94	1407.	1.1
79.	1.94	1408.	1.1
80.	1.94	1409.	1.1
81.	1.94	1410.	1.1
82.	1.94	1411.	1.1
83.	1.94	1412.	1.1
84.	1.94	1413.	1.1
85.	1.93	1414.	1.1
86.	1.93	1415.	1.1
87.	1.93	1416.	1.1
88.	1.93	1417.	1.1
89.	1.93	1418.	1.1
90.	1.93	1419.	1.1
91.	1.93	1420.	1.09
92.	1.92	1421.	1.1
93.	1.92	1422.	1.1
94.	1.92	1423.	1.1
95.	1.92	1424.	1.09
96.	1.92	1425.	1.1
97.	1.92	1426.	1.09

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
98.	1.92	1427.	1.09
99.	1.92	1428.	1.09
100.	1.92	1429.	1.09
101.	1.91	1430.	1.09
102.	1.91	1431.	1.09
103.	1.91	1432.	1.09
104.	1.91	1433.	1.09
105.	1.91	1434.	1.09
106.	1.91	1435.	1.09
107.	1.91	1436.	1.09
108.	1.91	1437.	1.09
109.	1.9	1438.	1.09
110.	1.9	1439.	1.09
111.	1.9	1440.	1.09
112.	1.9	1441.	1.09
113.	1.9	1442.	1.09
114.	1.9	1443.	1.09
115.	1.9	1444.	1.09
116.	1.9	1445.	1.09
117.	1.9	1446.	1.09
118.	1.89	1447.	1.09
119.	1.89	1448.	1.09
120.	1.89	1449.	1.09
121.	1.89	1450.	1.09
122.	1.89	1451.	1.09
123.	1.89	1452.	1.09
124.	1.89	1453.	1.09
125.	1.89	1454.	1.09
126.	1.88	1455.	1.08
127.	1.88	1456.	1.09
128.	1.88	1457.	1.08
129.	1.88	1458.	1.08
130.	1.88	1459.	1.08
131.	1.88	1460.	1.08
132.	1.88	1461.	1.08
133.	1.88	1462.	1.08
134.	1.88	1463.	1.08
135.	1.87	1464.	1.08
136.	1.87	1465.	1.08
137.	1.87	1466.	1.08
138.	1.87	1467.	1.08
139.	1.87	1468.	1.08
140.	1.87	1469.	1.08
141.	1.87	1470.	1.08
142.	1.87	1471.	1.08
143.	1.87	1472.	1.08
144.	1.87	1473.	1.08
145.	1.86	1474.	1.08
146.	1.86	1475.	1.08
147.	1.86	1476.	1.08
148.	1.86	1477.	1.08
149.	1.86	1478.	1.08
150.	1.86	1479.	1.08
151.	1.86	1480.	1.08
152.	1.86	1481.	1.08
153.	1.86	1482.	1.08
154.	1.85	1483.	1.08
155.	1.85	1484.	1.08
156.	1.85	1485.	1.08
157.	1.85	1486.	1.08
158.	1.85	1487.	1.07
159.	1.85	1488.	1.07
160.	1.85	1489.	1.07
161.	1.85	1490.	1.07
162.	1.85	1491.	1.07
163.	1.85	1492.	1.07

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
164.	1.84	1493.	1.07
165.	1.84	1494.	1.07
166.	1.84	1495.	1.07
167.	1.84	1496.	1.07
168.	1.84	1497.	1.07
169.	1.84	1498.	1.07
170.	1.84	1499.	1.07
171.	1.84	1500.	1.07
172.	1.84	1501.	1.07
173.	1.84	1502.	1.07
174.	1.83	1503.	1.07
175.	1.83	1504.	1.07
176.	1.83	1505.	1.07
177.	1.83	1506.	1.07
178.	1.83	1507.	1.07
179.	1.83	1508.	1.07
180.	1.83	1509.	1.07
181.	1.83	1510.	1.07
182.	1.83	1511.	1.07
183.	1.82	1512.	1.07
184.	1.82	1513.	1.07
185.	1.82	1514.	1.07
186.	1.82	1515.	1.07
187.	1.82	1516.	1.07
188.	1.82	1517.	1.07
189.	1.82	1518.	1.06
190.	1.82	1519.	1.06
191.	1.82	1520.	1.06
192.	1.81	1521.	1.06
193.	1.81	1522.	1.06
194.	1.81	1523.	1.06
195.	1.81	1524.	1.06
196.	1.81	1525.	1.06
197.	1.81	1526.	1.06
198.	1.81	1527.	1.06
199.	1.81	1528.	1.06
200.	1.81	1529.	1.06
201.	1.81	1530.	1.06
202.	1.81	1531.	1.06
203.	1.8	1532.	1.06
204.	1.8	1533.	1.06
205.	1.8	1534.	1.06
206.	1.8	1535.	1.06
207.	1.8	1536.	1.06
208.	1.8	1537.	1.06
209.	1.8	1538.	1.06
210.	1.8	1539.	1.06
211.	1.8	1540.	1.06
212.	1.8	1541.	1.06
213.	1.79	1542.	1.06
214.	1.79	1543.	1.06
215.	1.79	1544.	1.06
216.	1.79	1545.	1.05
217.	1.79	1546.	1.05
218.	1.79	1547.	1.06
219.	1.79	1548.	1.06
220.	1.79	1549.	1.06
221.	1.79	1550.	1.05
222.	1.79	1551.	1.05
223.	1.78	1552.	1.05
224.	1.78	1553.	1.05
225.	1.78	1554.	1.05
226.	1.78	1555.	1.05
227.	1.78	1556.	1.05
228.	1.78	1557.	1.05
229.	1.78	1558.	1.05

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
230.	1.78	1559.	1.05
231.	1.78	1560.	1.05
232.	1.78	1561.	1.05
233.	1.78	1562.	1.05
234.	1.77	1563.	1.05
235.	1.77	1564.	1.05
236.	1.77	1565.	1.05
237.	1.77	1566.	1.05
238.	1.77	1567.	1.05
239.	1.77	1568.	1.05
240.	1.77	1569.	1.05
241.	1.77	1570.	1.05
242.	1.77	1571.	1.05
243.	1.77	1572.	1.05
244.	1.76	1573.	1.05
245.	1.76	1574.	1.05
246.	1.76	1575.	1.05
247.	1.76	1576.	1.05
248.	1.76	1577.	1.05
249.	1.76	1578.	1.05
250.	1.76	1579.	1.05
251.	1.76	1580.	1.05
252.	1.76	1581.	1.04
253.	1.75	1582.	1.04
254.	1.75	1583.	1.04
255.	1.76	1584.	1.04
256.	1.75	1585.	1.04
257.	1.75	1586.	1.04
258.	1.75	1587.	1.04
259.	1.75	1588.	1.04
260.	1.75	1589.	1.04
261.	1.75	1590.	1.04
262.	1.75	1591.	1.04
263.	1.75	1592.	1.04
264.	1.75	1593.	1.04
265.	1.74	1594.	1.04
266.	1.74	1595.	1.04
267.	1.74	1596.	1.04
268.	1.74	1597.	1.04
269.	1.74	1598.	1.04
270.	1.74	1599.	1.04
271.	1.74	1600.	1.04
272.	1.74	1601.	1.04
273.	1.74	1602.	1.04
274.	1.74	1603.	1.04
275.	1.74	1604.	1.04
276.	1.74	1605.	1.04
277.	1.73	1606.	1.04
278.	1.73	1607.	1.04
279.	1.73	1608.	1.04
280.	1.73	1609.	1.04
281.	1.73	1610.	1.04
282.	1.73	1611.	1.04
283.	1.73	1612.	1.04
284.	1.73	1613.	1.03
285.	1.73	1614.	1.04
286.	1.72	1615.	1.03
287.	1.73	1616.	1.03
288.	1.73	1617.	1.03
289.	1.72	1618.	1.03
290.	1.72	1619.	1.03
291.	1.72	1620.	1.03
292.	1.72	1621.	1.03
293.	1.72	1622.	1.03
294.	1.72	1623.	1.03
295.	1.72	1624.	1.03

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
296.	1.72	1625.	1.03
297.	1.72	1626.	1.03
298.	1.71	1627.	1.03
299.	1.71	1628.	1.03
300.	1.71	1629.	1.03
301.	1.71	1630.	1.03
302.	1.71	1631.	1.03
303.	1.71	1632.	1.03
304.	1.71	1633.	1.03
305.	1.71	1634.	1.03
306.	1.71	1635.	1.03
307.	1.71	1636.	1.03
308.	1.71	1637.	1.03
309.	1.71	1638.	1.03
310.	1.71	1639.	1.03
311.	1.7	1640.	1.03
312.	1.7	1641.	1.03
313.	1.7	1642.	1.03
314.	1.7	1643.	1.03
315.	1.7	1644.	1.03
316.	1.7	1645.	1.03
317.	1.7	1646.	1.03
318.	1.7	1647.	1.02
319.	1.7	1648.	1.02
320.	1.7	1649.	1.02
321.	1.7	1650.	1.02
322.	1.7	1651.	1.02
323.	1.7	1652.	1.02
324.	1.69	1653.	1.02
325.	1.69	1654.	1.02
326.	1.69	1655.	1.02
327.	1.69	1656.	1.02
328.	1.69	1657.	1.02
329.	1.69	1658.	1.02
330.	1.69	1659.	1.02
331.	1.69	1660.	1.02
332.	1.69	1661.	1.02
333.	1.68	1662.	1.02
334.	1.68	1663.	1.02
335.	1.68	1664.	1.02
336.	1.68	1665.	1.02
337.	1.68	1666.	1.02
338.	1.68	1667.	1.02
339.	1.68	1668.	1.02
340.	1.68	1669.	1.02
341.	1.68	1670.	1.02
342.	1.68	1671.	1.02
343.	1.68	1672.	1.02
344.	1.68	1673.	1.02
345.	1.68	1674.	1.02
346.	1.67	1675.	1.02
347.	1.67	1676.	1.02
348.	1.67	1677.	1.02
349.	1.67	1678.	1.02
350.	1.67	1679.	1.02
351.	1.67	1680.	1.01
352.	1.67	1681.	1.02
353.	1.67	1682.	1.02
354.	1.67	1683.	1.02
355.	1.67	1684.	1.01
356.	1.67	1685.	1.01
357.	1.67	1686.	1.01
358.	1.66	1687.	1.02
359.	1.66	1688.	1.01
360.	1.66	1689.	1.01
361.	1.66	1690.	1.01

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
362.	1.66	1691.	1.01
363.	1.66	1692.	1.01
364.	1.66	1693.	1.01
365.	1.66	1694.	1.01
366.	1.66	1695.	1.01
367.	1.66	1696.	1.01
368.	1.66	1697.	1.01
369.	1.65	1698.	1.01
370.	1.65	1699.	1.01
371.	1.65	1700.	1.01
372.	1.65	1701.	1.01
373.	1.65	1702.	1.01
374.	1.65	1703.	1.01
375.	1.65	1704.	1.01
376.	1.65	1705.	1.01
377.	1.65	1706.	1.01
378.	1.65	1707.	1.01
379.	1.65	1708.	1.01
380.	1.65	1709.	1.01
381.	1.65	1710.	1.01
382.	1.65	1711.	1.01
383.	1.64	1712.	1.01
384.	1.64	1713.	1.01
385.	1.64	1714.	1.
386.	1.64	1715.	1.01
387.	1.64	1716.	1.01
388.	1.64	1717.	1.
389.	1.64	1718.	1.
390.	1.64	1719.	1.
391.	1.64	1720.	1.
392.	1.64	1721.	1.
393.	1.64	1722.	1.
394.	1.63	1723.	1.
395.	1.63	1724.	1.
396.	1.63	1725.	1.
397.	1.63	1726.	1.
398.	1.63	1727.	1.
399.	1.63	1728.	1.
400.	1.63	1729.	1.
401.	1.63	1730.	1.
402.	1.63	1731.	1.
403.	1.63	1732.	1.
404.	1.63	1733.	1.
405.	1.63	1734.	1.
406.	1.63	1735.	1.
407.	1.63	1736.	1.
408.	1.62	1737.	1.
409.	1.62	1738.	1.
410.	1.62	1739.	1.
411.	1.62	1740.	1.
412.	1.62	1741.	1.
413.	1.62	1742.	1.
414.	1.62	1743.	1.
415.	1.62	1744.	1.
416.	1.62	1745.	1.
417.	1.62	1746.	1.
418.	1.62	1747.	1.
419.	1.61	1748.	1.
420.	1.61	1749.	1.
421.	1.61	1750.	1.
422.	1.61	1751.	1.
423.	1.61	1752.	1.
424.	1.61	1753.	1.
425.	1.61	1754.	0.99
426.	1.61	1755.	1.
427.	1.61	1756.	1.

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
428.	1.61	1757.	0.99
429.	1.61	1758.	0.99
430.	1.6	1759.	0.99
431.	1.61	1760.	0.99
432.	1.6	1761.	0.99
433.	1.6	1762.	0.99
434.	1.6	1763.	0.99
435.	1.6	1764.	0.99
436.	1.6	1765.	0.99
437.	1.6	1766.	0.99
438.	1.6	1767.	0.99
439.	1.6	1768.	0.99
440.	1.6	1769.	0.99
441.	1.6	1770.	0.99
442.	1.6	1771.	0.99
443.	1.6	1772.	0.99
444.	1.6	1773.	0.99
445.	1.6	1774.	0.99
446.	1.6	1775.	0.99
447.	1.59	1776.	0.99
448.	1.59	1777.	0.99
449.	1.59	1778.	0.99
450.	1.59	1779.	0.99
451.	1.59	1780.	0.99
452.	1.59	1781.	0.99
453.	1.59	1782.	0.99
454.	1.59	1783.	0.99
455.	1.59	1784.	0.98
456.	1.59	1785.	0.99
457.	1.59	1786.	0.98
458.	1.59	1787.	0.99
459.	1.58	1788.	0.99
460.	1.58	1789.	0.98
461.	1.58	1790.	0.99
462.	1.58	1791.	0.98
463.	1.58	1792.	0.98
464.	1.58	1793.	0.98
465.	1.58	1794.	0.98
466.	1.58	1795.	0.98
467.	1.58	1796.	0.98
468.	1.58	1797.	0.98
469.	1.58	1798.	0.98
470.	1.58	1799.	0.98
471.	1.58	1800.	0.98
472.	1.58	1801.	0.98
473.	1.57	1802.	0.98
474.	1.57	1803.	0.98
475.	1.57	1804.	0.98
476.	1.57	1805.	0.98
477.	1.57	1806.	0.98
478.	1.57	1807.	0.98
479.	1.57	1808.	0.98
480.	1.57	1809.	0.98
481.	1.57	1810.	0.98
482.	1.57	1811.	0.98
483.	1.57	1812.	0.98
484.	1.57	1813.	0.98
485.	1.57	1814.	0.98
486.	1.56	1815.	0.98
487.	1.56	1816.	0.98
488.	1.56	1817.	0.98
489.	1.56	1818.	0.98
490.	1.56	1819.	0.98
491.	1.56	1820.	0.98
492.	1.56	1821.	0.98
493.	1.56	1822.	0.98

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
494.	1.56	1823.	0.98
495.	1.56	1824.	0.97
496.	1.56	1825.	0.98
497.	1.56	1826.	0.98
498.	1.56	1827.	0.97
499.	1.55	1828.	0.98
500.	1.55	1829.	0.98
501.	1.55	1830.	0.97
502.	1.55	1831.	0.97
503.	1.55	1832.	0.97
504.	1.55	1833.	0.97
505.	1.55	1834.	0.97
506.	1.55	1835.	0.97
507.	1.55	1836.	0.97
508.	1.55	1837.	0.97
509.	1.55	1838.	0.97
510.	1.55	1839.	0.97
511.	1.55	1840.	0.97
512.	1.55	1841.	0.97
513.	1.55	1842.	0.97
514.	1.54	1843.	0.97
515.	1.54	1844.	0.97
516.	1.54	1845.	0.97
517.	1.54	1846.	0.97
518.	1.54	1847.	0.97
519.	1.54	1848.	0.97
520.	1.54	1849.	0.97
521.	1.54	1850.	0.97
522.	1.54	1851.	0.97
523.	1.54	1852.	0.97
524.	1.54	1853.	0.97
525.	1.54	1854.	0.97
526.	1.54	1855.	0.97
527.	1.54	1856.	0.97
528.	1.53	1857.	0.97
529.	1.53	1858.	0.97
530.	1.53	1859.	0.97
531.	1.53	1860.	0.97
532.	1.53	1861.	0.97
533.	1.53	1862.	0.97
534.	1.53	1863.	0.96
535.	1.53	1864.	0.97
536.	1.53	1865.	0.96
537.	1.53	1866.	0.97
538.	1.53	1867.	0.97
539.	1.53	1868.	0.96
540.	1.52	1869.	0.97
541.	1.52	1870.	0.96
542.	1.52	1871.	0.96
543.	1.52	1872.	0.96
544.	1.52	1873.	0.96
545.	1.52	1874.	0.96
546.	1.52	1875.	0.96
547.	1.52	1876.	0.96
548.	1.52	1877.	0.96
549.	1.52	1878.	0.96
550.	1.52	1879.	0.96
551.	1.52	1880.	0.96
552.	1.52	1881.	0.96
553.	1.52	1882.	0.96
554.	1.52	1883.	0.96
555.	1.52	1884.	0.96
556.	1.52	1885.	0.96
557.	1.51	1886.	0.96
558.	1.51	1887.	0.96
559.	1.51	1888.	0.96

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
560.	1.51	1889.	0.96
561.	1.51	1890.	0.96
562.	1.51	1891.	0.96
563.	1.51	1892.	0.96
564.	1.51	1893.	0.96
565.	1.51	1894.	0.96
566.	1.51	1895.	0.96
567.	1.51	1896.	0.96
568.	1.51	1897.	0.96
569.	1.51	1898.	0.96
570.	1.51	1899.	0.96
571.	1.5	1900.	0.96
572.	1.5	1901.	0.96
573.	1.5	1902.	0.96
574.	1.5	1903.	0.96
575.	1.5	1904.	0.96
576.	1.5	1905.	0.96
577.	1.5	1906.	0.95
578.	1.5	1907.	0.96
579.	1.5	1908.	0.95
580.	1.5	1909.	0.95
581.	1.5	1910.	0.95
582.	1.5	1911.	0.95
583.	1.5	1912.	0.96
584.	1.49	1913.	0.95
585.	1.49	1914.	0.95
586.	1.49	1915.	0.95
587.	1.49	1916.	0.95
588.	1.49	1917.	0.95
589.	1.49	1918.	0.95
590.	1.49	1919.	0.95
591.	1.49	1920.	0.95
592.	1.49	1921.	0.95
593.	1.49	1922.	0.95
594.	1.49	1923.	0.95
595.	1.49	1924.	0.95
596.	1.49	1925.	0.95
597.	1.49	1926.	0.95
598.	1.48	1927.	0.95
599.	1.49	1928.	0.95
600.	1.48	1929.	0.95
601.	1.48	1930.	0.95
602.	1.48	1931.	0.95
603.	1.48	1932.	0.95
604.	1.48	1933.	0.95
605.	1.48	1934.	0.95
606.	1.48	1935.	0.95
607.	1.48	1936.	0.95
608.	1.48	1937.	0.95
609.	1.48	1938.	0.95
610.	1.48	1939.	0.95
611.	1.48	1940.	0.95
612.	1.47	1941.	0.95
613.	1.48	1942.	0.95
614.	1.48	1943.	0.95
615.	1.47	1944.	0.95
616.	1.47	1945.	0.95
617.	1.47	1946.	0.95
618.	1.47	1947.	0.95
619.	1.47	1948.	0.95
620.	1.47	1949.	0.95
621.	1.47	1950.	0.95
622.	1.47	1951.	0.94
623.	1.47	1952.	0.94
624.	1.47	1953.	0.94
625.	1.47	1954.	0.94

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
626.	1.47	1955.	0.94
627.	1.47	1956.	0.94
628.	1.47	1957.	0.94
629.	1.46	1958.	0.94
630.	1.46	1959.	0.94
631.	1.46	1960.	0.94
632.	1.46	1961.	0.94
633.	1.46	1962.	0.94
634.	1.46	1963.	0.94
635.	1.46	1964.	0.94
636.	1.46	1965.	0.94
637.	1.46	1966.	0.94
638.	1.46	1967.	0.94
639.	1.46	1968.	0.94
640.	1.46	1969.	0.94
641.	1.46	1970.	0.94
642.	1.46	1971.	0.94
643.	1.46	1972.	0.94
644.	1.46	1973.	0.94
645.	1.45	1974.	0.94
646.	1.45	1975.	0.94
647.	1.45	1976.	0.94
648.	1.45	1977.	0.94
649.	1.45	1978.	0.94
650.	1.45	1979.	0.94
651.	1.45	1980.	0.94
652.	1.45	1981.	0.94
653.	1.45	1982.	0.94
654.	1.45	1983.	0.94
655.	1.45	1984.	0.94
656.	1.45	1985.	0.94
657.	1.45	1986.	0.94
658.	1.45	1987.	0.94
659.	1.45	1988.	0.94
660.	1.45	1989.	0.94
661.	1.44	1990.	0.94
662.	1.44	1991.	0.94
663.	1.45	1992.	0.94
664.	1.44	1993.	0.94
665.	1.44	1994.	0.93
666.	1.44	1995.	0.94
667.	1.44	1996.	0.93
668.	1.44	1997.	0.93
669.	1.44	1998.	0.93
670.	1.44	1999.	0.93
671.	1.44	2000.	0.93
672.	1.44	2001.	0.93
673.	1.44	2002.	0.93
674.	1.44	2003.	0.93
675.	1.44	2004.	0.93
676.	1.44	2005.	0.93
677.	1.43	2006.	0.93
678.	1.43	2007.	0.93
679.	1.43	2008.	0.93
680.	1.44	2009.	0.93
681.	1.43	2010.	0.93
682.	1.43	2011.	0.93
683.	1.43	2012.	0.93
684.	1.43	2013.	0.93
685.	1.43	2014.	0.93
686.	1.43	2015.	0.93
687.	1.43	2016.	0.93
688.	1.43	2017.	0.93
689.	1.43	2018.	0.93
690.	1.43	2019.	0.93
691.	1.43	2020.	0.93

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
692.	1.42	2021.	0.93
693.	1.43	2022.	0.93
694.	1.43	2023.	0.93
695.	1.43	2024.	0.93
696.	1.42	2025.	0.93
697.	1.42	2026.	0.93
698.	1.42	2027.	0.93
699.	1.42	2028.	0.93
700.	1.42	2029.	0.93
701.	1.42	2030.	0.93
702.	1.42	2031.	0.93
703.	1.42	2032.	0.93
704.	1.42	2033.	0.93
705.	1.42	2034.	0.93
706.	1.42	2035.	0.93
707.	1.42	2036.	0.93
708.	1.42	2037.	0.92
709.	1.42	2038.	0.93
710.	1.42	2039.	0.92
711.	1.41	2040.	0.93
712.	1.41	2041.	0.92
713.	1.42	2042.	0.92
714.	1.41	2043.	0.92
715.	1.41	2044.	0.92
716.	1.41	2045.	0.92
717.	1.41	2046.	0.92
718.	1.41	2047.	0.92
719.	1.41	2048.	0.92
720.	1.41	2049.	0.92
721.	1.41	2050.	0.92
722.	1.41	2051.	0.92
723.	1.41	2052.	0.92
724.	1.41	2053.	0.92
725.	1.41	2054.	0.92
726.	1.41	2055.	0.92
727.	1.4	2056.	0.92
728.	1.4	2057.	0.92
729.	1.4	2058.	0.92
730.	1.4	2059.	0.92
731.	1.4	2060.	0.92
732.	1.4	2061.	0.92
733.	1.4	2062.	0.92
734.	1.4	2063.	0.92
735.	1.4	2064.	0.92
736.	1.4	2065.	0.92
737.	1.4	2066.	0.92
738.	1.4	2067.	0.92
739.	1.4	2068.	0.92
740.	1.4	2069.	0.92
741.	1.4	2070.	0.92
742.	1.4	2071.	0.92
743.	1.4	2072.	0.92
744.	1.4	2073.	0.92
745.	1.4	2074.	0.92
746.	1.39	2075.	0.92
747.	1.39	2076.	0.92
748.	1.4	2077.	0.92
749.	1.4	2078.	0.92
750.	1.39	2079.	0.92
751.	1.39	2080.	0.92
752.	1.39	2081.	0.92
753.	1.39	2082.	0.92
754.	1.39	2083.	0.92
755.	1.39	2084.	0.92
756.	1.39	2085.	0.91
757.	1.39	2086.	0.92

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
758.	1.39	2087.	0.91
759.	1.39	2088.	0.91
760.	1.39	2089.	0.92
761.	1.38	2090.	0.91
762.	1.39	2091.	0.91
763.	1.39	2092.	0.91
764.	1.38	2093.	0.91
765.	1.39	2094.	0.91
766.	1.38	2095.	0.91
767.	1.38	2096.	0.91
768.	1.38	2097.	0.91
769.	1.38	2098.	0.91
770.	1.38	2099.	0.91
771.	1.38	2100.	0.91
772.	1.38	2101.	0.91
773.	1.38	2102.	0.91
774.	1.38	2103.	0.91
775.	1.38	2104.	0.91
776.	1.38	2105.	0.91
777.	1.38	2106.	0.91
778.	1.38	2107.	0.91
779.	1.38	2108.	0.91
780.	1.38	2109.	0.91
781.	1.38	2110.	0.91
782.	1.38	2111.	0.91
783.	1.37	2112.	0.91
784.	1.37	2113.	0.91
785.	1.37	2114.	0.91
786.	1.37	2115.	0.91
787.	1.37	2116.	0.91
788.	1.37	2117.	0.91
789.	1.37	2118.	0.91
790.	1.37	2119.	0.91
791.	1.37	2120.	0.91
792.	1.37	2121.	0.91
793.	1.37	2122.	0.91
794.	1.37	2123.	0.91
795.	1.37	2124.	0.91
796.	1.37	2125.	0.91
797.	1.37	2126.	0.91
798.	1.36	2127.	0.91
799.	1.37	2128.	0.91
800.	1.37	2129.	0.91
801.	1.36	2130.	0.91
802.	1.36	2131.	0.91
803.	1.36	2132.	0.91
804.	1.36	2133.	0.91
805.	1.36	2134.	0.9
806.	1.36	2135.	0.91
807.	1.36	2136.	0.9
808.	1.36	2137.	0.9
809.	1.36	2138.	0.9
810.	1.36	2139.	0.9
811.	1.36	2140.	0.9
812.	1.36	2141.	0.9
813.	1.36	2142.	0.9
814.	1.36	2143.	0.9
815.	1.35	2144.	0.9
816.	1.35	2145.	0.9
817.	1.36	2146.	0.9
818.	1.35	2147.	0.9
819.	1.35	2148.	0.9
820.	1.35	2149.	0.9
821.	1.35	2150.	0.9
822.	1.35	2151.	0.9
823.	1.35	2152.	0.9

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
824.	1.35	2153.	0.9
825.	1.35	2154.	0.9
826.	1.35	2155.	0.9
827.	1.35	2156.	0.9
828.	1.35	2157.	0.9
829.	1.35	2158.	0.9
830.	1.35	2159.	0.9
831.	1.35	2160.	0.9
832.	1.35	2161.	0.9
833.	1.35	2162.	0.9
834.	1.35	2163.	0.9
835.	1.35	2164.	0.9
836.	1.35	2165.	0.9
837.	1.35	2166.	0.9
838.	1.34	2167.	0.9
839.	1.34	2168.	0.9
840.	1.34	2169.	0.9
841.	1.34	2170.	0.9
842.	1.34	2171.	0.9
843.	1.35	2172.	0.9
844.	1.34	2173.	0.9
845.	1.34	2174.	0.9
846.	1.34	2175.	0.9
847.	1.34	2176.	0.9
848.	1.34	2177.	0.9
849.	1.34	2178.	0.9
850.	1.34	2179.	0.9
851.	1.34	2180.	0.9
852.	1.34	2181.	0.9
853.	1.34	2182.	0.9
854.	1.34	2183.	0.89
855.	1.33	2184.	0.9
856.	1.34	2185.	0.89
857.	1.33	2186.	0.89
858.	1.33	2187.	0.89
859.	1.33	2188.	0.89
860.	1.33	2189.	0.9
861.	1.33	2190.	0.89
862.	1.33	2191.	0.89
863.	1.33	2192.	0.89
864.	1.33	2193.	0.89
865.	1.33	2194.	0.89
866.	1.33	2195.	0.89
867.	1.33	2196.	0.89
868.	1.33	2197.	0.89
869.	1.33	2198.	0.89
870.	1.33	2199.	0.89
871.	1.33	2200.	0.89
872.	1.33	2201.	0.89
873.	1.32	2202.	0.89
874.	1.33	2203.	0.89
875.	1.32	2204.	0.89
876.	1.33	2205.	0.89
877.	1.32	2206.	0.89
878.	1.32	2207.	0.89
879.	1.32	2208.	0.89
880.	1.32	2209.	0.89
881.	1.32	2210.	0.89
882.	1.32	2211.	0.89
883.	1.32	2212.	0.89
884.	1.32	2213.	0.89
885.	1.32	2214.	0.89
886.	1.32	2215.	0.89
887.	1.32	2216.	0.89
888.	1.32	2217.	0.89
889.	1.32	2218.	0.89

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
890.	1.32	2219.	0.89
891.	1.32	2220.	0.89
892.	1.32	2221.	0.89
893.	1.32	2222.	0.89
894.	1.31	2223.	0.89
895.	1.31	2224.	0.89
896.	1.31	2225.	0.89
897.	1.31	2226.	0.89
898.	1.31	2227.	0.89
899.	1.31	2228.	0.88
900.	1.31	2229.	0.89
901.	1.31	2230.	0.89
902.	1.31	2231.	0.88
903.	1.31	2232.	0.89
904.	1.31	2233.	0.88
905.	1.31	2234.	0.88
906.	1.31	2235.	0.88
907.	1.31	2236.	0.88
908.	1.31	2237.	0.89
909.	1.31	2238.	0.88
910.	1.31	2239.	0.88
911.	1.31	2240.	0.88
912.	1.3	2241.	0.88
913.	1.31	2242.	0.88
914.	1.3	2243.	0.88
915.	1.3	2244.	0.88
916.	1.3	2245.	0.88
917.	1.3	2246.	0.88
918.	1.3	2247.	0.88
919.	1.3	2248.	0.88
920.	1.3	2249.	0.88
921.	1.3	2250.	0.88
922.	1.3	2251.	0.88
923.	1.3	2252.	0.88
924.	1.3	2253.	0.88
925.	1.3	2254.	0.88
926.	1.3	2255.	0.88
927.	1.3	2256.	0.88
928.	1.3	2257.	0.88
929.	1.3	2258.	0.88
930.	1.29	2259.	0.88
931.	1.3	2260.	0.88
932.	1.3	2261.	0.88
933.	1.3	2262.	0.88
934.	1.3	2263.	0.88
935.	1.29	2264.	0.88
936.	1.29	2265.	0.88
937.	1.29	2266.	0.88
938.	1.29	2267.	0.88
939.	1.29	2268.	0.88
940.	1.29	2269.	0.88
941.	1.29	2270.	0.88
942.	1.29	2271.	0.88
943.	1.29	2272.	0.88
944.	1.29	2273.	0.88
945.	1.29	2274.	0.88
946.	1.29	2275.	0.88
947.	1.29	2276.	0.88
948.	1.29	2277.	0.87
949.	1.29	2278.	0.88
950.	1.29	2279.	0.87
951.	1.29	2280.	0.88
952.	1.29	2281.	0.88
953.	1.29	2282.	0.87
954.	1.28	2283.	0.87
955.	1.28	2284.	0.87

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
956.	1.28	2285.	0.88
957.	1.28	2286.	0.87
958.	1.28	2287.	0.87
959.	1.28	2288.	0.87
960.	1.28	2289.	0.87
961.	1.28	2290.	0.87
962.	1.28	2291.	0.87
963.	1.28	2292.	0.87
964.	1.28	2293.	0.87
965.	1.28	2294.	0.87
966.	1.28	2295.	0.87
967.	1.28	2296.	0.87
968.	1.28	2297.	0.87
969.	1.28	2298.	0.87
970.	1.28	2299.	0.87
971.	1.28	2300.	0.87
972.	1.28	2301.	0.87
973.	1.28	2302.	0.87
974.	1.28	2303.	0.87
975.	1.28	2304.	0.87
976.	1.27	2305.	0.87
977.	1.27	2306.	0.87
978.	1.27	2307.	0.87
979.	1.27	2308.	0.87
980.	1.27	2309.	0.87
981.	1.27	2310.	0.87
982.	1.27	2311.	0.87
983.	1.27	2312.	0.87
984.	1.27	2313.	0.87
985.	1.27	2314.	0.87
986.	1.27	2315.	0.87
987.	1.27	2316.	0.87
988.	1.27	2317.	0.87
989.	1.27	2318.	0.87
990.	1.27	2319.	0.87
991.	1.27	2320.	0.87
992.	1.27	2321.	0.87
993.	1.27	2322.	0.87
994.	1.27	2323.	0.87
995.	1.26	2324.	0.87
996.	1.26	2325.	0.87
997.	1.26	2326.	0.87
998.	1.26	2327.	0.87
999.	1.26	2328.	0.87
1000.	1.26	2329.	0.87
1001.	1.26	2330.	0.87
1002.	1.26	2331.	0.87
1003.	1.26	2332.	0.87
1004.	1.26	2333.	0.86
1005.	1.26	2334.	0.86
1006.	1.26	2335.	0.86
1007.	1.26	2336.	0.87
1008.	1.26	2337.	0.86
1009.	1.26	2338.	0.86
1010.	1.26	2339.	0.86
1011.	1.26	2340.	0.87
1012.	1.26	2341.	0.86
1013.	1.26	2342.	0.86
1014.	1.26	2343.	0.86
1015.	1.26	2344.	0.86
1016.	1.26	2345.	0.86
1017.	1.26	2346.	0.86
1018.	1.25	2347.	0.86
1019.	1.25	2348.	0.86
1020.	1.26	2349.	0.86
1021.	1.25	2350.	0.86

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1022.	1.25	2351.	0.86
1023.	1.25	2352.	0.86
1024.	1.25	2353.	0.86
1025.	1.25	2354.	0.86
1026.	1.25	2355.	0.86
1027.	1.25	2356.	0.86
1028.	1.25	2357.	0.86
1029.	1.25	2358.	0.86
1030.	1.25	2359.	0.86
1031.	1.25	2360.	0.86
1032.	1.25	2361.	0.86
1033.	1.25	2362.	0.86
1034.	1.25	2363.	0.86
1035.	1.25	2364.	0.86
1036.	1.25	2365.	0.86
1037.	1.24	2366.	0.86
1038.	1.24	2367.	0.86
1039.	1.24	2368.	0.86
1040.	1.24	2369.	0.86
1041.	1.24	2370.	0.86
1042.	1.24	2371.	0.86
1043.	1.24	2372.	0.86
1044.	1.24	2373.	0.86
1045.	1.24	2374.	0.86
1046.	1.24	2375.	0.86
1047.	1.24	2376.	0.86
1048.	1.24	2377.	0.86
1049.	1.24	2378.	0.86
1050.	1.24	2379.	0.86
1051.	1.24	2380.	0.86
1052.	1.24	2381.	0.86
1053.	1.24	2382.	0.86
1054.	1.24	2383.	0.86
1055.	1.24	2384.	0.86
1056.	1.24	2385.	0.86
1057.	1.24	2386.	0.86
1058.	1.24	2387.	0.86
1059.	1.23	2388.	0.86
1060.	1.24	2389.	0.85
1061.	1.23	2390.	0.86
1062.	1.23	2391.	0.85
1063.	1.23	2392.	0.85
1064.	1.23	2393.	0.85
1065.	1.23	2394.	0.85
1066.	1.23	2395.	0.85
1067.	1.23	2396.	0.85
1068.	1.23	2397.	0.85
1069.	1.23	2398.	0.85
1070.	1.23	2399.	0.85
1071.	1.23	2400.	0.85
1072.	1.23	2401.	0.85
1073.	1.23	2402.	0.85
1074.	1.23	2403.	0.85
1075.	1.23	2404.	0.85
1076.	1.23	2405.	0.85
1077.	1.23	2406.	0.85
1078.	1.23	2407.	0.85
1079.	1.23	2408.	0.85
1080.	1.23	2409.	0.85
1081.	1.23	2410.	0.85
1082.	1.23	2411.	0.85
1083.	1.22	2412.	0.85
1084.	1.23	2413.	0.85
1085.	1.23	2414.	0.85
1086.	1.22	2415.	0.85
1087.	1.22	2416.	0.85

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1088.	1.22	2417.	0.85
1089.	1.22	2418.	0.85
1090.	1.22	2419.	0.85
1091.	1.22	2420.	0.85
1092.	1.22	2421.	0.85
1093.	1.22	2422.	0.85
1094.	1.22	2423.	0.85
1095.	1.22	2424.	0.85
1096.	1.22	2425.	0.85
1097.	1.22	2426.	0.85
1098.	1.22	2427.	0.85
1099.	1.22	2428.	0.85
1100.	1.22	2429.	0.85
1101.	1.22	2430.	0.85
1102.	1.22	2431.	0.85
1103.	1.22	2432.	0.85
1104.	1.22	2433.	0.85
1105.	1.21	2434.	0.85
1106.	1.21	2435.	0.85
1107.	1.21	2436.	0.85
1108.	1.21	2437.	0.85
1109.	1.21	2438.	0.85
1110.	1.21	2439.	0.85
1111.	1.21	2440.	0.85
1112.	1.21	2441.	0.85
1113.	1.21	2442.	0.85
1114.	1.21	2443.	0.84
1115.	1.21	2444.	0.85
1116.	1.21	2445.	0.84
1117.	1.21	2446.	0.85
1118.	1.21	2447.	0.84
1119.	1.21	2448.	0.85
1120.	1.21	2449.	0.85
1121.	1.21	2450.	0.84
1122.	1.21	2451.	0.84
1123.	1.21	2452.	0.84
1124.	1.21	2453.	0.84
1125.	1.21	2454.	0.84
1126.	1.21	2455.	0.84
1127.	1.21	2456.	0.84
1128.	1.2	2457.	0.84
1129.	1.2	2458.	0.84
1130.	1.2	2459.	0.84
1131.	1.2	2460.	0.84
1132.	1.2	2461.	0.84
1133.	1.2	2462.	0.84
1134.	1.2	2463.	0.84
1135.	1.2	2464.	0.84
1136.	1.2	2465.	0.84
1137.	1.2	2466.	0.84
1138.	1.2	2467.	0.84
1139.	1.2	2468.	0.84
1140.	1.2	2469.	0.84
1141.	1.2	2470.	0.84
1142.	1.2	2471.	0.84
1143.	1.2	2472.	0.84
1144.	1.2	2473.	0.84
1145.	1.2	2474.	0.84
1146.	1.2	2475.	0.84
1147.	1.2	2476.	0.84
1148.	1.2	2477.	0.84
1149.	1.2	2478.	0.84
1150.	1.2	2479.	0.84
1151.	1.19	2480.	0.84
1152.	1.2	2481.	0.84
1153.	1.19	2482.	0.84

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1154.	1.19	2483.	0.84
1155.	1.19	2484.	0.84
1156.	1.19	2485.	0.84
1157.	1.19	2486.	0.84
1158.	1.19	2487.	0.84
1159.	1.19	2488.	0.84
1160.	1.19	2489.	0.84
1161.	1.19	2490.	0.84
1162.	1.19	2491.	0.84
1163.	1.19	2492.	0.84
1164.	1.19	2493.	0.84
1165.	1.19	2494.	0.84
1166.	1.19	2495.	0.84
1167.	1.19	2496.	0.84
1168.	1.19	2497.	0.84
1169.	1.19	2498.	0.84
1170.	1.19	2499.	0.84
1171.	1.19	2500.	0.83
1172.	1.19	2501.	0.84
1173.	1.19	2502.	0.84
1174.	1.19	2503.	0.83
1175.	1.18	2504.	0.83
1176.	1.19	2505.	0.83
1177.	1.19	2506.	0.83
1178.	1.18	2507.	0.83
1179.	1.18	2508.	0.83
1180.	1.18	2509.	0.83
1181.	1.18	2510.	0.83
1182.	1.18	2511.	0.83
1183.	1.18	2512.	0.83
1184.	1.18	2513.	0.83
1185.	1.18	2514.	0.83
1186.	1.18	2515.	0.83
1187.	1.18	2516.	0.83
1188.	1.18	2517.	0.83
1189.	1.18	2518.	0.83
1190.	1.18	2519.	0.83
1191.	1.18	2520.	0.83
1192.	1.18	2521.	0.83
1193.	1.18	2522.	0.83
1194.	1.18	2523.	0.83
1195.	1.18	2524.	0.83
1196.	1.18	2525.	0.83
1197.	1.18	2526.	0.83
1198.	1.18	2527.	0.83
1199.	1.18	2528.	0.83
1200.	1.18	2529.	0.83
1201.	1.18	2530.	0.83
1202.	1.17	2531.	0.83
1203.	1.17	2532.	0.83
1204.	1.17	2533.	0.83
1205.	1.18	2534.	0.83
1206.	1.17	2535.	0.83
1207.	1.17	2536.	0.83
1208.	1.17	2537.	0.83
1209.	1.17	2538.	0.83
1210.	1.17	2539.	0.83
1211.	1.17	2540.	0.83
1212.	1.17	2541.	0.83
1213.	1.17	2542.	0.83
1214.	1.17	2543.	0.83
1215.	1.17	2544.	0.83
1216.	1.17	2545.	0.83
1217.	1.17	2546.	0.83
1218.	1.17	2547.	0.83
1219.	1.17	2548.	0.83

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1220.	1.17	2549.	0.83
1221.	1.17	2550.	0.83
1222.	1.17	2551.	0.83
1223.	1.17	2552.	0.83
1224.	1.17	2553.	0.83
1225.	1.16	2554.	0.83
1226.	1.16	2555.	0.83
1227.	1.16	2556.	0.83
1228.	1.17	2557.	0.83
1229.	1.16	2558.	0.83
1230.	1.16	2559.	0.83
1231.	1.16	2560.	0.83
1232.	1.16	2561.	0.83
1233.	1.16	2562.	0.82
1234.	1.16	2563.	0.82
1235.	1.16	2564.	0.82
1236.	1.16	2565.	0.83
1237.	1.16	2566.	0.82
1238.	1.16	2567.	0.82
1239.	1.16	2568.	0.82
1240.	1.16	2569.	0.82
1241.	1.16	2570.	0.82
1242.	1.16	2571.	0.82
1243.	1.16	2572.	0.82
1244.	1.16	2573.	0.82
1245.	1.16	2574.	0.82
1246.	1.16	2575.	0.82
1247.	1.16	2576.	0.82
1248.	1.16	2577.	0.82
1249.	1.16	2578.	0.82
1250.	1.16	2579.	0.82
1251.	1.16	2580.	0.82
1252.	1.16	2581.	0.82
1253.	1.16	2582.	0.82
1254.	1.15	2583.	0.82
1255.	1.15	2584.	0.82
1256.	1.16	2585.	0.82
1257.	1.15	2586.	0.82
1258.	1.15	2587.	0.82
1259.	1.15	2588.	0.82
1260.	1.15	2589.	0.82
1261.	1.15	2590.	0.82
1262.	1.15	2591.	0.82
1263.	1.15	2592.	0.82
1264.	1.15	2593.	0.82
1265.	1.15	2594.	0.82
1266.	1.15	2595.	0.82
1267.	1.15	2596.	0.82
1268.	1.15	2597.	0.82
1269.	1.15	2598.	0.82
1270.	1.15	2599.	0.82
1271.	1.15	2600.	0.82
1272.	1.15	2601.	0.82
1273.	1.15	2602.	0.82
1274.	1.15	2603.	0.82
1275.	1.15	2604.	0.82
1276.	1.15	2605.	0.82
1277.	1.15	2606.	0.82
1278.	1.15	2607.	0.82
1279.	1.15	2608.	0.82
1280.	1.15	2609.	0.82
1281.	1.14	2610.	0.82
1282.	1.15	2611.	0.82
1283.	1.14	2612.	0.82
1284.	1.14	2613.	0.82
1285.	1.14	2614.	0.82

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1286.	1.14	2615.	0.82
1287.	1.14	2616.	0.81
1288.	1.14	2617.	0.82
1289.	1.14	2618.	0.82
1290.	1.14	2619.	0.82
1291.	1.14	2620.	0.82
1292.	1.14	2621.	0.82
1293.	1.14	2622.	0.82
1294.	1.14	2623.	0.82
1295.	1.14	2624.	0.81
1296.	1.14	2625.	0.82
1297.	1.14	2626.	0.81
1298.	1.14	2627.	0.81
1299.	1.14	2628.	0.81
1300.	1.14	2629.	0.81
1301.	1.14	2630.	0.81
1302.	1.14	2631.	0.81
1303.	1.14	2632.	0.81
1304.	1.14	2633.	0.81
1305.	1.14	2634.	0.81
1306.	1.14	2635.	0.81
1307.	1.13	2636.	0.81
1308.	1.14	2637.	0.81
1309.	1.14	2638.	0.81
1310.	1.13	2639.	0.81
1311.	1.13	2640.	0.81
1312.	1.13	2641.	0.81
1313.	1.13	2642.	0.81
1314.	1.13	2643.	0.81
1315.	1.13	2644.	0.81
1316.	1.13	2645.	0.82
1317.	1.13	2646.	0.81
1318.	1.13	2647.	0.81
1319.	1.13	2648.	0.81
1320.	1.13	2649.	0.81
1321.	1.13	2650.	0.81
1322.	1.13	2651.	0.81
1323.	1.13	2652.	0.81
1324.	1.13	2653.	0.81
1325.	1.13	2654.	0.81
1326.	1.13	2655.	0.81
1327.	1.13	2656.	0.81
1328.	1.13	2657.	0.81
1329.	1.13	2658.	0.81
1330.	1.13	2659.	0.81
1331.	1.13		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.56

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.621E-5	cm/sec
y0	2.006	ft

T = K*b = 0.003953 cm²/sec

APPENDIX B

May 2014 TCEQ PDP Area APAR Approval Letter

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 29, 2014

Mr. David P. Duncan
Director Environmental Generation
Luminant Power
1601 Bryan Street (EP-27)
Dallas, Texas 75201

Re: Approval with Comment
Affected Property Assessment Report, dated May 13, 2014
Luminant Power, Martin Lake Steam Electric Station, 8850 FM 2658 North,
TCEQ SWR No. 31277, CN603256413, RN102583093
EPA ID No. TXD000821306

Dear Mr. Duncan:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above referenced submittal, dated May 13, 2014. The subject Affected Property Assessment Report (APAR) addresses the Permanent Disposal Pond Area (PDP). The subject APAR was triggered by an elevated detection of selenium above TRRP Tier 1 Residential Assessment Level (RAL) in monitor well MW-12A located approximately 150 feet east of the PDP. No groundwater wells are located within 0.5 miles of the site.

With the exception of an apparently anomalous detection of selenium in MW-12B (October 2013), no chemicals of concern (COCs) were detected above their respective critical Tier 1 PCLs.

Based on the TCEQ review of the report, Texas Risk Reduction Program (TRRP) Remedy Standard A Residential Protective Concentration Levels (PCLs) have been achieved such that no institutional control or post-response action care is required. However, although corrective actions are no required at this time based on the results of the subject APAR, Luminant will restrict future use of groundwater within the PDP area as part of a long-term monitoring plan in anticipation of future closure of the impoundments. The TCEQ concurs with the proposed long-term monitoring as proposed.

In order to attain Remedy Standard A under TRRP, all industrial solid waste and municipal hazardous waste and waste residues must be removed or decontaminated from affected media (i.e., soil, surface water, groundwater, air, etc.) to applicable human

health and ecological based standards and criteria. In order to be released from the requirement to file an institutional control in accordance with 30 TAC §350 Subchapter F, contaminants that remain in place must not exceed Residential PCLs.

Please be aware that it is the continuing obligation of persons associated with a site to ensure that municipal hazardous waste and industrial solid waste are managed in a manner which does not cause the discharge or imminent threat of discharge of waste into or adjacent to waters in the state, a nuisance, or the endangerment of the public health and welfare as required by 30 TAC §335.4. If the actual response action fails to comply with these requirements, please take any necessary and authorized action to correct such conditions. A TCEQ field inspector may conduct an inspection of your site to determine compliance with the RAP.

Questions concerning this letter should be directed to me at (512) 239-2591. When responding by mail, please submit an original and one copy of all correspondence and reports to the TCEQ Remediation Division at Mail Code MC-127. An additional copy should be submitted to the local TCEQ Region Office. Please note that the Remediation Division has instituted a policy of sending letters via Portable Document Format (PDF) and email when appropriate. Therefore, current email addresses and the site identification information in the reference block should be included in all future submittals.

Sincerely,

for

C. Todd Counter, Project Manager
Team 1, VCP-CA Section
Remediation Division
Texas Commission on Environmental Quality

CTC/mdh

cc: Mr. Brian Thomas, Pastor, Behling & Wheeler, LLC, 5416 Plaza Drive, Texarkana, Texas 75503-1607
Mr. Michael Brashear, Waste Section Manager, TCEQ Region 5 Office, Tyler

APPENDIX C

PDP-5 Monitoring Well Boring and Well Construction Logs

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-17A
Project Name:	Martin Lake SES	Date Drilled:	October 1, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	384.63' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	387.53' msl	Depth to Water/Date:	26.62' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	360.91' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA	10, 20, 30, 40, 50			See MW-17B boring log for Lithologic Description	10.0, 20.0, 30.0, 40.0, 50.0	Cement/ Concrete Well Cover; Bentonite Pellets to 25'; 30' Casing; 20' Screen with 2" End Cap; Sand Backfill of Annular Space from 25' to 47'
								The boring was terminated and the well was set at 47' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.		

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-17B
Project Name:	Martin Lake SES	Date Drilled:	October 1, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	384.63' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	387.60' msl	Depth to Water/Date:	30.52' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	357.08' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA		CT	NA		GM		GRAVELLY road base		Cement/ Concrete Well Cover
		50			5	SC		Dry, dense, reddish-brown, CLAYEY SAND	5.0	Bentonite Pellets to 57'
		50						-stringer of reddish-brown, fine-grained SAND		
					10	CL		Dry, very stiff, reddish-brown, SANDY CLAY	10.0	
		70						-moist ▽		
						SM		Wet, dense, reddish-brown, fine-grained SAND		62' Casing
					15	CL		Moist, very stiff, light gray, CLAY with iron staining	15.0	
		90				CL		Moist, very stiff, brown and light gray, SILTY CLAY		
					20	SC		Wet, loose, reddish-brown CLAYEY SAND	20.0	
		90				CL		Wet, medium stiff, reddish-brown and gray, SILTY CLAY		
								-with some iron deposits		
					25	ML		Wet, soft, reddish-brown and gray, CLAYEY SILT	25.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-17B
Date Drilled: October 1, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		90			30			▽ -less CLAY	30.0	
		90			35			-more CLAY -heavy iron deposits		
						ML		Dry, very stiff, gray, CLAYEY SILT	35.0	
		100			40	ML		Moist to wet, dense, gray, SILT	40.0	
		90			45			-hard, shaley	45.0	
		100			50			-stringer of coal (4") -stringer of very dense, gray, SILTY SAND (fine-grained SAND)	50.0	
		80			55			-loose/soft with some CLAY -hard, shaley	55.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-17B
Date Drilled: October 1, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			60			-stringer of coal (4")	60.0	20' Screen with 2" End Cap
		100			65			-dense, not shaley, low CLAY	65.0	
		100			70				70.0	Sand Backfill of Annular Space from 57' to 79'
		100			75				75.0	
		100			80			The boring was terminated and the well was set at 79' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	80.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-18A
Project Name:	Martin Lake SES	Date Drilled:	October 2, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	410.83' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	414.43' msl	Depth to Water/Date:	43.17' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	371.26' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth
NA	NA	NA	CT	NA	10, 20, 30, 40, 50, 60, 70			See MW-18B boring log for Lithologic Description	10.0, 20.0, 30.0, 40.0 ▽, 50.0, 60.0, 70.0
								The boring was terminated and the well was set at 67' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	

Well Diagram:

- Cement/ Concrete Well Cover
- Bentonite Pellets to 45'
- 50' Casing
- 20' Screen with 2" End Cap
- Sand Backfill of Annular Space from 45' to 67'

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-18B
Project Name:	Martin Lake SES	Date Drilled:	October 2, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	8/16 Grade Silica Sand
Ground Elevation:	410.83' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	414.25' msl	Depth to Water/Date:	44.41' BTOC/10-10-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	369.84' msl/10-10-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	30	CT	NA	5	SM		Dry, medium dense, brown, fine-grained SAND -light brown -stringer of coal combustion by-product	5.0	Cement/ Concrete Well Cover Bentonite Pellets to 73'
		10			10	SC		CLAYEY SAND fill with partially burned lumber, tin -reddish brown	10.0	78' Casing
		70			15			-no waste -brown, no CLAY -stringer of stiff, brown, SILTY CLAY	15.0	
		100			20	SM		Dry, dense, reddish-brown, very fine-grained SAND	20.0	
		60			25			-with some light gray and brown -loose, light gray and brown	25.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-18B
Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			30			-medium dense -dense	30.0	
		60			35			-stringer of very dense, light gray, CLAYEY SILT -wet ▽	35.0	
		100			40	CL		Moist, very stiff, brown and gray SILTY CLAY	40.0	
		100			45			-wet, soft, reddish-brown and gray -interbedded layers of CLAY/SILT	45.0	
		90			50			-moist -medium stiff	50.0	
		100			55	ML		Wet, soft, brown CLAYEY SILT	55.0	
						ML		Moist, dense, gray, SILT ▽		

BORING/WELL CONSTRUCTION LOG

GREEN STAR ENVIRONMENTAL

Project Number: 08-1388
Project Name: Martin Lake SES

Boring/Well Number: MW-18B
Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
		100			60			-shaley	60.0	
		100			65			-not shaley	65.0	
		100			70	SP		Wet, medium dense, gray, fine-grained SAND	70.0	
		100			75	ML		Dry, dense, gray, SILT (shaley)	75.0	20' Screen with 2" End Cap
		100			80	SP		-wet Wet, medium dense, gray, fine-grained SAND -interbedded layers of shaley SILT and wet SAND (4")	80.0	Sand Backfill of Annular Space from 73' to 95'
		100			85				85.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES

Boring/Well Number: MW-18B
Date Drilled: October 2, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
								-fewer/narrower SAND layers		
					90				90.0	
					95			The boring was terminated and the well was set at 95' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	95.0	

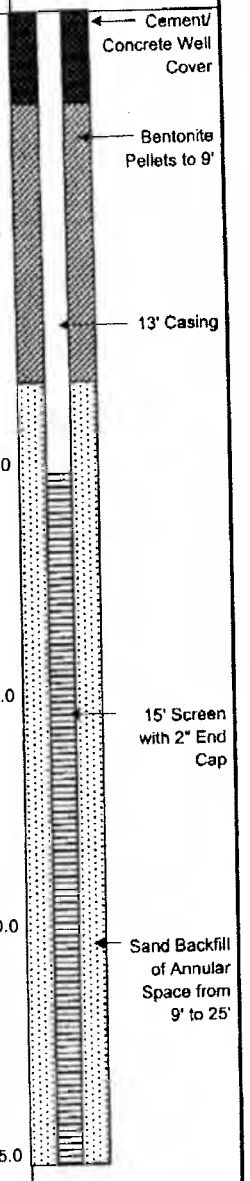
GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-19
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	367.84' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	371.23' msl	Depth to Water/Date:	13.89' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	357.34' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth
NA	NA	90	CT	NA		SC		Moist, medium dense, reddish-brown, CLAYEY SAND (fine-grained SAND)	
						CL		Moist, soft, reddish-brown, SANDY CLAY	
						SP		Moist, loose, reddish-brown, fine-grained SAND	
					5			-gray	5.0
		60				CL		Moist to wet, soft, brown, SANDY CLAY (fine-grained SAND)	
								-stiff	
					10			-light gray ▽	10.0
		100				CL		Moist, very stiff, light gray, SILTY CLAY	
						SC		Moist, dense, gray and reddish-brown, CLAYEY SAND (fine-grained SAND) ▽	15.0
					15	SP		Wet, loose, light gray and reddish-brown, fine-grained SAND	
		70						-medium dense	
						SC		Wet, medium dense, light gray and reddish-brown, CLAYEY SAND (fine-grained SAND)	20.0
					20			-stringer of dense	
		100						-stringer of dense	
						ML		Moist, very stiff, gray CLAYEY SILT with some iron staining	25.0
					25			The boring was terminated and the well was set at 25' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	

Well Diagram



GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-20A
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	6850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	395.95' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	398.34' msl	Depth to Water/Date:	29.19' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	369.65' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	NA	CT	NA	10			See MW-20B boring log for Lithologic Description	10.0	Cement/ Concrete Well Cover; Bentonite Pellets to 19'; 24' Casing
					20				20.0	20' Screen with 2" End Cap
					30				30.0	Sand Backfill of Annular Space from 19' to 41'
					40				40.0	
								The boring was terminated and the well was set at 41' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.		

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number:	08-1388	Boring/Well Number:	MW-20B
Project Name:	Martin Lake SES	Date Drilled:	September 30, 2008
Location:	8850 FM 2658 Tatum, TX	Casing Type/Diameter:	PVC/2" ID
Drilling Method:	HSA / FA	Screen Type/Diameter:	PVC/0.01"
Sampling Method:	CT / FA	Gravel Pack Type:	20/40 Grade Silica Sand
Ground Elevation:	395.95' msl	Grout Type:	Bentonite Pellets
Top of Casing Elevation:	398.94' msl	Depth to Water/Date:	36.42' BTOC/10-09-2008
Logged by:	T. Ripley	Ground Water Elevation/Date:	362.52' msl/10-09-2008
Remarks:		Drilling Co./Driller:	SCI / M. Bridges

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
NA	NA	100	CT	NA	5	SP		Moist, loose, brown, SILTY SAND (fine-grained) -stringer of coal combustion by-product -stringer of moist, soft, light gray to brown SILTY CLAY -with some CLAY	5.0	Cement/ Concrete Well Cover
		100			10	SP		Moist, loose, light gray, fine-grained SAND		Bentonite Pellets to 42'
						CL		Moist, medium stiff, brown, SANDY CLAY (fine-grained SAND) -light gray and reddish-brown ▽	10.0	
		100			15	SP		Wet, medium dense, reddish-brown, fine-grained SAND -with some light gray -light gray and reddish-brown	15.0	48' Casing
		100			20	CL		Moist, stiff, light gray, reddish-brown, and brown, SANDY CLAY (fine-grained SAND) -stringer of hard -no brown	20.0	
		100			25	SC		Moist, dense, light gray to reddish-brown, CLAYEY SAND (fine-grained SAND) -gray	25.0	
		100			30	CL		Moist to wet, stiff, gray, SILTY CLAY	30.0	

GREEN STAR ENVIRONMENTAL

BORING/WELL CONSTRUCTION LOG

Project Number: 08-1388
Project Name: Martin Lake SES
Boring/Well Number: MW-20B
Date Drilled: September 30, 2008

PID (ppm)	Blow Counts	Recovery (%)	Sampling Method	Sample	Depth (ft. BGL)	U.S.C.S	Graphic Log	Lithologic Description	Contact Depth	Well Diagram
								-hard		
		100				CL		Moist, hard, gray and reddish-brown, SILTY CLAY ▽		
								-stringer of hard red SANDSTONE GRAVEL (coarse)		
					35	SP		Wet, medium dense, reddish-brown, fine-grained SAND	35.0	
		60						-stringer of wet, soft, brown, CLAY with some angular, red GRAVEL		
					40			-stringer of wet, soft, dense, gray, CLAYEY SAND	40.0	
		100								
					45	ML		Dry, medium stiff, dark to light gray, CLAYEY SILT	45.0	
		100								
					50			-stringer of moist, medium dense, gray, fine-grained SAND	50.0	20' Screen with 2" End Cap
								-stringer of hard (SHALEY)		
		100						-stringer of coal		
					55				55.0	
		90								
			FA		60			Refusal at 59' bgs, advanced to 65' bgs with flight auger instead of sample tube.	60.0	Sand Backfill of Annular Space from 42' to 65'
		0								
					65			The boring was terminated and the well was set at 65' bgs. The well was completed with a protective stickup which requires approximately 3 feet of additional casing above grade.	65.0	

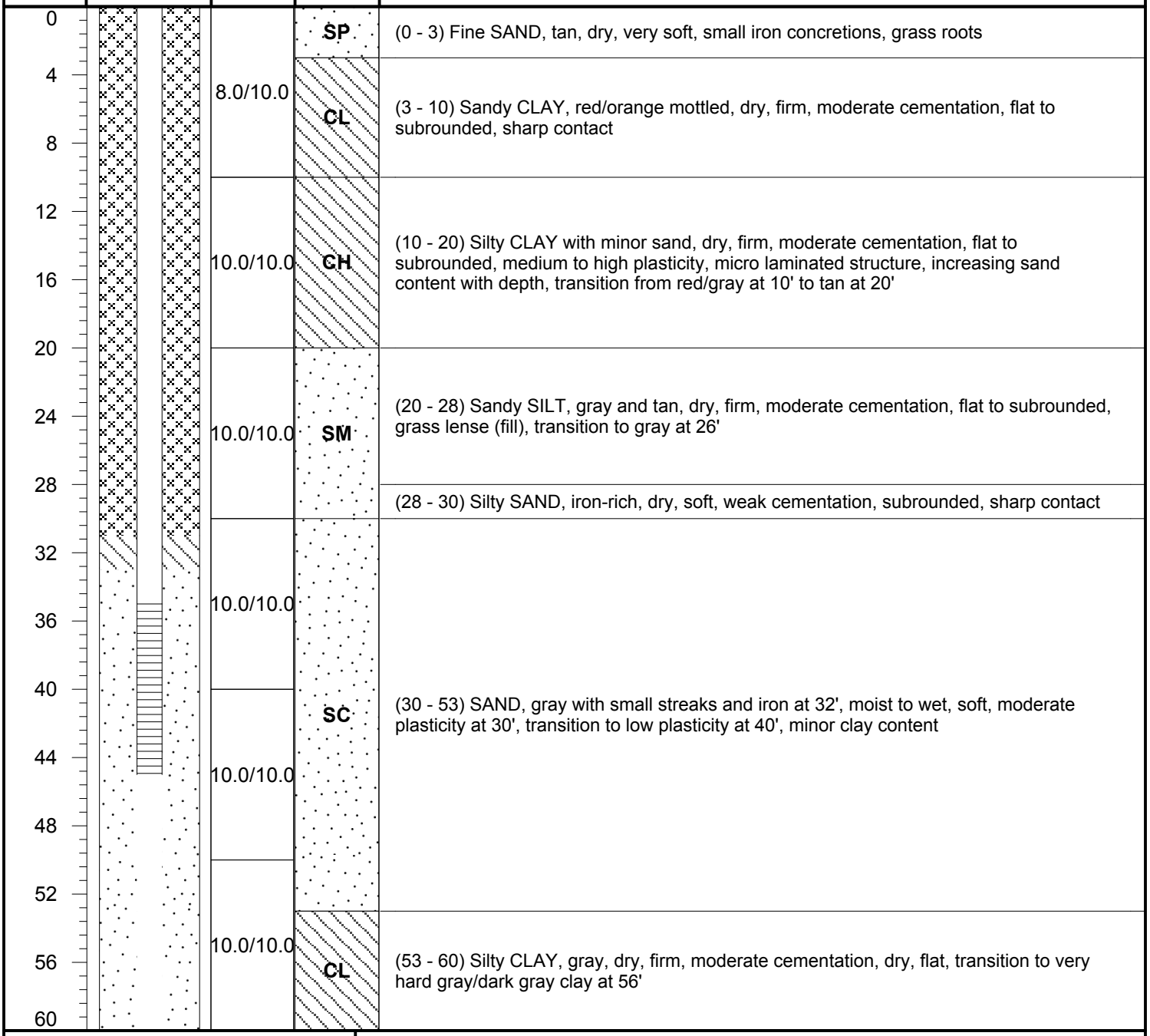
Luminant

Log of Boring: PDP-22

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	60
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



Lithologic Description
(0 - 3) Fine SAND, tan, dry, very soft, small iron concretions, grass roots
(3 - 10) Sandy CLAY, red/orange mottled, dry, firm, moderate cementation, flat to subrounded, sharp contact
(10 - 20) Silty CLAY with minor sand, dry, firm, moderate cementation, flat to subrounded, medium to high plasticity, micro laminated structure, increasing sand content with depth, transition from red/gray at 10' to tan at 20'
(20 - 28) Sandy SILT, gray and tan, dry, firm, moderate cementation, flat to subrounded, grass lense (fill), transition to gray at 26'
(28 - 30) Silty SAND, iron-rich, dry, soft, weak cementation, subrounded, sharp contact
(30 - 53) SAND, gray with small streaks and iron at 32', moist to wet, soft, moderate plasticity at 30', transition to low plasticity at 40', minor clay content
(53 - 60) Silty CLAY, gray, dry, firm, moderate cementation, dry, flat, transition to very hard gray/dark gray clay at 56'

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-60') 20/40 sand

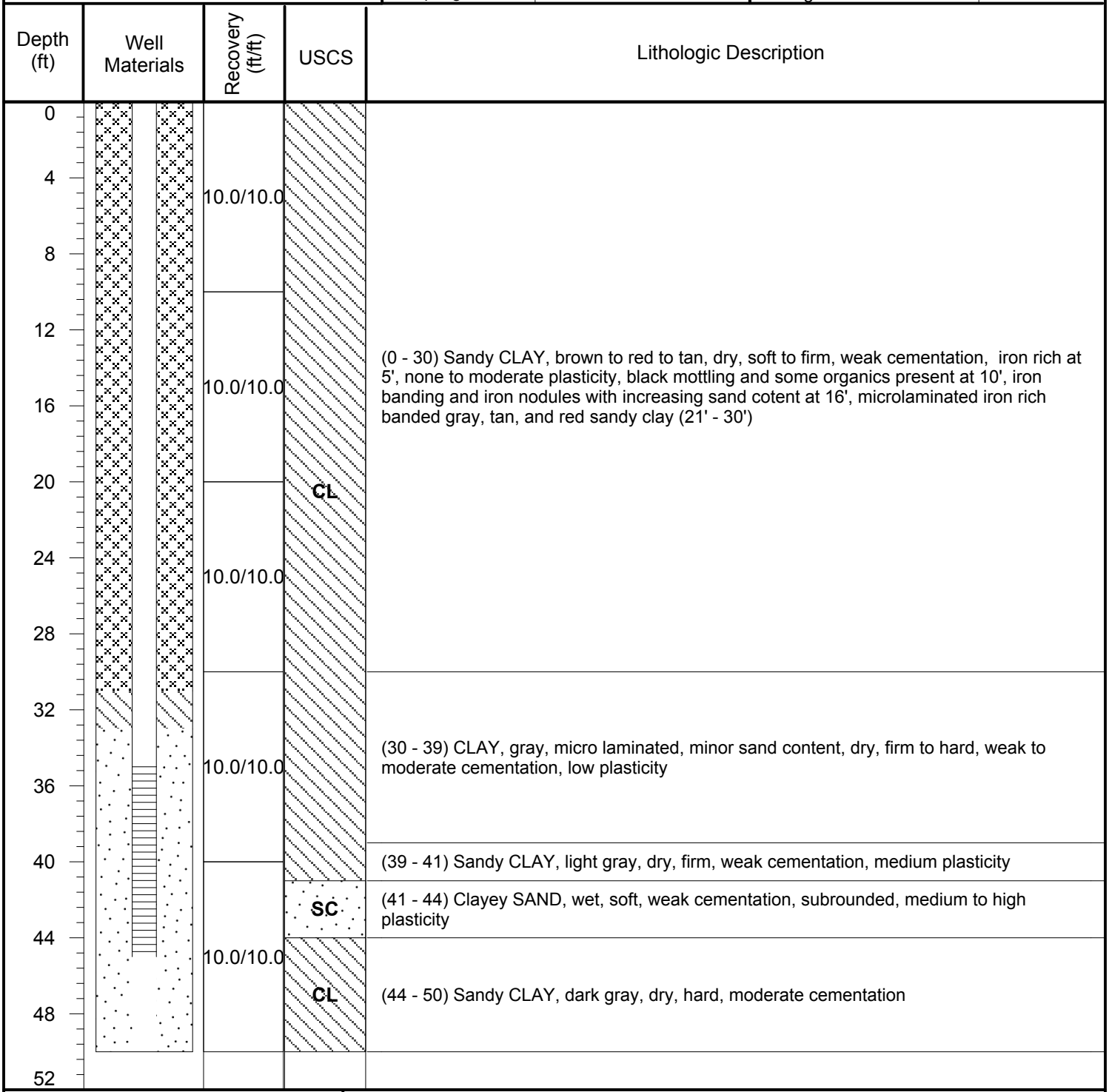
Luminant

Log of Boring: PDP-23

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/10/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-35) Casing, 2" Sch 40 FJT PVC
(35-45) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-31') Grout
(31'-33') Bentonite pellets
(33'-45') 20/40 sand

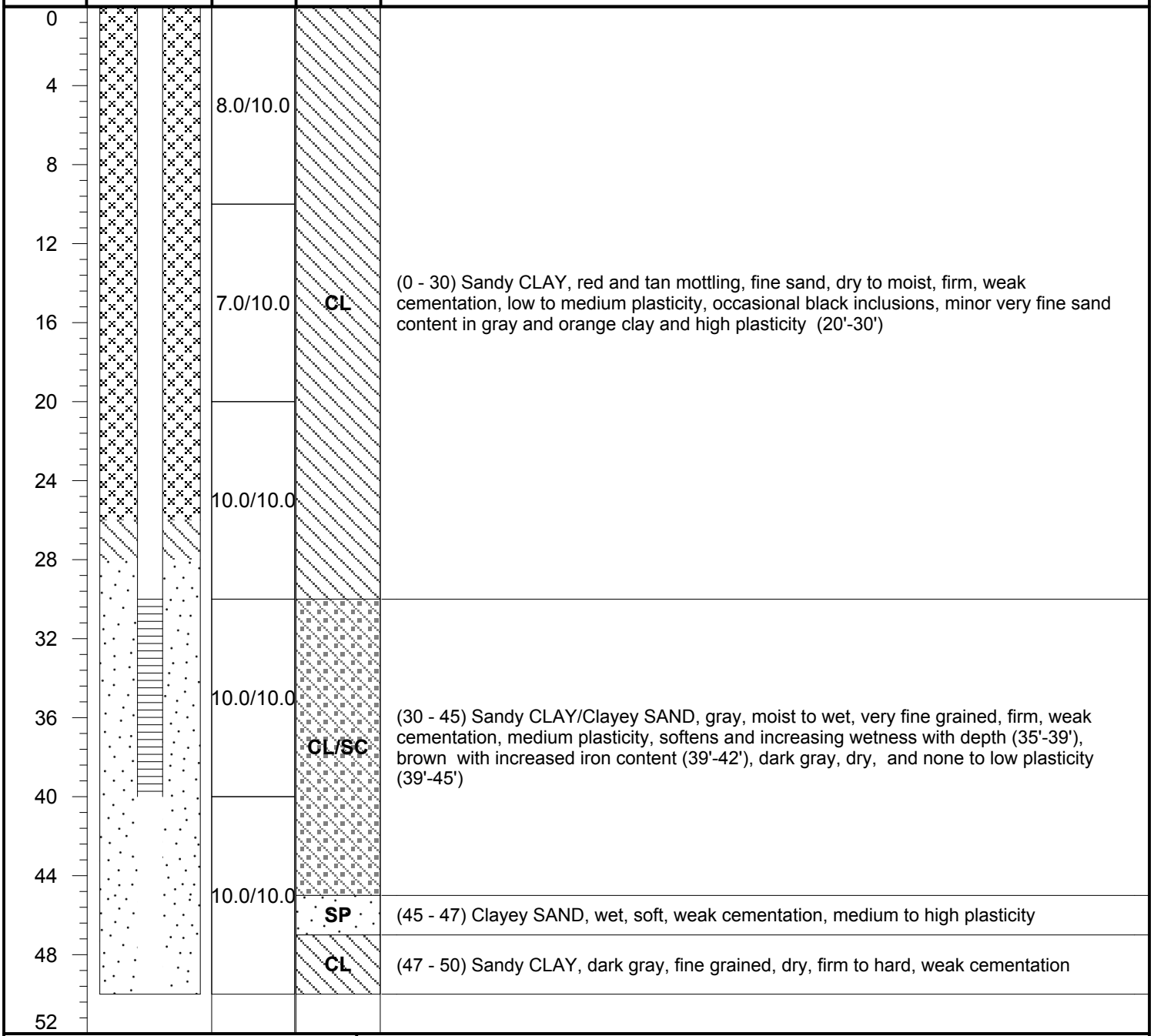
Luminant

Log of Boring: PDP-24

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-30) Casing, 2" Sch 40 FJT PVC
(30-40) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-26') Grout
(26'-28') Bentonite pellets
(28'-40') 20/40 sand

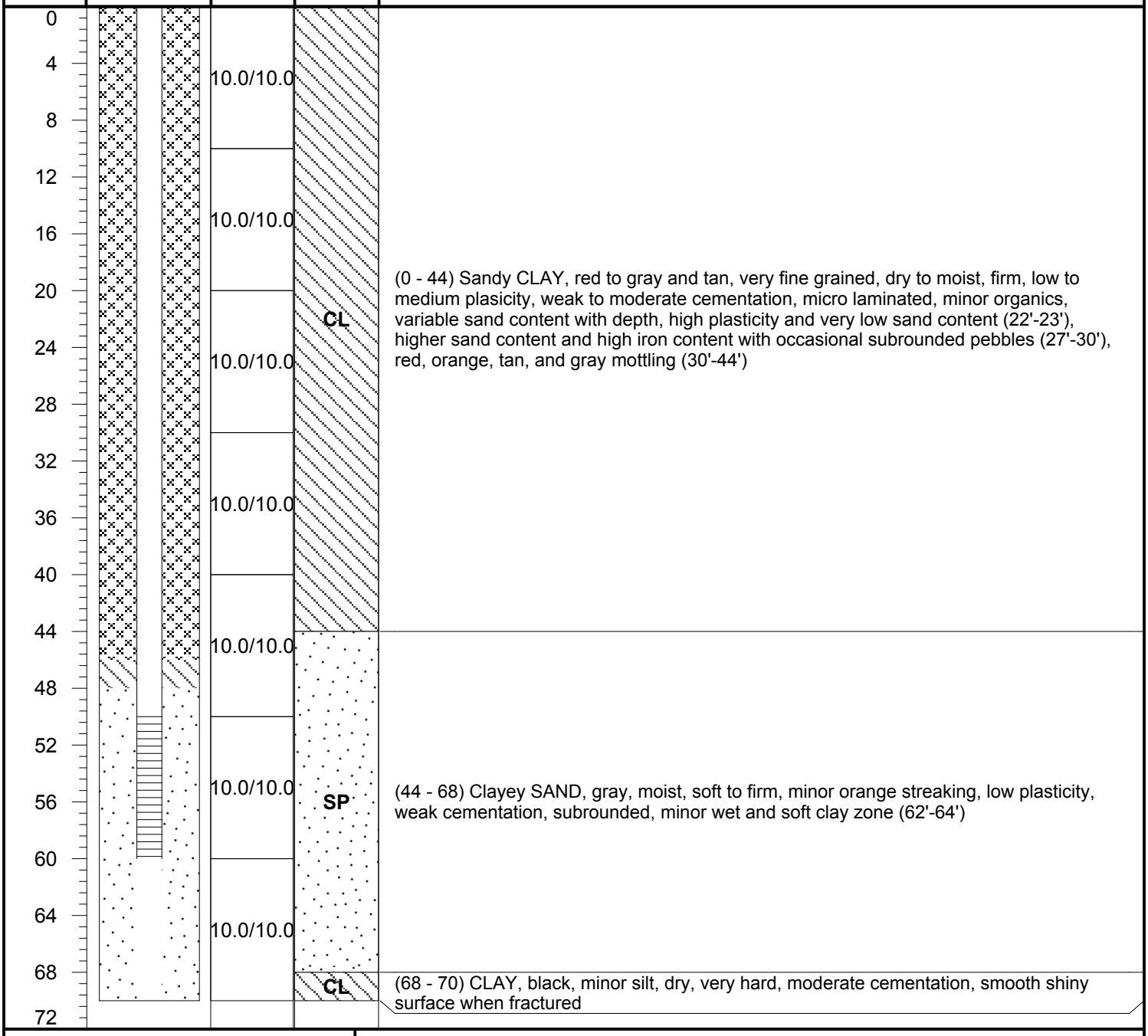
Luminant

Log of Boring: PDP-25

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/11/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	70
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	



PBW

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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-50) Casing, 2" Sch 40 FJT PVC
(50-60) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-46') Grout
(46'-48') Bentonite pellets
(48'-60') 20/40 sand

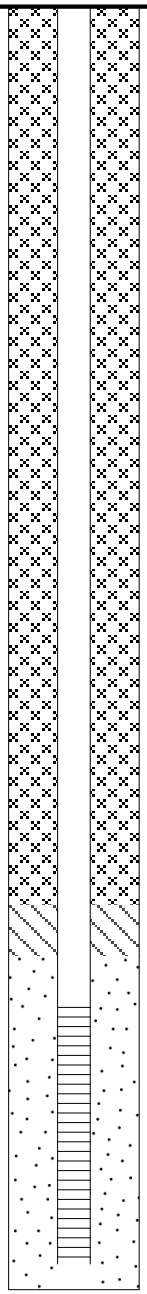
Luminant

Log of Boring: PDP-26

Martin Lake Steam Electric Station
Tatum, TX

PBW Project No. 5164B

Completion Date:	9/9/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Timmy Beach	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	
Logged By:	Ryan Francis	Northing:	
Sampling Method:	4"x10' Core barrel	Easting:	

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0		10.0/10.0	SP	(0 - 3) SAND, tan, dry, very soft, weak cementation
4			SC	(3 - 6) Clayey SAND, dry, firm, black lignite present
8			CL	(6 - 9) CLAY with minor sand, red, moist, firm, medium plasticity, smear zone black lignite
12		10.0/10.0	SC	(9 - 16) Clayey SAND, tan, moist, soft, low plasticity, more clay content with depth
16				
20		10.0/10.0	CL	(16 - 40) CLAY, tan, micro laminated orange and gray, moist, soft, medium plasticity, dry and silty clay (19'-27'), micro laminated gray and dark gray (27'-36'), increasing sand content (30'-36'), organics layer (36.5'-37'), high iron content (39'-40')
24				
28				
32		10.0/10.0		
36				
40		10.0/10.0	SP	(40 - 48) SAND, tan, medium, moist to wet, soft, subrounded
44				
48			CL	(48 - 50) CLAY, gray, micro laminated, dry, firm, moderate cementation
52				

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. This log should not be used separately from the report to which it is attached.

Well Materials
(0-39) Casing, 2" Sch 40 FJT PVC
(39-49) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0'-35') Grout
(35'-37') Bentonite pellets
(37'-49') 20/40 sand

APPENDIX D

PDP-5 Alternative Source Demonstration - 2019 Semi-Annual Detection Monitoring Results

ALTERNATE SOURCE DEMONSTRATION SUMMARY

MARTIN LAKE STEAM ELECTRIC STATION – PDP 5

Introduction

This Alternative Source Demonstration Summary was prepared to document that a source other than the Permanent Disposal Pond 5 (PDP 5) (the Site) caused the statistically significant increases (SSIs) over background levels observed during the 2019 Detection Monitoring Program sampling events as required by 40 CFR 257.94(e)(2). A detailed Site plan of the Coal Combustion Residual (CCR) groundwater monitoring network is shown on Figure 1. The Detection Monitoring Program groundwater data are summarized in Table 1.

2019 Semi-Annual Detection Monitoring Results and Discussion

Detection Monitoring Program groundwater samples were collected on a semi-annual basis from the Site CCR monitoring well network in 2019 in accordance with 40 CFR 257.94. Golder collected the initial 2019 Detection Monitoring Program groundwater samples in May 2019 and the second semi-annual Detection Monitoring Program groundwater samples in November 2019. Based on the semi-annual analytical results, SSIs were identified for boron in well PDP-25 and calcium in well PDP-23. Prediction limits for boron, calcium, and sulfate in well MW-20A and calcium in well PDP-25 were exceeded during the first semi-annual 2019 sampling event; however, since the prediction limits were not exceeded during the second semi-annual 2019 event, SSIs were not indicated for these constituents/wells in accordance with the procedures outlined in the Statistical Analysis Plan (PBW, 2017).

The boron concentrations in the 2019 groundwater samples from well PDP-25 (maximum sample concentration of 0.184 mg/L) exceeded the boron prediction limit of 0.136 mg/L for that well; however, the PDP-25 boron results are significantly lower than the boron concentrations observed at other Site wells where SSIs were not indicated. For example, five of the eight other CCR monitoring wells (MW-17A, MW-19, MW-20A, PDP-22, and PDP-24) had boron sample concentrations in 2019 that were higher than those observed in the PDP-25 samples, but SSIs were not indicated in these other wells. As such, the boron sample concentrations observed at PDP-25 are similar or less than those observed in other Site wells and are attributed to variability caused by the heterogeneity of the uppermost aquifer at the Site.

The calcium concentrations in the November 2019 groundwater sample from well PDP-23 (maximum sample concentration of 2.14 mg/L) exceeded the calcium prediction limit of 2.0 mg/L for that well; however, based on the extremely low concentrations of calcium in PDP-23, and the high variability in calcium concentrations observed in the site-wide PDP 5 detection monitoring samples (average calcium concentration for all wells in November 2019 was 22.6 mg/L), the prediction limit exceedance observed in PDP-23 is attributed to variability caused by the heterogeneity of the uppermost aquifer at the Site.

PDP 5 is built on top of three closed and capped landfills (PDP 1, PDP 2, and PDP 3). PDP 4, which is located adjacent to PDP 5 to the south, is also a closed and capped landfill. PDP 1 through PDP 4 are not considered regulated units under the CCR Rule. In addition to the natural variability caused by the heterogeneity of the groundwater system at the Site, sample concentrations identified as SSIs may also be influenced by potential historical effects caused by the closed landfills in the vicinity of PDP 5.

Conclusion

SSIs were identified for boron and calcium during the 2019 Detection Monitoring Program sampling events at PDP 5. All observed SSIs are attributed to natural variation in groundwater quality due to the heterogeneity of the

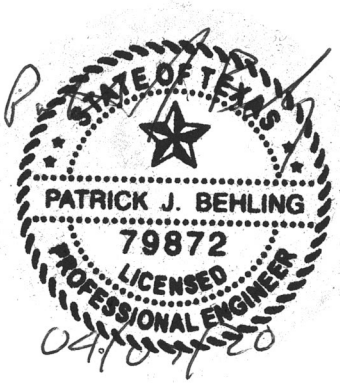
groundwater system and to potential effects from the closed landfills in the vicinity of PDP 5 (PDP 1 through PDP 4), and are not considered evidence of a release from the CCR unit. In accordance with Section 257.94(e)(2), Luminant should continue the Detection Monitoring Program. Initiation of an Assessment Monitoring Program is not required at this time.

References

Pastor, Behling & Wheeler, LLC (PBW), 2017. Coal Combustion Residual Rule, Statistical Analysis Plan, PDP 5, Rusk County, Texas. October 11, 2017.

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Golder Associates Inc. under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the alternative source demonstration at the referenced facility meets the requirements of Section 257.94(e)(2) of the CCR Rule.



Patrick J. Behling, P.E.

Principal Engineer

GOLDER ASSOCIATES INC.

Table 1
CCR Groundwater Detection Monitoring Data Summary
Martin Lake Steam Electric Station - PDP 5

Sample Location	Date Sampled	B		Ca		Cl		Fl		field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
MW-17A	09/22/17	0.538	0.402	6.73	3.1	10.4	8.3	0.4	<0.1	2.5 9.19	6.78	51.9	31.2	170	111
	06/14/18		0.485		6.48		9.16		<0.1		6.87		45.9		129
	09/11/18		0.523		5.06		8.82		0.179 J		5.03		43.1		137
	05/13/19		0.497		4.88		9.18		<0.1		6.79		44.7		145
	11/07/19		0.52		5.05		8.81		<0.100		6.44		43.9		127
MW-18A	09/21/17	0.20	0.0654	3.1	1.04	10.4	5.27	0.4	<0.1	4.88 7.92	6.94	9.1	3.23	157	45
	06/14/18		0.102		2		6.56		<0.1		6.92		3.48		71
	09/12/18		0.211		3.23		9.06		<0.1		5.69		4.82		150
	11/07/18		0.128		--		--		--		--		--		--
	05/13/19		0.117		1.01		6.17		0.138 J		6.64		3.23		73
	11/07/19		0.127		11.5		6.34		<0.100		6.23		3.67		68
MW-19	09/22/17	0.782	0.0677	237	2.74	57.7	5.36	0.512	<0.1	4.6 8.08	6.94	672	1.46 J	1,380	98
	06/14/18		0.577		133		24.4		0.216 J		6.78		328		758
	09/11/18		0.243		38		65.1		0.228 J		6.04		166		597
	11/07/18		--		--		5.22		--		--		--		--
	05/13/19		0.429		122		26.8		0.229 J		6.72		349		813
	11/08/19		0.529		77.8		49.3		0.189 J		6.87		310		844
MW-20A	09/22/17	0.213	0.0807	25.7	17.4	12.3	12.6	0.954	0.175 J	3.06 8.76	6.71	148	74.2	381	237
	02/21/18 re-sample		--		--		10.7		--		--		--		--
	06/13/18		0.171		24		10.9		0.672		6.72		132		250
	09/11/18		0.141		7.16		11		0.235 J		4.70		39.1		154
	05/13/19		0.239		37.4		10.2		0.731		6.81		178		328
	11/08/19		0.132		9.9		10.2		0.465		6.51		88		205

Table 1
CCR Groundwater Detection Monitoring Data Summary
Martin Lake Steam Electric Station - PDP 5

Sample Location	Date Sampled	B		Ca		Cl		Fl		field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
PDP-22	09/22/17	0.411	0.221	306	92.5	32.7	12.3	1.07	0.321 J	4.08 8.63	6.98	216	178	1,780	558
	06/14/18		0.115		7.78		11.8		0.239		6.63		186		491
	09/12/18		0.164		61.1		10.9		0.216 J		5.88		143		476
	05/13/19		0.158		98.2		10.1		0.303 J		6.86		184		615
	11/12/19		0.226		34.3		12.6		0.218 J		6.93		215		482
PDP-23	09/22/17	0.0678	0.0463	2	2.34	7.52	4.48	0.4	0.147 J	3.38 8.45	6.77	3.27	1.47 J	143	111
	02/21/18 re-sample		--		2.37		--		--		--		--		--
	06/13/18		0.0357		2.29		6.21		<0.1		6.82		1.26 J		98
	09/11/18		0.0760		1.96		6.38		<0.1		5.32		1.52 J		98
	11/07/18		0.0683		--		--		--		--		--		--
	05/13/19		0.0628		1.89		6.98		<0.1		6.68		1.28 J		103
	11/12/19		0.0675		2.14		4.98		<0.100		6.72		1.41 J		93
PDP-24	09/22/17	4.92	3.01	45.9	25.8	22.6	17.5	1.03	0.898	1.33 9.97	6.95	533	231	894	440
	06/14/18		2.71		23.9		21.1		0.629		6.82		284		481
	09/11/18		4.08		41.6		19.4		0.832		4.20		460		760
	05/13/19		3.23		23		21		0.871		6.95		300		537
	11/12/19		3		21.9		20.6		0.751		6.87		295		520
	11/12/19		2.97		22.2		20.5		0.744		6.87		300		504
PDP-25	09/22/17	0.136	0.133	41.3	36.8	197	130	0.4	0.157 J	4.65 7.93	6.81	118	89.1	705	481
	06/14/18		0.119		40.4		111		<0.1		6.78		73.4		439
	09/11/18		0.167		36.2		135		0.115 J		5.87		90.3		469
	11/07/18		0.142		--		--		--		--		--		--
	05/13/19		0.144		44.4		108		0.121 J		6.84		69		469
	11/12/19		0.184		38.6		117		<0.100		6.82		71.4		454

Table 1
CCR Groundwater Detection Monitoring Data Summary
Martin Lake Steam Electric Station - PDP 5

Sample Location	Date Sampled	B		Ca		Cl		Fl		field pH		SO_4		TDS	
		Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data	Prediction Limit	Sample Data
PDP-26	09/22/17	0.111	0.0343	4.74	2.32	14.6	5.24	0.577	0.157 J	5.35 7.57	6.84	64.6	5.88	438	107
	06/14/18		0.0225 J		2.93		4.8		<0.1		6.89		4.27		100
	09/12/18		0.0371		2.37		4.88		<0.1		6.07		2.66 J		107
	05/13/19		0.0528		1.9		4.59		0.217 J		6.86		2.7 J		106
	11/12/19		0.0622		2.25		4.64		0.122 J		6.77		2.1 J		102

Notes:
1. All concentrations in mg/L. pH in standard units.
2. J - concentration is below sample quantitation limit; result is an estimate.

EXPLANATION

CCR Monitoring Well

N

Scale in Feet

0 275 550

SOURCE:
Imagery from www.tnris.gov, Rusk County, aerial photographs, 2012.

MARTIN LAKE STEAM ELECTRIC STATION
TATUM, TEXAS

Figure 1

PDP 5 AREA
DETAILED SITE PLAN

PROJECT: 5164B	BY: AJD	REVISIONS
DATE: SEPT., 2017	CHECKED: PJB	

APPENDIX E

PDP-5 Location Restrictions Demonstration Report

TECHNICAL MEMORANDUM

DATE October 10, 2018 **Project No.** 18107517

TO Jeff Jones
Luminant Generation Company LLC

FROM Patrick J. Behling, P.E.

LUMINANT GENERATION COMPANY LLC
CCR RULE LOCATION RESTRICTION DEMONSTRATIONS
MARTIN LAKE STEAM ELECTRIC STATION – RUSK COUNTY, TEXAS
PERMANENT DISPOSAL POND 5

Luminant Generation Company LLC (Luminant) operates the Martin Lake Steam Electric Station (MLSES) located approximately 5 miles southwest of Tatum, Rusk County, Texas. The MLSES consists of three coal/lignite-fired units with a combined operating capacity of approximately 2,250 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, boiler slag and scrubber gypsum are generated as part of MLSES unit operation.

The U.S. Environmental Protection Agency's (EPA's) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities* (CCR Rule) has established technical requirements for CCR landfills and surface impoundments (See 80 Fed. Reg. 21,302 (Apr. 17, 2015); 83 Fed. Reg. 36,435 (July 30, 2018)). The following surface impoundment at the MLSES has been identified as an Existing CCR Surface Impoundment regulated under the CCR Rule:

- Permanent Disposal Pond 5 (PDP-5)

PDP-5 is located approximately 3,000 feet west of the MLSES power plant (Figure 1).

Golder Associates Inc. (Golder) was retained by Luminant to evaluate PDP-5 against the five (5) applicable location restriction criteria for existing CCR surface impoundments described in Sections 257.60 through 257.64 of the CCR Rule. This memorandum sets forth Luminant's location restriction demonstrations and corresponding certifications required by the CCR Rule.

LOCATION RESTRICTION DEMONSTRATION – SUMMARY OF FINDINGS/CONCLUSIONS

This location restriction demonstration concludes that PDP-5 satisfies each of the five (5) CCR Rule location restriction criteria for existing CCR surface impoundments (placement above the uppermost aquifer, wetlands, fault areas, seismic impact zone and unstable areas):

- The base of PDP-5 was determined to be > 5.0 feet above the upper limit of the uppermost aquifer satisfying the separation criteria defined in §257.60.
- PDP-5 was determined to not be located in wetlands as per §257.61.
- Based on the available published geologic data and information reviewed, the nearest known fault to

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PDP-5 is located approximately 18 miles south of the MLSES. Therefore, PDP-5 satisfies the location restriction criteria presented in §257.62.

- PDP-5 was determined to not be located in a Seismic Impact Zone as per §257.63.
- PDP-5 was determined to not be located in an Unstable Area as per §257.64.

A professional engineering certification that covers all five location restriction evaluations is included on page 10 of this memorandum.

MEMORANDUM ORGANIZATION

The memorandum is organized as follows:

SECTION 1.0 - Location Restriction Criteria & CCR Unit Description

SECTION 2.0 - Placement Above Uppermost Aquifer

SECTION 3.0 - Wetlands

SECTION 4.0 - Fault Areas

SECTION 5.0 - Seismic Impact Zone

SECTION 6.0 - Unstable Areas

SECTION 7.0 - Limitations

SECTION 8.0 - Professional Certification

FIGURE 1 – Site Plan – PDP-5

SECTION 1.0 Location Restriction Criteria & CCR Unit Description

LOCATION RESTRICTION CRITERIA

Existing CCR Surface Impoundments must comply with the following five location restrictions described in Sections 257.60 through 257.64 of the CCR Rule:

- §257.60 – Placement above the Uppermost Aquifer
- §257.61 – Wetlands
- §257.62 – Fault Areas
- §257.63 – Seismic Impact Zone
- §257.64 – Unstable Areas

The CCR Rule requires that the CCR Surface Impoundment owner or operator certify that the CCR Unit meets the specified location restriction requirements by October 17, 2018 for continued operation of the CCR Unit.

CCR UNIT DESCRIPTION

PDP-5 is used to store material from the ML Ash Ponds during cleaning cycles and for storage of water from large precipitation events and excess process wastewater from the scrubber gypsum and bottom ash transport systems. PDP-5 was constructed in 2010 on top of three former ash surface impoundments previously closed in-place as landfills and is provided with a 2 foot thick compacted clay liner. PDP-5 is constructed above grade and is surrounded by earthen embankments that extend approximately 10 to 15 feet above grade.

Section 2.0 Placement Above Uppermost Aquifer

Section 257.60(a) of the CCR Rule states:

a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.*

Section 257.53 of the CCR Rule defines uppermost aquifer as follows:

- Aquifer: a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.

- Uppermost aquifer: the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

Golder evaluated the distance between the base of PDP-5 and the uppermost aquifer by comparing the documented elevations of the base of the pond liner system and groundwater elevations as measured from monitoring wells in the vicinity of the pond. The upper limit of the uppermost aquifer in the vicinity of PDP-5 is at approximately Elev. 381 feet MSL and as-built engineering drawings indicate that the base of the clay liner in the pond is at approximately Elev. 389 feet MSL. As a result, the separation between the base of the unit and the upper limit of the uppermost aquifer was confirmed to be greater than five feet, and therefore, PDP-5 complies with the requirements of §257.60(a).

Section 3.0 Wetlands

Section 257.61(a) of the CCR Rule states:

a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.*

40 CFR 232.2 defines wetlands as follows:

- Wetlands: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

PDP-5 was constructed in 2010 and is located in a developed industrial area that is part of the MLSES power plant. To determine if PDP-5 is located in wetlands, the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) website was reviewed by Golder. Although PDP-5 itself is represented on the NWI maps as a “permanently flooded freshwater basin that was diked/impounded by humans”, wastewater discharges from the MLSES are regulated under Texas Pollution Discharge Elimination System (TPDES) permit WQ0001528000 and PDP-5 is part of the MLSES wastewater management system. As a result, PDP-5 was designed and constructed to meet Clean Water Act requirements and is therefore not considered federally jurisdictional wetlands in accordance with 33 CFR § 328.3(b)(1).

Based on the NWI maps and the construction characteristics of PDP-5, PDP-5 is not “located in wetlands” as per §257.61(a), and PDP-5 satisfies the wetlands location restriction criterion.

Section 4.0 Fault Areas

Section 257.62(a) of the CCR Rule states:

a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.*

Section 257.53 of the CCR Rule defines Holocene as the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch (11,700 years before present) to present.

Golder evaluated the potential for existence of CCR Rule-defined faults in proximity to PDP-5 based on geologic maps and documents published by the United States Geological Survey (USGS). The nearest known mapped fault to PDP-5 is located approximately 18 miles south of the MLSES, which greatly exceeds the 200-foot distance prescribed in the CCR Rule. As a result, PDP-5 complies with the requirements of §257.62(a).

Section 5.0 Seismic Impact Zone

Section 257.63(a) of the CCR Rule states:

a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.*

Section 257.53 of the CCR Rule defines these terms as follows:

- Seismic impact zone: an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 50 years.
- Lithified earth material: all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. This term does not include man-made materials, such as fill, concrete, and asphalt, or unconsolidated earth materials, soil, or regolith lying at or near the earth surface.
- Maximum horizontal acceleration in lithified earth material: the maximum expected horizontal acceleration at the ground surface as depicted on a seismic hazard map, with a 98% or greater probability that the acceleration will not be exceeded in 50 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.
- Structural components: liners, leachate collection and removal systems, final covers, run-on and run-off systems, inflow design flood control systems, and any other component used in the construction and operation of the CCR unit that is necessary to ensure the integrity of the unit and that the contents of the unit are not released into the environment.

Golder evaluated the location of PDP-5 relative to seismic impact zones using maps and documents published by the United States Geological Survey (USGS). PDP-5 is located in an area with peak ground accelerations between 0.04g and 0.06g, which is well below the maximum acceleration of 0.10g specified in the CCR Rule to be considered a Seismic Impact Zone. As a result, PDP-5 is not located in a Seismic Impact Zone as defined in the CCR Rule and therefore complies with § 257.63(a).

Section 6.0 Unstable Areas

Section 257.64(a) of the CCR Rule states:

a) *An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.*

Section 257.53 of the CCR Rule defines unstable area as follows:

- Unstable area: a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.
- Poor Foundation Conditions: those areas where features exist which indicate that a natural or human-induced event may result in inadequate foundation support for the structural components of an existing or new CCR unit.
- Areas Susceptible to Mass Movement: those areas of influence (i.e., areas characterized as having an active or substantial possibility of mass movement) where, because of natural or human-induced events, the movement of earthen material at, beneath, or adjacent to the CCR unit results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, soil fluctuation, block sliding, and rock fall.
- Karst terrain: an area where karst topography, with its characteristic erosional surface and subterranean features, is developed as a result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrain include, but are not limited to, dolines, collapse shafts (sinkholes), sinking streams, caves, seeps, large springs, and blind valleys.

Under § 257.64(b), the following factors must be considered when determining whether an area is unstable:

- on-site or local soil conditions that may result in significant differential settling;
- on-site or local geologic or geomorphic features; and
- on-site or local human-made features or events (both surface and subsurface).

Golder completed a CCR Rule Structural Stability Assessment Report for PDP-5 in 2012 and updated the assessment in 2016. The Structural Stability Assessment Report concluded that the material underlying PDP-5 were stable. As a result, PDP-5 is not located in an unstable area as defined in the CCR Rule.

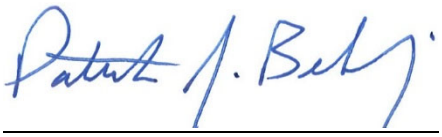
Section 7.0 Limitations

In preparing this evaluation, Golder has reviewed historic, design and investigative information and other data furnished by Luminant. Golder has relied on this information in completing the location restriction evaluations for PDP-5.

The conclusions presented in this memorandum assume that subsurface site conditions in the vicinity of PDP-5 reasonably match those conditions associated with site borings, laboratory testing results, etc. The reported conclusions are also based on our understanding of current site operations, maintenance and CCR management practices at the MLSES at the current time as provided by Luminant.

Section 8.0 Professional Certification

I, Patrick J. Behling, being a Registered Professional Engineer in good standing in the State of Texas, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this CCR Rule Location Restrictions Demonstration has been prepared in accordance with the accepted practice of engineering. I certify that the CCR Unit described in this report and as explained further in the CCR Rule Location Restriction Evaluation – Martin Lake Steam Electric Station PDP-5, Golder Associates Inc. October 10, 2018, meets the requirements of 40 CFR Sections 257.60 through 257.64.



Patrick J. Behling, P.E.
Principal Engineer
Texas PE No. 79872
Golder Associates Inc.
Texas Engineering Firm No. 2578

Figures

LEGEND

CCR MONITORING WELL LOCATION

REFERENCE(S)

IMAGERY FROM WWW.TNRIS.GOV, RUSK COUNTY, AERIAL PHOTOGRAPHS, 2012.

CLIENT
LUMINANT GENERATION COMPANY LLC

PROJECT
MARTIN LAKE STEAM ELECTRIC STATION
PDP 5 AREA
CCR RULE LOCATION RESTRICTION DEMONSTRATION

TITLE
SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2018-10-05
DESIGNED	BZH
PREPARED	BZH
REVIEWED	PJB
APPROVED	PJB

PROJECT NO. 18107517 | REV. 0 | FIGURE 1

APPENDIX F

PDP-5 Structural Stability Assessment Report

REPORT

STRUCTURAL STABILITY ASSESSMENT REPORT

Martin Lake Steam Electric Station

Submitted To: Luminant
1601 Bryan Street
Dallas, TX 75201

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA

Professional Engineering Firm
Registration Number F-2578

October 2016

Project No. 164816402

Golder Associates

Table of Contents

List of Figures

List of Appendices

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
0 1 in

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

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

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

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

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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								

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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		

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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

(Continued Next Page)

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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)

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

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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Fax: (281) 821-6870

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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Fax: (281) 821-6870

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.

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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
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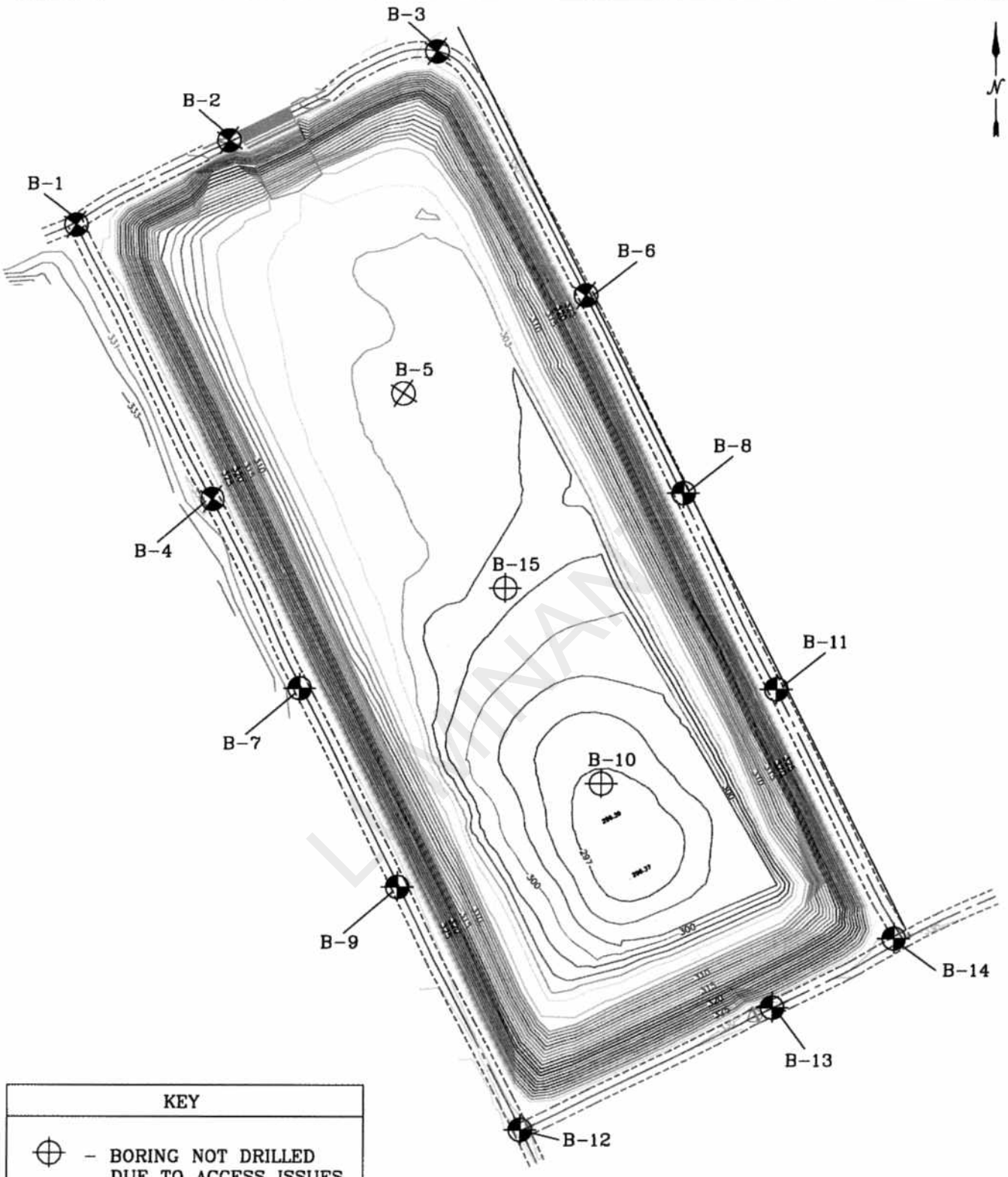
BORING NUMBER BH-211

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

MAIN OFFICE
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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(%) 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

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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		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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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) 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

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		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

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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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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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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

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	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

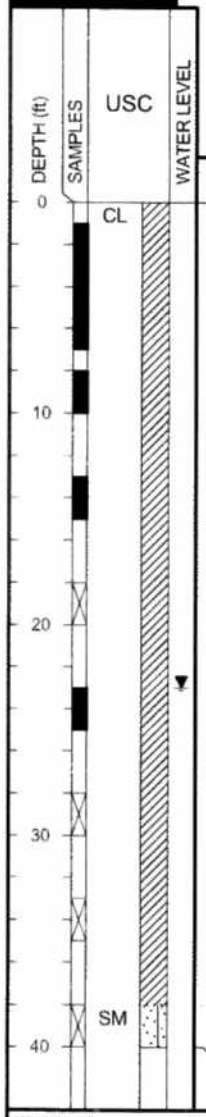
PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

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)

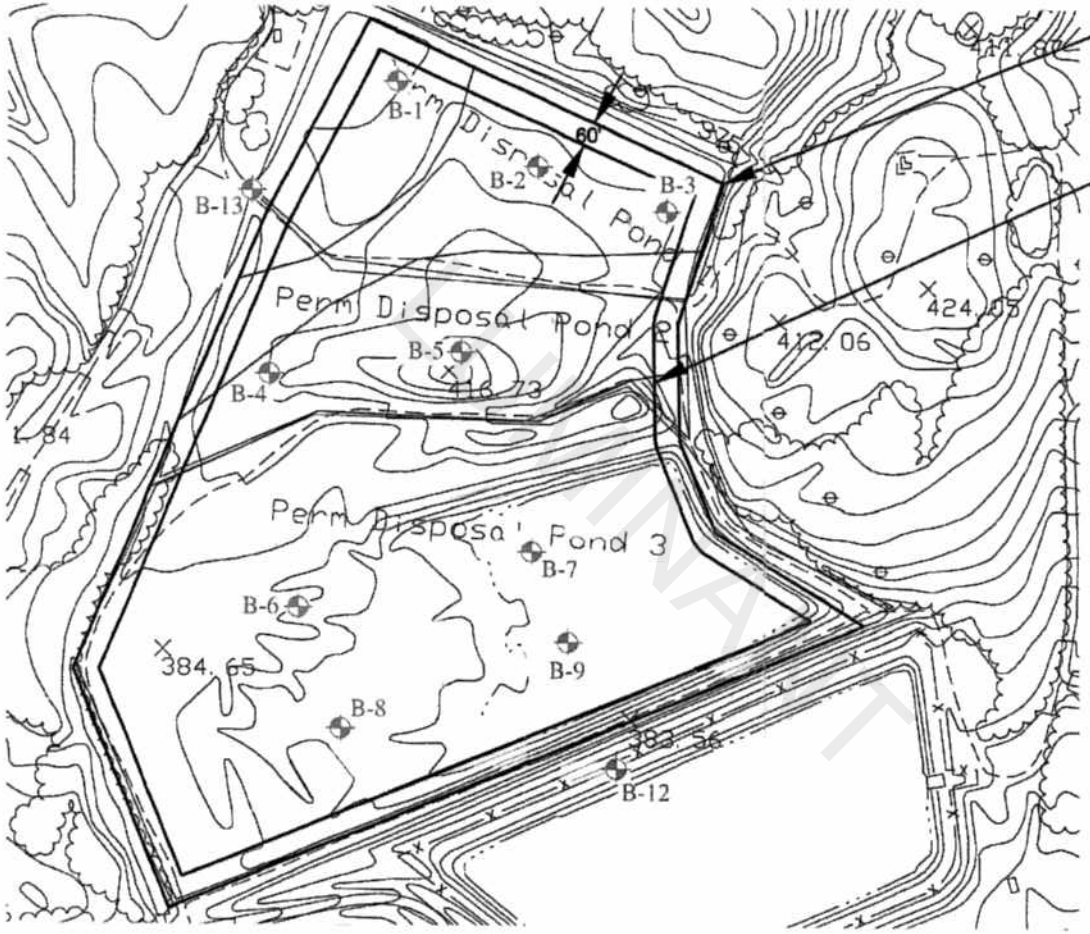
Water Level Est.: Measured: Perched:

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

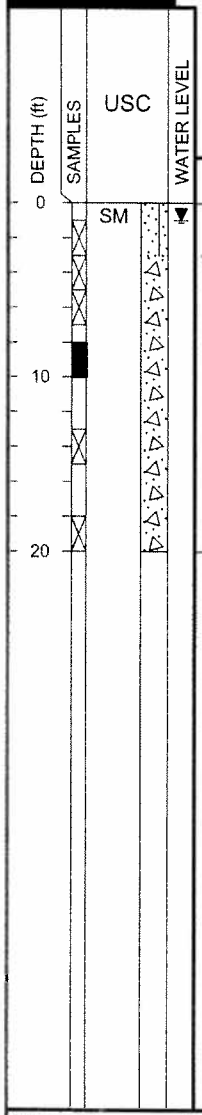
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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

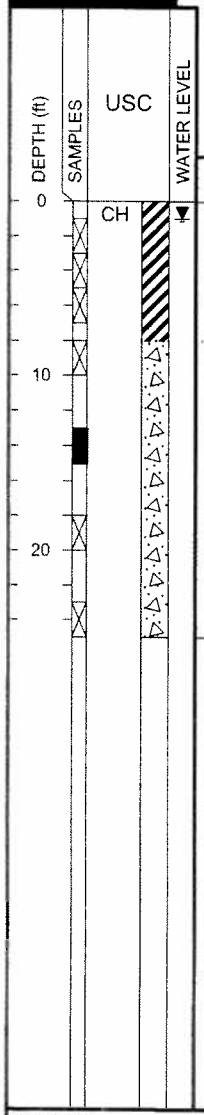
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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

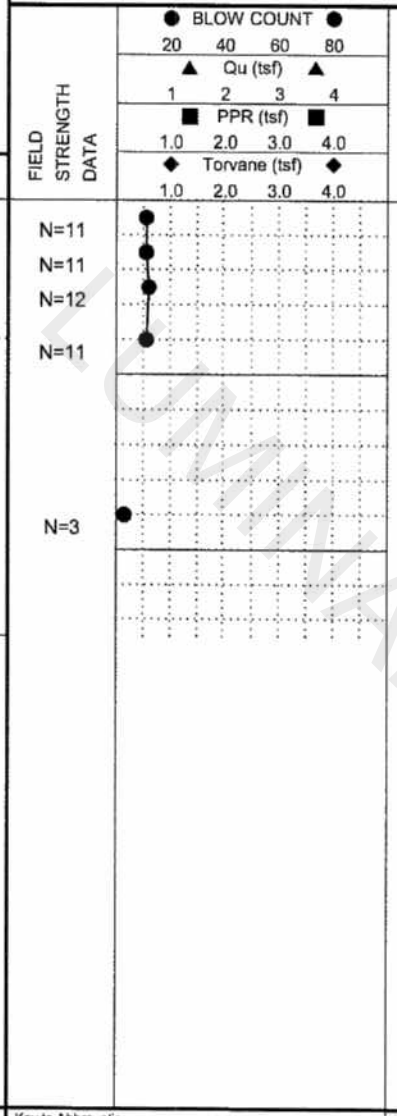
--with sand

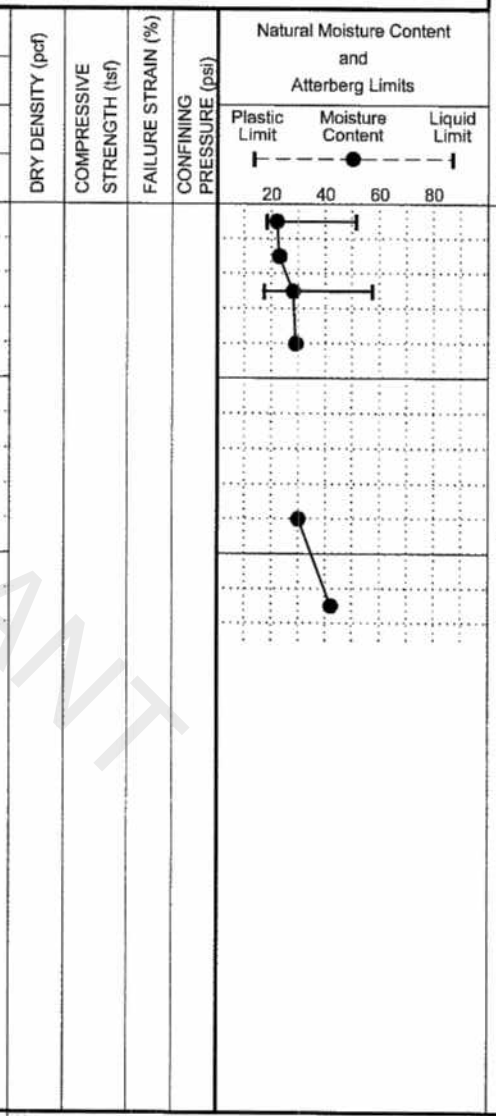
ASH SEDIMENT medium dense; black

--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

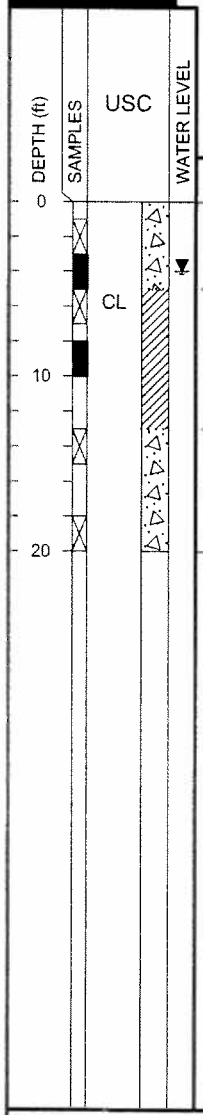
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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

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 2/20/08

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:

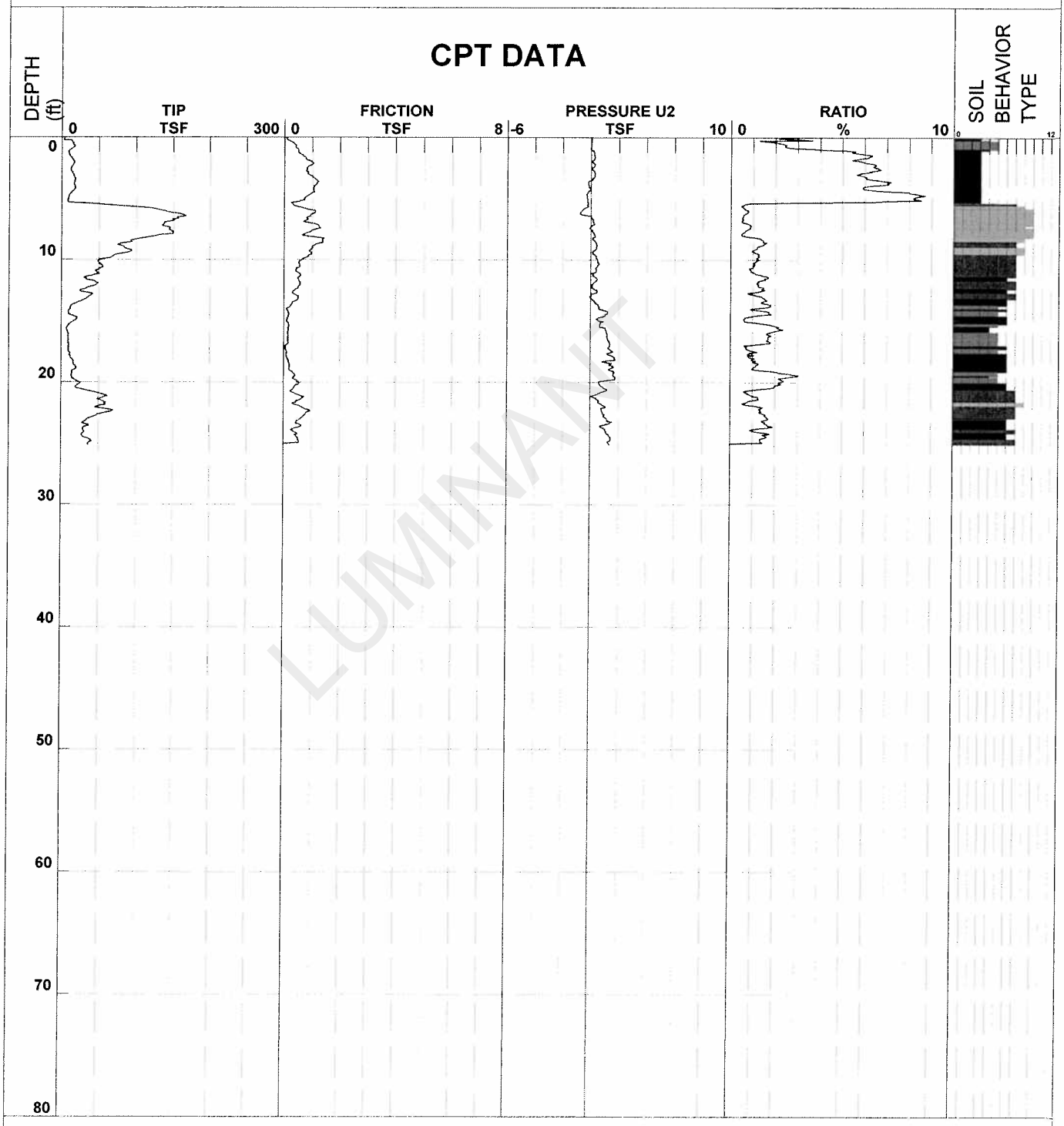
Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 18' upon completion. Dry and caved to 4' on 2/29/08.

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	

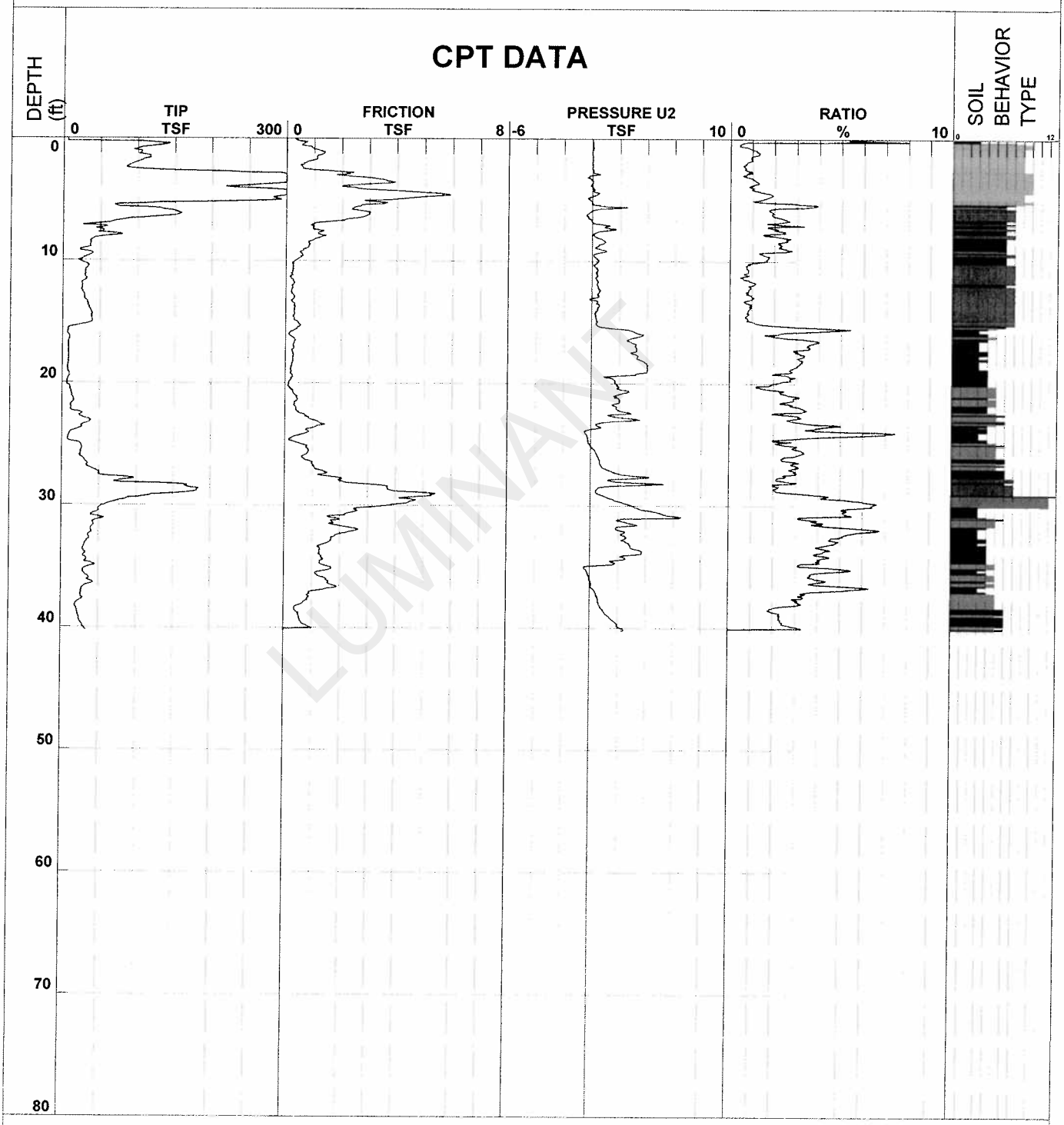


1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

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 (*)

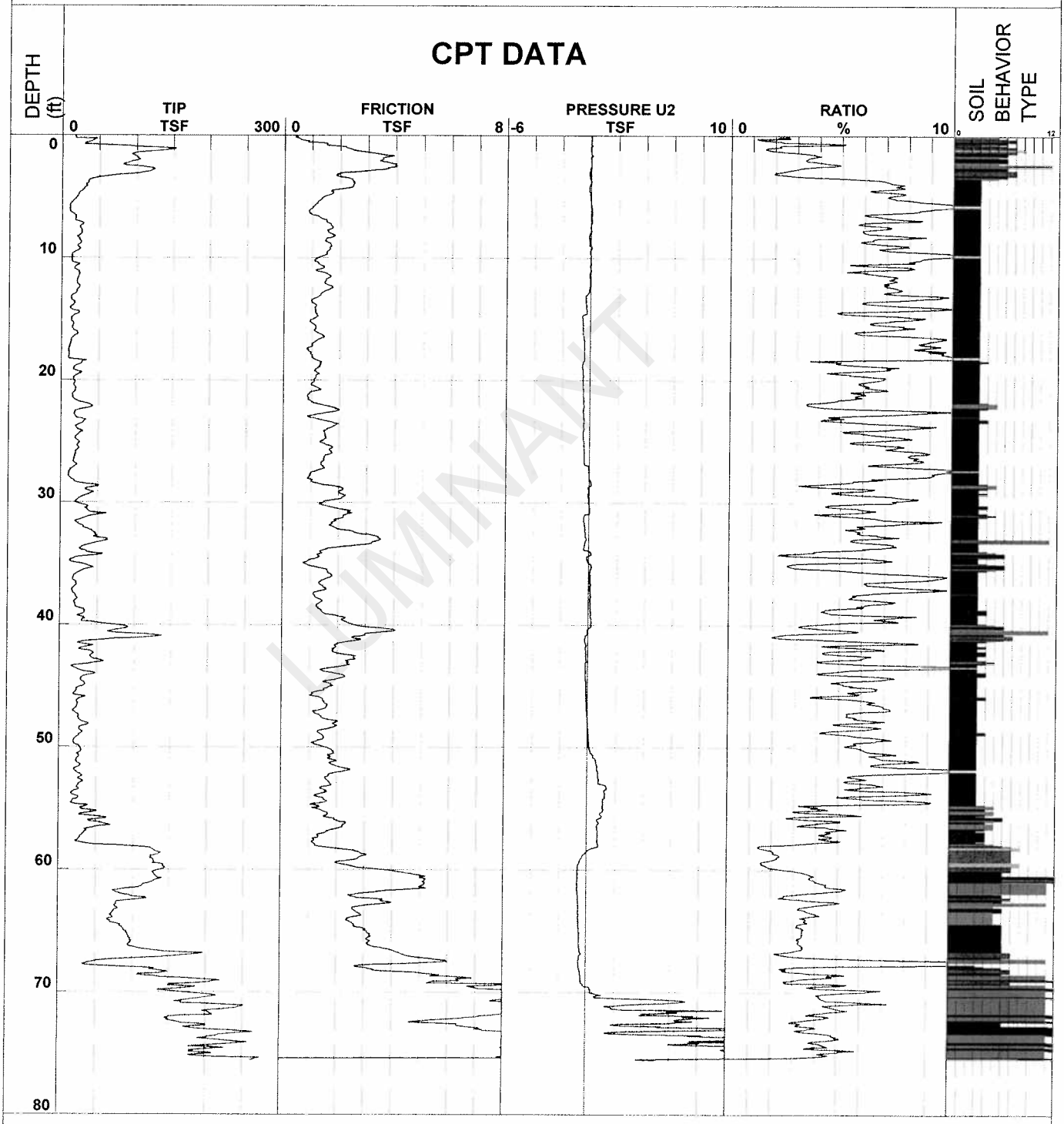
Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

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

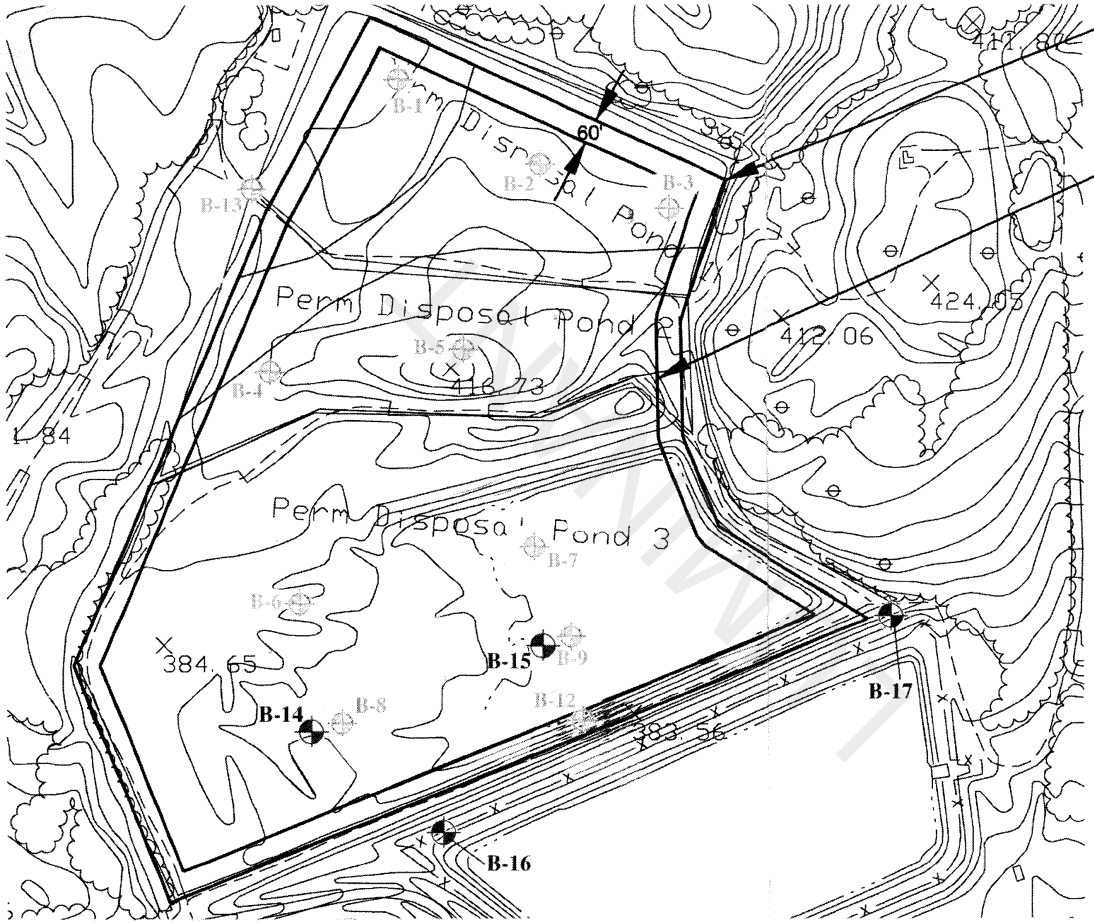
Operator GLENN JOHNSON | Date and T 16-Apr-2008 10:58:47 | Cone Number F7.5CKEW2/B 1866

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.	

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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

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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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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'

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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
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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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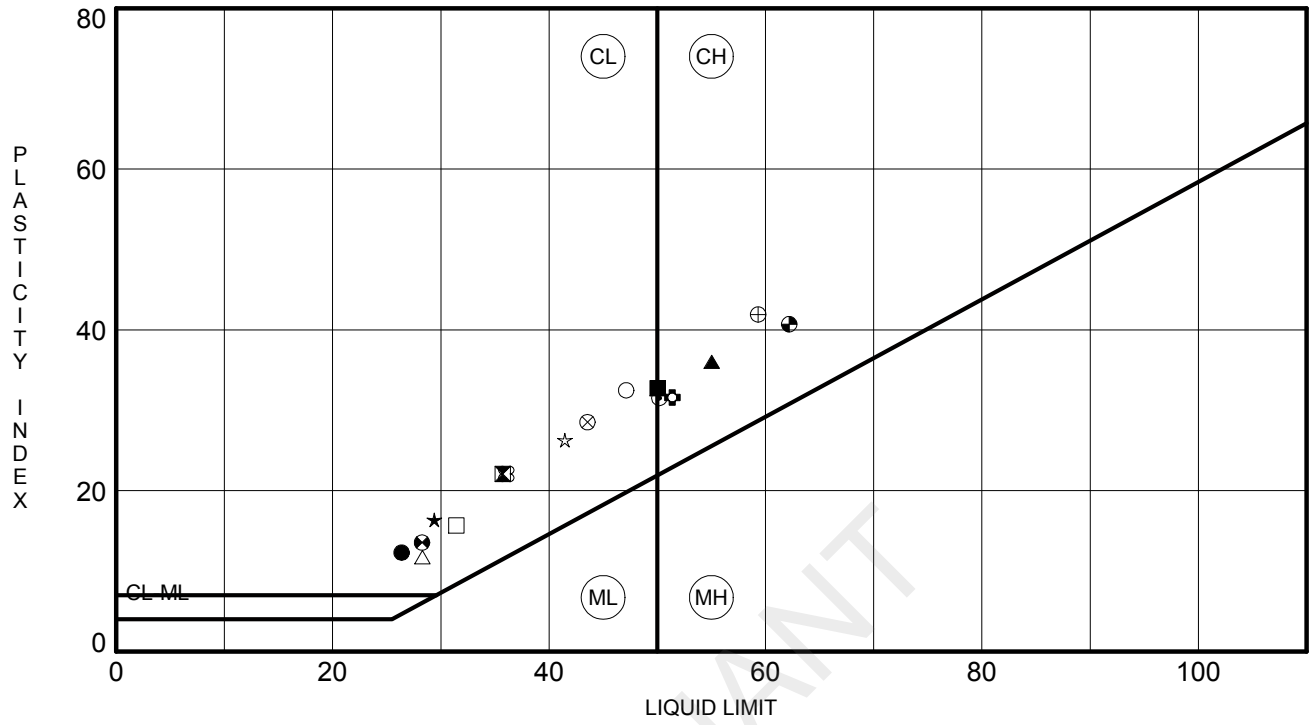
ATTERBERG LIMITS' RESULTS

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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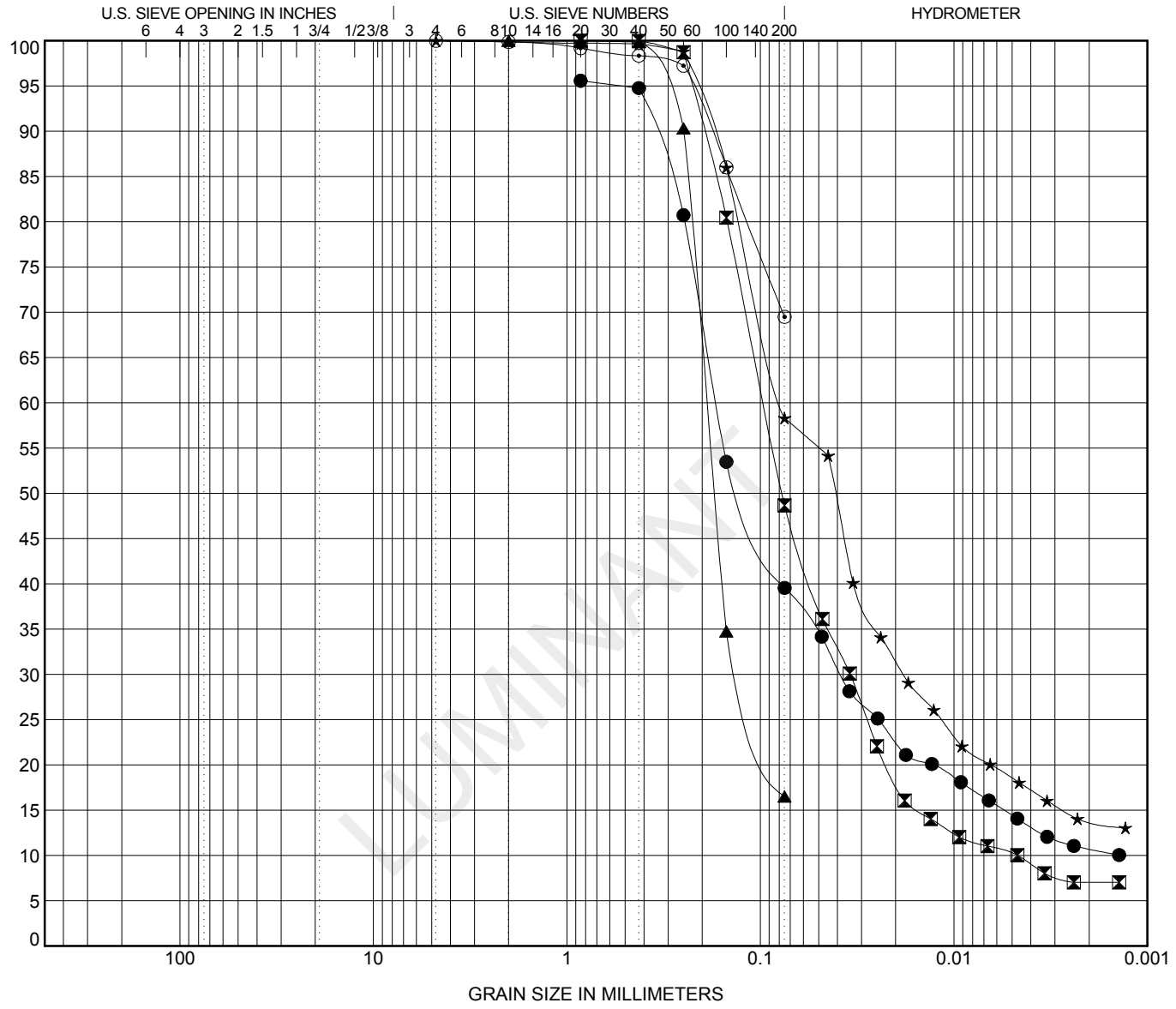
GRAIN SIZE DISTRIBUTION

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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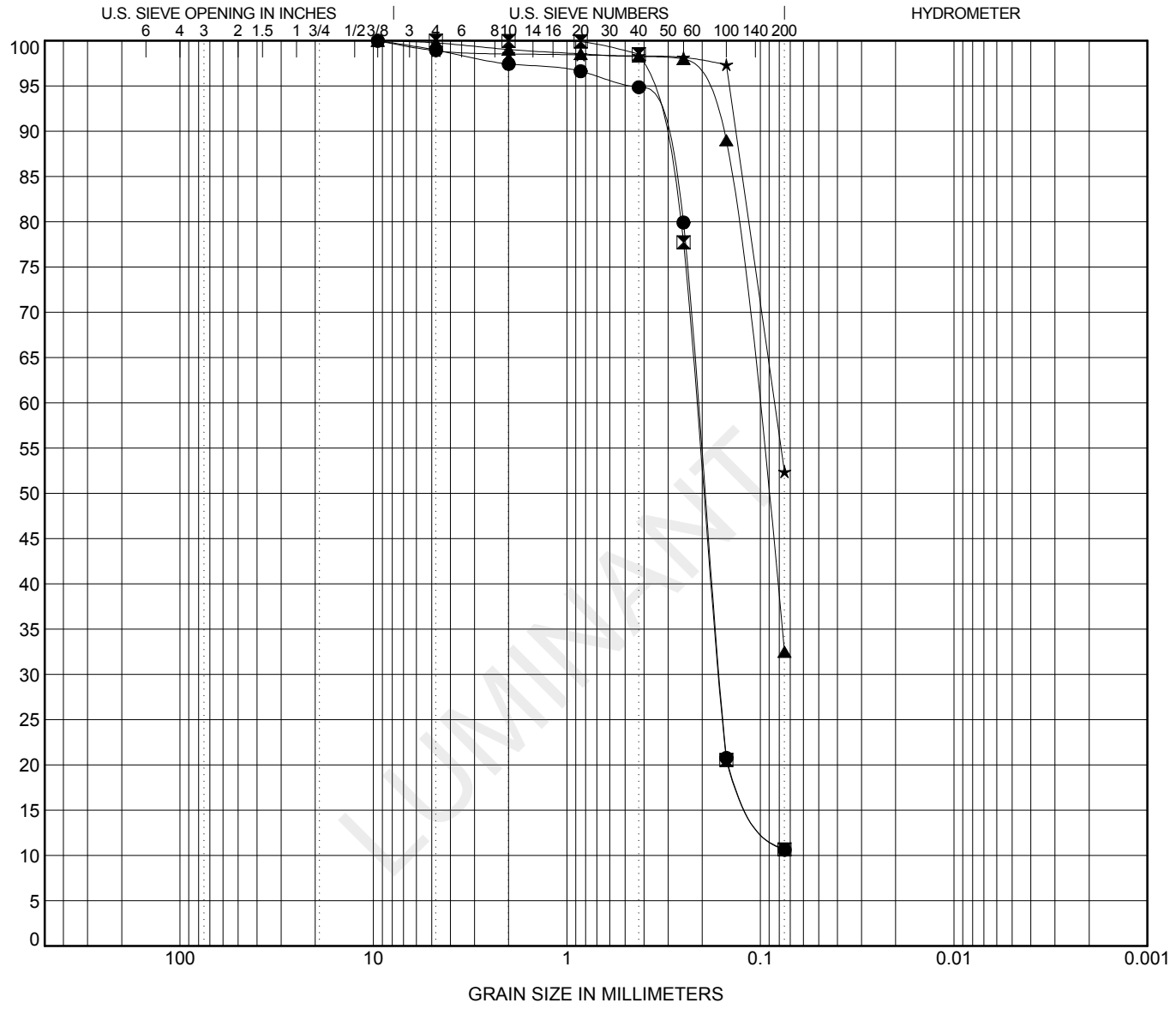
GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

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

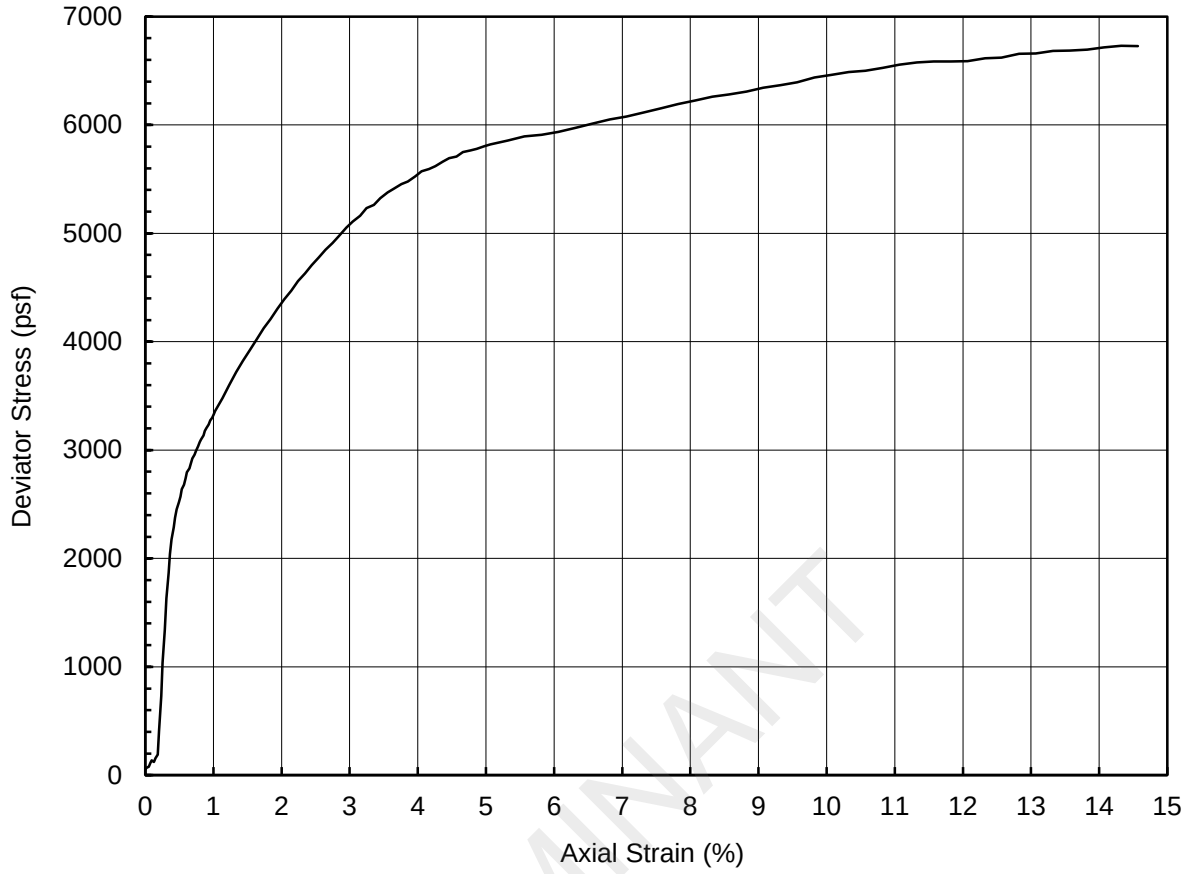


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	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**	

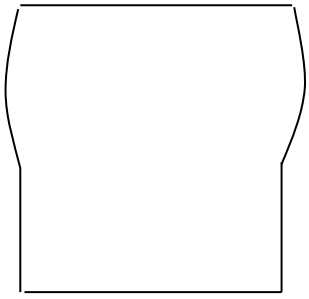
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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	

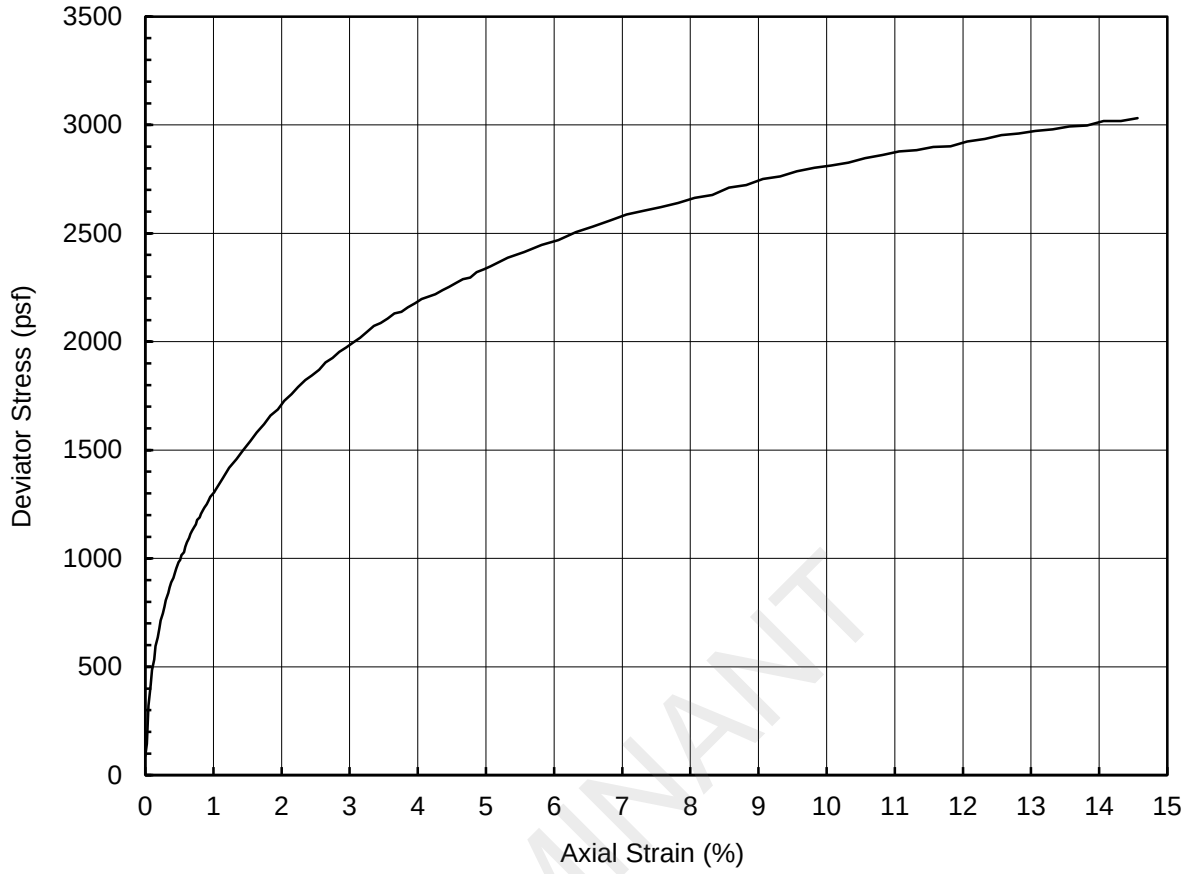


Failure Sketch

Golder Associates

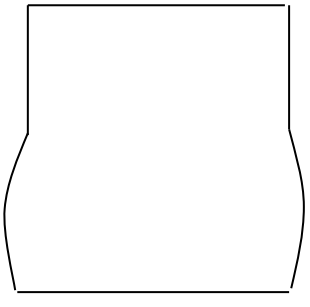
Performed by	**PN**
Date	**12-Nov-12**
Check	**HR**
Review	**SBK**

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		



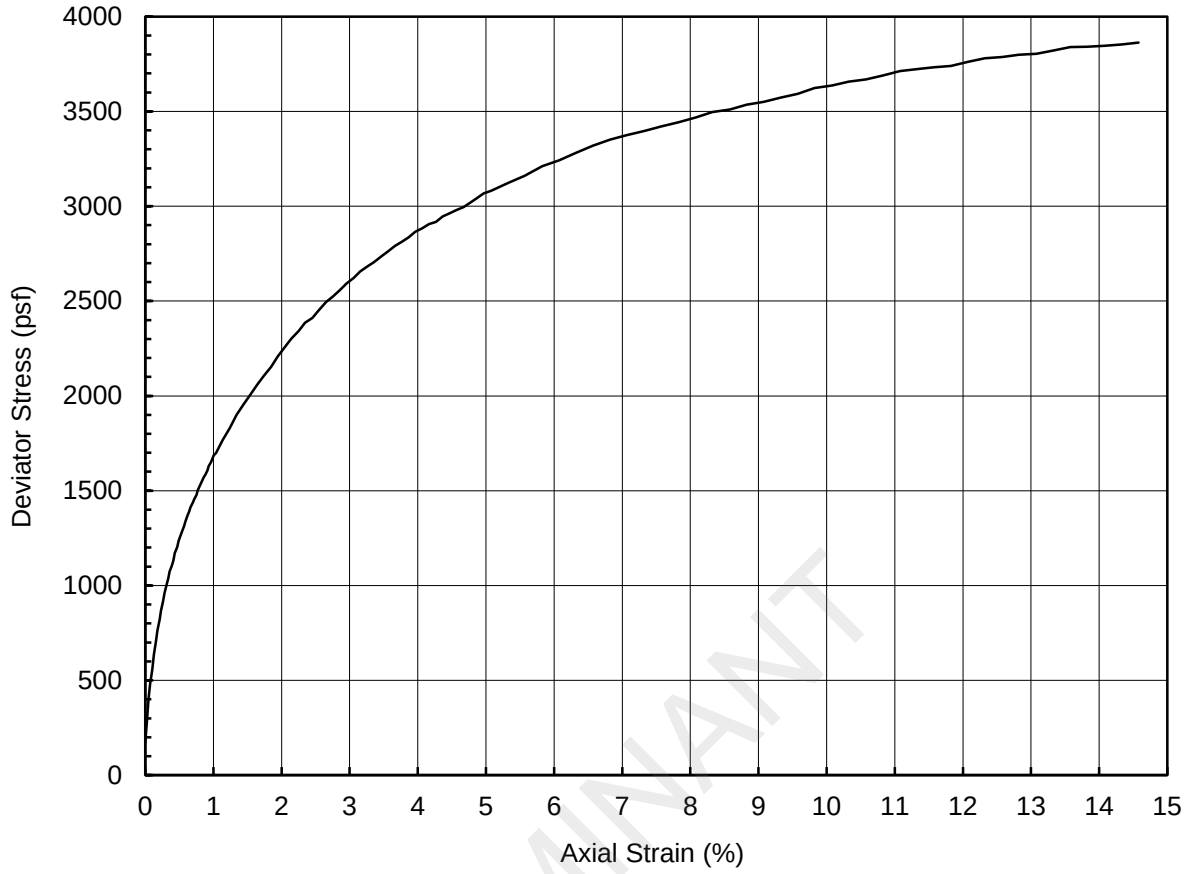
Failure Sketch

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

Golder Associates

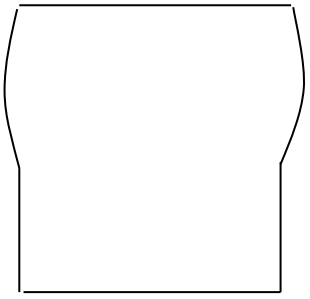
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



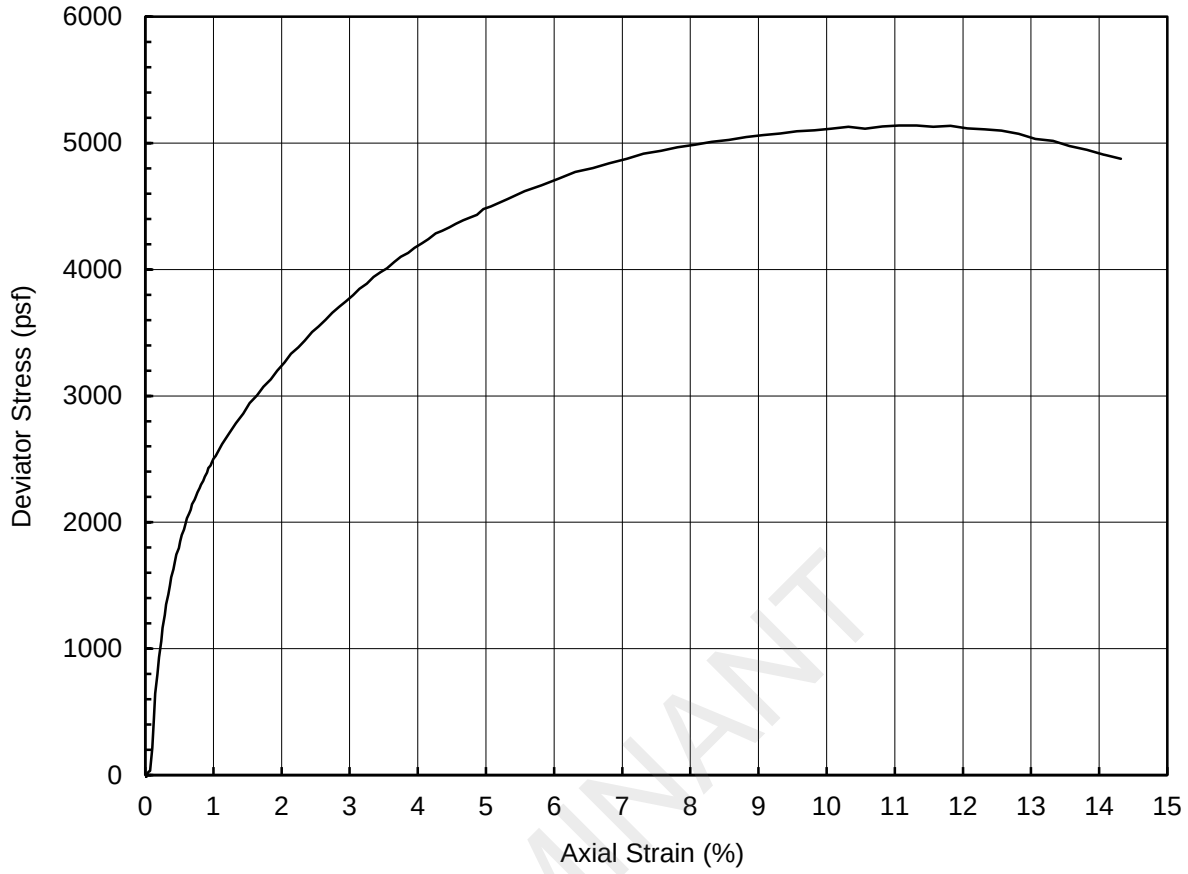
Failure Sketch

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

Golder Associates

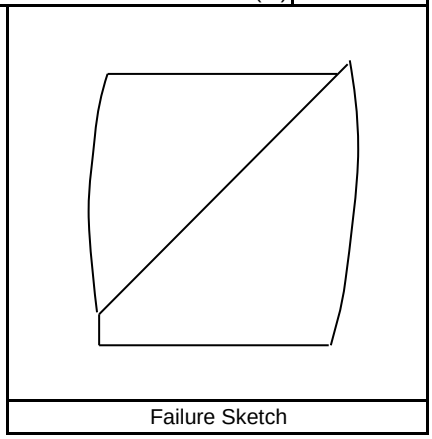
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



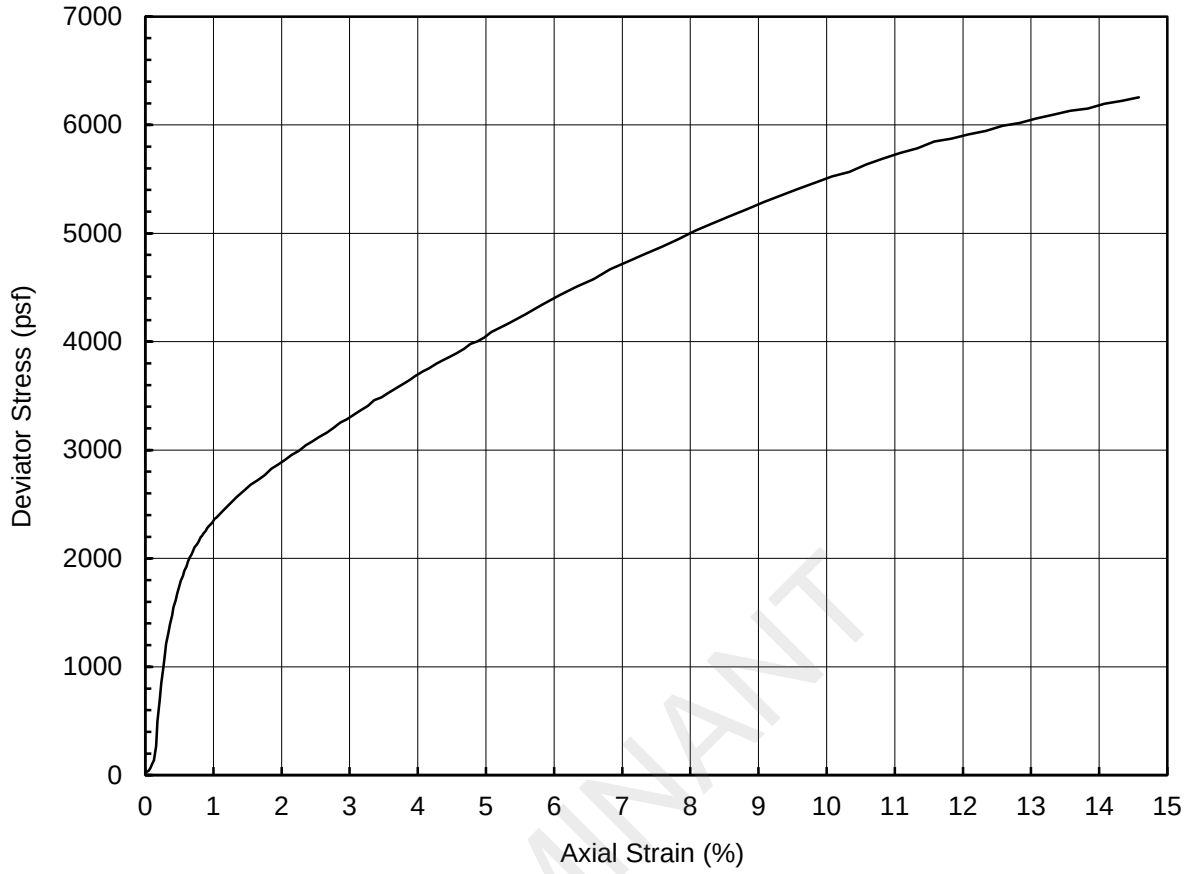
Failure Sketch

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**

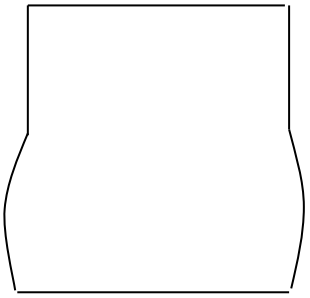
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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	

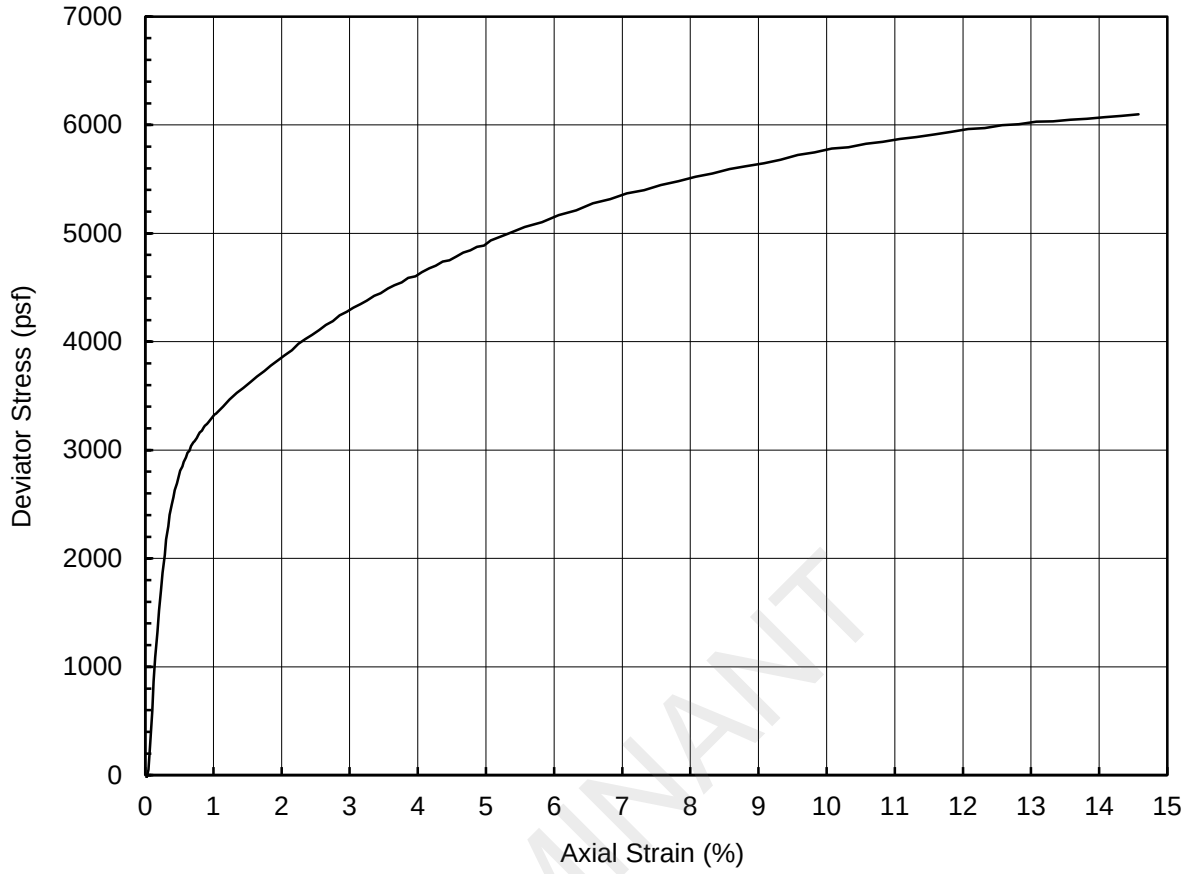


Failure Sketch

Golder Associates

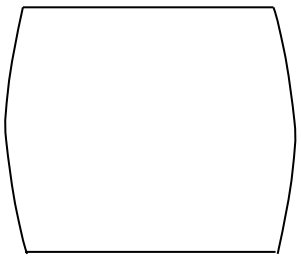
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



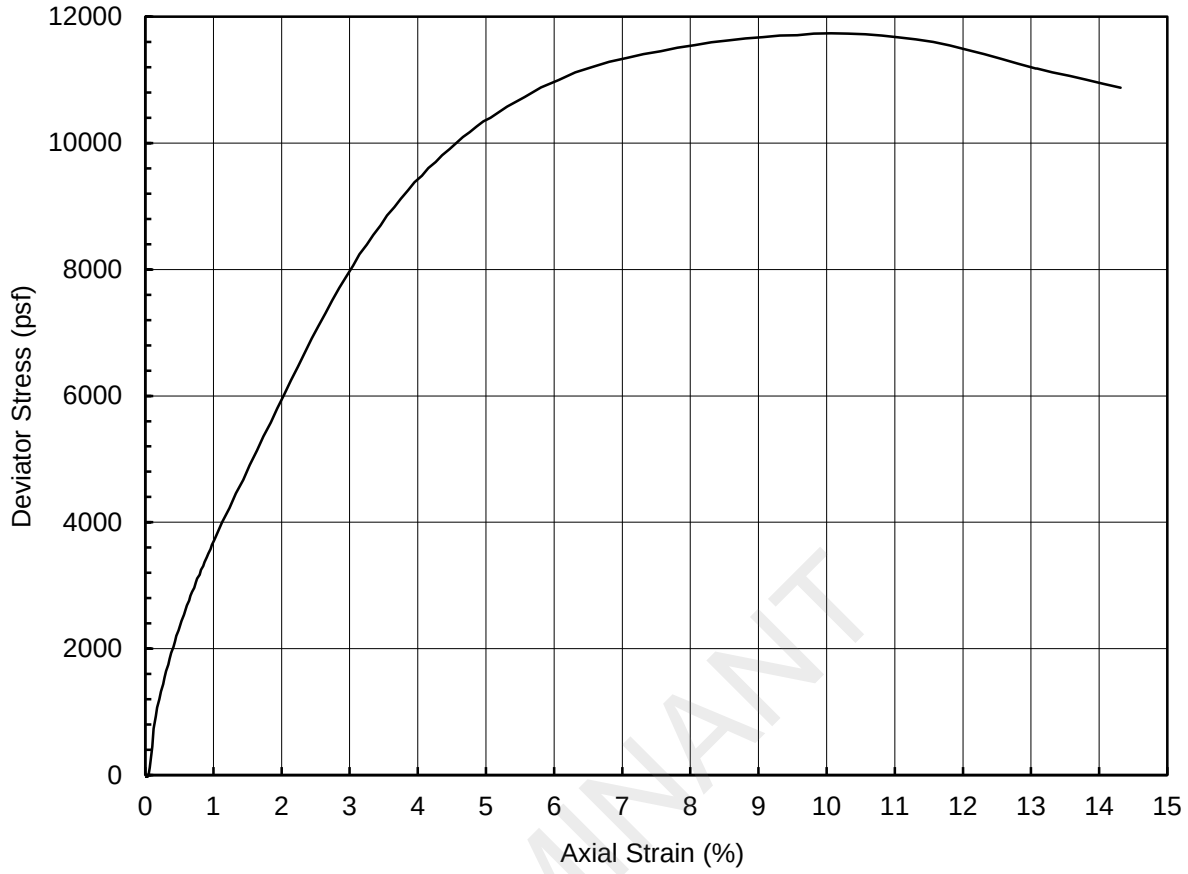
Failure Sketch

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

Golder Associates

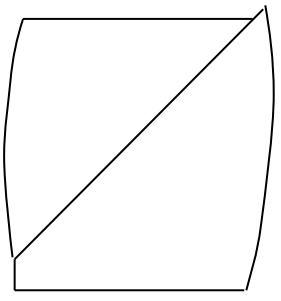
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

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		



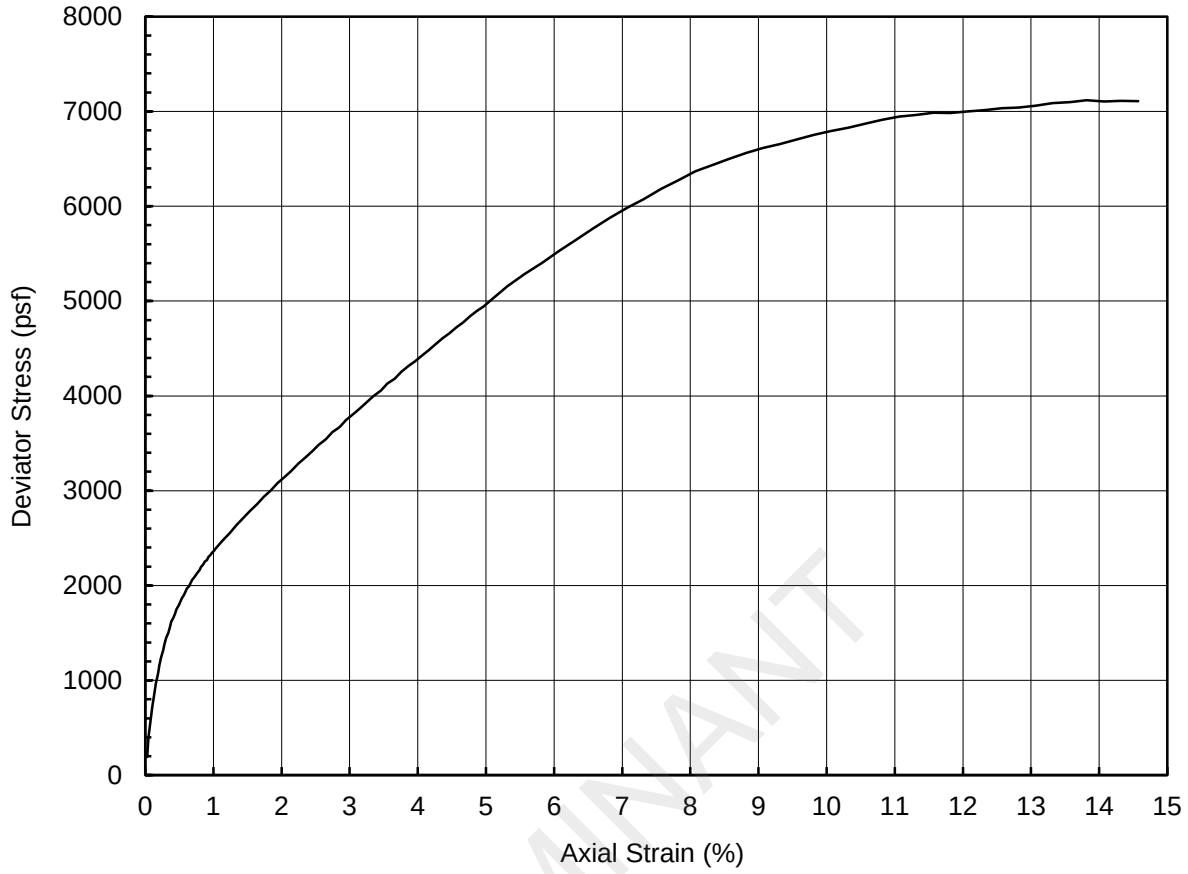
Failure Sketch

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

Golder Associates

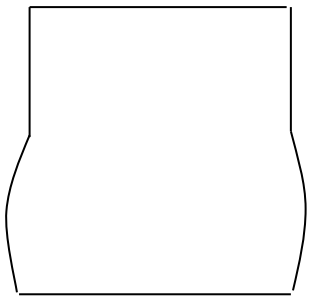
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

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		



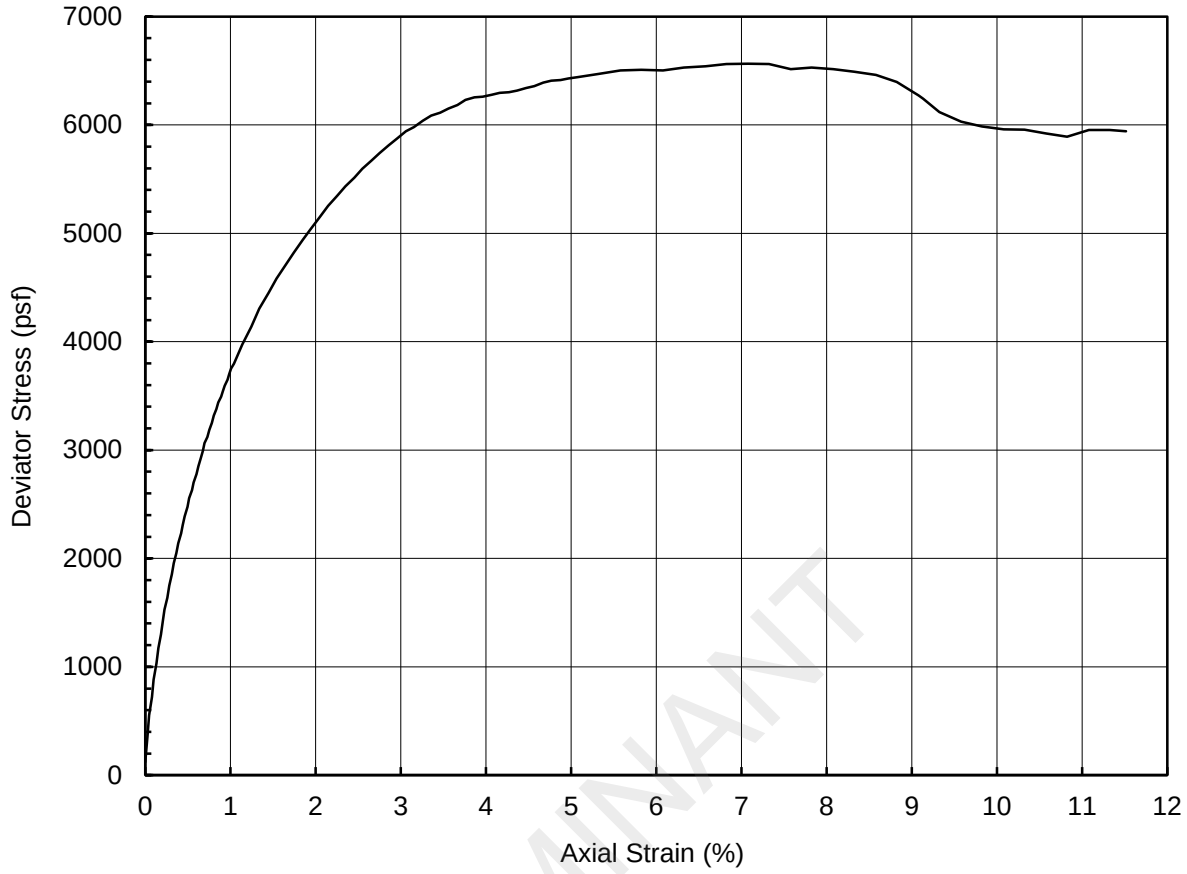
Failure Sketch

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**

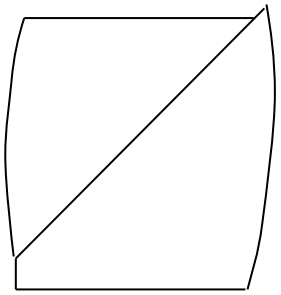
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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	

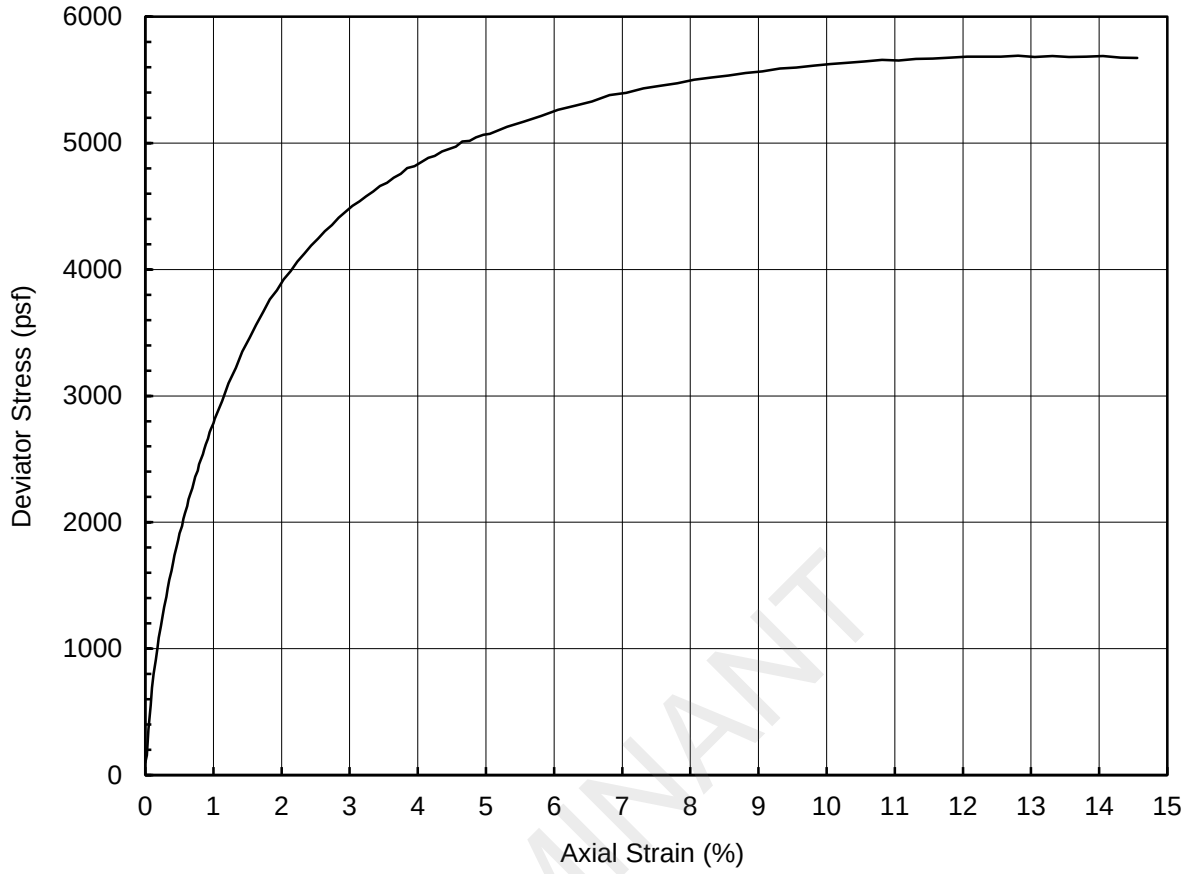


Failure Sketch

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

Golder Associates

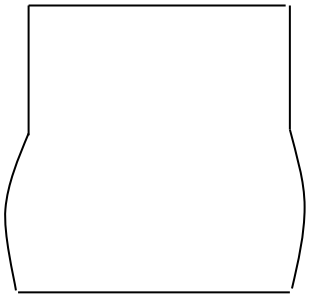
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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	

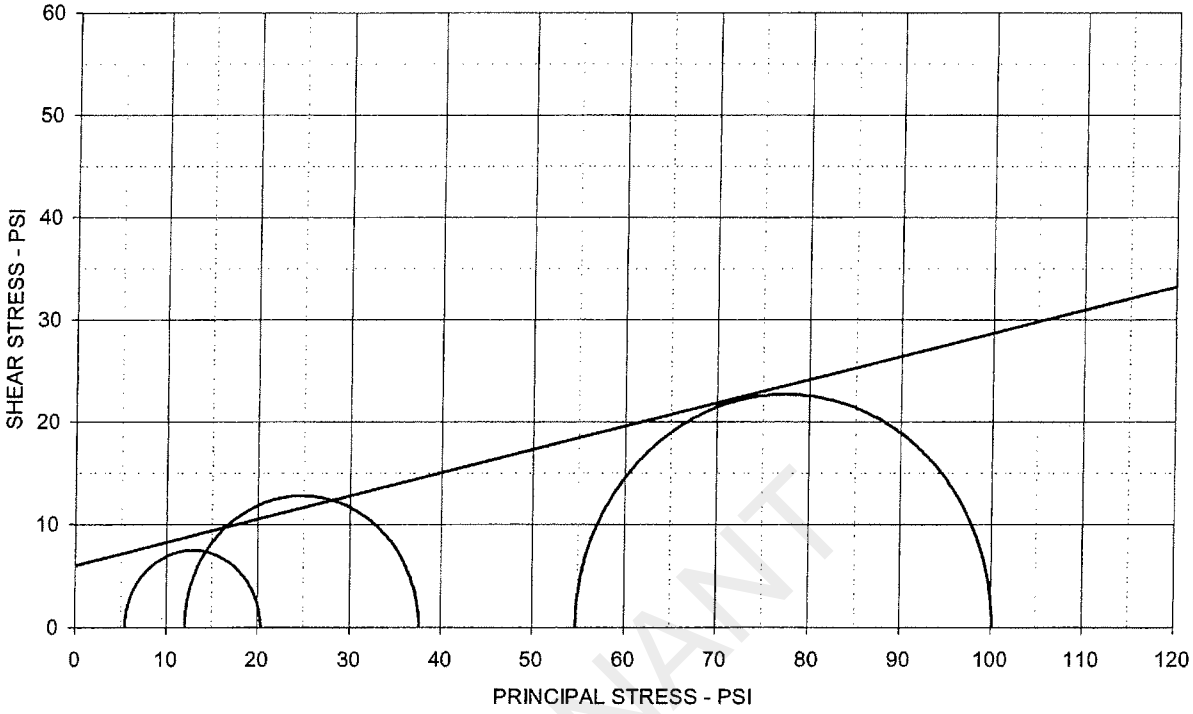
SPECIMEN NO. 3

	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

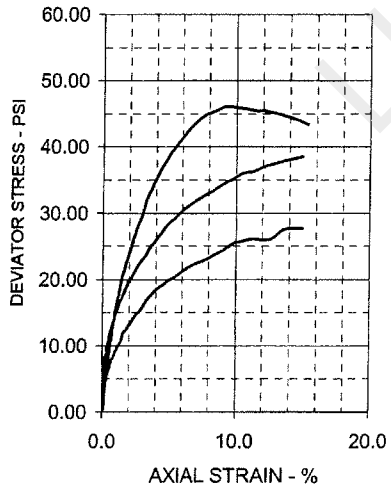
Change in Ht due to saturation :	-0.001	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.052	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.6	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.97		At test dry density:	pcf

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

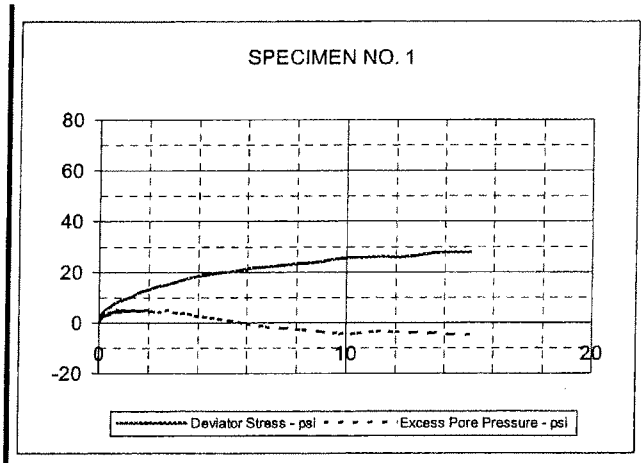
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-13, 3'-10' Fill

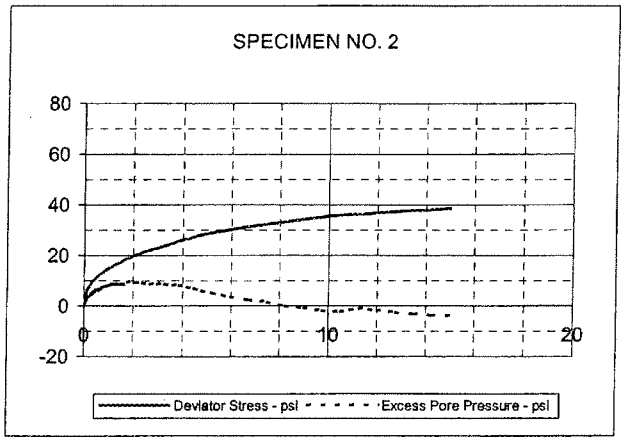
PROJECT INFORMATION

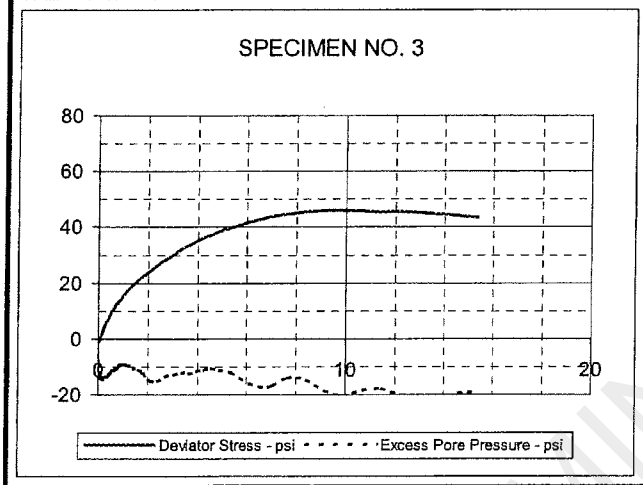
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

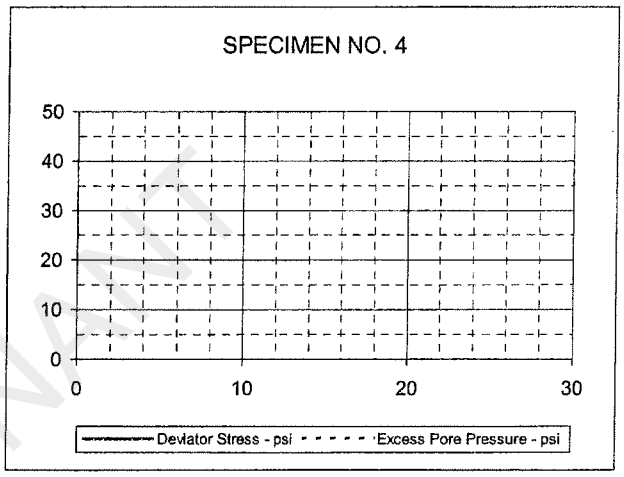
ETTL ENGINEERS & CONSULTANTS

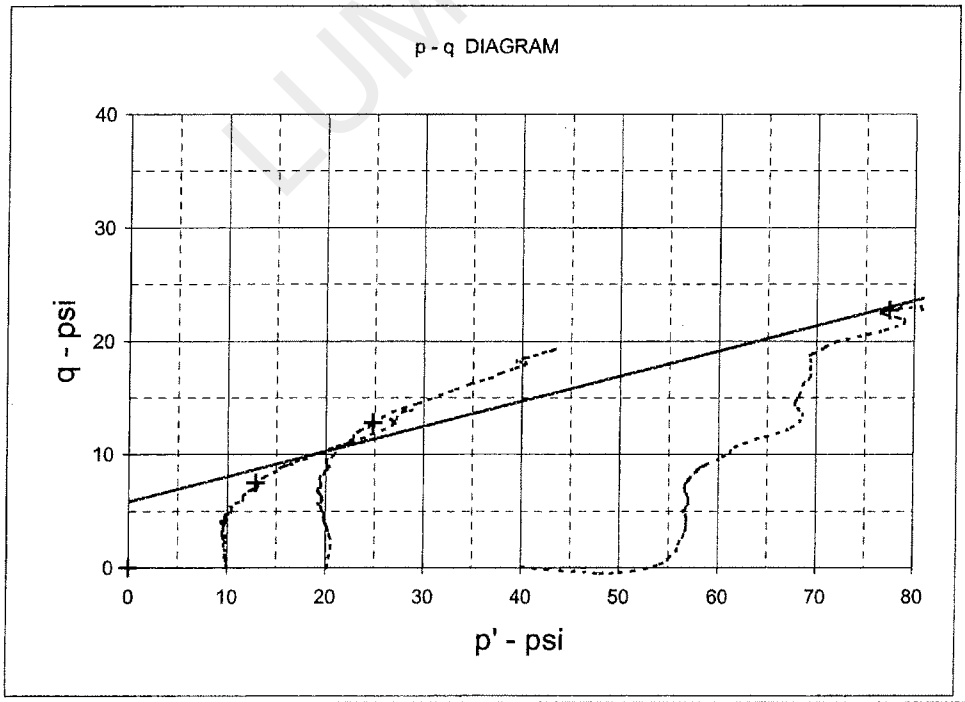
PLATE: B.1







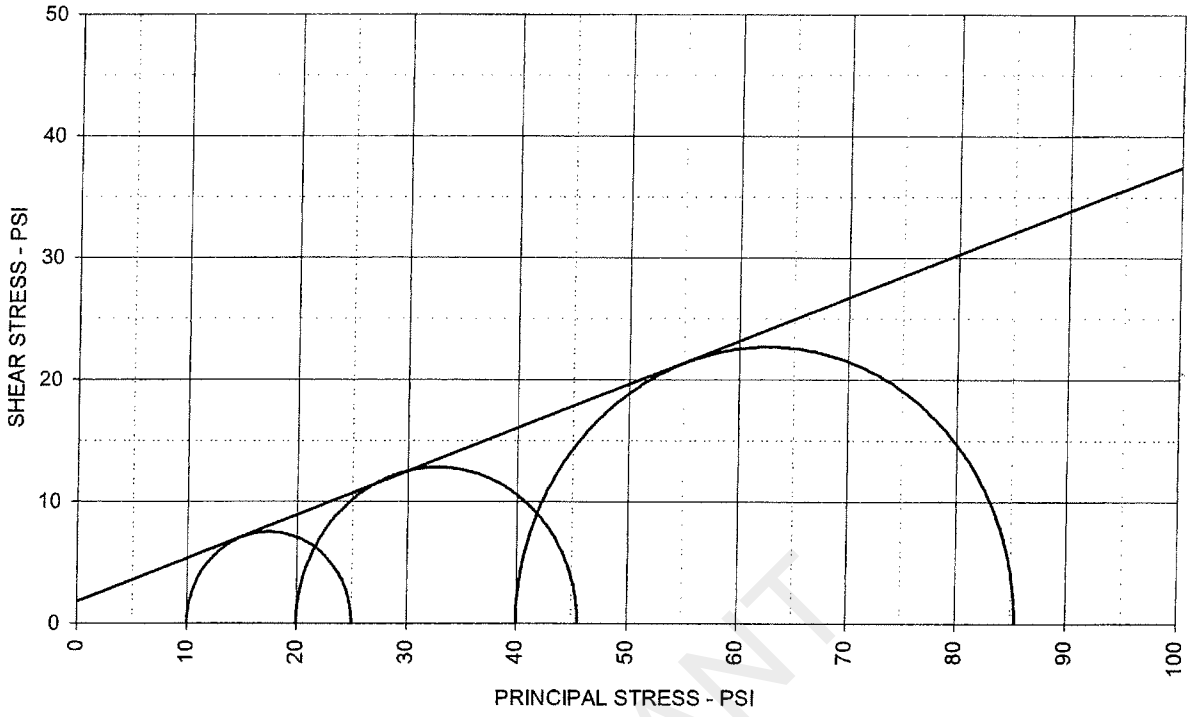




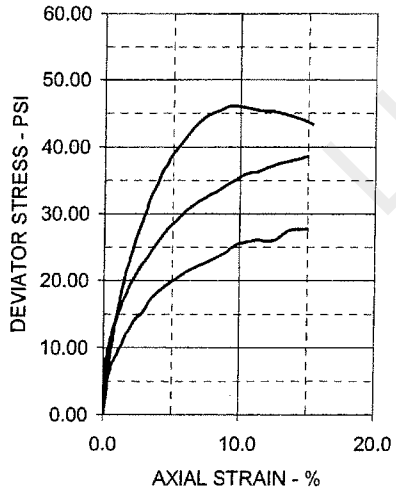
EFFECTIVE STRESS PARAMETERS	R^2 = 0.97	α (deg) = 12.5	a (psi) = 5.8
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay			

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	

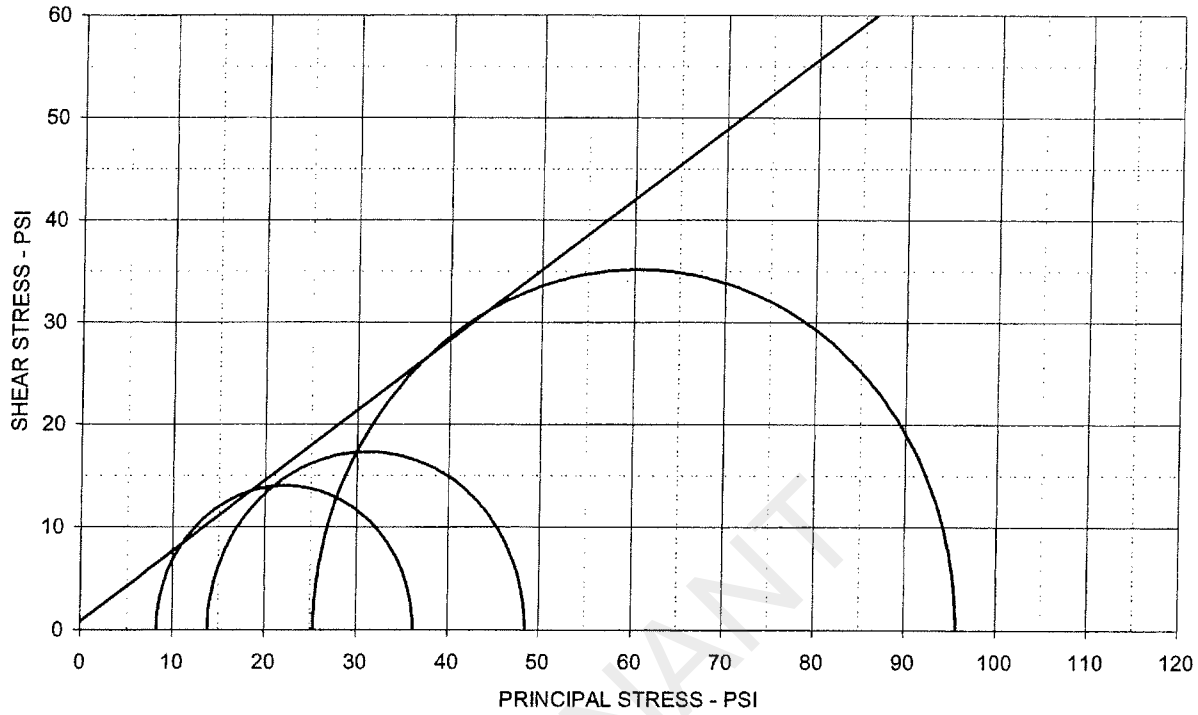
SPECIMEN NO. 3

	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

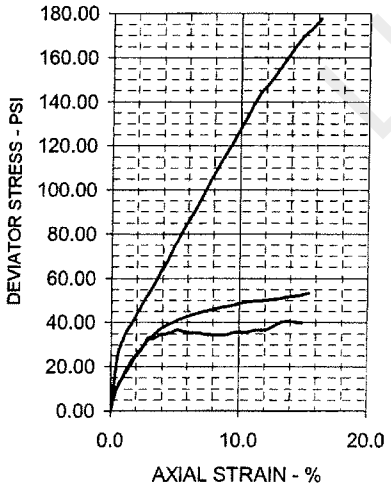
Change in Ht due to saturation :	-0.021	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.4	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.99		At test dry density:	pcf

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

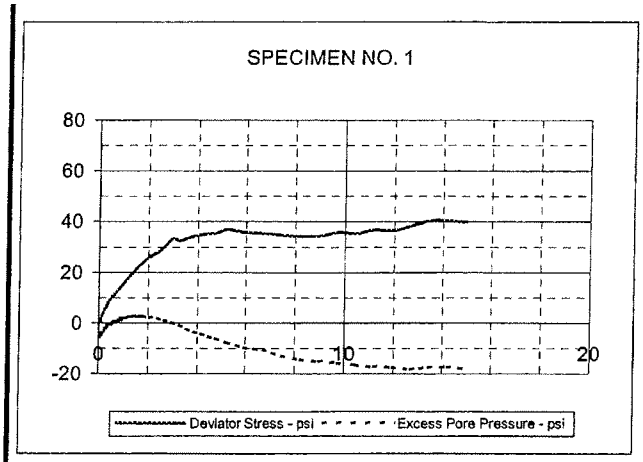
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-2, 8'-20' Native

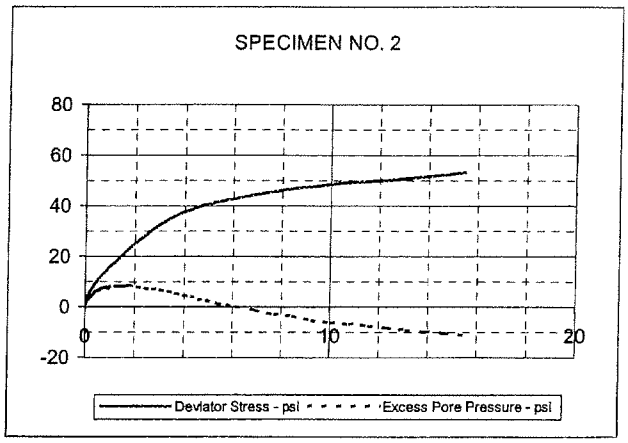
PROJECT INFORMATION

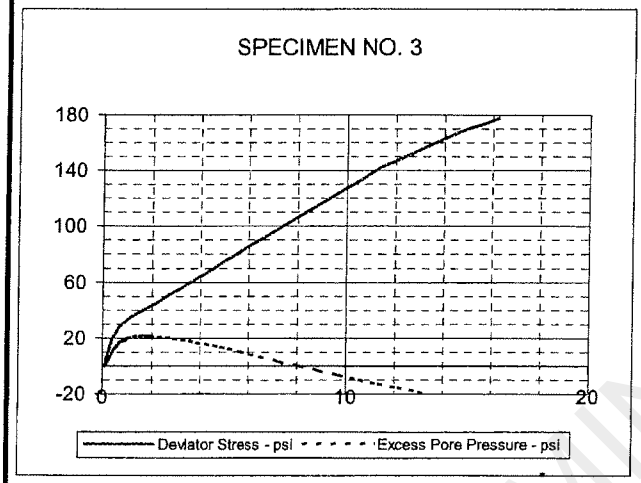
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

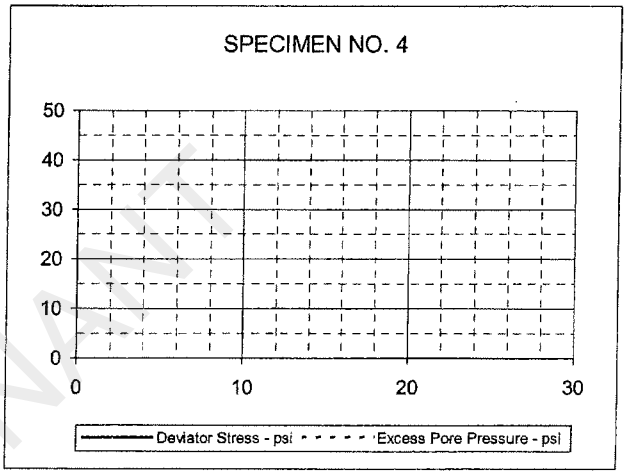
ETTL ENGINEERS & CONSULTANTS

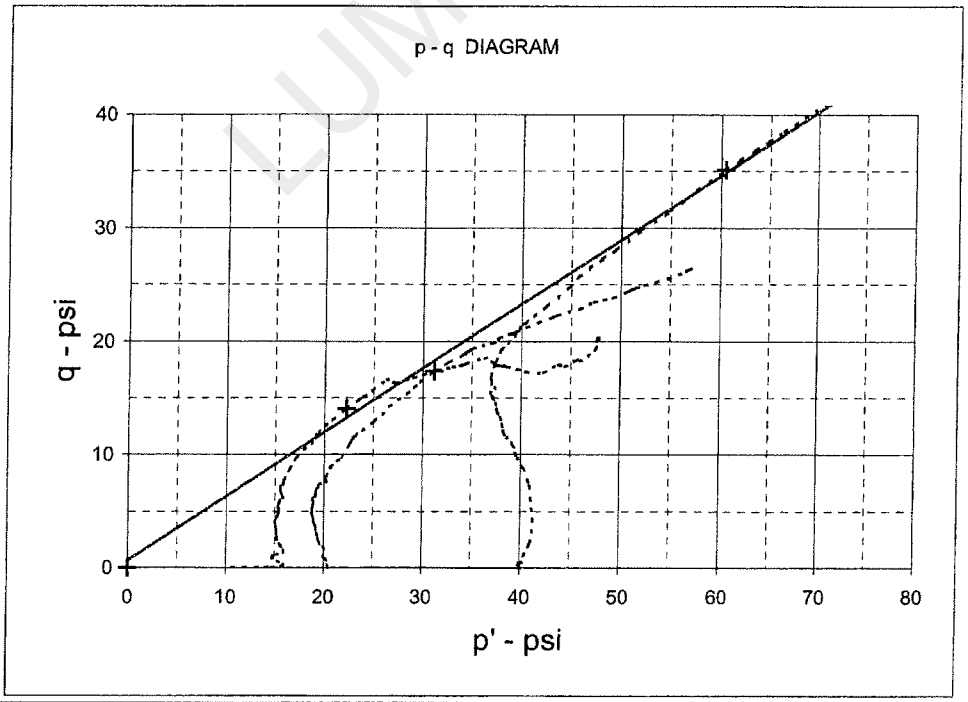
PLATE: B.1







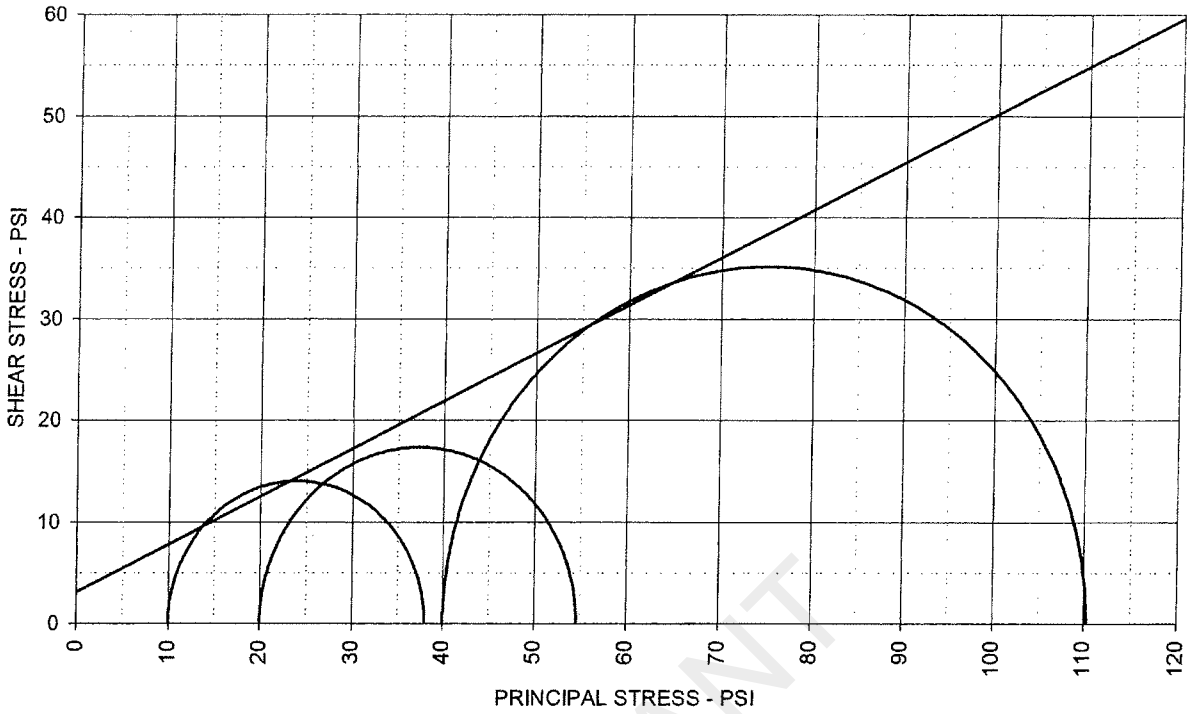




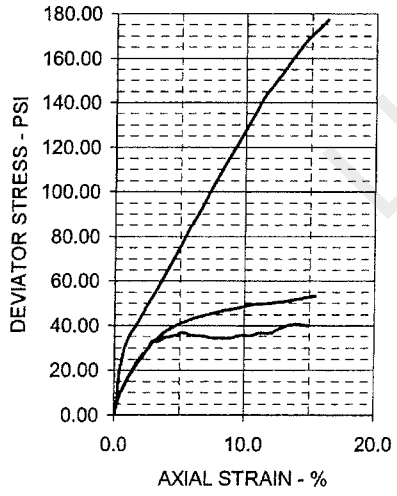
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 29.5	a (psi) = 0.7
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel			

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	

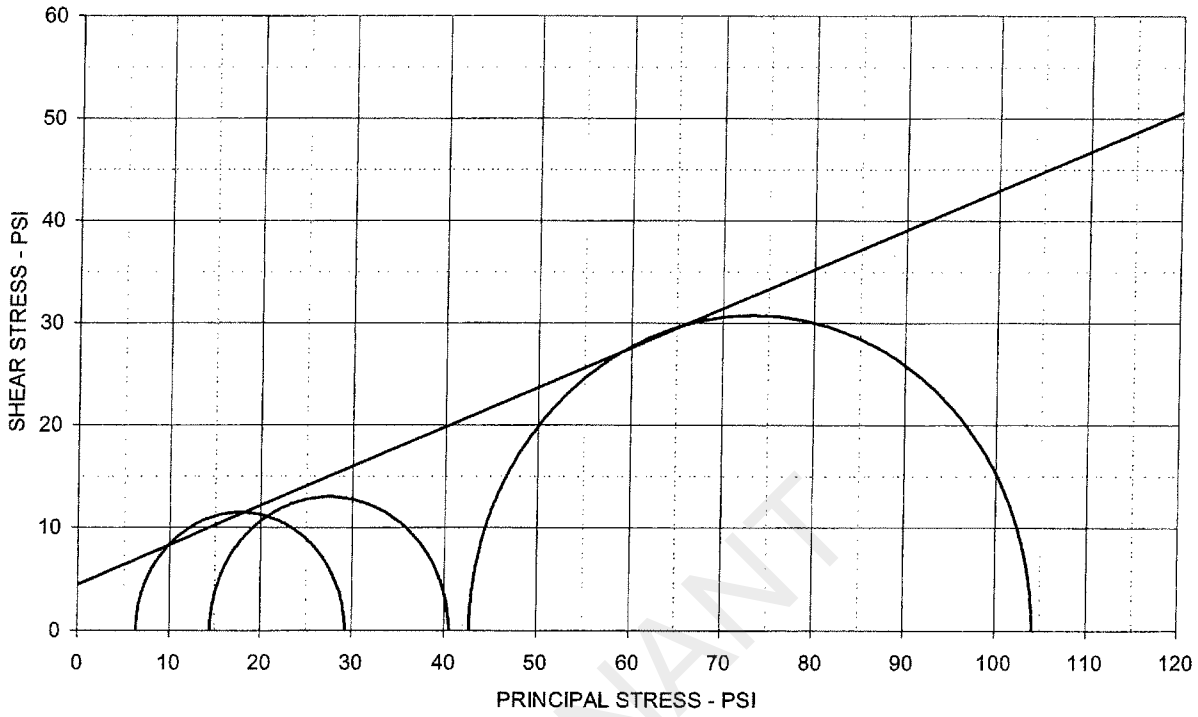
SPECIMEN NO. 3

	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

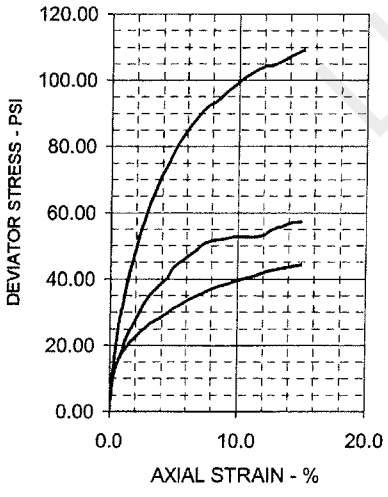
Change in Ht due to saturation :	-0.017	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.039	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	4.6	cc	Initial dry density :	pcf
Saturation Parameter " B " = 0.97			At test dry density:	pcf

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

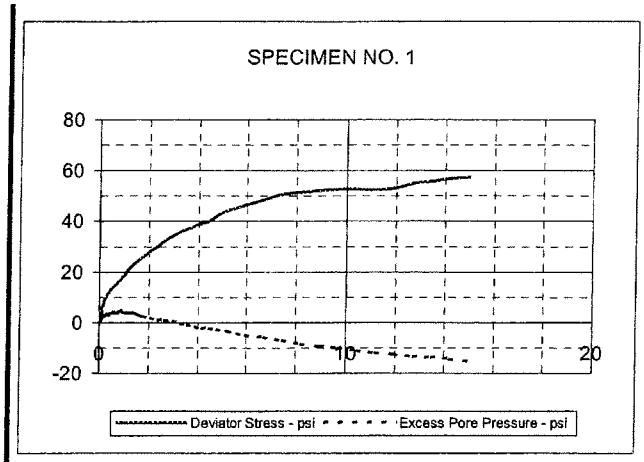
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-1, 3'-10' Fill

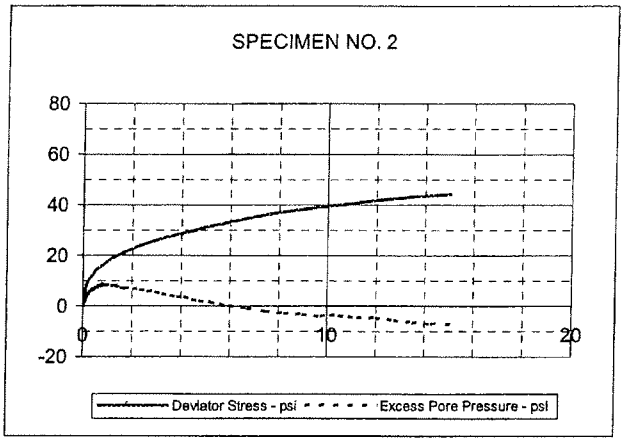
PROJECT INFORMATION

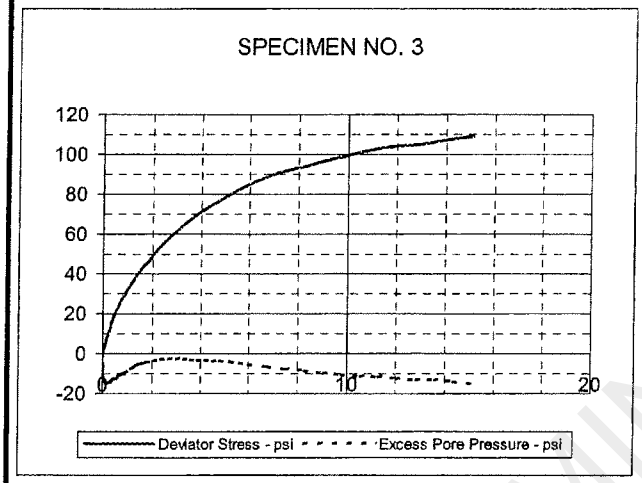
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

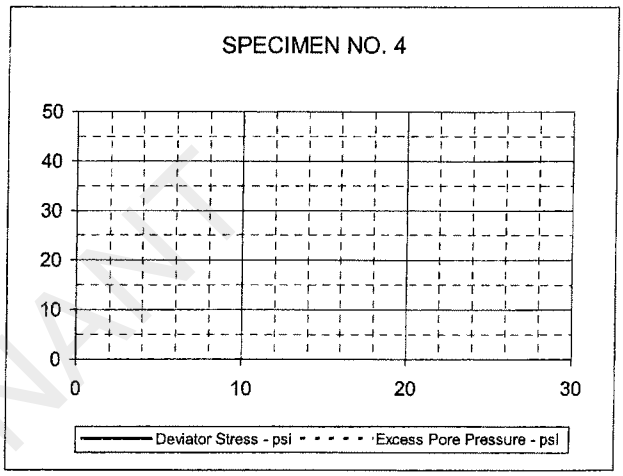
ETTL ENGINEERS & CONSULTANTS

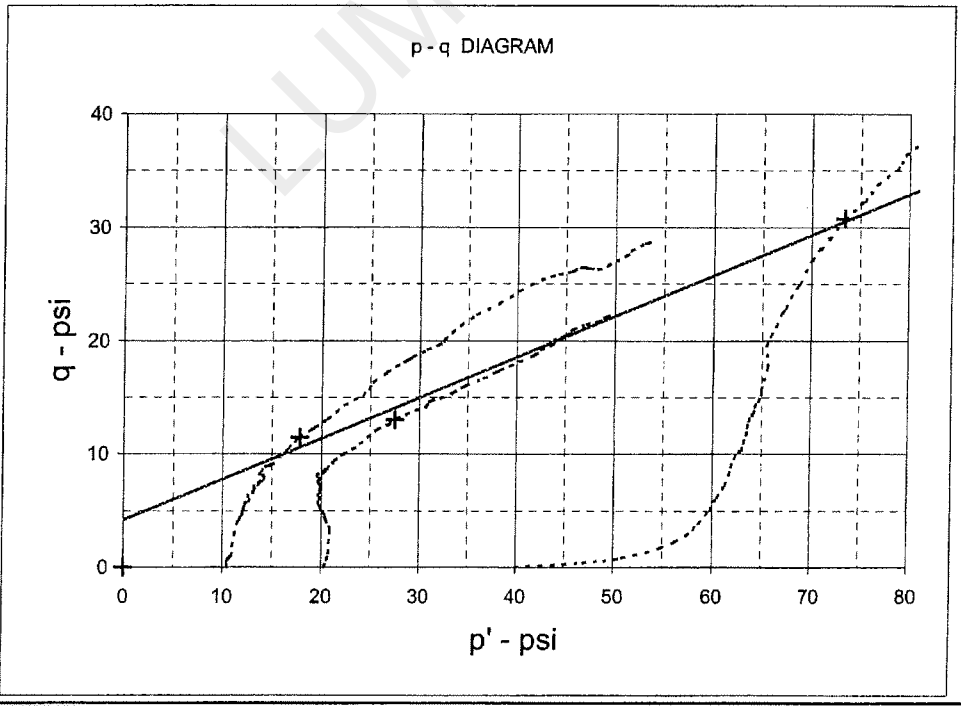
PLATE: B.1







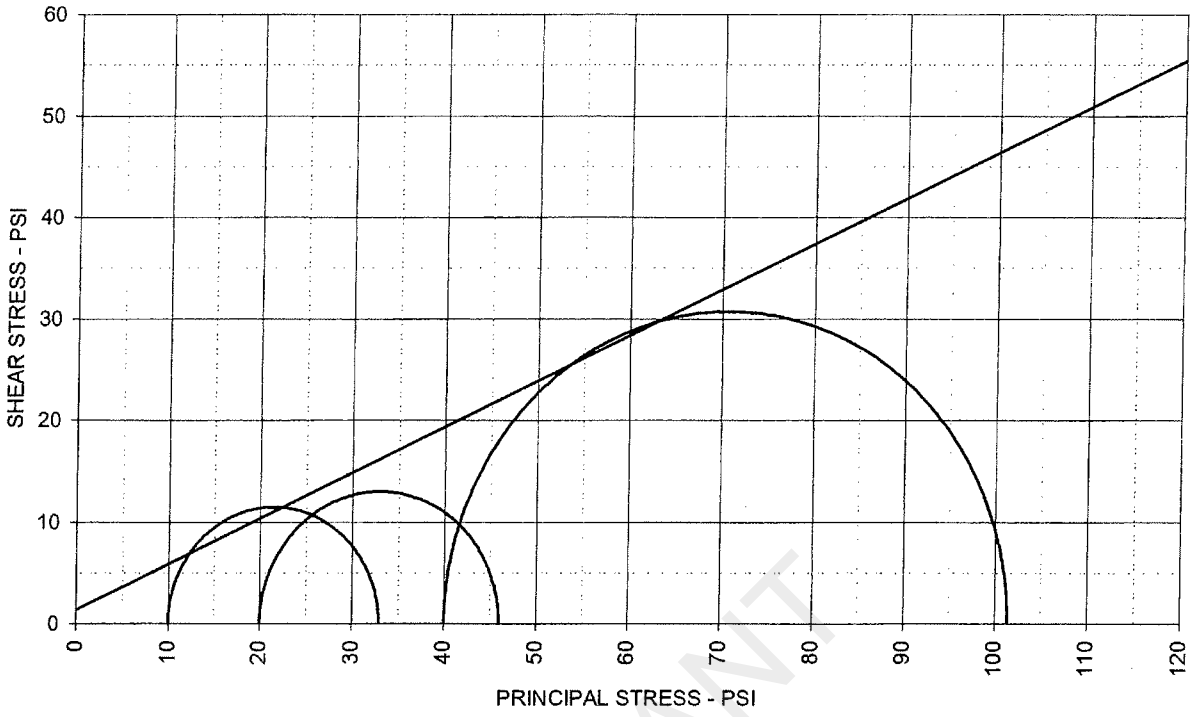




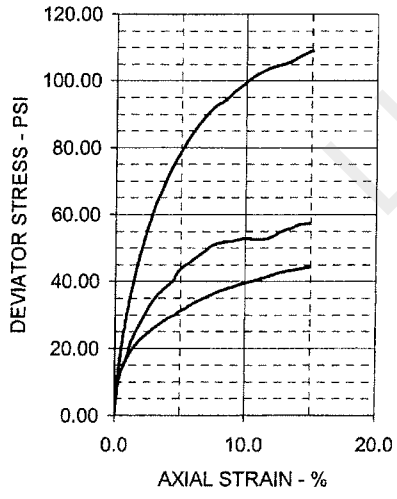
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 19.7	a (psi) = 4.2
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots			

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

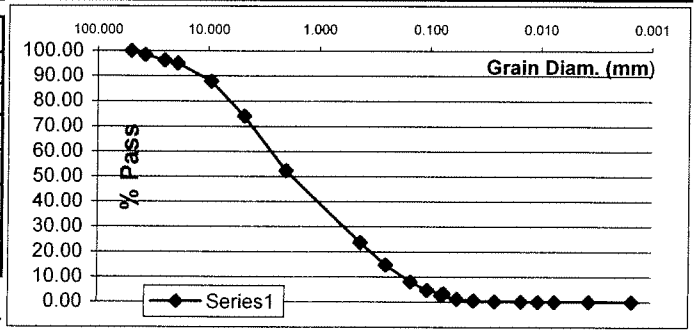
	Mc Hydrom
Tare Wt	29.89
Wet Wt.	68.94
Dry Wt	68.90
MC	0.1025%

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

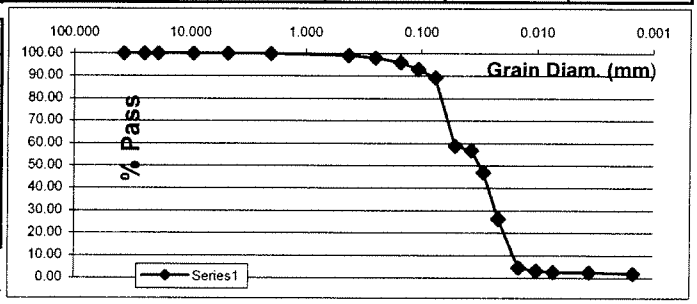
	Mc Hydrom
Tare Wt	29.50
Wet Wt.	62.41
Dry Wt	62.32
MC	0.2742%

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

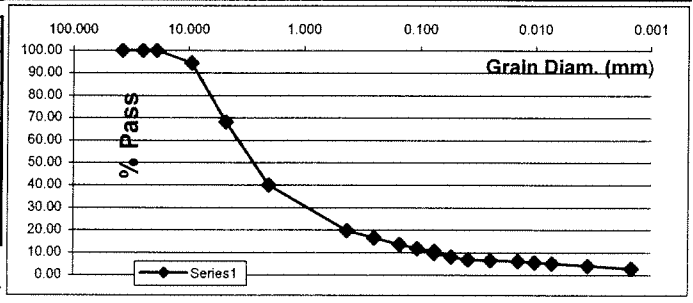
Mc Hydrom	
Tare Wt	30.03
Wet Wt.	45.86
Dry Wt	45.80
MC	0.3805%

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

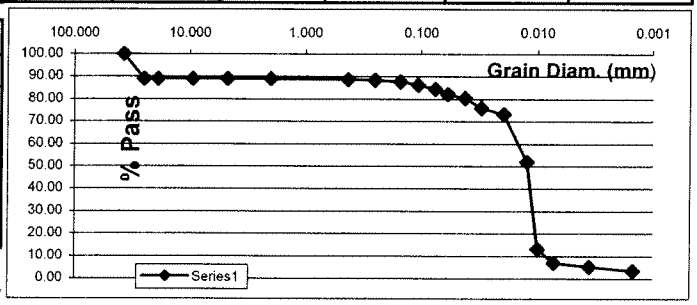
	Mc Hydrom
Tare Wt	29.86
Wet Wt.	51.33
Dry Wt	51.25
MC	0.3740%

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

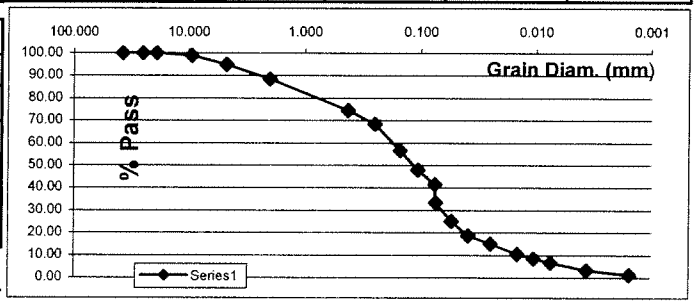
	Mc Hydrom
Tare Wt	29.43
Wet Wt.	65.41
Dry Wt	65.07
MC	0.9540%

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

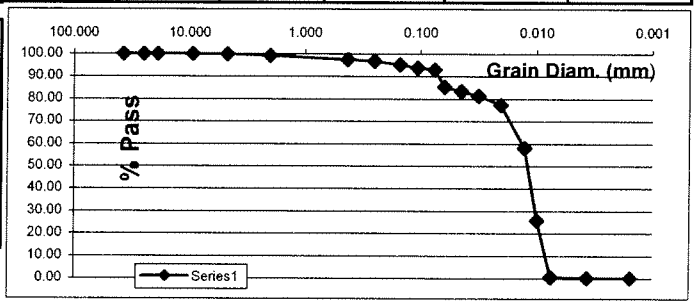
	Mc Hydrom
Tare Wt	29.91
Wet Wt.	55.02
Dry Wt	54.60
MC	1.7011%

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

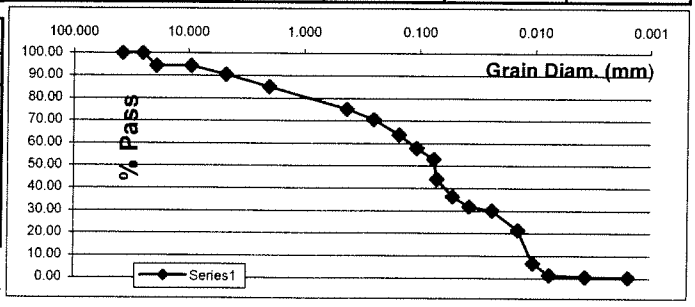
	Mc Hydrom
Tare Wt	29.29
Wet Wt.	59.40
Dry Wt	58.97
MC	1.4488%

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

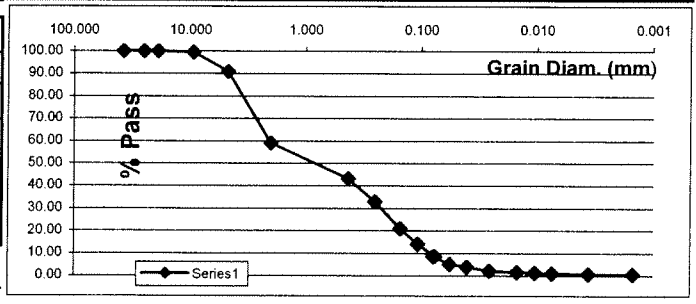
	Mc Hydrom
Tare Wt	30.27
Wet Wt.	62.43
Dry Wt	62.42
MC	0.0311%

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**

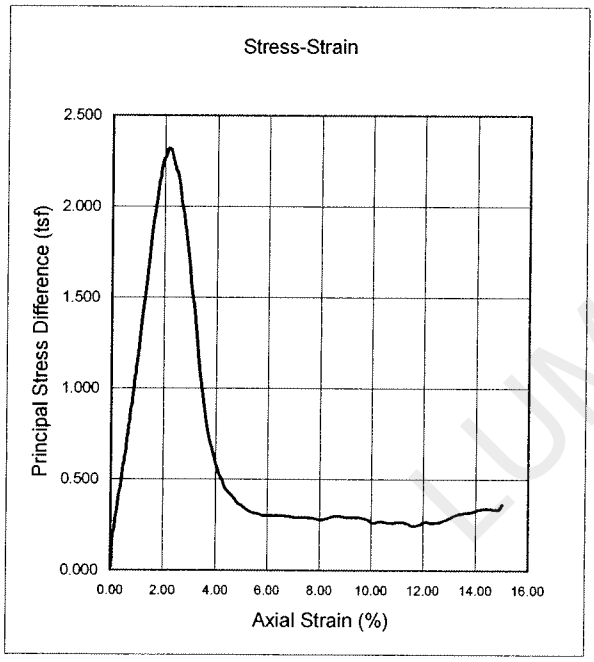
	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
2182.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	12.53	99.43
2182.22	No 4	200.01	90.83
	No 10	895.12	58.98



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

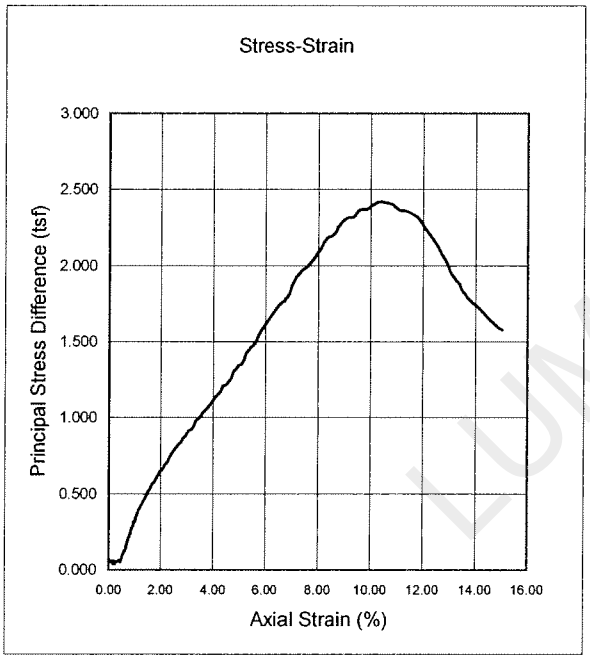
RQD Value: 100%

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	

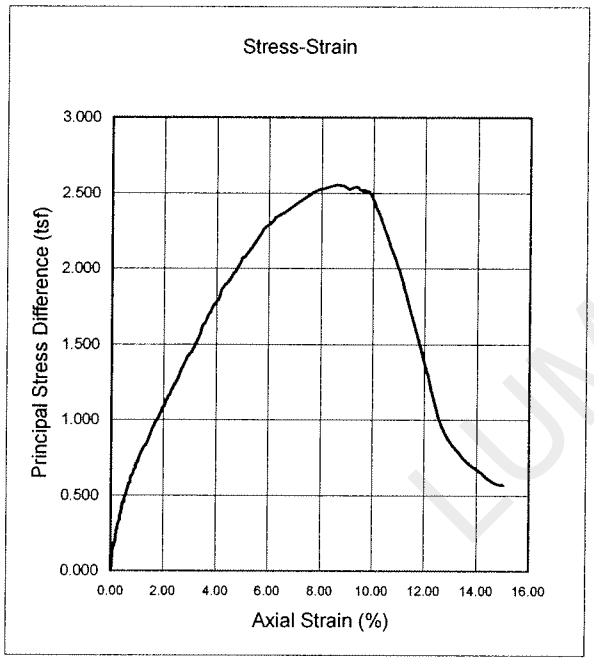
1/2 Stress (KSF)	2.416	Secant Modulus (KSF) @ 1/2 Peak Stress	61
Strain at 1/2 Stress (%)	3.94	RQD Value:	100%
Type of Specimen:	Native	Angle of Fracture in Degrees:	N/A

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%

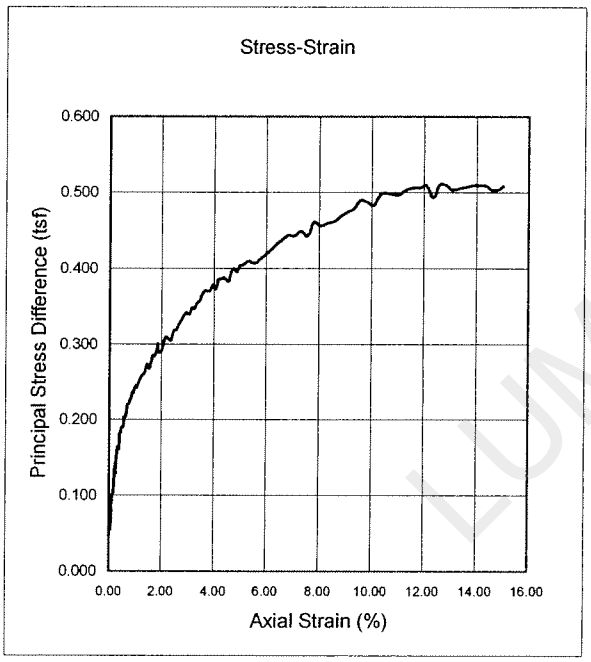
Angle of Break in Degrees: 60

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%

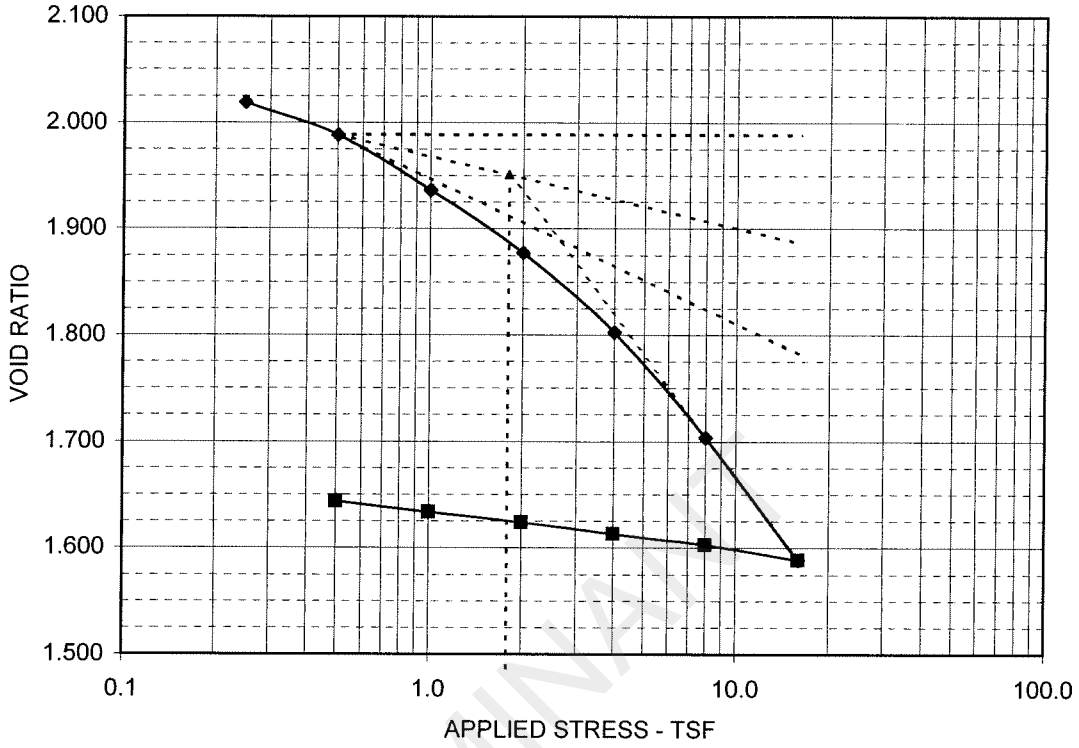
Angle of Break in Degrees: 53

Remarks: Not able to find a well defined fracture

Sketch of Fracture:

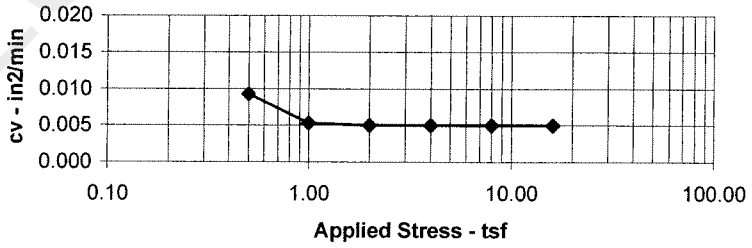
CONSOLIDATION TEST REPORT

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

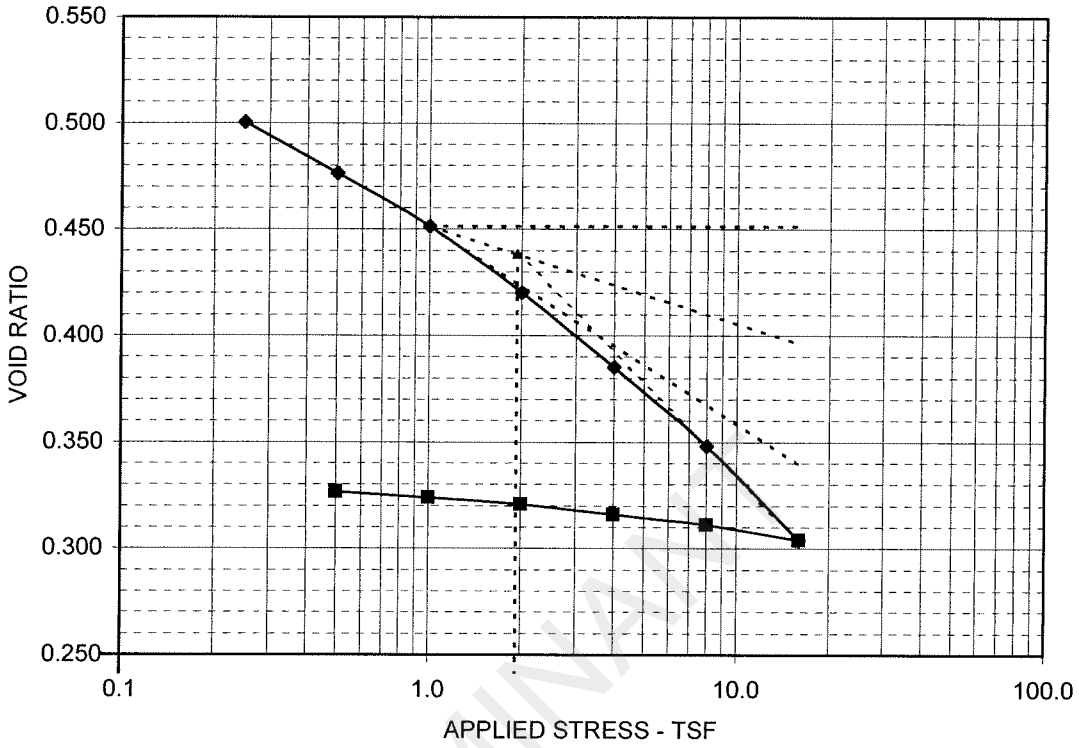


c_v values calculated by Sivaram and Swamee's Method

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		

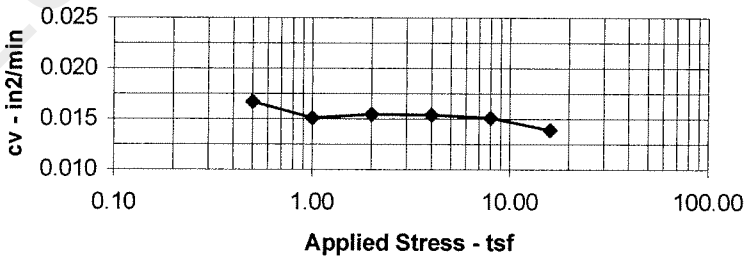
CONSOLIDATION TEST REPORT

ASTM D 2435



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

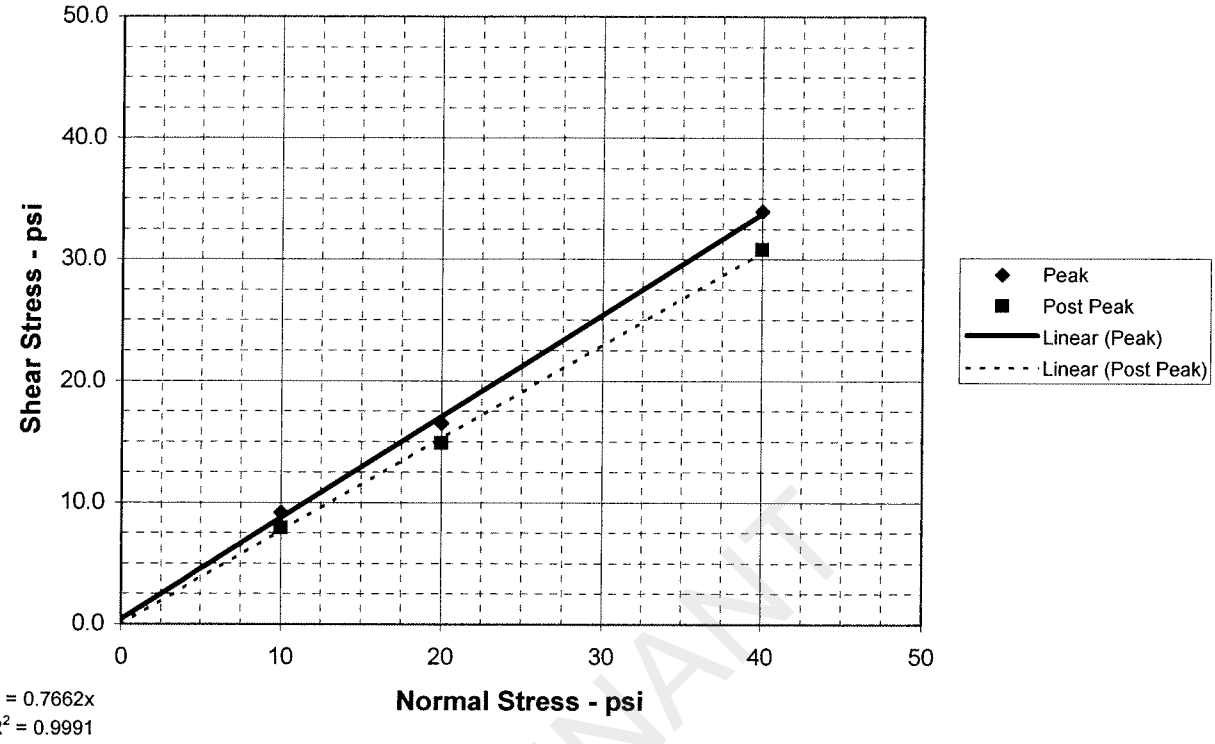
LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	1.67E-02	2.82E-06
1.00	1.51E-02	1.33E-06
2.00	1.55E-02	8.75E-07
4.00	1.54E-02	5.00E-07
8.00	1.51E-02	2.67E-07
16.00	1.39E-02	1.50E-07



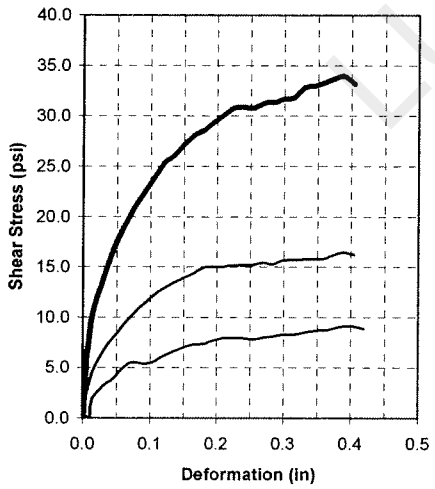
c_v values calculated by Sivaram and Swamee's Method

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

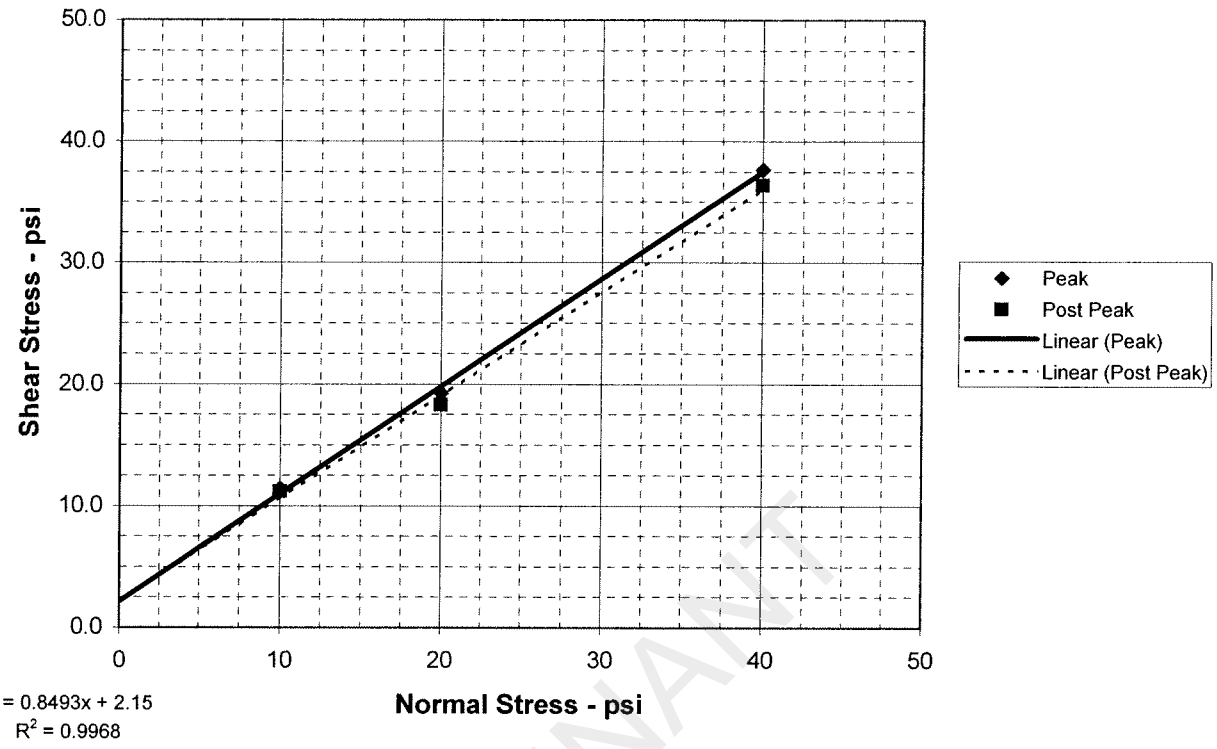
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Ash, black and gray
SAMPLE LOCATION: B-6, 3-5 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: 35 PL: 19 PI: 16 Percent -200: 61
REMARKS: Multi-Specimen

PROJECT INFORMATION

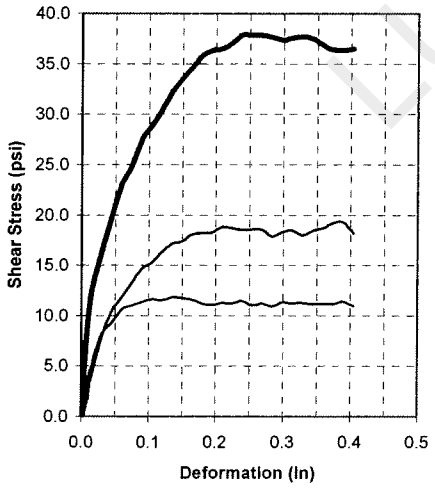
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:4/25/08

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

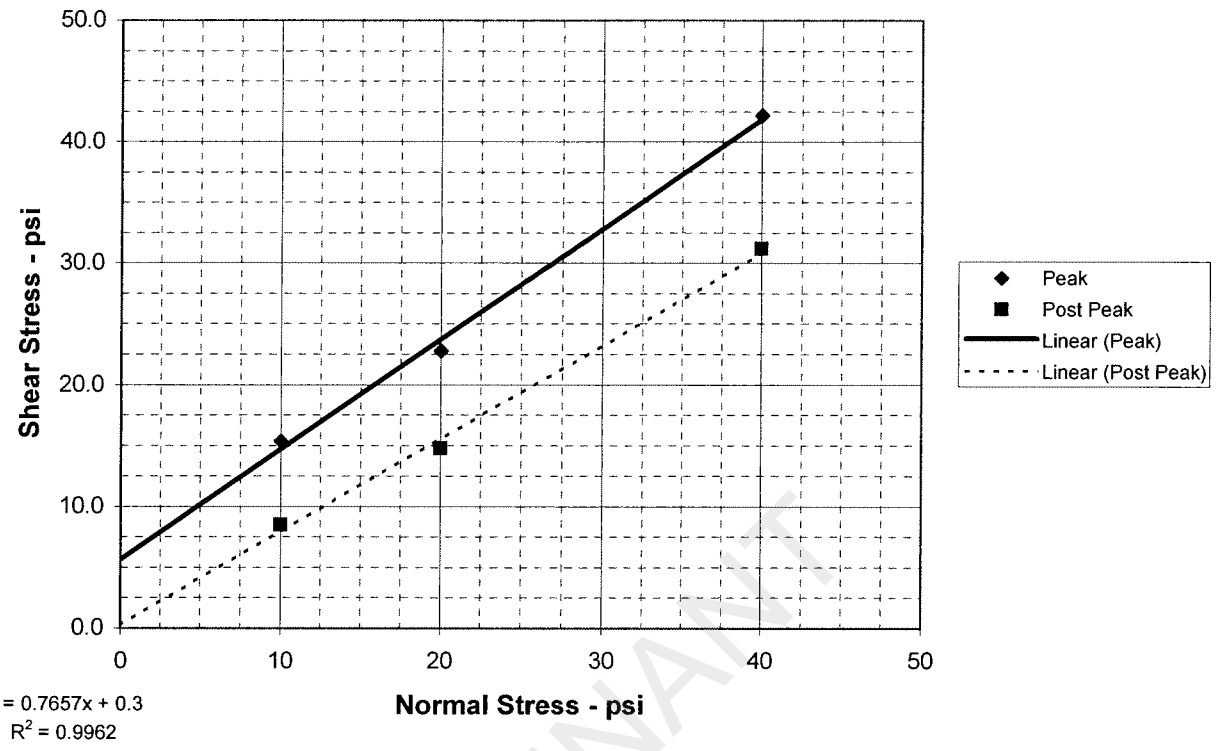
TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Ash, black and dark gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.56
LL: NP PL: NP PI: NP Percent -200: 3.33
REMARKS: Multi-Specimen

PROJECT INFORMATION

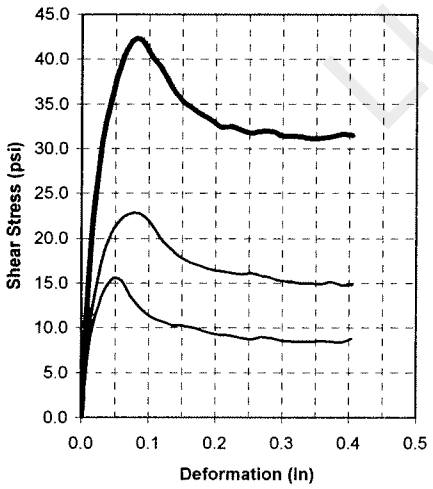
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/6/08

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

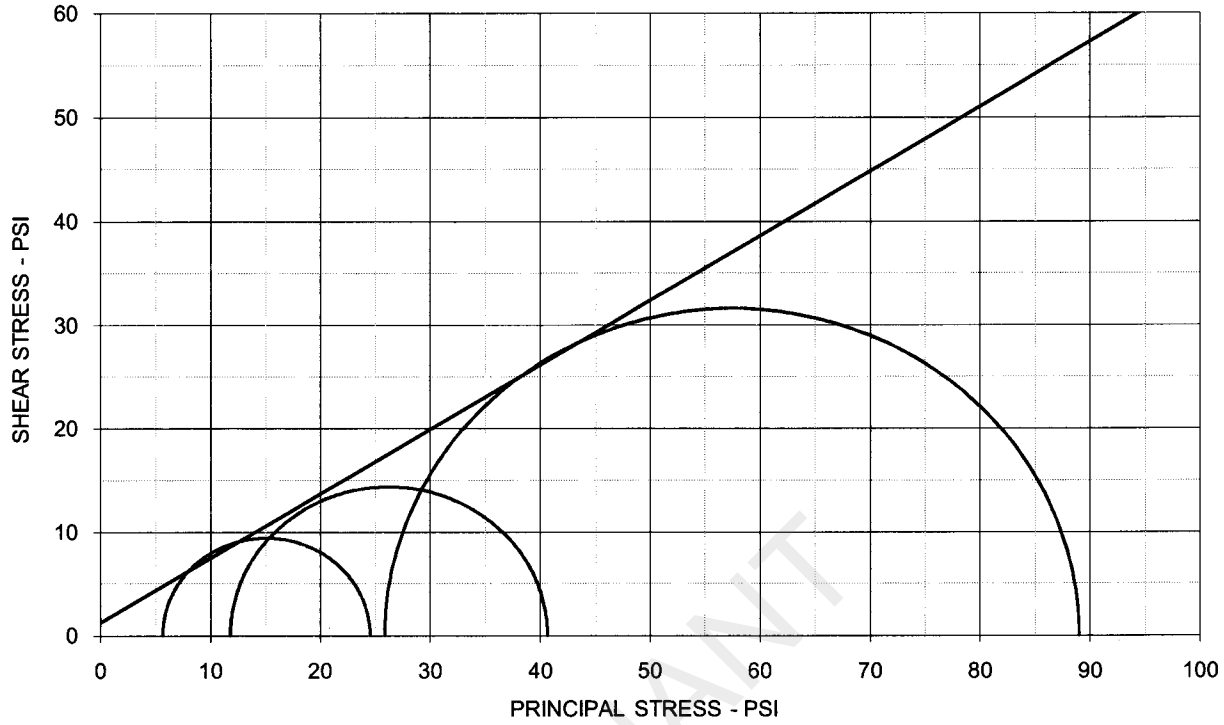
Number of Specimens = 3

PLATE: B.1

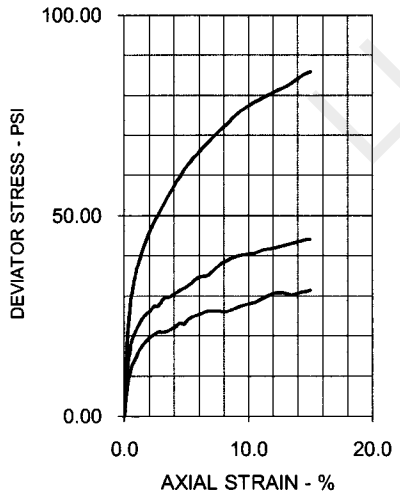
PLATE: B.2

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

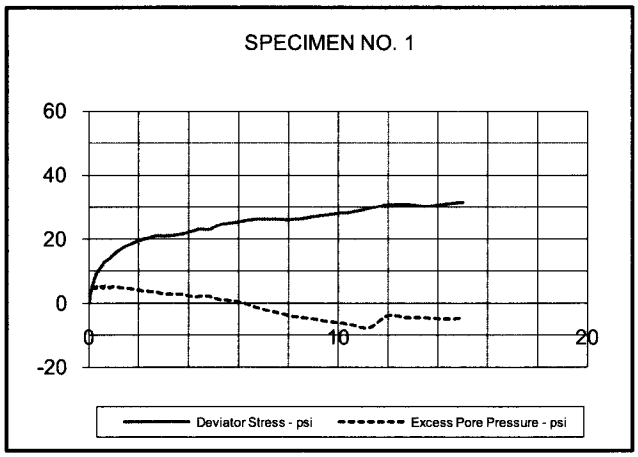
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan w/ Red & Gray Clayey Sand
Sampled on Site, B-16 8' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
~~G 3219-09, B-16 8'-10' Native~~

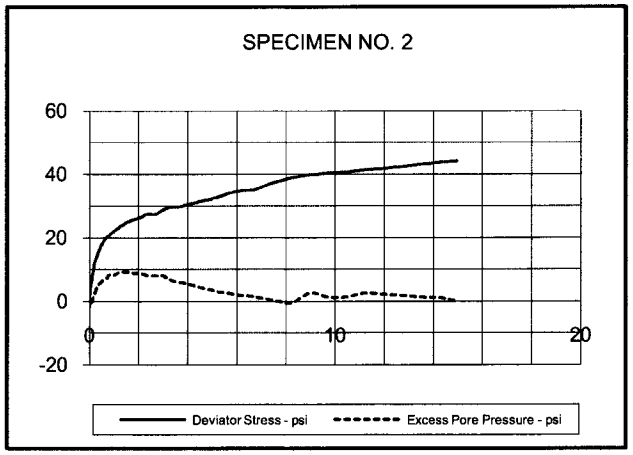
PROJECT INFORMATION

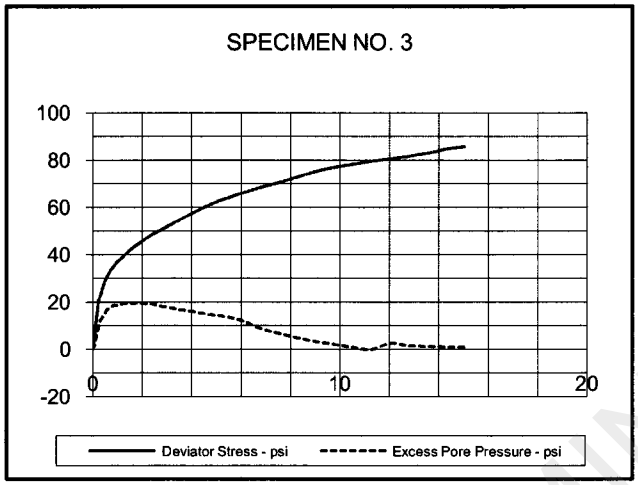
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

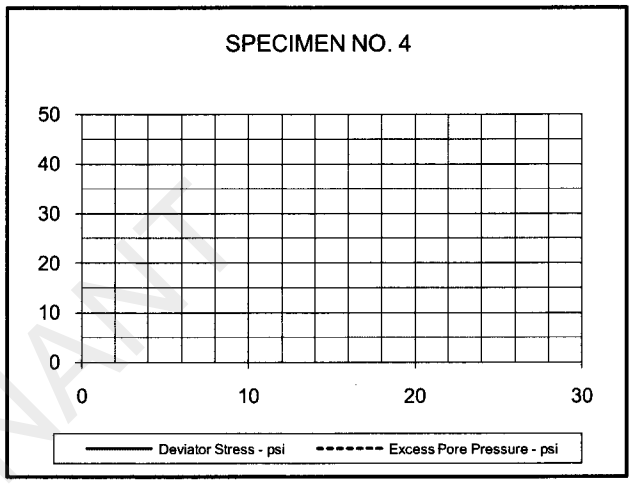
ETTL ENGINEERS & CONSULTANTS

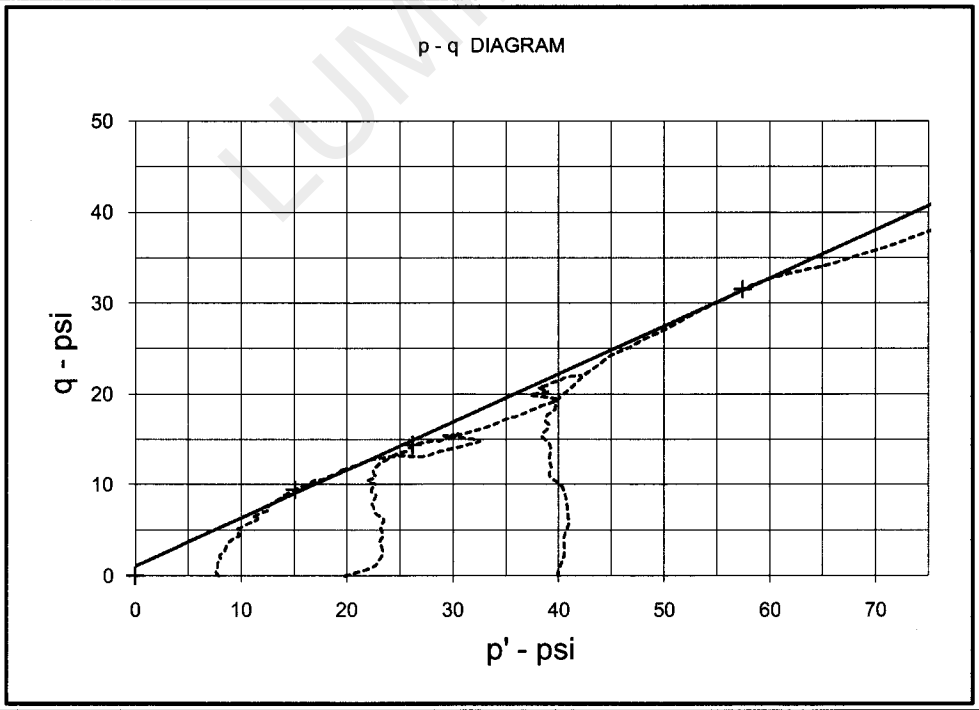
PLATE: B.1







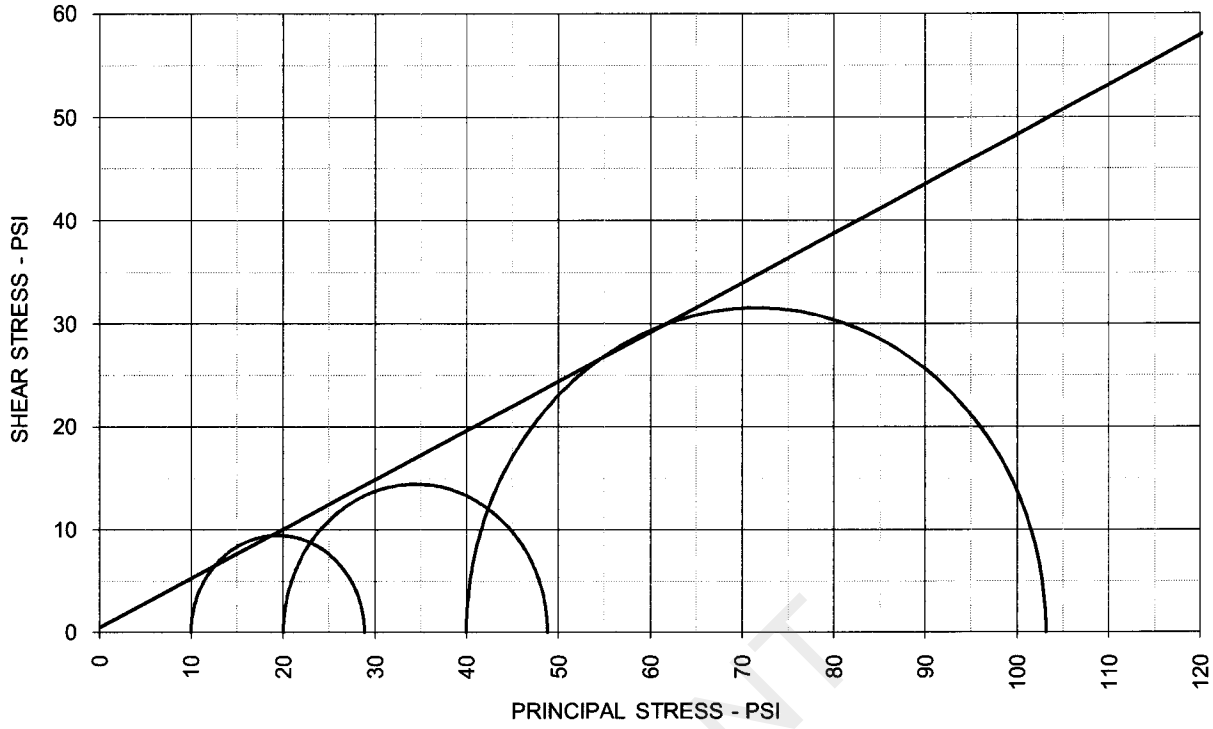




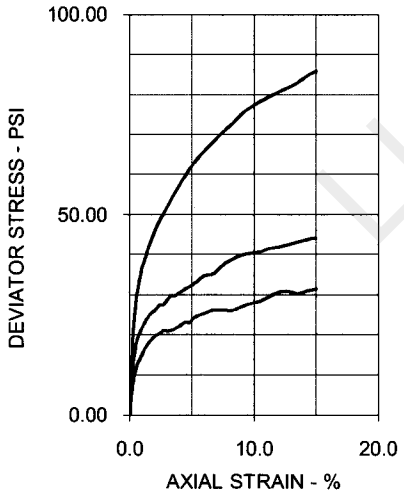
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.9	a (psi) = 1.1
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan w/ Red & Gray Clayey Sand			

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

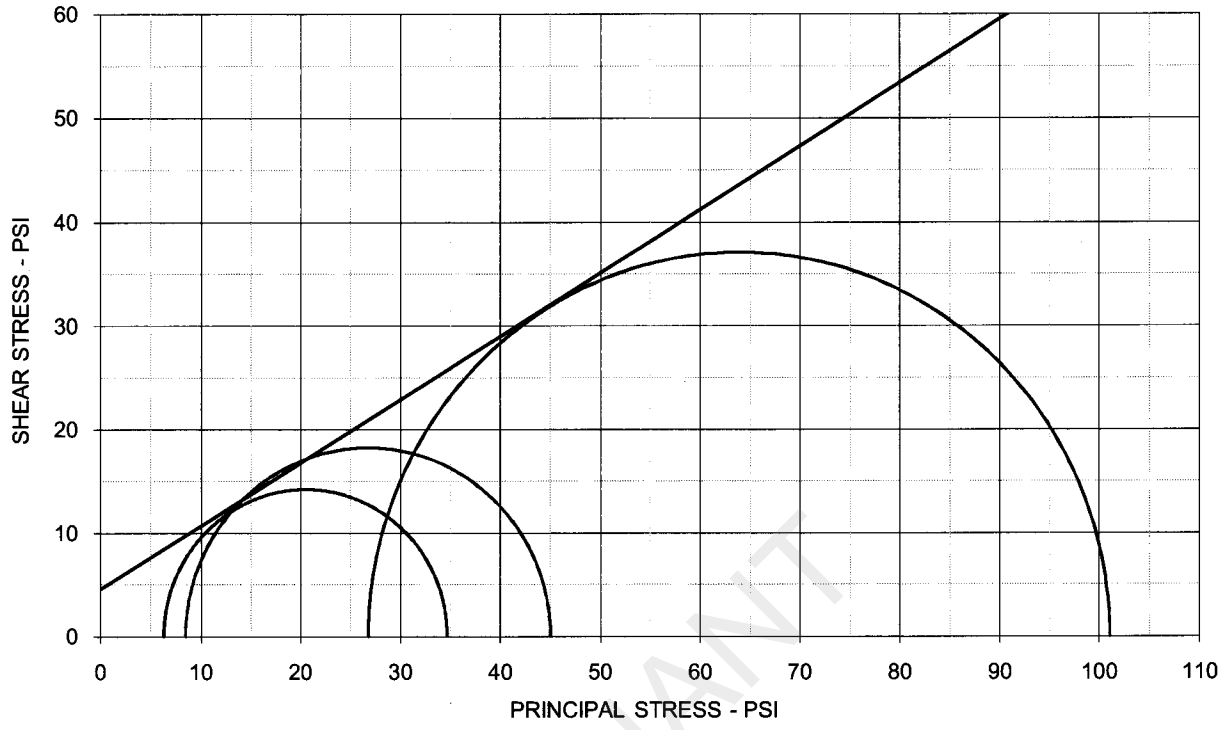
PLATE: B.1

PLATE: B.2

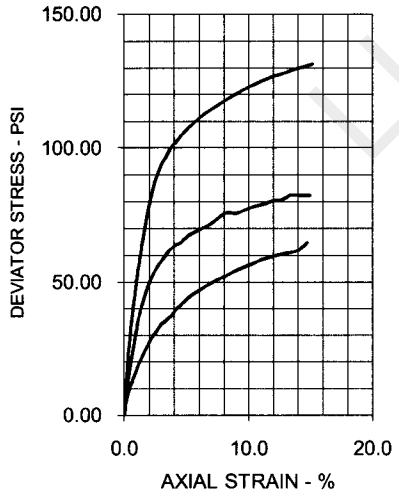
PLATE: B.3

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

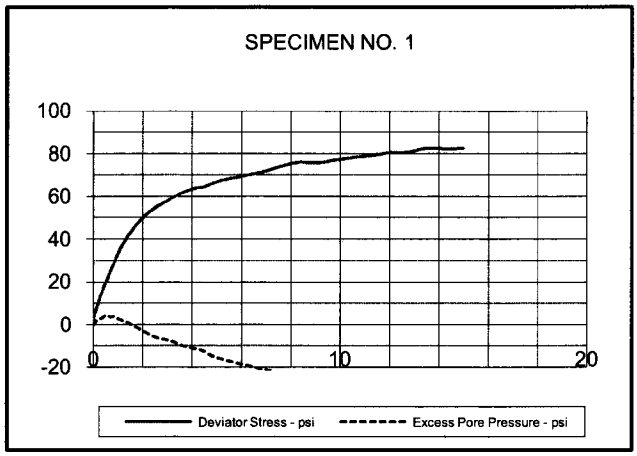
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan & Red Sandy Lean Clay
Sampled on Site, B-17 3' to 7' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
G 3219-09, B-17 3'-7' Native

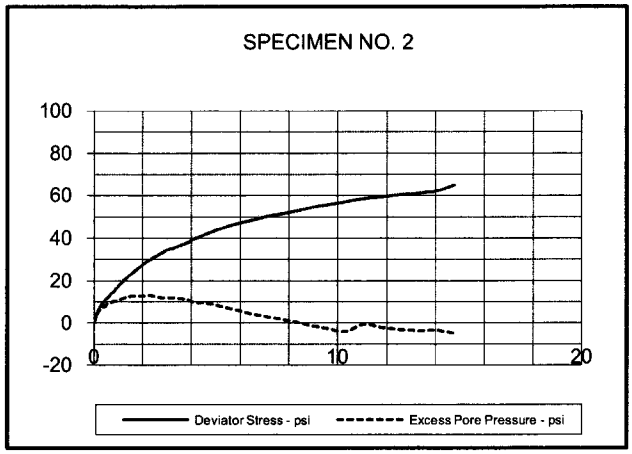
PROJECT INFORMATION

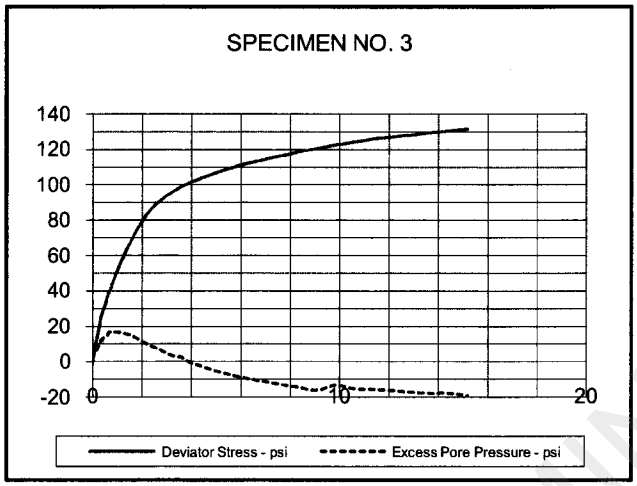
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

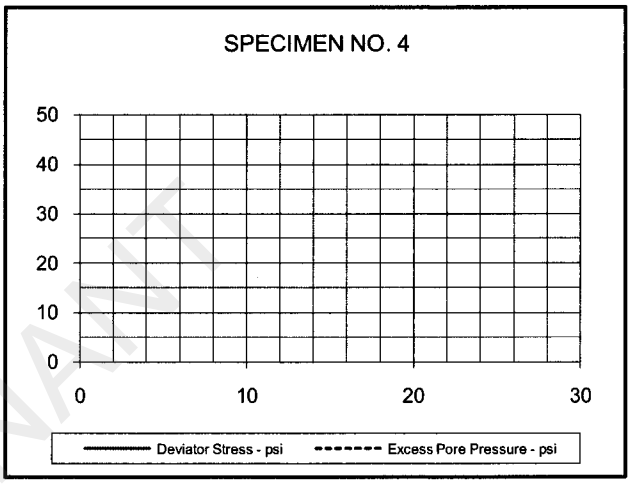
ETTL ENGINEERS & CONSULTANTS

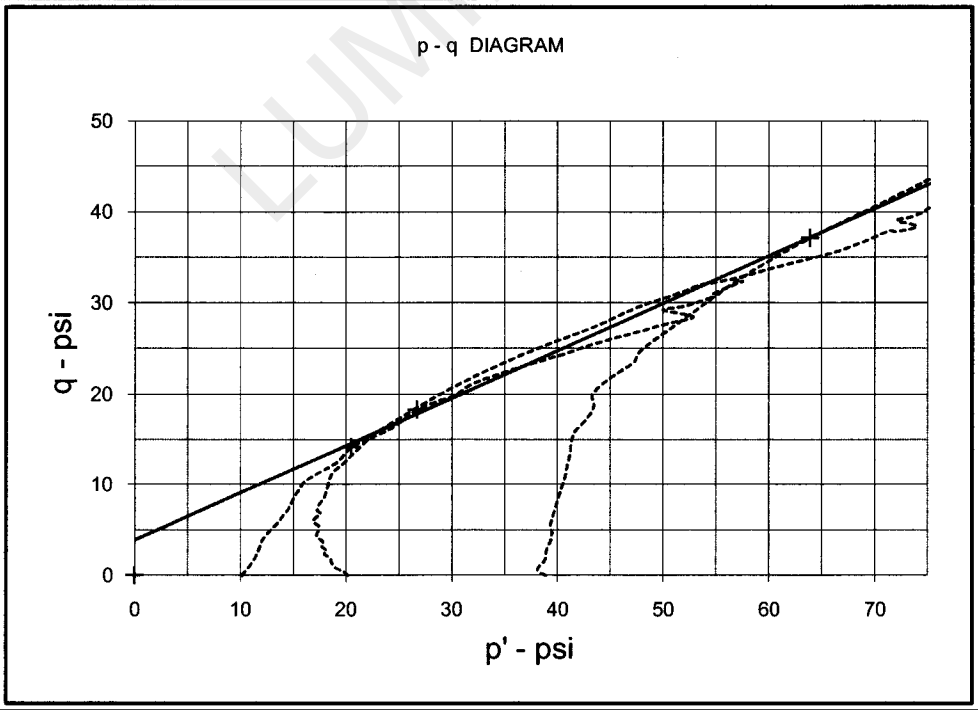
PLATE: B.1







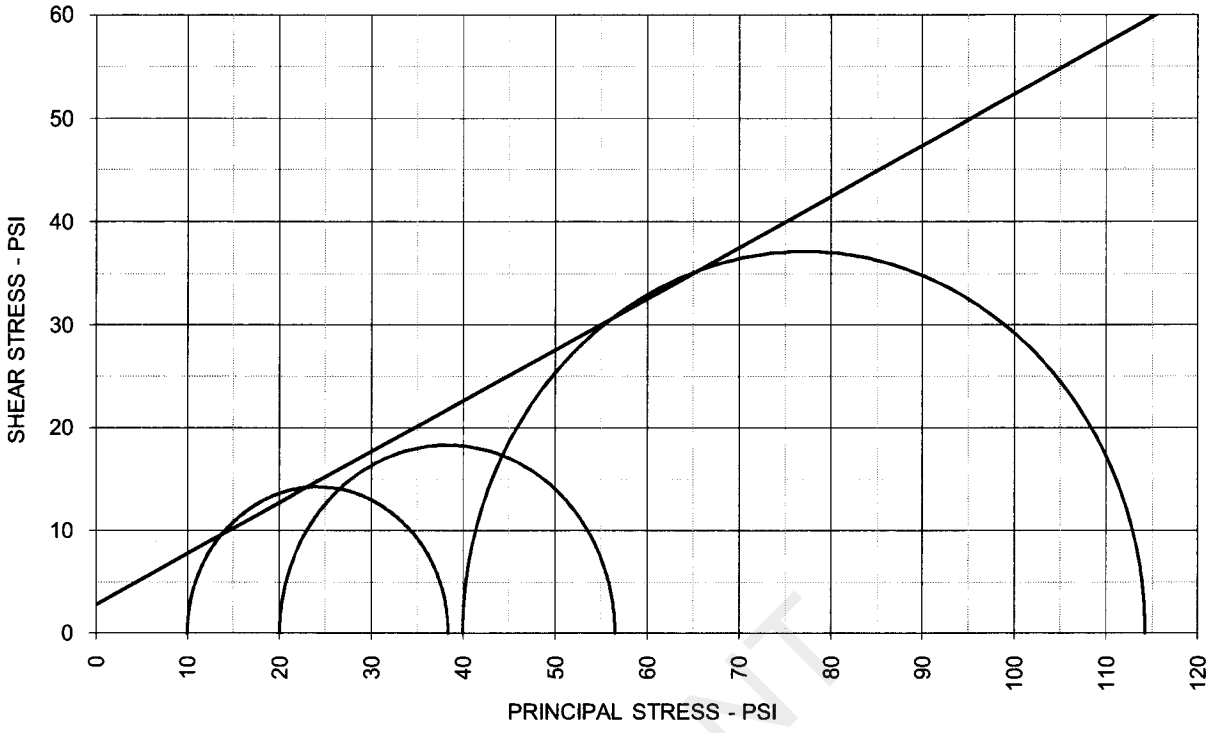




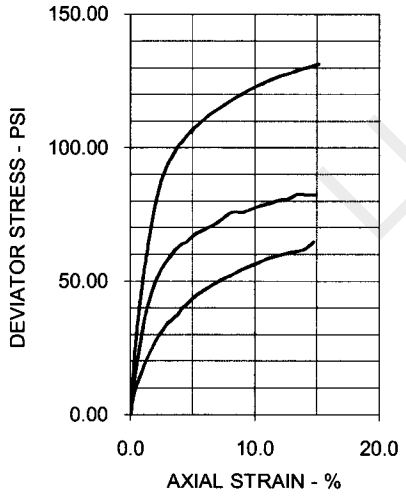
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.5	a (psi) = 3.9
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay			

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%

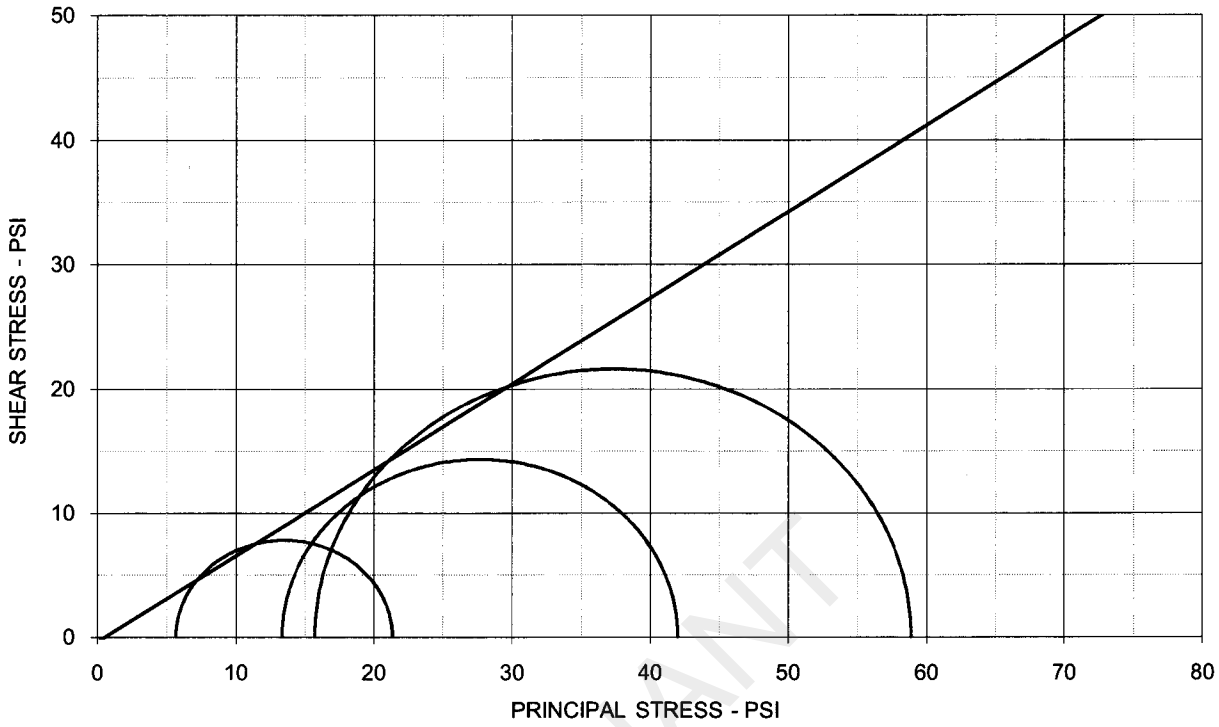
PLATE: B.1

PLATE: B.2

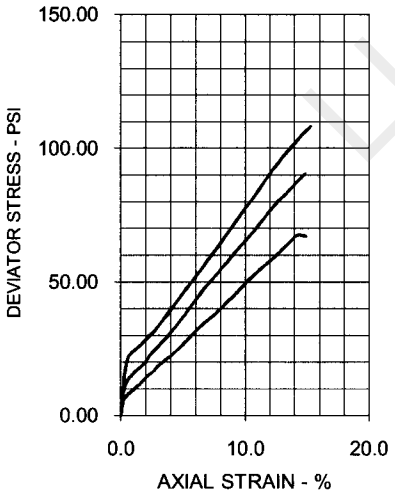
PLATE: B.3

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

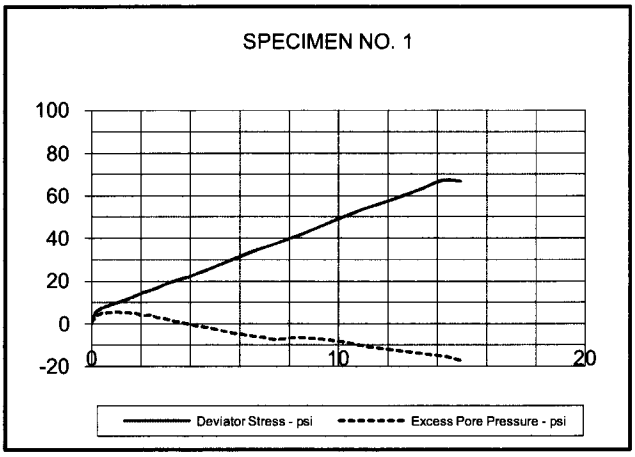
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Lab Molded
DESCRIPTION: Tan & Reddish Tan Silty Sand
Sampled on Site, TP- 31 0' to 5' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve 2%
LL: 20 PL: 17 PI: 3 Percent -200: 27%
REMARKS: Both Ends Trimmed + # 4 Sieve 1%
G 3219-09, TP-31 0'-5' Lab Molded

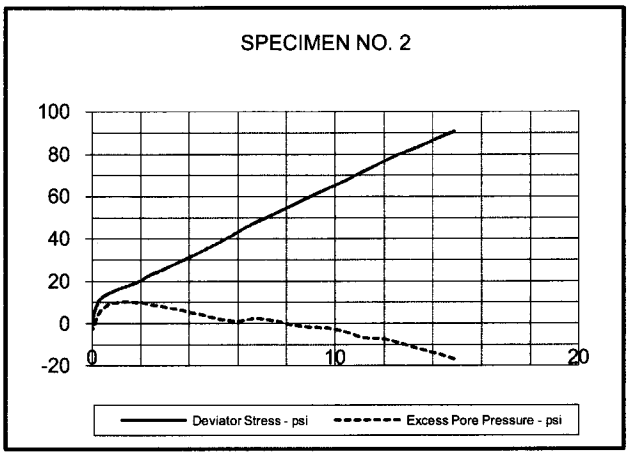
PROJECT INFORMATION

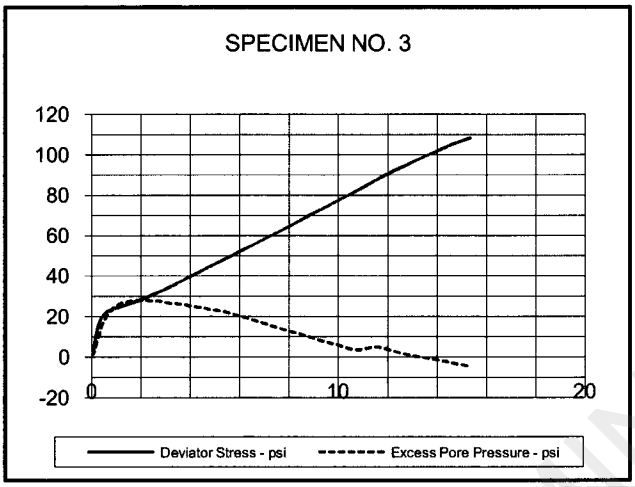
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

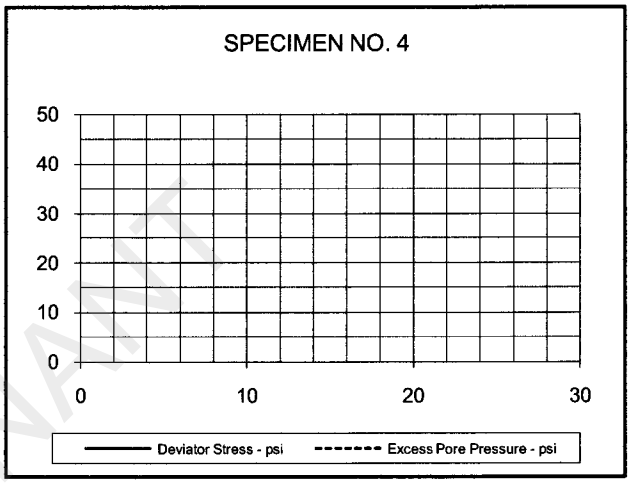
ETTL ENGINEERS & CONSULTANTS

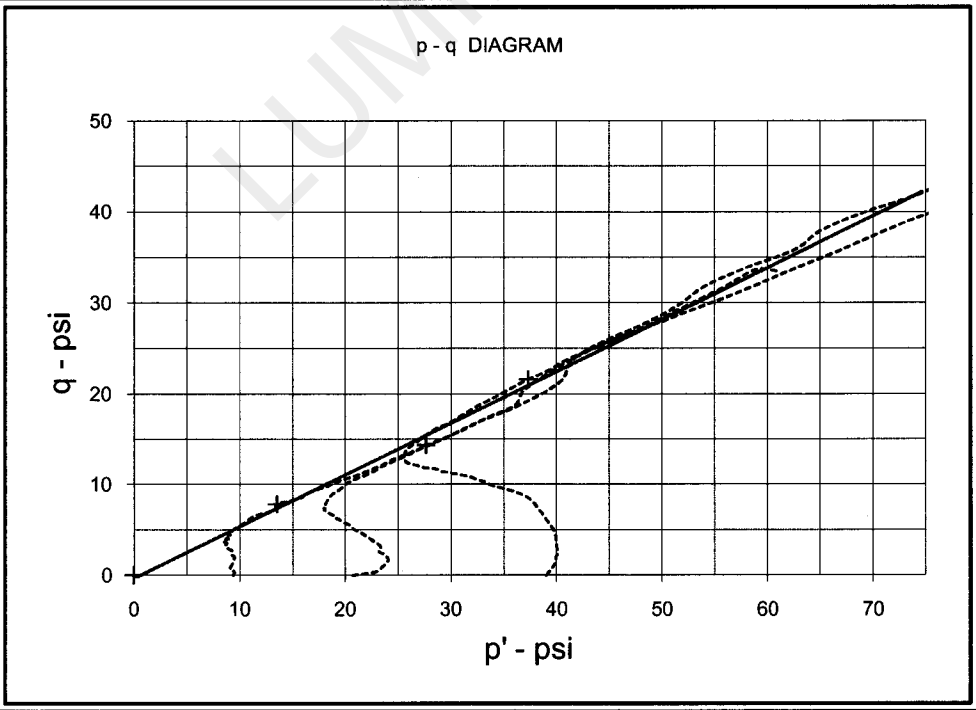
PLATE: B.1







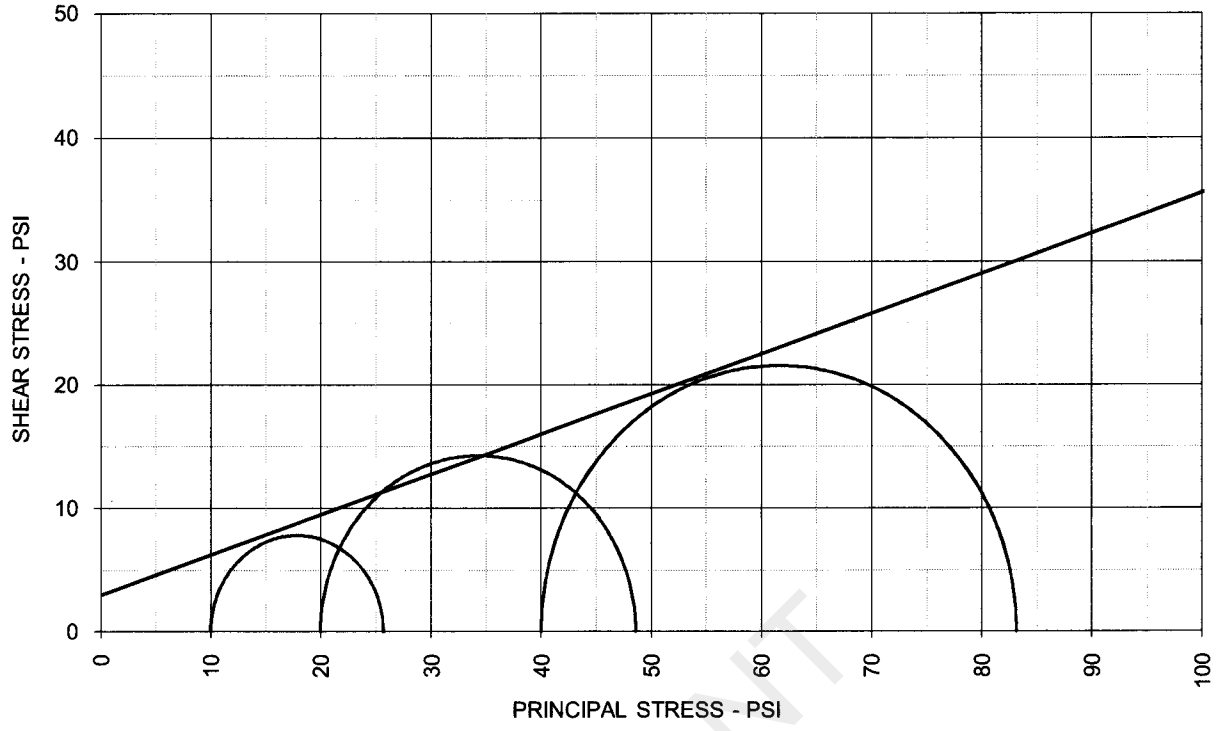




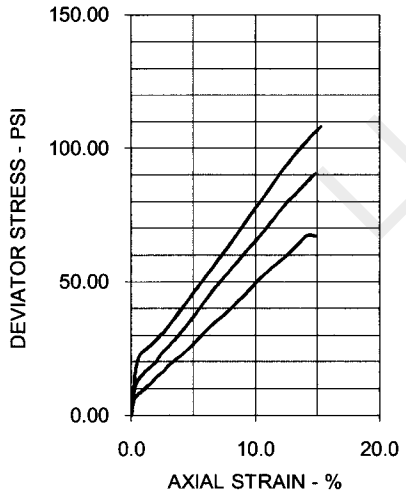
EFFECTIVE STRESS PARAMETERS	R^2 = 0.98	α (deg) = 29.7	a (psi) = -0.3
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Reddish Tan Silty Sand			

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%

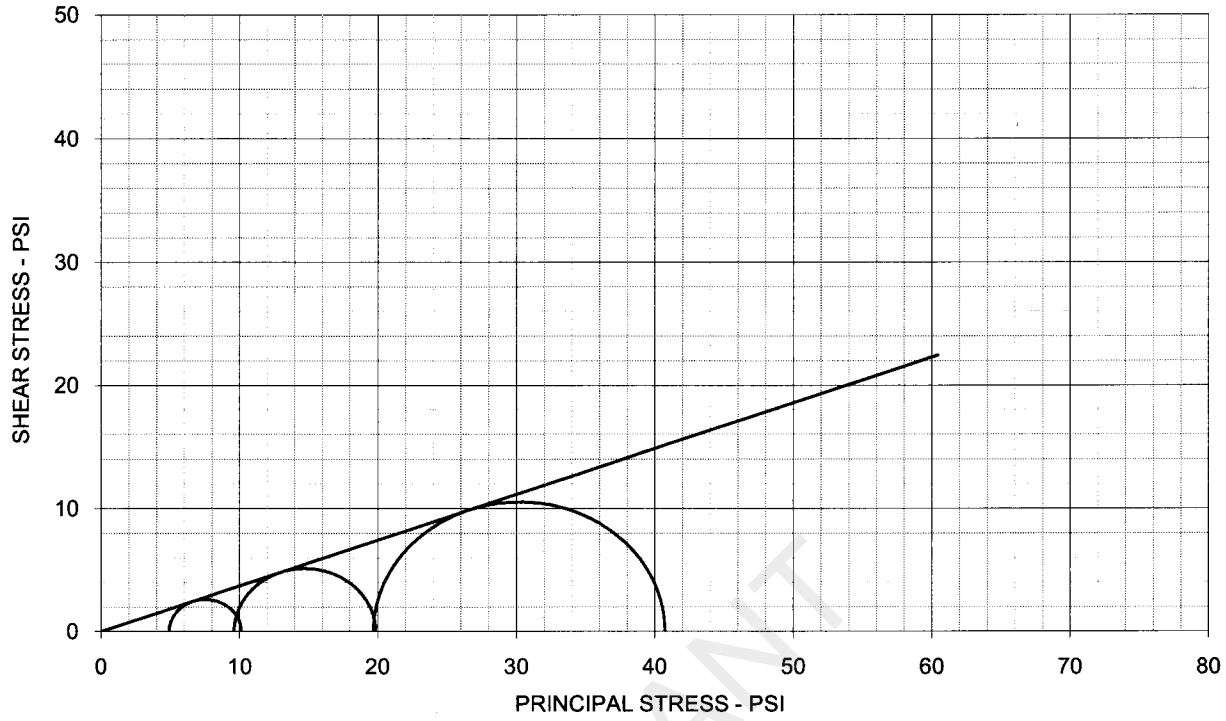
PROJECT INFORMATION

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

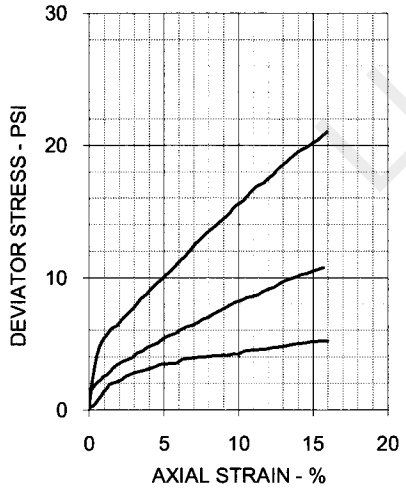
ETTL ENGINEERS & CONSULTANTS

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	



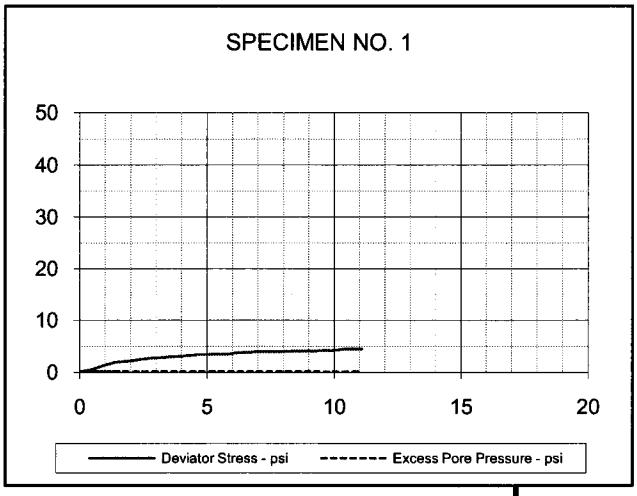
TEST DESCRIPTION

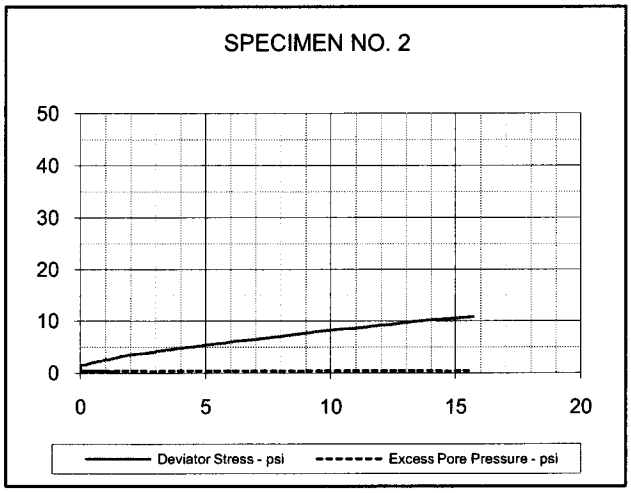
TYPE OF TEST & NO: CD Triaxial - CD-1
SAMPLE TYPE: SHELBY TUBE
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray
SAMPLE LOCATION: B-16, 3-5'
ASSUMED SPECIFIC GRAVITY: 2.70
LL: 43 PL: 14 PI: 29 Percent -200: 56
REMARKS: Tested in a fully softened remolded state

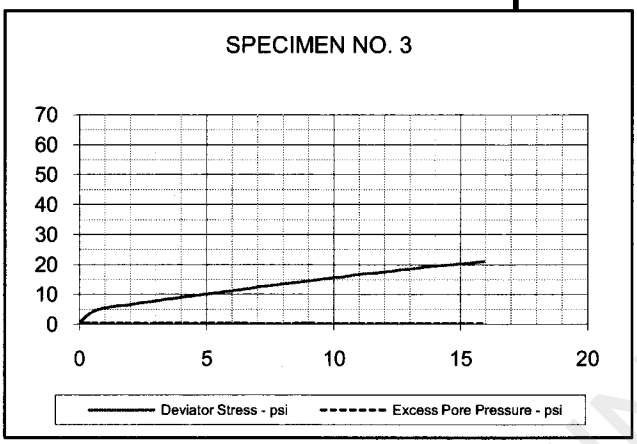
PROJECT INFORMATION

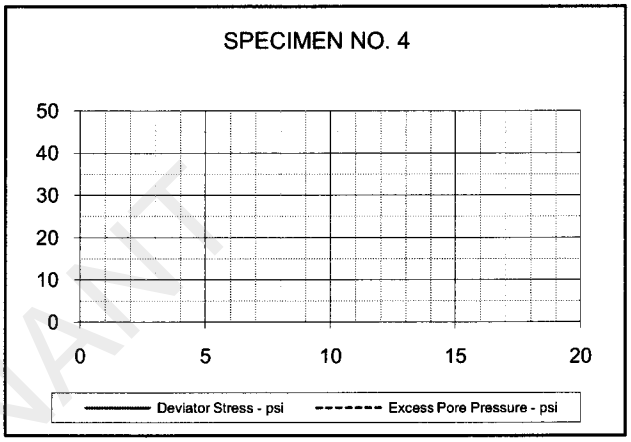
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11
CLIENT: ETTL Engineers & Consultants, Inc.
DATE: 9/15/09

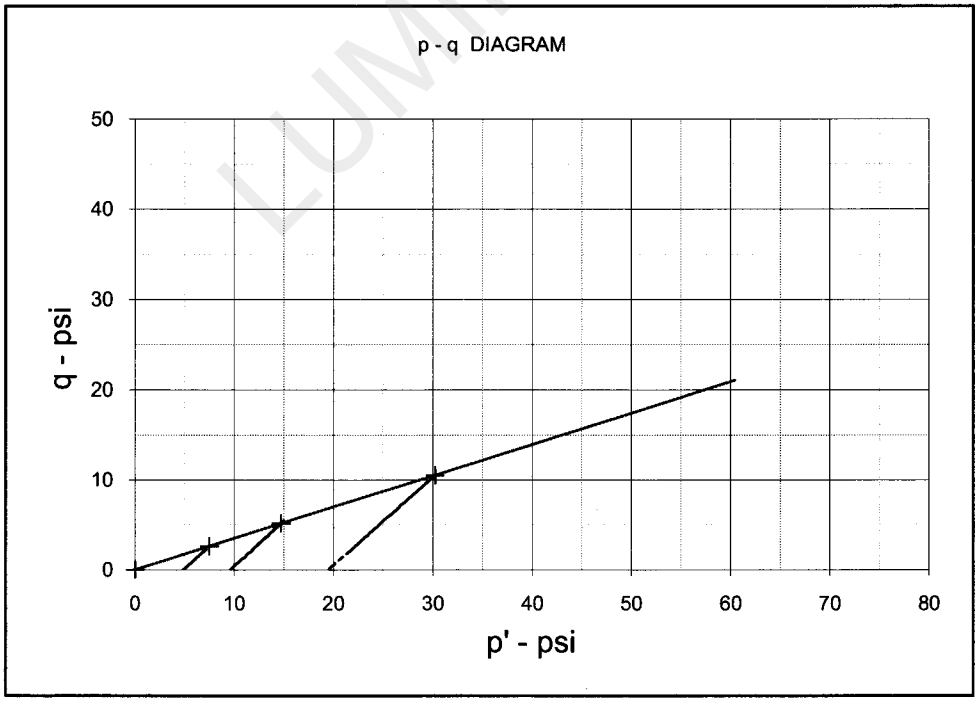
GREGORY GEOTECHNICAL | PLATE: B-CD.1







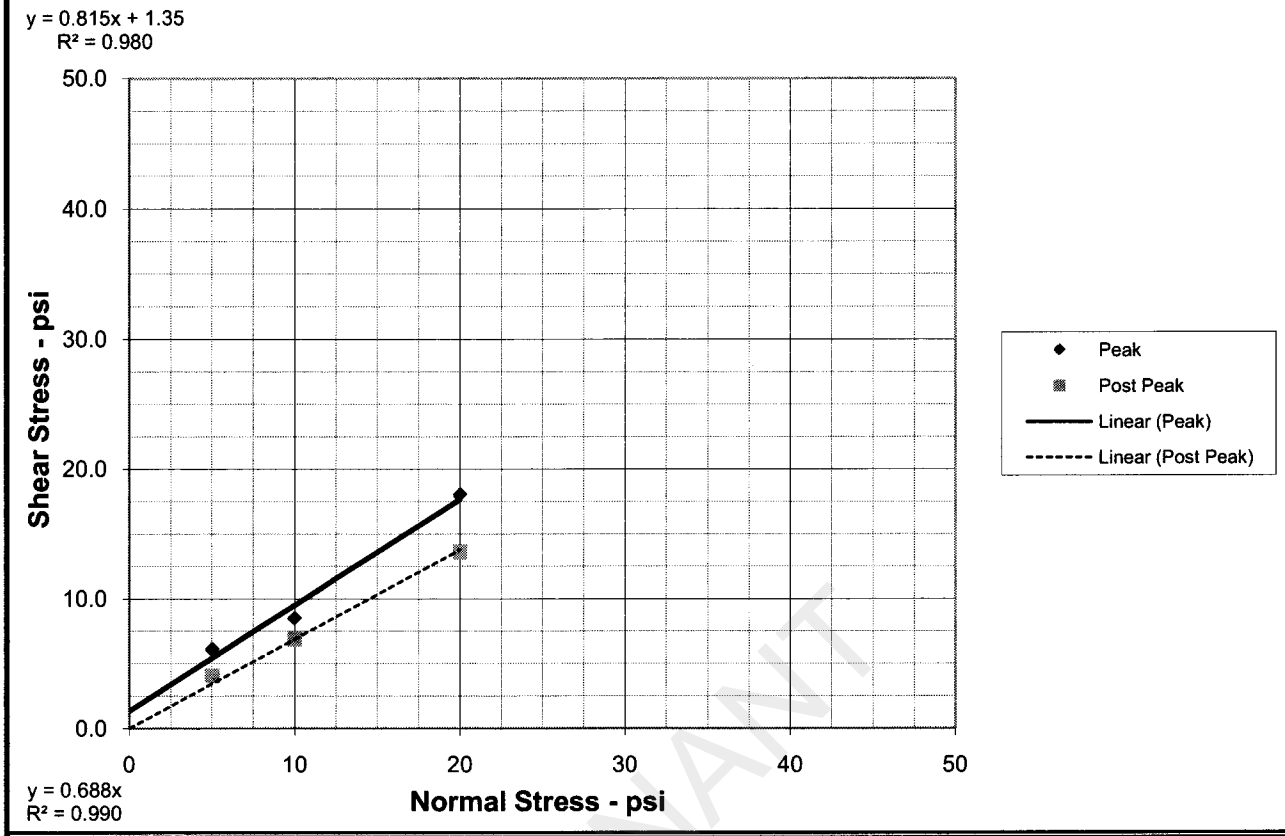




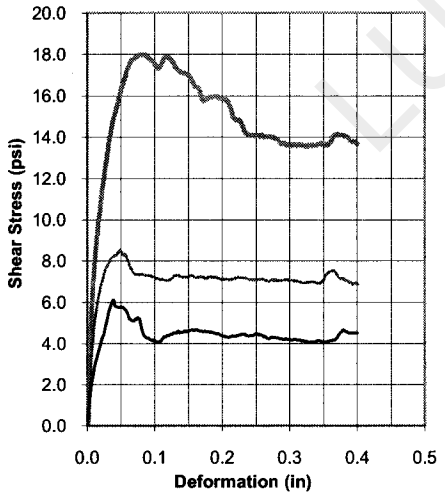
EFFECTIVE STRESS PARAMETERS	R^2 = 1.000	α (deg) = 19.2	a (psi) = 0.0
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion		TYPE OF TEST & NO: CD Triaxial - CD-1	
PROJECT NO: ETT08002-11		***GREGORY GEOTECHNICAL***	PLATE: B-CD.2
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray			

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

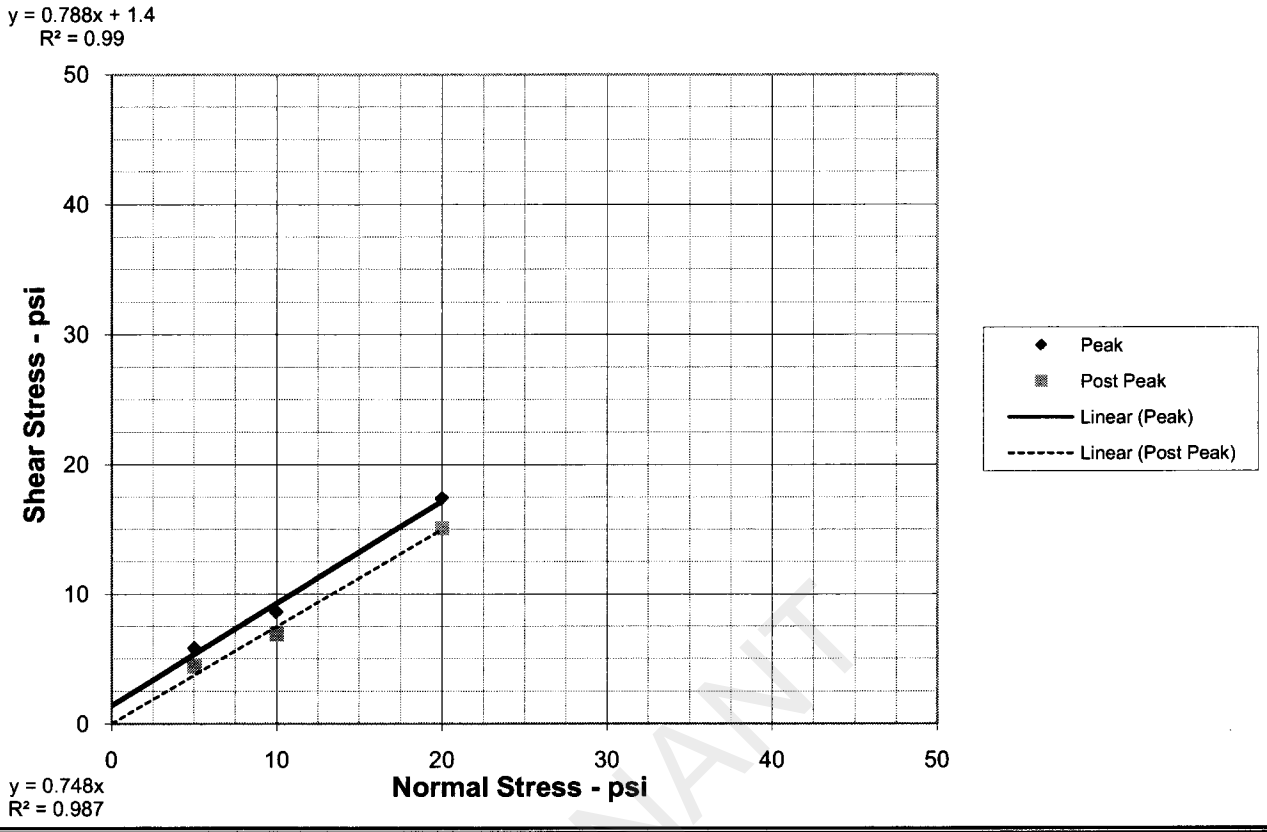
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: SILT(MH), black (classification tests from 13-15 ft)
SAMPLE LOCATION: B-15, 18-20 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: NP PL: NP PI: NP Percent -200: 95
REMARKS: Tested at natural MC

PROJECT INFORMATION

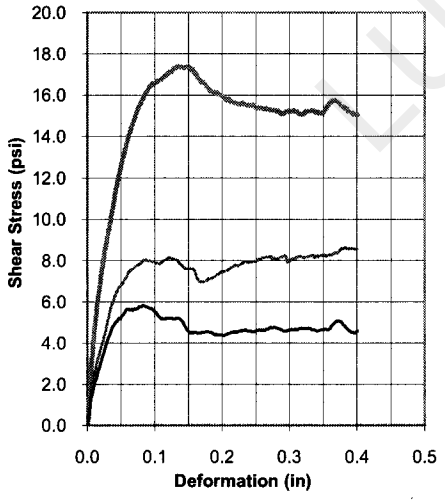
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11 (G3219-09)
CLIENT : ETTL Engineers & Consultants, Inc
DATE: 9/25/09

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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ETTL Engineers & Consultants Inc.

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

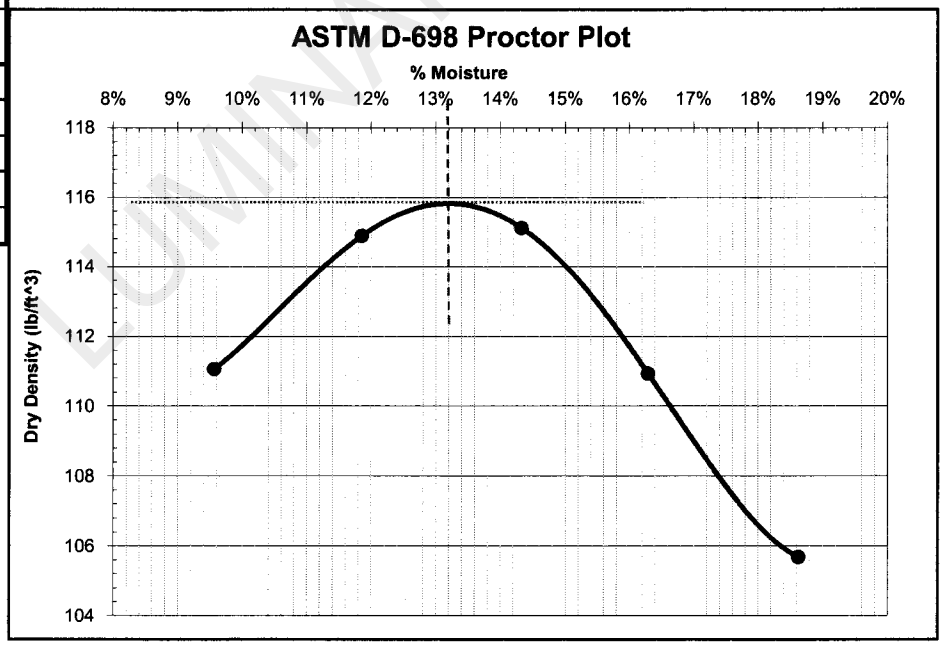
Maximum Dry Density: (ASTM D 698)	115.9	(lb/ft^3)
Optimum Moisture Content:	13.2	(%)

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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Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity

APPENDIX G

PDP-5 Safety Factor Assessment Report

REPORT

SAFETY FACTOR ASSESSMENT REPORT

Martin Lake Steam Electric Station

Submitted To: Luminant
1601 Bryan Street
Dallas, TX 75201

Submitted By: Golder Associates Inc.
500 Century Plaza Drive, Suite 190
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 safety factor assessments in accordance with §257.73(e). This report provides the safety factor assessments 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. PDF-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 New 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.

Groundwater levels measured in 2015, from wells surrounding the BAPs vary 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 four additional borings within the pond footprint. A map of 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.

Since the subsurface investigations for the PDP-5 area were performed prior to construction of the PDP-5 embankment, there are no borings that pass through the embankment. However, ETTL (ETTL 2009) identified a site borrow source (characterized as sandy materials), soils from which were to be used in the construction of the embankment. Triaxial strength testing (CU tests) were also performed on these site soils, and hence, the embankment strength has been estimated.

Two borings located outside of the ash encountered water 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 STABILITY ANALYSIS - §257.73(e)

3.1 Safety Factor Assessment

According to the CCR rules, structural stability factors of safety need to be evaluated for the critical cross-section of each CCR facility under static and seismic loading for “Maximum Storage Pool” (2 feet of freeboard for this facility) and “Maximum Surcharge Pool” (no freeboard)conditions. Liquefaction potential analysis is only necessary when soil sampling, construction documentation or anecdotal evidence from personnel with knowledge about the facility, indicates that soils of the embankment are susceptible to liquefaction. Since ash classifying as sandy soil is present below portions of the PDP-5 embankment, liquefaction potential is considered for PDP-5 foundation soils.

The safety factor assessment [§257.73(e)] does not require evaluation of rapid-drawdown loading conditions; however, if the CCR unit has downstream slopes that can be inundated by an adjacent water body, the structural stability assessment requirements [§257.73(d)(1)(viii)] state that these slopes must be assessed. Since one of the cross-sections analyzed in this Safety Factor Assessment may be subjected to rapid draw-drawdown conditions, this condition was evaluated and presented herein. The results of the analysis are also reported in the Structural Stability Assessment Report (Golder, 2016).

Slope stability analyses were performed using a limit-equilibrium-based commercial computer program, Slide v7.0 by Rocscience. The analyses used a searching routine to identify the potential failure surface with minimum factor of safety for a given set of geometry, ground and groundwater conditions. The Spencer method of analysis was used in the analyses, while the Morgenstern Price method was used for verification. The factors of safety of numerous potential failure surfaces were computed to establish minimum factors of safety. Circular failure surfaces were considered for all cases. Stability analyses were performed for “Maximum Storage Pool” (freeboard of 2 feet) and “Maximum Surcharge Pool” (no freeboard) conditions for both the interior and exterior slopes of the ponds. In addition, the interior slopes were analyzed while the pond is empty. For each case, respective slopes were analyzed for both static and seismic loading conditions. The interior berms separating individual ponds were not analyzed since the failure of the interior berms will not result in any release of CCR materials beyond the embankment surrounding the BAPs and NSP.

3.2 Cross-Sections Analyzed

3.2.1 Bottom Ash Ponds and New Scrubber Pond

The BAPs and NSP are contiguous ponds surrounded by a continuous embankment that was built using the same site soils. Hence, the embankment is considered as one structure and a critical cross-section was identified after considering multiple cross-sections across the entire embankment. The geometry of the slopes, soil profile, loading conditions, and phreatic surface of each segment of the embankment were

evaluated in identifying the critical cross-section. Cross-section (A-A'), located on the eastern slope of the EAP as shown on Figure 1, was identified as the critical cross-section for the BAPs and NSP and was selected for evaluation of factors of safety under the loading conditions identified in §257.74(e)(1)(i) - (iv).

3.2.2 Permanent Disposal Pond – 5

The geometry of the slopes, soil profile, loading conditions and phreatic surface of each segment of the embankment surrounding the PDP-5 was evaluated. Cross-Section B-B', located on the south side of PDP-5 as shown on Figure 1, was identified as the critical cross-section and was selected for evaluation of factors of safety under the loading conditions identified in §257.74(e)(1)(i) - (iv).

3.3 Material Properties

3.3.1 Bottom Ash Ponds and New Scrubber Pond – Cross Section A-A'

Based on the previous subsurface investigations, appropriate material properties were selected for use in the stability analysis. CU triaxial testing was performed on three samples on the BAP embankments, by ETTL (2008). The effective stress parameters from these three tests are averaged and used in the analysis. For the subsequent foundation soil layers, values of shear strength are chosen either based on testing of deeper samples by ETTL or by assuming typical, conservative values for sandy soils. Table 1 summarizes the material properties used in the stability analysis of Section A-A'.

Table 1: Soil Properties for Section A-A'

Soil Material	Description	Moist Unit Weight (lb/ft^3)	Saturated Unit Weight (lb/ft^3)	Drained Soil Properties	
				Cohesion, c' (lb/ft^2)	Friction Angle, ϕ' (°)
I	Fat Clay	120	125	542	23
II	Silty Sand	127	132	0	30
III	Clayey Sand	127	132	0	32
IV	Sand/Silty Sand	127	132	0	34

3.3.2 Permanent Disposal Pond – 5 – Cross Section B-B'

Based on the borings and CU tests performed as part of the 2009 investigation by ETTL, shear strength parameters were chosen for the soil layers for cross-section B-B'. For the deep sand layer, a conservative friction angle of 34° and zero cohesion was assumed. Table 2 summarizes the material properties used in the stability analysis of cross-section B-B'.

Table 2: Soil Properties for Section B-B'

Soil Material	Description	Moist Unit Weight (lb/ft^3)	Saturated Unit Weight (lb/ft^3)	Drained Soil Properties	
				Cohesion, c' (lb/ft^2)	Friction Angle, ϕ' (°)
I	New embankment	125	130	0	34.7
II	Clay liner	127	132	650	31.4
III	Old ash	90	95	0	34.6
IV	Native clay	127	132	175	31.9
V	Sandy Clay/Clayey Sand	127	132	650	31.4
VI	Deep sand	127	132	0	34

3.4 Phreatic Surface

3.4.1 Bottom Ash Ponds and New Scrubber Pond

For the purpose of this report, the phreatic surface is defined as the potential saturated zone within the embankment that could exist due to infiltration of water from the ponded CCR. As discussed earlier, measurements within the monitoring wells indicate groundwater levels across the BAPs and NSP vary between El. 304 to 307 ft-msl. At cross-section A-A', the groundwater level is assumed to be El. 306 ft-msl. The interior slopes of the ponds have a clay liner, a double HDPE geomembrane layer, overlain by a concrete revetment. Hence, it is unlikely that the phreatic surface will extend into the embankment, or into the ground below on the floor of the ponds.

Drawdown of the water level in Martin Lake can potentially affect the stability of Section A-A'. Based on the historic water level data available from the Texas Water Development Board (TWDB 2016), the maximum drawdown was observed to be about 10 feet. This drawdown, however, was not instant but spread across a period of approximately one year. Hence, effective stress-transient drawdown analyses were conducted for the exterior slope at Section A-A', for a 10-foot drawdown in water level at a uniform rate, over one year.

3.4.2 Permanent Disposal Pond – 5

As mentioned previously, groundwater levels measured in 2015, from wells surrounding PDP-5, indicate that the groundwater level around the pond varies from approximately El. 355 ft-msl in the north to El. 375 ft-msl in the south. Underlying PDP-5, the ash in PDP-1, 2 and 3 is at least partially saturated. A toe drain system keeps the water level within the ash below El. 380 feet. Therefore, the saturated zone within the ash is assumed to be at El. 380 ft-msl for cross-section B-B' on the upstream side.

For the stability analysis of the exterior embankment slope, the location of the phreatic surface is estimated by allowing steady state seepage conditions to develop based on the water level within PDP-5 and the elevation of the saturated ash in PDP-1, 2 and 3.

Note that the phreatic surface elevations were conservatively assumed for stability analysis purposes -- they do not represent the elevation of the uppermost aquifer.

3.5 Seismic Loading

Based on the "US Seismic Hazard 2014 Map" prepared by the United States Geologic Survey (USGS) and the "2008 Interactive Deaggregations" (USGS), the peak ground acceleration (PGA) for a 2% probability of exceedance in 50 years (return period of 2,475 years) is 0.09g for the site location (including amplification factors for site soil conditions). Hence, a horizontal seismic load coefficient of 0.09g was used in the pseudostatic analysis.

3.6 Liquefaction Potential

Soil liquefaction describes a phenomenon whereby a saturated or partially saturated soil substantially loses strength and stiffness in response to an applied stress, usually earthquake shaking or other sudden change in stress condition, causing it to behave like a liquid. The phenomenon is most often observed in saturated, loose (low density or uncompacted), sandy soils.

3.6.1 Bottom Ash Ponds and New Scrubber Pond

The embankment soils of the BAPs and NSP are composed of clayey materials with significant fines content. The immediate foundation materials are composed of sandy clay and compact to dense sand. The subsurface investigations do not indicate the presence of any soils in the embankment or its foundation that are susceptible to liquefaction. Hence, failure of the pond slopes due to liquefaction is considered unlikely for the BAPs and NSP.

3.6.2 Permanent Disposal Pond - 5

Based on particle size, the bottom ash within PDP-1, 2, and 3 classifies as very loose to medium dense, poorly graded sand at some locations and silts at other locations and depths. Therefore, portions of the foundation soils for PDP-5 embankments are founded above potentially liquefiable material. 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. Nevertheless, due to the classification of the some of the underlying ash as poorly graded sand, the potential for cyclic liquefaction of the ash was evaluated.

As part of the 2008 investigation by ETTL, CPTs were conducted within the ash underlying PDP-5. Golder conducted a liquefaction analysis based on this CPT data using the commercially available program, CLiq

v.2.0.6.85 released by GeoLogismiki. The method prescribed by Robertson (2009) was adopted in the cyclic liquefaction analysis. The site earthquake information (magnitude and PGA) was estimated using the seismic hazard tool developed by USGS (USGS 2008).

The analysis showed that all three CPT locations showed a low likelihood for cyclic liquefaction with a factor of safety greater than the minimum factor of safety of 1.20 specified in §257.73(e)(iv). The results from the cyclic liquefaction analysis are presented in Appendix C.

3.7 Stability Analysis Results

Slope stability analyses were performed for long-term conditions for each of the critical cross-sections considered under static and seismic loading conditions. Both interior and exterior slopes were analyzed for "Maximum Storage Pool" (2 feet of freeboard) and "Maximum Surcharge Pool" (no freeboard) conditions. The interior slopes were analyzed for the condition where the pond is empty.

The results of the slope stability analyses cases are presented in Table 3 and Appendix D. The results indicate that the BAP, NSP, and PDP-5 pond slopes are sufficiently stable under all considered loading scenarios.

Table 3: Slope Stability Analysis Results

Pond(s)	Cross-Section	Case #	Slope Location	Pond Pool level	Loading Condition	Req'd Safety Factor (1)	Calculated Safety Factor
BAP and NSP	A-A'	1a	Exterior	Storage	Static	1.50	1.94
		1b			Pseudostatic	1.00	1.45
		1c			Rapid Drawdown	1.30(2)	1.61
		2a		Surcharge	Static	1.40	1.94
		2b			Pseudostatic	1.00	1.45
		3a	Interior	Storage	Static	1.50	6.43
		3b			Pseudostatic	1.00	4.22
		4a		Surcharge	Static	1.40	7.21
		4b			Pseudostatic	1.00	4.60
		5a		Empty	Static	1.50	2.54
		5b			Pseudostatic	1.00	1.91
PDP-5	B-B'	1a	Exterior	Storage	Static	1.50	1.67
		1b			Pseudostatic	1.00	1.13
		2a		Surcharge	Static	1.40	1.67
		2b			Pseudostatic	1.00	1.13
		3a	Interior	Storage	Static	1.50	2.05
		3b			Pseudostatic	1.00	1.31
		4a		Surcharge	Static	1.40	2.43
		4b			Pseudostatic	1.00	1.45
		5a		Empty	Static	1.50	2.31
		5b			Pseudostatic	1.00	1.73

Note: (1) Required safety factors per §257.73(e)(i)-(iii)
(2) Required factor safety per EM 1110–2–1902 (USACE 2003)

4.0 CONCLUSION

Based on our review of the information provided by Luminant, on information prepared by Golder Associates Inc., and on our analyses, the calculated factors of safety through the critical cross sections in the surface impoundments exceed the values listed in §257.73(e)(1)(i)-(iv).

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

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(e).

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

6.0 REFERENCES

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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

0 600 1200
1" = 1200' 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: 164816402A002.dwg

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
0 1 in

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

Golder Associates
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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)
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							

▲ 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-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								
		interbedded clay and sand seams at 38.0'	SS 11	100	8-7-8 (15)			▲●
40								
		no seams at 43.0'	SS 12	89	4-4-4 (8)			▲ ●
45								
		(SP) SAND, medium to fine, poorly graded, subangular, non-plastic, some silt and clay, wet, loose	SS 13	100	2-3-4 (7)			▲ ●
50								

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								
35		(CL) SANDY CLAY, low plasticity, some silt, tan and gray, moist, very stiff	SH 10	60		3.0		

(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)

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

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)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
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		
		(CL) SANDY CLAY, low plasticity, some silt, tan, gray, and red, dry, soft to firm	SH 5	50		2.0		
10								
			SH 6	40		2.5		
15								
		very stiff at 18.0'	SH 7	50		3.5		
20								
		hard at 23.0'	SH 8	46		5.0		
25								
		some sand seams, moist, very stiff at 28.0'	SH 9	54		3.0		
30	▽							
		(SC) CLAYEY SAND, fine, subangular, some silt, tan, gray, and red, moist	SH 10	60		2.5		
35								

(Continued Next Page)

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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.

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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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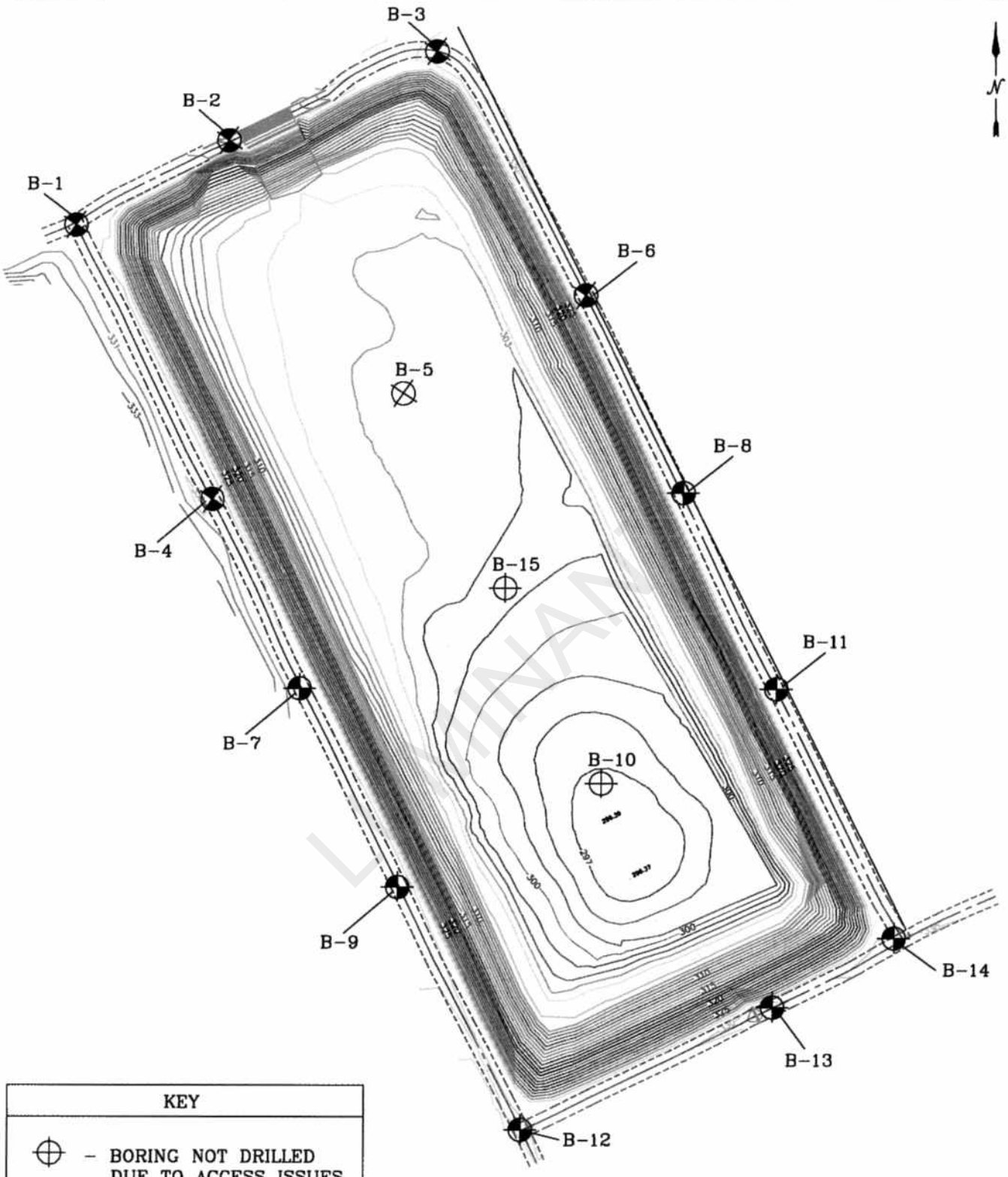
BORING NUMBER BH-211

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

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) 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 Abbreviations
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'											

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

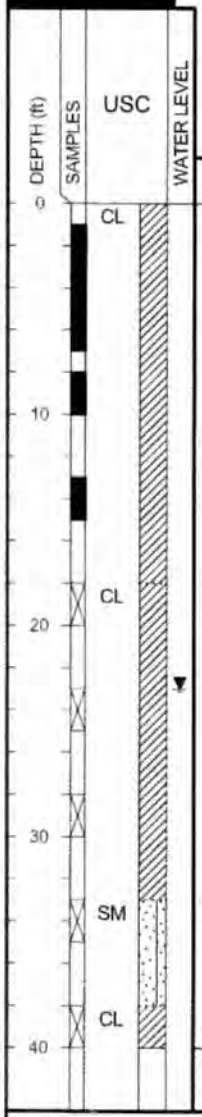
PROJECT NO.: G 2972-08 **BORING TYPE:** Flight Auger

DATE 10/9/08

SURFACE ELEVATION

ETTL ENGINEERS & CONSULTANTS

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



MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
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%
–with silty sand							
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%
	N=15						
–with sand seams	N=22						
SILTY SAND(SM) dense; gray and red; mottled	N=38						
SANDY LEAN CLAY(CL) very stiff; gray, red, and tan; mottled	N=18						
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 @ 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 Abbreviations:
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

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
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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)	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		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	N=18											
				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 @ 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

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

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

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+										
		--stiff	N=12					13	29	13	16	63	+40 Sieve =1%, +4 Sieve =0%
10	CL	SANDY LEAN CLAY(CL) very stiff; tan, gray, and red; mottled	N=16										
		--stiff; interbedded	N=14					16	31	16	15	58	+40 Sieve =2%, +4 Sieve =0%
20			N=15										
		--hard; brown, tan, and red	P=4.5+					12	40	14	26	77	+40 Sieve =1%, +4 Sieve =0%
30			N=19										
		--hard; with gray and brown silty sand	P=4.25										
40	SM	SILTY SAND(SM) medium dense; red and gray; saturated											

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

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)	SAMPLES	USC	WATER LEVEL	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 (Plastic Limit / Moisture Content / Liquid Limit)	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"											

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

MAIN OFFICE
1717 East Erwin
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					N=88											
				Bottom of Boring @ 100'												

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 Abbrevations:
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

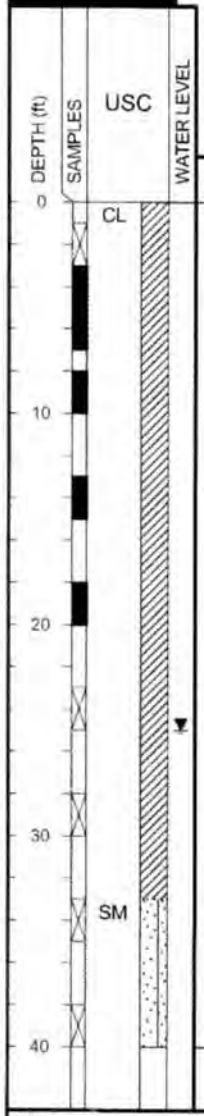
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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



MATERIAL DESCRIPTION

	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) 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	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)	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) very stiff; tan, red, and gray; mottled	P=3.5 P=2.5 P=3.0					18	33	13	20	68	+40 Sieve =1%, +4 Sieve =0%
10		--stiff	P=3.5 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'											

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 @ 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)	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) stiff; tan, red, and gray; mottled	N=13 P=2.5 P=4.5+					13	28	14	14	60	+40 Sieve =1%, +4 Sieve =0%
10		SC		CLAYEY SAND(SC) red, tan, and gray; mottled	P=2.0					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'											

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 @ 27' and open to 30' upon completion. Water level @ 23' and open to 28' 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°15.804', W 94°33.891'

LOG OF BORING B-6

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(%) 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'											

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

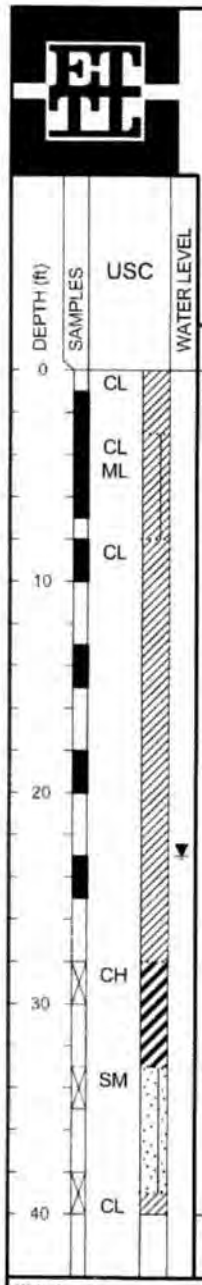
Natural Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
20 40 60 80

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'



ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING B-7

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	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=4.0										
	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										
20			P=1.5					15	36	15	21	72	+40 Sieve =0%, +4 Sieve =0%
	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'											

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

ETTL ENGINEERS & CONSULTANTS

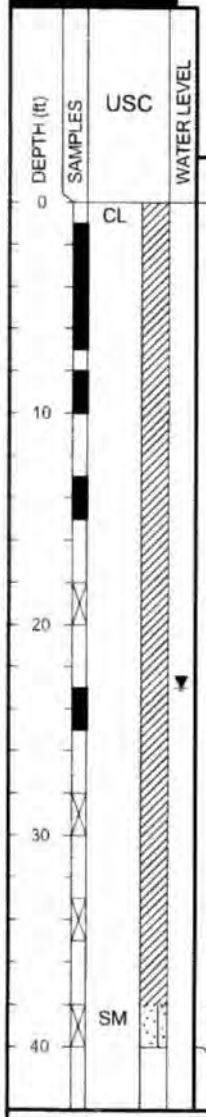
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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



MATERIAL DESCRIPTION

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. #)
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					13	29	13	16	67	+40 Sieve =0%, +4 Sieve =0%
	P=4.0										
	P=3.5										
--very stiff	N=15					18	44	18	26	70	+40 Sieve =3%, +4 Sieve =0%
	P=2.5										
	N=15					16	36	16	20	63	+40 Sieve =9%, +4 Sieve =3%
--red and gray; mottled	N=16										
SILTY SAND(SM) dense; red, tan, and reddish gray; mottled; saturated	N=26										
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 @ 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		SILTY SAND(SM) medium dense; gray, tan, and red; mottled	N=16										
		CL		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)

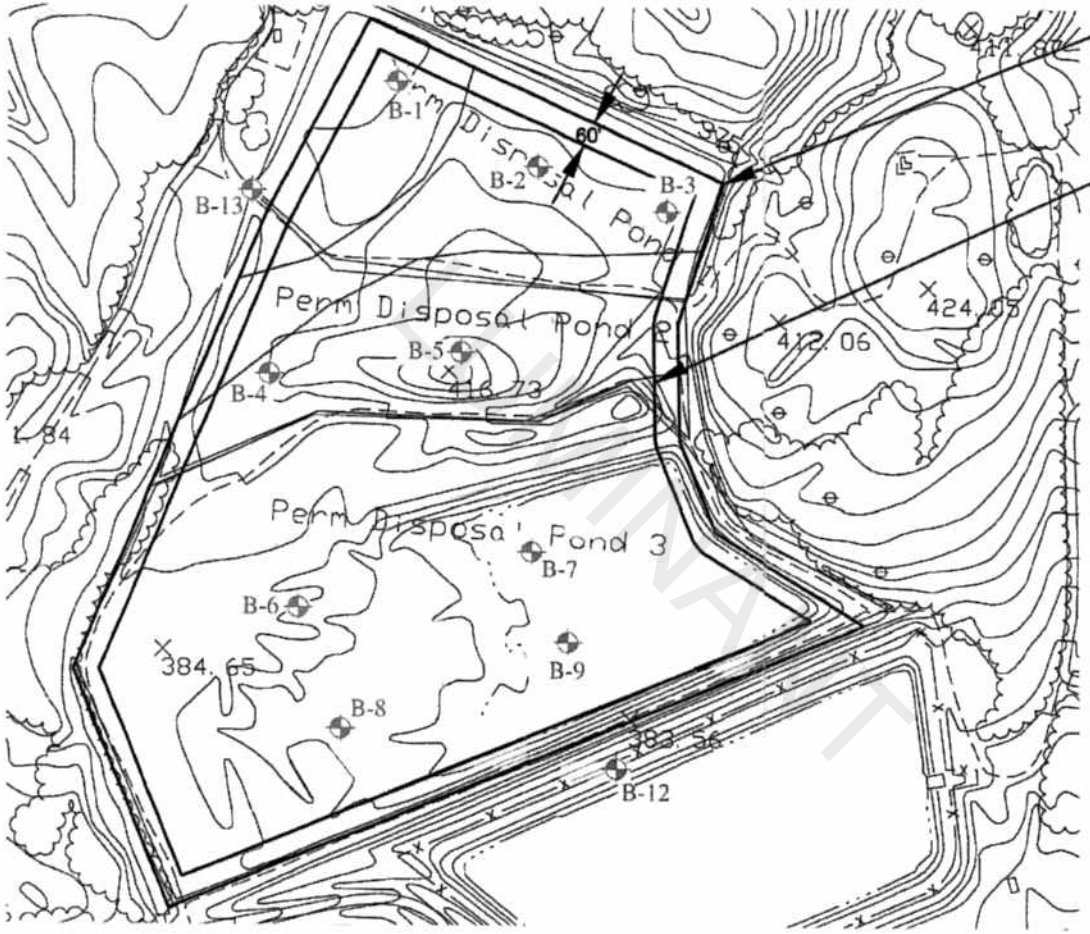
Water Level Est: Measured: Perched:

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 Penetrometer (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

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	SM	SILTY SAND(SM) loose; tan; moist; with ferric oxide; with organics	N=5					17	16	14	2	34	+40 Sieve =8%, +4 Sieve =3%
		ASH SEDIMENT medium dense; black and gray; coarse to very fine-grained sand	N=22	101				23					
			N=17					23					
10		--black		82				28				23	+40 Sieve =55%, +4 Sieve =26%
		--loose; black and gray; coarse to very fine-grained sand	N=8					36					
20			N=9					32				53	
		Bottom of Boring @ 20'											

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)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	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

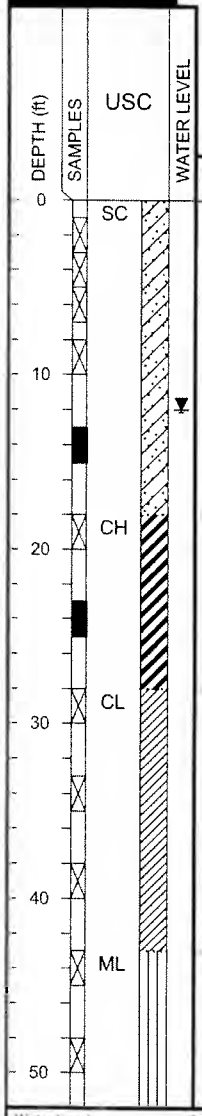
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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'



MATERIAL DESCRIPTION	FIELD STRENGTH DATA	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LL	PL	PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
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						
--tan, red, and gray	N=37						
FAT CLAY(CH) stiff; red, gray, and tan	P=1.5	23	51	20	31	89	+40 Sieve =7%, +4 Sieve =1%
--with iron laminations	P=1.5						
	P=1.5						
LEAN CLAY(CL) very stiff; gray	N=26	23	48	21	27	94	+40 Sieve =2%, +4 Sieve =0%
--hard	P=4.5+						
--gray and brown; with iron oxide cemented sandstone seams	P=4.5+						
SANDY SILT(ML) very dense; gray; with clay seams	N=63	26				66	+40 Sieve =2%, +4 Sieve =0%
	N=63						

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 @ 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	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. #)
				--hard; laminated with sand seams	P=4.5+											
				--very stiff; gray and green; with sand seams	P=2.5											
60		CL		LEAN CLAY(CL) hard; gray; laminated with sand seams	N=76						26	47	24	23	96	+40 Sieve =2%, +4 Sieve =0%
		SM		SILTY SAND(SM) very dense; gray	N=75											
70					N=50/3.5"											
		ML		SILT(ML) very dense; gray	N=78											
80				--with clay seams	P=SF											
					N=50/5"											
90					N=50/3"											
					N=50/4"											
100				Bottom of Boring @ 100'												

Field Sheet

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

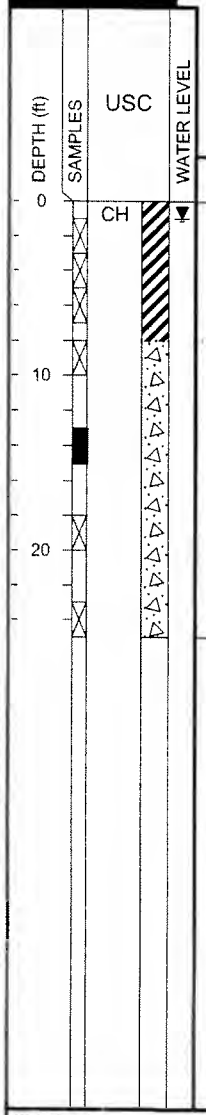
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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

Material Description	Field Strength Data	Moisture Content (%)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Minus #200 Sieve (%)	Other Tests Performed (Page Ref. #)
SANDY FAT CLAY(CH) stiff; red and orange	N=11	22	51	18	33	65	+40 Sieve =9%, +4 Sieve =6%
–with sand	N=11	23					
	N=12	28	57	17	40	78	+40 Sieve =2%, +4 Sieve =0%
ASH SEDIMENT medium dense; black	N=11	29				16	+40 Sieve =63%, +4 Sieve =40%
–very loose; with organic odor	N=3	30				39	+40 Sieve =36%, +4 Sieve =12%
–light gray		42				93	
Bottom of Boring @ 25'							

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)

ATTERBERG LIMITS(%)

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						
		--stiff	N=15	21	54	19	35	69	+40 Sieve =5%, +4 Sieve =1%
		ASH SEDIMENT dense; black	N=42	26				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)

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

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

Water Level Est: ▽ Measured: ▼ Perched: ▽

Water Observations: Seepage @ 8' while drilling. Water level @ 2' 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°15.746', W 94°34.855'. Minus #200 Sieve (42%) @ 5' (Hydrometer - Specific Gravity 2.561).

LOG OF BORING B-4

ETTL ENGINEERS & CONSULTANTS

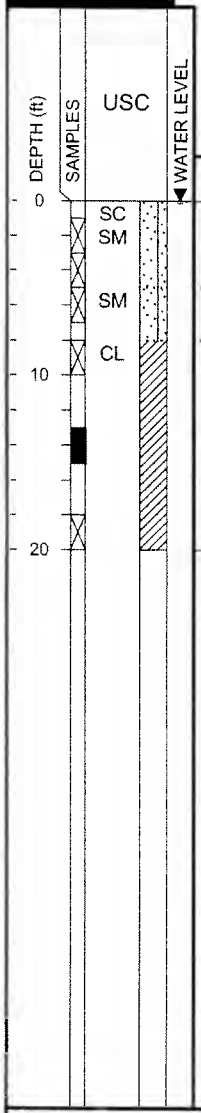
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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'



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. #)
SILTY CLAYEY SAND(SC-SM) medium dense; red and brown	N=14										
--very stiff; red and orange	N=21					15	20	14	6	42	+40 Sieve =1%, +4 Sieve =0%
SILTY SAND(SM) medium dense; red and tan	N=22										
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					
	N=25					21	39	21	18	81	+40 Sieve =0%, +4 Sieve =0%

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 @ 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

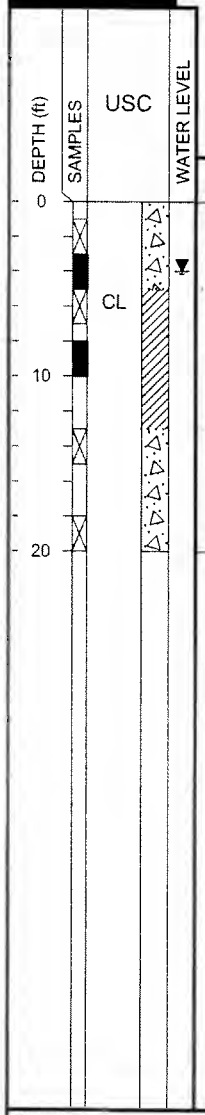
MAIN OFFICE
1717 East Erwin
Tyler, Texas 75702
(903) 595-4421

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

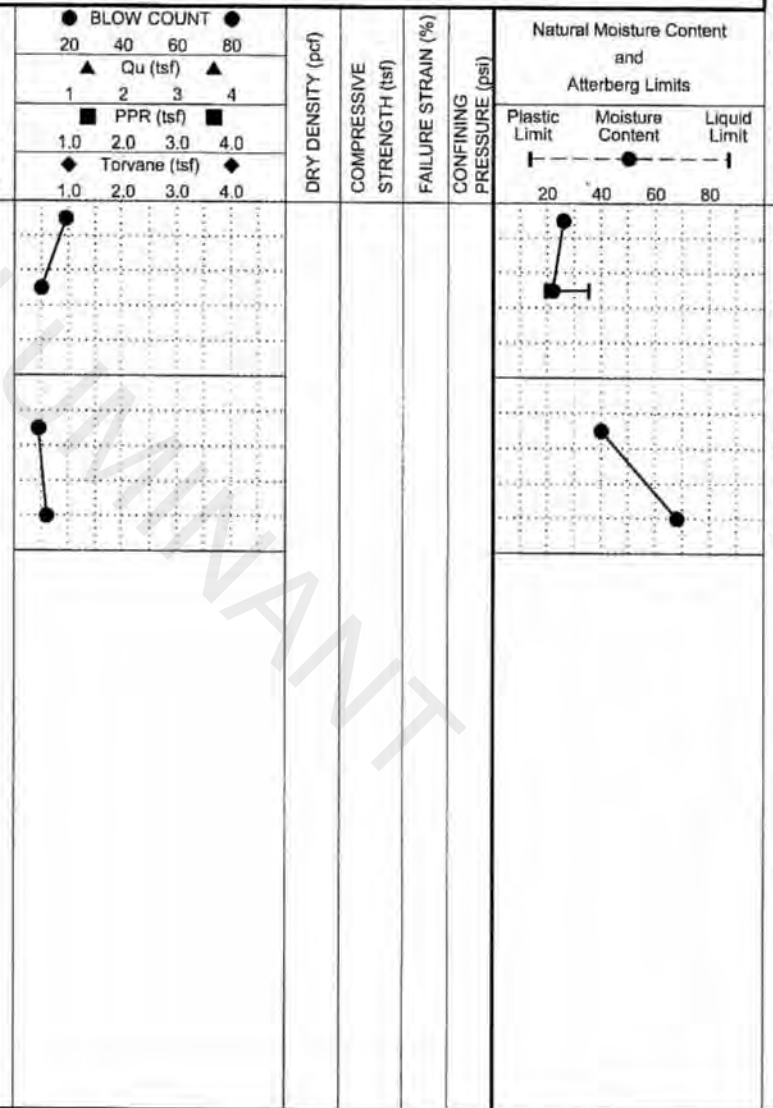
PROJECT NO.: G 2810-08 **BORING TYPE:** Flight Auger

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'											



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

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'

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 (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 (Plastic Limit / Moisture Content / Liquid Limit)	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	
20		CL		LEAN CLAY WITH SAND(CL) medium stiff; orange and black	N=7						27	42	17	25	75	+40 Sieve =4%, +4 Sieve =0%
				--tan and red		104	0.50	13	22		21					
30				--medium dense; red and orange	N=22											
		CH		SANDY FAT CLAY(CH) medium dense; red and orange	N=23						27	53	20	33	69	+40 Sieve =27%, +4 Sieve =22%
40					N=22											
				Bottom of Boring @ 40'												

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

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 2/20/08

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'												

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	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'												

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:

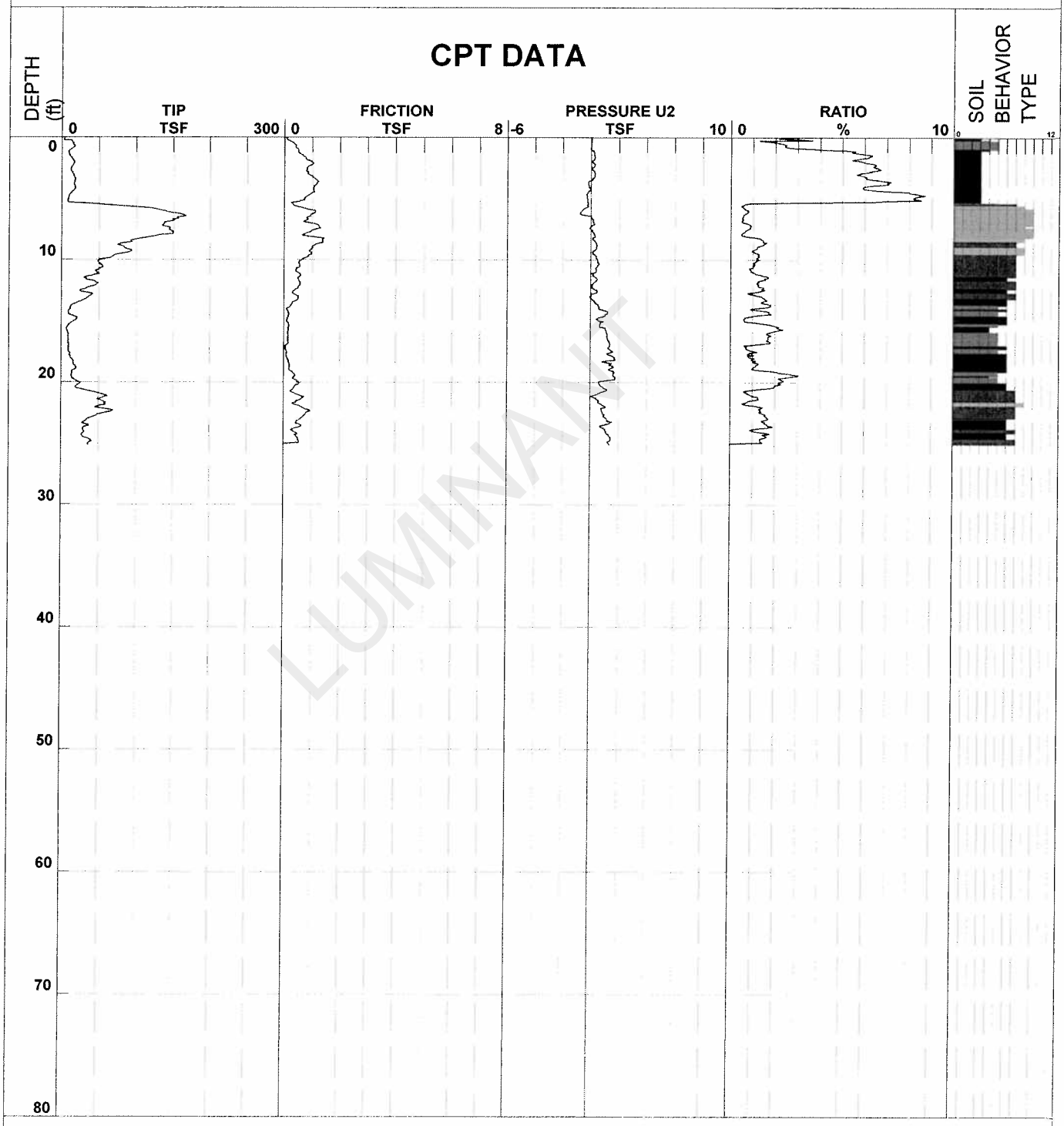
Water Observations: Seepage @ 4' while drilling. Water level @ 6' and caved to 18' upon completion. Dry and caved to 4' on 2/29/08.

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	

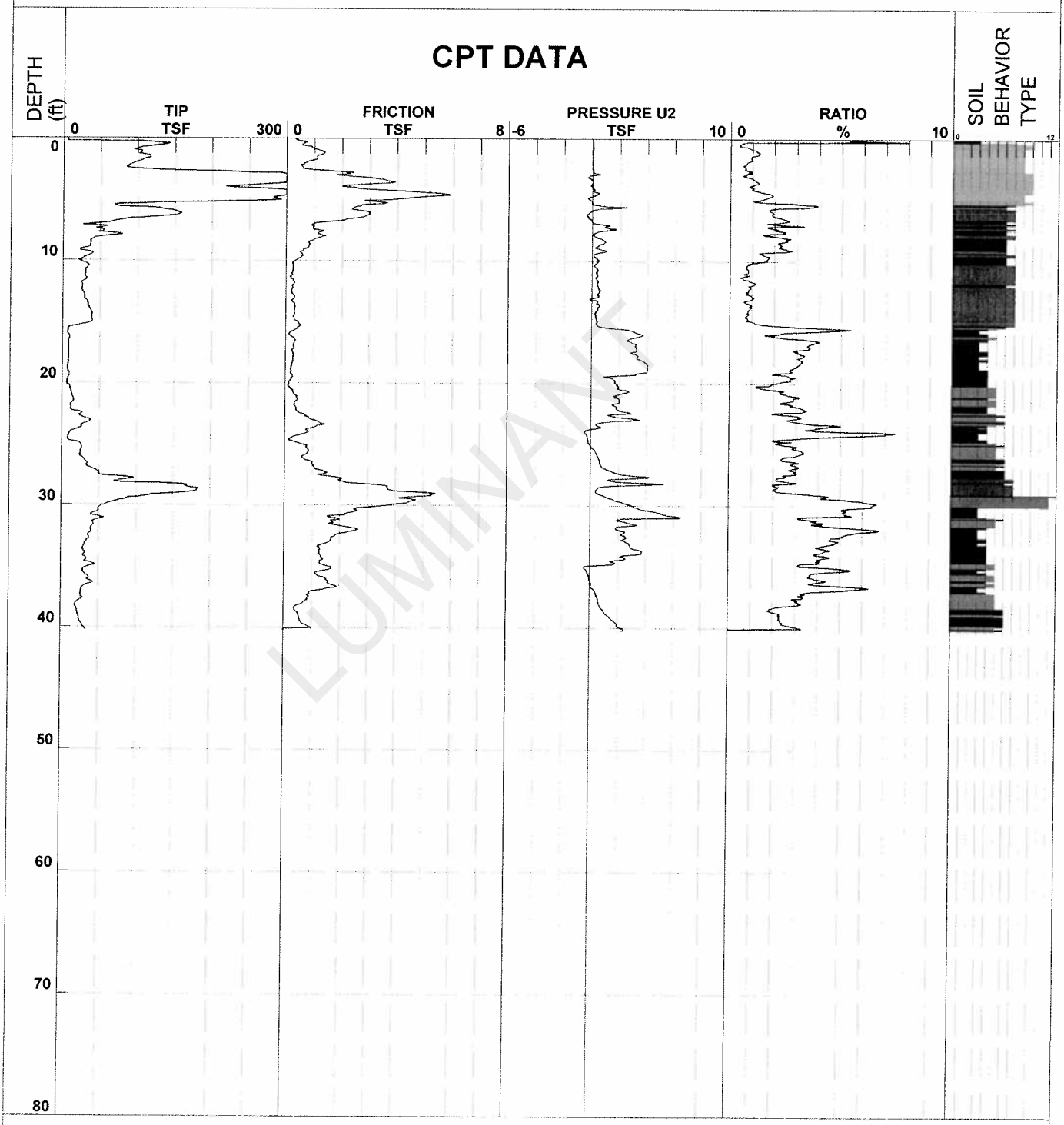


1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

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 (*)

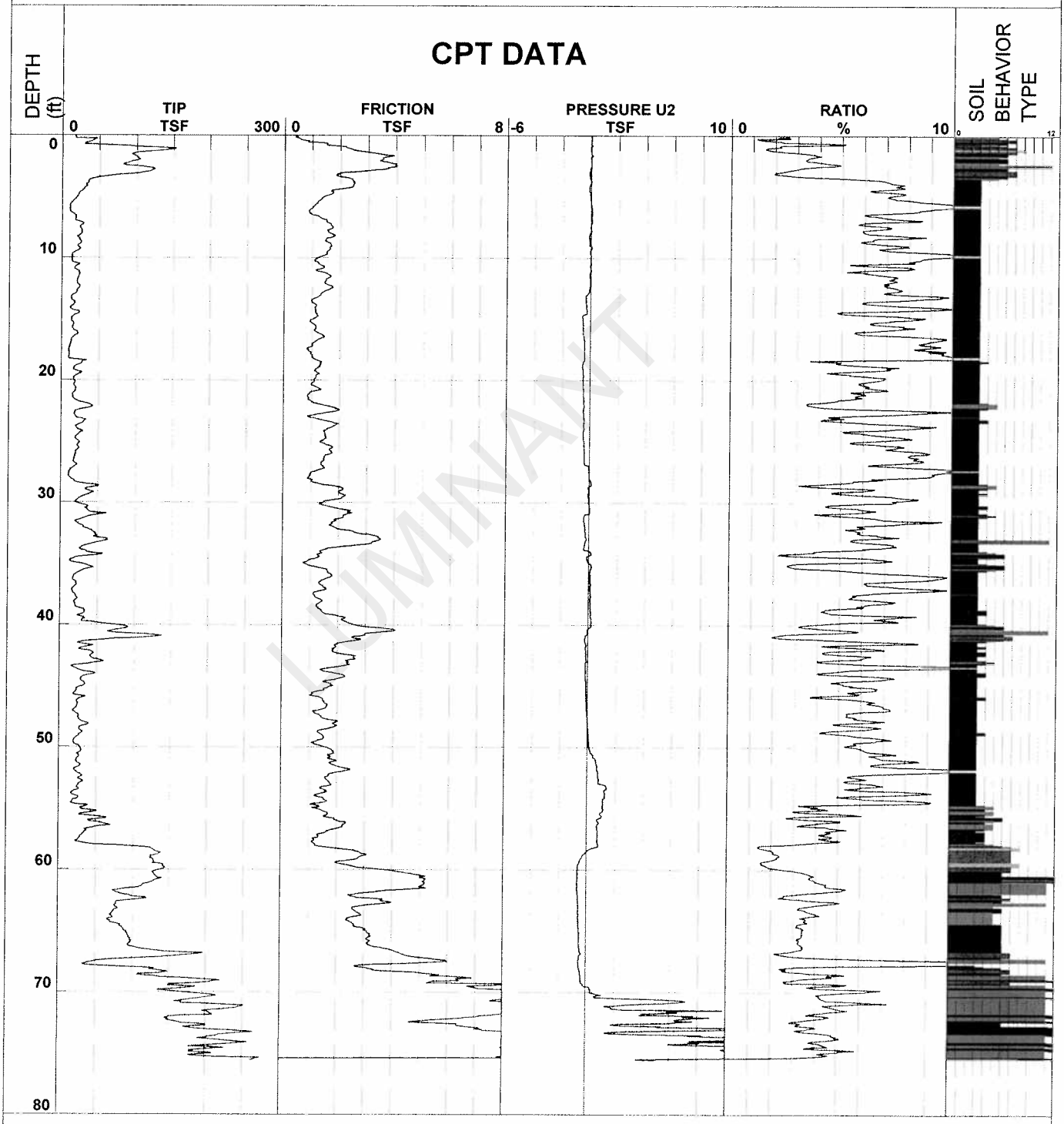
Robertson et al. 1986 * Overconsolidated or Cemented

CPT Data

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

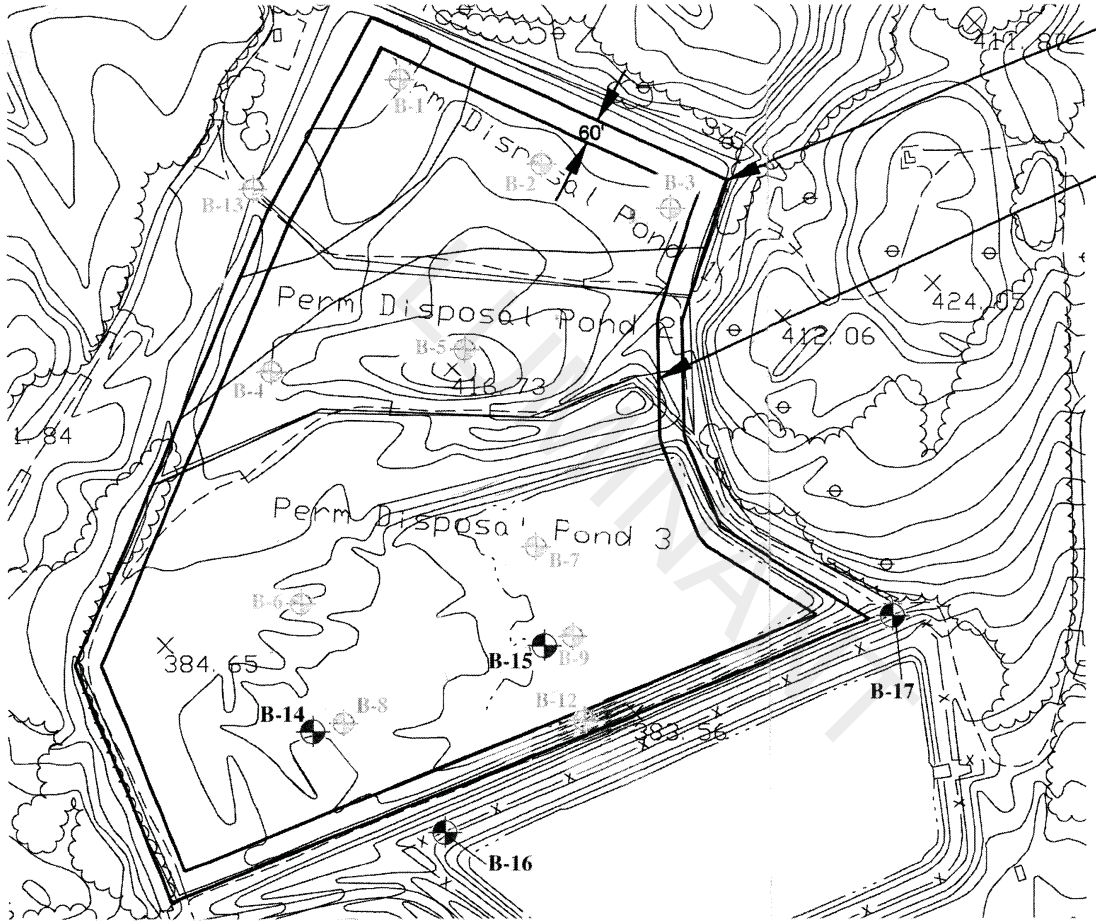
Operator GLENN JOHNSON | Date and T 16-Apr-2008 10:58:47 | Cone Number F7.5CKEW2/B 1866

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
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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

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Tyler, Texas 75702
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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
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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'

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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			

Golder Associates
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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			

Golder Associates
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Houston, Texas 77073
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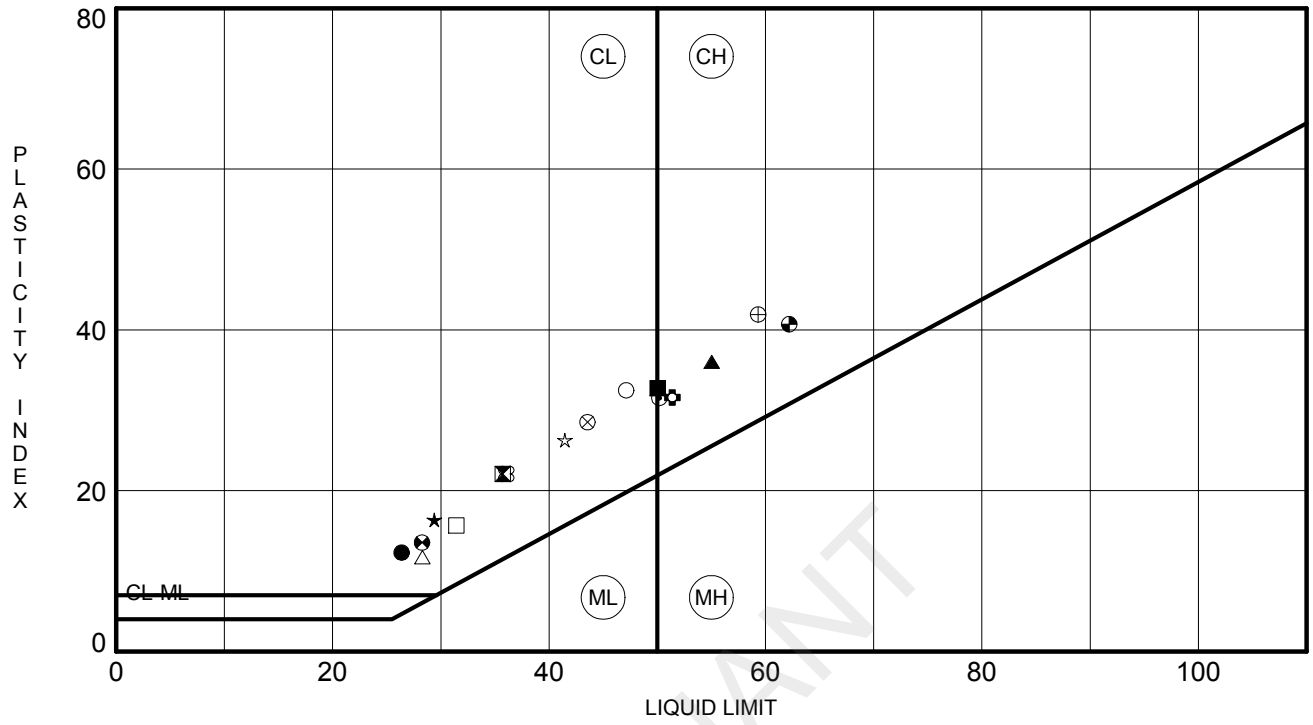
ATTERBERG LIMITS' RESULTS

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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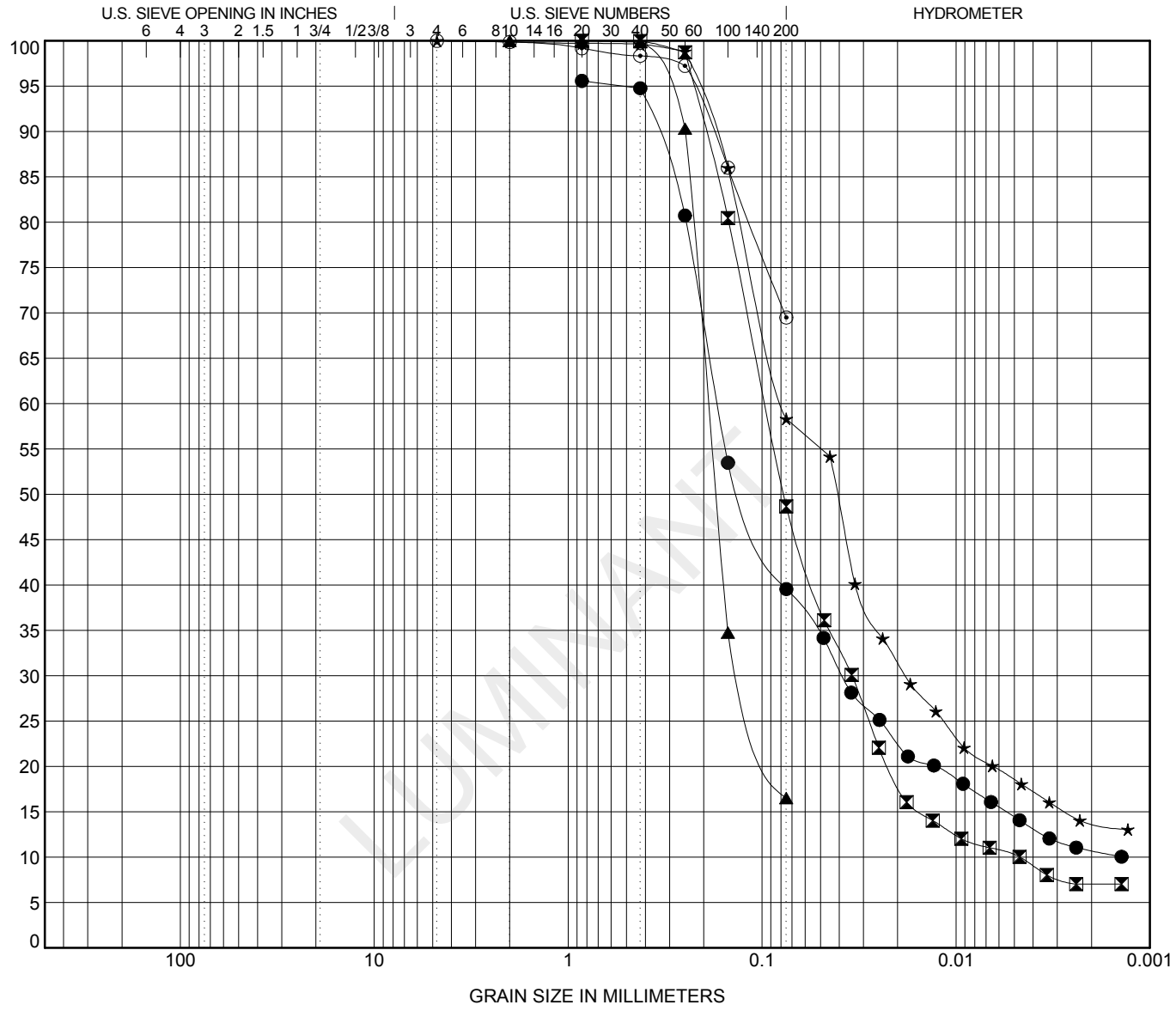
GRAIN SIZE DISTRIBUTION

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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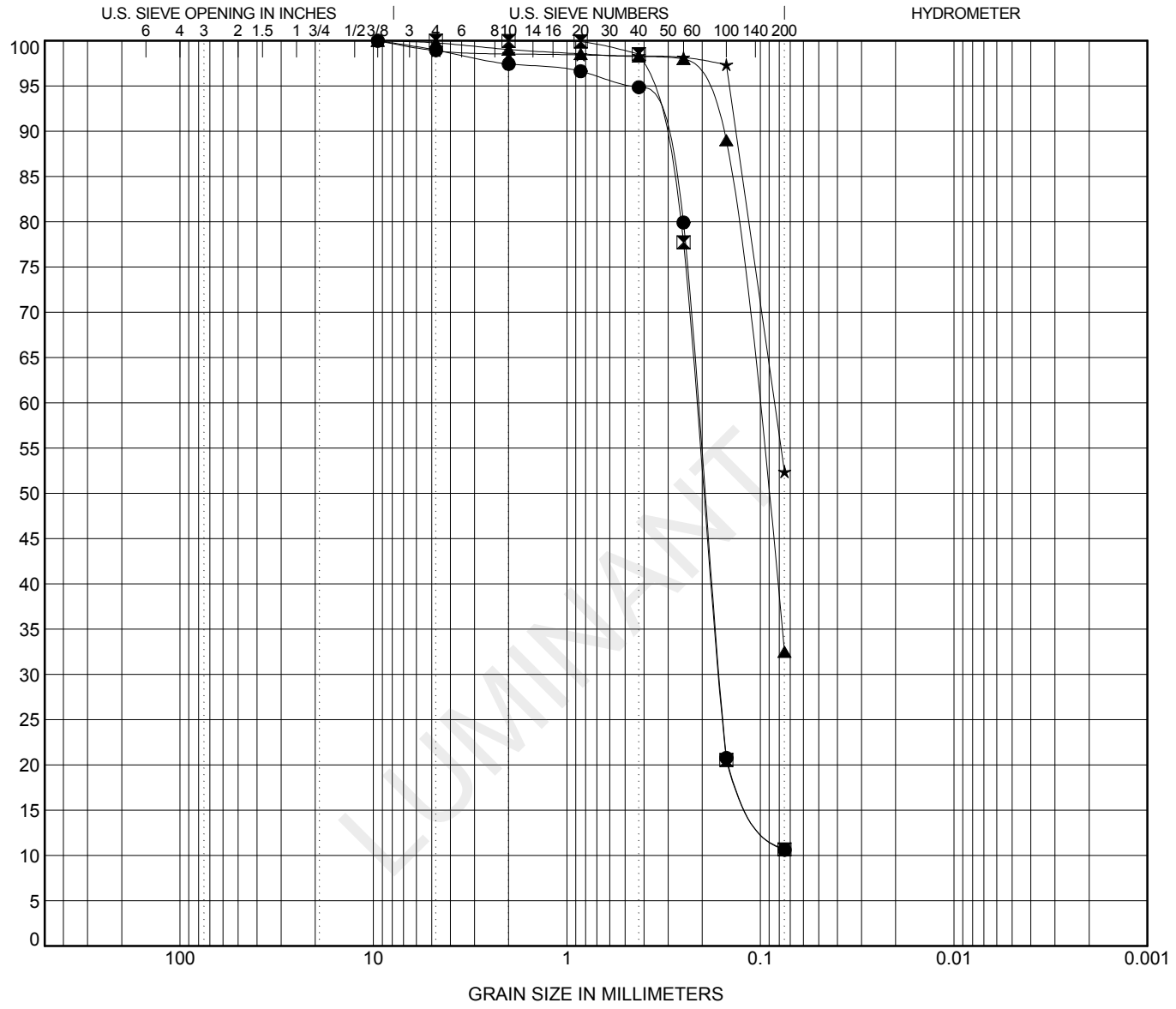
GRAIN SIZE DISTRIBUTION

CLIENT Luminant **PROJECT NAME** Pond Slope Stability

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

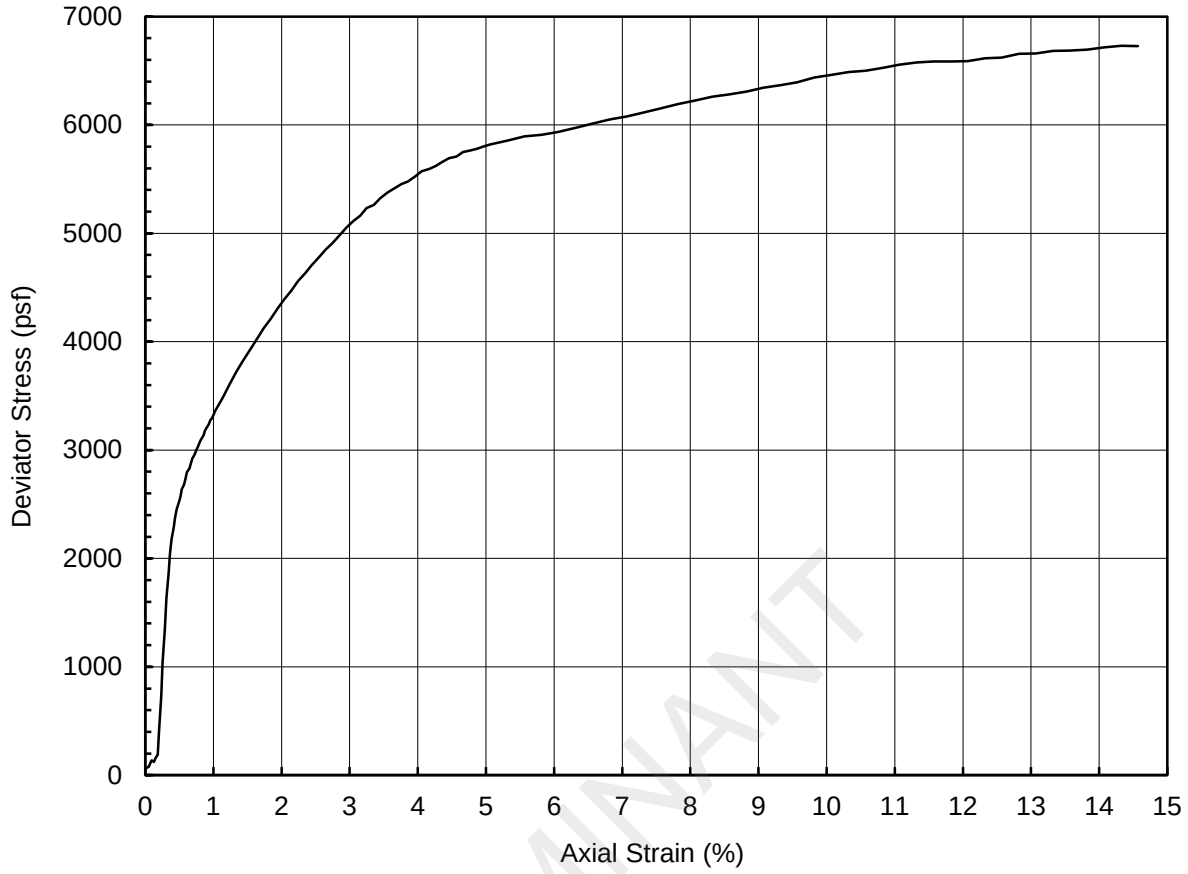


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	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**						

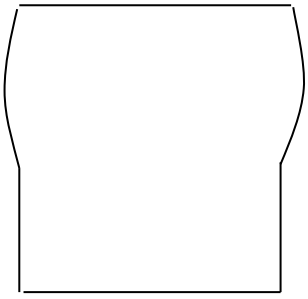
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-205**	**53**	**9.5**	**0.21**	**0.162**		**1.1**	**88.3**	**10.6**	
⧓	**BH-208**	**48**	**4.75**	**0.213**	**0.163**		**0.0**	**89.3**	**10.7**	
▲	**BH-210**	**48**	**9.5**	**0.105**			**0.2**	**67.2**	**32.5**	
★	**BH-211**	**28**	**9.5**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



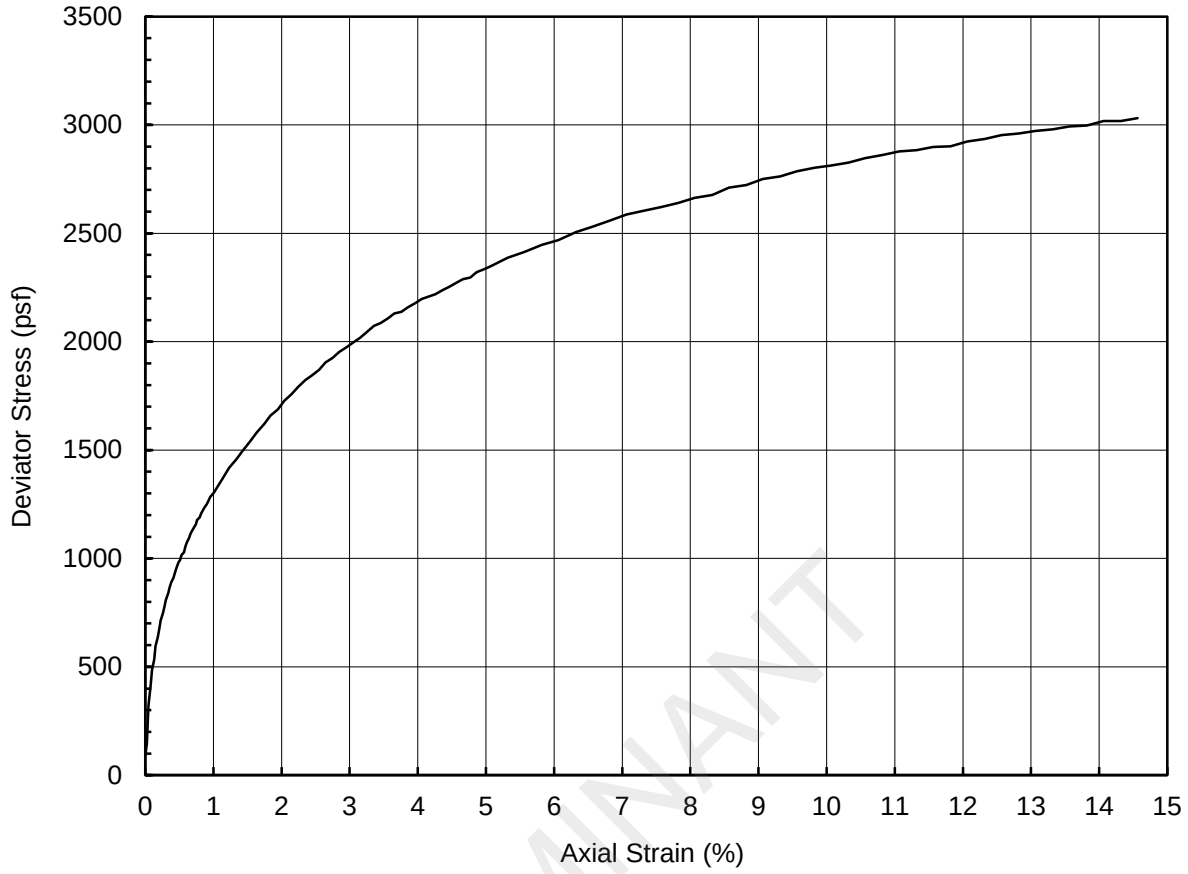
Failure Sketch

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

Golder Associates

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

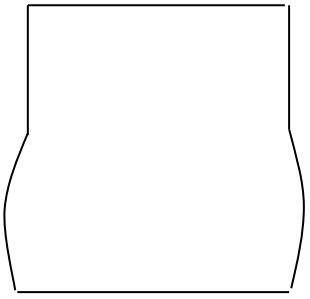
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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		

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



Failure Sketch

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

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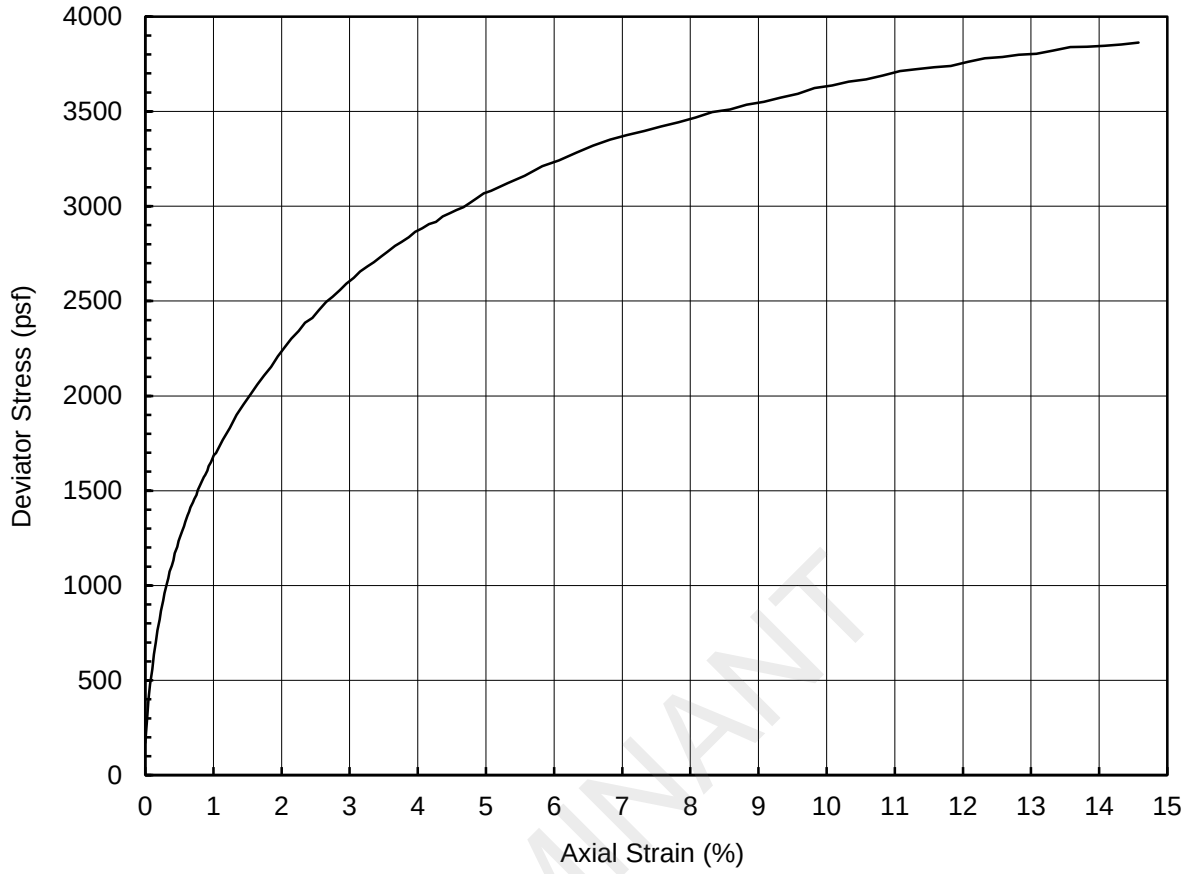
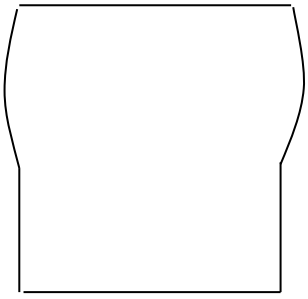
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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		



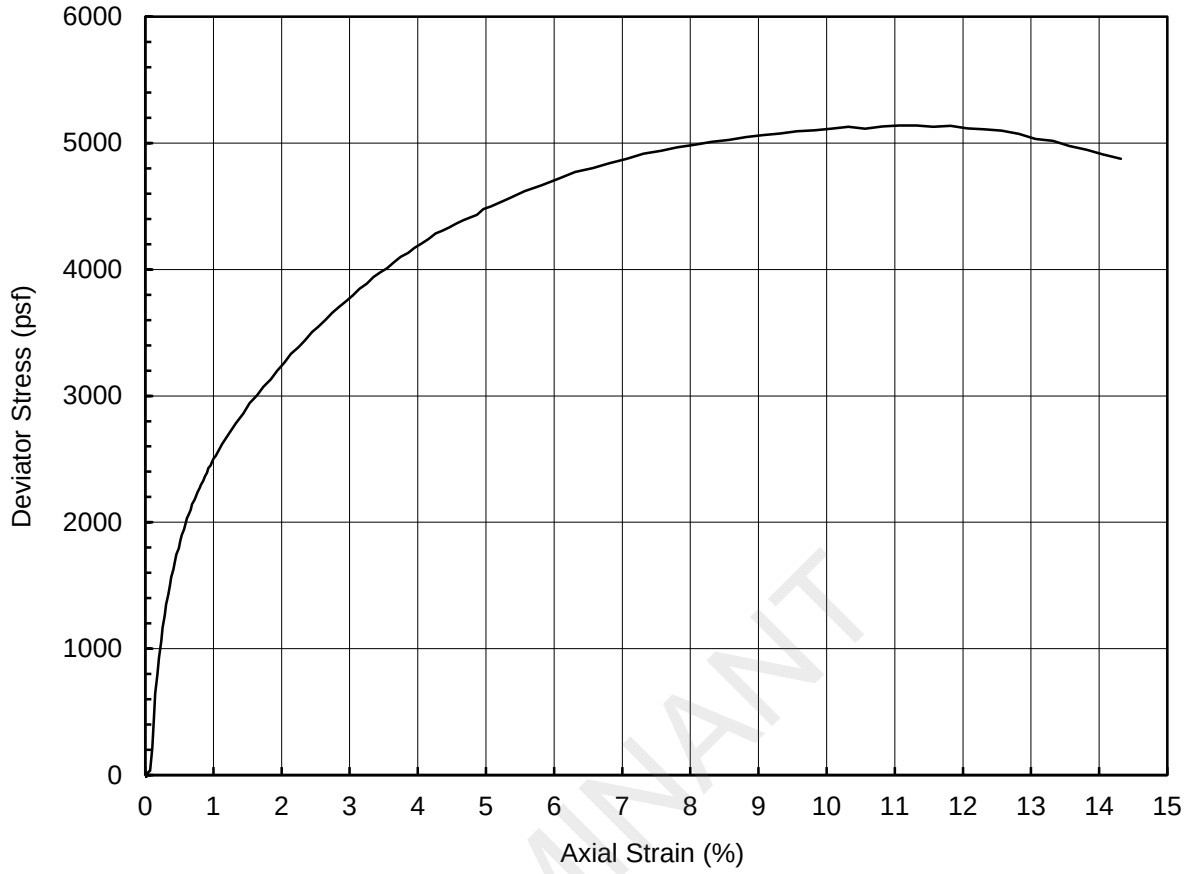
Failure Sketch

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

Golder Associates

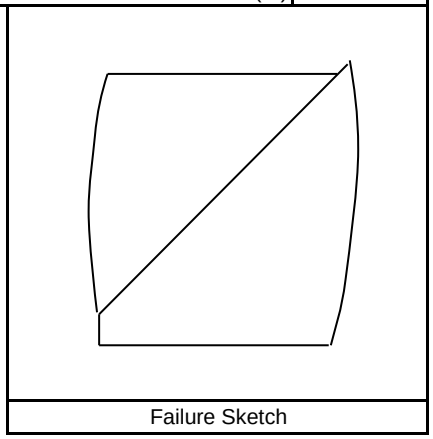
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



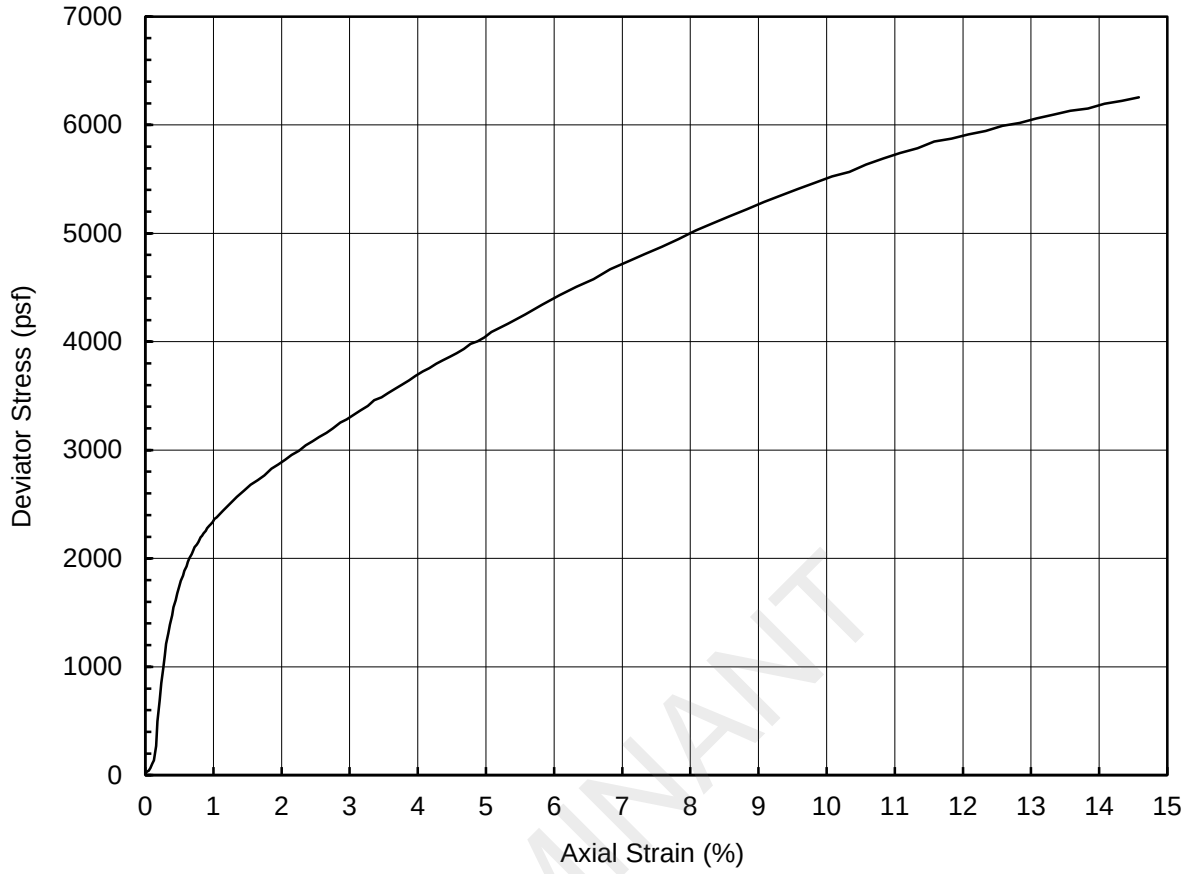
Failure Sketch

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

Golder Associates

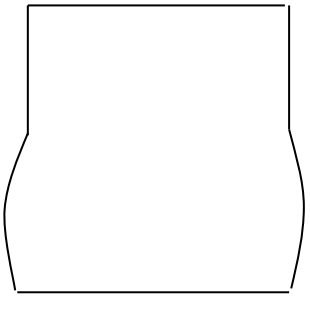
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



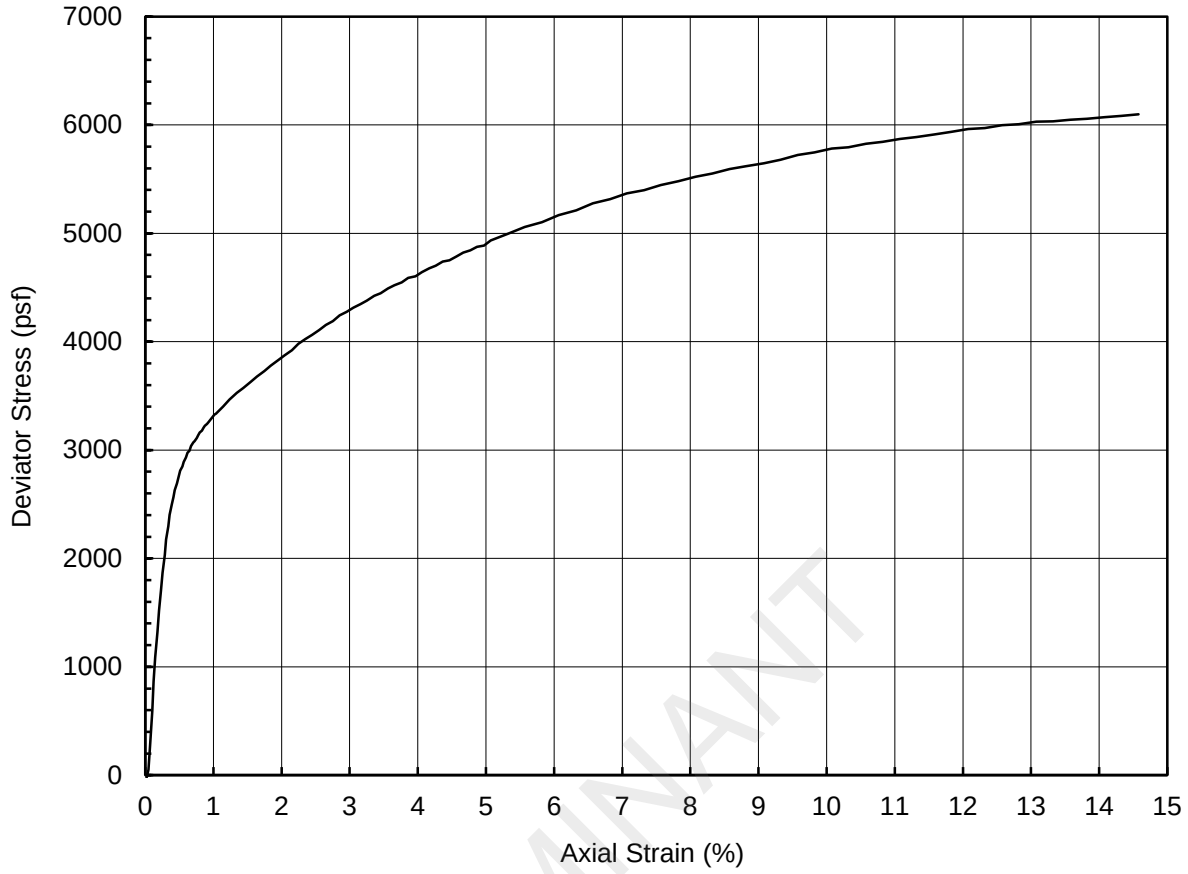
Failure Sketch

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

Golder Associates

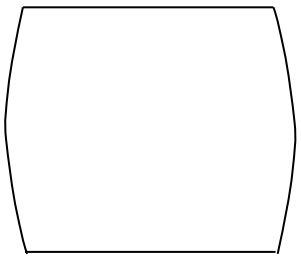
Performed by	**PN**
Date	**13-Nov-12**
Check	**HR**
Review	**SBK**

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		



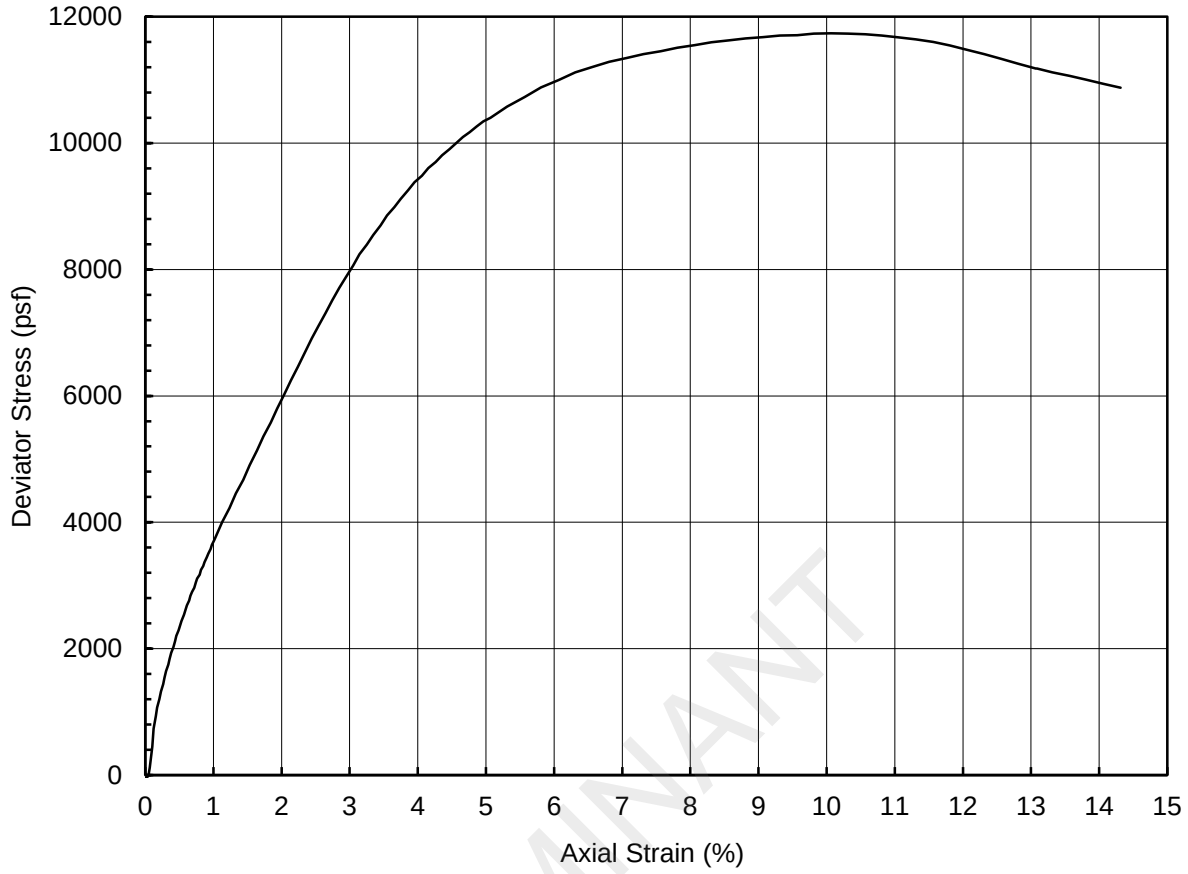
Failure Sketch

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

Golder Associates

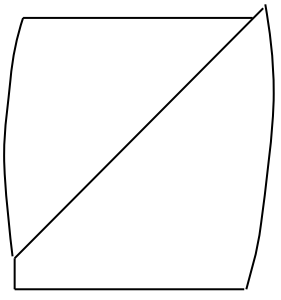
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

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		



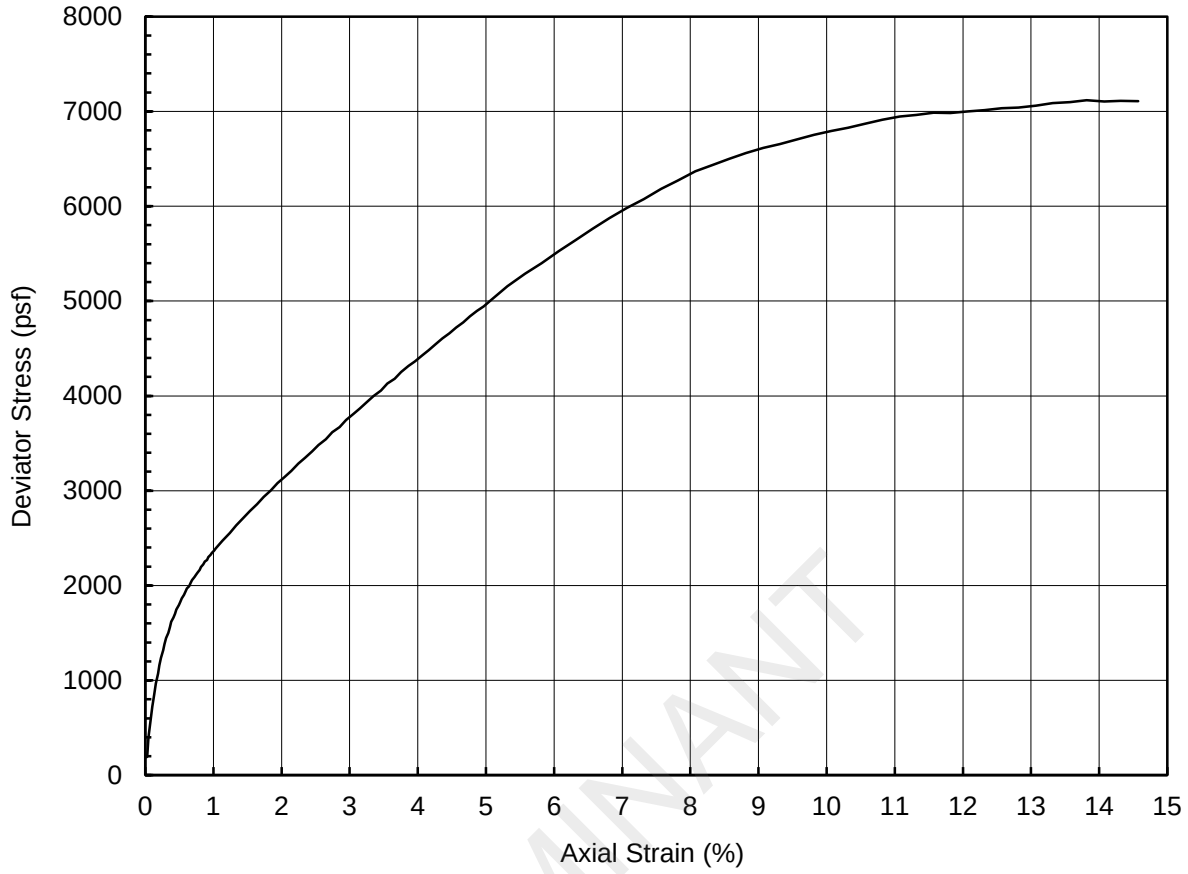
Failure Sketch

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

Golder Associates

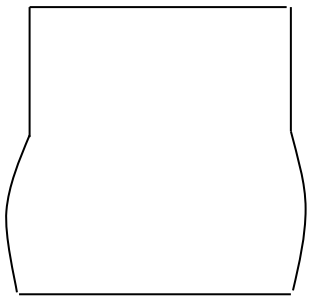
Performed by	**PN**
Date	**15-Nov-12**
Check	**HR**
Review	**JF**

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		



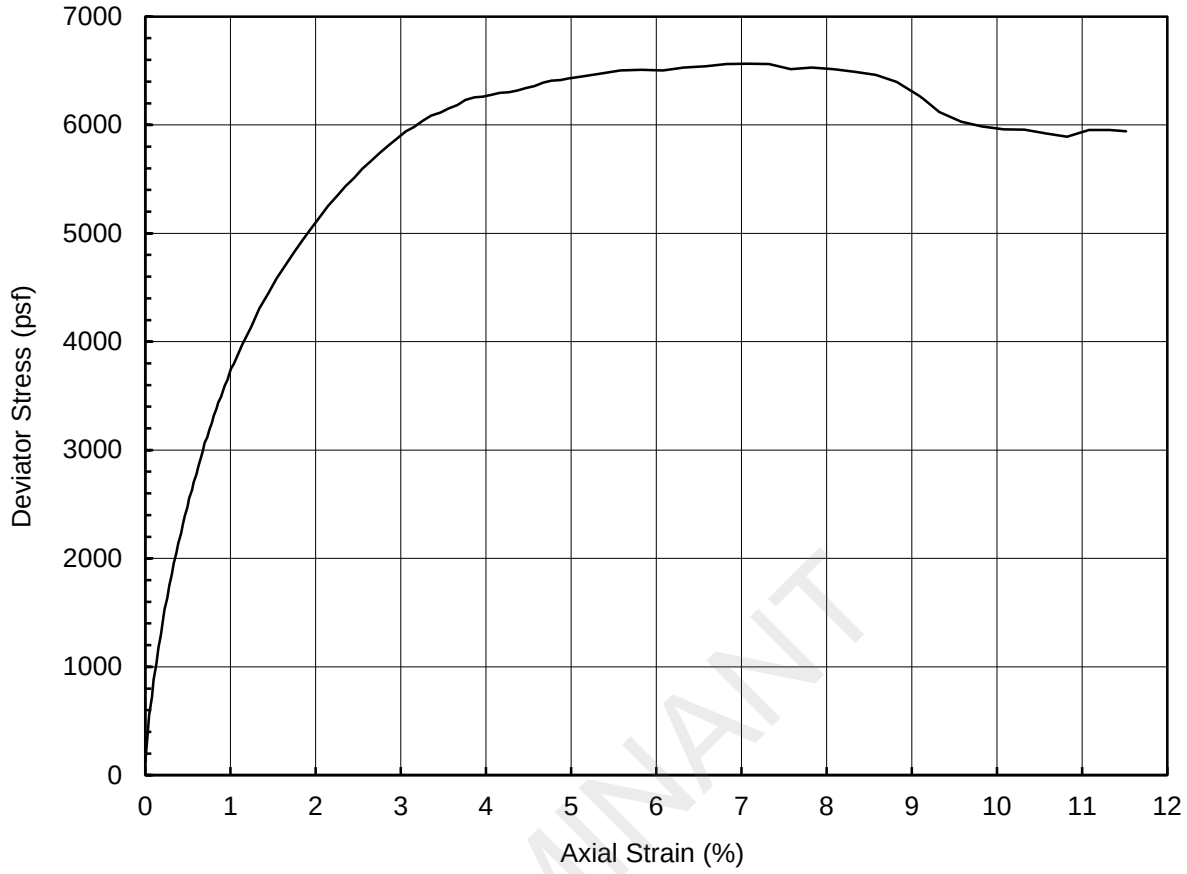
Failure Sketch

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

Golder Associates

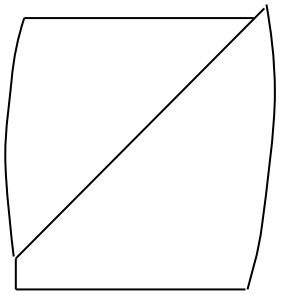
Performed by	**PN**
Date	**16-Nov-12**
Check	**HR**
Review	**JF**

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		



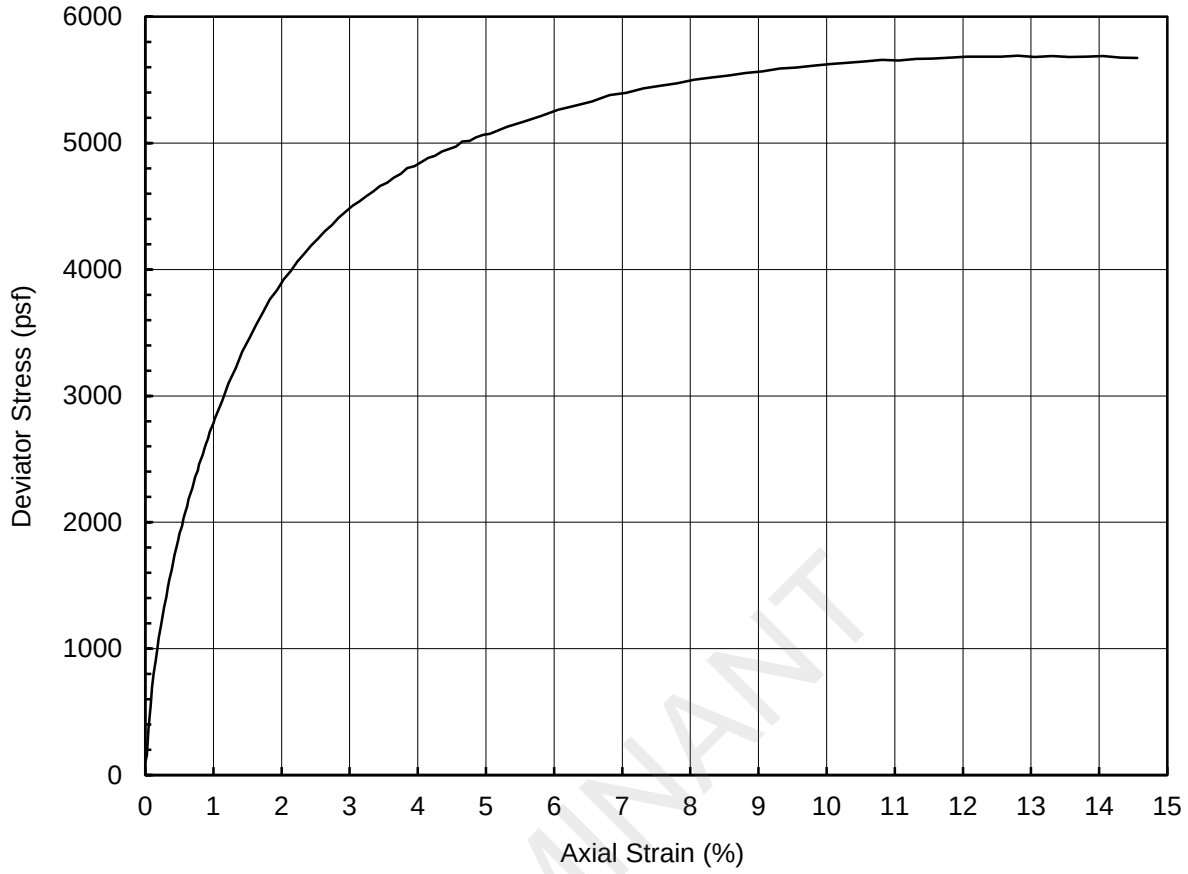
Failure Sketch

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

Golder Associates

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

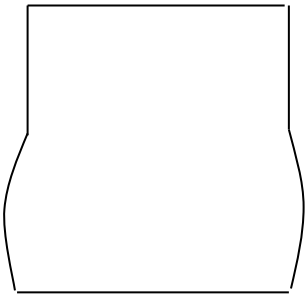
UNCONSOLIDATED / UNDRAINED COMPRESSIVE STRENGTH
ASTM D 2850



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 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, 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 :	15.45	%	16.00	%	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) =		
σ_1' Failure (psi) =	20.41	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	5.41	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	54.6	Cell Pressure (psi) =	60.0	

SPECIMEN NO. 2

	initial		final		Diameter			Height	
Moist soil & Tare :	549.80	g	656.40	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 :	19.56	%	18.01	%	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) =		
σ_1' Failure (psi) =	37.62	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	12.02	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	58.0	Cell Pressure (psi) =	70.0	

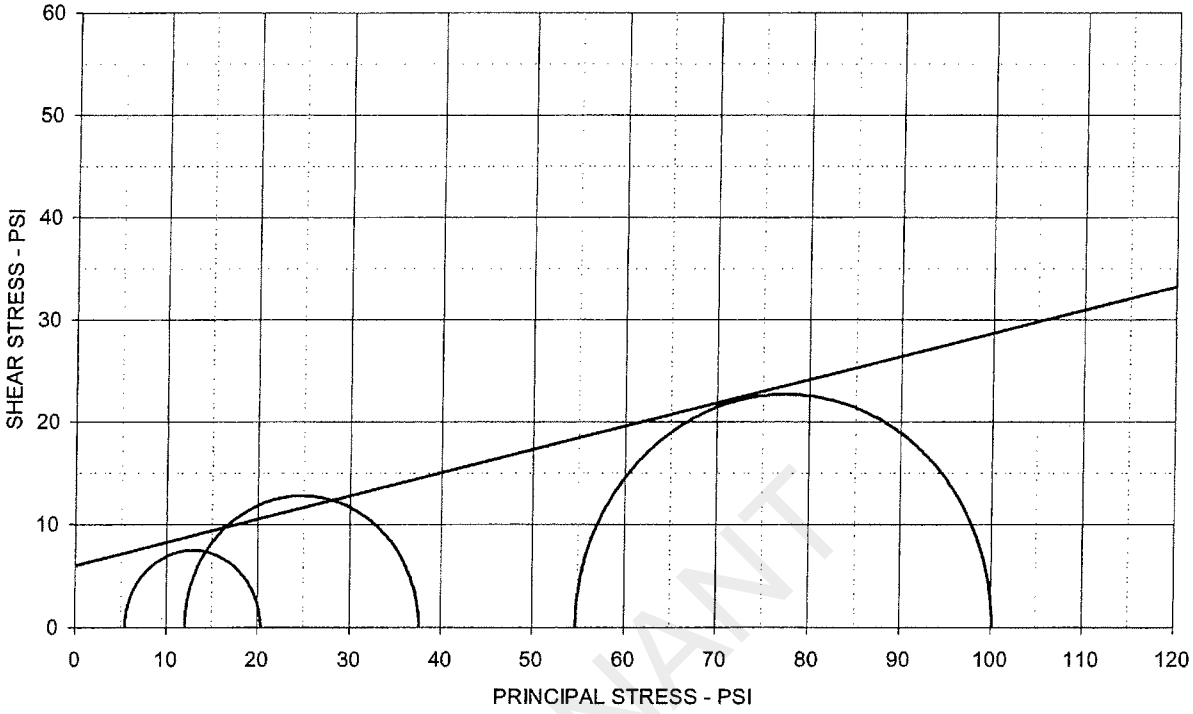
SPECIMEN NO. 3

	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 :	16.25	%	17.62	%	Avg	2.06	in	Ht4	4.54 in
Weight:	518.0	g						Avg Ht	4.54 in

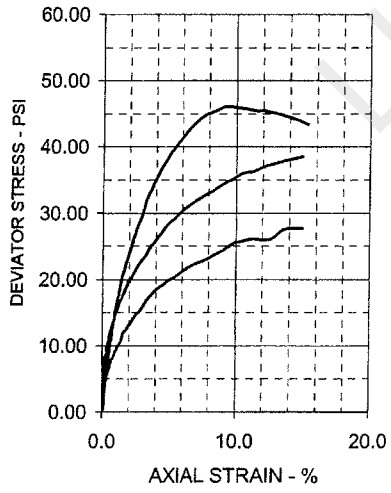
Change in Ht due to saturation :	-0.001	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.052	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.6	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.97		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	8.5	Effective Cell Pressure (psi) =		
σ_1' Failure (psi) =	100.17	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	54.77	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		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

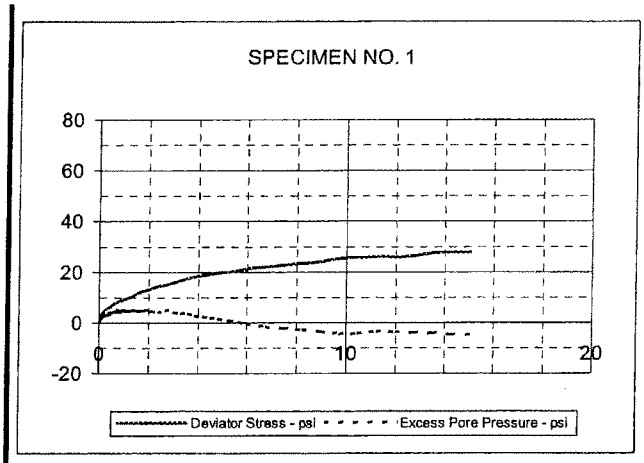
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay
Sampled on Site, B-13 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-13, 3'-10' Fill

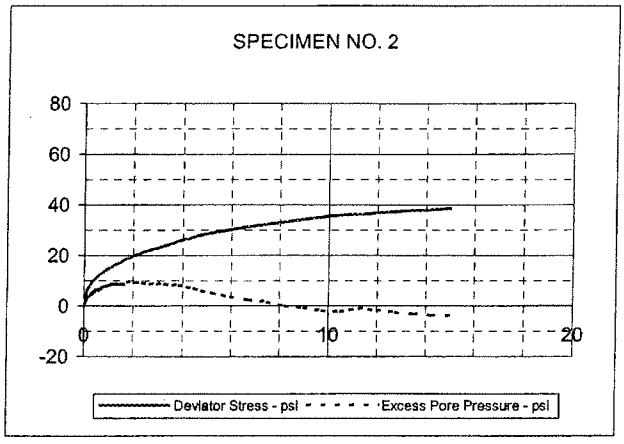
PROJECT INFORMATION

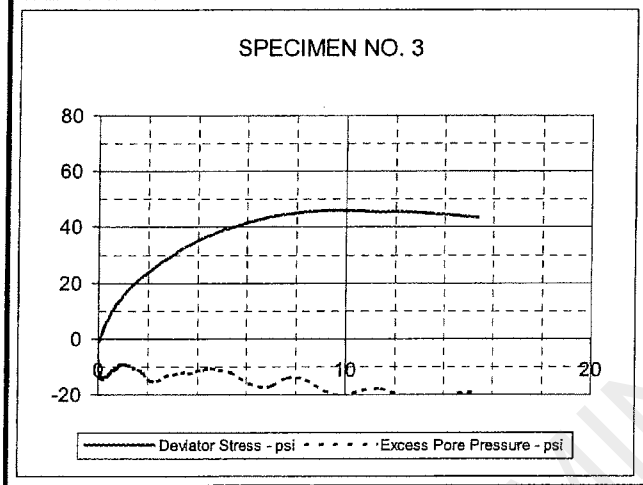
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

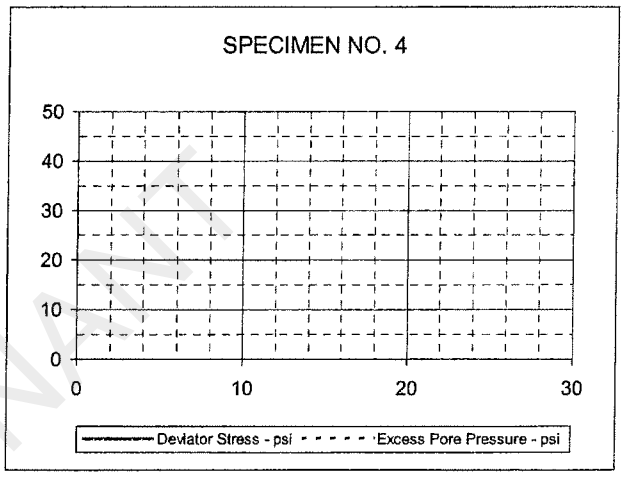
ETTL ENGINEERS & CONSULTANTS

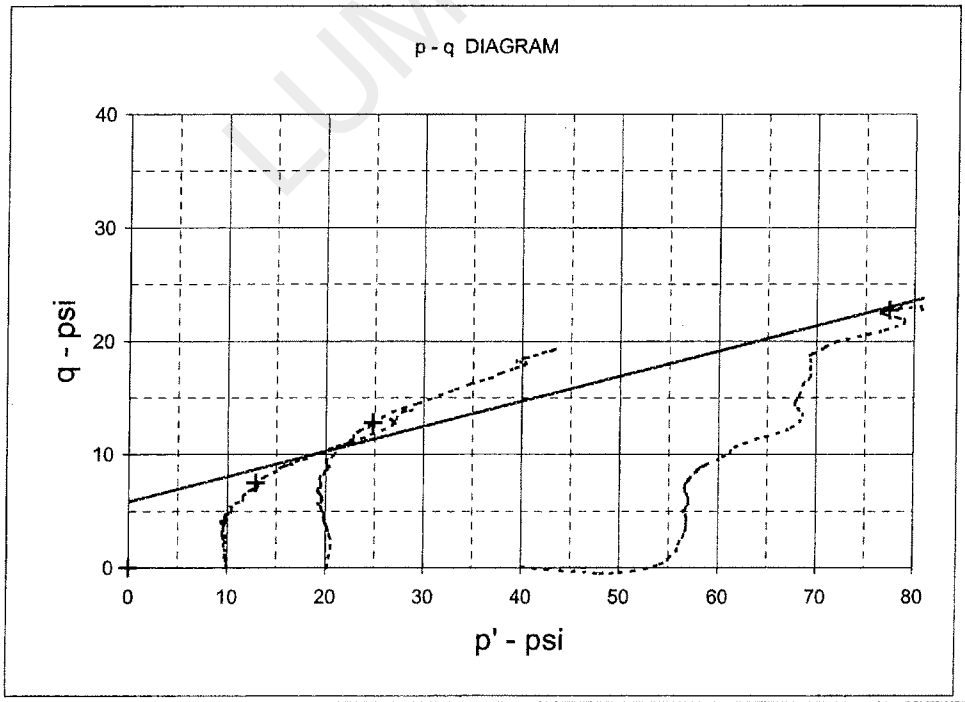
PLATE: B.1







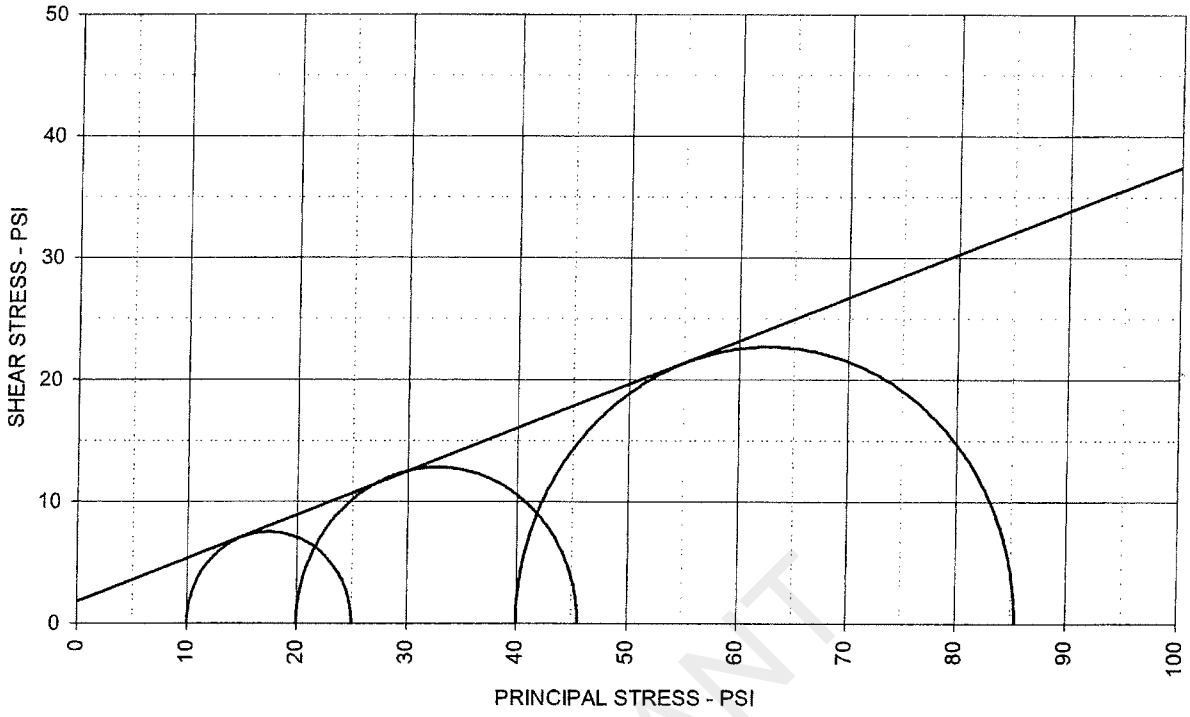




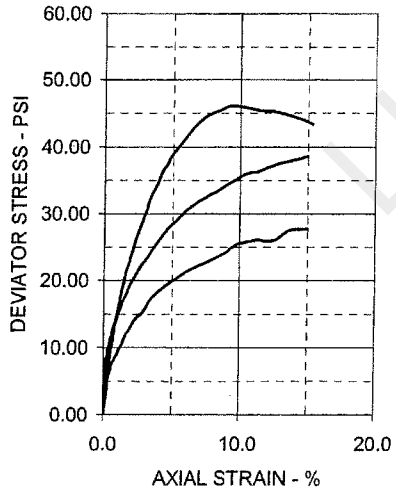
EFFECTIVE STRESS PARAMETERS	R^2 = 0.97	α (deg) = 12.5	a (psi) = 5.8
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan, Brown & Red Sandy Lean Clay			

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

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 :	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 :	18.51	%	14.37	%	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) =	96.26	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	537.80	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 :	16.05	%	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	

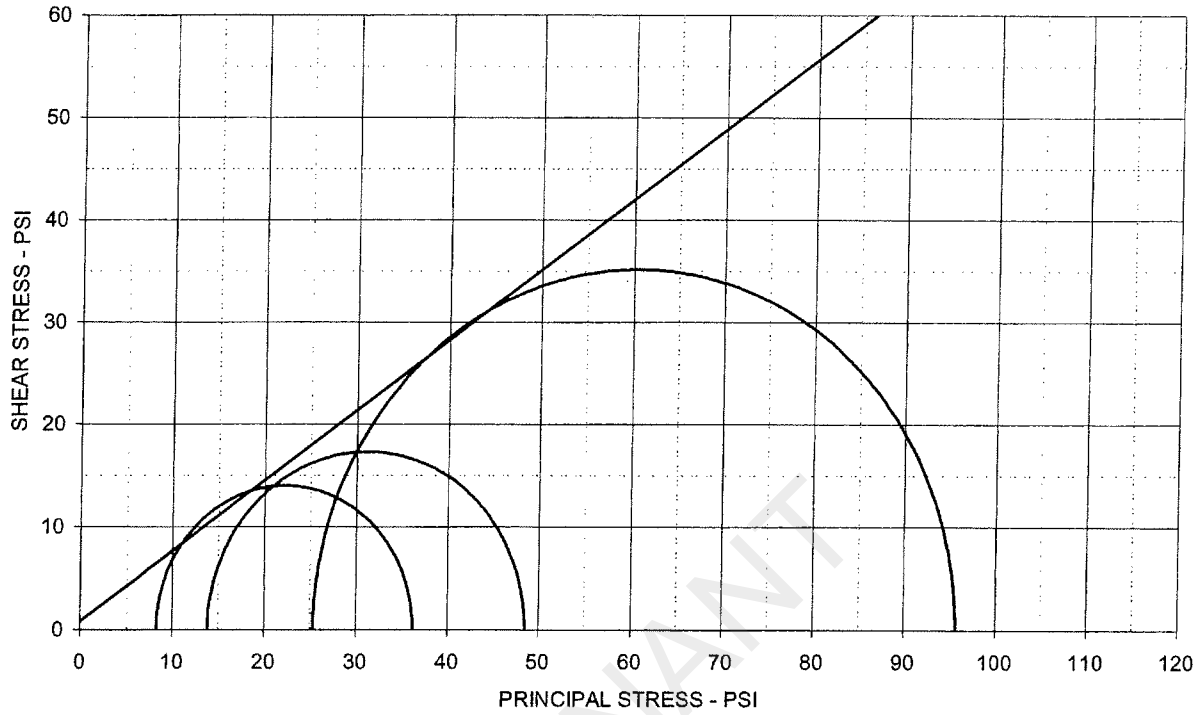
SPECIMEN NO. 3

	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	%	11.51	%	Avg	2.11	in	Ht4	4.62 in
Weight:	579.6	g						Avg Ht	4.62 in

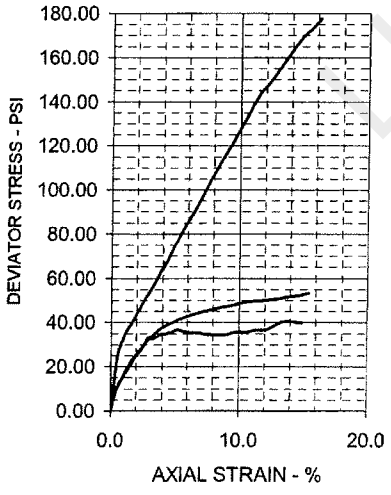
Change in Ht due to saturation :	-0.021	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.018	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	5.4	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.99		At test dry density:	pcf

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

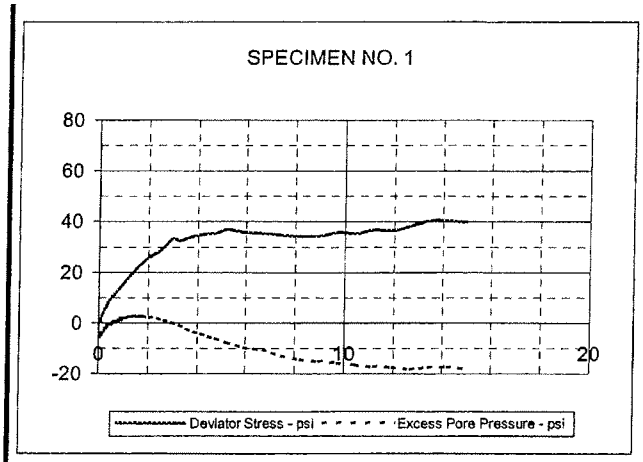
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Sample
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel
Sampled on Site, B-2 8' to 20' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-2, 8'-20' Native

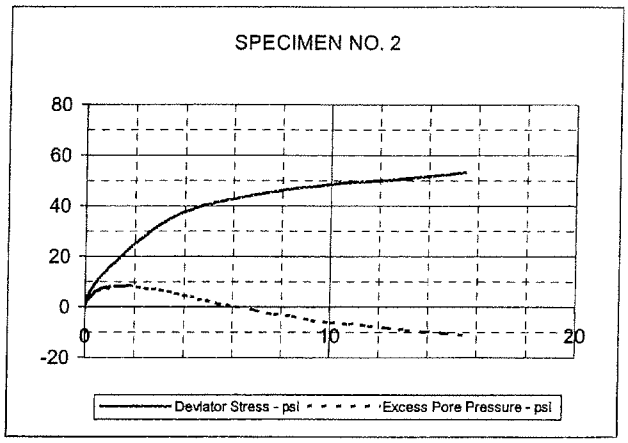
PROJECT INFORMATION

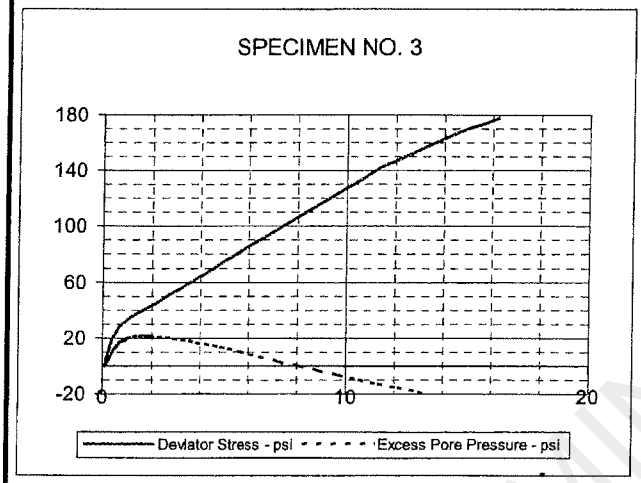
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

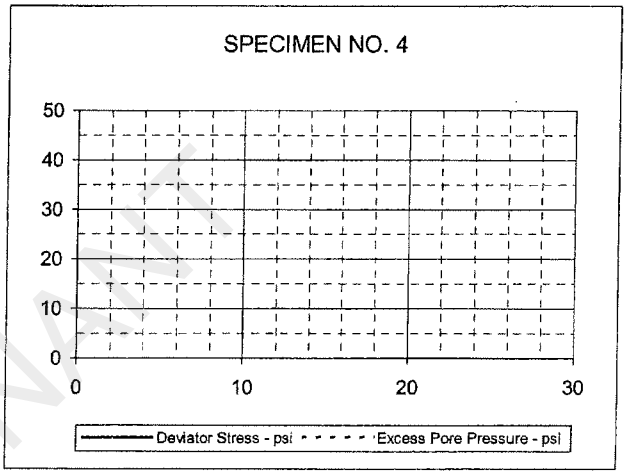
ETTL ENGINEERS & CONSULTANTS

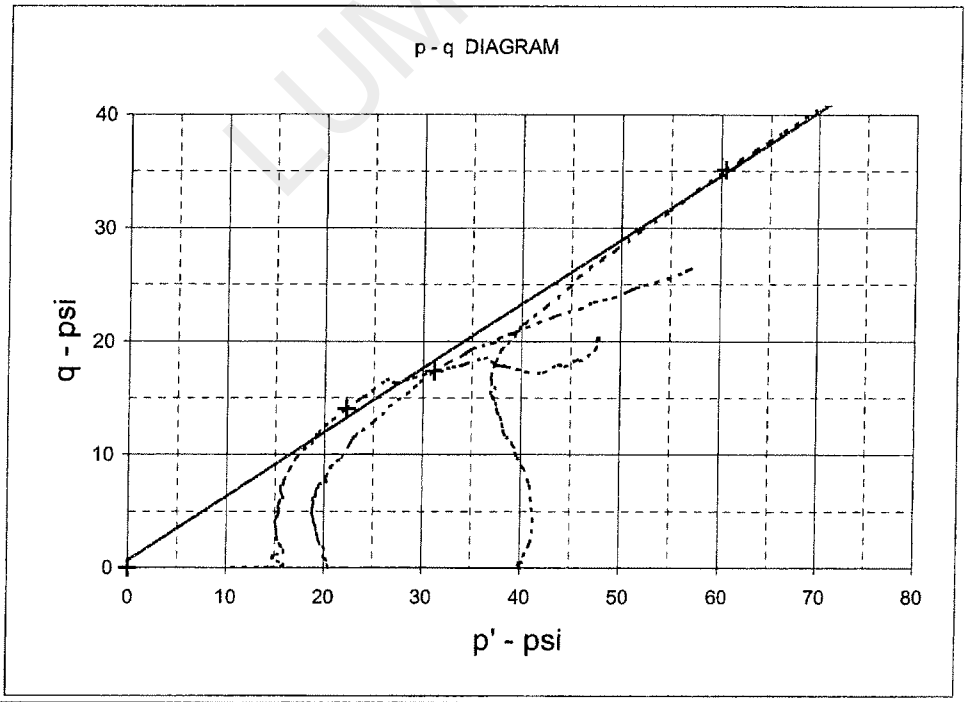
PLATE: B.1







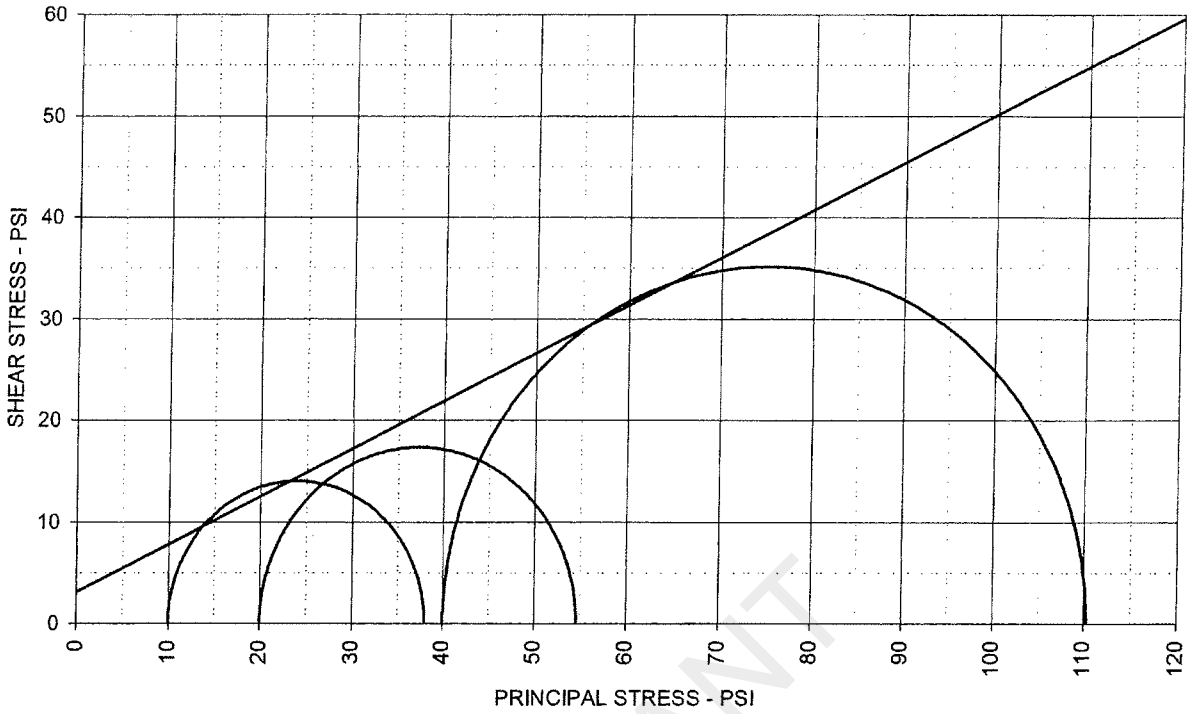




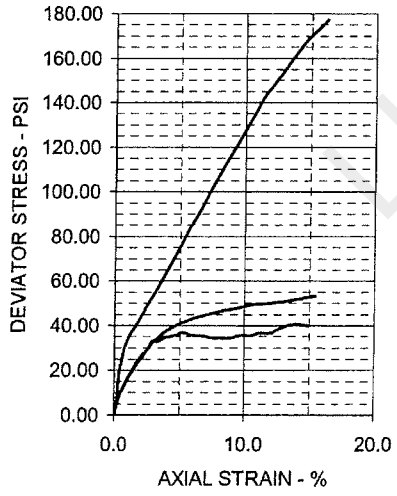
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 29.5	a (psi) = 0.7
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Gray, Tan & Redd. Br Sandy Clay w/ some Gravel			

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 - 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: 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 :	462.00	g	548.00	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	%	15.31	%	Avg	2.07	in	Ht4	4.23 in
Weight:	493.2	g						Avg Ht	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) =		
σ_1' Failure (psi) =	29.29	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	6.35	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		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 :		%		%	Avg		in	Ht4	4.25 in
Weight:	462.2	g						Avg Ht	in

Change in Ht due to saturation :	-0.009	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.033	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) =		
σ_1' Failure (psi) =	40.52	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	14.53	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		Total Pore Pressure =	55.5	Cell Pressure (psi) =	70.0	

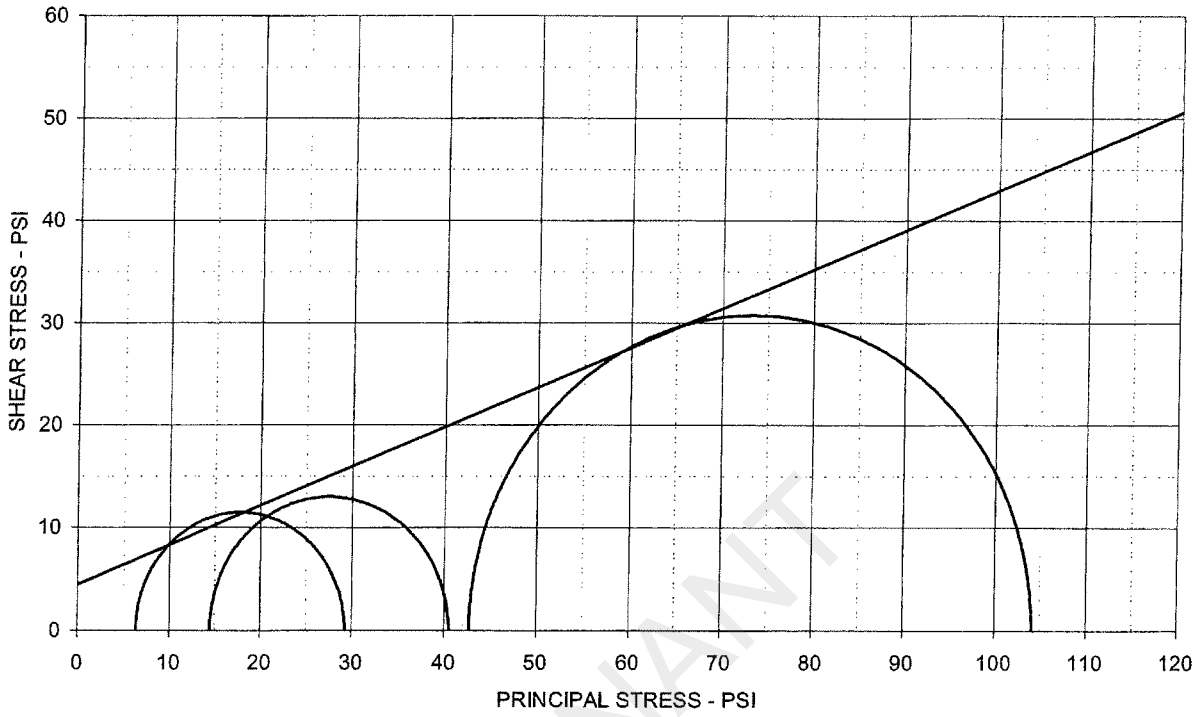
SPECIMEN NO. 3

	initial		final		Diameter			Height	
Moist soil & Tare :	491.00	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 :		%		%	Avg		in	Ht4	4.26 in
Weight:	510.5	g						Avg Ht	in

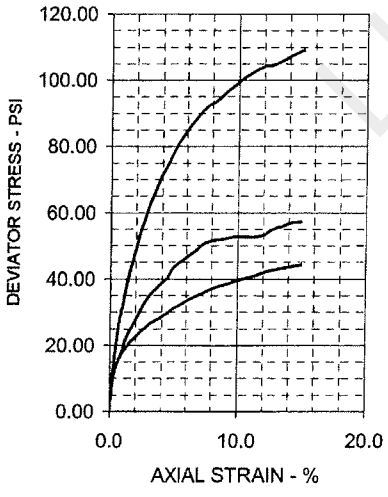
Change in Ht due to saturation :	-0.017	in	Initial specimen vol :	cc
Change in Ht due to consolidation :	-0.039	in	At test specimen vol :	cc
Change in pipet vol due to consolidation :	4.6	cc	Initial dry density :	pcf
Saturation Parameter " B " =	0.97		At test dry density:	pcf

Strain Rate (in/min) =	0.0005	Failure Strain % =	3.0	Effective Cell Pressure (psi) =		
σ_1' Failure (psi) =	104.13	σ_1 Failure (psi) =		Estimated ν =	0.35	
σ_3' Failure (psi) =	42.71	σ_3 Failure (psi) =		Back Pressure (psi) =	50.0	
ΔU =		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

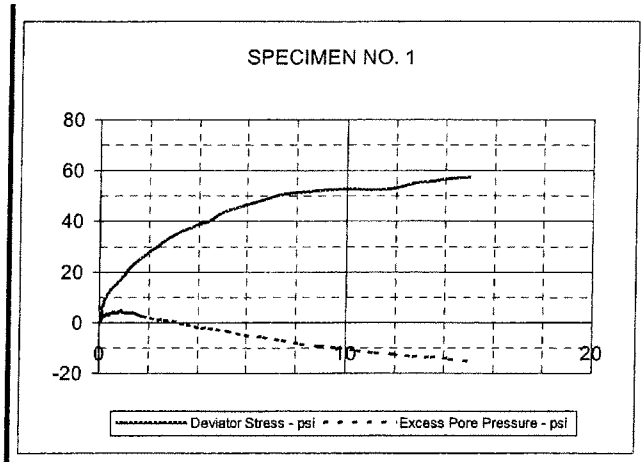
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Possible Fill Sample
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots
Sampled on Site, B-1 3' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Both Ends & Diameter Trimmed + # 4 Sieve
G 2972-08, B-1, 3'-10' Fill

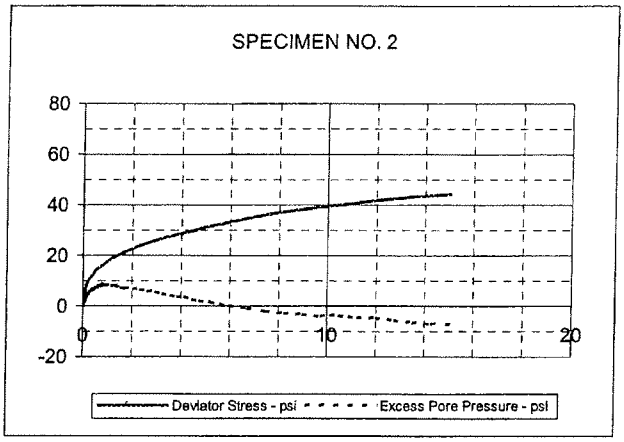
PROJECT INFORMATION

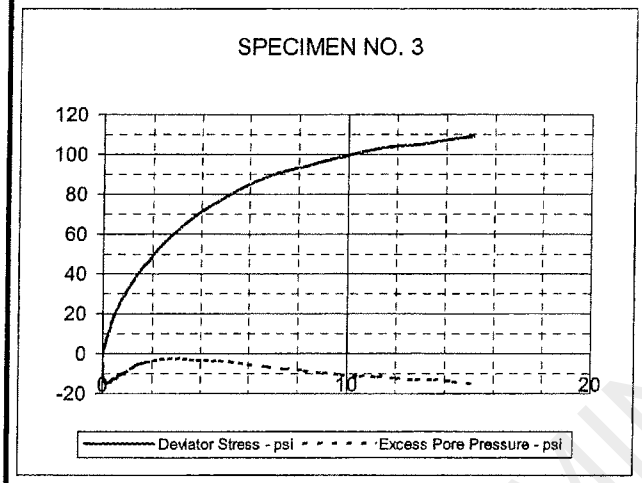
PROJECT: Luminant East Ash Disposal
LOCATION: Rusk County, Texas
PROJECT NO: G 2972 - 08
CLIENT:
Movember 2008

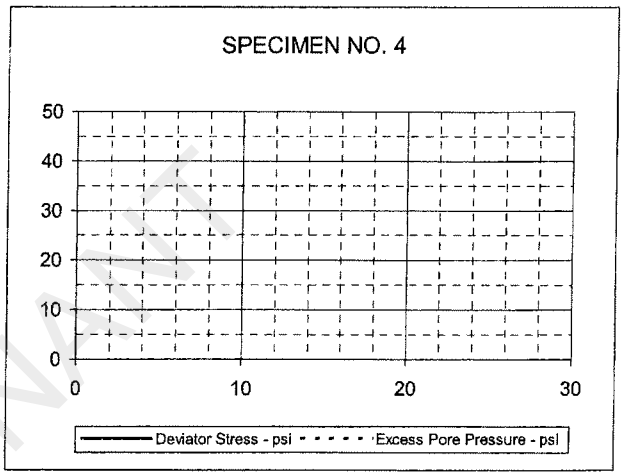
ETTL ENGINEERS & CONSULTANTS

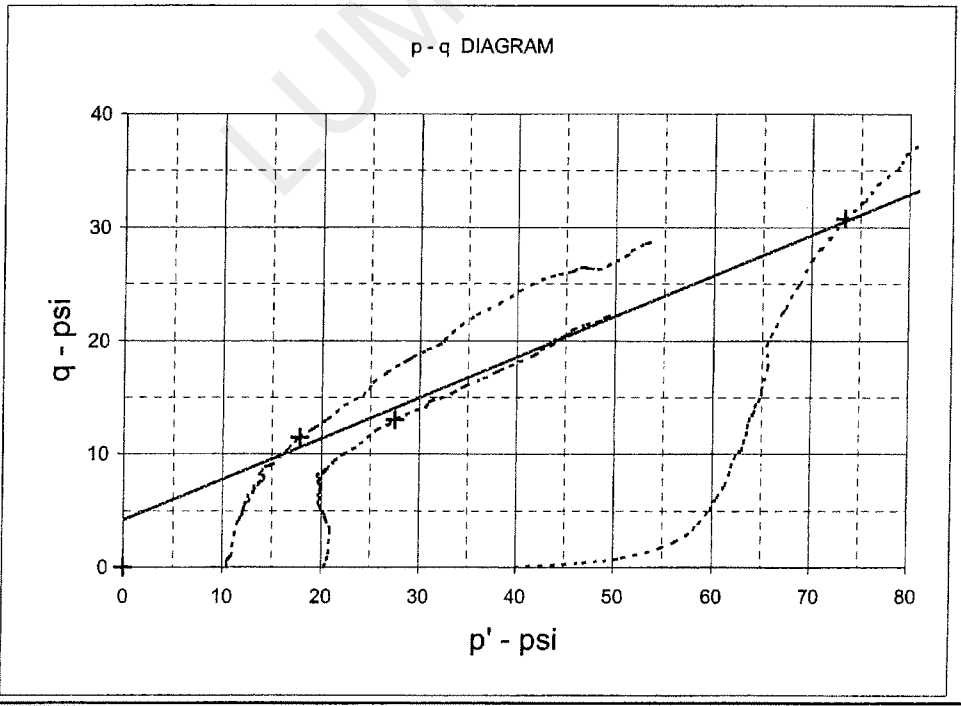
PLATE: B.1







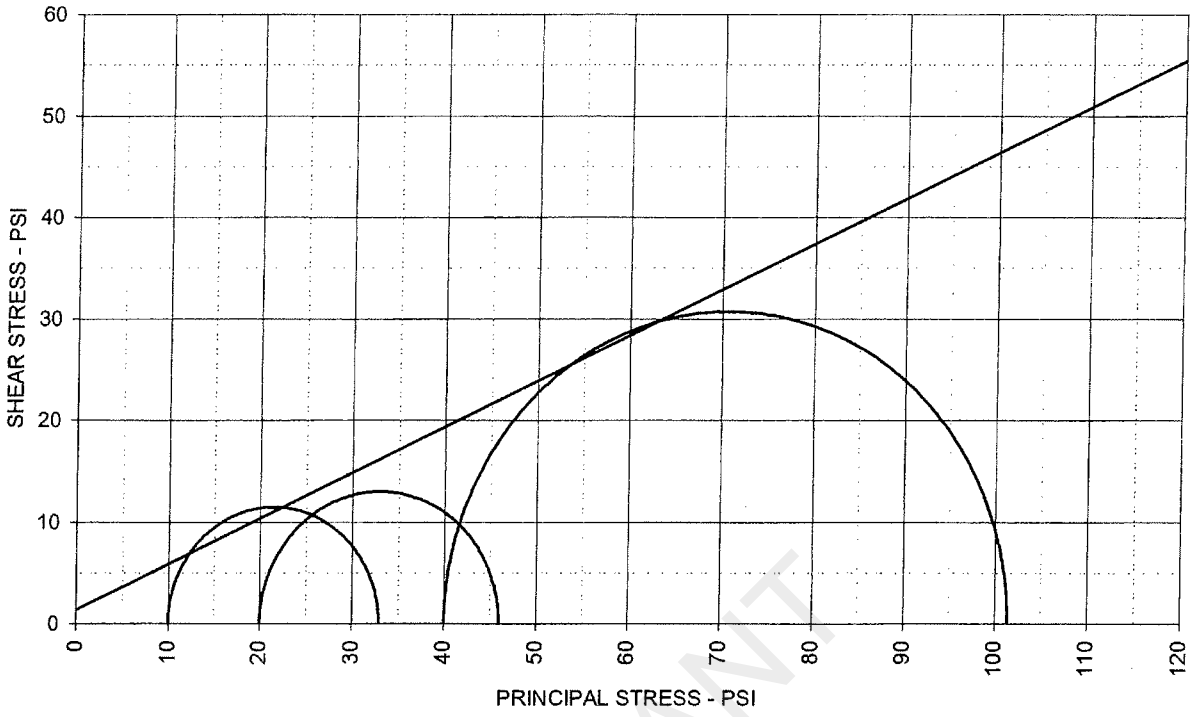




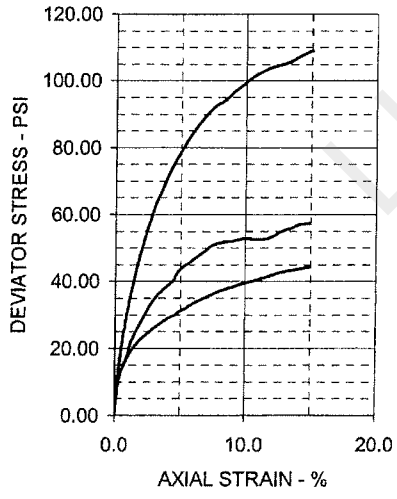
EFFECTIVE STRESS PARAMETERS	R^2 = 0.99	α (deg) = 19.7	a (psi) = 4.2
PROJECT: Luminant East Ash Disposal		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 2972 - 08		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay w/ Roots			

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

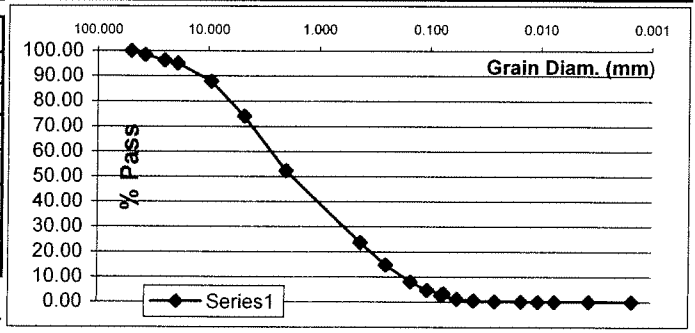
	Mc Hydrom
Tare Wt	29.89
Wet Wt.	68.94
Dry Wt	68.90
MC	0.1025%

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

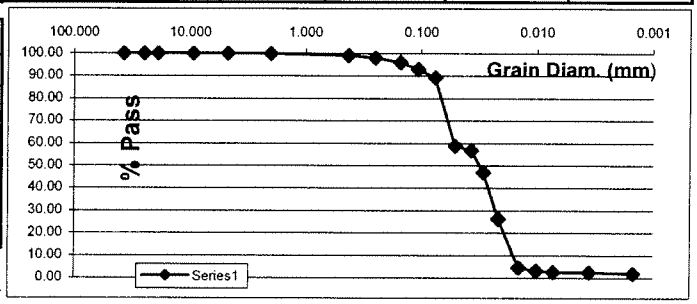
	Mc Hydrom
Tare Wt	29.50
Wet Wt.	62.41
Dry Wt	62.32
MC	0.2742%

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

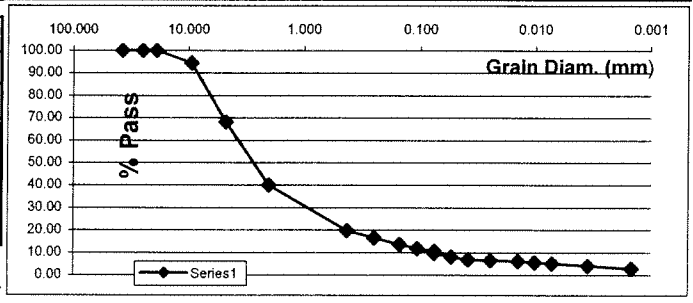
Mc Hydrom	
Tare Wt	30.03
Wet Wt.	45.86
Dry Wt	45.80
MC	0.3805%

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

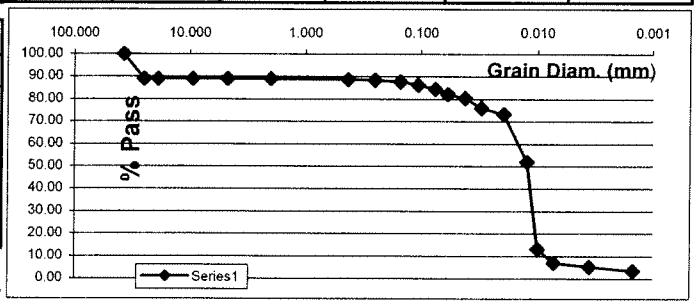
	Mc Hydrom
Tare Wt	29.86
Wet Wt.	51.33
Dry Wt	51.25
MC	0.3740%

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

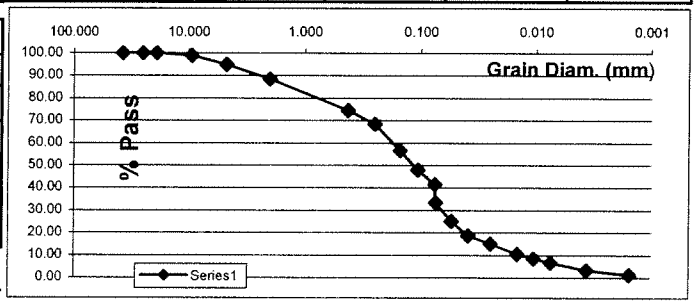
	Mc Hydrom
Tare Wt	29.43
Wet Wt.	65.41
Dry Wt	65.07
MC	0.9540%

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

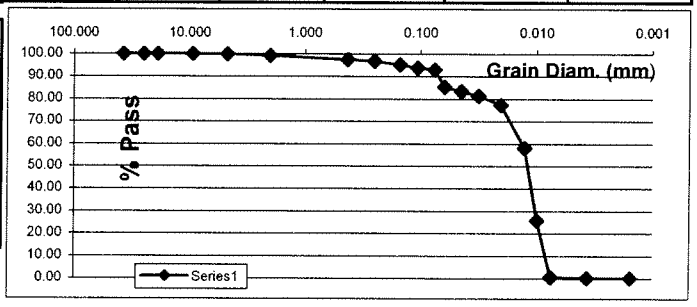
	Mc Hydrom
Tare Wt	29.91
Wet Wt.	55.02
Dry Wt	54.60
MC	1.7011%

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

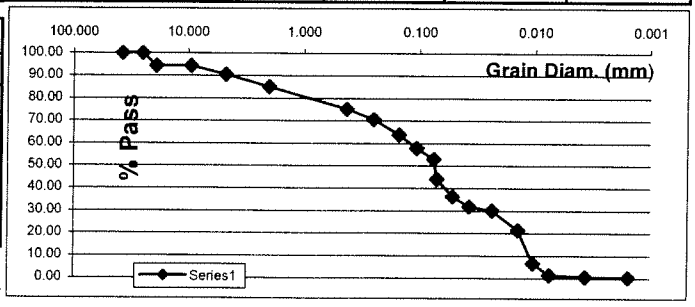
	Mc Hydrom
Tare Wt	29.29
Wet Wt.	59.40
Dry Wt	58.97
MC	1.4488%

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

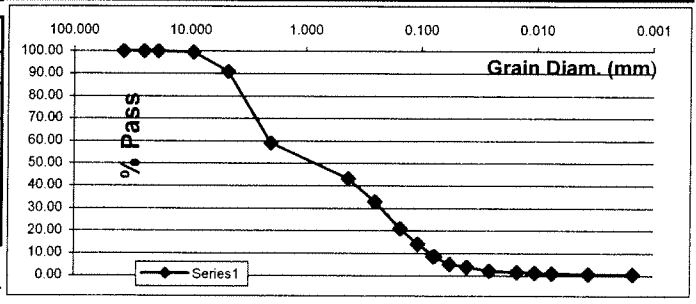
	Mc Hydrom
Tare Wt	30.27
Wet Wt.	62.43
Dry Wt	62.42
MC	0.0311%

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**

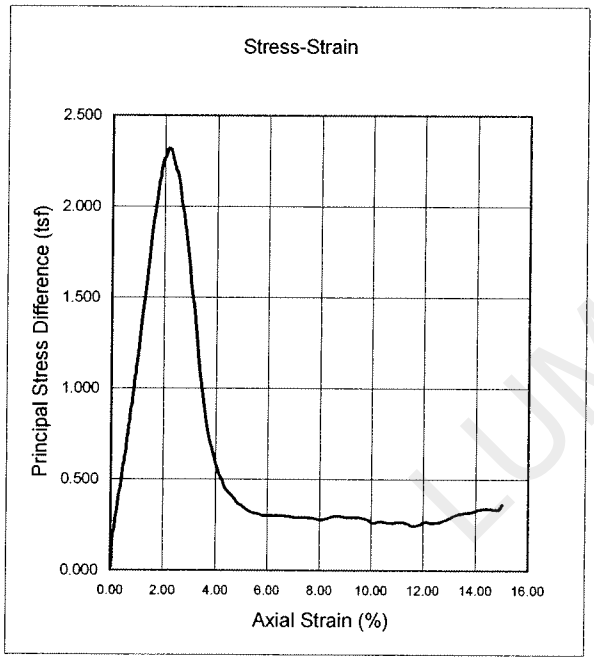
	Sieve Size	Grams Retain	% Pass
Sieve % Pass	1-1/2"	0.00	100.00
Air Dry Start Wt.:	1"	0.00	100.00
2182.9	3/4"	0.00	100.00
Dry Start Wt.:	3/8"	12.53	99.43
2182.22	No 4	200.01	90.83
	No 10	895.12	58.98



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

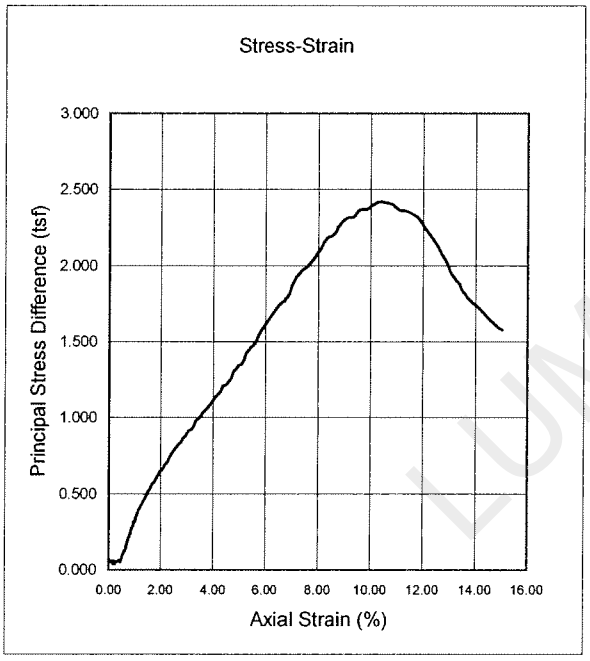
RQD Value: 100%

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	

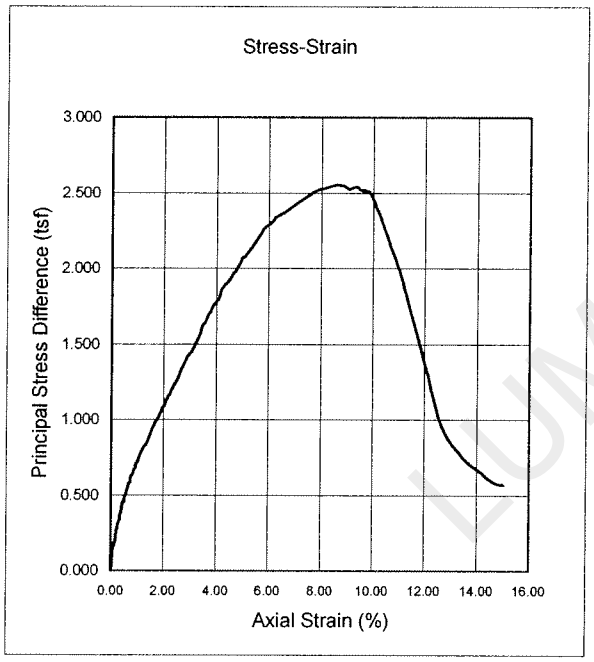
1/2 Stress (KSF)	2.416	Secant Modulus (KSF) @ 1/2 Peak Stress	61
Strain at 1/2 Stress (%)	3.94	RQD Value:	100%
Type of Specimen:	Native	Angle of Fracture in Degrees:	N/A

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%

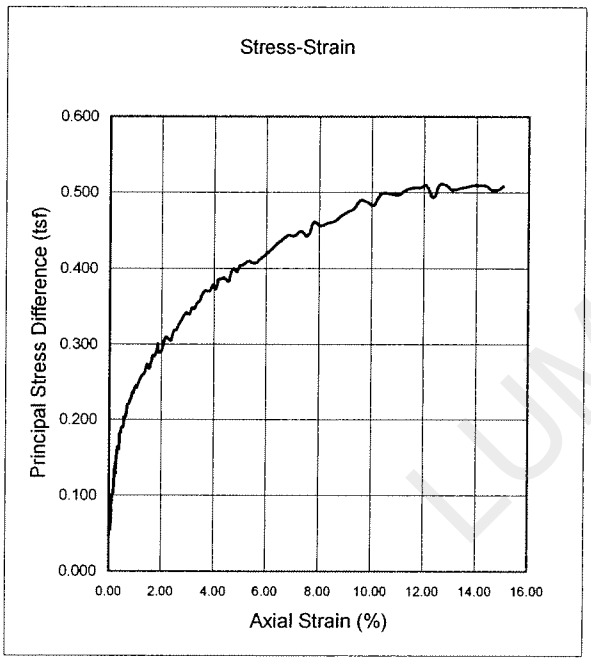
Angle of Break in Degrees: 60

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%

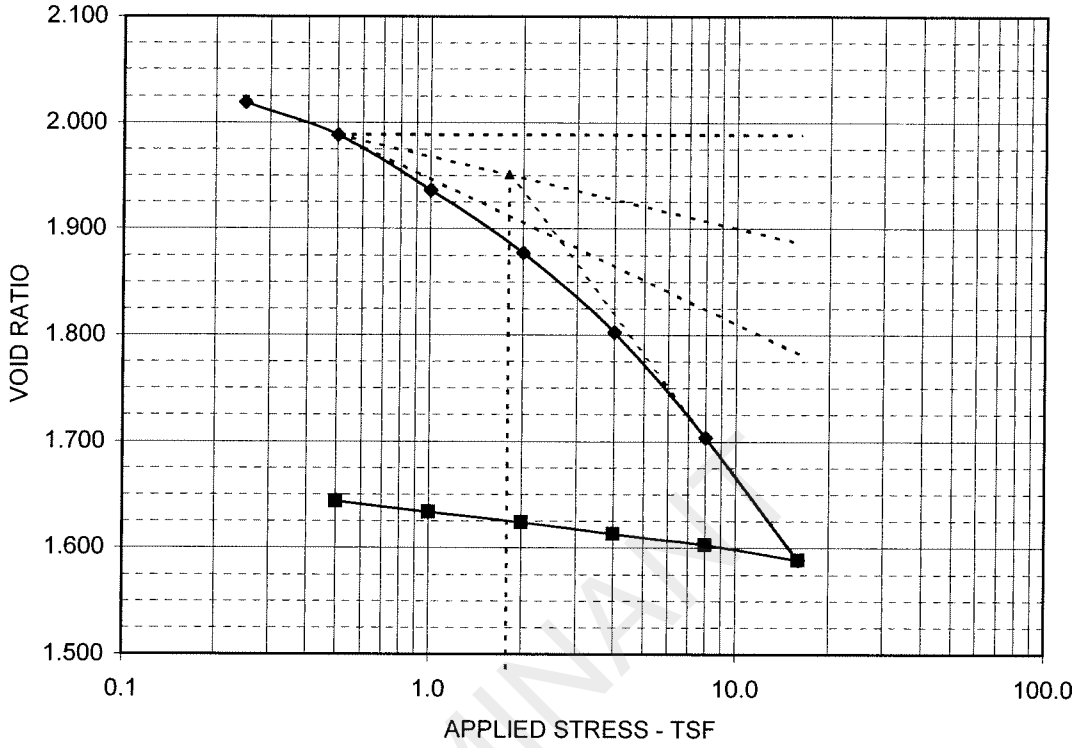
Angle of Break in Degrees: 53

Remarks: Not able to find a well defined fracture

Sketch of Fracture:

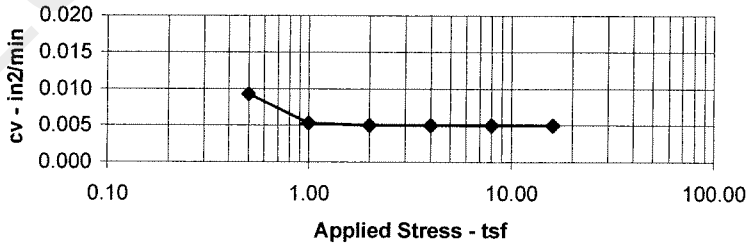
CONSOLIDATION TEST REPORT

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

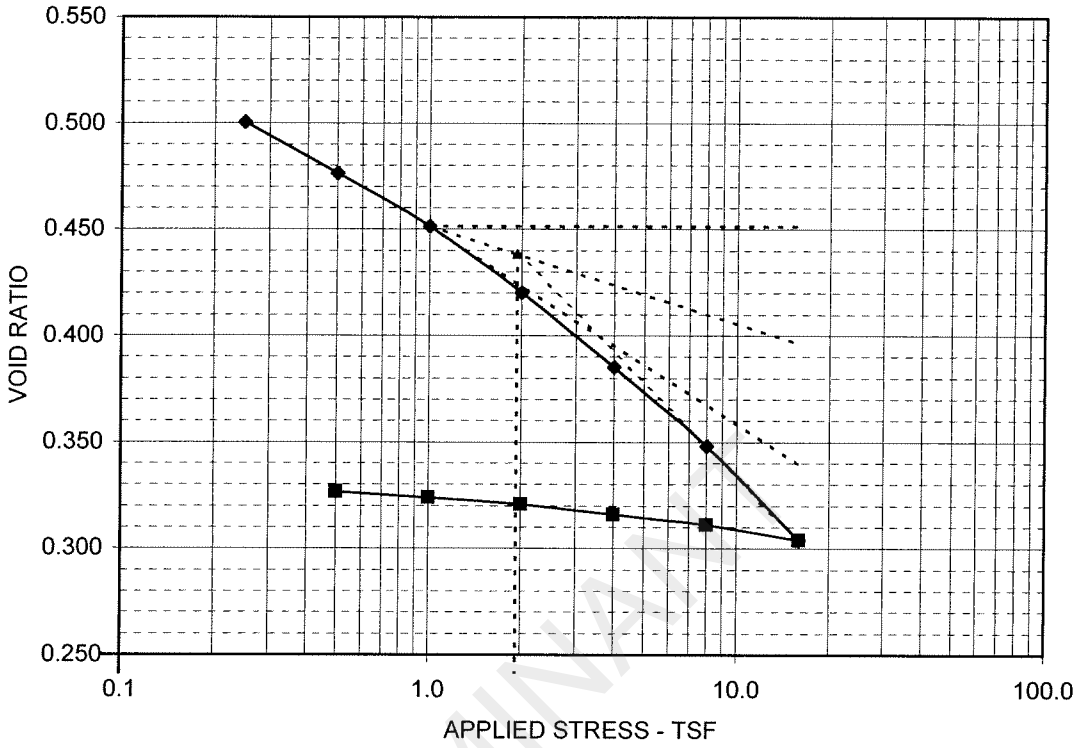


c_v values calculated by Sivaram and Swamee's Method

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		

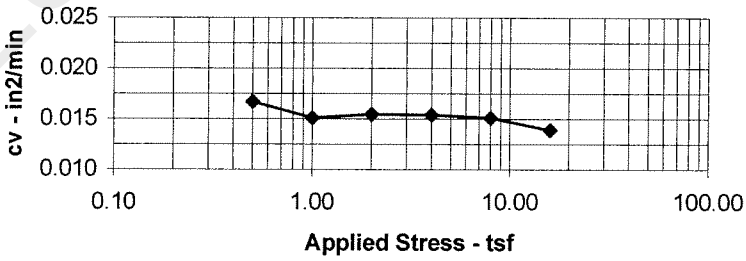
CONSOLIDATION TEST REPORT

ASTM D 2435



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

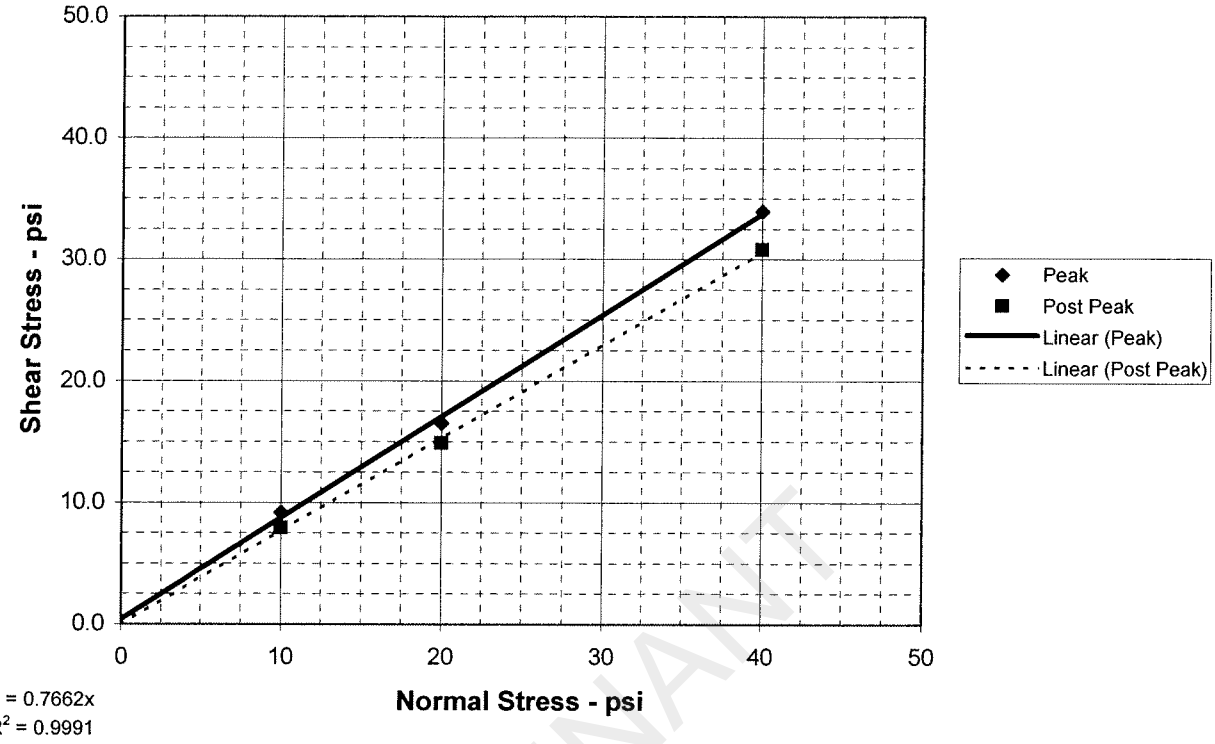
LOAD tsf	c_v in^2/min	k in/min
Seating	NA	NA
0.50	1.67E-02	2.82E-06
1.00	1.51E-02	1.33E-06
2.00	1.55E-02	8.75E-07
4.00	1.54E-02	5.00E-07
8.00	1.51E-02	2.67E-07
16.00	1.39E-02	1.50E-07



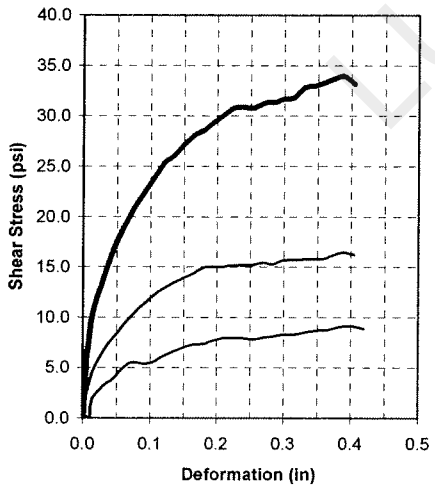
c_v values calculated by Sivaram and Swamee's Method

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

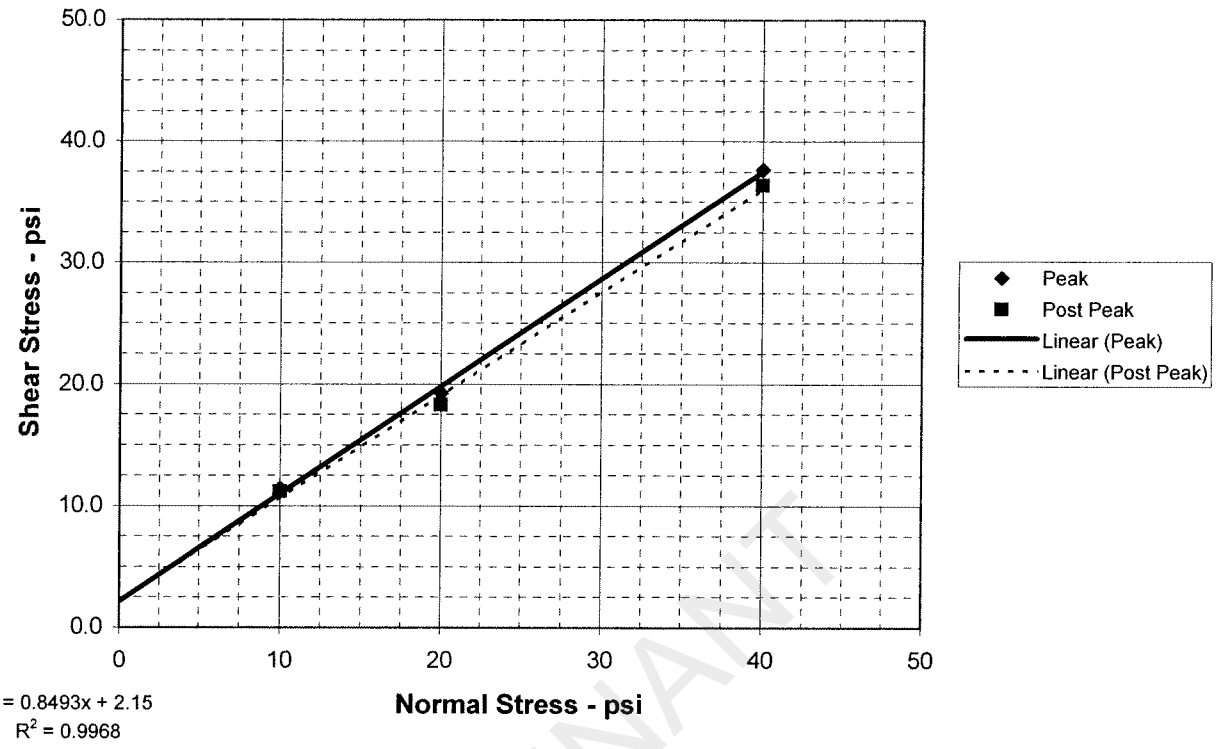
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Ash, black and gray
SAMPLE LOCATION: B-6, 3-5 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: 35 PL: 19 PI: 16 Percent -200: 61
REMARKS: Multi-Specimen

PROJECT INFORMATION

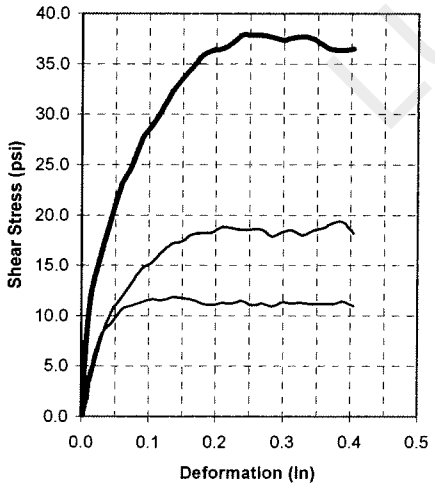
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:4/25/08

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

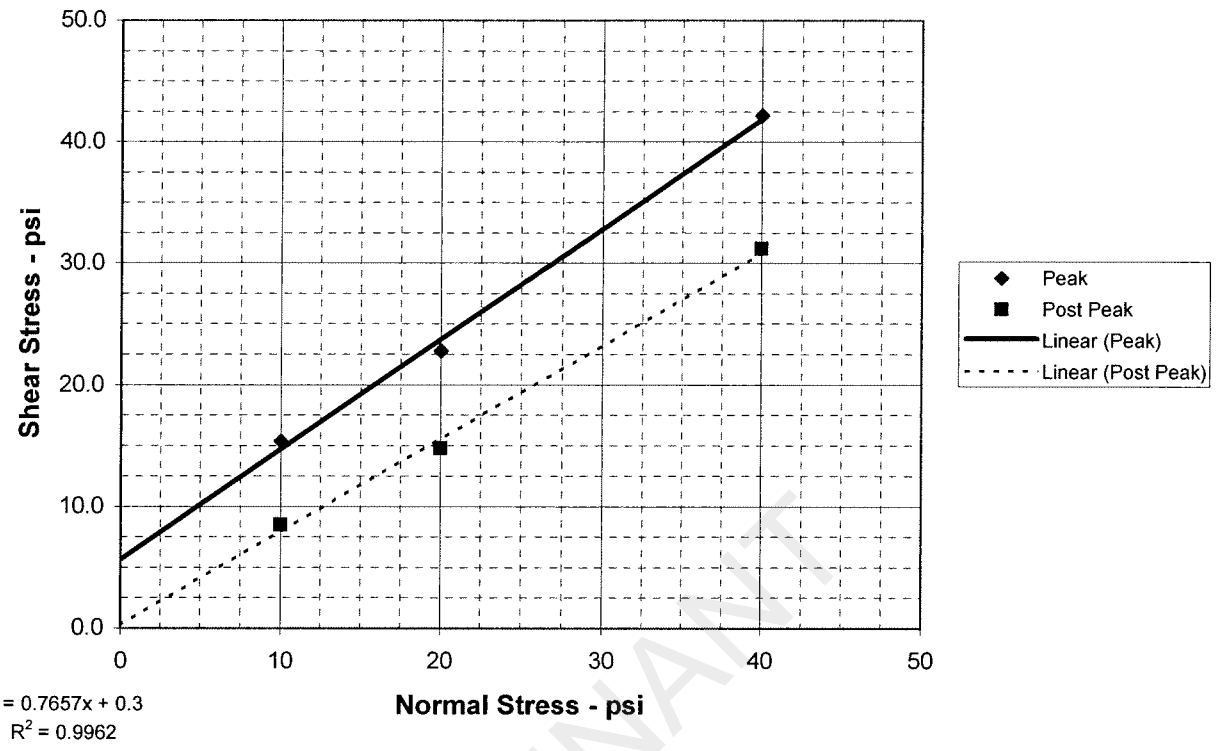
TYPE OF TEST & NO: CD-DS-2
SAMPLE TYPE: Re-Compacted
DESCRIPTION: Ash, black and dark gray
SAMPLE LOCATION: MLSES (Bulk)
SPECIFIC GRAVITY: 2.56
LL: NP PL: NP PI: NP Percent -200: 3.33
REMARKS: Multi-Specimen

PROJECT INFORMATION

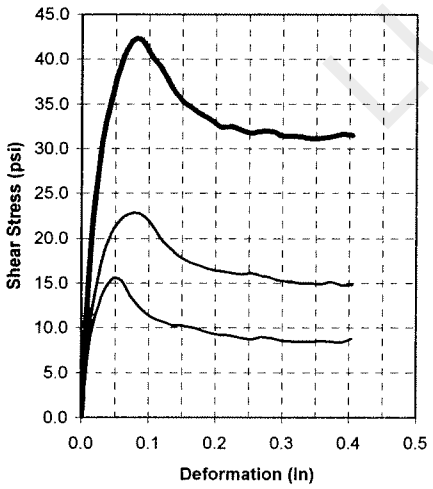
PROJECT: Luminant Martin Lake PDP 1-3
LOCATION: Rusk , TX
PROJECT NO: ETT08002-07 (G2810-08)
CLIENT : ETTL Engineers & Consultants, Inc
DATE:5/6/08

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

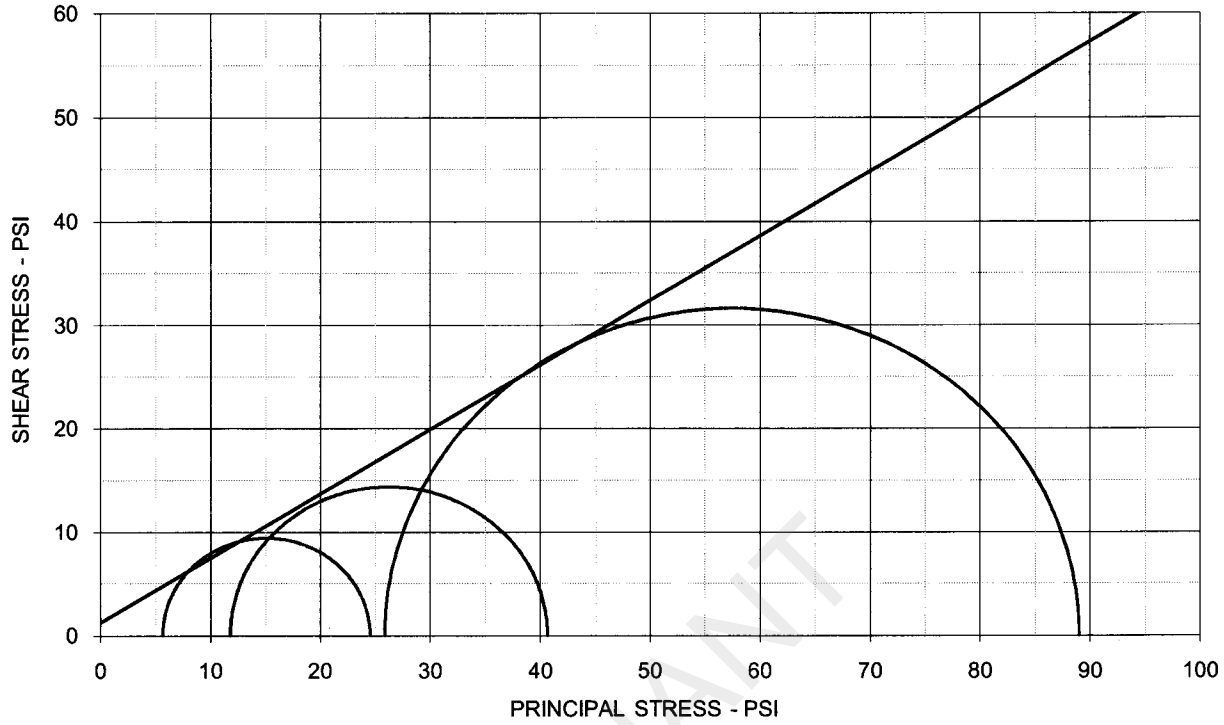
Number of Specimens = 3

PLATE: B.1

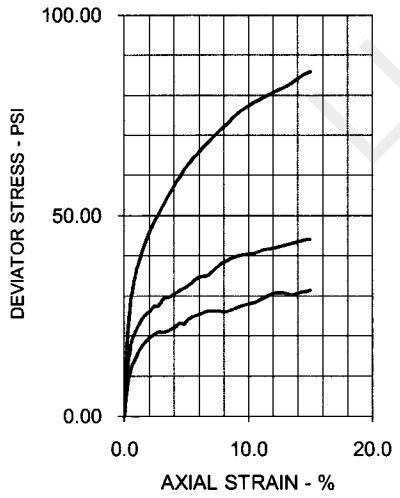
PLATE: B.2

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

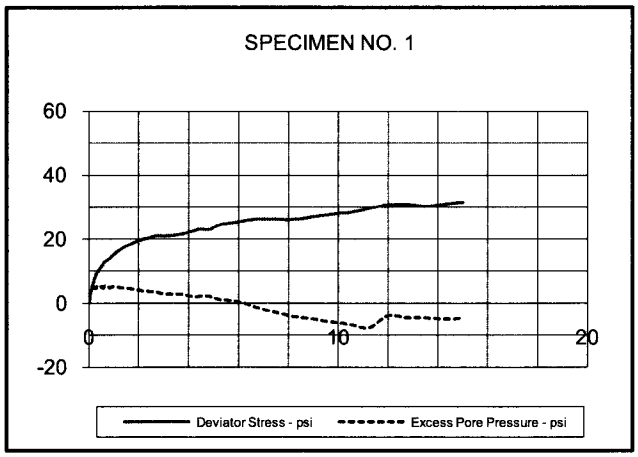
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan w/ Red & Gray Clayey Sand
Sampled on Site, B-16 8' to 10' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
~~G 3219-09, B-16 8'-10' Native~~

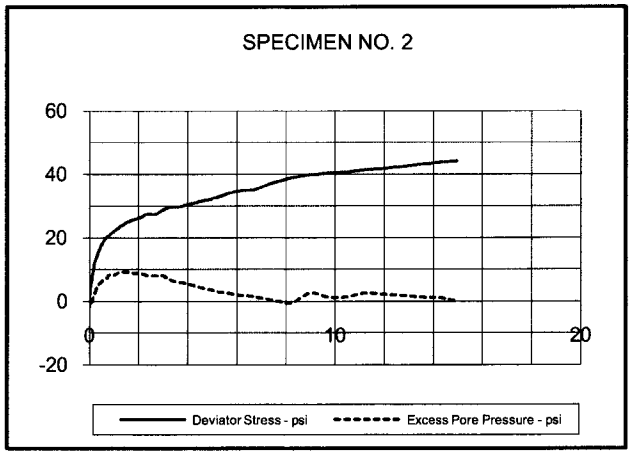
PROJECT INFORMATION

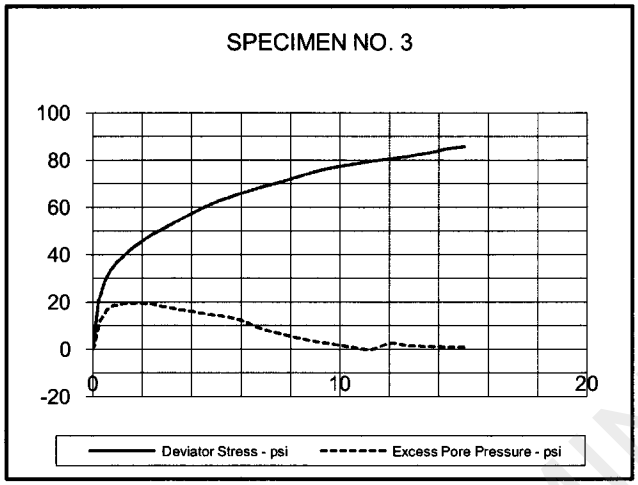
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

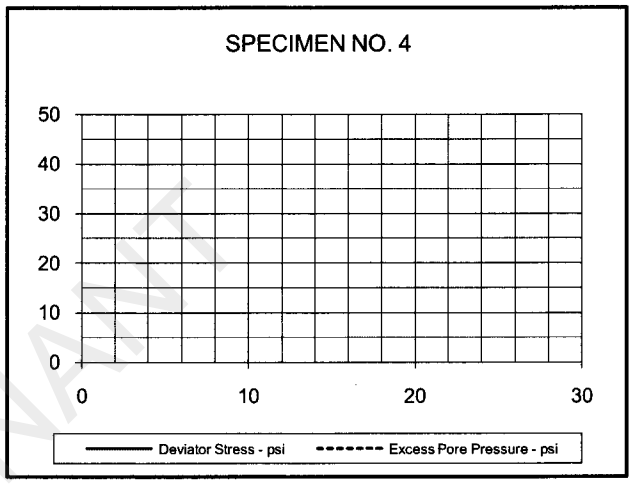
ETTL ENGINEERS & CONSULTANTS

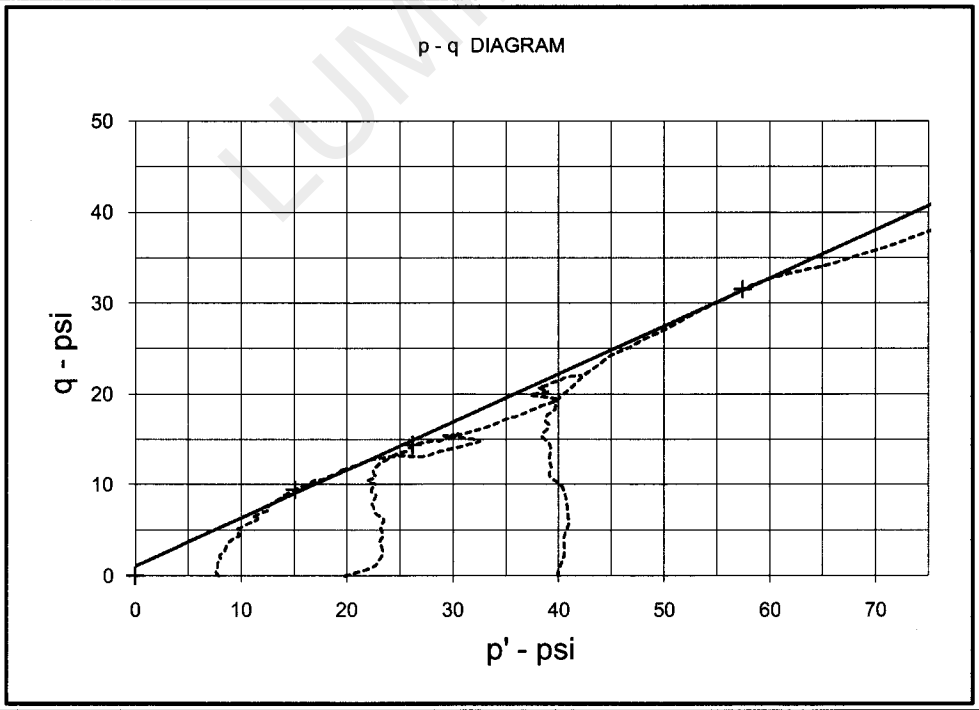
PLATE: B.1







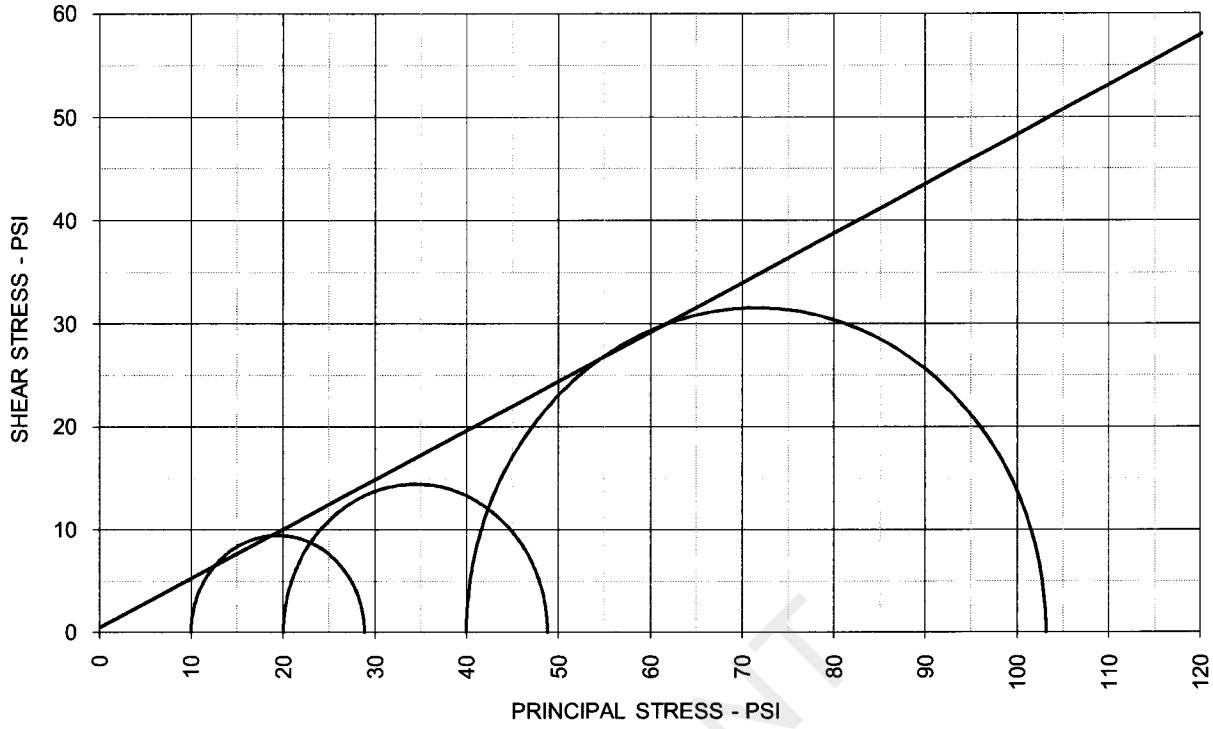




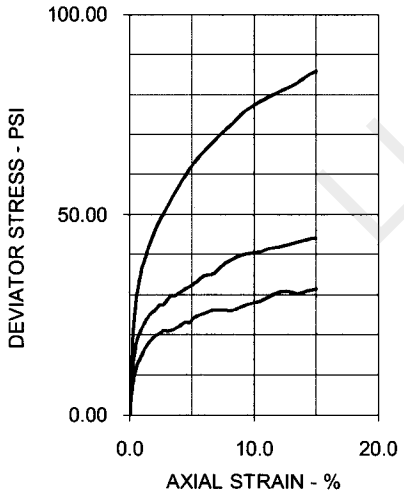
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.9	a (psi) = 1.1
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan w/ Red & Gray Clayey Sand			

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

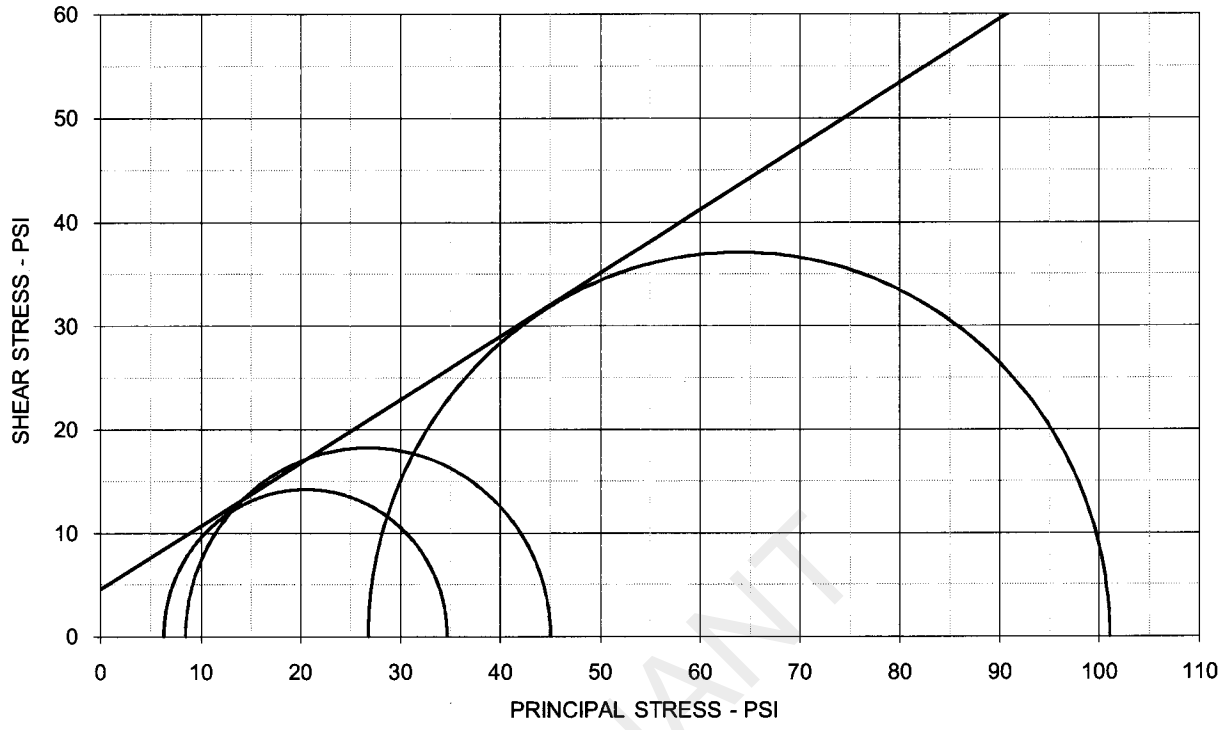
PLATE: B.1

PLATE: B.2

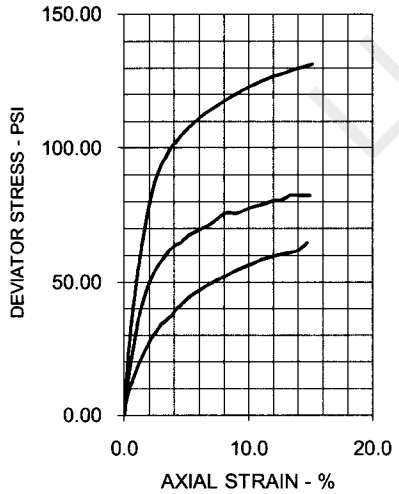
PLATE: B.3

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

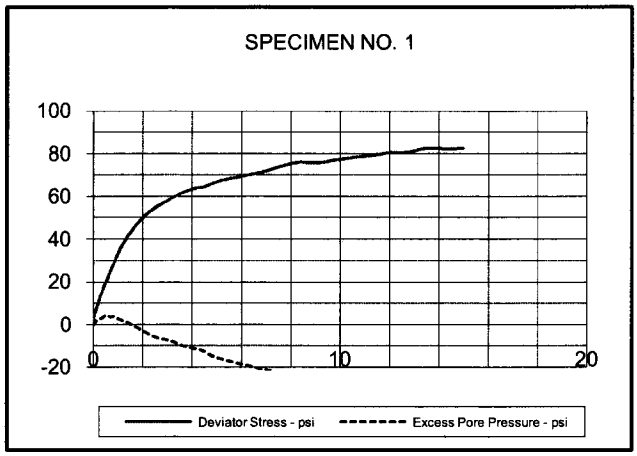
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Native Shelby Tube Sample
DESCRIPTION: Tan & Red Sandy Lean Clay
Sampled on Site, B-17 3' to 7' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve
LL: PL: PI: Percent -200:
REMARKS: Diameter and Both Ends Trimmed + # 4 Sieve
G 3219-09, B-17 3'-7' Native

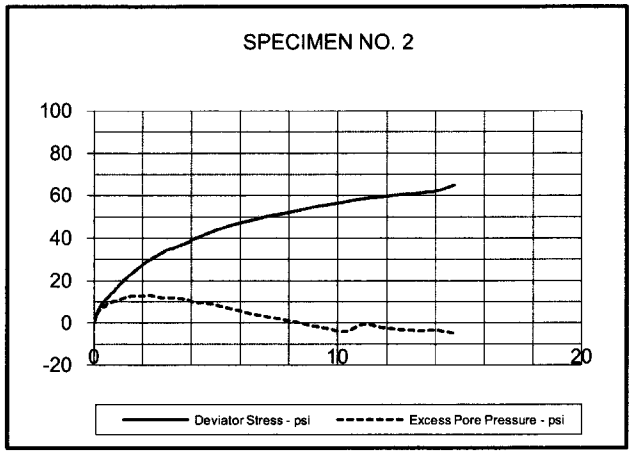
PROJECT INFORMATION

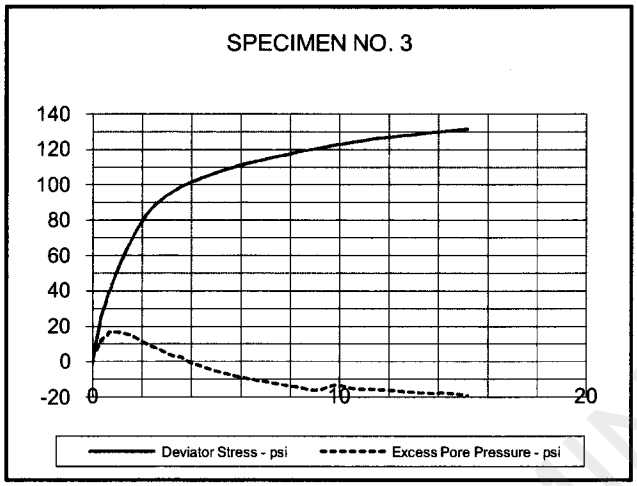
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

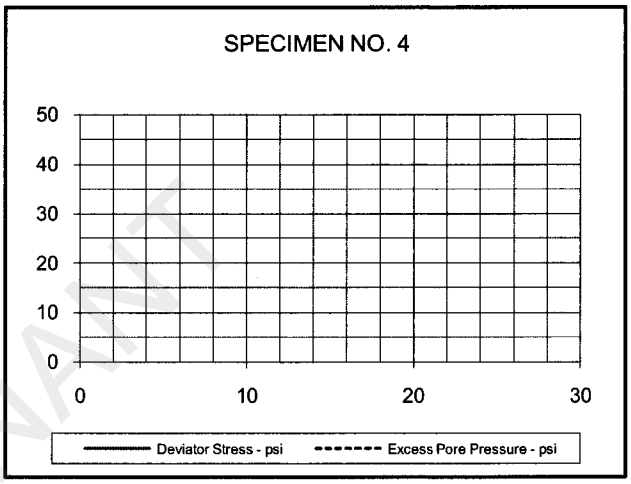
ETTL ENGINEERS & CONSULTANTS

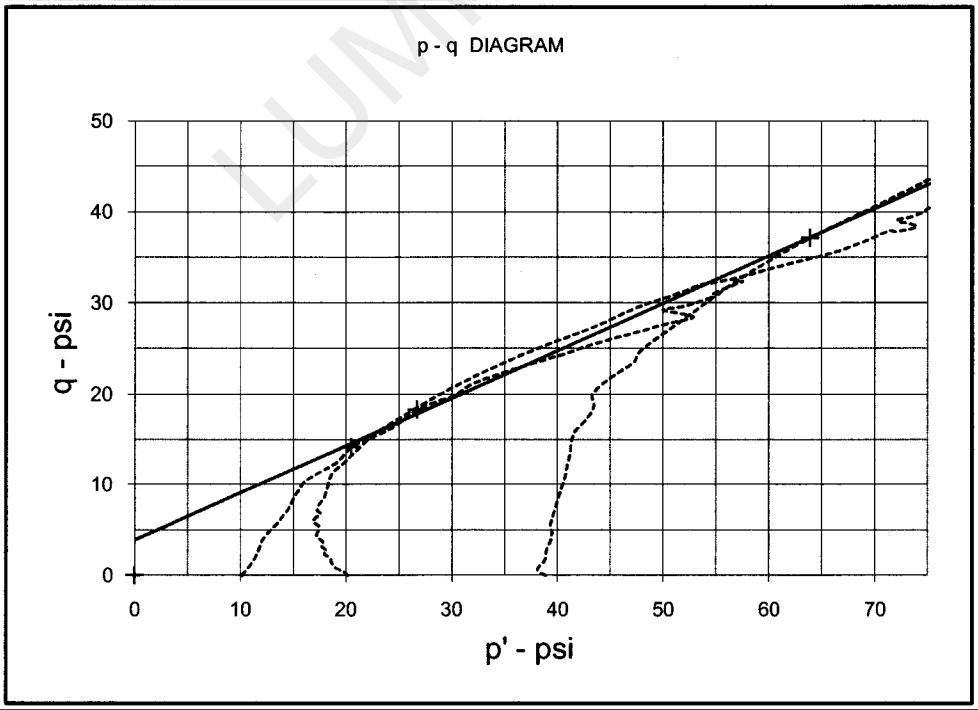
PLATE: B.1







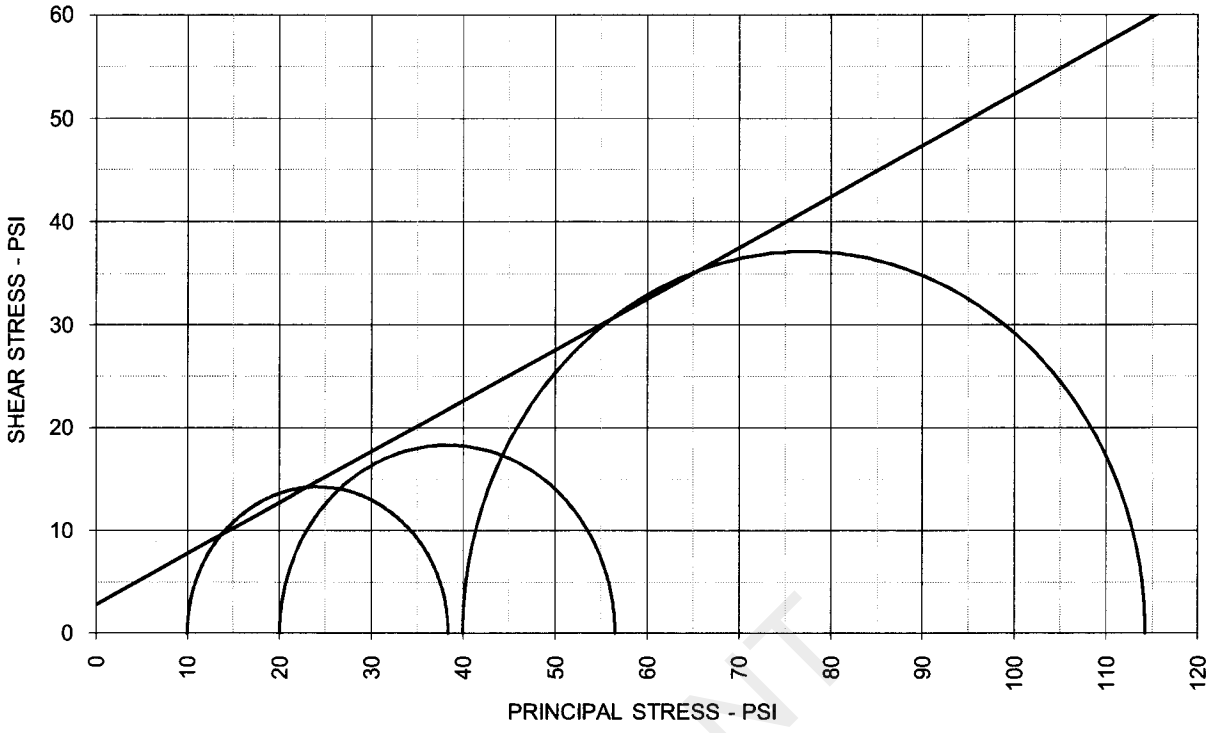




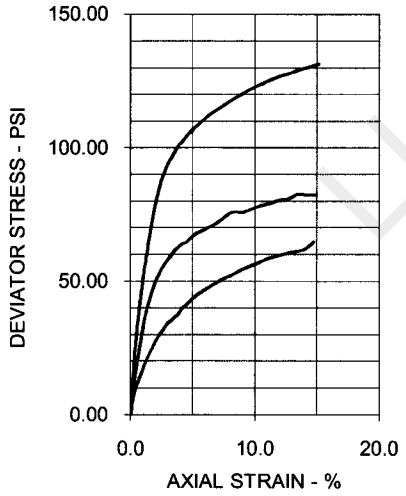
EFFECTIVE STRESS PARAMETERS	R^2 = 1.00	α (deg) = 27.5	a (psi) = 3.9
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Red Sandy Lean Clay			

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%

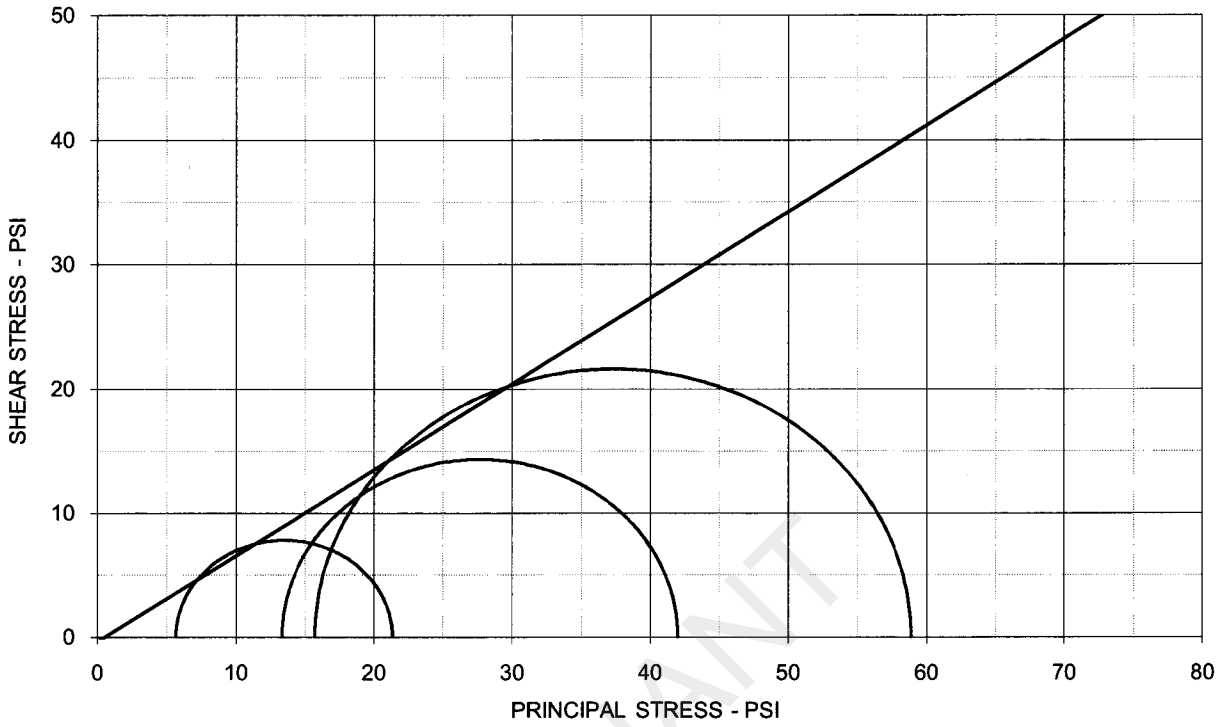
PLATE: B.1

PLATE: B.2

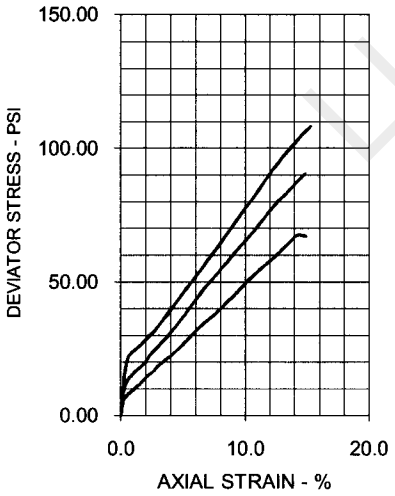
PLATE: B.3

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

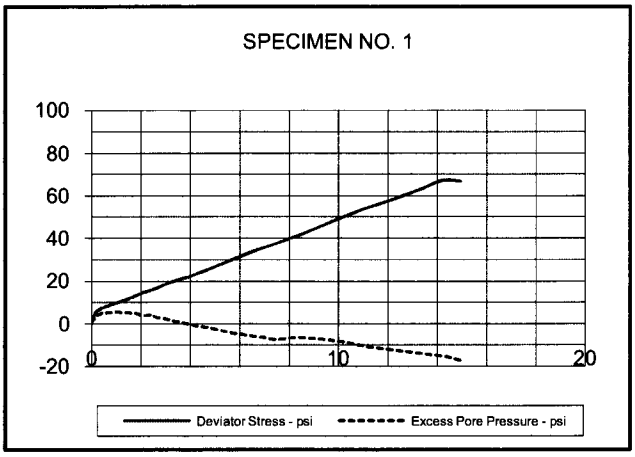
TYPE OF TEST & NO: CU with PP
SAMPLE TYPE: Lab Molded
DESCRIPTION: Tan & Reddish Tan Silty Sand
Sampled on Site, TP- 31 0' to 5' deep
ASSUMED SPECIFIC GRAVITY: 2.7 + 40 Sieve 2%
LL: 20 PL: 17 PI: 3 Percent -200: 27%
REMARKS: Both Ends Trimmed + # 4 Sieve 1%
G 3219-09, TP-31 0'-5' Lab Molded

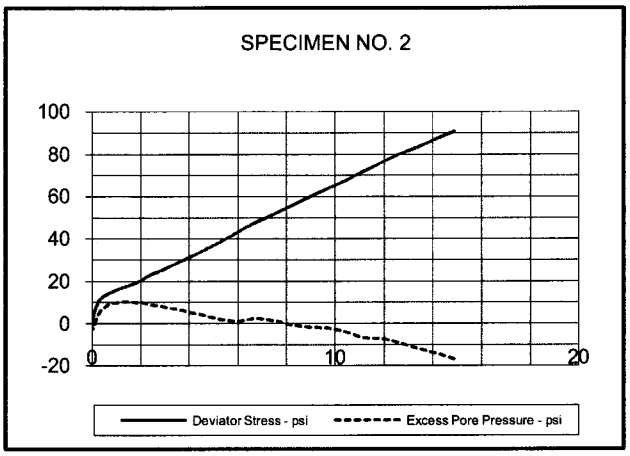
PROJECT INFORMATION

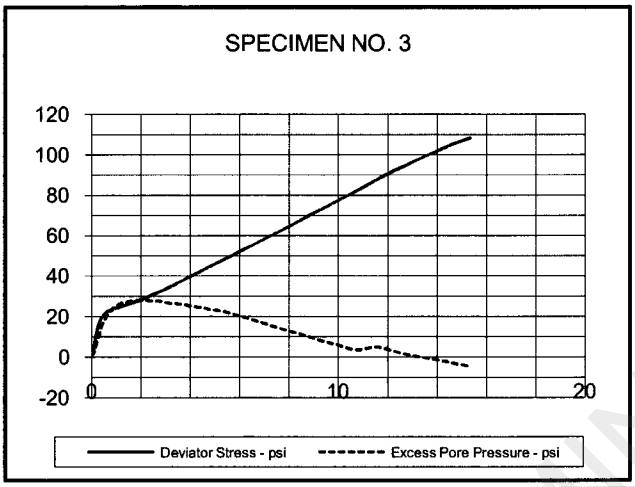
PROJECT: Martin Lake PDP 1 - 3 Supplemental
LOCATION:
PROJECT NO: G 3219 - 09
CLIENT: HDR
September 2009

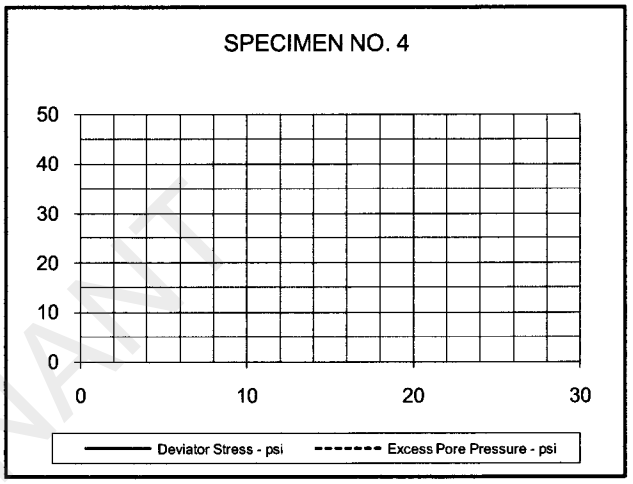
ETTL ENGINEERS & CONSULTANTS

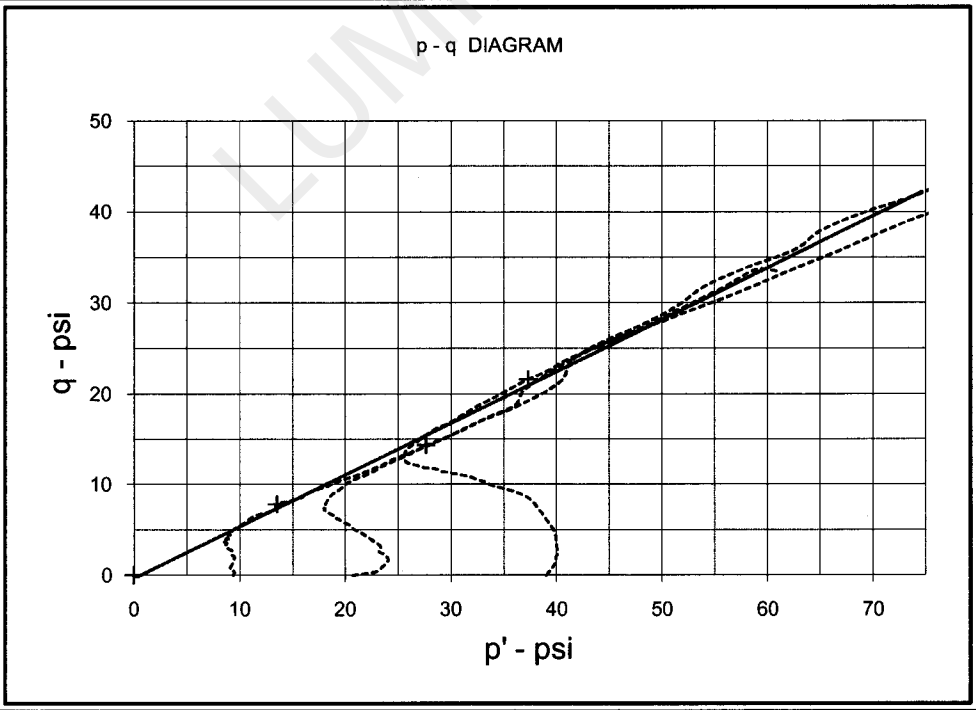
PLATE: B.1







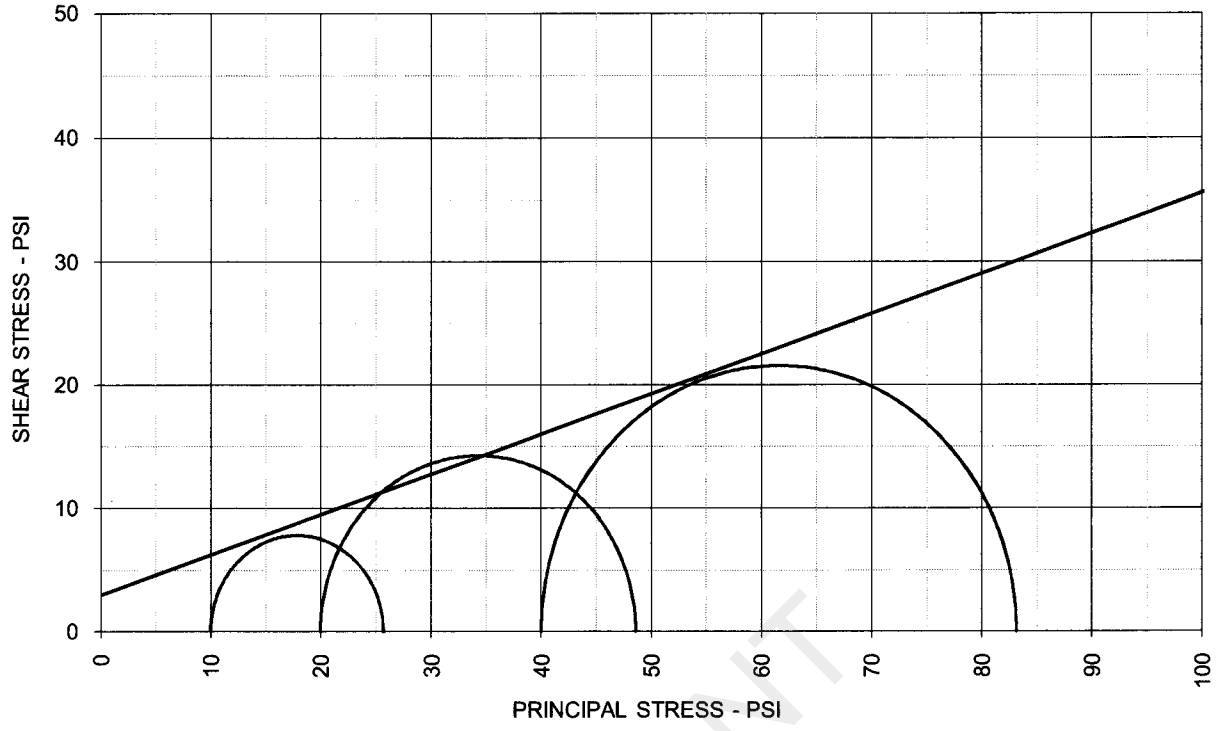




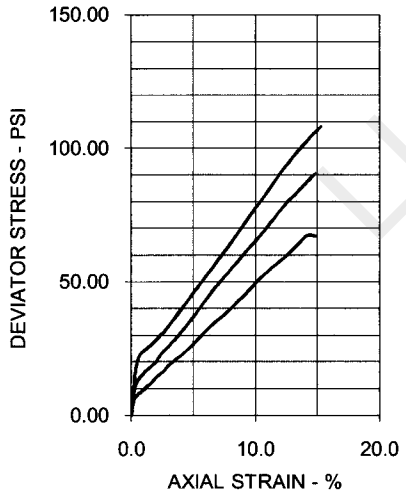
EFFECTIVE STRESS PARAMETERS	R^2 = 0.98	α (deg) = 29.7	a (psi) = -0.3
PROJECT: Martin Lake PDP 1 - 3 Supplemental		TYPE OF TEST & NO: CU with PP	
PROJECT NO: G 3219 - 09		ETTL ENGINEERS & CONSULTANTS	PLATE: B.2
DESCRIPTION: Tan & Reddish Tan Silty Sand			

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%

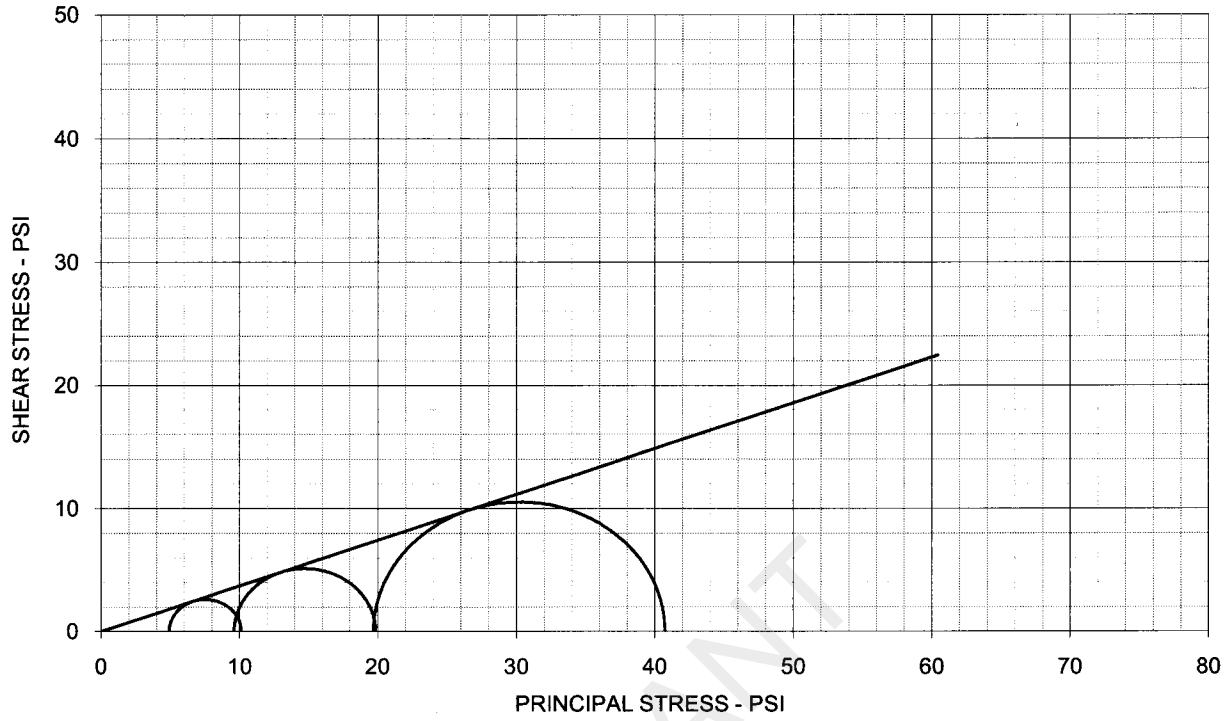
PROJECT INFORMATION

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

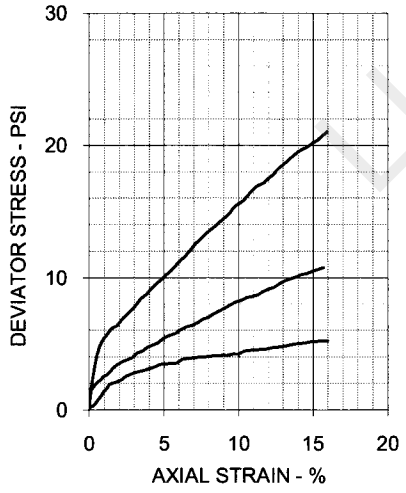
ETTL ENGINEERS & CONSULTANTS

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	



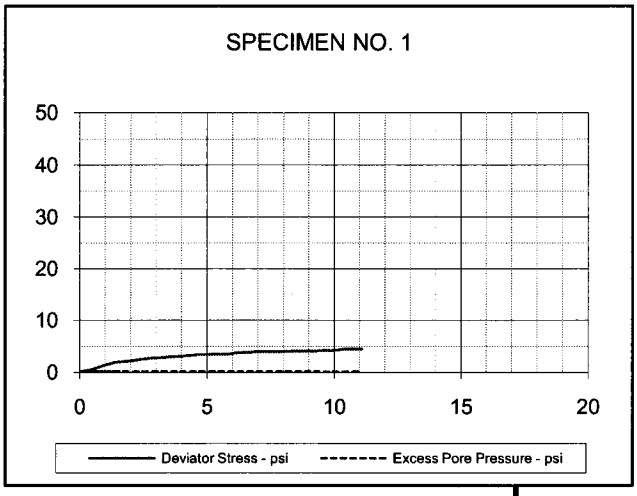
TEST DESCRIPTION

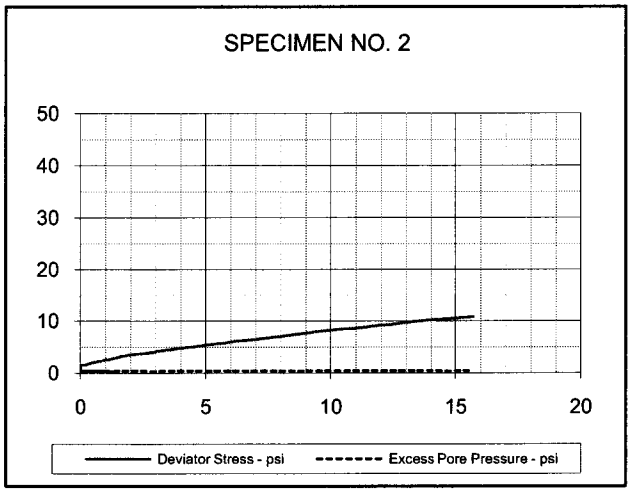
TYPE OF TEST & NO: CD Triaxial - CD-1
SAMPLE TYPE: SHELBY TUBE
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray
SAMPLE LOCATION: B-16, 3-5'
ASSUMED SPECIFIC GRAVITY: 2.70
LL: 43 PL: 14 PI: 29 Percent -200: 56
REMARKS: Tested in a fully softened remolded state

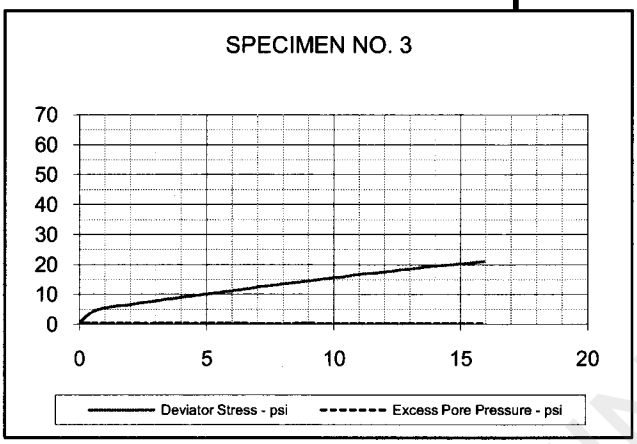
PROJECT INFORMATION

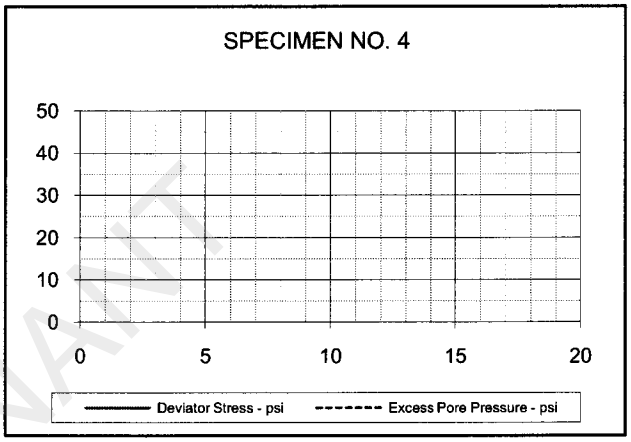
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11
CLIENT: ETTL Engineers & Consultants, Inc.
DATE: 9/15/09

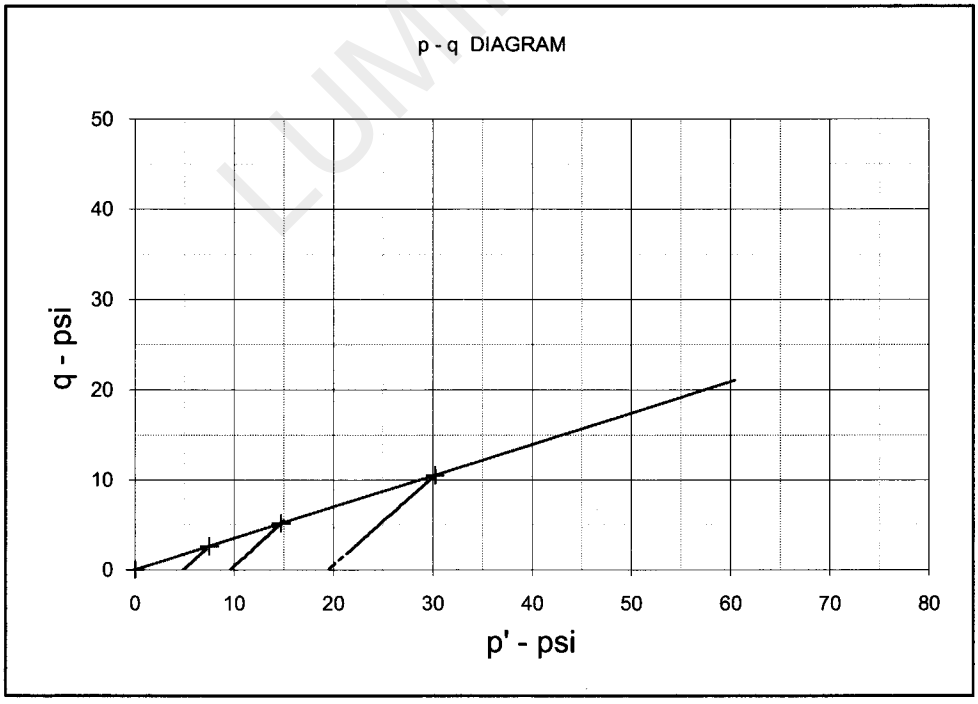
GREGORY GEOTECHNICAL | PLATE: B-CD.1







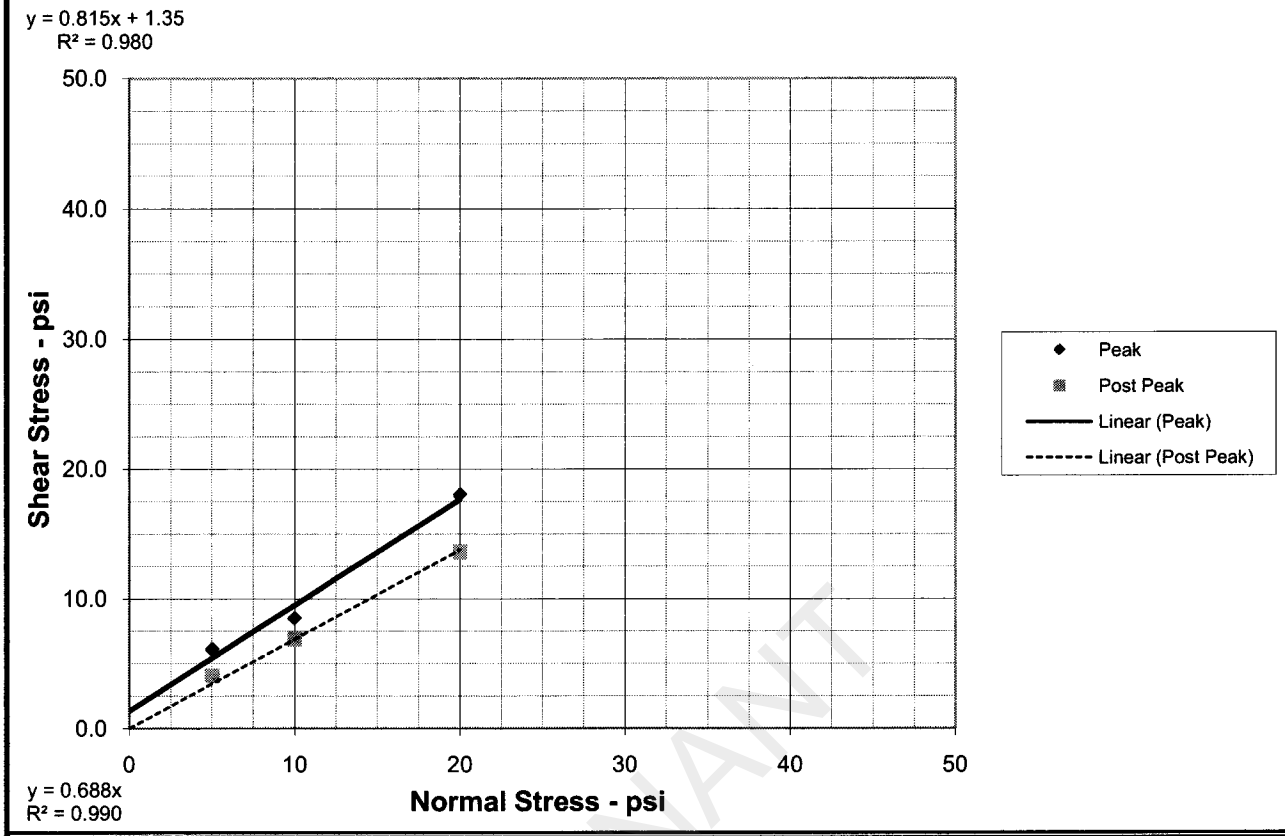




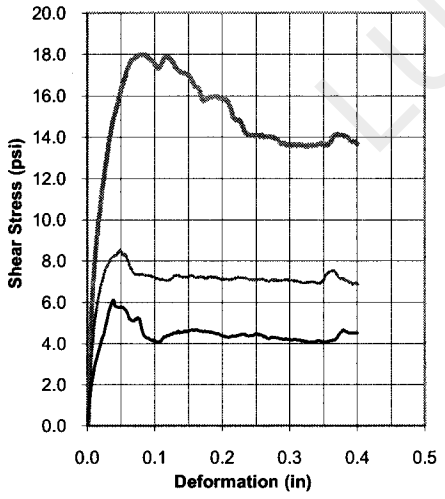
EFFECTIVE STRESS PARAMETERS	R^2 = 1.000	α (deg) = 19.2	a (psi) = 0.0
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion		TYPE OF TEST & NO: CD Triaxial - CD-1	
PROJECT NO: ETT08002-11		***GREGORY GEOTECHNICAL***	PLATE: B-CD.2
DESCRIPTION:SANDY LEAN CLAY(CL), tan br w/ red br and gray			

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

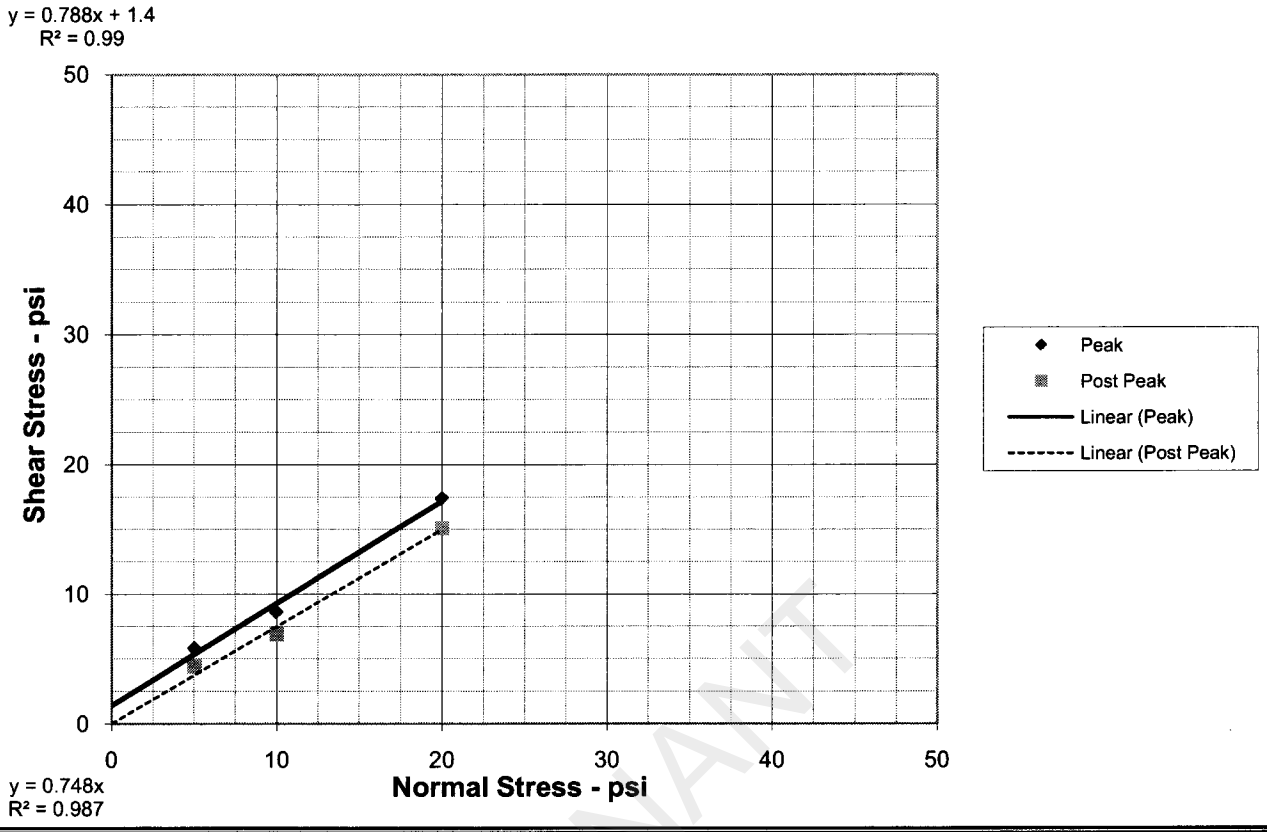
TYPE OF TEST & NO: CD-DS-1
SAMPLE TYPE: Shelby Tube
DESCRIPTION: SILT(MH), black (classification tests from 13-15 ft)
SAMPLE LOCATION: B-15, 18-20 ft
ASSUMED SPECIFIC GRAVITY: 2.65
LL: NP PL: NP PI: NP Percent -200: 95
REMARKS: Tested at natural MC

PROJECT INFORMATION

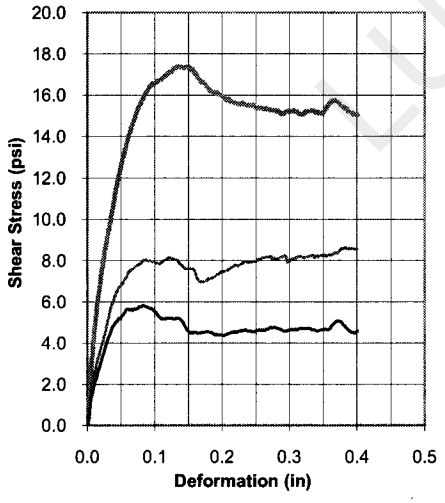
PROJECT: Luminant Martin Lake PDP 1-3 Vertical Expansion
LOCATION: Tatum, TX
PROJECT NO: ETT08002-11 (G3219-09)
CLIENT : ETTL Engineers & Consultants, Inc
DATE: 9/25/09

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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ETTL Engineers & Consultants Inc.

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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ETTL Engineers & Consultants Inc.

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

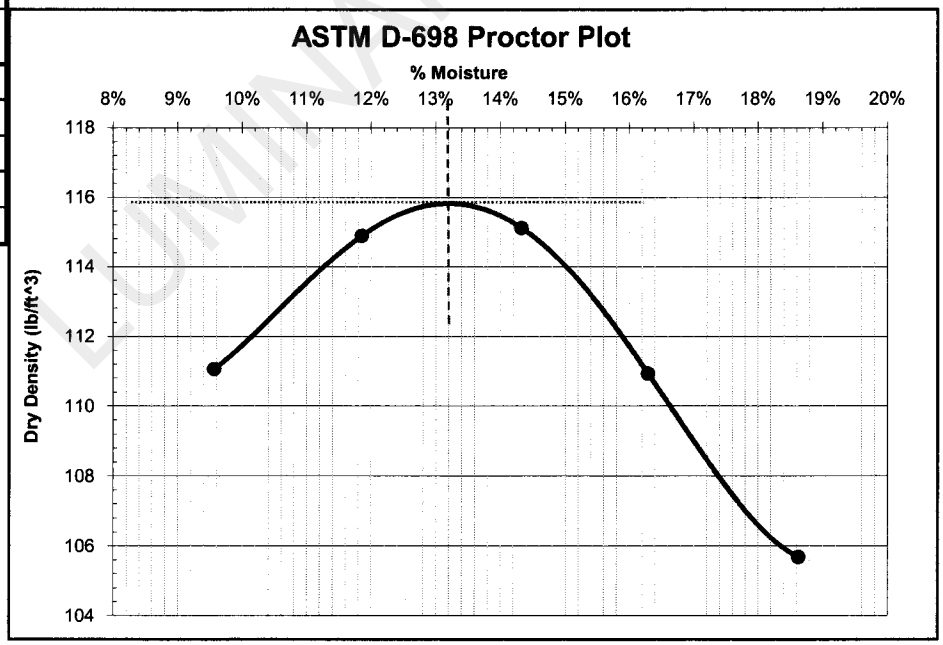
Maximum Dry Density: (ASTM D 698)	115.9	(lb/ft^3)
Optimum Moisture Content:	13.2	(%)

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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APPENDIX C

CPT-BASED LIQUEFACTION POTENTIAL ANALYSIS

TABLE OF CONTENTS

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

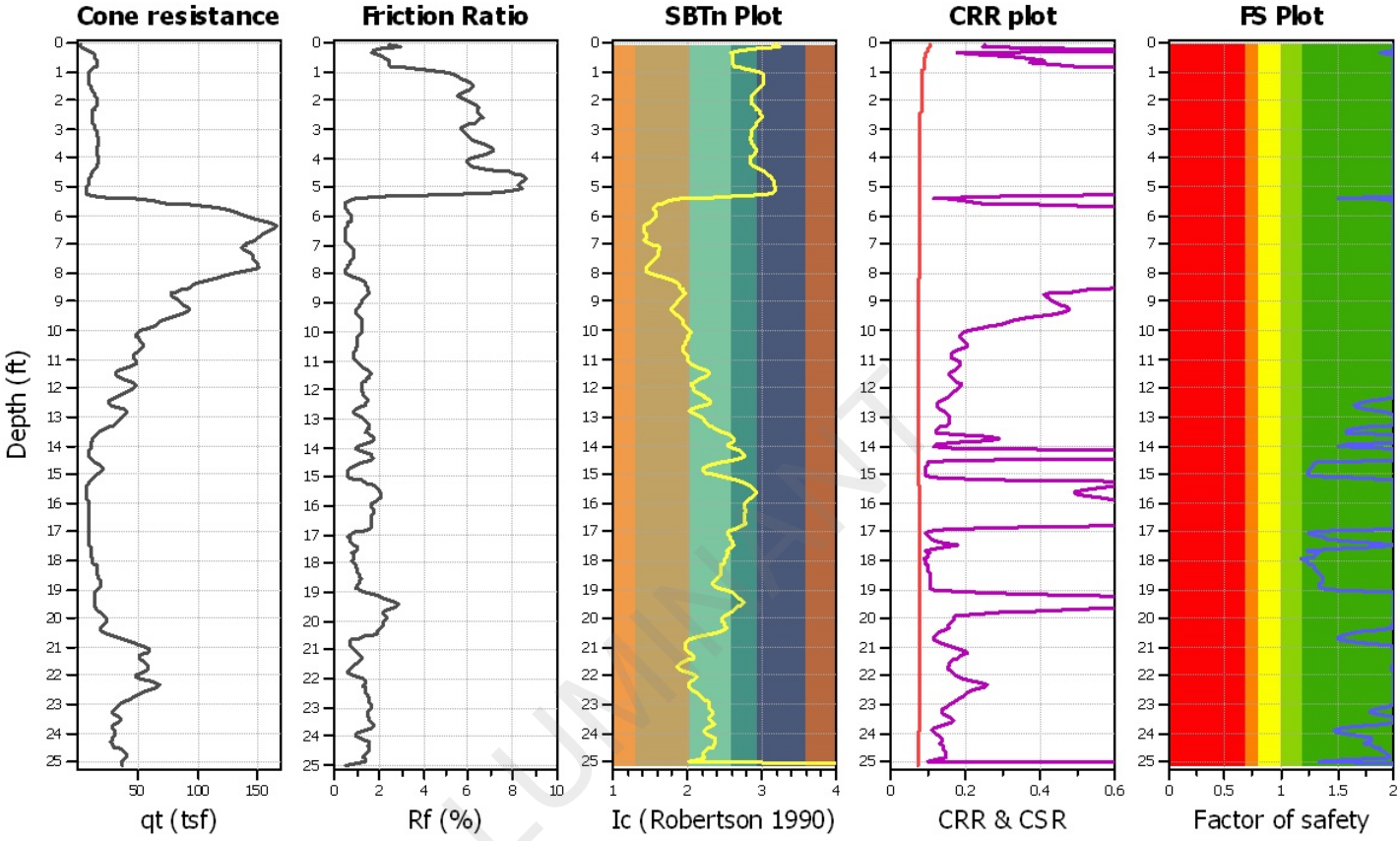
LIQUEFACTION ANALYSIS REPORT

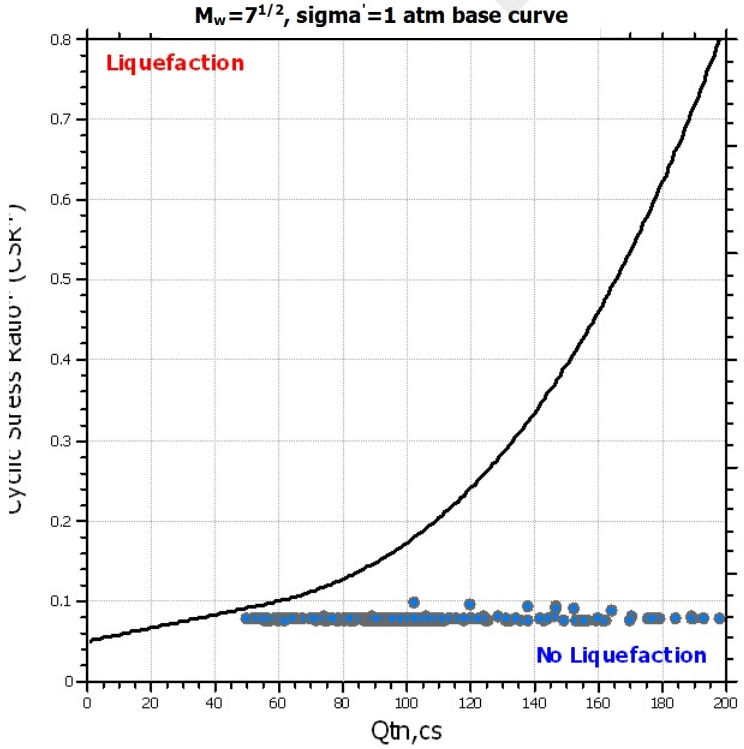
Project title : Martin Lake **Location : PDP-5**

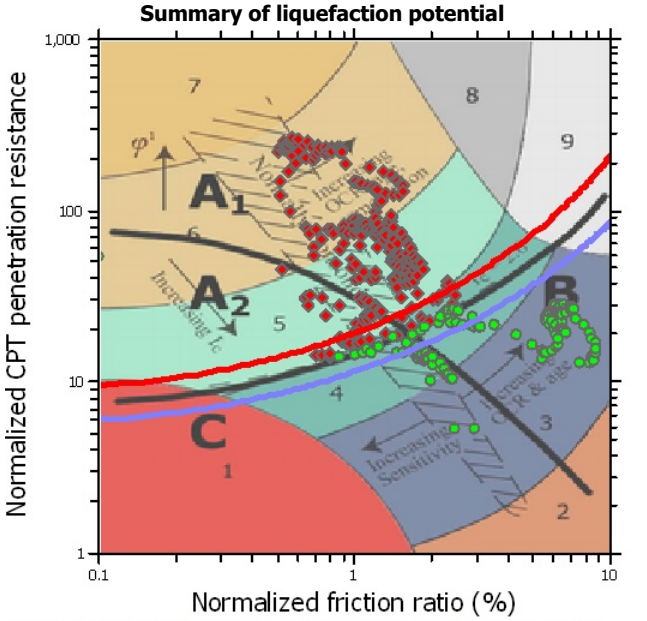
CPT file : B-02

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	1.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	0.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.20	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.09	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.07	2.00	0.00	9.99	0.06	0.00	0.13	2.00	0.00	9.98	0.06	0.00
0.20	2.00	0.00	9.97	0.07	0.00	0.26	2.00	0.00	9.96	0.06	0.00
0.33	1.88	0.00	9.95	0.07	0.00	0.39	2.00	0.00	9.94	0.06	0.00
0.46	2.00	0.00	9.93	0.07	0.00	0.52	2.00	0.00	9.92	0.06	0.00
0.59	2.00	0.00	9.91	0.07	0.00	0.66	2.00	0.00	9.90	0.07	0.00
0.72	2.00	0.00	9.89	0.06	0.00	0.79	2.00	0.00	9.88	0.07	0.00
0.85	2.00	0.00	9.87	0.06	0.00	0.92	2.00	0.00	9.86	0.07	0.00
0.98	2.00	0.00	9.85	0.06	0.00	1.05	2.00	0.00	9.84	0.07	0.00
1.12	2.00	0.00	9.83	0.07	0.00	1.18	2.00	0.00	9.82	0.06	0.00
1.25	2.00	0.00	9.81	0.07	0.00	1.31	2.00	0.00	9.80	0.06	0.00
1.38	2.00	0.00	9.79	0.07	0.00	1.44	2.00	0.00	9.78	0.06	0.00
1.51	2.00	0.00	9.77	0.07	0.00	1.57	2.00	0.00	9.76	0.06	0.00
1.64	2.00	0.00	9.75	0.07	0.00	1.71	2.00	0.00	9.74	0.07	0.00
1.77	2.00	0.00	9.73	0.06	0.00	1.84	2.00	0.00	9.72	0.07	0.00
1.90	2.00	0.00	9.71	0.06	0.00	1.97	2.00	0.00	9.70	0.07	0.00
2.03	2.00	0.00	9.69	0.06	0.00	2.10	2.00	0.00	9.68	0.07	0.00
2.16	2.00	0.00	9.67	0.06	0.00	2.23	2.00	0.00	9.66	0.07	0.00
2.30	2.00	0.00	9.65	0.07	0.00	2.36	2.00	0.00	9.64	0.06	0.00
2.43	2.00	0.00	9.63	0.07	0.00	2.49	2.00	0.00	9.62	0.06	0.00
2.56	2.00	0.00	9.61	0.07	0.00	2.62	2.00	0.00	9.60	0.06	0.00
2.69	2.00	0.00	9.59	0.07	0.00	2.76	2.00	0.00	9.58	0.07	0.00
2.82	2.00	0.00	9.57	0.06	0.00	2.89	2.00	0.00	9.56	0.07	0.00
2.95	2.00	0.00	9.55	0.06	0.00	3.02	2.00	0.00	9.54	0.07	0.00
3.08	2.00	0.00	9.53	0.06	0.00	3.15	2.00	0.00	9.52	0.07	0.00
3.21	2.00	0.00	9.51	0.06	0.00	3.28	2.00	0.00	9.50	0.07	0.00
3.35	2.00	0.00	9.49	0.07	0.00	3.41	2.00	0.00	9.48	0.06	0.00
3.48	2.00	0.00	9.47	0.07	0.00	3.54	2.00	0.00	9.46	0.06	0.00
3.61	2.00	0.00	9.45	0.07	0.00	3.67	2.00	0.00	9.44	0.06	0.00
3.74	2.00	0.00	9.43	0.07	0.00	3.80	2.00	0.00	9.42	0.06	0.00
3.87	2.00	0.00	9.41	0.07	0.00	3.94	2.00	0.00	9.40	0.07	0.00
4.00	2.00	0.00	9.39	0.06	0.00	4.07	2.00	0.00	9.38	0.07	0.00
4.13	2.00	0.00	9.37	0.06	0.00	4.20	2.00	0.00	9.36	0.07	0.00
4.26	2.00	0.00	9.35	0.06	0.00	4.33	2.00	0.00	9.34	0.07	0.00
4.40	2.00	0.00	9.33	0.07	0.00	4.46	2.00	0.00	9.32	0.06	0.00
4.53	2.00	0.00	9.31	0.07	0.00	4.59	2.00	0.00	9.30	0.06	0.00
4.66	2.00	0.00	9.29	0.07	0.00	4.72	2.00	0.00	9.28	0.06	0.00
4.79	2.00	0.00	9.27	0.07	0.00	4.85	2.00	0.00	9.26	0.06	0.00
4.92	2.00	0.00	9.25	0.07	0.00	4.99	2.00	0.00	9.24	0.07	0.00
5.05	2.00	0.00	9.23	0.06	0.00	5.12	2.00	0.00	9.22	0.07	0.00
5.18	2.00	0.00	9.21	0.06	0.00	5.25	2.00	0.00	9.20	0.07	0.00
5.31	2.00	0.00	9.19	0.06	0.00	5.38	1.50	0.00	9.18	0.07	0.00
5.44	1.85	0.00	9.17	0.06	0.00	5.51	2.00	0.00	9.16	0.07	0.00
5.58	2.00	0.00	9.15	0.07	0.00	5.64	2.00	0.00	9.14	0.06	0.00
5.71	2.00	0.00	9.13	0.07	0.00	5.77	2.00	0.00	9.12	0.06	0.00
5.84	2.00	0.00	9.11	0.07	0.00	5.90	2.00	0.00	9.10	0.06	0.00
5.97	2.00	0.00	9.09	0.07	0.00	6.04	2.00	0.00	9.08	0.07	0.00
6.10	2.00	0.00	9.07	0.06	0.00	6.17	2.00	0.00	9.06	0.07	0.00
6.23	2.00	0.00	9.05	0.06	0.00	6.30	2.00	0.00	9.04	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
6.36	2.00	0.00	9.03	0.06	0.00	6.43	2.00	0.00	9.02	0.07	0.00
6.49	2.00	0.00	9.01	0.06	0.00	6.56	2.00	0.00	9.00	0.07	0.00
6.63	2.00	0.00	8.99	0.07	0.00	6.69	2.00	0.00	8.98	0.06	0.00
6.76	2.00	0.00	8.97	0.07	0.00	6.82	2.00	0.00	8.96	0.06	0.00
6.89	2.00	0.00	8.95	0.07	0.00	6.95	2.00	0.00	8.94	0.06	0.00
7.02	2.00	0.00	8.93	0.07	0.00	7.08	2.00	0.00	8.92	0.06	0.00
7.15	2.00	0.00	8.91	0.07	0.00	7.22	2.00	0.00	8.90	0.07	0.00
7.28	2.00	0.00	8.89	0.06	0.00	7.35	2.00	0.00	8.88	0.07	0.00
7.41	2.00	0.00	8.87	0.06	0.00	7.48	2.00	0.00	8.86	0.07	0.00
7.54	2.00	0.00	8.85	0.06	0.00	7.61	2.00	0.00	8.84	0.07	0.00
7.68	2.00	0.00	8.83	0.07	0.00	7.74	2.00	0.00	8.82	0.06	0.00
7.81	2.00	0.00	8.81	0.07	0.00	7.87	2.00	0.00	8.80	0.06	0.00
7.94	2.00	0.00	8.79	0.07	0.00	8.00	2.00	0.00	8.78	0.06	0.00
8.07	2.00	0.00	8.77	0.07	0.00	8.13	2.00	0.00	8.76	0.06	0.00
8.20	2.00	0.00	8.75	0.07	0.00	8.27	2.00	0.00	8.74	0.07	0.00
8.33	2.00	0.00	8.73	0.06	0.00	8.40	2.00	0.00	8.72	0.07	0.00
8.46	2.00	0.00	8.71	0.06	0.00	8.53	2.00	0.00	8.70	0.07	0.00
8.59	2.00	0.00	8.69	0.06	0.00	8.66	2.00	0.00	8.68	0.07	0.00
8.72	2.00	0.00	8.67	0.06	0.00	8.79	2.00	0.00	8.66	0.07	0.00
8.86	2.00	0.00	8.65	0.07	0.00	8.92	2.00	0.00	8.64	0.06	0.00
8.99	2.00	0.00	8.63	0.07	0.00	9.05	2.00	0.00	8.62	0.06	0.00
9.12	2.00	0.00	8.61	0.07	0.00	9.18	2.00	0.00	8.60	0.06	0.00
9.25	2.00	0.00	8.59	0.07	0.00	9.32	2.00	0.00	8.58	0.07	0.00
9.38	2.00	0.00	8.57	0.06	0.00	9.45	2.00	0.00	8.56	0.07	0.00
9.51	2.00	0.00	8.55	0.06	0.00	9.58	2.00	0.00	8.54	0.07	0.00
9.64	2.00	0.00	8.53	0.06	0.00	9.71	2.00	0.00	8.52	0.07	0.00
9.77	2.00	0.00	8.51	0.06	0.00	9.84	2.00	0.00	8.50	0.07	0.00
9.91	2.00	0.00	8.49	0.07	0.00	9.97	2.00	0.00	8.48	0.06	0.00
10.04	2.00	0.00	8.47	0.07	0.00	10.10	2.00	0.00	8.46	0.06	0.00
10.17	2.00	0.00	8.45	0.07	0.00	10.23	2.00	0.00	8.44	0.06	0.00
10.30	2.00	0.00	8.43	0.07	0.00	10.36	2.00	0.00	8.42	0.06	0.00
10.43	2.00	0.00	8.41	0.07	0.00	10.50	2.00	0.00	8.40	0.07	0.00
10.56	2.00	0.00	8.39	0.06	0.00	10.63	2.00	0.00	8.38	0.07	0.00
10.69	2.00	0.00	8.37	0.06	0.00	10.76	2.00	0.00	8.36	0.07	0.00
10.82	2.00	0.00	8.35	0.06	0.00	10.89	2.00	0.00	8.34	0.07	0.00
10.96	2.00	0.00	8.33	0.07	0.00	11.02	2.00	0.00	8.32	0.06	0.00
11.09	2.00	0.00	8.31	0.07	0.00	11.15	2.00	0.00	8.30	0.06	0.00
11.22	2.00	0.00	8.29	0.07	0.00	11.28	2.00	0.00	8.28	0.06	0.00
11.35	2.00	0.00	8.27	0.07	0.00	11.41	2.00	0.00	8.26	0.06	0.00
11.48	2.00	0.00	8.25	0.07	0.00	11.55	2.00	0.00	8.24	0.07	0.00
11.61	2.00	0.00	8.23	0.06	0.00	11.68	2.00	0.00	8.22	0.07	0.00
11.74	2.00	0.00	8.21	0.06	0.00	11.81	2.00	0.00	8.20	0.07	0.00
11.87	2.00	0.00	8.19	0.06	0.00	11.94	2.00	0.00	8.18	0.07	0.00
12.00	2.00	0.00	8.17	0.06	0.00	12.07	2.00	0.00	8.16	0.07	0.00
12.14	2.00	0.00	8.15	0.07	0.00	12.20	2.00	0.00	8.14	0.06	0.00
12.27	2.00	0.00	8.13	0.07	0.00	12.33	2.00	0.00	8.12	0.06	0.00
12.40	1.89	0.00	8.11	0.07	0.00	12.46	1.78	0.00	8.10	0.06	0.00
12.53	1.71	0.00	8.09	0.07	0.00	12.60	1.65	0.00	8.08	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
12.66	1.66	0.00	8.07	0.06	0.00	12.73	1.76	0.00	8.06	0.07	0.00
12.79	1.87	0.00	8.05	0.06	0.00	12.86	1.97	0.00	8.04	0.07	0.00
12.92	2.00	0.00	8.03	0.06	0.00	12.99	2.00	0.00	8.02	0.07	0.00
13.05	2.00	0.00	8.01	0.06	0.00	13.12	2.00	0.00	8.00	0.07	0.00
13.19	2.00	0.00	7.99	0.07	0.00	13.25	2.00	0.00	7.98	0.06	0.00
13.32	1.93	0.00	7.97	0.07	0.00	13.38	1.78	0.00	7.96	0.06	0.00
13.45	1.65	0.00	7.95	0.07	0.00	13.51	1.59	0.00	7.94	0.06	0.00
13.58	1.57	0.00	7.93	0.07	0.00	13.64	2.00	0.00	7.92	0.06	0.00
13.71	2.00	0.00	7.91	0.07	0.00	13.78	2.00	0.00	7.90	0.07	0.00
13.84	2.00	0.00	7.89	0.06	0.00	13.91	2.00	0.00	7.88	0.07	0.00
13.97	1.58	0.00	7.87	0.06	0.00	14.04	1.52	0.00	7.86	0.07	0.00
14.10	2.00	0.00	7.85	0.06	0.00	14.17	2.00	0.00	7.84	0.07	0.00
14.24	2.00	0.00	7.83	0.07	0.00	14.30	2.00	0.00	7.82	0.06	0.00
14.37	2.00	0.00	7.81	0.07	0.00	14.43	2.00	0.00	7.80	0.06	0.00
14.50	2.00	0.00	7.79	0.07	0.00	14.56	1.31	0.00	7.78	0.06	0.00
14.63	1.29	0.00	7.77	0.07	0.00	14.69	1.27	0.00	7.76	0.06	0.00
14.76	1.26	0.00	7.75	0.07	0.00	14.83	1.25	0.00	7.74	0.07	0.00
14.89	1.24	0.00	7.73	0.06	0.00	14.96	1.22	0.00	7.72	0.07	0.00
15.02	1.23	0.00	7.71	0.06	0.00	15.09	1.26	0.00	7.70	0.07	0.00
15.15	1.73	0.00	7.69	0.06	0.00	15.22	2.00	0.00	7.68	0.07	0.00
15.28	2.00	0.00	7.67	0.06	0.00	15.35	2.00	0.00	7.66	0.07	0.00
15.42	2.00	0.00	7.65	0.07	0.00	15.48	2.00	0.00	7.64	0.06	0.00
15.55	2.00	0.00	7.63	0.07	0.00	15.61	2.00	0.00	7.62	0.06	0.00
15.68	2.00	0.00	7.61	0.07	0.00	15.74	2.00	0.00	7.60	0.06	0.00
15.81	2.00	0.00	7.59	0.07	0.00	15.88	2.00	0.00	7.58	0.07	0.00
15.94	2.00	0.00	7.57	0.06	0.00	16.01	2.00	0.00	7.56	0.07	0.00
16.07	2.00	0.00	7.55	0.06	0.00	16.14	2.00	0.00	7.54	0.07	0.00
16.20	2.00	0.00	7.53	0.06	0.00	16.27	2.00	0.00	7.52	0.07	0.00
16.33	2.00	0.00	7.51	0.06	0.00	16.40	2.00	0.00	7.50	0.07	0.00
16.47	2.00	0.00	7.49	0.07	0.00	16.53	2.00	0.00	7.48	0.06	0.00
16.60	2.00	0.00	7.47	0.07	0.00	16.66	2.00	0.00	7.46	0.06	0.00
16.73	2.00	0.00	7.45	0.07	0.00	16.79	2.00	0.00	7.44	0.06	0.00
16.86	2.00	0.00	7.43	0.07	0.00	16.92	1.96	0.00	7.42	0.06	0.00
16.99	1.33	0.00	7.41	0.07	0.00	17.06	1.24	0.00	7.40	0.07	0.00
17.12	1.29	0.00	7.39	0.06	0.00	17.19	1.38	0.00	7.38	0.07	0.00
17.25	1.40	0.00	7.37	0.06	0.00	17.32	1.56	0.00	7.36	0.07	0.00
17.38	1.82	0.00	7.35	0.06	0.00	17.45	2.00	0.00	7.34	0.07	0.00
17.52	1.88	0.00	7.33	0.07	0.00	17.58	1.48	0.00	7.32	0.06	0.00
17.65	1.23	0.00	7.31	0.07	0.00	17.71	1.33	0.00	7.30	0.06	0.00
17.78	1.29	0.00	7.29	0.07	0.00	17.84	1.29	0.00	7.28	0.06	0.00
17.91	1.18	0.00	7.27	0.07	0.00	17.97	1.23	0.00	7.26	0.06	0.00
18.04	1.23	0.00	7.25	0.07	0.00	18.11	1.25	0.00	7.24	0.07	0.00
18.17	1.27	0.00	7.23	0.06	0.00	18.24	1.29	0.00	7.22	0.07	0.00
18.30	1.30	0.00	7.21	0.06	0.00	18.37	1.31	0.00	7.20	0.07	0.00
18.43	1.34	0.00	7.19	0.06	0.00	18.50	1.36	0.00	7.18	0.07	0.00
18.56	1.36	0.00	7.17	0.06	0.00	18.63	1.36	0.00	7.16	0.07	0.00
18.70	1.37	0.00	7.15	0.07	0.00	18.76	1.36	0.00	7.14	0.06	0.00
18.83	1.34	0.00	7.13	0.07	0.00	18.89	1.34	0.00	7.12	0.06	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
18.96	1.35	0.00	7.11	0.07	0.00	19.02	1.52	0.00	7.10	0.06	0.00
19.09	2.00	0.00	7.09	0.07	0.00	19.16	2.00	0.00	7.08	0.07	0.00
19.22	2.00	0.00	7.07	0.06	0.00	19.29	2.00	0.00	7.06	0.07	0.00
19.35	2.00	0.00	7.05	0.06	0.00	19.42	2.00	0.00	7.04	0.07	0.00
19.48	2.00	0.00	7.03	0.06	0.00	19.55	2.00	0.00	7.02	0.07	0.00
19.61	2.00	0.00	7.01	0.06	0.00	19.68	2.00	0.00	7.00	0.07	0.00
19.75	2.00	0.00	6.99	0.07	0.00	19.81	2.00	0.00	6.98	0.06	0.00
19.88	2.00	0.00	6.97	0.07	0.00	19.94	2.00	0.00	6.96	0.06	0.00
20.01	2.00	0.00	6.95	0.07	0.00	20.07	2.00	0.00	6.94	0.06	0.00
20.14	2.00	0.00	6.93	0.07	0.00	20.20	2.00	0.00	6.92	0.06	0.00
20.27	1.99	0.00	6.91	0.07	0.00	20.34	2.00	0.00	6.90	0.07	0.00
20.40	1.90	0.00	6.89	0.06	0.00	20.47	1.69	0.00	6.88	0.07	0.00
20.53	1.62	0.00	6.87	0.06	0.00	20.60	1.54	0.00	6.86	0.07	0.00
20.66	1.50	0.00	6.85	0.06	0.00	20.73	1.52	0.00	6.84	0.07	0.00
20.80	1.62	0.00	6.83	0.07	0.00	20.86	1.77	0.00	6.82	0.06	0.00
20.93	1.97	0.00	6.81	0.07	0.00	20.99	2.00	0.00	6.80	0.06	0.00
21.06	2.00	0.00	6.79	0.07	0.00	21.12	2.00	0.00	6.78	0.06	0.00
21.19	2.00	0.00	6.77	0.07	0.00	21.25	2.00	0.00	6.76	0.06	0.00
21.32	2.00	0.00	6.75	0.07	0.00	21.39	2.00	0.00	6.74	0.07	0.00
21.45	2.00	0.00	6.73	0.06	0.00	21.52	2.00	0.00	6.72	0.07	0.00
21.58	2.00	0.00	6.71	0.06	0.00	21.65	2.00	0.00	6.70	0.07	0.00
21.71	1.99	0.00	6.69	0.06	0.00	21.78	1.99	0.00	6.68	0.07	0.00
21.84	2.00	0.00	6.67	0.06	0.00	21.91	2.00	0.00	6.66	0.07	0.00
21.98	2.00	0.00	6.65	0.07	0.00	22.04	2.00	0.00	6.64	0.06	0.00
22.11	2.00	0.00	6.63	0.07	0.00	22.17	2.00	0.00	6.62	0.06	0.00
22.24	2.00	0.00	6.61	0.07	0.00	22.30	2.00	0.00	6.60	0.06	0.00
22.37	2.00	0.00	6.59	0.07	0.00	22.44	2.00	0.00	6.58	0.07	0.00
22.50	2.00	0.00	6.57	0.06	0.00	22.57	2.00	0.00	6.56	0.07	0.00
22.63	2.00	0.00	6.55	0.06	0.00	22.70	2.00	0.00	6.54	0.07	0.00
22.76	2.00	0.00	6.53	0.06	0.00	22.83	2.00	0.00	6.52	0.07	0.00
22.89	2.00	0.00	6.51	0.06	0.00	22.96	2.00	0.00	6.50	0.07	0.00
23.03	2.00	0.00	6.49	0.07	0.00	23.09	1.96	0.00	6.48	0.06	0.00
23.16	1.86	0.00	6.47	0.07	0.00	23.22	1.81	0.00	6.46	0.06	0.00
23.29	1.78	0.00	6.45	0.07	0.00	23.35	1.86	0.00	6.44	0.06	0.00
23.42	1.98	0.00	6.43	0.07	0.00	23.48	2.00	0.00	6.42	0.06	0.00
23.55	2.00	0.00	6.41	0.07	0.00	23.62	2.00	0.00	6.40	0.07	0.00
23.68	1.93	0.00	6.39	0.06	0.00	23.75	1.69	0.00	6.38	0.07	0.00
23.81	1.53	0.00	6.37	0.06	0.00	23.88	1.47	0.00	6.36	0.07	0.00
23.94	1.49	0.00	6.35	0.06	0.00	24.01	1.58	0.00	6.34	0.07	0.00
24.08	1.70	0.00	6.33	0.07	0.00	24.14	1.81	0.00	6.32	0.06	0.00
24.21	1.80	0.00	6.31	0.07	0.00	24.27	1.77	0.00	6.30	0.06	0.00
24.34	1.73	0.00	6.29	0.07	0.00	24.40	1.80	0.00	6.28	0.06	0.00
24.47	1.84	0.00	6.27	0.07	0.00	24.53	1.87	0.00	6.26	0.06	0.00
24.60	1.89	0.00	6.25	0.07	0.00	24.67	1.90	0.00	6.24	0.07	0.00
24.73	1.93	0.00	6.23	0.06	0.00	24.80	1.96	0.00	6.22	0.07	0.00
24.86	1.96	0.00	6.21	0.06	0.00	24.93	1.61	0.00	6.20	0.07	0.00
24.99	1.34	0.00	6.19	0.06	0.00	25.06	2.00	0.00	6.18	0.07	0.00
25.12	2.00	0.00	6.17	0.06	0.00						

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI

Overall liquefaction potential: 0.00

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

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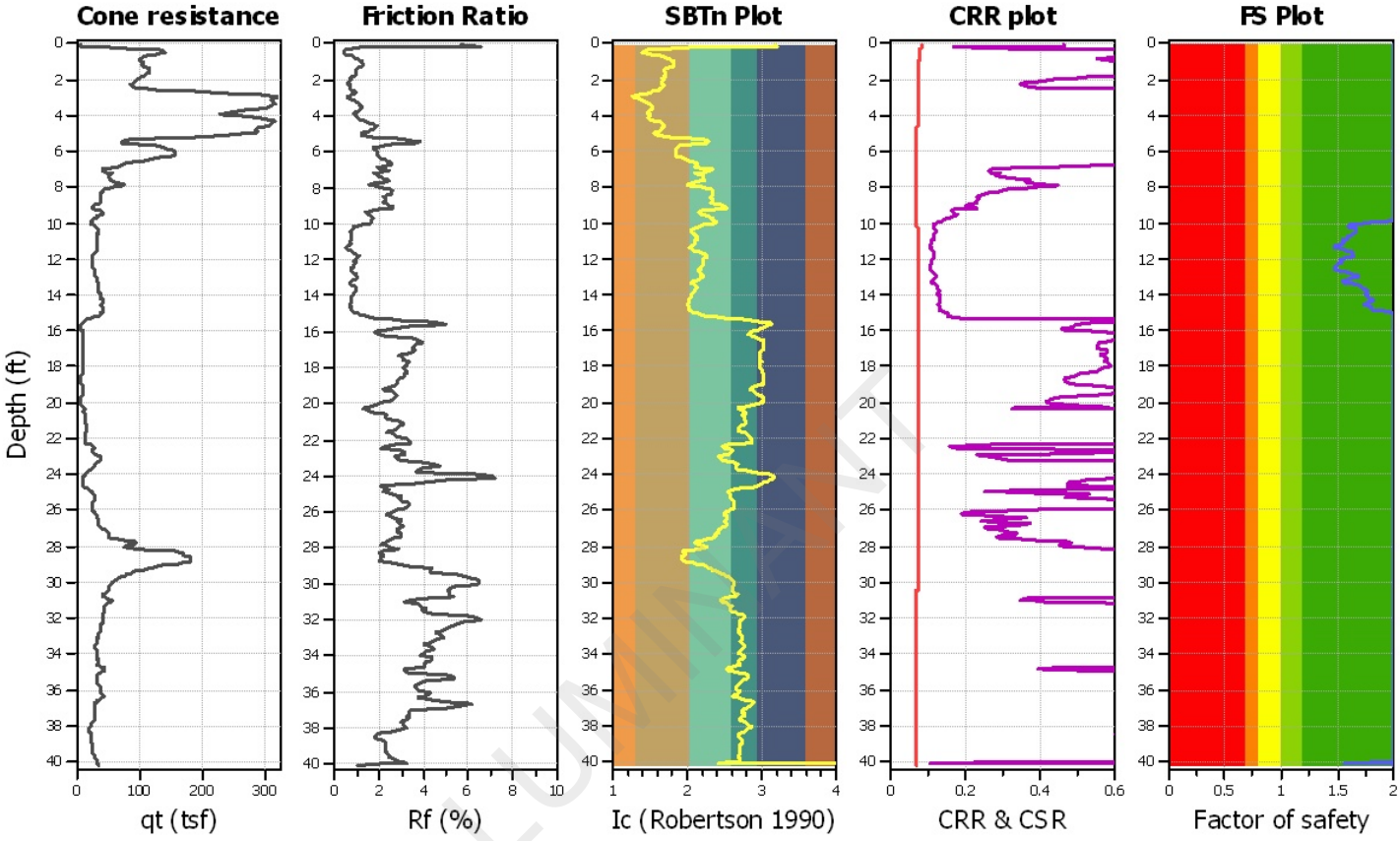
LIQUEFACTION ANALYSIS REPORT

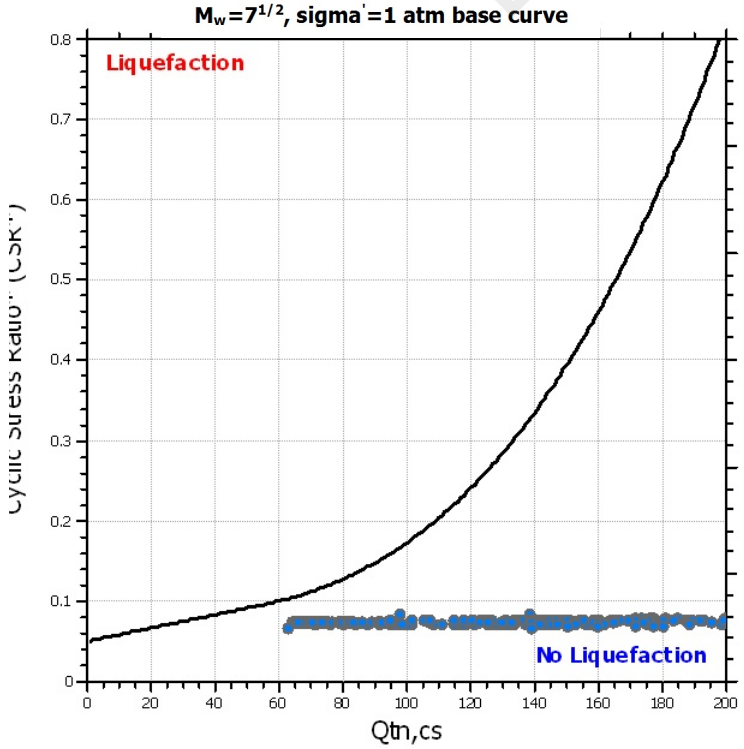
Project title : Martin Lake **Location : PDP-5**

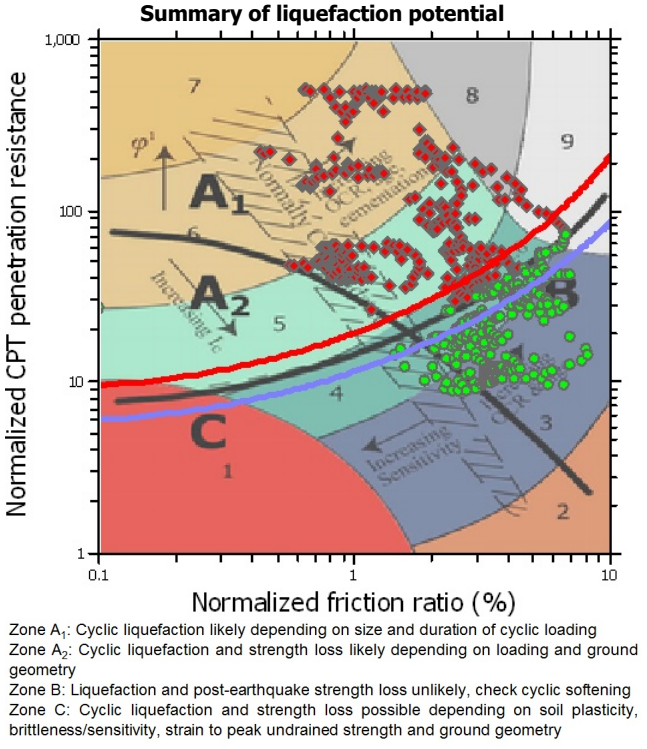
CPT file : B-07

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	1.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	0.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.20	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.09	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.07	2.00	0.00	9.99	0.06	0.00	0.13	2.00	0.00	9.98	0.06	0.00
0.20	2.00	0.00	9.97	0.07	0.00	0.26	2.00	0.00	9.96	0.06	0.00
0.33	2.00	0.00	9.95	0.07	0.00	0.39	2.00	0.00	9.94	0.06	0.00
0.46	2.00	0.00	9.93	0.07	0.00	0.52	2.00	0.00	9.92	0.06	0.00
0.59	2.00	0.00	9.91	0.07	0.00	0.66	2.00	0.00	9.90	0.07	0.00
0.72	2.00	0.00	9.89	0.06	0.00	0.79	2.00	0.00	9.88	0.07	0.00
0.85	2.00	0.00	9.87	0.06	0.00	0.92	2.00	0.00	9.86	0.07	0.00
0.98	2.00	0.00	9.85	0.06	0.00	1.05	2.00	0.00	9.84	0.07	0.00
1.12	2.00	0.00	9.83	0.07	0.00	1.18	2.00	0.00	9.82	0.06	0.00
1.25	2.00	0.00	9.81	0.07	0.00	1.31	2.00	0.00	9.80	0.06	0.00
1.38	2.00	0.00	9.79	0.07	0.00	1.44	2.00	0.00	9.78	0.06	0.00
1.51	2.00	0.00	9.77	0.07	0.00	1.57	2.00	0.00	9.76	0.06	0.00
1.64	2.00	0.00	9.75	0.07	0.00	1.71	2.00	0.00	9.74	0.07	0.00
1.77	2.00	0.00	9.73	0.06	0.00	1.84	2.00	0.00	9.72	0.07	0.00
1.90	2.00	0.00	9.71	0.06	0.00	1.97	2.00	0.00	9.70	0.07	0.00
2.03	2.00	0.00	9.69	0.06	0.00	2.10	2.00	0.00	9.68	0.07	0.00
2.16	2.00	0.00	9.67	0.06	0.00	2.23	2.00	0.00	9.66	0.07	0.00
2.30	2.00	0.00	9.65	0.07	0.00	2.36	2.00	0.00	9.64	0.06	0.00
2.43	2.00	0.00	9.63	0.07	0.00	2.49	2.00	0.00	9.62	0.06	0.00
2.56	2.00	0.00	9.61	0.07	0.00	2.62	2.00	0.00	9.60	0.06	0.00
2.69	2.00	0.00	9.59	0.07	0.00	2.76	2.00	0.00	9.58	0.07	0.00
2.82	2.00	0.00	9.57	0.06	0.00	2.89	2.00	0.00	9.56	0.07	0.00
2.95	2.00	0.00	9.55	0.06	0.00	3.02	2.00	0.00	9.54	0.07	0.00
3.08	2.00	0.00	9.53	0.06	0.00	3.15	2.00	0.00	9.52	0.07	0.00
3.21	2.00	0.00	9.51	0.06	0.00	3.28	2.00	0.00	9.50	0.07	0.00
3.35	2.00	0.00	9.49	0.07	0.00	3.41	2.00	0.00	9.48	0.06	0.00
3.48	2.00	0.00	9.47	0.07	0.00	3.54	2.00	0.00	9.46	0.06	0.00
3.61	2.00	0.00	9.45	0.07	0.00	3.67	2.00	0.00	9.44	0.06	0.00
3.74	2.00	0.00	9.43	0.07	0.00	3.80	2.00	0.00	9.42	0.06	0.00
3.87	2.00	0.00	9.41	0.07	0.00	3.94	2.00	0.00	9.40	0.07	0.00
4.00	2.00	0.00	9.39	0.06	0.00	4.07	2.00	0.00	9.38	0.07	0.00
4.13	2.00	0.00	9.37	0.06	0.00	4.20	2.00	0.00	9.36	0.07	0.00
4.26	2.00	0.00	9.35	0.06	0.00	4.33	2.00	0.00	9.34	0.07	0.00
4.40	2.00	0.00	9.33	0.07	0.00	4.46	2.00	0.00	9.32	0.06	0.00
4.53	2.00	0.00	9.31	0.07	0.00	4.59	2.00	0.00	9.30	0.06	0.00
4.66	2.00	0.00	9.29	0.07	0.00	4.72	2.00	0.00	9.28	0.06	0.00
4.79	2.00	0.00	9.27	0.07	0.00	4.85	2.00	0.00	9.26	0.06	0.00
4.92	2.00	0.00	9.25	0.07	0.00	4.99	2.00	0.00	9.24	0.07	0.00
5.05	2.00	0.00	9.23	0.06	0.00	5.12	2.00	0.00	9.22	0.07	0.00
5.18	2.00	0.00	9.21	0.06	0.00	5.25	2.00	0.00	9.20	0.07	0.00
5.31	2.00	0.00	9.19	0.06	0.00	5.38	2.00	0.00	9.18	0.07	0.00
5.44	2.00	0.00	9.17	0.06	0.00	5.51	2.00	0.00	9.16	0.07	0.00
5.58	2.00	0.00	9.15	0.07	0.00	5.64	2.00	0.00	9.14	0.06	0.00
5.71	2.00	0.00	9.13	0.07	0.00	5.77	2.00	0.00	9.12	0.06	0.00
5.84	2.00	0.00	9.11	0.07	0.00	5.90	2.00	0.00	9.10	0.06	0.00
5.97	2.00	0.00	9.09	0.07	0.00	6.04	2.00	0.00	9.08	0.07	0.00
6.10	2.00	0.00	9.07	0.06	0.00	6.17	2.00	0.00	9.06	0.07	0.00
6.23	2.00	0.00	9.05	0.06	0.00	6.30	2.00	0.00	9.04	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
6.36	2.00	0.00	9.03	0.06	0.00	6.43	2.00	0.00	9.02	0.07	0.00
6.49	2.00	0.00	9.01	0.06	0.00	6.56	2.00	0.00	9.00	0.07	0.00
6.63	2.00	0.00	8.99	0.07	0.00	6.69	2.00	0.00	8.98	0.06	0.00
6.76	2.00	0.00	8.97	0.07	0.00	6.82	2.00	0.00	8.96	0.06	0.00
6.89	2.00	0.00	8.95	0.07	0.00	6.95	2.00	0.00	8.94	0.06	0.00
7.02	2.00	0.00	8.93	0.07	0.00	7.08	2.00	0.00	8.92	0.06	0.00
7.15	2.00	0.00	8.91	0.07	0.00	7.22	2.00	0.00	8.90	0.07	0.00
7.28	2.00	0.00	8.89	0.06	0.00	7.35	2.00	0.00	8.88	0.07	0.00
7.41	2.00	0.00	8.87	0.06	0.00	7.48	2.00	0.00	8.86	0.07	0.00
7.54	2.00	0.00	8.85	0.06	0.00	7.61	2.00	0.00	8.84	0.07	0.00
7.68	2.00	0.00	8.83	0.07	0.00	7.74	2.00	0.00	8.82	0.06	0.00
7.81	2.00	0.00	8.81	0.07	0.00	7.87	2.00	0.00	8.80	0.06	0.00
7.94	2.00	0.00	8.79	0.07	0.00	8.00	2.00	0.00	8.78	0.06	0.00
8.07	2.00	0.00	8.77	0.07	0.00	8.13	2.00	0.00	8.76	0.06	0.00
8.20	2.00	0.00	8.75	0.07	0.00	8.27	2.00	0.00	8.74	0.07	0.00
8.33	2.00	0.00	8.73	0.06	0.00	8.40	2.00	0.00	8.72	0.07	0.00
8.46	2.00	0.00	8.71	0.06	0.00	8.53	2.00	0.00	8.70	0.07	0.00
8.59	2.00	0.00	8.69	0.06	0.00	8.66	2.00	0.00	8.68	0.07	0.00
8.72	2.00	0.00	8.67	0.06	0.00	8.79	2.00	0.00	8.66	0.07	0.00
8.86	2.00	0.00	8.65	0.07	0.00	8.92	2.00	0.00	8.64	0.06	0.00
8.99	2.00	0.00	8.63	0.07	0.00	9.05	2.00	0.00	8.62	0.06	0.00
9.12	2.00	0.00	8.61	0.07	0.00	9.18	2.00	0.00	8.60	0.06	0.00
9.25	2.00	0.00	8.59	0.07	0.00	9.32	2.00	0.00	8.58	0.07	0.00
9.38	2.00	0.00	8.57	0.06	0.00	9.45	2.00	0.00	8.56	0.07	0.00
9.51	2.00	0.00	8.55	0.06	0.00	9.58	2.00	0.00	8.54	0.07	0.00
9.64	2.00	0.00	8.53	0.06	0.00	9.71	2.00	0.00	8.52	0.07	0.00
9.77	2.00	0.00	8.51	0.06	0.00	9.84	2.00	0.00	8.50	0.07	0.00
9.91	1.91	0.00	8.49	0.07	0.00	9.97	1.81	0.00	8.48	0.06	0.00
10.04	1.70	0.00	8.47	0.07	0.00	10.10	1.61	0.00	8.46	0.06	0.00
10.17	1.60	0.00	8.45	0.07	0.00	10.23	1.61	0.00	8.44	0.06	0.00
10.30	1.66	0.00	8.43	0.07	0.00	10.36	1.67	0.00	8.42	0.06	0.00
10.43	1.67	0.00	8.41	0.07	0.00	10.50	1.67	0.00	8.40	0.07	0.00
10.56	1.65	0.00	8.39	0.06	0.00	10.63	1.63	0.00	8.38	0.07	0.00
10.69	1.62	0.00	8.37	0.06	0.00	10.76	1.60	0.00	8.36	0.07	0.00
10.82	1.60	0.00	8.35	0.06	0.00	10.89	1.59	0.00	8.34	0.07	0.00
10.96	1.55	0.00	8.33	0.07	0.00	11.02	1.54	0.00	8.32	0.06	0.00
11.09	1.55	0.00	8.31	0.07	0.00	11.15	1.55	0.00	8.30	0.06	0.00
11.22	1.50	0.00	8.29	0.07	0.00	11.28	1.46	0.00	8.28	0.06	0.00
11.35	1.47	0.00	8.27	0.07	0.00	11.41	1.51	0.00	8.26	0.06	0.00
11.48	1.57	0.00	8.25	0.07	0.00	11.55	1.60	0.00	8.24	0.07	0.00
11.61	1.63	0.00	8.23	0.06	0.00	11.68	1.62	0.00	8.22	0.07	0.00
11.74	1.64	0.00	8.21	0.06	0.00	11.81	1.64	0.00	8.20	0.07	0.00
11.87	1.62	0.00	8.19	0.06	0.00	11.94	1.57	0.00	8.18	0.07	0.00
12.00	1.55	0.00	8.17	0.06	0.00	12.07	1.53	0.00	8.16	0.07	0.00
12.14	1.54	0.00	8.15	0.07	0.00	12.20	1.53	0.00	8.14	0.06	0.00
12.27	1.51	0.00	8.13	0.07	0.00	12.33	1.49	0.00	8.12	0.06	0.00
12.40	1.48	0.00	8.11	0.07	0.00	12.46	1.47	0.00	8.10	0.06	0.00
12.53	1.48	0.00	8.09	0.07	0.00	12.60	1.48	0.00	8.08	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
12.66	1.52	0.00	8.07	0.06	0.00	12.73	1.55	0.00	8.06	0.07	0.00
12.79	1.61	0.00	8.05	0.06	0.00	12.86	1.65	0.00	8.04	0.07	0.00
12.92	1.68	0.00	8.03	0.06	0.00	12.99	1.69	0.00	8.02	0.07	0.00
13.05	1.65	0.00	8.01	0.06	0.00	13.12	1.60	0.00	8.00	0.07	0.00
13.19	1.55	0.00	7.99	0.07	0.00	13.25	1.54	0.00	7.98	0.06	0.00
13.32	1.55	0.00	7.97	0.07	0.00	13.38	1.61	0.00	7.96	0.06	0.00
13.45	1.68	0.00	7.95	0.07	0.00	13.51	1.72	0.00	7.94	0.06	0.00
13.58	1.73	0.00	7.93	0.07	0.00	13.64	1.74	0.00	7.92	0.06	0.00
13.71	1.75	0.00	7.91	0.07	0.00	13.78	1.78	0.00	7.90	0.07	0.00
13.84	1.76	0.00	7.89	0.06	0.00	13.91	1.76	0.00	7.88	0.07	0.00
13.97	1.76	0.00	7.87	0.06	0.00	14.04	1.77	0.00	7.86	0.07	0.00
14.10	1.78	0.00	7.85	0.06	0.00	14.17	1.78	0.00	7.84	0.07	0.00
14.24	1.81	0.00	7.83	0.07	0.00	14.30	1.83	0.00	7.82	0.06	0.00
14.37	1.82	0.00	7.81	0.07	0.00	14.43	1.77	0.00	7.80	0.06	0.00
14.50	1.74	0.00	7.79	0.07	0.00	14.56	1.75	0.00	7.78	0.06	0.00
14.63	1.78	0.00	7.77	0.07	0.00	14.69	1.81	0.00	7.76	0.06	0.00
14.76	1.81	0.00	7.75	0.07	0.00	14.83	1.83	0.00	7.74	0.07	0.00
14.89	1.90	0.00	7.73	0.06	0.00	14.96	2.00	0.00	7.72	0.07	0.00
15.02	2.00	0.00	7.71	0.06	0.00	15.09	2.00	0.00	7.70	0.07	0.00
15.15	2.00	0.00	7.69	0.06	0.00	15.22	2.00	0.00	7.68	0.07	0.00
15.28	2.00	0.00	7.67	0.06	0.00	15.35	2.00	0.00	7.66	0.07	0.00
15.42	2.00	0.00	7.65	0.07	0.00	15.48	2.00	0.00	7.64	0.06	0.00
15.55	2.00	0.00	7.63	0.07	0.00	15.61	2.00	0.00	7.62	0.06	0.00
15.68	2.00	0.00	7.61	0.07	0.00	15.74	2.00	0.00	7.60	0.06	0.00
15.81	2.00	0.00	7.59	0.07	0.00	15.88	2.00	0.00	7.58	0.07	0.00
15.94	2.00	0.00	7.57	0.06	0.00	16.01	2.00	0.00	7.56	0.07	0.00
16.07	2.00	0.00	7.55	0.06	0.00	16.14	2.00	0.00	7.54	0.07	0.00
16.20	2.00	0.00	7.53	0.06	0.00	16.27	2.00	0.00	7.52	0.07	0.00
16.33	2.00	0.00	7.51	0.06	0.00	16.40	2.00	0.00	7.50	0.07	0.00
16.47	2.00	0.00	7.49	0.07	0.00	16.53	2.00	0.00	7.48	0.06	0.00
16.60	2.00	0.00	7.47	0.07	0.00	16.66	2.00	0.00	7.46	0.06	0.00
16.73	2.00	0.00	7.45	0.07	0.00	16.79	2.00	0.00	7.44	0.06	0.00
16.86	2.00	0.00	7.43	0.07	0.00	16.92	2.00	0.00	7.42	0.06	0.00
16.99	2.00	0.00	7.41	0.07	0.00	17.06	2.00	0.00	7.40	0.07	0.00
17.12	2.00	0.00	7.39	0.06	0.00	17.19	2.00	0.00	7.38	0.07	0.00
17.25	2.00	0.00	7.37	0.06	0.00	17.32	2.00	0.00	7.36	0.07	0.00
17.38	2.00	0.00	7.35	0.06	0.00	17.45	2.00	0.00	7.34	0.07	0.00
17.52	2.00	0.00	7.33	0.07	0.00	17.58	2.00	0.00	7.32	0.06	0.00
17.65	2.00	0.00	7.31	0.07	0.00	17.71	2.00	0.00	7.30	0.06	0.00
17.78	2.00	0.00	7.29	0.07	0.00	17.84	2.00	0.00	7.28	0.06	0.00
17.91	2.00	0.00	7.27	0.07	0.00	17.97	2.00	0.00	7.26	0.06	0.00
18.04	2.00	0.00	7.25	0.07	0.00	18.11	2.00	0.00	7.24	0.07	0.00
18.17	2.00	0.00	7.23	0.06	0.00	18.24	2.00	0.00	7.22	0.07	0.00
18.30	2.00	0.00	7.21	0.06	0.00	18.37	2.00	0.00	7.20	0.07	0.00
18.43	2.00	0.00	7.19	0.06	0.00	18.50	2.00	0.00	7.18	0.07	0.00
18.56	2.00	0.00	7.17	0.06	0.00	18.63	2.00	0.00	7.16	0.07	0.00
18.70	2.00	0.00	7.15	0.07	0.00	18.76	2.00	0.00	7.14	0.06	0.00
18.83	2.00	0.00	7.13	0.07	0.00	18.89	2.00	0.00	7.12	0.06	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
18.96	2.00	0.00	7.11	0.07	0.00	19.02	2.00	0.00	7.10	0.06	0.00
19.09	2.00	0.00	7.09	0.07	0.00	19.16	2.00	0.00	7.08	0.07	0.00
19.22	2.00	0.00	7.07	0.06	0.00	19.29	2.00	0.00	7.06	0.07	0.00
19.35	2.00	0.00	7.05	0.06	0.00	19.42	2.00	0.00	7.04	0.07	0.00
19.48	2.00	0.00	7.03	0.06	0.00	19.55	2.00	0.00	7.02	0.07	0.00
19.61	2.00	0.00	7.01	0.06	0.00	19.68	2.00	0.00	7.00	0.07	0.00
19.75	2.00	0.00	6.99	0.07	0.00	19.81	2.00	0.00	6.98	0.06	0.00
19.88	2.00	0.00	6.97	0.07	0.00	19.94	2.00	0.00	6.96	0.06	0.00
20.01	2.00	0.00	6.95	0.07	0.00	20.07	2.00	0.00	6.94	0.06	0.00
20.14	2.00	0.00	6.93	0.07	0.00	20.20	2.00	0.00	6.92	0.06	0.00
20.27	2.00	0.00	6.91	0.07	0.00	20.34	2.00	0.00	6.90	0.07	0.00
20.40	2.00	0.00	6.89	0.06	0.00	20.47	2.00	0.00	6.88	0.07	0.00
20.53	2.00	0.00	6.87	0.06	0.00	20.60	2.00	0.00	6.86	0.07	0.00
20.66	2.00	0.00	6.85	0.06	0.00	20.73	2.00	0.00	6.84	0.07	0.00
20.80	2.00	0.00	6.83	0.07	0.00	20.86	2.00	0.00	6.82	0.06	0.00
20.93	2.00	0.00	6.81	0.07	0.00	20.99	2.00	0.00	6.80	0.06	0.00
21.06	2.00	0.00	6.79	0.07	0.00	21.12	2.00	0.00	6.78	0.06	0.00
21.19	2.00	0.00	6.77	0.07	0.00	21.25	2.00	0.00	6.76	0.06	0.00
21.32	2.00	0.00	6.75	0.07	0.00	21.39	2.00	0.00	6.74	0.07	0.00
21.45	2.00	0.00	6.73	0.06	0.00	21.52	2.00	0.00	6.72	0.07	0.00
21.58	2.00	0.00	6.71	0.06	0.00	21.65	2.00	0.00	6.70	0.07	0.00
21.71	2.00	0.00	6.69	0.06	0.00	21.78	2.00	0.00	6.68	0.07	0.00
21.84	2.00	0.00	6.67	0.06	0.00	21.91	2.00	0.00	6.66	0.07	0.00
21.98	2.00	0.00	6.65	0.07	0.00	22.04	2.00	0.00	6.64	0.06	0.00
22.11	2.00	0.00	6.63	0.07	0.00	22.17	2.00	0.00	6.62	0.06	0.00
22.24	2.00	0.00	6.61	0.07	0.00	22.30	2.00	0.00	6.60	0.06	0.00
22.37	2.00	0.00	6.59	0.07	0.00	22.44	2.00	0.00	6.58	0.07	0.00
22.50	2.00	0.00	6.57	0.06	0.00	22.57	2.00	0.00	6.56	0.07	0.00
22.63	2.00	0.00	6.55	0.06	0.00	22.70	2.00	0.00	6.54	0.07	0.00
22.76	2.00	0.00	6.53	0.06	0.00	22.83	2.00	0.00	6.52	0.07	0.00
22.89	2.00	0.00	6.51	0.06	0.00	22.96	2.00	0.00	6.50	0.07	0.00
23.03	2.00	0.00	6.49	0.07	0.00	23.09	2.00	0.00	6.48	0.06	0.00
23.16	2.00	0.00	6.47	0.07	0.00	23.22	2.00	0.00	6.46	0.06	0.00
23.29	2.00	0.00	6.45	0.07	0.00	23.35	2.00	0.00	6.44	0.06	0.00
23.42	2.00	0.00	6.43	0.07	0.00	23.48	2.00	0.00	6.42	0.06	0.00
23.55	2.00	0.00	6.41	0.07	0.00	23.62	2.00	0.00	6.40	0.07	0.00
23.68	2.00	0.00	6.39	0.06	0.00	23.75	2.00	0.00	6.38	0.07	0.00
23.81	2.00	0.00	6.37	0.06	0.00	23.88	2.00	0.00	6.36	0.07	0.00
23.94	2.00	0.00	6.35	0.06	0.00	24.01	2.00	0.00	6.34	0.07	0.00
24.08	2.00	0.00	6.33	0.07	0.00	24.14	2.00	0.00	6.32	0.06	0.00
24.21	2.00	0.00	6.31	0.07	0.00	24.27	2.00	0.00	6.30	0.06	0.00
24.34	2.00	0.00	6.29	0.07	0.00	24.40	2.00	0.00	6.28	0.06	0.00
24.47	2.00	0.00	6.27	0.07	0.00	24.53	2.00	0.00	6.26	0.06	0.00
24.60	2.00	0.00	6.25	0.07	0.00	24.67	2.00	0.00	6.24	0.07	0.00
24.73	2.00	0.00	6.23	0.06	0.00	24.80	2.00	0.00	6.22	0.07	0.00
24.86	2.00	0.00	6.21	0.06	0.00	24.93	2.00	0.00	6.20	0.07	0.00
24.99	2.00	0.00	6.19	0.06	0.00	25.06	2.00	0.00	6.18	0.07	0.00
25.12	2.00	0.00	6.17	0.06	0.00	25.19	2.00	0.00	6.16	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
25.26	2.00	0.00	6.15	0.07	0.00	25.32	2.00	0.00	6.14	0.06	0.00
25.39	2.00	0.00	6.13	0.07	0.00	25.45	2.00	0.00	6.12	0.06	0.00
25.52	2.00	0.00	6.11	0.07	0.00	25.58	2.00	0.00	6.10	0.06	0.00
25.65	2.00	0.00	6.09	0.07	0.00	25.72	2.00	0.00	6.08	0.07	0.00
25.78	2.00	0.00	6.07	0.06	0.00	25.85	2.00	0.00	6.06	0.07	0.00
25.91	2.00	0.00	6.05	0.06	0.00	25.98	2.00	0.00	6.04	0.07	0.00
26.04	2.00	0.00	6.03	0.06	0.00	26.11	2.00	0.00	6.02	0.07	0.00
26.17	2.00	0.00	6.01	0.06	0.00	26.24	2.00	0.00	6.00	0.07	0.00
26.31	2.00	0.00	5.99	0.07	0.00	26.37	2.00	0.00	5.98	0.06	0.00
26.44	2.00	0.00	5.97	0.07	0.00	26.50	2.00	0.00	5.96	0.06	0.00
26.57	2.00	0.00	5.95	0.07	0.00	26.63	2.00	0.00	5.94	0.06	0.00
26.70	2.00	0.00	5.93	0.07	0.00	26.76	2.00	0.00	5.92	0.06	0.00
26.83	2.00	0.00	5.91	0.07	0.00	26.90	2.00	0.00	5.90	0.07	0.00
26.96	2.00	0.00	5.89	0.06	0.00	27.03	2.00	0.00	5.88	0.07	0.00
27.09	2.00	0.00	5.87	0.06	0.00	27.16	2.00	0.00	5.86	0.07	0.00
27.22	2.00	0.00	5.85	0.06	0.00	27.29	2.00	0.00	5.84	0.07	0.00
27.36	2.00	0.00	5.83	0.07	0.00	27.42	2.00	0.00	5.82	0.06	0.00
27.49	2.00	0.00	5.81	0.07	0.00	27.55	2.00	0.00	5.80	0.06	0.00
27.62	2.00	0.00	5.79	0.07	0.00	27.68	2.00	0.00	5.78	0.06	0.00
27.75	2.00	0.00	5.77	0.07	0.00	27.81	2.00	0.00	5.76	0.06	0.00
27.88	2.00	0.00	5.75	0.07	0.00	27.95	2.00	0.00	5.74	0.07	0.00
28.01	2.00	0.00	5.73	0.06	0.00	28.08	2.00	0.00	5.72	0.07	0.00
28.14	2.00	0.00	5.71	0.06	0.00	28.21	2.00	0.00	5.70	0.07	0.00
28.27	2.00	0.00	5.69	0.06	0.00	28.34	2.00	0.00	5.68	0.07	0.00
28.40	2.00	0.00	5.67	0.06	0.00	28.47	2.00	0.00	5.66	0.07	0.00
28.54	2.00	0.00	5.65	0.07	0.00	28.60	2.00	0.00	5.64	0.06	0.00
28.67	2.00	0.00	5.63	0.07	0.00	28.73	2.00	0.00	5.62	0.06	0.00
28.80	2.00	0.00	5.61	0.07	0.00	28.86	2.00	0.00	5.60	0.06	0.00
28.93	2.00	0.00	5.59	0.07	0.00	29.00	2.00	0.00	5.58	0.07	0.00
29.06	2.00	0.00	5.57	0.06	0.00	29.13	2.00	0.00	5.56	0.07	0.00
29.19	2.00	0.00	5.55	0.06	0.00	29.26	2.00	0.00	5.54	0.07	0.00
29.32	2.00	0.00	5.53	0.06	0.00	29.39	2.00	0.00	5.52	0.07	0.00
29.45	2.00	0.00	5.51	0.06	0.00	29.52	2.00	0.00	5.50	0.07	0.00
29.59	2.00	0.00	5.49	0.07	0.00	29.65	2.00	0.00	5.48	0.06	0.00
29.72	2.00	0.00	5.47	0.07	0.00	29.78	2.00	0.00	5.46	0.06	0.00
29.85	2.00	0.00	5.45	0.07	0.00	29.91	2.00	0.00	5.44	0.06	0.00
29.98	2.00	0.00	5.43	0.07	0.00	30.04	2.00	0.00	5.42	0.06	0.00
30.11	2.00	0.00	5.41	0.07	0.00	30.18	2.00	0.00	5.40	0.07	0.00
30.24	2.00	0.00	5.39	0.06	0.00	30.31	2.00	0.00	5.38	0.07	0.00
30.37	2.00	0.00	5.37	0.06	0.00	30.44	2.00	0.00	5.36	0.07	0.00
30.50	2.00	0.00	5.35	0.06	0.00	30.57	2.00	0.00	5.34	0.07	0.00
30.64	2.00	0.00	5.33	0.07	0.00	30.70	2.00	0.00	5.32	0.06	0.00
30.77	2.00	0.00	5.31	0.07	0.00	30.83	2.00	0.00	5.30	0.06	0.00
30.90	2.00	0.00	5.29	0.07	0.00	30.96	2.00	0.00	5.28	0.06	0.00
31.03	2.00	0.00	5.27	0.07	0.00	31.09	2.00	0.00	5.26	0.06	0.00
31.16	2.00	0.00	5.25	0.07	0.00	31.23	2.00	0.00	5.24	0.07	0.00
31.29	2.00	0.00	5.23	0.06	0.00	31.36	2.00	0.00	5.22	0.07	0.00
31.42	2.00	0.00	5.21	0.06	0.00	31.49	2.00	0.00	5.20	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.55	2.00	0.00	5.19	0.06	0.00	31.62	2.00	0.00	5.18	0.07	0.00
31.68	2.00	0.00	5.17	0.06	0.00	31.75	2.00	0.00	5.16	0.07	0.00
31.82	2.00	0.00	5.15	0.07	0.00	31.88	2.00	0.00	5.14	0.06	0.00
31.95	2.00	0.00	5.13	0.07	0.00	32.01	2.00	0.00	5.12	0.06	0.00
32.08	2.00	0.00	5.11	0.07	0.00	32.14	2.00	0.00	5.10	0.06	0.00
32.21	2.00	0.00	5.09	0.07	0.00	32.28	2.00	0.00	5.08	0.07	0.00
32.34	2.00	0.00	5.07	0.06	0.00	32.41	2.00	0.00	5.06	0.07	0.00
32.47	2.00	0.00	5.05	0.06	0.00	32.54	2.00	0.00	5.04	0.07	0.00
32.60	2.00	0.00	5.03	0.06	0.00	32.67	2.00	0.00	5.02	0.07	0.00
32.73	2.00	0.00	5.01	0.06	0.00	32.80	2.00	0.00	5.00	0.07	0.00
32.87	2.00	0.00	4.99	0.07	0.00	32.93	2.00	0.00	4.98	0.06	0.00
33.00	2.00	0.00	4.97	0.07	0.00	33.06	2.00	0.00	4.96	0.06	0.00
33.13	2.00	0.00	4.95	0.07	0.00	33.19	2.00	0.00	4.94	0.06	0.00
33.26	2.00	0.00	4.93	0.07	0.00	33.32	2.00	0.00	4.92	0.06	0.00
33.39	2.00	0.00	4.91	0.07	0.00	33.46	2.00	0.00	4.90	0.07	0.00
33.52	2.00	0.00	4.89	0.06	0.00	33.59	2.00	0.00	4.88	0.07	0.00
33.65	2.00	0.00	4.87	0.06	0.00	33.72	2.00	0.00	4.86	0.07	0.00
33.78	2.00	0.00	4.85	0.06	0.00	33.85	2.00	0.00	4.84	0.07	0.00
33.92	2.00	0.00	4.83	0.07	0.00	33.98	2.00	0.00	4.82	0.06	0.00
34.05	2.00	0.00	4.81	0.07	0.00	34.11	2.00	0.00	4.80	0.06	0.00
34.18	2.00	0.00	4.79	0.07	0.00	34.24	2.00	0.00	4.78	0.06	0.00
34.31	2.00	0.00	4.77	0.07	0.00	34.37	2.00	0.00	4.76	0.06	0.00
34.44	2.00	0.00	4.75	0.07	0.00	34.51	2.00	0.00	4.74	0.07	0.00
34.57	2.00	0.00	4.73	0.06	0.00	34.64	2.00	0.00	4.72	0.07	0.00
34.70	2.00	0.00	4.71	0.06	0.00	34.77	2.00	0.00	4.70	0.07	0.00
34.83	2.00	0.00	4.69	0.06	0.00	34.90	2.00	0.00	4.68	0.07	0.00
34.96	2.00	0.00	4.67	0.06	0.00	35.03	2.00	0.00	4.66	0.07	0.00
35.10	2.00	0.00	4.65	0.07	0.00	35.16	2.00	0.00	4.64	0.06	0.00
35.23	2.00	0.00	4.63	0.07	0.00	35.29	2.00	0.00	4.62	0.06	0.00
35.36	2.00	0.00	4.61	0.07	0.00	35.42	2.00	0.00	4.60	0.06	0.00
35.49	2.00	0.00	4.59	0.07	0.00	35.56	2.00	0.00	4.58	0.07	0.00
35.62	2.00	0.00	4.57	0.06	0.00	35.69	2.00	0.00	4.56	0.07	0.00
35.75	2.00	0.00	4.55	0.06	0.00	35.82	2.00	0.00	4.54	0.07	0.00
35.88	2.00	0.00	4.53	0.06	0.00	35.95	2.00	0.00	4.52	0.07	0.00
36.01	2.00	0.00	4.51	0.06	0.00	36.08	2.00	0.00	4.50	0.07	0.00
36.15	2.00	0.00	4.49	0.07	0.00	36.21	2.00	0.00	4.48	0.06	0.00
36.28	2.00	0.00	4.47	0.07	0.00	36.34	2.00	0.00	4.46	0.06	0.00
36.41	2.00	0.00	4.45	0.07	0.00	36.47	2.00	0.00	4.44	0.06	0.00
36.54	2.00	0.00	4.43	0.07	0.00	36.60	2.00	0.00	4.42	0.06	0.00
36.67	2.00	0.00	4.41	0.07	0.00	36.74	2.00	0.00	4.40	0.07	0.00
36.80	2.00	0.00	4.39	0.06	0.00	36.87	2.00	0.00	4.38	0.07	0.00
36.93	2.00	0.00	4.37	0.06	0.00	37.00	2.00	0.00	4.36	0.07	0.00
37.06	2.00	0.00	4.35	0.06	0.00	37.13	2.00	0.00	4.34	0.07	0.00
37.20	2.00	0.00	4.33	0.07	0.00	37.26	2.00	0.00	4.32	0.06	0.00
37.33	2.00	0.00	4.31	0.07	0.00	37.39	2.00	0.00	4.30	0.06	0.00
37.46	2.00	0.00	4.29	0.07	0.00	37.52	2.00	0.00	4.28	0.06	0.00
37.59	2.00	0.00	4.27	0.07	0.00	37.65	2.00	0.00	4.26	0.06	0.00
37.72	2.00	0.00	4.25	0.07	0.00	37.79	2.00	0.00	4.24	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
37.85	2.00	0.00	4.23	0.06	0.00	37.92	2.00	0.00	4.22	0.07	0.00
37.98	2.00	0.00	4.21	0.06	0.00	38.05	2.00	0.00	4.20	0.07	0.00
38.11	2.00	0.00	4.19	0.06	0.00	38.18	2.00	0.00	4.18	0.07	0.00
38.24	2.00	0.00	4.17	0.06	0.00	38.31	2.00	0.00	4.16	0.07	0.00
38.38	2.00	0.00	4.15	0.07	0.00	38.44	2.00	0.00	4.14	0.06	0.00
38.51	2.00	0.00	4.13	0.07	0.00	38.57	2.00	0.00	4.12	0.06	0.00
38.64	2.00	0.00	4.11	0.07	0.00	38.70	2.00	0.00	4.10	0.06	0.00
38.77	2.00	0.00	4.09	0.07	0.00	38.84	2.00	0.00	4.08	0.07	0.00
38.90	2.00	0.00	4.07	0.06	0.00	38.97	2.00	0.00	4.06	0.07	0.00
39.03	2.00	0.00	4.05	0.06	0.00	39.10	2.00	0.00	4.04	0.07	0.00
39.16	2.00	0.00	4.03	0.06	0.00	39.23	2.00	0.00	4.02	0.07	0.00
39.29	2.00	0.00	4.01	0.06	0.00	39.36	2.00	0.00	4.00	0.07	0.00
39.43	2.00	0.00	3.99	0.07	0.00	39.49	2.00	0.00	3.98	0.06	0.00
39.56	2.00	0.00	3.97	0.07	0.00	39.62	2.00	0.00	3.96	0.06	0.00
39.69	2.00	0.00	3.95	0.07	0.00	39.75	2.00	0.00	3.94	0.06	0.00
39.82	2.00	0.00	3.93	0.07	0.00	39.88	2.00	0.00	3.92	0.06	0.00
39.95	2.00	0.00	3.91	0.07	0.00	40.02	2.00	0.00	3.90	0.07	0.00
40.08	1.57	0.00	3.89	0.06	0.00	40.15	2.00	0.00	3.88	0.07	0.00
40.21	2.00	0.00	3.87	0.06	0.00						

Overall liquefaction potential: 0.00

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

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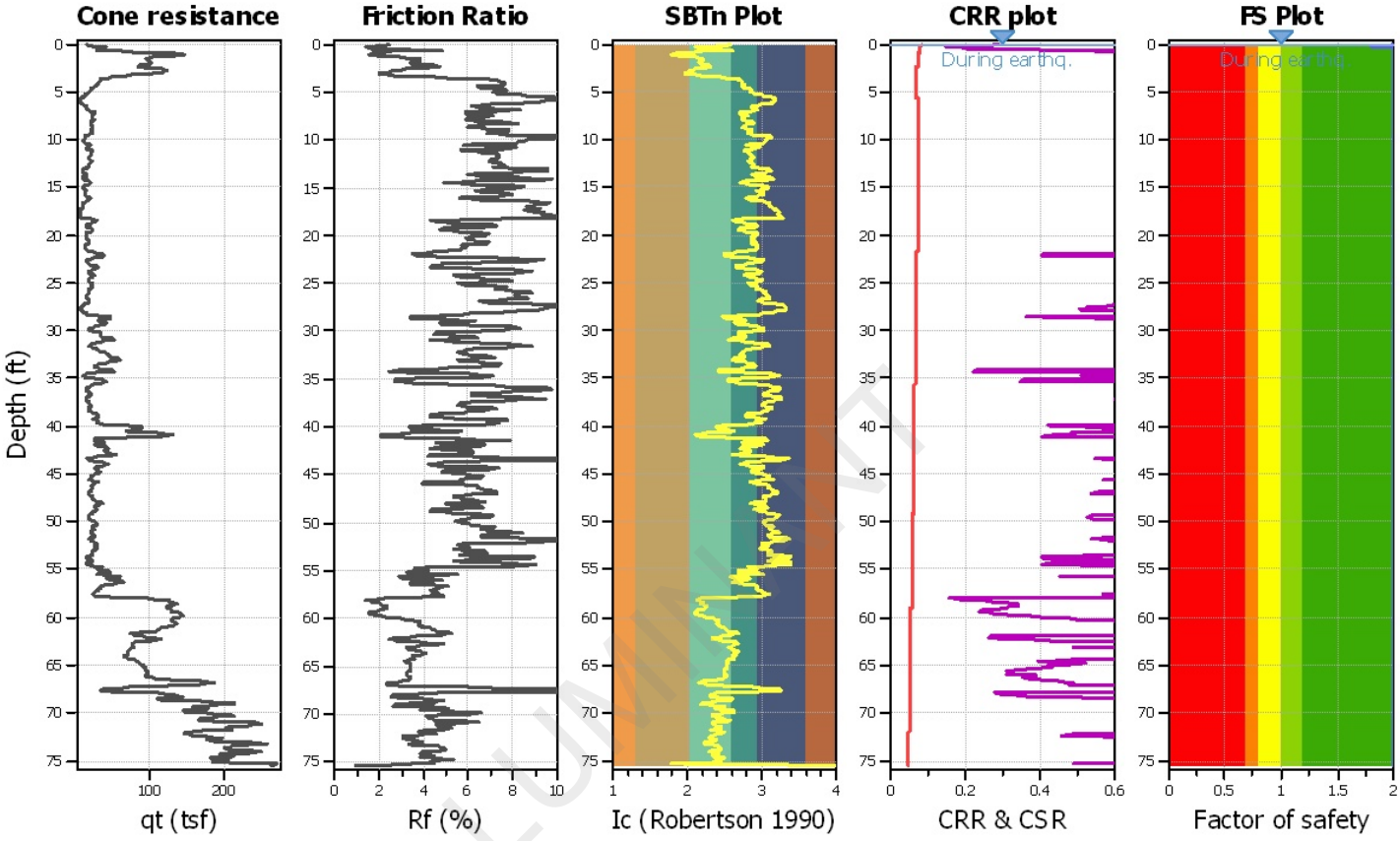
LIQUEFACTION ANALYSIS REPORT

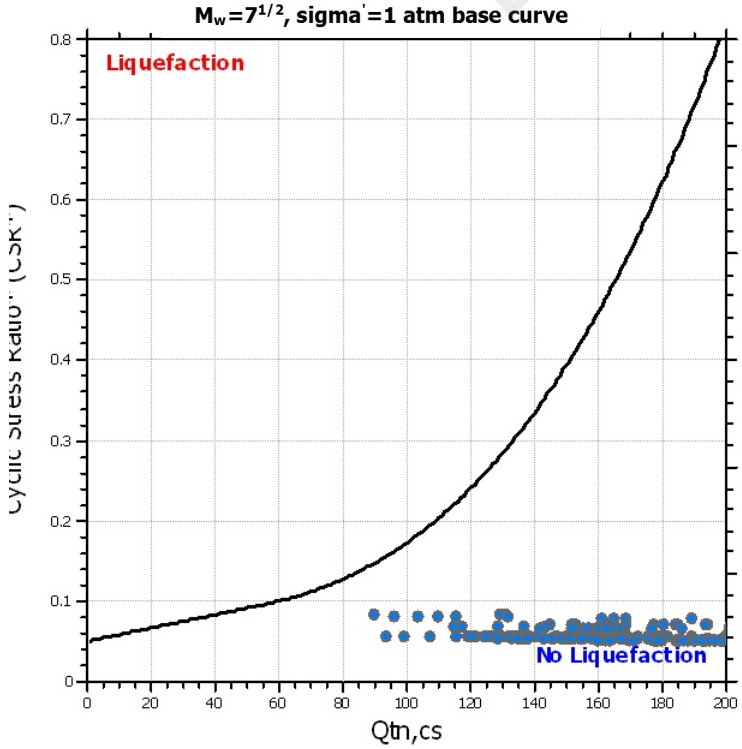
Project title : Martin Lake **Location : PDP-5**

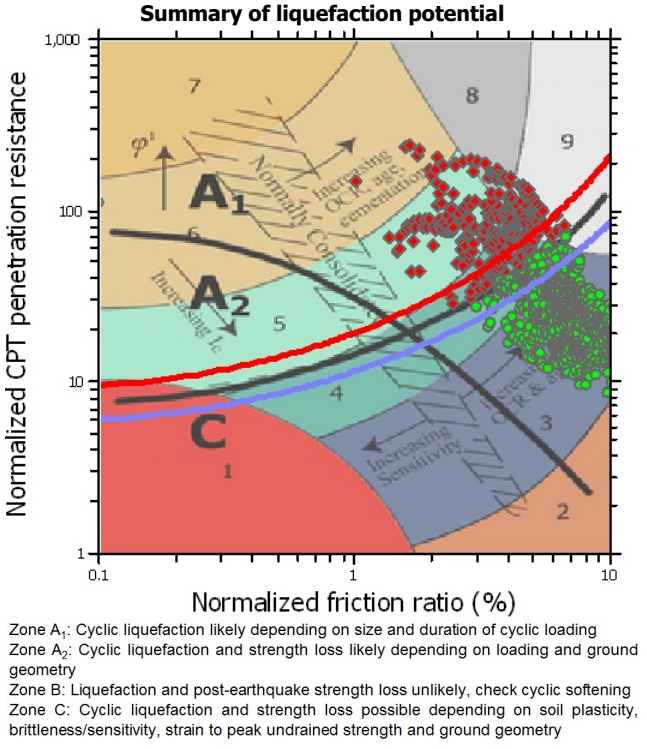
CPT file : B-12

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	1.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	0.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.20	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.09	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.07	2.00	0.00	9.99	0.06	0.00	0.13	2.00	0.00	9.98	0.06	0.00
0.20	1.80	0.00	9.97	0.07	0.00	0.26	2.00	0.00	9.96	0.06	0.00
0.33	2.00	0.00	9.95	0.07	0.00	0.39	2.00	0.00	9.94	0.06	0.00
0.46	2.00	0.00	9.93	0.07	0.00	0.52	2.00	0.00	9.92	0.06	0.00
0.59	2.00	0.00	9.91	0.07	0.00	0.66	2.00	0.00	9.90	0.07	0.00
0.72	2.00	0.00	9.89	0.06	0.00	0.79	2.00	0.00	9.88	0.07	0.00
0.85	2.00	0.00	9.87	0.06	0.00	0.92	2.00	0.00	9.86	0.07	0.00
0.98	2.00	0.00	9.85	0.06	0.00	1.05	2.00	0.00	9.84	0.07	0.00
1.12	2.00	0.00	9.83	0.07	0.00	1.18	2.00	0.00	9.82	0.06	0.00
1.25	2.00	0.00	9.81	0.07	0.00	1.31	2.00	0.00	9.80	0.06	0.00
1.38	2.00	0.00	9.79	0.07	0.00	1.44	2.00	0.00	9.78	0.06	0.00
1.51	2.00	0.00	9.77	0.07	0.00	1.57	2.00	0.00	9.76	0.06	0.00
1.64	2.00	0.00	9.75	0.07	0.00	1.71	2.00	0.00	9.74	0.07	0.00
1.77	2.00	0.00	9.73	0.06	0.00	1.84	2.00	0.00	9.72	0.07	0.00
1.90	2.00	0.00	9.71	0.06	0.00	1.97	2.00	0.00	9.70	0.07	0.00
2.03	2.00	0.00	9.69	0.06	0.00	2.10	2.00	0.00	9.68	0.07	0.00
2.16	2.00	0.00	9.67	0.06	0.00	2.23	2.00	0.00	9.66	0.07	0.00
2.30	2.00	0.00	9.65	0.07	0.00	2.36	2.00	0.00	9.64	0.06	0.00
2.43	2.00	0.00	9.63	0.07	0.00	2.49	2.00	0.00	9.62	0.06	0.00
2.56	2.00	0.00	9.61	0.07	0.00	2.62	2.00	0.00	9.60	0.06	0.00
2.69	2.00	0.00	9.59	0.07	0.00	2.76	2.00	0.00	9.58	0.07	0.00
2.82	2.00	0.00	9.57	0.06	0.00	2.89	2.00	0.00	9.56	0.07	0.00
2.95	2.00	0.00	9.55	0.06	0.00	3.02	2.00	0.00	9.54	0.07	0.00
3.08	2.00	0.00	9.53	0.06	0.00	3.15	2.00	0.00	9.52	0.07	0.00
3.21	2.00	0.00	9.51	0.06	0.00	3.28	2.00	0.00	9.50	0.07	0.00
3.35	2.00	0.00	9.49	0.07	0.00	3.41	2.00	0.00	9.48	0.06	0.00
3.48	2.00	0.00	9.47	0.07	0.00	3.54	2.00	0.00	9.46	0.06	0.00
3.61	2.00	0.00	9.45	0.07	0.00	3.67	2.00	0.00	9.44	0.06	0.00
3.74	2.00	0.00	9.43	0.07	0.00	3.80	2.00	0.00	9.42	0.06	0.00
3.87	2.00	0.00	9.41	0.07	0.00	3.94	2.00	0.00	9.40	0.07	0.00
4.00	2.00	0.00	9.39	0.06	0.00	4.07	2.00	0.00	9.38	0.07	0.00
4.13	2.00	0.00	9.37	0.06	0.00	4.20	2.00	0.00	9.36	0.07	0.00
4.26	2.00	0.00	9.35	0.06	0.00	4.33	2.00	0.00	9.34	0.07	0.00
4.40	2.00	0.00	9.33	0.07	0.00	4.46	2.00	0.00	9.32	0.06	0.00
4.53	2.00	0.00	9.31	0.07	0.00	4.59	2.00	0.00	9.30	0.06	0.00
4.66	2.00	0.00	9.29	0.07	0.00	4.72	2.00	0.00	9.28	0.06	0.00
4.79	2.00	0.00	9.27	0.07	0.00	4.85	2.00	0.00	9.26	0.06	0.00
4.92	2.00	0.00	9.25	0.07	0.00	4.99	2.00	0.00	9.24	0.07	0.00
5.05	2.00	0.00	9.23	0.06	0.00	5.12	2.00	0.00	9.22	0.07	0.00
5.18	2.00	0.00	9.21	0.06	0.00	5.25	2.00	0.00	9.20	0.07	0.00
5.31	2.00	0.00	9.19	0.06	0.00	5.38	2.00	0.00	9.18	0.07	0.00
5.44	2.00	0.00	9.17	0.06	0.00	5.51	2.00	0.00	9.16	0.07	0.00
5.58	2.00	0.00	9.15	0.07	0.00	5.64	2.00	0.00	9.14	0.06	0.00
5.71	2.00	0.00	9.13	0.07	0.00	5.77	2.00	0.00	9.12	0.06	0.00
5.84	2.00	0.00	9.11	0.07	0.00	5.90	2.00	0.00	9.10	0.06	0.00
5.97	2.00	0.00	9.09	0.07	0.00	6.04	2.00	0.00	9.08	0.07	0.00
6.10	2.00	0.00	9.07	0.06	0.00	6.17	2.00	0.00	9.06	0.07	0.00
6.23	2.00	0.00	9.05	0.06	0.00	6.30	2.00	0.00	9.04	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
6.36	2.00	0.00	9.03	0.06	0.00	6.43	2.00	0.00	9.02	0.07	0.00
6.49	2.00	0.00	9.01	0.06	0.00	6.56	2.00	0.00	9.00	0.07	0.00
6.63	2.00	0.00	8.99	0.07	0.00	6.69	2.00	0.00	8.98	0.06	0.00
6.76	2.00	0.00	8.97	0.07	0.00	6.82	2.00	0.00	8.96	0.06	0.00
6.89	2.00	0.00	8.95	0.07	0.00	6.95	2.00	0.00	8.94	0.06	0.00
7.02	2.00	0.00	8.93	0.07	0.00	7.08	2.00	0.00	8.92	0.06	0.00
7.15	2.00	0.00	8.91	0.07	0.00	7.22	2.00	0.00	8.90	0.07	0.00
7.28	2.00	0.00	8.89	0.06	0.00	7.35	2.00	0.00	8.88	0.07	0.00
7.41	2.00	0.00	8.87	0.06	0.00	7.48	2.00	0.00	8.86	0.07	0.00
7.54	2.00	0.00	8.85	0.06	0.00	7.61	2.00	0.00	8.84	0.07	0.00
7.68	2.00	0.00	8.83	0.07	0.00	7.74	2.00	0.00	8.82	0.06	0.00
7.81	2.00	0.00	8.81	0.07	0.00	7.87	2.00	0.00	8.80	0.06	0.00
7.94	2.00	0.00	8.79	0.07	0.00	8.00	2.00	0.00	8.78	0.06	0.00
8.07	2.00	0.00	8.77	0.07	0.00	8.13	2.00	0.00	8.76	0.06	0.00
8.20	2.00	0.00	8.75	0.07	0.00	8.27	2.00	0.00	8.74	0.07	0.00
8.33	2.00	0.00	8.73	0.06	0.00	8.40	2.00	0.00	8.72	0.07	0.00
8.46	2.00	0.00	8.71	0.06	0.00	8.53	2.00	0.00	8.70	0.07	0.00
8.59	2.00	0.00	8.69	0.06	0.00	8.66	2.00	0.00	8.68	0.07	0.00
8.72	2.00	0.00	8.67	0.06	0.00	8.79	2.00	0.00	8.66	0.07	0.00
8.86	2.00	0.00	8.65	0.07	0.00	8.92	2.00	0.00	8.64	0.06	0.00
8.99	2.00	0.00	8.63	0.07	0.00	9.05	2.00	0.00	8.62	0.06	0.00
9.12	2.00	0.00	8.61	0.07	0.00	9.18	2.00	0.00	8.60	0.06	0.00
9.25	2.00	0.00	8.59	0.07	0.00	9.32	2.00	0.00	8.58	0.07	0.00
9.38	2.00	0.00	8.57	0.06	0.00	9.45	2.00	0.00	8.56	0.07	0.00
9.51	2.00	0.00	8.55	0.06	0.00	9.58	2.00	0.00	8.54	0.07	0.00
9.64	2.00	0.00	8.53	0.06	0.00	9.71	2.00	0.00	8.52	0.07	0.00
9.77	2.00	0.00	8.51	0.06	0.00	9.84	2.00	0.00	8.50	0.07	0.00
9.91	2.00	0.00	8.49	0.07	0.00	9.97	2.00	0.00	8.48	0.06	0.00
10.04	2.00	0.00	8.47	0.07	0.00	10.10	2.00	0.00	8.46	0.06	0.00
10.17	2.00	0.00	8.45	0.07	0.00	10.23	2.00	0.00	8.44	0.06	0.00
10.30	2.00	0.00	8.43	0.07	0.00	10.36	2.00	0.00	8.42	0.06	0.00
10.43	2.00	0.00	8.41	0.07	0.00	10.50	2.00	0.00	8.40	0.07	0.00
10.56	2.00	0.00	8.39	0.06	0.00	10.63	2.00	0.00	8.38	0.07	0.00
10.69	2.00	0.00	8.37	0.06	0.00	10.76	2.00	0.00	8.36	0.07	0.00
10.82	2.00	0.00	8.35	0.06	0.00	10.89	2.00	0.00	8.34	0.07	0.00
10.96	2.00	0.00	8.33	0.07	0.00	11.02	2.00	0.00	8.32	0.06	0.00
11.09	2.00	0.00	8.31	0.07	0.00	11.15	2.00	0.00	8.30	0.06	0.00
11.22	2.00	0.00	8.29	0.07	0.00	11.28	2.00	0.00	8.28	0.06	0.00
11.35	2.00	0.00	8.27	0.07	0.00	11.41	2.00	0.00	8.26	0.06	0.00
11.48	2.00	0.00	8.25	0.07	0.00	11.55	2.00	0.00	8.24	0.07	0.00
11.61	2.00	0.00	8.23	0.06	0.00	11.68	2.00	0.00	8.22	0.07	0.00
11.74	2.00	0.00	8.21	0.06	0.00	11.81	2.00	0.00	8.20	0.07	0.00
11.87	2.00	0.00	8.19	0.06	0.00	11.94	2.00	0.00	8.18	0.07	0.00
12.00	2.00	0.00	8.17	0.06	0.00	12.07	2.00	0.00	8.16	0.07	0.00
12.14	2.00	0.00	8.15	0.07	0.00	12.20	2.00	0.00	8.14	0.06	0.00
12.27	2.00	0.00	8.13	0.07	0.00	12.33	2.00	0.00	8.12	0.06	0.00
12.40	2.00	0.00	8.11	0.07	0.00	12.46	2.00	0.00	8.10	0.06	0.00
12.53	2.00	0.00	8.09	0.07	0.00	12.60	2.00	0.00	8.08	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
12.66	2.00	0.00	8.07	0.06	0.00	12.73	2.00	0.00	8.06	0.07	0.00
12.79	2.00	0.00	8.05	0.06	0.00	12.86	2.00	0.00	8.04	0.07	0.00
12.92	2.00	0.00	8.03	0.06	0.00	12.99	2.00	0.00	8.02	0.07	0.00
13.05	2.00	0.00	8.01	0.06	0.00	13.12	2.00	0.00	8.00	0.07	0.00
13.19	2.00	0.00	7.99	0.07	0.00	13.25	2.00	0.00	7.98	0.06	0.00
13.32	2.00	0.00	7.97	0.07	0.00	13.38	2.00	0.00	7.96	0.06	0.00
13.45	2.00	0.00	7.95	0.07	0.00	13.51	2.00	0.00	7.94	0.06	0.00
13.58	2.00	0.00	7.93	0.07	0.00	13.64	2.00	0.00	7.92	0.06	0.00
13.71	2.00	0.00	7.91	0.07	0.00	13.78	2.00	0.00	7.90	0.07	0.00
13.84	2.00	0.00	7.89	0.06	0.00	13.91	2.00	0.00	7.88	0.07	0.00
13.97	2.00	0.00	7.87	0.06	0.00	14.04	2.00	0.00	7.86	0.07	0.00
14.10	2.00	0.00	7.85	0.06	0.00	14.17	2.00	0.00	7.84	0.07	0.00
14.24	2.00	0.00	7.83	0.07	0.00	14.30	2.00	0.00	7.82	0.06	0.00
14.37	2.00	0.00	7.81	0.07	0.00	14.43	2.00	0.00	7.80	0.06	0.00
14.50	2.00	0.00	7.79	0.07	0.00	14.56	2.00	0.00	7.78	0.06	0.00
14.63	2.00	0.00	7.77	0.07	0.00	14.69	2.00	0.00	7.76	0.06	0.00
14.76	2.00	0.00	7.75	0.07	0.00	14.83	2.00	0.00	7.74	0.07	0.00
14.89	2.00	0.00	7.73	0.06	0.00	14.96	2.00	0.00	7.72	0.07	0.00
15.02	2.00	0.00	7.71	0.06	0.00	15.09	2.00	0.00	7.70	0.07	0.00
15.15	2.00	0.00	7.69	0.06	0.00	15.22	2.00	0.00	7.68	0.07	0.00
15.28	2.00	0.00	7.67	0.06	0.00	15.35	2.00	0.00	7.66	0.07	0.00
15.42	2.00	0.00	7.65	0.07	0.00	15.48	2.00	0.00	7.64	0.06	0.00
15.55	2.00	0.00	7.63	0.07	0.00	15.61	2.00	0.00	7.62	0.06	0.00
15.68	2.00	0.00	7.61	0.07	0.00	15.74	2.00	0.00	7.60	0.06	0.00
15.81	2.00	0.00	7.59	0.07	0.00	15.88	2.00	0.00	7.58	0.07	0.00
15.94	2.00	0.00	7.57	0.06	0.00	16.01	2.00	0.00	7.56	0.07	0.00
16.07	2.00	0.00	7.55	0.06	0.00	16.14	2.00	0.00	7.54	0.07	0.00
16.20	2.00	0.00	7.53	0.06	0.00	16.27	2.00	0.00	7.52	0.07	0.00
16.33	2.00	0.00	7.51	0.06	0.00	16.40	2.00	0.00	7.50	0.07	0.00
16.47	2.00	0.00	7.49	0.07	0.00	16.53	2.00	0.00	7.48	0.06	0.00
16.60	2.00	0.00	7.47	0.07	0.00	16.66	2.00	0.00	7.46	0.06	0.00
16.73	2.00	0.00	7.45	0.07	0.00	16.79	2.00	0.00	7.44	0.06	0.00
16.86	2.00	0.00	7.43	0.07	0.00	16.92	2.00	0.00	7.42	0.06	0.00
16.99	2.00	0.00	7.41	0.07	0.00	17.06	2.00	0.00	7.40	0.07	0.00
17.12	2.00	0.00	7.39	0.06	0.00	17.19	2.00	0.00	7.38	0.07	0.00
17.25	2.00	0.00	7.37	0.06	0.00	17.32	2.00	0.00	7.36	0.07	0.00
17.38	2.00	0.00	7.35	0.06	0.00	17.45	2.00	0.00	7.34	0.07	0.00
17.52	2.00	0.00	7.33	0.07	0.00	17.58	2.00	0.00	7.32	0.06	0.00
17.65	2.00	0.00	7.31	0.07	0.00	17.71	2.00	0.00	7.30	0.06	0.00
17.78	2.00	0.00	7.29	0.07	0.00	17.84	2.00	0.00	7.28	0.06	0.00
17.91	2.00	0.00	7.27	0.07	0.00	17.97	2.00	0.00	7.26	0.06	0.00
18.04	2.00	0.00	7.25	0.07	0.00	18.11	2.00	0.00	7.24	0.07	0.00
18.17	2.00	0.00	7.23	0.06	0.00	18.24	2.00	0.00	7.22	0.07	0.00
18.30	2.00	0.00	7.21	0.06	0.00	18.37	2.00	0.00	7.20	0.07	0.00
18.43	2.00	0.00	7.19	0.06	0.00	18.50	2.00	0.00	7.18	0.07	0.00
18.56	2.00	0.00	7.17	0.06	0.00	18.63	2.00	0.00	7.16	0.07	0.00
18.70	2.00	0.00	7.15	0.07	0.00	18.76	2.00	0.00	7.14	0.06	0.00
18.83	2.00	0.00	7.13	0.07	0.00	18.89	2.00	0.00	7.12	0.06	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
18.96	2.00	0.00	7.11	0.07	0.00	19.02	2.00	0.00	7.10	0.06	0.00
19.09	2.00	0.00	7.09	0.07	0.00	19.16	2.00	0.00	7.08	0.07	0.00
19.22	2.00	0.00	7.07	0.06	0.00	19.29	2.00	0.00	7.06	0.07	0.00
19.35	2.00	0.00	7.05	0.06	0.00	19.42	2.00	0.00	7.04	0.07	0.00
19.48	2.00	0.00	7.03	0.06	0.00	19.55	2.00	0.00	7.02	0.07	0.00
19.61	2.00	0.00	7.01	0.06	0.00	19.68	2.00	0.00	7.00	0.07	0.00
19.75	2.00	0.00	6.99	0.07	0.00	19.81	2.00	0.00	6.98	0.06	0.00
19.88	2.00	0.00	6.97	0.07	0.00	19.94	2.00	0.00	6.96	0.06	0.00
20.01	2.00	0.00	6.95	0.07	0.00	20.07	2.00	0.00	6.94	0.06	0.00
20.14	2.00	0.00	6.93	0.07	0.00	20.20	2.00	0.00	6.92	0.06	0.00
20.27	2.00	0.00	6.91	0.07	0.00	20.34	2.00	0.00	6.90	0.07	0.00
20.40	2.00	0.00	6.89	0.06	0.00	20.47	2.00	0.00	6.88	0.07	0.00
20.53	2.00	0.00	6.87	0.06	0.00	20.60	2.00	0.00	6.86	0.07	0.00
20.66	2.00	0.00	6.85	0.06	0.00	20.73	2.00	0.00	6.84	0.07	0.00
20.80	2.00	0.00	6.83	0.07	0.00	20.86	2.00	0.00	6.82	0.06	0.00
20.93	2.00	0.00	6.81	0.07	0.00	20.99	2.00	0.00	6.80	0.06	0.00
21.06	2.00	0.00	6.79	0.07	0.00	21.12	2.00	0.00	6.78	0.06	0.00
21.19	2.00	0.00	6.77	0.07	0.00	21.25	2.00	0.00	6.76	0.06	0.00
21.32	2.00	0.00	6.75	0.07	0.00	21.39	2.00	0.00	6.74	0.07	0.00
21.45	2.00	0.00	6.73	0.06	0.00	21.52	2.00	0.00	6.72	0.07	0.00
21.58	2.00	0.00	6.71	0.06	0.00	21.65	2.00	0.00	6.70	0.07	0.00
21.71	2.00	0.00	6.69	0.06	0.00	21.78	2.00	0.00	6.68	0.07	0.00
21.84	2.00	0.00	6.67	0.06	0.00	21.91	2.00	0.00	6.66	0.07	0.00
21.98	2.00	0.00	6.65	0.07	0.00	22.04	2.00	0.00	6.64	0.06	0.00
22.11	2.00	0.00	6.63	0.07	0.00	22.17	2.00	0.00	6.62	0.06	0.00
22.24	2.00	0.00	6.61	0.07	0.00	22.30	2.00	0.00	6.60	0.06	0.00
22.37	2.00	0.00	6.59	0.07	0.00	22.44	2.00	0.00	6.58	0.07	0.00
22.50	2.00	0.00	6.57	0.06	0.00	22.57	2.00	0.00	6.56	0.07	0.00
22.63	2.00	0.00	6.55	0.06	0.00	22.70	2.00	0.00	6.54	0.07	0.00
22.76	2.00	0.00	6.53	0.06	0.00	22.83	2.00	0.00	6.52	0.07	0.00
22.89	2.00	0.00	6.51	0.06	0.00	22.96	2.00	0.00	6.50	0.07	0.00
23.03	2.00	0.00	6.49	0.07	0.00	23.09	2.00	0.00	6.48	0.06	0.00
23.16	2.00	0.00	6.47	0.07	0.00	23.22	2.00	0.00	6.46	0.06	0.00
23.29	2.00	0.00	6.45	0.07	0.00	23.35	2.00	0.00	6.44	0.06	0.00
23.42	2.00	0.00	6.43	0.07	0.00	23.48	2.00	0.00	6.42	0.06	0.00
23.55	2.00	0.00	6.41	0.07	0.00	23.62	2.00	0.00	6.40	0.07	0.00
23.68	2.00	0.00	6.39	0.06	0.00	23.75	2.00	0.00	6.38	0.07	0.00
23.81	2.00	0.00	6.37	0.06	0.00	23.88	2.00	0.00	6.36	0.07	0.00
23.94	2.00	0.00	6.35	0.06	0.00	24.01	2.00	0.00	6.34	0.07	0.00
24.08	2.00	0.00	6.33	0.07	0.00	24.14	2.00	0.00	6.32	0.06	0.00
24.21	2.00	0.00	6.31	0.07	0.00	24.27	2.00	0.00	6.30	0.06	0.00
24.34	2.00	0.00	6.29	0.07	0.00	24.40	2.00	0.00	6.28	0.06	0.00
24.47	2.00	0.00	6.27	0.07	0.00	24.53	2.00	0.00	6.26	0.06	0.00
24.60	2.00	0.00	6.25	0.07	0.00	24.67	2.00	0.00	6.24	0.07	0.00
24.73	2.00	0.00	6.23	0.06	0.00	24.80	2.00	0.00	6.22	0.07	0.00
24.86	2.00	0.00	6.21	0.06	0.00	24.93	2.00	0.00	6.20	0.07	0.00
24.99	2.00	0.00	6.19	0.06	0.00	25.06	2.00	0.00	6.18	0.07	0.00
25.12	2.00	0.00	6.17	0.06	0.00	25.19	2.00	0.00	6.16	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
25.26	2.00	0.00	6.15	0.07	0.00	25.32	2.00	0.00	6.14	0.06	0.00
25.39	2.00	0.00	6.13	0.07	0.00	25.45	2.00	0.00	6.12	0.06	0.00
25.52	2.00	0.00	6.11	0.07	0.00	25.58	2.00	0.00	6.10	0.06	0.00
25.65	2.00	0.00	6.09	0.07	0.00	25.72	2.00	0.00	6.08	0.07	0.00
25.78	2.00	0.00	6.07	0.06	0.00	25.85	2.00	0.00	6.06	0.07	0.00
25.91	2.00	0.00	6.05	0.06	0.00	25.98	2.00	0.00	6.04	0.07	0.00
26.04	2.00	0.00	6.03	0.06	0.00	26.11	2.00	0.00	6.02	0.07	0.00
26.17	2.00	0.00	6.01	0.06	0.00	26.24	2.00	0.00	6.00	0.07	0.00
26.31	2.00	0.00	5.99	0.07	0.00	26.37	2.00	0.00	5.98	0.06	0.00
26.44	2.00	0.00	5.97	0.07	0.00	26.50	2.00	0.00	5.96	0.06	0.00
26.57	2.00	0.00	5.95	0.07	0.00	26.63	2.00	0.00	5.94	0.06	0.00
26.70	2.00	0.00	5.93	0.07	0.00	26.76	2.00	0.00	5.92	0.06	0.00
26.83	2.00	0.00	5.91	0.07	0.00	26.90	2.00	0.00	5.90	0.07	0.00
26.96	2.00	0.00	5.89	0.06	0.00	27.03	2.00	0.00	5.88	0.07	0.00
27.09	2.00	0.00	5.87	0.06	0.00	27.16	2.00	0.00	5.86	0.07	0.00
27.22	2.00	0.00	5.85	0.06	0.00	27.29	2.00	0.00	5.84	0.07	0.00
27.36	2.00	0.00	5.83	0.07	0.00	27.42	2.00	0.00	5.82	0.06	0.00
27.49	2.00	0.00	5.81	0.07	0.00	27.55	2.00	0.00	5.80	0.06	0.00
27.62	2.00	0.00	5.79	0.07	0.00	27.68	2.00	0.00	5.78	0.06	0.00
27.75	2.00	0.00	5.77	0.07	0.00	27.81	2.00	0.00	5.76	0.06	0.00
27.88	2.00	0.00	5.75	0.07	0.00	27.95	2.00	0.00	5.74	0.07	0.00
28.01	2.00	0.00	5.73	0.06	0.00	28.08	2.00	0.00	5.72	0.07	0.00
28.14	2.00	0.00	5.71	0.06	0.00	28.21	2.00	0.00	5.70	0.07	0.00
28.27	2.00	0.00	5.69	0.06	0.00	28.34	2.00	0.00	5.68	0.07	0.00
28.40	2.00	0.00	5.67	0.06	0.00	28.47	2.00	0.00	5.66	0.07	0.00
28.54	2.00	0.00	5.65	0.07	0.00	28.60	2.00	0.00	5.64	0.06	0.00
28.67	2.00	0.00	5.63	0.07	0.00	28.73	2.00	0.00	5.62	0.06	0.00
28.80	2.00	0.00	5.61	0.07	0.00	28.86	2.00	0.00	5.60	0.06	0.00
28.93	2.00	0.00	5.59	0.07	0.00	29.00	2.00	0.00	5.58	0.07	0.00
29.06	2.00	0.00	5.57	0.06	0.00	29.13	2.00	0.00	5.56	0.07	0.00
29.19	2.00	0.00	5.55	0.06	0.00	29.26	2.00	0.00	5.54	0.07	0.00
29.32	2.00	0.00	5.53	0.06	0.00	29.39	2.00	0.00	5.52	0.07	0.00
29.45	2.00	0.00	5.51	0.06	0.00	29.52	2.00	0.00	5.50	0.07	0.00
29.59	2.00	0.00	5.49	0.07	0.00	29.65	2.00	0.00	5.48	0.06	0.00
29.72	2.00	0.00	5.47	0.07	0.00	29.78	2.00	0.00	5.46	0.06	0.00
29.85	2.00	0.00	5.45	0.07	0.00	29.91	2.00	0.00	5.44	0.06	0.00
29.98	2.00	0.00	5.43	0.07	0.00	30.04	2.00	0.00	5.42	0.06	0.00
30.11	2.00	0.00	5.41	0.07	0.00	30.18	2.00	0.00	5.40	0.07	0.00
30.24	2.00	0.00	5.39	0.06	0.00	30.31	2.00	0.00	5.38	0.07	0.00
30.37	2.00	0.00	5.37	0.06	0.00	30.44	2.00	0.00	5.36	0.07	0.00
30.50	2.00	0.00	5.35	0.06	0.00	30.57	2.00	0.00	5.34	0.07	0.00
30.64	2.00	0.00	5.33	0.07	0.00	30.70	2.00	0.00	5.32	0.06	0.00
30.77	2.00	0.00	5.31	0.07	0.00	30.83	2.00	0.00	5.30	0.06	0.00
30.90	2.00	0.00	5.29	0.07	0.00	30.96	2.00	0.00	5.28	0.06	0.00
31.03	2.00	0.00	5.27	0.07	0.00	31.09	2.00	0.00	5.26	0.06	0.00
31.16	2.00	0.00	5.25	0.07	0.00	31.23	2.00	0.00	5.24	0.07	0.00
31.29	2.00	0.00	5.23	0.06	0.00	31.36	2.00	0.00	5.22	0.07	0.00
31.42	2.00	0.00	5.21	0.06	0.00	31.49	2.00	0.00	5.20	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
31.55	2.00	0.00	5.19	0.06	0.00	31.62	2.00	0.00	5.18	0.07	0.00
31.68	2.00	0.00	5.17	0.06	0.00	31.75	2.00	0.00	5.16	0.07	0.00
31.82	2.00	0.00	5.15	0.07	0.00	31.88	2.00	0.00	5.14	0.06	0.00
31.95	2.00	0.00	5.13	0.07	0.00	32.01	2.00	0.00	5.12	0.06	0.00
32.08	2.00	0.00	5.11	0.07	0.00	32.14	2.00	0.00	5.10	0.06	0.00
32.21	2.00	0.00	5.09	0.07	0.00	32.28	2.00	0.00	5.08	0.07	0.00
32.34	2.00	0.00	5.07	0.06	0.00	32.41	2.00	0.00	5.06	0.07	0.00
32.47	2.00	0.00	5.05	0.06	0.00	32.54	2.00	0.00	5.04	0.07	0.00
32.60	2.00	0.00	5.03	0.06	0.00	32.67	2.00	0.00	5.02	0.07	0.00
32.73	2.00	0.00	5.01	0.06	0.00	32.80	2.00	0.00	5.00	0.07	0.00
32.87	2.00	0.00	4.99	0.07	0.00	32.93	2.00	0.00	4.98	0.06	0.00
33.00	2.00	0.00	4.97	0.07	0.00	33.06	2.00	0.00	4.96	0.06	0.00
33.13	2.00	0.00	4.95	0.07	0.00	33.19	2.00	0.00	4.94	0.06	0.00
33.26	2.00	0.00	4.93	0.07	0.00	33.32	2.00	0.00	4.92	0.06	0.00
33.39	2.00	0.00	4.91	0.07	0.00	33.46	2.00	0.00	4.90	0.07	0.00
33.52	2.00	0.00	4.89	0.06	0.00	33.59	2.00	0.00	4.88	0.07	0.00
33.65	2.00	0.00	4.87	0.06	0.00	33.72	2.00	0.00	4.86	0.07	0.00
33.78	2.00	0.00	4.85	0.06	0.00	33.85	2.00	0.00	4.84	0.07	0.00
33.92	2.00	0.00	4.83	0.07	0.00	33.98	2.00	0.00	4.82	0.06	0.00
34.05	2.00	0.00	4.81	0.07	0.00	34.11	2.00	0.00	4.80	0.06	0.00
34.18	2.00	0.00	4.79	0.07	0.00	34.24	2.00	0.00	4.78	0.06	0.00
34.31	2.00	0.00	4.77	0.07	0.00	34.37	2.00	0.00	4.76	0.06	0.00
34.44	2.00	0.00	4.75	0.07	0.00	34.51	2.00	0.00	4.74	0.07	0.00
34.57	2.00	0.00	4.73	0.06	0.00	34.64	2.00	0.00	4.72	0.07	0.00
34.70	2.00	0.00	4.71	0.06	0.00	34.77	2.00	0.00	4.70	0.07	0.00
34.83	2.00	0.00	4.69	0.06	0.00	34.90	2.00	0.00	4.68	0.07	0.00
34.96	2.00	0.00	4.67	0.06	0.00	35.03	2.00	0.00	4.66	0.07	0.00
35.10	2.00	0.00	4.65	0.07	0.00	35.16	2.00	0.00	4.64	0.06	0.00
35.23	2.00	0.00	4.63	0.07	0.00	35.29	2.00	0.00	4.62	0.06	0.00
35.36	2.00	0.00	4.61	0.07	0.00	35.42	2.00	0.00	4.60	0.06	0.00
35.49	2.00	0.00	4.59	0.07	0.00	35.56	2.00	0.00	4.58	0.07	0.00
35.62	2.00	0.00	4.57	0.06	0.00	35.69	2.00	0.00	4.56	0.07	0.00
35.75	2.00	0.00	4.55	0.06	0.00	35.82	2.00	0.00	4.54	0.07	0.00
35.88	2.00	0.00	4.53	0.06	0.00	35.95	2.00	0.00	4.52	0.07	0.00
36.01	2.00	0.00	4.51	0.06	0.00	36.08	2.00	0.00	4.50	0.07	0.00
36.15	2.00	0.00	4.49	0.07	0.00	36.21	2.00	0.00	4.48	0.06	0.00
36.28	2.00	0.00	4.47	0.07	0.00	36.34	2.00	0.00	4.46	0.06	0.00
36.41	2.00	0.00	4.45	0.07	0.00	36.47	2.00	0.00	4.44	0.06	0.00
36.54	2.00	0.00	4.43	0.07	0.00	36.60	2.00	0.00	4.42	0.06	0.00
36.67	2.00	0.00	4.41	0.07	0.00	36.74	2.00	0.00	4.40	0.07	0.00
36.80	2.00	0.00	4.39	0.06	0.00	36.87	2.00	0.00	4.38	0.07	0.00
36.93	2.00	0.00	4.37	0.06	0.00	37.00	2.00	0.00	4.36	0.07	0.00
37.06	2.00	0.00	4.35	0.06	0.00	37.13	2.00	0.00	4.34	0.07	0.00
37.20	2.00	0.00	4.33	0.07	0.00	37.26	2.00	0.00	4.32	0.06	0.00
37.33	2.00	0.00	4.31	0.07	0.00	37.39	2.00	0.00	4.30	0.06	0.00
37.46	2.00	0.00	4.29	0.07	0.00	37.52	2.00	0.00	4.28	0.06	0.00
37.59	2.00	0.00	4.27	0.07	0.00	37.65	2.00	0.00	4.26	0.06	0.00
37.72	2.00	0.00	4.25	0.07	0.00	37.79	2.00	0.00	4.24	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
37.85	2.00	0.00	4.23	0.06	0.00	37.92	2.00	0.00	4.22	0.07	0.00
37.98	2.00	0.00	4.21	0.06	0.00	38.05	2.00	0.00	4.20	0.07	0.00
38.11	2.00	0.00	4.19	0.06	0.00	38.18	2.00	0.00	4.18	0.07	0.00
38.24	2.00	0.00	4.17	0.06	0.00	38.31	2.00	0.00	4.16	0.07	0.00
38.38	2.00	0.00	4.15	0.07	0.00	38.44	2.00	0.00	4.14	0.06	0.00
38.51	2.00	0.00	4.13	0.07	0.00	38.57	2.00	0.00	4.12	0.06	0.00
38.64	2.00	0.00	4.11	0.07	0.00	38.70	2.00	0.00	4.10	0.06	0.00
38.77	2.00	0.00	4.09	0.07	0.00	38.84	2.00	0.00	4.08	0.07	0.00
38.90	2.00	0.00	4.07	0.06	0.00	38.97	2.00	0.00	4.06	0.07	0.00
39.03	2.00	0.00	4.05	0.06	0.00	39.10	2.00	0.00	4.04	0.07	0.00
39.16	2.00	0.00	4.03	0.06	0.00	39.23	2.00	0.00	4.02	0.07	0.00
39.29	2.00	0.00	4.01	0.06	0.00	39.36	2.00	0.00	4.00	0.07	0.00
39.43	2.00	0.00	3.99	0.07	0.00	39.49	2.00	0.00	3.98	0.06	0.00
39.56	2.00	0.00	3.97	0.07	0.00	39.62	2.00	0.00	3.96	0.06	0.00
39.69	2.00	0.00	3.95	0.07	0.00	39.75	2.00	0.00	3.94	0.06	0.00
39.82	2.00	0.00	3.93	0.07	0.00	39.88	2.00	0.00	3.92	0.06	0.00
39.95	2.00	0.00	3.91	0.07	0.00	40.02	2.00	0.00	3.90	0.07	0.00
40.08	2.00	0.00	3.89	0.06	0.00	40.15	2.00	0.00	3.88	0.07	0.00
40.21	2.00	0.00	3.87	0.06	0.00	40.28	2.00	0.00	3.86	0.07	0.00
40.34	2.00	0.00	3.85	0.06	0.00	40.41	2.00	0.00	3.84	0.07	0.00
40.48	2.00	0.00	3.83	0.07	0.00	40.54	2.00	0.00	3.82	0.06	0.00
40.61	2.00	0.00	3.81	0.07	0.00	40.67	2.00	0.00	3.80	0.06	0.00
40.74	2.00	0.00	3.79	0.07	0.00	40.80	2.00	0.00	3.78	0.06	0.00
40.87	2.00	0.00	3.77	0.07	0.00	40.93	2.00	0.00	3.76	0.06	0.00
41.00	2.00	0.00	3.75	0.07	0.00	41.07	2.00	0.00	3.74	0.07	0.00
41.13	2.00	0.00	3.73	0.06	0.00	41.20	2.00	0.00	3.72	0.07	0.00
41.26	2.00	0.00	3.71	0.06	0.00	41.33	2.00	0.00	3.70	0.07	0.00
41.39	2.00	0.00	3.69	0.06	0.00	41.46	2.00	0.00	3.68	0.07	0.00
41.52	2.00	0.00	3.67	0.06	0.00	41.59	2.00	0.00	3.66	0.07	0.00
41.66	2.00	0.00	3.65	0.07	0.00	41.72	2.00	0.00	3.64	0.06	0.00
41.79	2.00	0.00	3.63	0.07	0.00	41.85	2.00	0.00	3.62	0.06	0.00
41.92	2.00	0.00	3.61	0.07	0.00	41.98	2.00	0.00	3.60	0.06	0.00
42.05	2.00	0.00	3.59	0.07	0.00	42.12	2.00	0.00	3.58	0.07	0.00
42.18	2.00	0.00	3.57	0.06	0.00	42.25	2.00	0.00	3.56	0.07	0.00
42.31	2.00	0.00	3.55	0.06	0.00	42.38	2.00	0.00	3.54	0.07	0.00
42.44	2.00	0.00	3.53	0.06	0.00	42.51	2.00	0.00	3.52	0.07	0.00
42.57	2.00	0.00	3.51	0.06	0.00	42.64	2.00	0.00	3.50	0.07	0.00
42.71	2.00	0.00	3.49	0.07	0.00	42.77	2.00	0.00	3.48	0.06	0.00
42.84	2.00	0.00	3.47	0.07	0.00	42.90	2.00	0.00	3.46	0.06	0.00
42.97	2.00	0.00	3.45	0.07	0.00	43.03	2.00	0.00	3.44	0.06	0.00
43.10	2.00	0.00	3.43	0.07	0.00	43.16	2.00	0.00	3.42	0.06	0.00
43.23	2.00	0.00	3.41	0.07	0.00	43.30	2.00	0.00	3.40	0.07	0.00
43.36	2.00	0.00	3.39	0.06	0.00	43.43	2.00	0.00	3.38	0.07	0.00
43.49	2.00	0.00	3.37	0.06	0.00	43.56	2.00	0.00	3.36	0.07	0.00
43.62	2.00	0.00	3.35	0.06	0.00	43.69	2.00	0.00	3.34	0.07	0.00
43.76	2.00	0.00	3.33	0.07	0.00	43.82	2.00	0.00	3.32	0.06	0.00
43.89	2.00	0.00	3.31	0.07	0.00	43.95	2.00	0.00	3.30	0.06	0.00
44.02	2.00	0.00	3.29	0.07	0.00	44.08	2.00	0.00	3.28	0.06	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
44.15	2.00	0.00	3.27	0.07	0.00	44.21	2.00	0.00	3.26	0.06	0.00
44.28	2.00	0.00	3.25	0.07	0.00	44.35	2.00	0.00	3.24	0.07	0.00
44.41	2.00	0.00	3.23	0.06	0.00	44.48	2.00	0.00	3.22	0.07	0.00
44.54	2.00	0.00	3.21	0.06	0.00	44.61	2.00	0.00	3.20	0.07	0.00
44.67	2.00	0.00	3.19	0.06	0.00	44.74	2.00	0.00	3.18	0.07	0.00
44.80	2.00	0.00	3.17	0.06	0.00	44.87	2.00	0.00	3.16	0.07	0.00
44.94	2.00	0.00	3.15	0.07	0.00	45.00	2.00	0.00	3.14	0.06	0.00
45.07	2.00	0.00	3.13	0.07	0.00	45.13	2.00	0.00	3.12	0.06	0.00
45.20	2.00	0.00	3.11	0.07	0.00	45.26	2.00	0.00	3.10	0.06	0.00
45.33	2.00	0.00	3.09	0.07	0.00	45.40	2.00	0.00	3.08	0.07	0.00
45.46	2.00	0.00	3.07	0.06	0.00	45.53	2.00	0.00	3.06	0.07	0.00
45.59	2.00	0.00	3.05	0.06	0.00	45.66	2.00	0.00	3.04	0.07	0.00
45.72	2.00	0.00	3.03	0.06	0.00	45.79	2.00	0.00	3.02	0.07	0.00
45.85	2.00	0.00	3.01	0.06	0.00	45.92	2.00	0.00	3.00	0.07	0.00
45.99	2.00	0.00	2.99	0.07	0.00	46.05	2.00	0.00	2.98	0.06	0.00
46.12	2.00	0.00	2.97	0.07	0.00	46.18	2.00	0.00	2.96	0.06	0.00
46.25	2.00	0.00	2.95	0.07	0.00	46.31	2.00	0.00	2.94	0.06	0.00
46.38	2.00	0.00	2.93	0.07	0.00	46.45	2.00	0.00	2.92	0.07	0.00
46.51	2.00	0.00	2.91	0.06	0.00	46.58	2.00	0.00	2.90	0.07	0.00
46.64	2.00	0.00	2.89	0.06	0.00	46.71	2.00	0.00	2.88	0.07	0.00
46.77	2.00	0.00	2.87	0.06	0.00	46.84	2.00	0.00	2.86	0.07	0.00
46.90	2.00	0.00	2.85	0.06	0.00	46.97	2.00	0.00	2.84	0.07	0.00
47.04	2.00	0.00	2.83	0.07	0.00	47.10	2.00	0.00	2.82	0.06	0.00
47.17	2.00	0.00	2.81	0.07	0.00	47.23	2.00	0.00	2.80	0.06	0.00
47.30	2.00	0.00	2.79	0.07	0.00	47.36	2.00	0.00	2.78	0.06	0.00
47.43	2.00	0.00	2.77	0.07	0.00	47.49	2.00	0.00	2.76	0.06	0.00
47.56	2.00	0.00	2.75	0.07	0.00	47.63	2.00	0.00	2.74	0.07	0.00
47.69	2.00	0.00	2.73	0.06	0.00	47.76	2.00	0.00	2.72	0.07	0.00
47.82	2.00	0.00	2.71	0.06	0.00	47.89	2.00	0.00	2.70	0.07	0.00
47.95	2.00	0.00	2.69	0.06	0.00	48.02	2.00	0.00	2.68	0.07	0.00
48.09	2.00	0.00	2.67	0.07	0.00	48.15	2.00	0.00	2.66	0.06	0.00
48.22	2.00	0.00	2.65	0.07	0.00	48.28	2.00	0.00	2.64	0.06	0.00
48.35	2.00	0.00	2.63	0.07	0.00	48.41	2.00	0.00	2.62	0.06	0.00
48.48	2.00	0.00	2.61	0.07	0.00	48.54	2.00	0.00	2.60	0.06	0.00
48.61	2.00	0.00	2.59	0.07	0.00	48.68	2.00	0.00	2.58	0.07	0.00
48.74	2.00	0.00	2.57	0.06	0.00	48.81	2.00	0.00	2.56	0.07	0.00
48.87	2.00	0.00	2.55	0.06	0.00	48.94	2.00	0.00	2.54	0.07	0.00
49.00	2.00	0.00	2.53	0.06	0.00	49.07	2.00	0.00	2.52	0.07	0.00
49.13	2.00	0.00	2.51	0.06	0.00	49.20	2.00	0.00	2.50	0.07	0.00
49.27	2.00	0.00	2.49	0.07	0.00	49.33	2.00	0.00	2.48	0.06	0.00
49.40	2.00	0.00	2.47	0.07	0.00	49.46	2.00	0.00	2.46	0.06	0.00
49.53	2.00	0.00	2.45	0.07	0.00	49.59	2.00	0.00	2.44	0.06	0.00
49.66	2.00	0.00	2.43	0.07	0.00	49.73	2.00	0.00	2.42	0.07	0.00
49.79	2.00	0.00	2.41	0.06	0.00	49.86	2.00	0.00	2.40	0.07	0.00
49.92	2.00	0.00	2.39	0.06	0.00	49.99	2.00	0.00	2.38	0.07	0.00
50.05	2.00	0.00	2.37	0.06	0.00	50.12	2.00	0.00	2.36	0.07	0.00
50.18	2.00	0.00	2.35	0.06	0.00	50.25	2.00	0.00	2.34	0.07	0.00
50.32	2.00	0.00	2.33	0.07	0.00	50.38	2.00	0.00	2.32	0.06	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
50.45	2.00	0.00	2.31	0.07	0.00	50.51	2.00	0.00	2.30	0.06	0.00
50.58	2.00	0.00	2.29	0.07	0.00	50.64	2.00	0.00	2.28	0.06	0.00
50.71	2.00	0.00	2.27	0.07	0.00	50.77	2.00	0.00	2.26	0.06	0.00
50.84	2.00	0.00	2.25	0.07	0.00	50.91	2.00	0.00	2.24	0.07	0.00
50.97	2.00	0.00	2.23	0.06	0.00	51.04	2.00	0.00	2.22	0.07	0.00
51.10	2.00	0.00	2.21	0.06	0.00	51.17	2.00	0.00	2.20	0.07	0.00
51.23	2.00	0.00	2.19	0.06	0.00	51.30	2.00	0.00	2.18	0.07	0.00
51.37	2.00	0.00	2.17	0.07	0.00	51.43	2.00	0.00	2.16	0.06	0.00
51.50	2.00	0.00	2.15	0.07	0.00	51.56	2.00	0.00	2.14	0.06	0.00
51.63	2.00	0.00	2.13	0.07	0.00	51.69	2.00	0.00	2.12	0.06	0.00
51.76	2.00	0.00	2.11	0.07	0.00	51.82	2.00	0.00	2.10	0.06	0.00
51.89	2.00	0.00	2.09	0.07	0.00	51.96	2.00	0.00	2.08	0.07	0.00
52.02	2.00	0.00	2.07	0.06	0.00	52.09	2.00	0.00	2.06	0.07	0.00
52.15	2.00	0.00	2.05	0.06	0.00	52.22	2.00	0.00	2.04	0.07	0.00
52.28	2.00	0.00	2.03	0.06	0.00	52.35	2.00	0.00	2.02	0.07	0.00
52.41	2.00	0.00	2.01	0.06	0.00	52.48	2.00	0.00	2.00	0.07	0.00
52.55	2.00	0.00	1.99	0.07	0.00	52.61	2.00	0.00	1.98	0.06	0.00
52.68	2.00	0.00	1.97	0.07	0.00	52.74	2.00	0.00	1.96	0.06	0.00
52.81	2.00	0.00	1.95	0.07	0.00	52.87	2.00	0.00	1.94	0.06	0.00
52.94	2.00	0.00	1.93	0.07	0.00	53.01	2.00	0.00	1.92	0.07	0.00
53.07	2.00	0.00	1.91	0.06	0.00	53.14	2.00	0.00	1.90	0.07	0.00
53.20	2.00	0.00	1.89	0.06	0.00	53.27	2.00	0.00	1.88	0.07	0.00
53.33	2.00	0.00	1.87	0.06	0.00	53.40	2.00	0.00	1.86	0.07	0.00
53.46	2.00	0.00	1.85	0.06	0.00	53.53	2.00	0.00	1.84	0.07	0.00
53.60	2.00	0.00	1.83	0.07	0.00	53.66	2.00	0.00	1.82	0.06	0.00
53.73	2.00	0.00	1.81	0.07	0.00	53.79	2.00	0.00	1.80	0.06	0.00
53.86	2.00	0.00	1.79	0.07	0.00	53.92	2.00	0.00	1.78	0.06	0.00
53.99	2.00	0.00	1.77	0.07	0.00	54.05	2.00	0.00	1.76	0.06	0.00
54.12	2.00	0.00	1.75	0.07	0.00	54.19	2.00	0.00	1.74	0.07	0.00
54.25	2.00	0.00	1.73	0.06	0.00	54.32	2.00	0.00	1.72	0.07	0.00
54.38	2.00	0.00	1.71	0.06	0.00	54.45	2.00	0.00	1.70	0.07	0.00
54.51	2.00	0.00	1.69	0.06	0.00	54.58	2.00	0.00	1.68	0.07	0.00
54.65	2.00	0.00	1.67	0.07	0.00	54.71	2.00	0.00	1.66	0.06	0.00
54.78	2.00	0.00	1.65	0.07	0.00	54.84	2.00	0.00	1.64	0.06	0.00
54.91	2.00	0.00	1.63	0.07	0.00	54.97	2.00	0.00	1.62	0.06	0.00
55.04	2.00	0.00	1.61	0.07	0.00	55.10	2.00	0.00	1.60	0.06	0.00
55.17	2.00	0.00	1.59	0.07	0.00	55.24	2.00	0.00	1.58	0.07	0.00
55.30	2.00	0.00	1.57	0.06	0.00	55.37	2.00	0.00	1.56	0.07	0.00
55.43	2.00	0.00	1.55	0.06	0.00	55.50	2.00	0.00	1.54	0.07	0.00
55.56	2.00	0.00	1.53	0.06	0.00	55.63	2.00	0.00	1.52	0.07	0.00
55.69	2.00	0.00	1.51	0.06	0.00	55.76	2.00	0.00	1.50	0.07	0.00
55.83	2.00	0.00	1.49	0.07	0.00	55.89	2.00	0.00	1.48	0.06	0.00
55.96	2.00	0.00	1.47	0.07	0.00	56.02	2.00	0.00	1.46	0.06	0.00
56.09	2.00	0.00	1.45	0.07	0.00	56.15	2.00	0.00	1.44	0.06	0.00
56.22	2.00	0.00	1.43	0.07	0.00	56.29	2.00	0.00	1.42	0.07	0.00
56.35	2.00	0.00	1.41	0.06	0.00	56.42	2.00	0.00	1.40	0.07	0.00
56.48	2.00	0.00	1.39	0.06	0.00	56.55	2.00	0.00	1.38	0.07	0.00
56.61	2.00	0.00	1.37	0.06	0.00	56.68	2.00	0.00	1.36	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
56.74	2.00	0.00	1.35	0.06	0.00	56.81	2.00	0.00	1.34	0.07	0.00
56.88	2.00	0.00	1.33	0.07	0.00	56.94	2.00	0.00	1.32	0.06	0.00
57.01	2.00	0.00	1.31	0.07	0.00	57.07	2.00	0.00	1.30	0.06	0.00
57.14	2.00	0.00	1.29	0.07	0.00	57.20	2.00	0.00	1.28	0.06	0.00
57.27	2.00	0.00	1.27	0.07	0.00	57.33	2.00	0.00	1.26	0.06	0.00
57.40	2.00	0.00	1.25	0.07	0.00	57.47	2.00	0.00	1.24	0.07	0.00
57.53	2.00	0.00	1.23	0.06	0.00	57.60	2.00	0.00	1.22	0.07	0.00
57.66	2.00	0.00	1.21	0.06	0.00	57.73	2.00	0.00	1.20	0.07	0.00
57.79	2.00	0.00	1.19	0.06	0.00	57.86	2.00	0.00	1.18	0.07	0.00
57.93	2.00	0.00	1.17	0.07	0.00	57.99	2.00	0.00	1.16	0.06	0.00
58.06	2.00	0.00	1.15	0.07	0.00	58.12	2.00	0.00	1.14	0.06	0.00
58.19	2.00	0.00	1.13	0.07	0.00	58.25	2.00	0.00	1.12	0.06	0.00
58.32	2.00	0.00	1.11	0.07	0.00	58.38	2.00	0.00	1.10	0.06	0.00
58.45	2.00	0.00	1.09	0.07	0.00	58.52	2.00	0.00	1.08	0.07	0.00
58.58	2.00	0.00	1.07	0.06	0.00	58.65	2.00	0.00	1.06	0.07	0.00
58.71	2.00	0.00	1.05	0.06	0.00	58.78	2.00	0.00	1.04	0.07	0.00
58.84	2.00	0.00	1.03	0.06	0.00	58.91	2.00	0.00	1.02	0.07	0.00
58.97	2.00	0.00	1.01	0.06	0.00	59.04	2.00	0.00	1.00	0.07	0.00
59.11	2.00	0.00	0.99	0.07	0.00	59.17	2.00	0.00	0.98	0.06	0.00
59.24	2.00	0.00	0.97	0.07	0.00	59.30	2.00	0.00	0.96	0.06	0.00
59.37	2.00	0.00	0.95	0.07	0.00	59.43	2.00	0.00	0.94	0.06	0.00
59.50	2.00	0.00	0.93	0.07	0.00	59.57	2.00	0.00	0.92	0.07	0.00
59.63	2.00	0.00	0.91	0.06	0.00	59.70	2.00	0.00	0.90	0.07	0.00
59.76	2.00	0.00	0.89	0.06	0.00	59.83	2.00	0.00	0.88	0.07	0.00
59.89	2.00	0.00	0.87	0.06	0.00	59.96	2.00	0.00	0.86	0.07	0.00
60.02	2.00	0.00	0.85	0.06	0.00	60.09	2.00	0.00	0.84	0.07	0.00
60.16	2.00	0.00	0.83	0.07	0.00	60.22	2.00	0.00	0.82	0.06	0.00
60.29	2.00	0.00	0.81	0.07	0.00	60.35	2.00	0.00	0.80	0.06	0.00
60.42	2.00	0.00	0.79	0.07	0.00	60.48	2.00	0.00	0.78	0.06	0.00
60.55	2.00	0.00	0.77	0.07	0.00	60.61	2.00	0.00	0.76	0.06	0.00
60.68	2.00	0.00	0.75	0.07	0.00	60.75	2.00	0.00	0.74	0.07	0.00
60.81	2.00	0.00	0.73	0.06	0.00	60.88	2.00	0.00	0.72	0.07	0.00
60.94	2.00	0.00	0.71	0.06	0.00	61.01	2.00	0.00	0.70	0.07	0.00
61.07	2.00	0.00	0.69	0.06	0.00	61.14	2.00	0.00	0.68	0.07	0.00
61.21	2.00	0.00	0.67	0.07	0.00	61.27	2.00	0.00	0.66	0.06	0.00
61.34	2.00	0.00	0.65	0.07	0.00	61.40	2.00	0.00	0.64	0.06	0.00
61.47	2.00	0.00	0.63	0.07	0.00	61.53	2.00	0.00	0.62	0.06	0.00
61.60	2.00	0.00	0.61	0.07	0.00	61.66	2.00	0.00	0.60	0.06	0.00
61.73	2.00	0.00	0.59	0.07	0.00	61.80	2.00	0.00	0.58	0.07	0.00
61.86	2.00	0.00	0.57	0.06	0.00	61.93	2.00	0.00	0.56	0.07	0.00
61.99	2.00	0.00	0.55	0.06	0.00	62.06	2.00	0.00	0.54	0.07	0.00
62.12	2.00	0.00	0.53	0.06	0.00	62.19	2.00	0.00	0.52	0.07	0.00
62.25	2.00	0.00	0.51	0.06	0.00	62.32	2.00	0.00	0.50	0.07	0.00
62.39	2.00	0.00	0.49	0.07	0.00	62.45	2.00	0.00	0.48	0.06	0.00
62.52	2.00	0.00	0.47	0.07	0.00	62.58	2.00	0.00	0.46	0.06	0.00
62.65	2.00	0.00	0.45	0.07	0.00	62.71	2.00	0.00	0.44	0.06	0.00
62.78	2.00	0.00	0.43	0.07	0.00	62.85	2.00	0.00	0.42	0.07	0.00
62.91	2.00	0.00	0.41	0.06	0.00	62.98	2.00	0.00	0.40	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
63.04	2.00	0.00	0.39	0.06	0.00	63.11	2.00	0.00	0.38	0.07	0.00
63.17	2.00	0.00	0.37	0.06	0.00	63.24	2.00	0.00	0.36	0.07	0.00
63.30	2.00	0.00	0.35	0.06	0.00	63.37	2.00	0.00	0.34	0.07	0.00
63.44	2.00	0.00	0.33	0.07	0.00	63.50	2.00	0.00	0.32	0.06	0.00
63.57	2.00	0.00	0.31	0.07	0.00	63.63	2.00	0.00	0.30	0.06	0.00
63.70	2.00	0.00	0.29	0.07	0.00	63.76	2.00	0.00	0.28	0.06	0.00
63.83	2.00	0.00	0.27	0.07	0.00	63.89	2.00	0.00	0.26	0.06	0.00
63.96	2.00	0.00	0.25	0.07	0.00	64.03	2.00	0.00	0.24	0.07	0.00
64.09	2.00	0.00	0.23	0.06	0.00	64.16	2.00	0.00	0.22	0.07	0.00
64.22	2.00	0.00	0.21	0.06	0.00	64.29	2.00	0.00	0.20	0.07	0.00
64.35	2.00	0.00	0.19	0.06	0.00	64.42	2.00	0.00	0.18	0.07	0.00
64.49	2.00	0.00	0.17	0.07	0.00	64.55	2.00	0.00	0.16	0.06	0.00
64.62	2.00	0.00	0.15	0.07	0.00	64.68	2.00	0.00	0.14	0.06	0.00
64.75	2.00	0.00	0.13	0.07	0.00	64.81	2.00	0.00	0.12	0.06	0.00
64.88	2.00	0.00	0.11	0.07	0.00	64.94	2.00	0.00	0.10	0.06	0.00
65.01	2.00	0.00	0.09	0.07	0.00	65.08	2.00	0.00	0.08	0.07	0.00
65.14	2.00	0.00	0.07	0.06	0.00	65.21	2.00	0.00	0.06	0.07	0.00
65.27	2.00	0.00	0.05	0.06	0.00	65.34	2.00	0.00	0.04	0.07	0.00
65.40	2.00	0.00	0.03	0.06	0.00	65.47	2.00	0.00	0.02	0.07	0.00
65.53	2.00	0.00	0.01	0.06	0.00	65.60	2.00	0.00	0.00	0.07	0.00
65.67	2.00	0.00	0.00	0.00	0.00	65.73	2.00	0.00	0.00	0.00	0.00
65.80	2.00	0.00	0.00	0.00	0.00	65.86	2.00	0.00	0.00	0.00	0.00
65.93	2.00	0.00	0.00	0.00	0.00	65.99	2.00	0.00	0.00	0.00	0.00
66.06	2.00	0.00	0.00	0.00	0.00	66.13	2.00	0.00	0.00	0.00	0.00
66.19	2.00	0.00	0.00	0.00	0.00	66.26	2.00	0.00	0.00	0.00	0.00
66.32	2.00	0.00	0.00	0.00	0.00	66.39	2.00	0.00	0.00	0.00	0.00
66.45	2.00	0.00	0.00	0.00	0.00	66.52	2.00	0.00	0.00	0.00	0.00
66.58	2.00	0.00	0.00	0.00	0.00	66.65	2.00	0.00	0.00	0.00	0.00
66.72	2.00	0.00	0.00	0.00	0.00	66.78	2.00	0.00	0.00	0.00	0.00
66.85	2.00	0.00	0.00	0.00	0.00	66.91	2.00	0.00	0.00	0.00	0.00
66.98	2.00	0.00	0.00	0.00	0.00	67.04	2.00	0.00	0.00	0.00	0.00
67.11	2.00	0.00	0.00	0.00	0.00	67.17	2.00	0.00	0.00	0.00	0.00
67.24	2.00	0.00	0.00	0.00	0.00	67.31	2.00	0.00	0.00	0.00	0.00
67.37	2.00	0.00	0.00	0.00	0.00	67.44	2.00	0.00	0.00	0.00	0.00
67.50	2.00	0.00	0.00	0.00	0.00	67.57	2.00	0.00	0.00	0.00	0.00
67.63	2.00	0.00	0.00	0.00	0.00	67.70	2.00	0.00	0.00	0.00	0.00
67.77	2.00	0.00	0.00	0.00	0.00	67.83	2.00	0.00	0.00	0.00	0.00
67.90	2.00	0.00	0.00	0.00	0.00	67.96	2.00	0.00	0.00	0.00	0.00
68.03	2.00	0.00	0.00	0.00	0.00	68.09	2.00	0.00	0.00	0.00	0.00
68.16	2.00	0.00	0.00	0.00	0.00	68.22	2.00	0.00	0.00	0.00	0.00
68.29	2.00	0.00	0.00	0.00	0.00	68.36	2.00	0.00	0.00	0.00	0.00
68.42	2.00	0.00	0.00	0.00	0.00	68.49	2.00	0.00	0.00	0.00	0.00
68.55	2.00	0.00	0.00	0.00	0.00	68.62	2.00	0.00	0.00	0.00	0.00
68.68	2.00	0.00	0.00	0.00	0.00	68.75	2.00	0.00	0.00	0.00	0.00
68.81	2.00	0.00	0.00	0.00	0.00	68.88	2.00	0.00	0.00	0.00	0.00
68.95	2.00	0.00	0.00	0.00	0.00	69.01	2.00	0.00	0.00	0.00	0.00
69.08	2.00	0.00	0.00	0.00	0.00	69.14	2.00	0.00	0.00	0.00	0.00
69.21	2.00	0.00	0.00	0.00	0.00	69.27	2.00	0.00	0.00	0.00	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
69.34	2.00	0.00	0.00	0.00	0.00	69.41	2.00	0.00	0.00	0.00	0.00
69.47	2.00	0.00	0.00	0.00	0.00	69.54	2.00	0.00	0.00	0.00	0.00
69.60	2.00	0.00	0.00	0.00	0.00	69.67	2.00	0.00	0.00	0.00	0.00
69.73	2.00	0.00	0.00	0.00	0.00	69.80	2.00	0.00	0.00	0.00	0.00
69.86	2.00	0.00	0.00	0.00	0.00	69.93	2.00	0.00	0.00	0.00	0.00
70.00	2.00	0.00	0.00	0.00	0.00	70.06	2.00	0.00	0.00	0.00	0.00
70.13	2.00	0.00	0.00	0.00	0.00	70.19	2.00	0.00	0.00	0.00	0.00
70.26	2.00	0.00	0.00	0.00	0.00	70.32	2.00	0.00	0.00	0.00	0.00
70.39	2.00	0.00	0.00	0.00	0.00	70.45	2.00	0.00	0.00	0.00	0.00
70.52	2.00	0.00	0.00	0.00	0.00	70.59	2.00	0.00	0.00	0.00	0.00
70.65	2.00	0.00	0.00	0.00	0.00	70.72	2.00	0.00	0.00	0.00	0.00
70.78	2.00	0.00	0.00	0.00	0.00	70.85	2.00	0.00	0.00	0.00	0.00
70.91	2.00	0.00	0.00	0.00	0.00	70.98	2.00	0.00	0.00	0.00	0.00
71.05	2.00	0.00	0.00	0.00	0.00	71.11	2.00	0.00	0.00	0.00	0.00
71.18	2.00	0.00	0.00	0.00	0.00	71.24	2.00	0.00	0.00	0.00	0.00
71.31	2.00	0.00	0.00	0.00	0.00	71.37	2.00	0.00	0.00	0.00	0.00
71.44	2.00	0.00	0.00	0.00	0.00	71.50	2.00	0.00	0.00	0.00	0.00
71.57	2.00	0.00	0.00	0.00	0.00	71.64	2.00	0.00	0.00	0.00	0.00
71.70	2.00	0.00	0.00	0.00	0.00	71.77	2.00	0.00	0.00	0.00	0.00
71.83	2.00	0.00	0.00	0.00	0.00	71.90	2.00	0.00	0.00	0.00	0.00
71.96	2.00	0.00	0.00	0.00	0.00	72.03	2.00	0.00	0.00	0.00	0.00
72.09	2.00	0.00	0.00	0.00	0.00	72.16	2.00	0.00	0.00	0.00	0.00
72.23	2.00	0.00	0.00	0.00	0.00	72.29	2.00	0.00	0.00	0.00	0.00
72.36	2.00	0.00	0.00	0.00	0.00	72.42	2.00	0.00	0.00	0.00	0.00
72.49	2.00	0.00	0.00	0.00	0.00	72.55	2.00	0.00	0.00	0.00	0.00
72.62	2.00	0.00	0.00	0.00	0.00	72.69	2.00	0.00	0.00	0.00	0.00
72.75	2.00	0.00	0.00	0.00	0.00	72.82	2.00	0.00	0.00	0.00	0.00
72.88	2.00	0.00	0.00	0.00	0.00	72.95	2.00	0.00	0.00	0.00	0.00
73.01	2.00	0.00	0.00	0.00	0.00	73.08	2.00	0.00	0.00	0.00	0.00
73.14	2.00	0.00	0.00	0.00	0.00	73.21	2.00	0.00	0.00	0.00	0.00
73.28	2.00	0.00	0.00	0.00	0.00	73.34	2.00	0.00	0.00	0.00	0.00
73.41	2.00	0.00	0.00	0.00	0.00	73.47	2.00	0.00	0.00	0.00	0.00
73.54	2.00	0.00	0.00	0.00	0.00	73.60	2.00	0.00	0.00	0.00	0.00
73.67	2.00	0.00	0.00	0.00	0.00	73.73	2.00	0.00	0.00	0.00	0.00
73.80	2.00	0.00	0.00	0.00	0.00	73.87	2.00	0.00	0.00	0.00	0.00
73.93	2.00	0.00	0.00	0.00	0.00	74.00	2.00	0.00	0.00	0.00	0.00
74.06	2.00	0.00	0.00	0.00	0.00	74.13	2.00	0.00	0.00	0.00	0.00
74.19	2.00	0.00	0.00	0.00	0.00	74.26	2.00	0.00	0.00	0.00	0.00
74.32	2.00	0.00	0.00	0.00	0.00	74.39	2.00	0.00	0.00	0.00	0.00
74.46	2.00	0.00	0.00	0.00	0.00	74.52	2.00	0.00	0.00	0.00	0.00
74.59	2.00	0.00	0.00	0.00	0.00	74.65	2.00	0.00	0.00	0.00	0.00
74.72	2.00	0.00	0.00	0.00	0.00	74.78	2.00	0.00	0.00	0.00	0.00
74.85	2.00	0.00	0.00	0.00	0.00	74.92	2.00	0.00	0.00	0.00	0.00
74.98	2.00	0.00	0.00	0.00	0.00	75.05	2.00	0.00	0.00	0.00	0.00
75.11	2.00	0.00	0.00	0.00	0.00	75.18	2.00	0.00	0.00	0.00	0.00
75.24	2.00	0.00	0.00	0.00	0.00	75.31	2.00	0.00	0.00	0.00	0.00
75.37	2.00	0.00	0.00	0.00	0.00	75.44	2.00	0.00	0.00	0.00	0.00
75.51	2.00	0.00	0.00	0.00	0.00						

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI

Overall liquefaction potential: 0.00

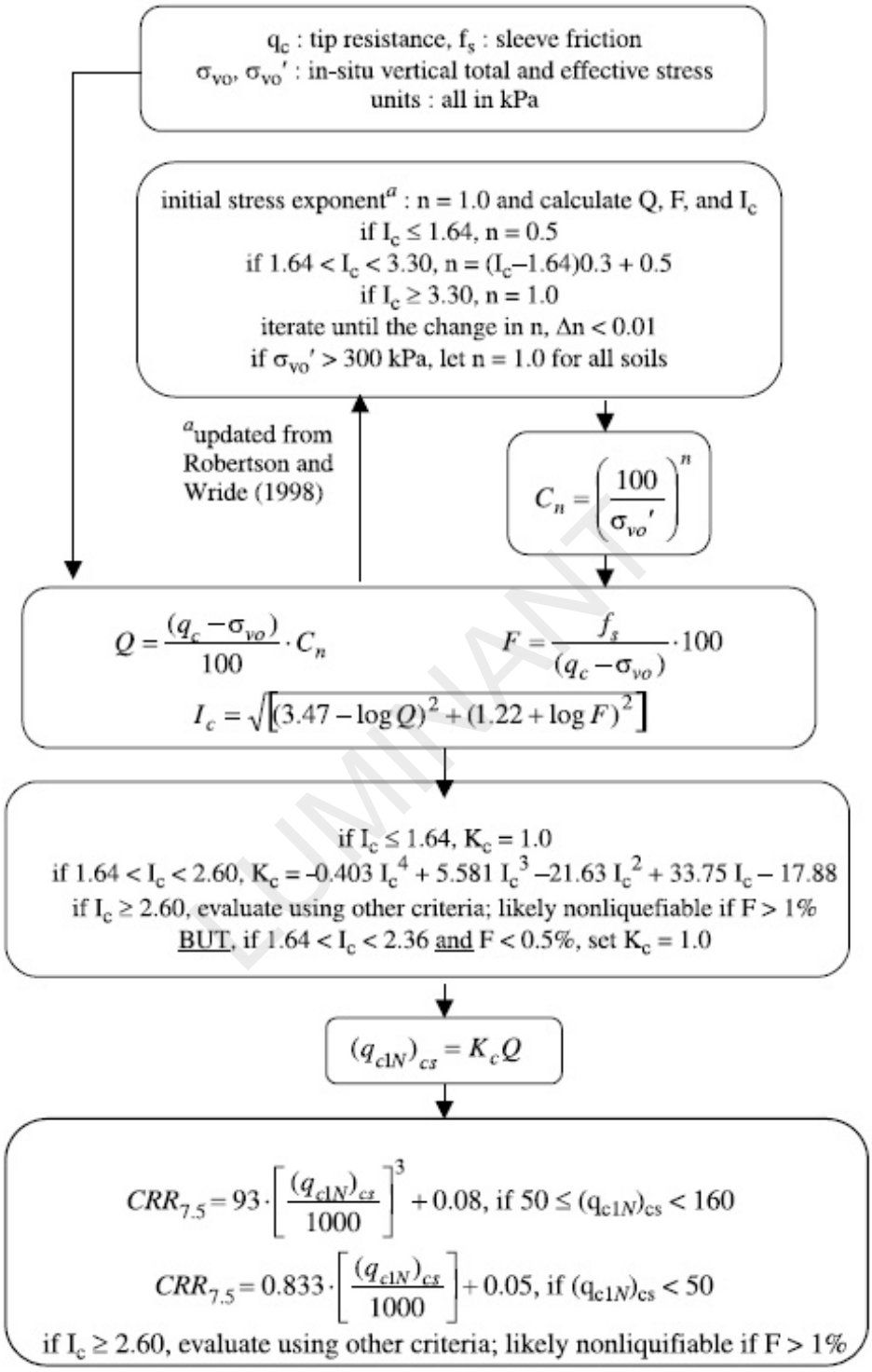
LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS: Calculated factor of safety for test point
F_L: 1 - FS
w_z: Function value of the extend of soil liquefaction according to depth
d_z: Layer thickness (ft)
LPI: Liquefaction potential index value for test point

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

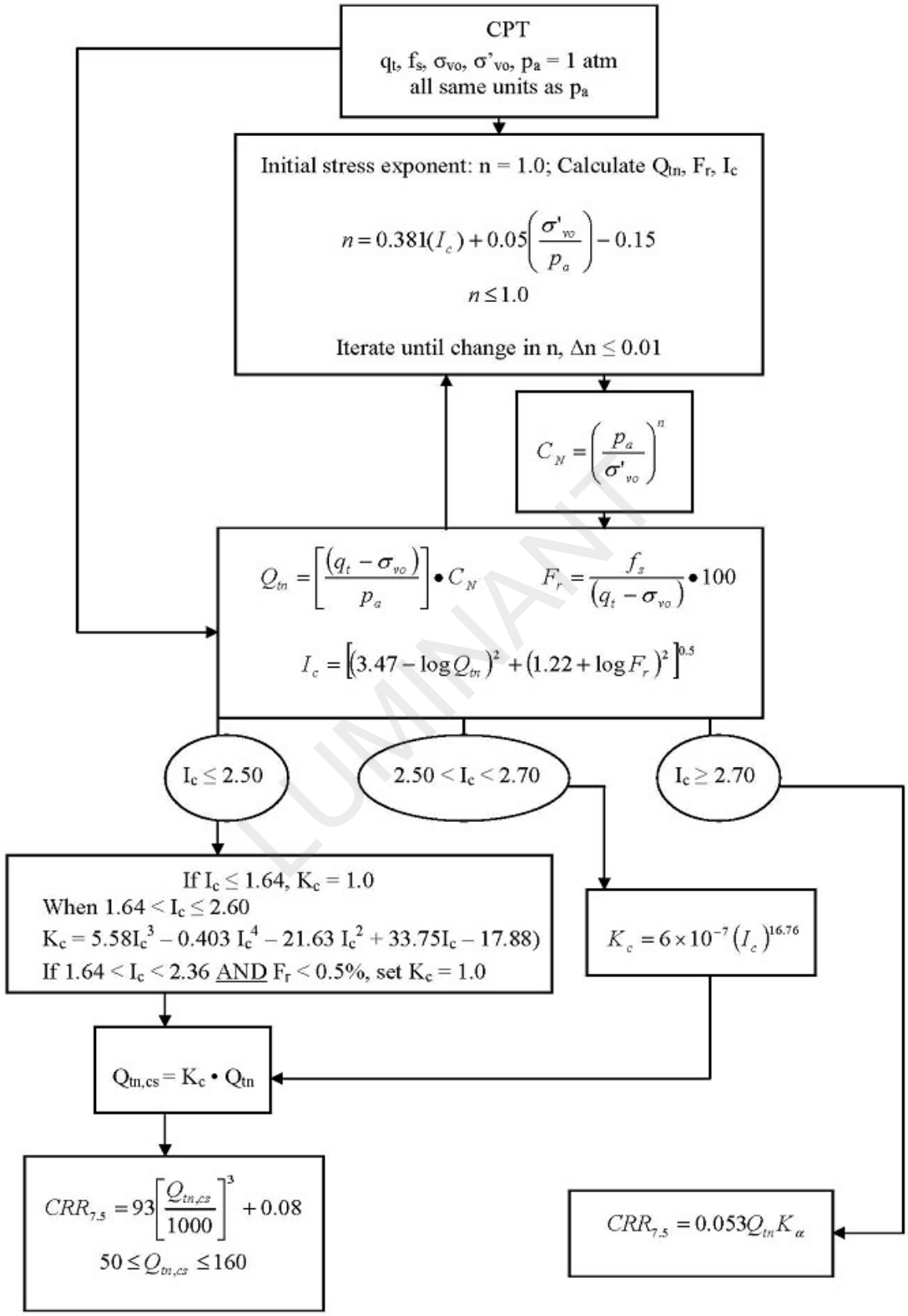
Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

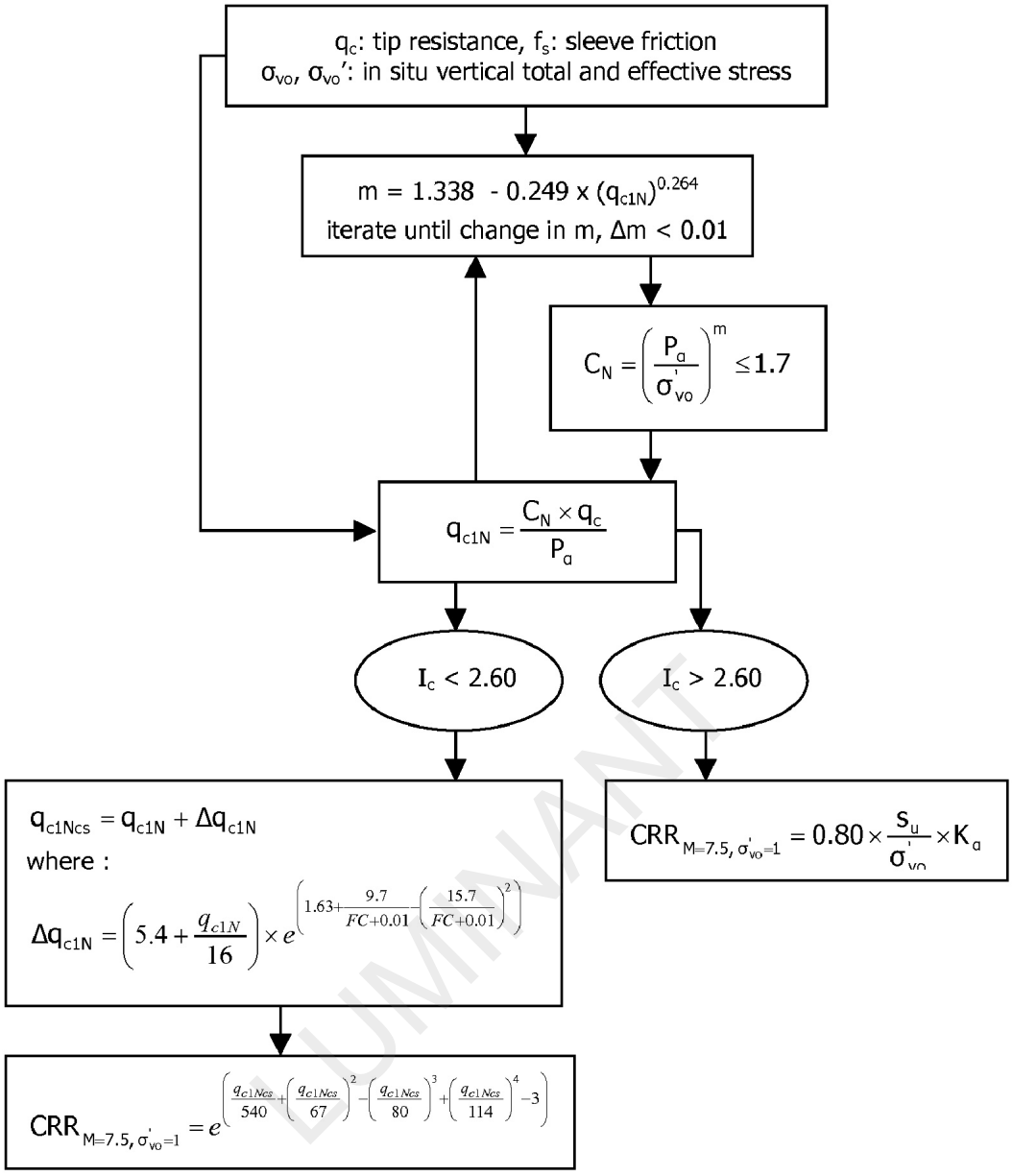
Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:

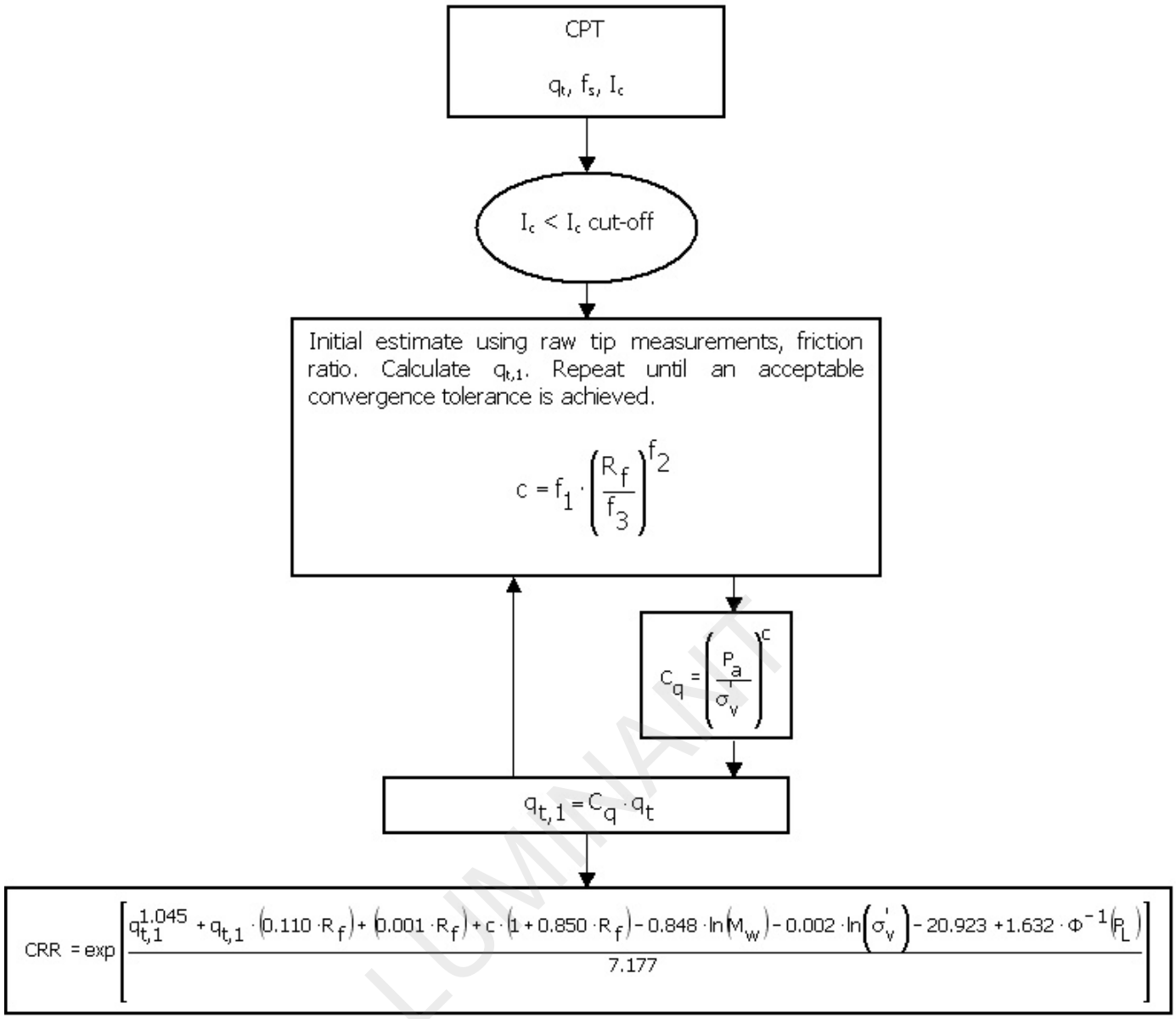


[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)

$$FS_{liq} = \frac{CRR_{M=7.5,\sigma'_v=1atm}}{CSR_{M=7.5,\sigma'_v=1atm}}$$

$$CSR_{M=7.5,\sigma'_v=1atm} = 0.65 \frac{\sigma_v}{\sigma'_v} \frac{a_{max}}{g} r_d \frac{1}{MSF} \frac{1}{K_\sigma}$$

$$r_d = \exp\left[\alpha(z) + \beta(z) \cdot M\right]$$

$$\alpha(z) = -1.012 - 1.126 \sin\left(\frac{z}{11.73} + 5.133\right)$$

$$\beta(z) = 0.106 + 0.118 \sin\left(\frac{z}{11.28} + 5.142\right)$$

$$K_\sigma = 1 - C_\sigma \ln\left(\frac{\sigma'_v}{P_a}\right) \le 1.1$$

$$C_\sigma = \frac{1}{37.3 - 8.27\left(q_{c1Ncs}\right)^{0.264}} \le 0.3$$

$$MSF = 1 + \left(MSF_{max} - 1\right)\left(8.64 \exp\left(\frac{-M}{4}\right) - 1.325\right)$$

$$MSF_{max} = 1.09 + \left(\frac{q_{c1Ncs}}{180}\right)^3 \le 2.2$$

σ'_v *and* σ_v *at start of earthquake shaking*

$$CRR_{M=7.5,\sigma'_v=1atm} = \exp\left(\frac{q_{c1Ncs}}{113} + \left(\frac{q_{c1Ncs}}{1000}\right)^2 - \left(\frac{q_{c1Ncs}}{140}\right)^3 + \left(\frac{q_{c1Ncs}}{137}\right)^4 - 2.80\right)$$

$$q_{c1Ncs} = q_{c1N} + \Delta q_{c1N}$$

$$\Delta q_{c1N} = \left(11.9 + \frac{q_{c1N}}{14.6}\right) \exp\left(1.63 - \frac{9.7}{FC+2} - \left(\frac{15.7}{FC+2}\right)^2\right)$$

$$q_{c1N} = C_{Ne} \frac{q_c}{P_a}$$

$$C_{Ne} = \left(\frac{P_a}{\sigma'_v}\right)^m \le 1.7$$

$$m = 1.338 - 0.249\left(q_{c1Ncs}\right)^{0.264} \quad with \quad 0.264 \le m \le 0.782$$

$$FC = 80\left(I_C + C_{FC}\right) - 137 \quad with \quad 0\% \le FC \le 100\%$$

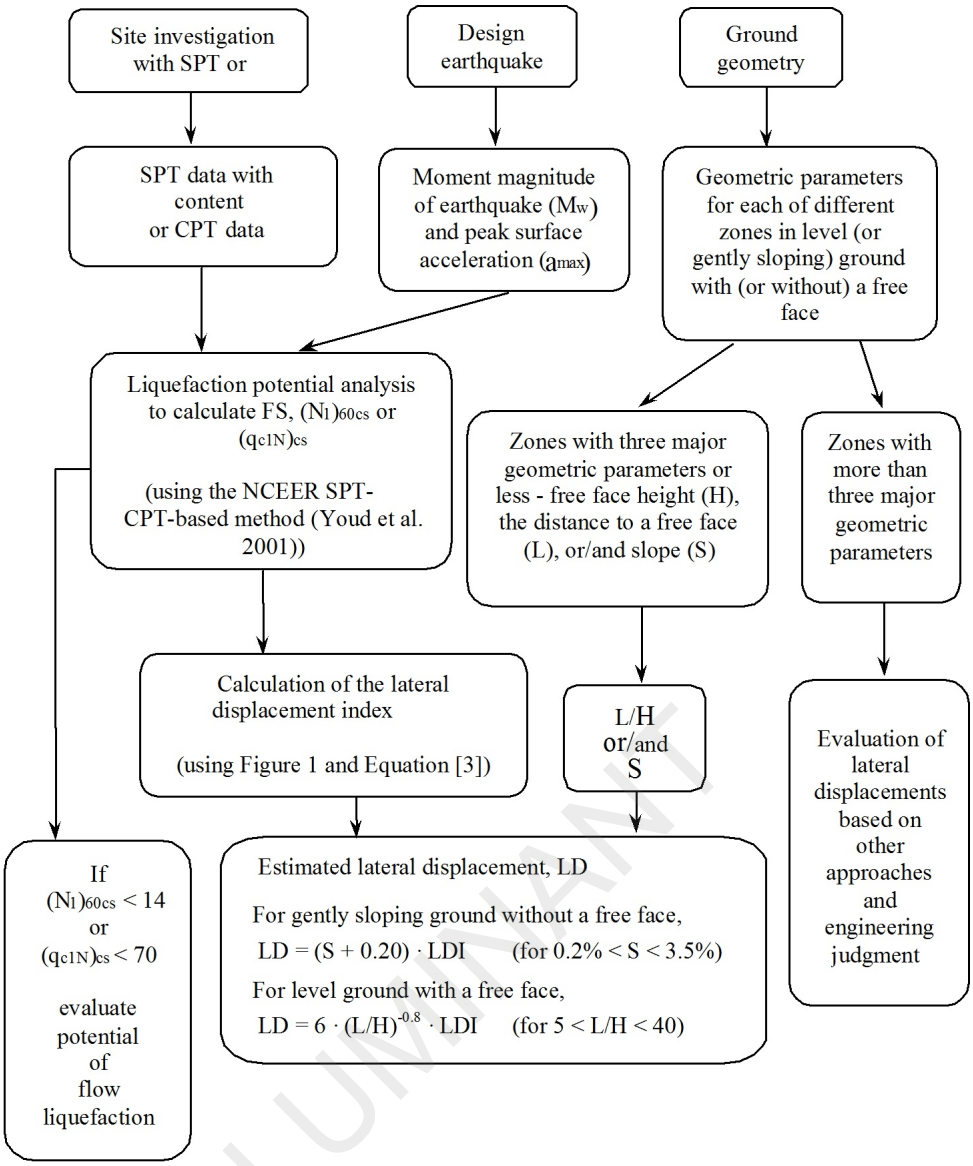
$$I_c = \left[\left(3.47 - \log\left(Q\right)\right)^2 + \left(1.22 + \log\left(F\right)\right)^2\right]^{0.5}$$

$$Q = \left(\frac{q_c - \sigma_{vc}}{P_a}\right)\left(\frac{P_a}{\sigma'_{vc}}\right)^n \; with \; 0.5 \le n \le 1.0 \; per \; Robertson \; \& \; Wride \; (1998)$$

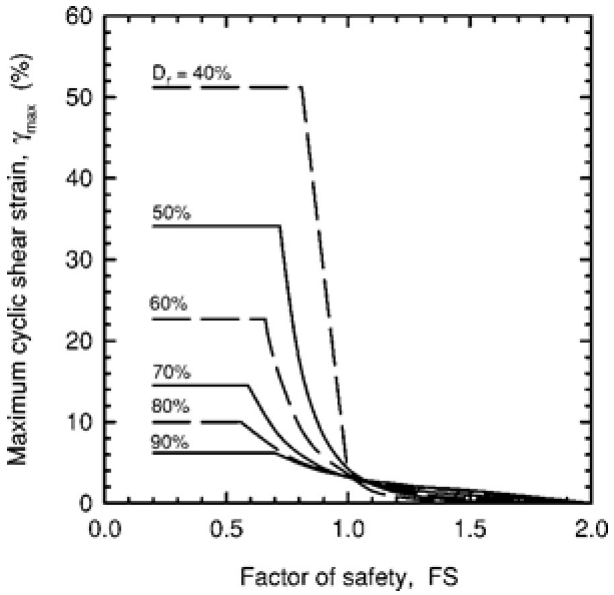
$$F = \left(\frac{f_s}{q_c - \sigma_{vc}}\right) \cdot 100\%$$

σ'_v *at time of CPT sounding*

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



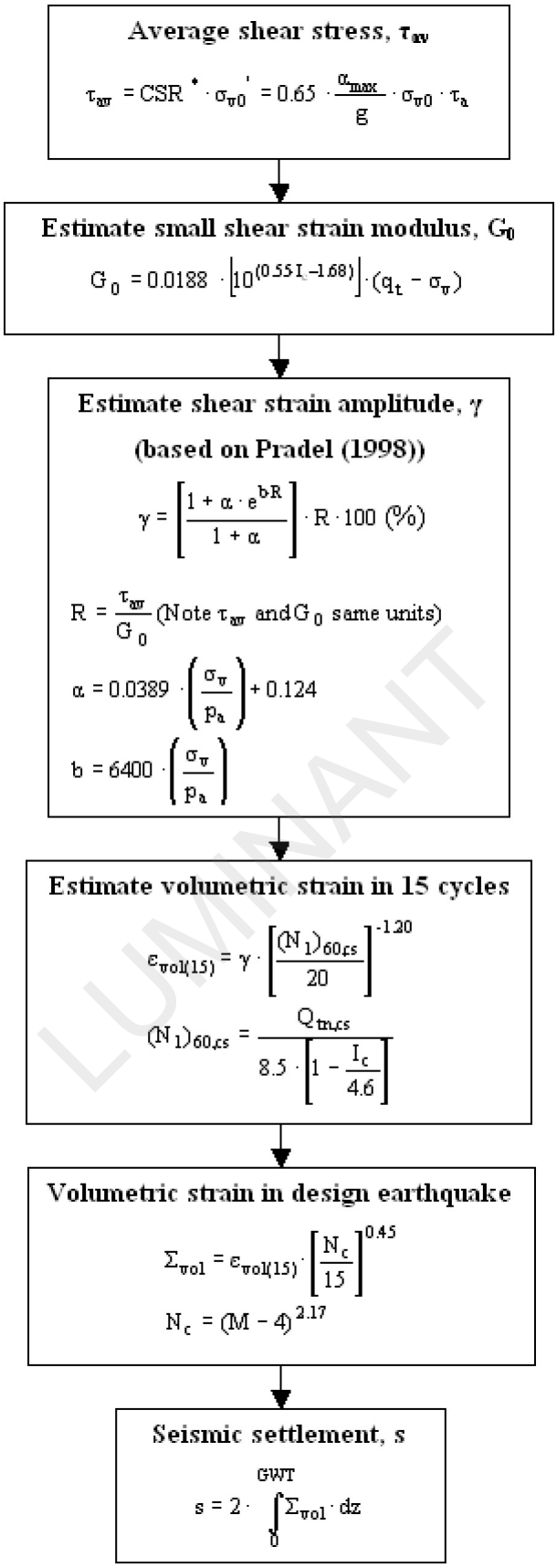
[1] **Figure 1**

$$LDI = \int_0^{z_{max}} \gamma_{max} dz$$

[1] **Equation [3]**

[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands



Robertson, P.K. and Lisheng, S., 2010, "Estimation of seismic compression in dry soils using the CPT" FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

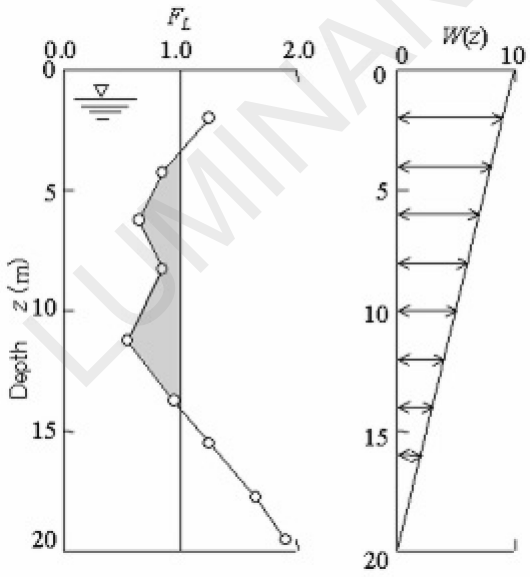
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\mathbf{LPI} = \int_0^{20} (10 - 0{,}5z) \times F_L \times dz$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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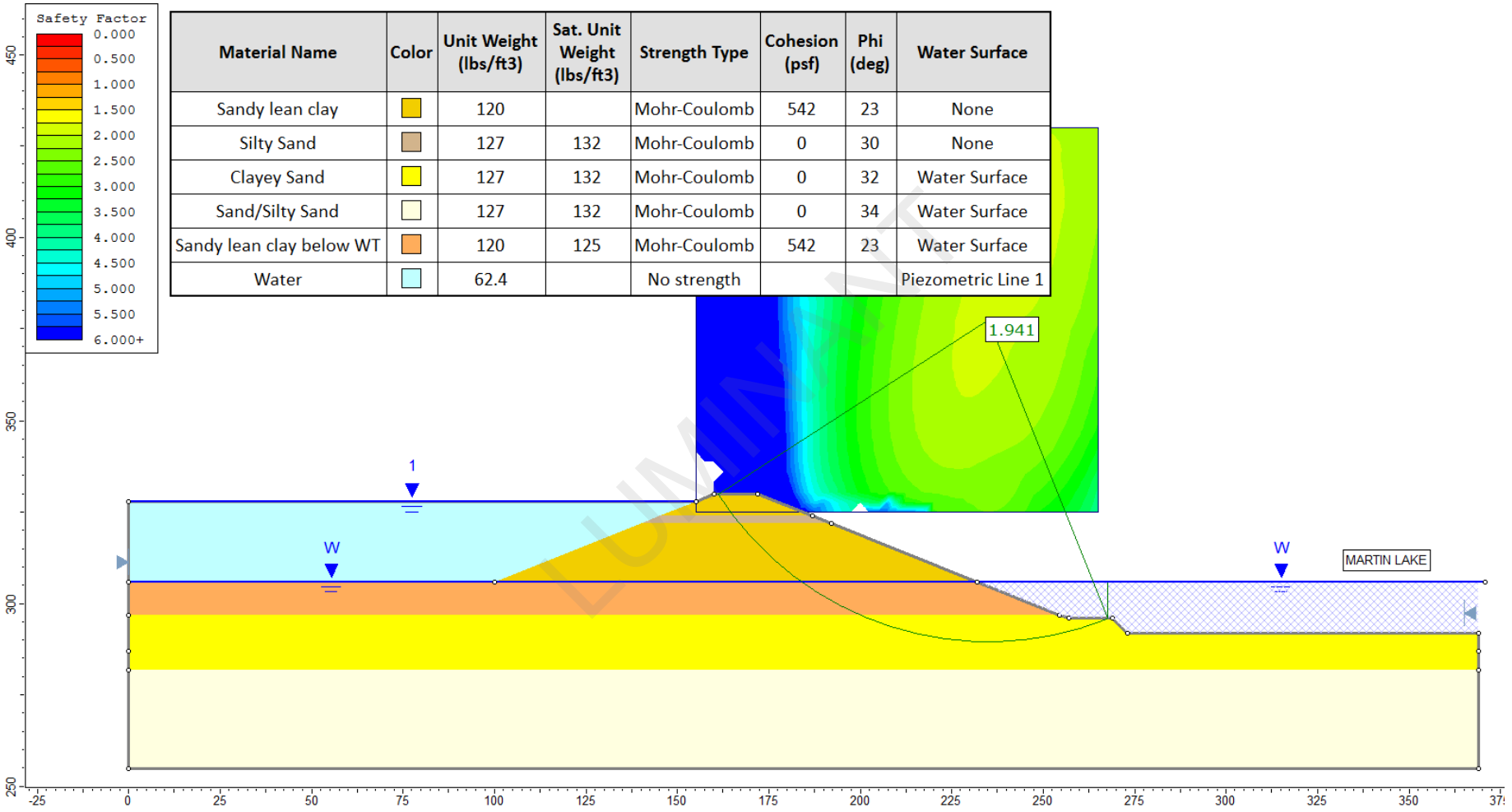
APPENDIX D

SLOPE STABILITY ANALYSIS RESULTS

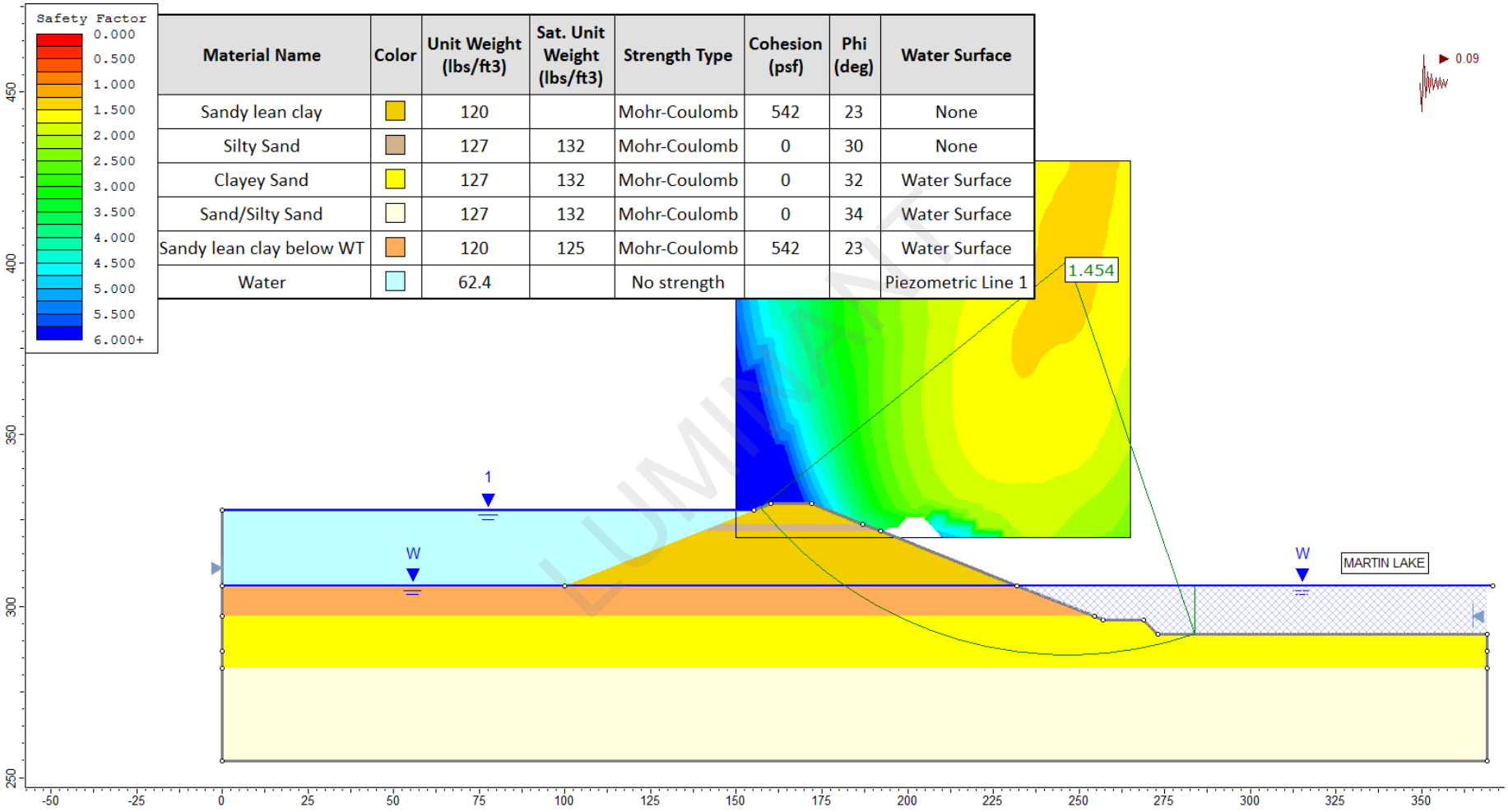


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.1**

Results of Stability Analysis − BAP−SP: A−A' − Case 1a

Stability and Safety Factor Assessment, Martin Lake SES

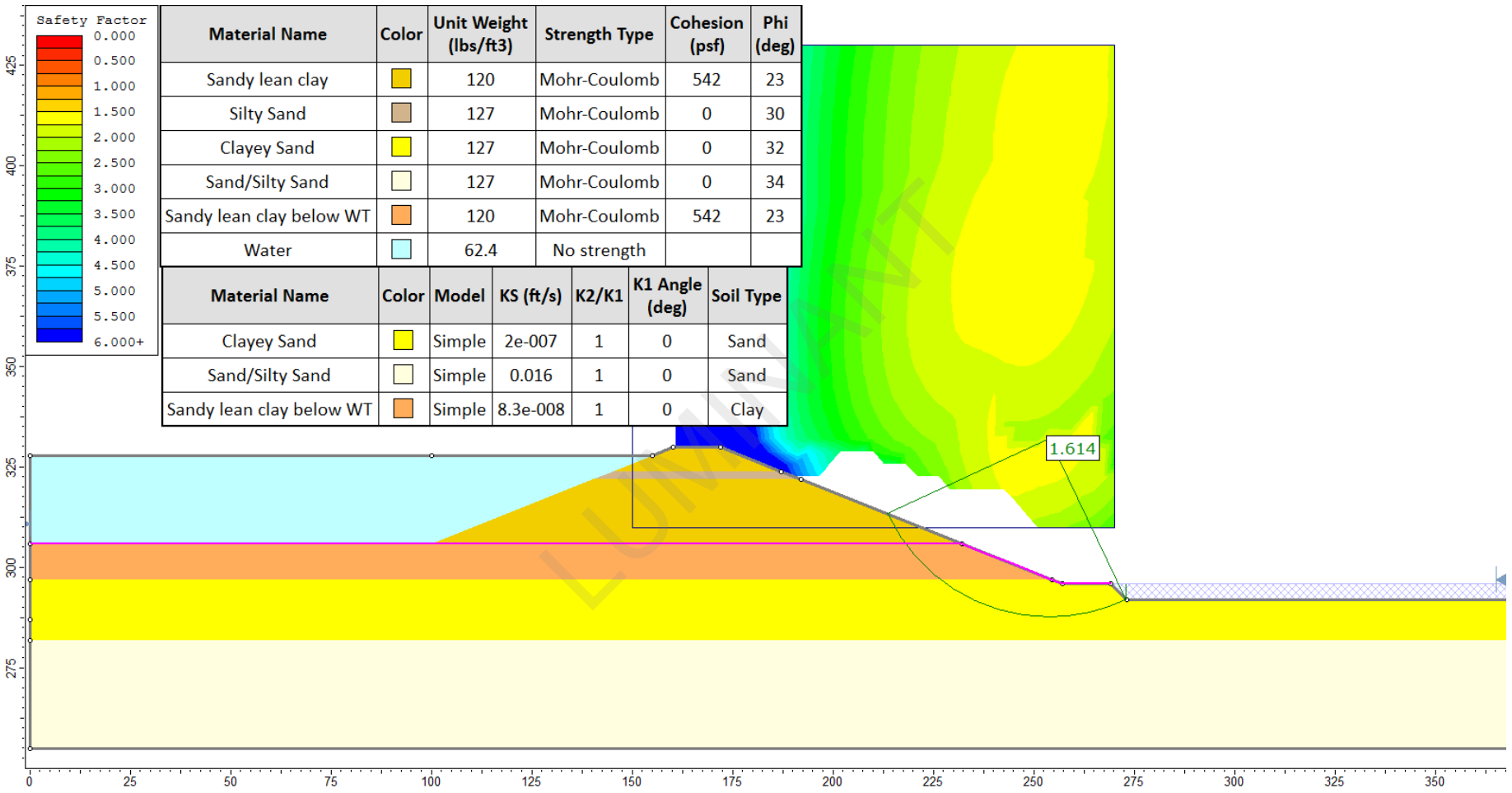


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.2**

Results of Stability Analysis − BAP−SP: A−A' − Case 1b

Stability and Safety Factor Assessment, Martin Lake SES



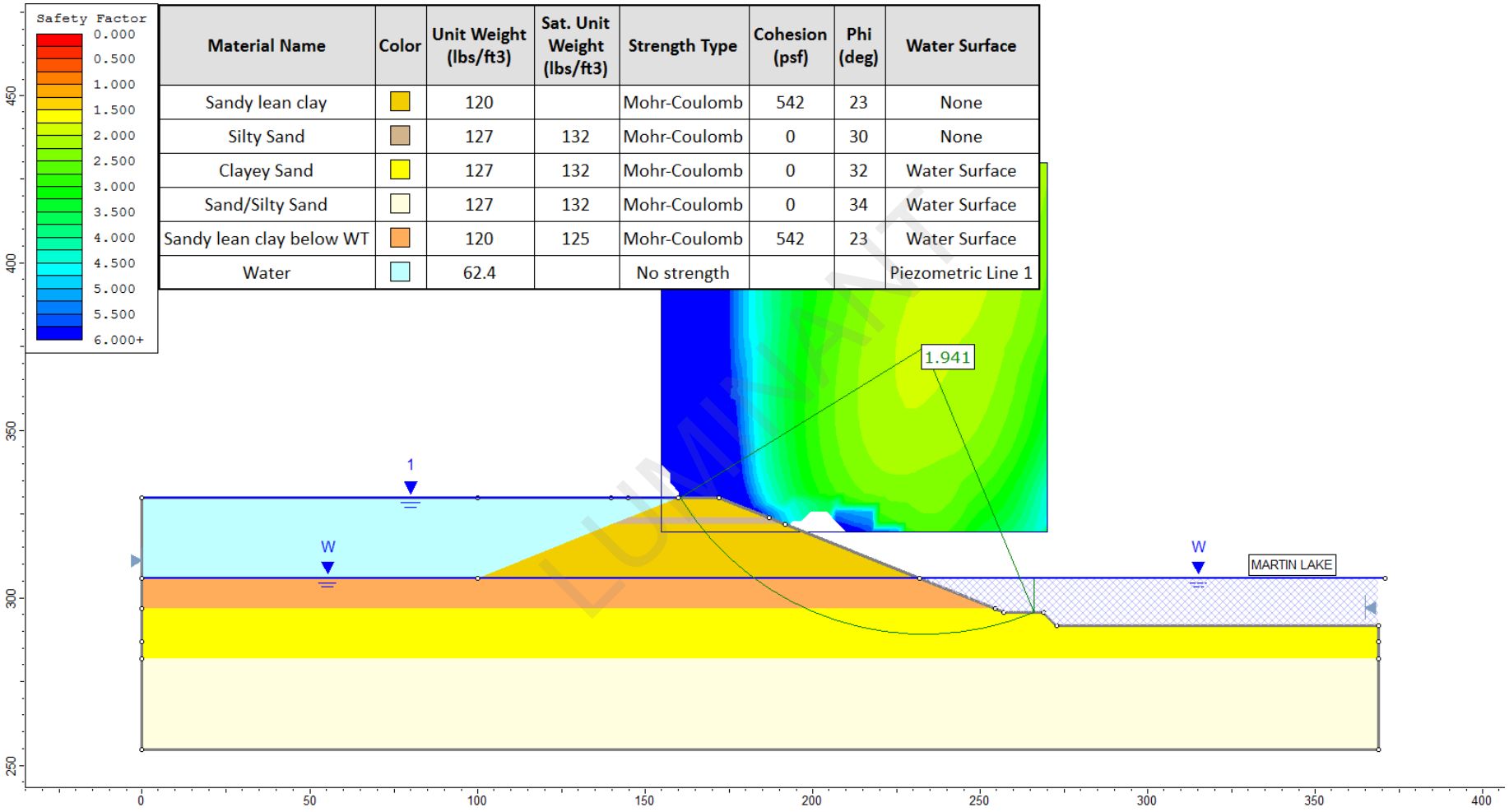
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Sandy lean clay		120	Mohr-Coulomb	542	23
Silty Sand		127	Mohr-Coulomb	0	30
Clayey Sand		127	Mohr-Coulomb	0	32
Sand/Silty Sand		127	Mohr-Coulomb	0	34
Sandy lean clay below WT		120	Mohr-Coulomb	542	23
Water		62.4	No strength		

Material Name	Color	Model	KS (ft/s)	K2/K1	K1 Angle (deg)	Soil Type
Clayey Sand		Simple	2e-007	1	0	Sand
Sand/Silty Sand		Simple	0.016	1	0	Sand
Sandy lean clay below WT		Simple	8.3e-008	1	0	Clay

FIGURE **C.3**

Results of Stability Analysis − BAP−SP: A−A' − Case 1c

Stability and Safety Factor Assessment, Martin Lake SES

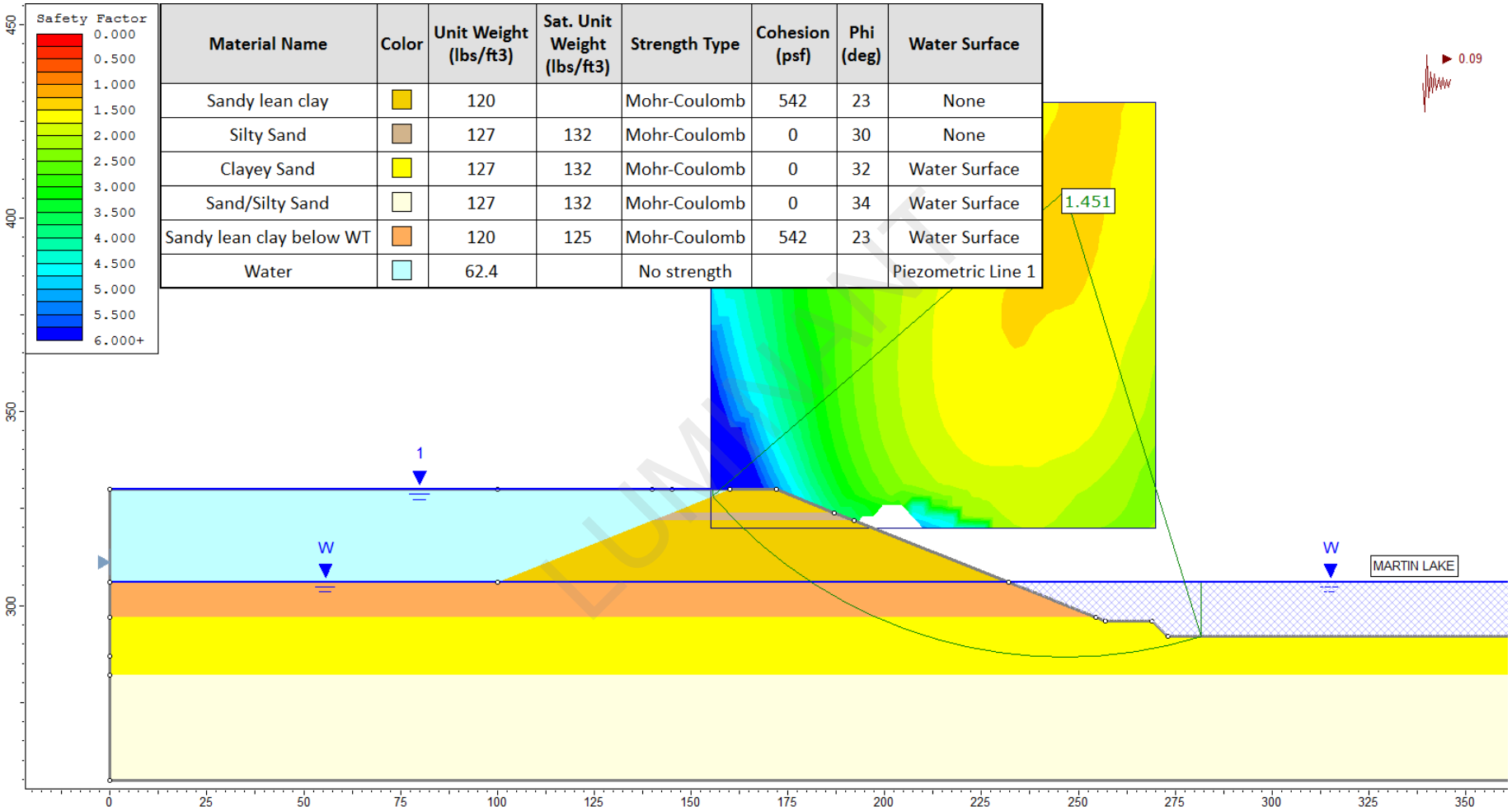


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.4**

Results of Stability Analysis − BAP−SP: A−A' − Case 2a

Stability and Safety Factor Assessment, Martin Lake SES

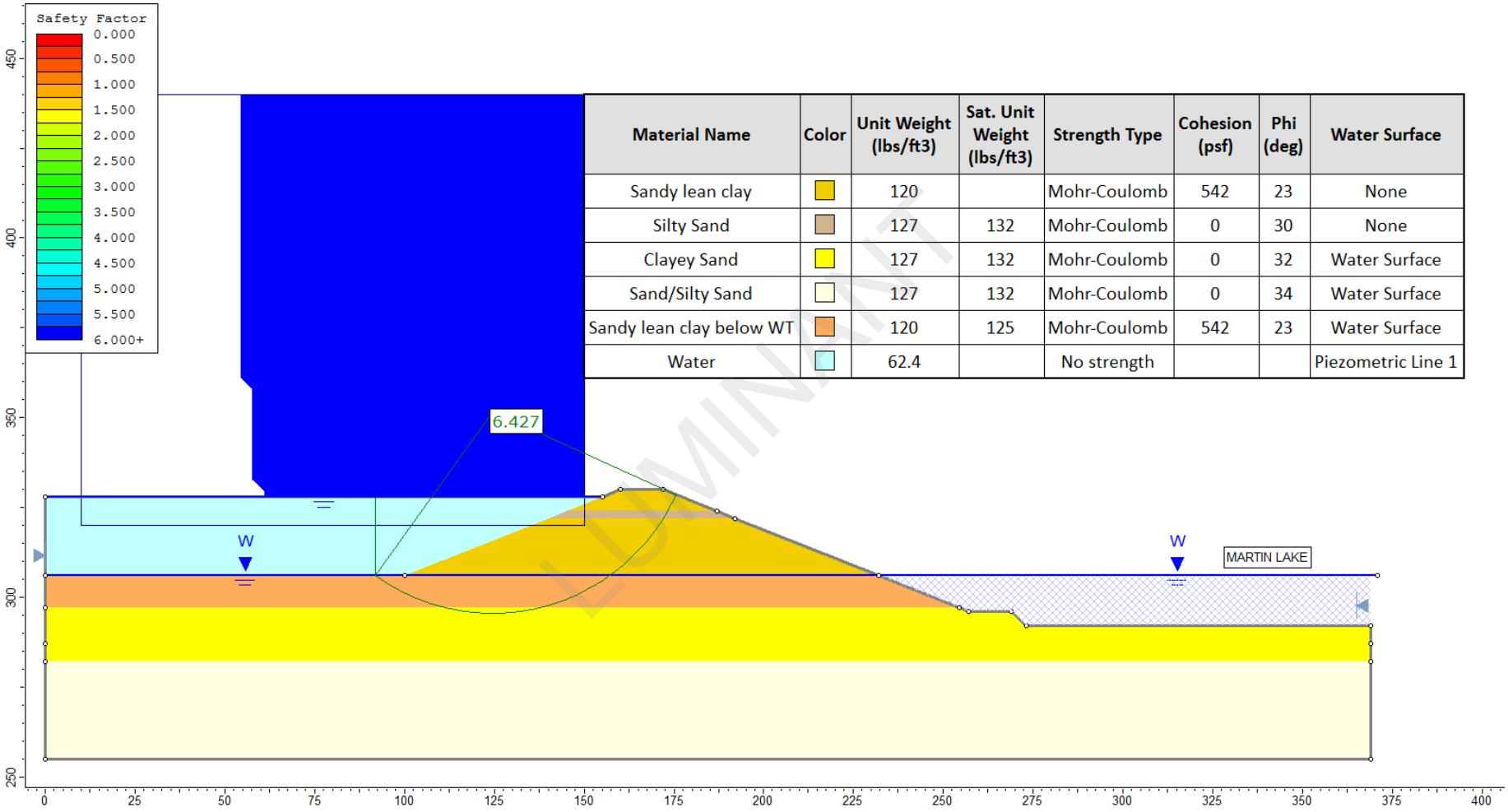


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.5**

Results of Stability Analysis − BAP−SP: A−A' − Case 2b

Stability and Safety Factor Assessment, Martin Lake SES

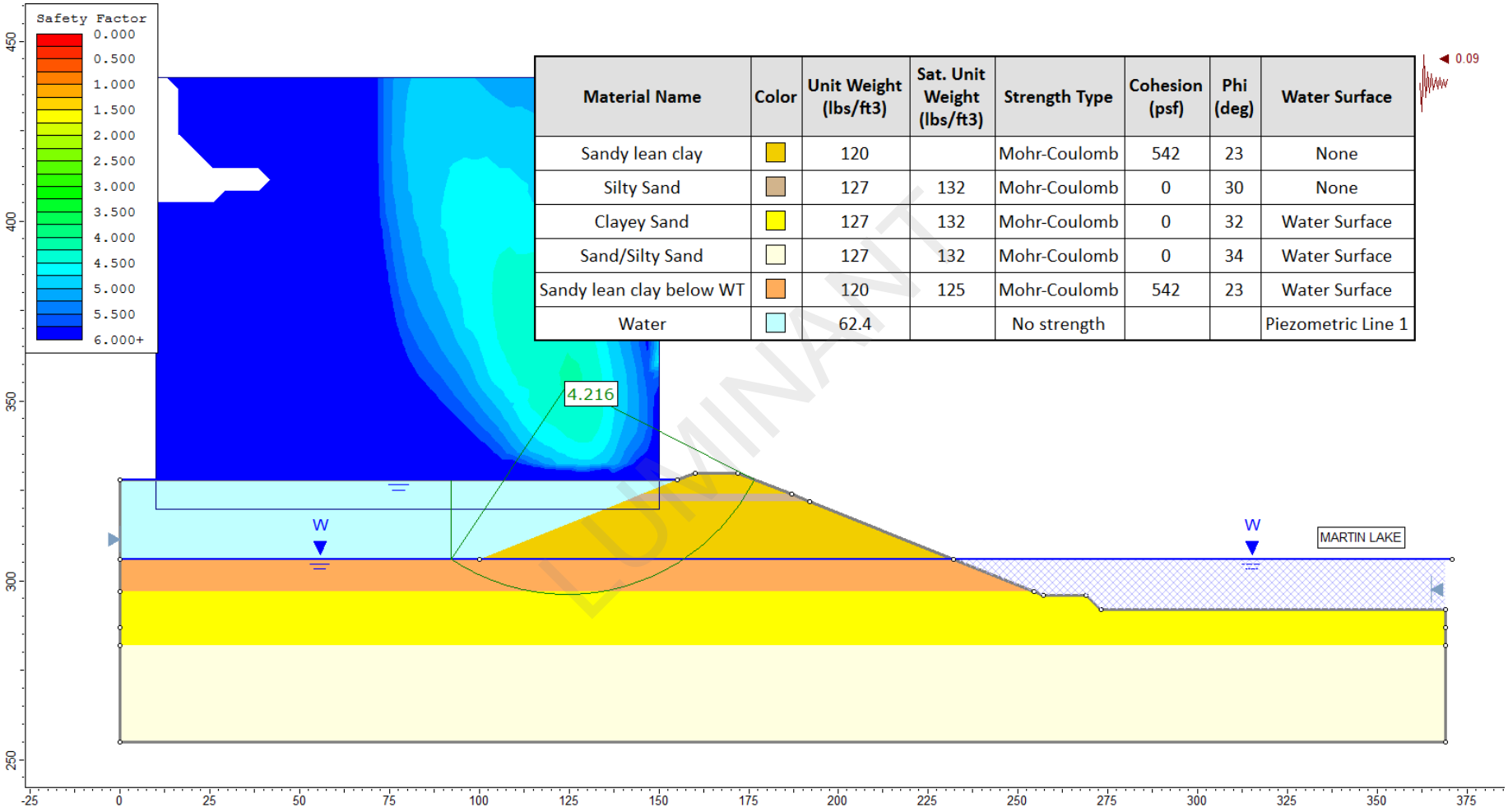


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.6**

Results of Stability Analysis − BAP−SP: A−A' − Case 3a

Stability and Safety Factor Assessment, Martin Lake SES

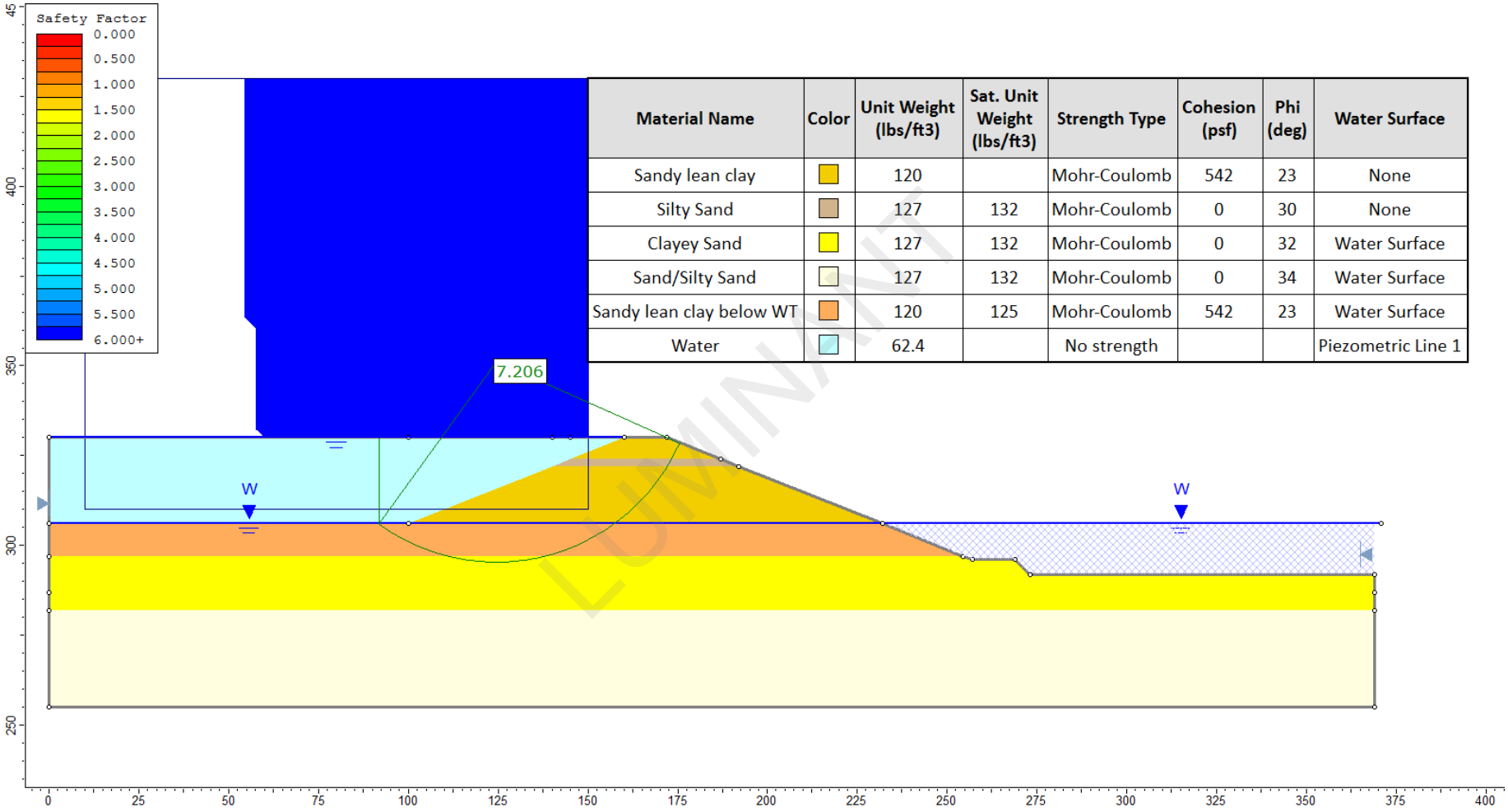


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.7**

Results of Stability Analysis − BAP−SP: A−A' − Case 3b

Stability and Safety Factor Assessment, Martin Lake SES

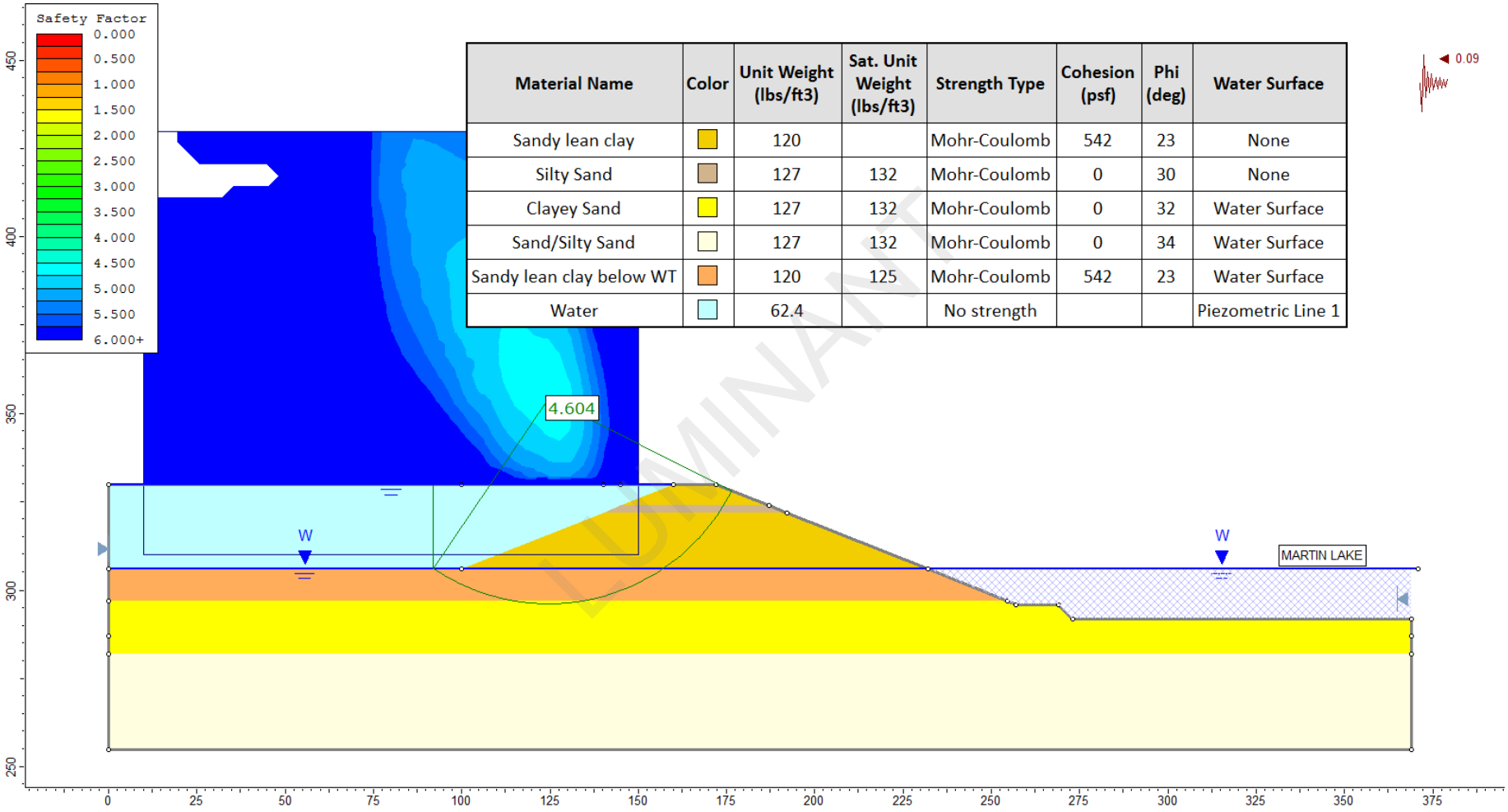


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.8**

Results of Stability Analysis − BAP−SP: A−A' − Case 4a

Stability and Safety Factor Assessment, Martin Lake SES

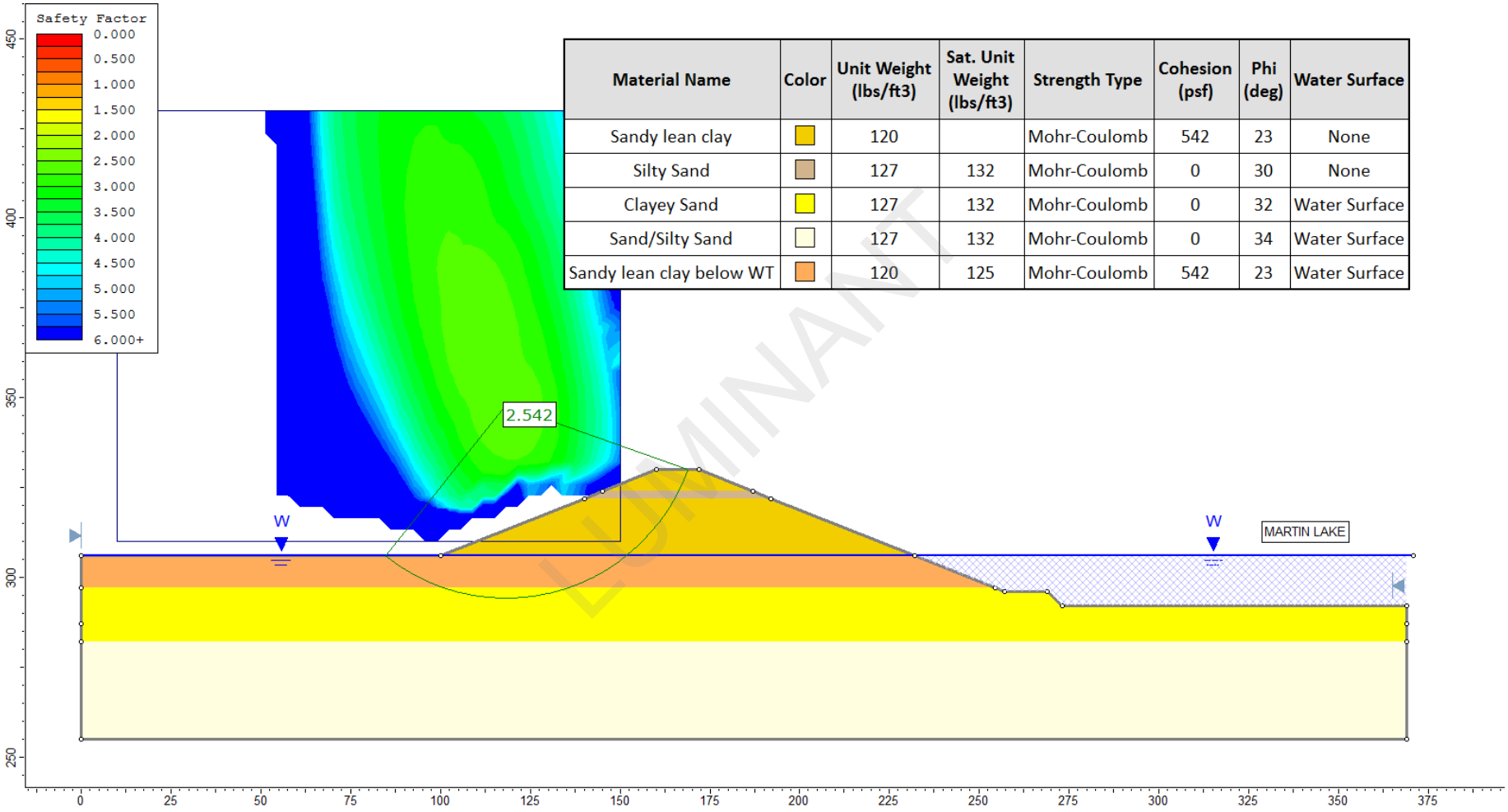


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface
Water		62.4		No strength			Piezometric Line 1

FIGURE **C.9**

Results of Stability Analysis − BAP−SP: A−A' − Case 4b

Stability and Safety Factor Assessment, Martin Lake SES

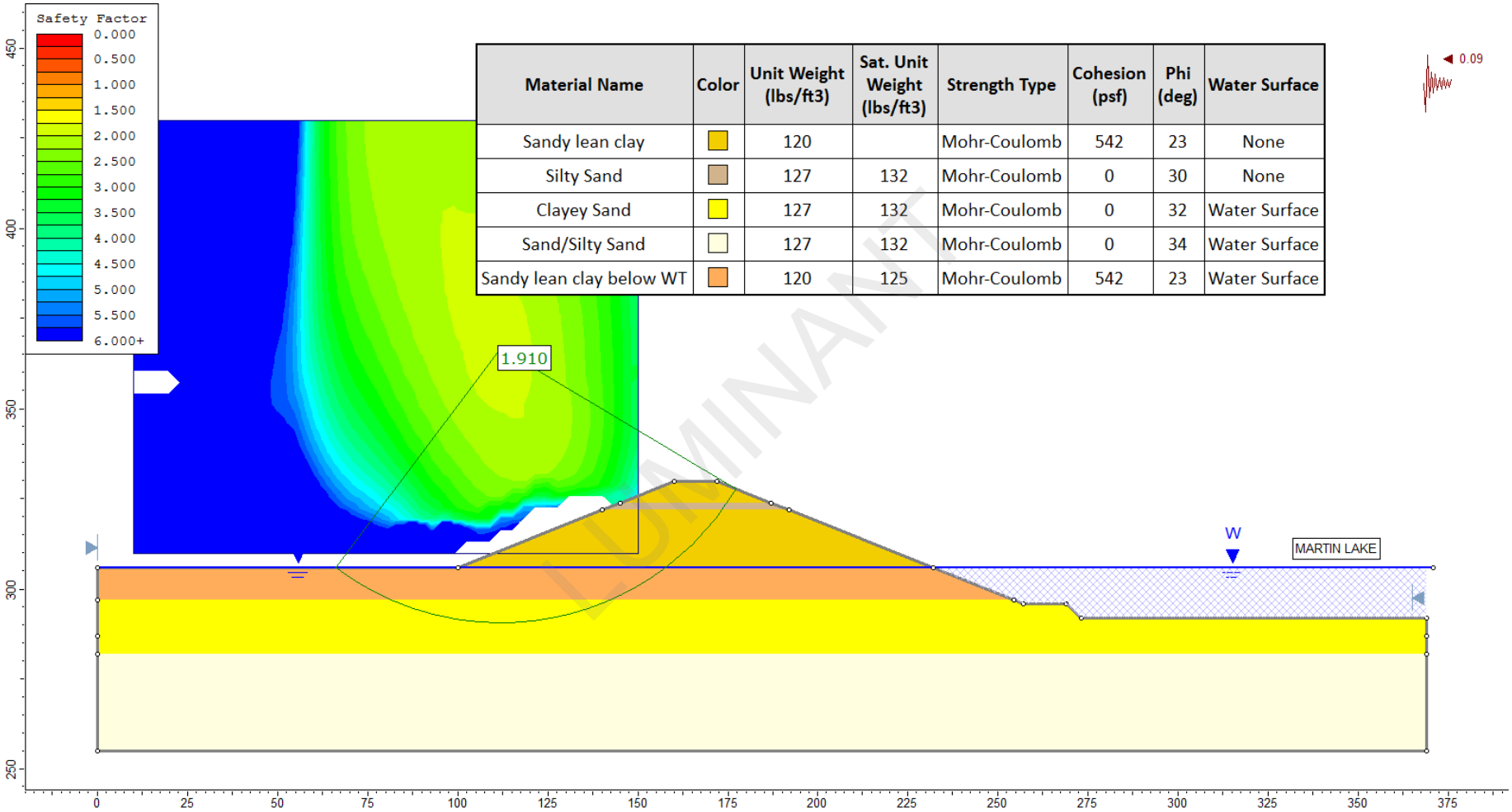


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface

FIGURE **C.10**

Results of Stability Analysis − BAP−SP: A−A' − Case 5a

Stability and Safety Factor Assessment, Martin Lake SES

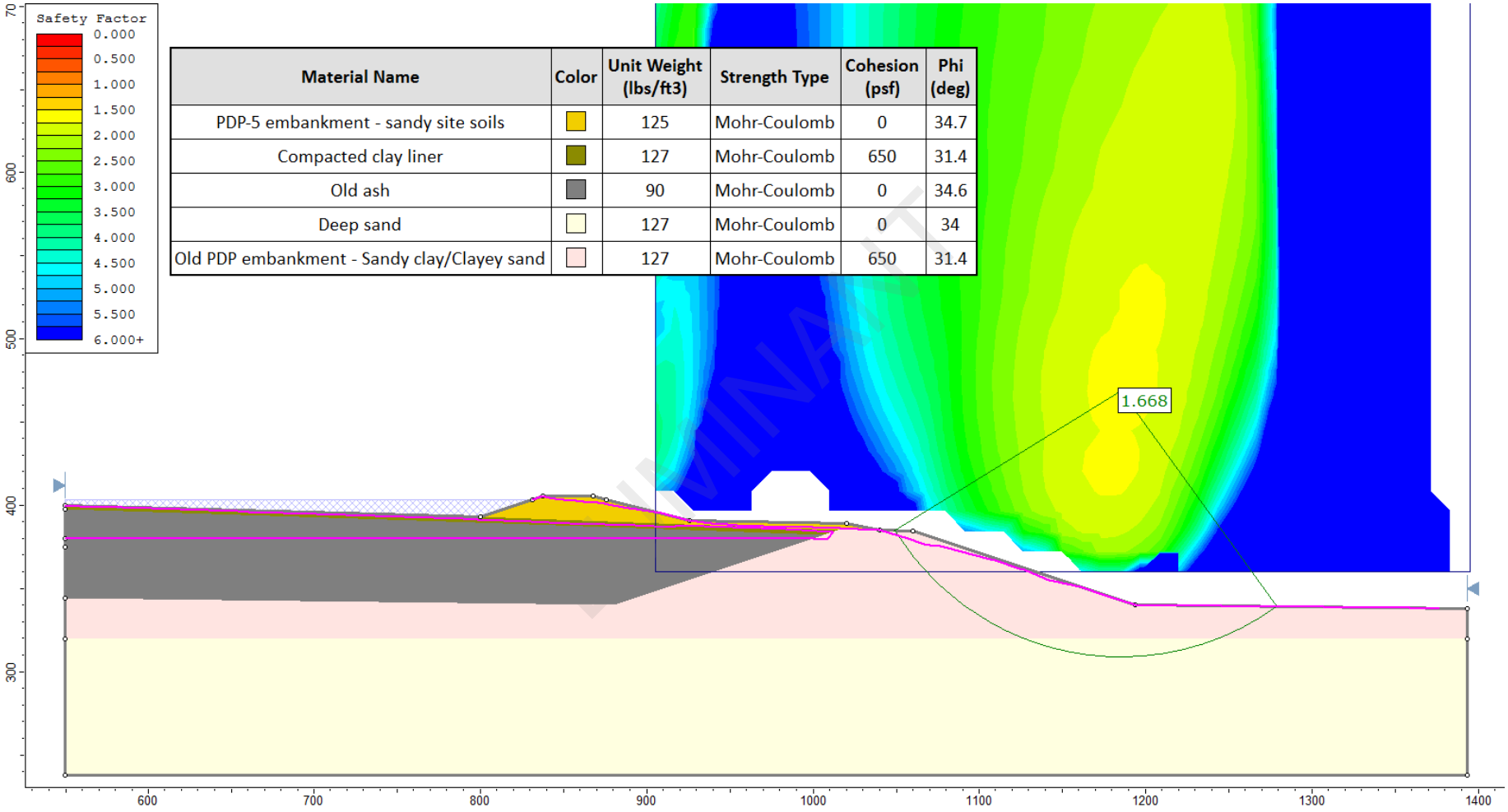


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Sandy lean clay		120		Mohr-Coulomb	542	23	None
Silty Sand		127	132	Mohr-Coulomb	0	30	None
Clayey Sand		127	132	Mohr-Coulomb	0	32	Water Surface
Sand/Silty Sand		127	132	Mohr-Coulomb	0	34	Water Surface
Sandy lean clay below WT		120	125	Mohr-Coulomb	542	23	Water Surface

FIGURE **C.11**

Results of Stability Analysis – BAP–SP: A–A' – Case 5b

Stability and Safety Factor Assessment, Martin Lake SES

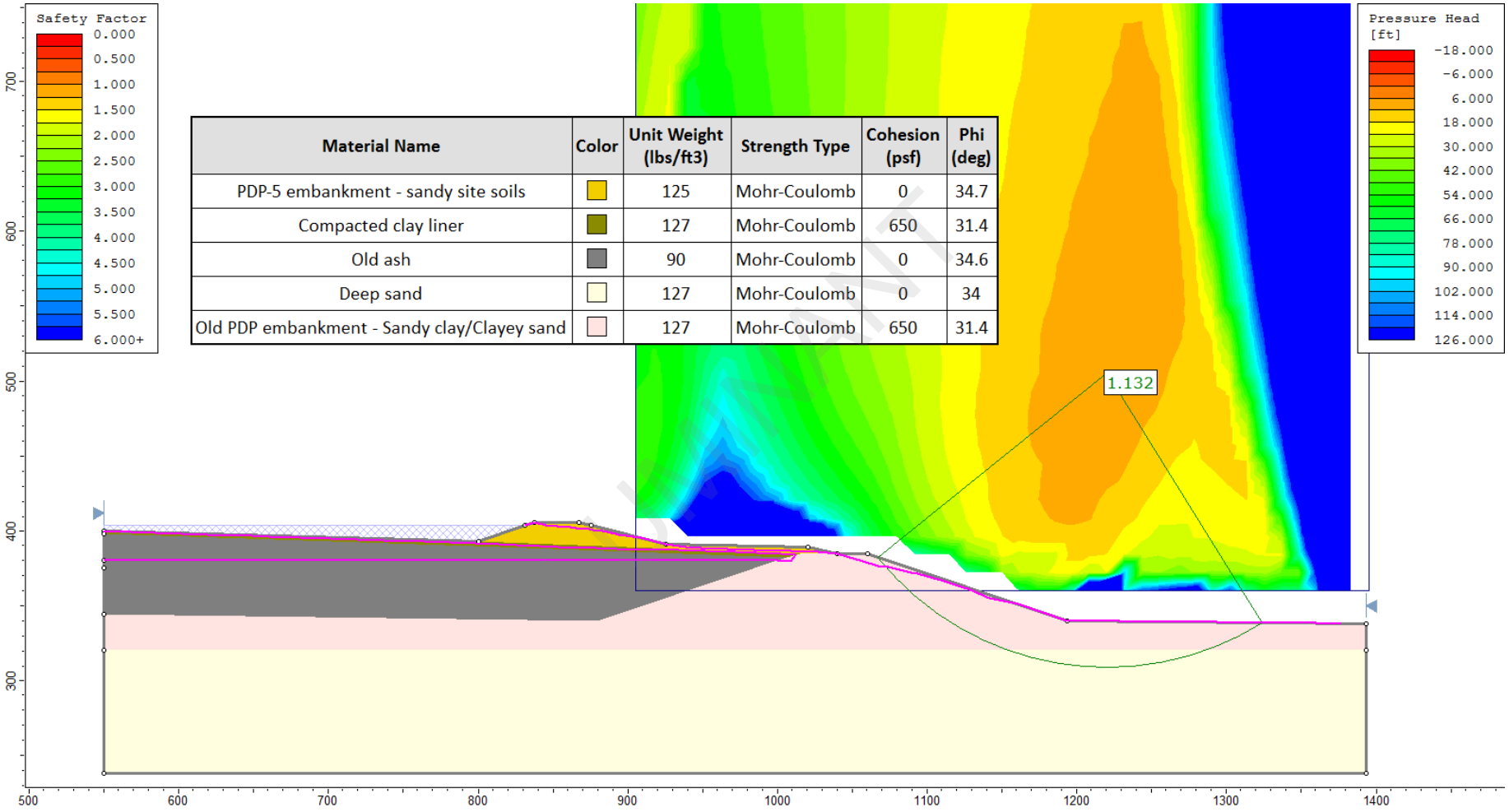


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.12**

Results of Stability Analysis − PDP5: B−B' − Case 1a

Stability and Safety Factor Assessment, Martin Lake SES

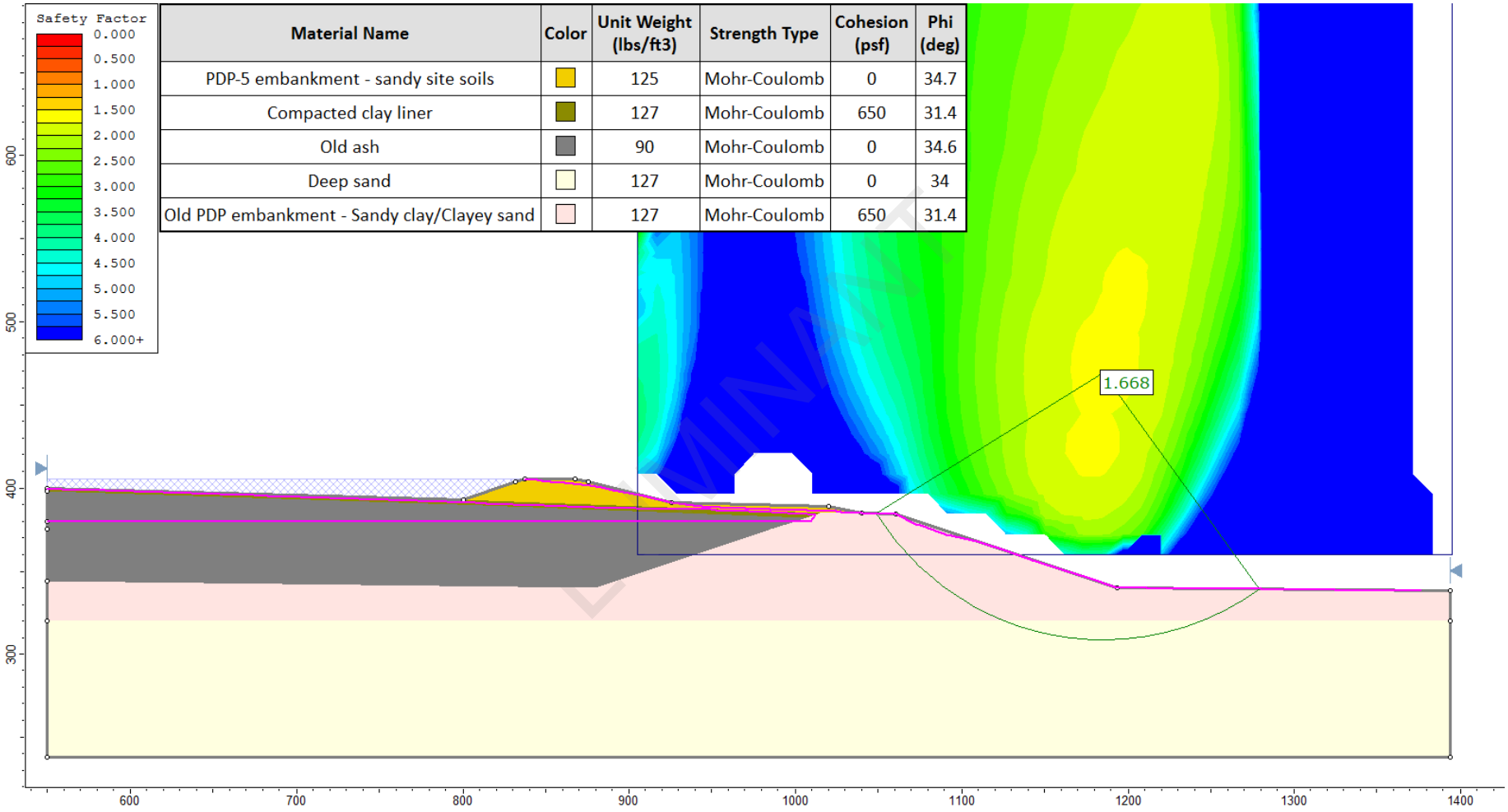


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.13**

Results of Stability Analysis – PDP5: B–B' – Case 1b

Stability and Safety Factor Assessment, Martin Lake SES

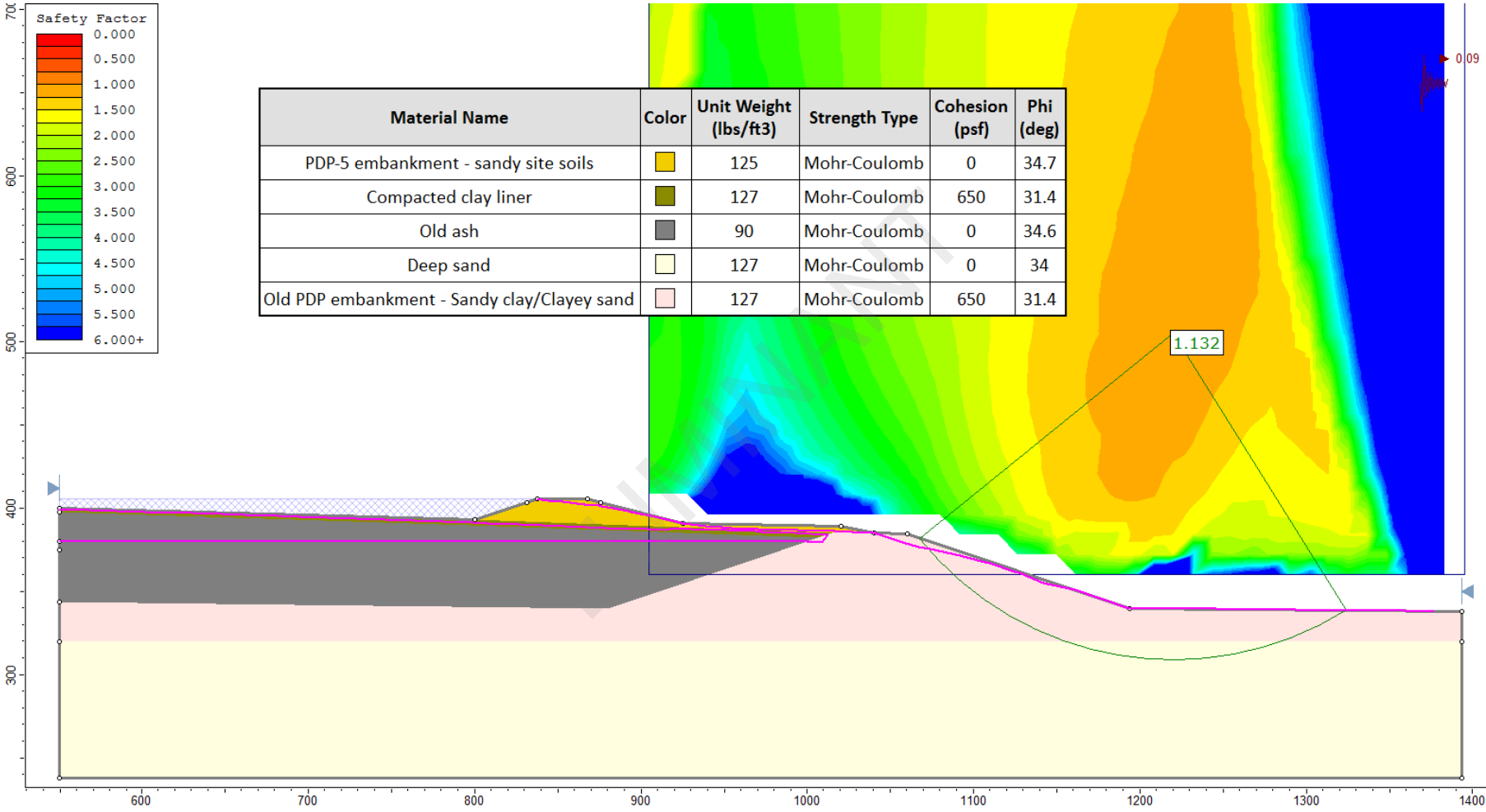


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.14**

Results of Stability Analysis − PDP5: B−B' − Case 2a

Stability and Safety Factor Assessment, Martin Lake SES

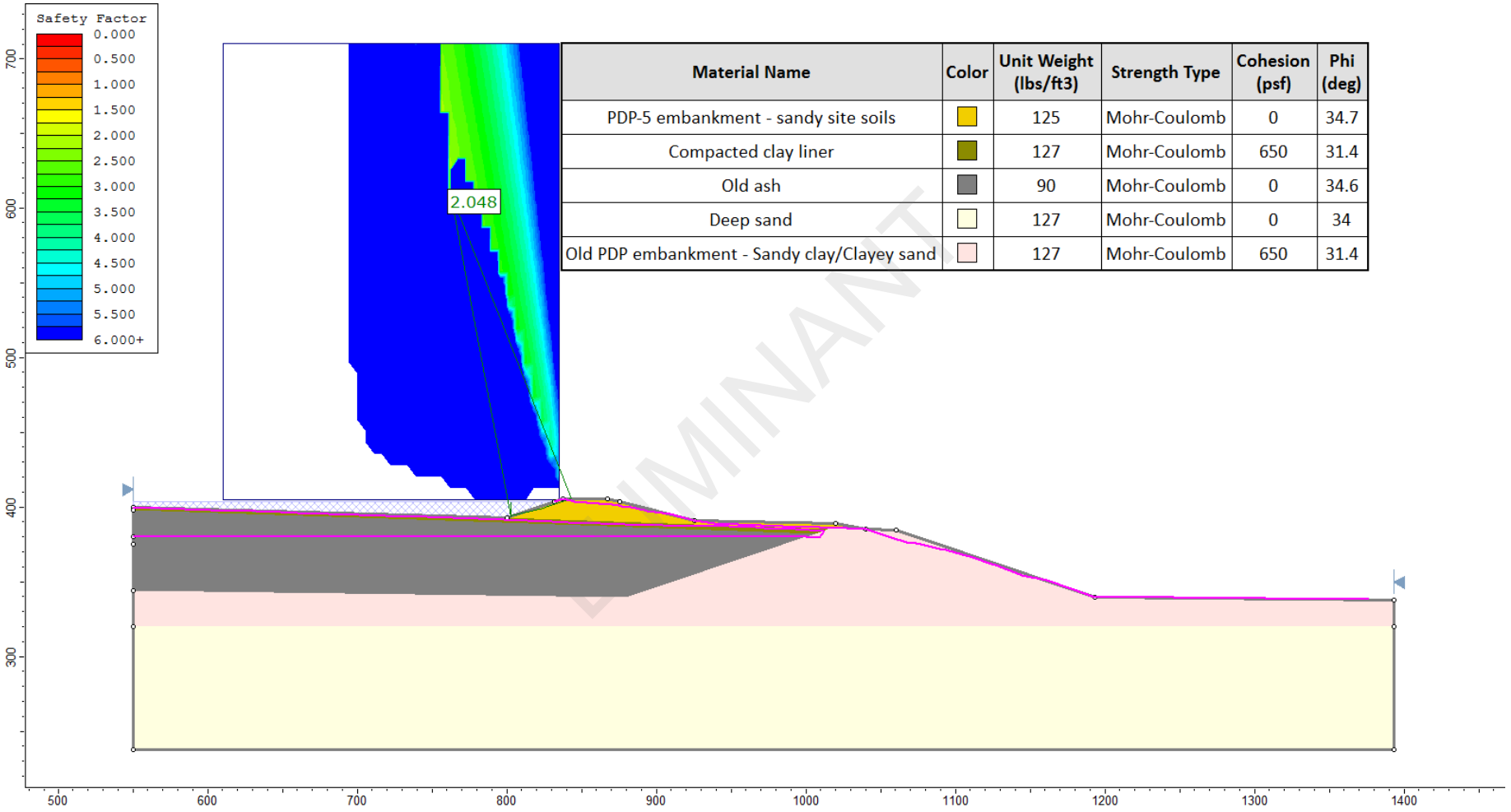


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.15**

Results of Stability Analysis − PDP5: B−B' − Case 2b

Stability and Safety Factor Assessment, Martin Lake SES

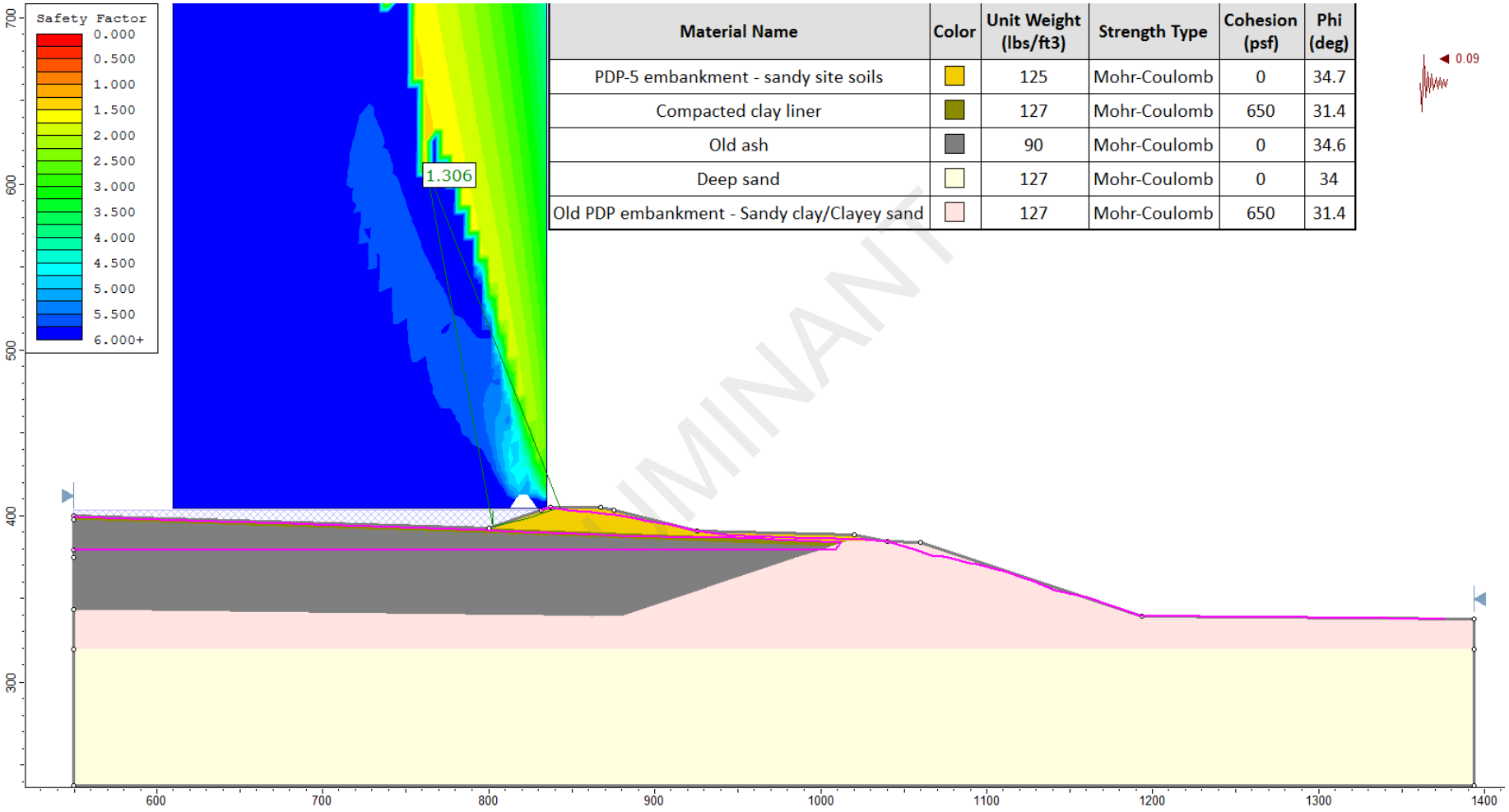


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.16**

Results of Stability Analysis – PDP5: B–B' – Case 3a

Stability and Safety Factor Assessment, Martin Lake SES

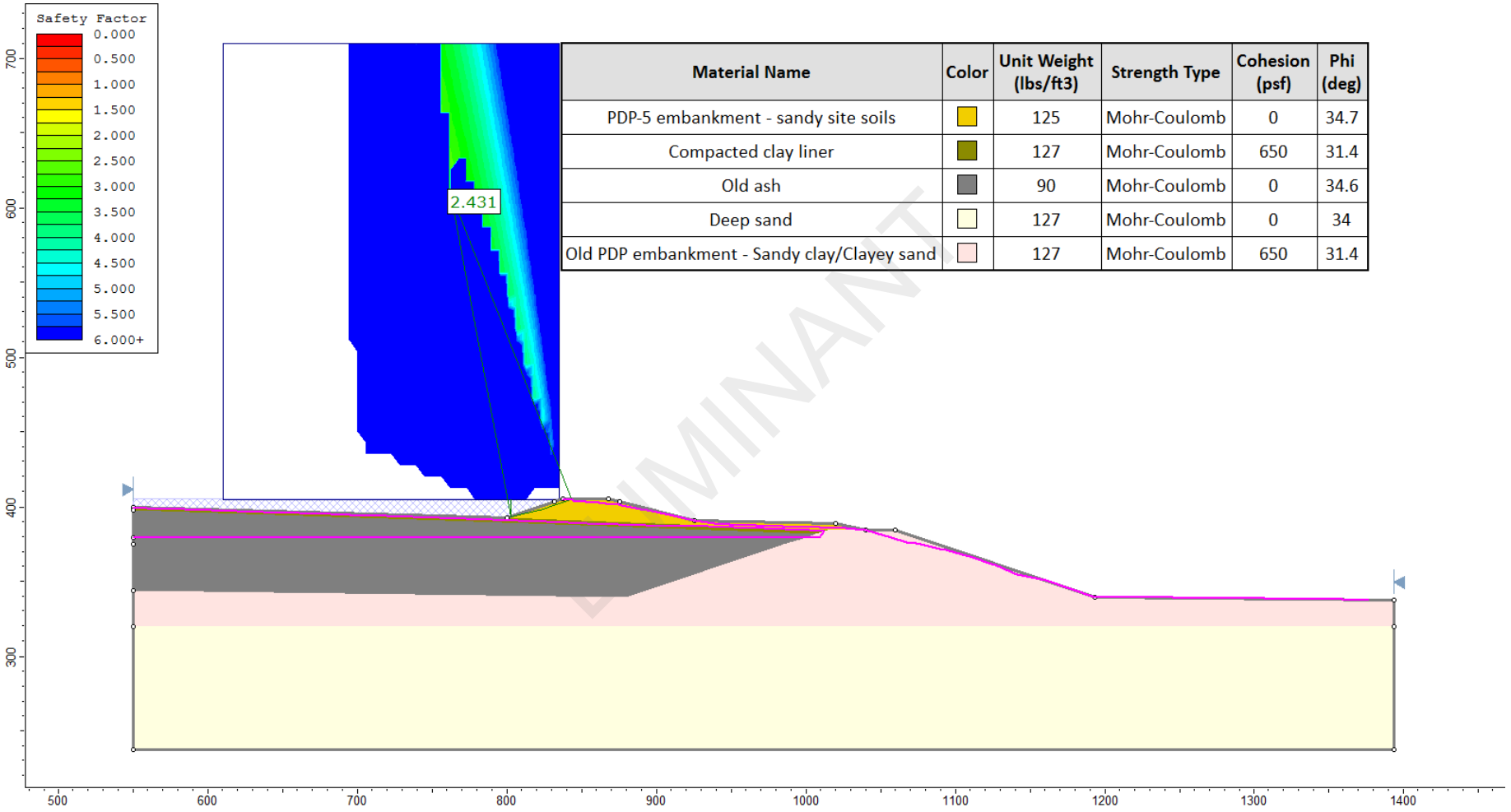


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.17**

Results of Stability Analysis − PDP5: B−B' − Case 3b

Stability and Safety Factor Assessment, Martin Lake SES

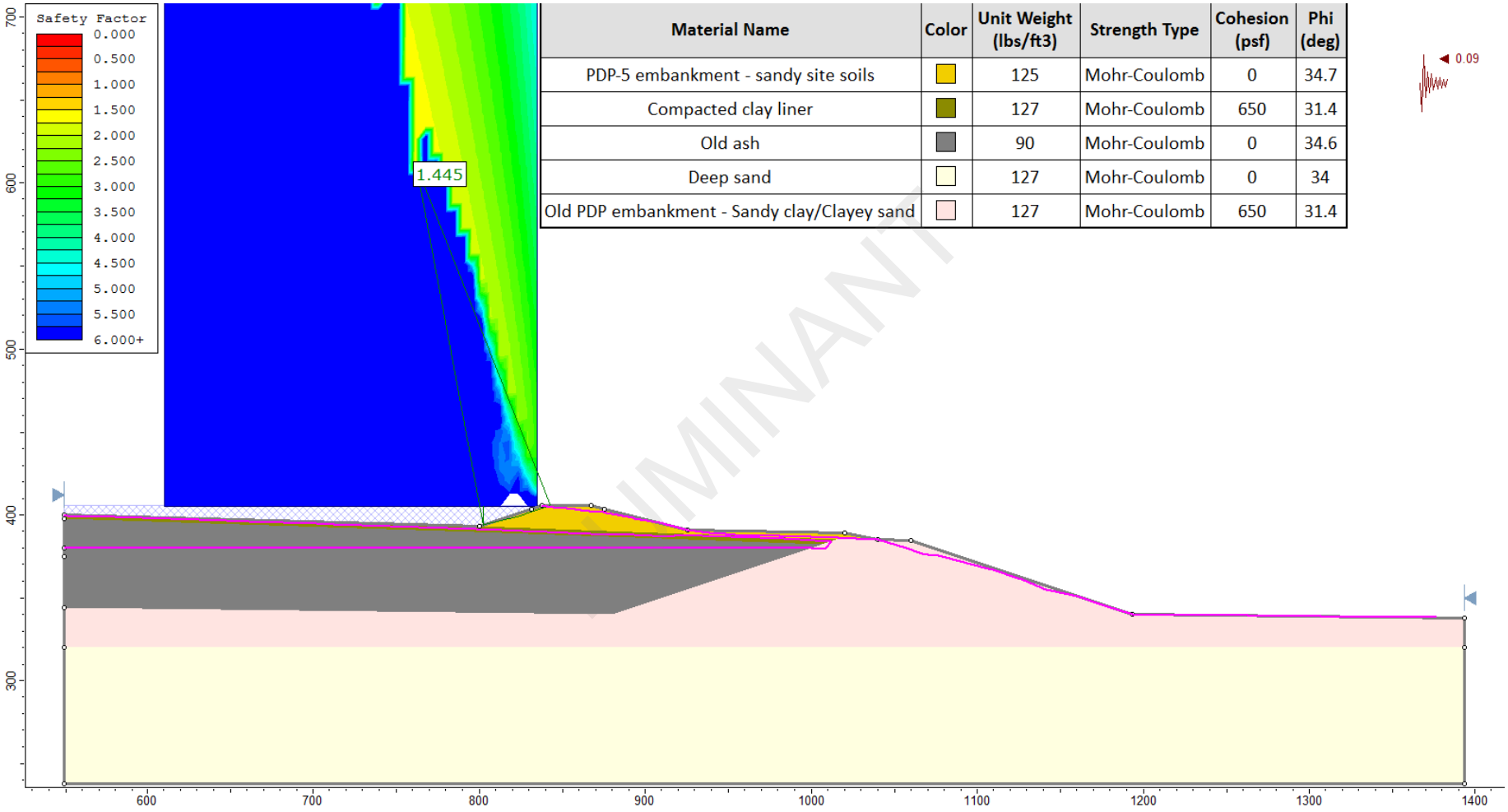


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.18**

Results of Stability Analysis − PDP5: B−B' − Case 4a

Stability and Safety Factor Assessment, Martin Lake SES

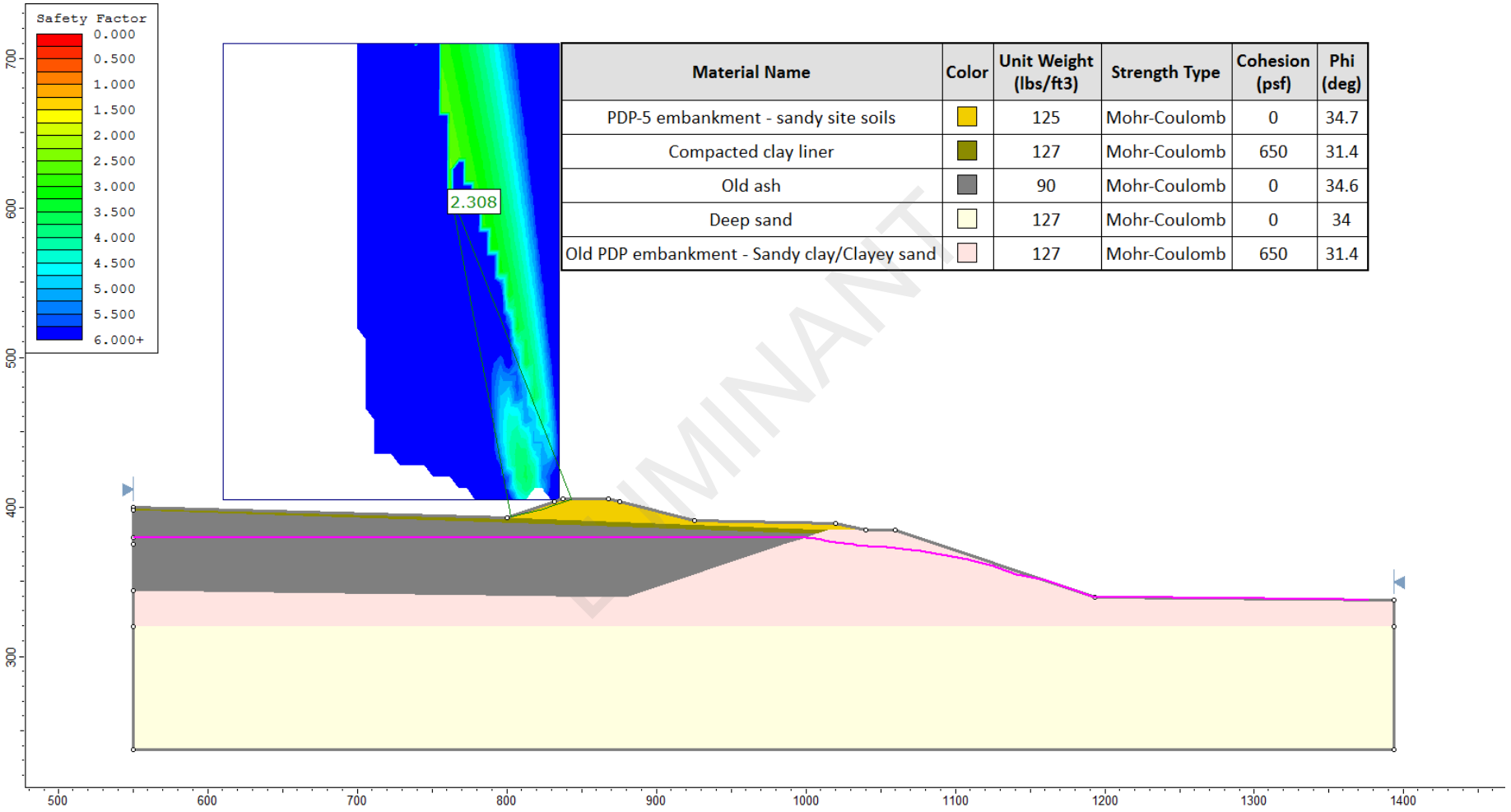


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.19**

Results of Stability Analysis − PDP5: B−B' − Case 4b

Stability and Safety Factor Assessment, Martin Lake SES

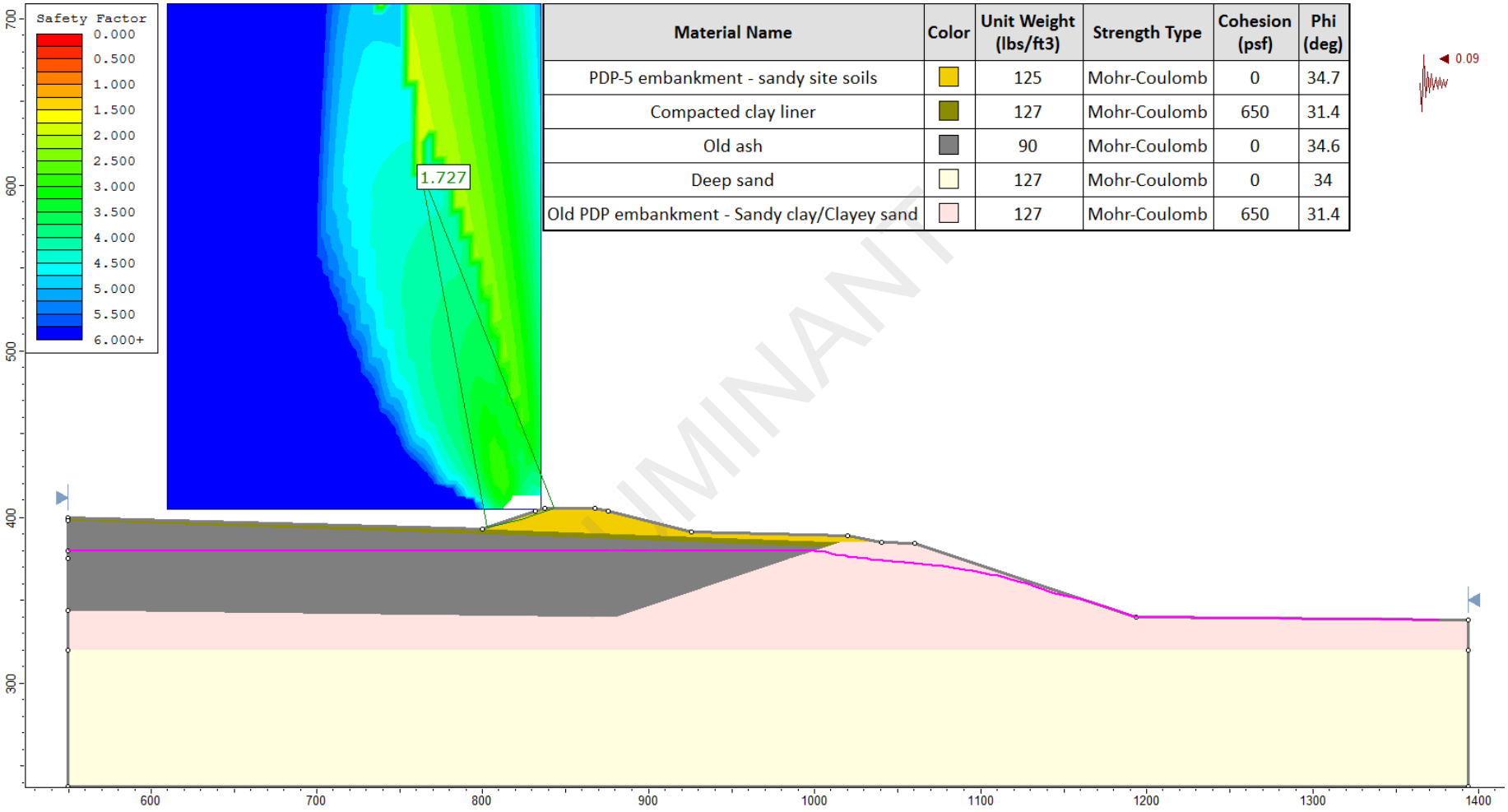


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.20**

Results of Stability Analysis − PDP5: B−B' − Case 5a

Stability and Safety Factor Assessment, Martin Lake SES



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
PDP-5 embankment - sandy site soils		125	Mohr-Coulomb	0	34.7
Compacted clay liner		127	Mohr-Coulomb	650	31.4
Old ash		90	Mohr-Coulomb	0	34.6
Deep sand		127	Mohr-Coulomb	0	34
Old PDP embankment - Sandy clay/Clayey sand		127	Mohr-Coulomb	650	31.4

FIGURE **C.21**

Results of Stability Analysis − PDP5: B−B' − Case 5b

Stability and Safety Factor Assessment, Martin Lake SES

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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South America	+ 56 2 2616 2000

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Fax: (281) 821-6870

Golder Associates

Engineering Earth's Development, Preserving Earth's Integrity

APPENDIX H

PDP-5 Hazard Potential Classification Assessment Report

HAZARD POTENTIAL CLASSIFICATION ASSESSMENT
MARTIN LAKE STEAM ELECTRIC STATION
ASH POND AREA AND PERMANENT DISPOSAL POND NO. 5
RUSK COUNTY, TEXAS

October 2016

Prepared for:

LUMINANT GENERATION COMPANY, LLC
1601 Bryan Street (EP-27)
Dallas, Texas 75201

Prepared by:

PASTOR, BEHLING & WHEELER, LLC
5416 Plaza Drive
Texarkana, Texas 75503
Texas Engineering Firm No. 4760

PBW Project No. 5196B

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the hazard potential classification assessment was conducted in accordance with the requirements of Section 257.73(a)(2) of the CCR Rule.

10/5/16

Brian Thomas, P.E.
Principal Engineer
PASTOR, BEHLING & WHEELER, LLC

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1.0 INTRODUCTION

Luminant Generation Company, LLC (Luminant) owns and operates the Martin Lake Steam Electric Station (MLSES) located approximately five miles southwest of Tatum in Rusk County, Texas. The power plant and related support areas occupy approximately 700 acres on a peninsula on the southwest side of Martin Lake (Figure 1). The MLSES consists of three coal/lignite-fired units with a combined operating capacity of approximately 2,250 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of MLSES unit operation. The CCRs are transported off-site for beneficial use by third-parties, are managed by Luminant on-site at Permanent Disposal Pond No. 5 (PDP-5) or are disposed at Luminant's A-1 Area Landfill.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes national operating criteria for existing CCR surface impoundments and landfills, including periodic hazard potential classification assessment requirements for all CCR impoundments. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to perform the initial hazard potential classification assessment for the CCR impoundments at the MLSES. This report presents the findings of the initial hazard potential classification assessment.

1.1 Hazard Potential Classification Assessment Requirements - CCR Surface Impoundments

Section 257.73(a)(2) of the CCR Rule specifies that periodic hazard potential classification assessments be performed by a qualified professional engineer for each existing CCR surface impoundment. The hazard potential classification assessments must document the hazard potential classification of each CCR impoundment as either:

- A high hazard potential CCR surface impoundment,
- A significant hazard potential CCR surface impoundment, or
- A low hazard potential CCR surface impoundment.

The assessments must document the basis for each hazard potential classification and must be certified by a qualified professional engineer confirming that the hazard potential classifications were conducted in accordance with the requirements of section 257.73(a)(2) of the CCR Rule.

In accordance with 257.73(f) of the CCR Rule, the initial hazard potential classification assessment for an existing CCR surface impoundment must be completed and placed in the facility operating record no later than October 17, 2016. Subsequent periodic hazard potential classification assessments must be completed every five years from the completion date of the initial assessment.

1.2 MLSES Impoundments Subject to Hazard Potential Classification Assessments

The CCR Rule defines CCR's such as fly ash, bottom ash, boiler slag, flue gas desulfurization (FGD) materials (gypsum), and related solids generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers. The hazard potential classification assessment requirements of the CCR Rule apply to surface impoundments that dispose or otherwise engage in solid waste management of CCRs.

The following surface impoundments at the MLSES have been identified as CCR Units subject to the hazard potential classification assessment requirements (Figure 2):

- West Ash Pond (WAP),
- East Ash Pond (EAP),
- New Scrubber Pond (SP), and
- PDP-5.

A simplified flow diagram for the MLSES impoundments is shown on Figure 3.

1.3 Description of Bottom Ash Ponds

The WAP and EAP (collectively "Bottom Ash Ponds" or "BAPs") are located approximately 2,000 feet east of the MLSES power plant (Figure 4). The WAP and EAP receive recovered sluice water from bottom ash dewatering bins and other MLSES process wastewater sources that typically include bottom ash fines. The ponds also act as surge basins for various water streams in the ash-water system. Process wastewater can be transferred from the MLSES impoundments to the SP and PDP-5 or used as makeup water to the bottom ash system. When sufficient ash has accumulated in either the WAP or EAP, the recovered sluice water is diverted to the other pond. Ash in the inactive pond is then removed and transported via rail car to the A1 Area Landfill. The BAPs were originally constructed in the 1977 and upgraded in 1988 (WAP) and 2010 (EAP).

The WAP and EAP are constructed partially above and partially below grade and are surrounded by

engineered earthen embankments that extend above grade. The WAP and EAP share an interior embankment and cover areas of approximately 14.6 acres and 9.6 acres, respectively. The crest elevation of the BAP embankments is 330 feet above mean sea level (MSL) and the EAP borders Martin Lake (normal pool elevation 306 feet MSL).

The BAPs impoundments were originally constructed in the 1977 with an in-situ compacted clay liner. The WAP was removed from service in March 1988 and re-lined with a double 60-mil high density polyethylene (HDPE) liner system overlain with a concrete revetment mat. The EAP was dredged and removed from service in 1989, and a new south embankment was constructed to allow for an increase in the size of the SP. The EAP remained inactive until the installation of a new double 60-mil HDPE liner system with concrete revetment mat was completed in February 2010.

1.4 Description of New Scrubber Pond

The New Scrubber Pond (SP) is located immediately south of the EAP and east of the WAP (Figure 4). The SP is an approximately 12.5 acre surface impoundment that is used to manage FGD wastes as well as discharge from the sludge thickener sumps, the plant yard sumps, and storm water management areas. Solids present in the FGD wastewater settle within the pond and are periodically removed and managed similar to the ash solids from the WAP and EAP. Process wastewater can be transferred from the SP to the BAPs and PDP-5, or used as makeup water to the scrubber systems. The SP was originally constructed in the 1977 and was expanded to its current size in 1989.

The SP is constructed partially above and partially below grade and is surrounded by engineered earthen embankments that extend above grade. The west embankment of the SP is an internal/shared embankment with the WAP and a portion of the northern embankment is an internal/shared embankment with the EAP. The crest elevation of the SP embankments is 330 feet MSL. Martin Lake (normal pool elevation 306 feet MSL) adjoins portions of the north and south embankments of the SP.

The SP was originally constructed in 1977 with an in-situ compacted clay liner and was expanded to its current size in 1989. The SP was relined in 1989 with a double 60-mil HDPE liner system, overlain with a concrete revetment mat.

1.5 Description of PDP-5

Permanent Disposal Pond No. 5 (PDP-5) is located approximately 3,000 feet west-northwest of the MLSES power plant (Figure 2). PDP-5 is an approximately 40-acre surface impoundment that was constructed in 2010 over three closed PDPs (PDPs 1-3; Figure 5). PDP-5 is primarily used to manage excess liquids, including storm water from large precipitation events and excess process wastewater from both the FGD and bottom ash loops. Recovered CCR wastewaters are received in PDP-5 during cleaning cycles for the BAPs and SP. Process wastewater can be transferred between the BAPs, SP, or used as makeup water for specific CCR related systems. Process wastewater can be transferred from PDP-5 to the BAPs and the SP.

PDP-5 is constructed above grade and is surrounded by engineered earthen embankments. The crest elevation of the PDP-5 embankments is 405.5 feet MSL, and the embankments are approximately 10 to 15 feet above surrounding grade. The liner system for the PDP-5 consists of the following:

- a six-inch thick soil layer over the closed PDPs (in-place permeability of $1x10^{-5}$ cm/sec);
- two-foot thick compacted clay liner (in-place permeability of $1x10^{-7}$ cm/sec); and
- three-foot thick compacted clay interior/exterior embankment liner (minimum in-place permeability of $1x10^{-7}$ cm/sec).

Based on available construction data the BAPs, SP and PDP-5 were constructed to provide the following estimated storage capacities:

- WAP: 232.6 acre-feet;
- EAP: 125.8 acre-feet;
- SP: 198.9 acre-feet; and
- PDP-5: 190.3 acre-feet.

Total design capacity of the CCR impoundments located within the ash pond area (WAP, EAP and SP) is 557.2 acre-feet or approximately 181,564,000 gallons.

1.6 USACE Size Classification for BAPs, SP and PDP5

The US Army Corps of Engineers (USACE) classifies the relative size of dams based on the height of the dam and the storage capacity of the impounded area behind the dam (USACE, 1979). As shown in the table below, based on the embankment heights and operating capacities of the BAPs, SP and PDP-5 impoundments, these impoundments would be categorized as small impoundments based on the USACE

dam size classification criteria:

USACE Dam Size Classification		
Size Category	**Impoundment Capacity (acre-ft)**	**Impoundment Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

2.0 CCR HAZARD CLASSIFICATION ASSESSMENT METHODOLOGY

As defined in Section 257.53 of the CCR Rule, hazard potential classification means the possible adverse incremental consequences that result from the release of water or stored contents due to failure of a diked CCR surface impoundment or misoperation of the diked CCR surface impoundment or its appurtenances. Hazardous potential classifications for CCR surface impoundments include high hazard potential CCR surface impoundment, significant hazard potential CCR surface impoundment, and low hazard potential CCR surface impoundment, which are defined in the CCR Rule as follows:

- High Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or misoperation will probably cause loss of human life.

- Significant Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or misoperation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. FEMA considers lifeline facilities to include transportation facilities (highways, airports, ports, trains), electric power, water and sewer, communications (telephone, TV, radio, electronic) and gas and liquid fuel pipelines (FEMA, 1995).

- Low Hazard Potential CCR Surface Impoundment. A diked surface impoundment where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.

The hazard classification assessment for the BAPs, SP and PDP-5 impoundments was performed using the methodology presented in *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams* developed by the Federal Emergency Management Agency (FEMA, 2004). The FEMA guidelines classify dams into similar hazard potential categories to those defined in the CCR Rule (low hazard potential, significant hazard potential and high hazard potential) and the FEMA guidelines are listed in the Preamble to the CCR Rule as one of the technical resources considered by EPA during development of the CCR Rule.

The FEMA hazard potential evaluation is based on assessing the probable loss of human life and the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure or misoperation of a dam or its appurtenances. The location/size of the dam and impoundment area is evaluated against development, occupancy and land use conditions in areas downstream of the dam/impoundment that would be affected by a failure of the dam and release of the impounded water. The FEMA evaluation recognizes that the failure of any dam or water-retaining structure, no matter how small, represents a potential danger to downstream life and property and there is always the possibility of someone being in the path of the resulting discharge. However, the FEMA evaluation recognizes that considering every conceivable circumstance that might remotely place a person in the area potentially

inundated as a result of the dam failure should not be the basis for determining the hazard classification level of the dam/impoundment. The FEMA evaluation considers “probable loss of life” to exist where persons are permanently located in the area potentially inundated as a result of the dam failure.

The hazard classification of the BAPs, SP and PDP-5 was assessed by identifying the development, occupancy and land use characteristics of potentially affected areas downstream of the impoundments. The assessment included a review of available aerial photographs, USGS topographic maps, interviews with Luminant personnel familiar with the area, and similar resources. Classification of the BAPs, SP and PDP-5 in accordance with the FEMA hazard potential criteria is based on the assessment of probable loss of human life and the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure of the embankments surrounding the BAPs, SP and PDP-5.

3.0 PREVIOUS BAP, SP & PDP-5 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

In 2012, the USEPA contracted with Dewberry Consultants LLC (Dewberry) of Fairfax, Virginia to assess the stability and functionality of the CCR impoundments at the MLSES. The purpose of the assessment was to evaluate the condition and potential for residue release from the BAPs, SP and PDP-5 impoundments based on a review of available documentation and a site assessment conducted by Dewberry personnel on September 25, 2012. The assessment included a determination of the hazard potential classification of the impoundments.

The results of the MLSES impoundment assessments were presented to EPA in a March 2014 report (Dewberry, 2014). Key findings related to the hazard potential classification for the BAPs, SP and PDP-5 can be summarized as follows:

- Based on the size of the BAPs, SP and PDP-5 impoundment embankment heights and impoundment storage capacities, the impoundments would be classified as Small by USACE criteria.
- With exception of Martin Lake State Park, which is located along the northern portion of the lake, Luminant owns most of the property in the vicinity of the plant, including the lake and dam (Figure1).
- Failure or misoperation of the impoundments was not expected to result in a probable loss of human life; however, the Dewberry report concluded that a release into the reservoir (Martin Lake) is expected to have some economic and environmental impact since Martin Lake State Park provides public access for recreational purposes. Therefore, a Federal Hazard Classification of Significant was identified for the BAPs, SP and PDP-5.

The hazard potential classification checklist developed by Dewberry for the BAP, SP and PDP-5 impoundments as part of the assessment is reproduced in Appendix A.

4.0 BAP, SP & PDP-5 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The hazard potential classification of the impoundments was assessed by identifying the development, occupancy and land use characteristics of areas downstream of the impoundments, assessing the probable loss of human life and/or the potential for economic losses, environmental damage, and/or disruption to lifelines caused by failure of the embankments surrounding the impoundments, and using the results of the assessment to classify the impoundments based on the FEMA hazard potential criteria described in Section 2.0 of this report.

4.1 Areas Downstream BAPs, SP and PDP-5

The MLSES is located approximately five miles southwest of Tatum, Texas. Martin Creek Reservoir (Martin Lake) borders the plant on the north, east and south sides. The BAPs, and SP impoundments are located on the northeast side of the plant and border Martin Lake. The PDP-5 impoundment is located approximately 3,000 feet west-northwest of the plant. The impoundments are located in the drainage areas of Martin Lake and a failure of the embankments surrounding the impoundments would release CCR solids/fluids that would flow into Martin Lake. Figure 2 shows the locations of the impoundments relative to Martin Lake and adjacent areas.

Martin Lake is a man-made reservoir located on Martin Creek and was constructed in 1974 to provide cooling water for MLSES. Luminant owns the water rights to the lake and operates and maintains Martin Lake Dam. The crest of the dam is approximately 321 ft. above mean sea level (MSL) with a normal lake (conservation pool) elevation of 306 ft. MSL. At the conservation pool elevation, the lake covers an area of approximately 4,954 acres, and contains a total volume of approximately 75,726 acre-ft of water (TWDB, 2015). The emergency spillway elevation is 312 ft. MSL.

The shoreline of Martin Lake is mostly undeveloped and there are no permanent residences along the lake shoreline. Luminant owns all property immediately adjacent to the lake, except for Martin Lake State Park, which is located on the north side of Martin Lake (Figure 1). The park covers an area of approximately 290 acres. Activities available at the park include camping, backpacking, hiking, bird watching, boating, fishing and related water sports on the lake. Lake access is also provided by one boat ramp.

Several gas gathering lines and petroleum pipelines traverse Martin Lake at various locations (RRC, 2016). In addition, three Farm Market Roads (FM 2145, FM 2658, FM 3231), and the Luminant railroad cross Martin Lake.

4.2 Hazard Potential Classification Assessment

A failure of the embankments surrounding the impoundments would release CCR solids/fluids that would flow north, east and south toward Martin Lake. As described in Sections 1.3, 1.4 and 1.5 of this report, the total combined operating volume of the MLSES impoundments is approximately 747.6 acre-ft. In the unlikely event that the entire volume of all impoundments is released through catastrophic failure of the embankments, the total volume of fluids that could enter the lake from the impoundments (747.6 acre-ft) represents less than one percent of the conservation pool volume of Martin Lake (75,726 acre-ft).

Assuming a lake surface area of 4,954 acres at the conservation pool elevation of 306 feet, the total volume of the impoundments would raise the lake level by approximately 0.15 feet or slightly less than two inches. The resulting water surface elevation (306.15 feet) is well below the emergency spillway elevation at Martin Lake Dam (312 feet), indicating that the total volume of the impoundments would be retained and equalized within Martin Lake.

Using the FEMA hazard potential criteria described in Section 2.0 of this report, the projected effects of catastrophic failure or misoperation of the impoundments results in a hazard potential classification of **Low** for the BAP, SP and PDP-5 impoundments. This classification is supported by the following:

- No Probable Loss of Human Life - FEMA considers "probable loss of life" to exist where persons are permanently located in the area potentially inundated as a result of dam failure. The shoreline of Martin Lake is mostly undeveloped and there are no permanent residences along the lake shoreline. In addition, the total volume of the impoundments would be retained and equalized in Martin Lake in the event of a catastrophic failure of the impoundment embankments, since the lake level would be raised by approximately 0.15 feet, which is well below the emergency spillway elevation of Martin Lake Dam. As a result, a release from the impoundments would result in no probable loss of human life.

- Low Economic and/or Environmental Losses. FEMA considers low economic and or environmental losses to occur when losses resulting from a dam failure are principally limited to the dam owner's property. Since Luminant owns the water rights to Martin Lake and the land surrounding the lake (with exception of 290 acres owned by TPWD), any losses would primarily be limited to the Luminant property.

  As described above, catastrophic failure of the impoundments into Martin Lake would result in only a nominal increase in lake water levels. As a result, land-based activities in Martin Lake State Park would not be adversely affected by impoundment failure. Impoundment failure could

adversely affect access from Martin Lake State Park to the lake for swimming, fishing and related water sports due to potential changes in lake water quality; however, the economic and environmental losses associated with these activities are low.

- No Significant Disruption of Lifelines. There are several gas gathering lines, petroleum pipelines, highways and railroad bridge that traverse Martin Lake. A release from the surface impoundments would only result in a small rise in the elevation of Martin Lake, therefore these lifelines would be unaffected by a release from the impoundments.

5.0 FINDINGS OF HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

Pastor, Behling & Wheeler, LLC was retained by Luminant to perform the initial hazard potential classification assessment for the BAPs, SP and PDP-5 surface impoundments at the MLSES in accordance with the requirements of Section 257.73(a)(2) of the CCR Rule. The hazard classification assessment for the impoundments was performed using the methodology presented in *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams* developed by the Federal Emergency Management Agency.

Based on the FEMA hazard potential criteria, the impoundments are classified as LOW hazard potential CCR surface impoundments, since a failure or misoperation of the impoundments results in no probable loss of human life, low economic and/or environmental losses, and no significant disruption of lifeline systems.

In accordance with 257.73(f) of the CCR Rule, this initial hazard potential classification assessment must be placed in the operating record for the MLSES no later than October 17, 2016. Subsequent periodic hazard potential classification assessments must be completed every five years from the completion date of this initial assessment.

6.0 REFERENCES

Dewberry Consultants, LLC (Dewberrry), 2014. *Coal Combustion Residue Impoundment Round 12 - Dam Assessment Report, Martin Lake Steam Electric Plant Coal Combustion Residuals Impoundments, Tatum, Texas,* EP-09W001727, March.

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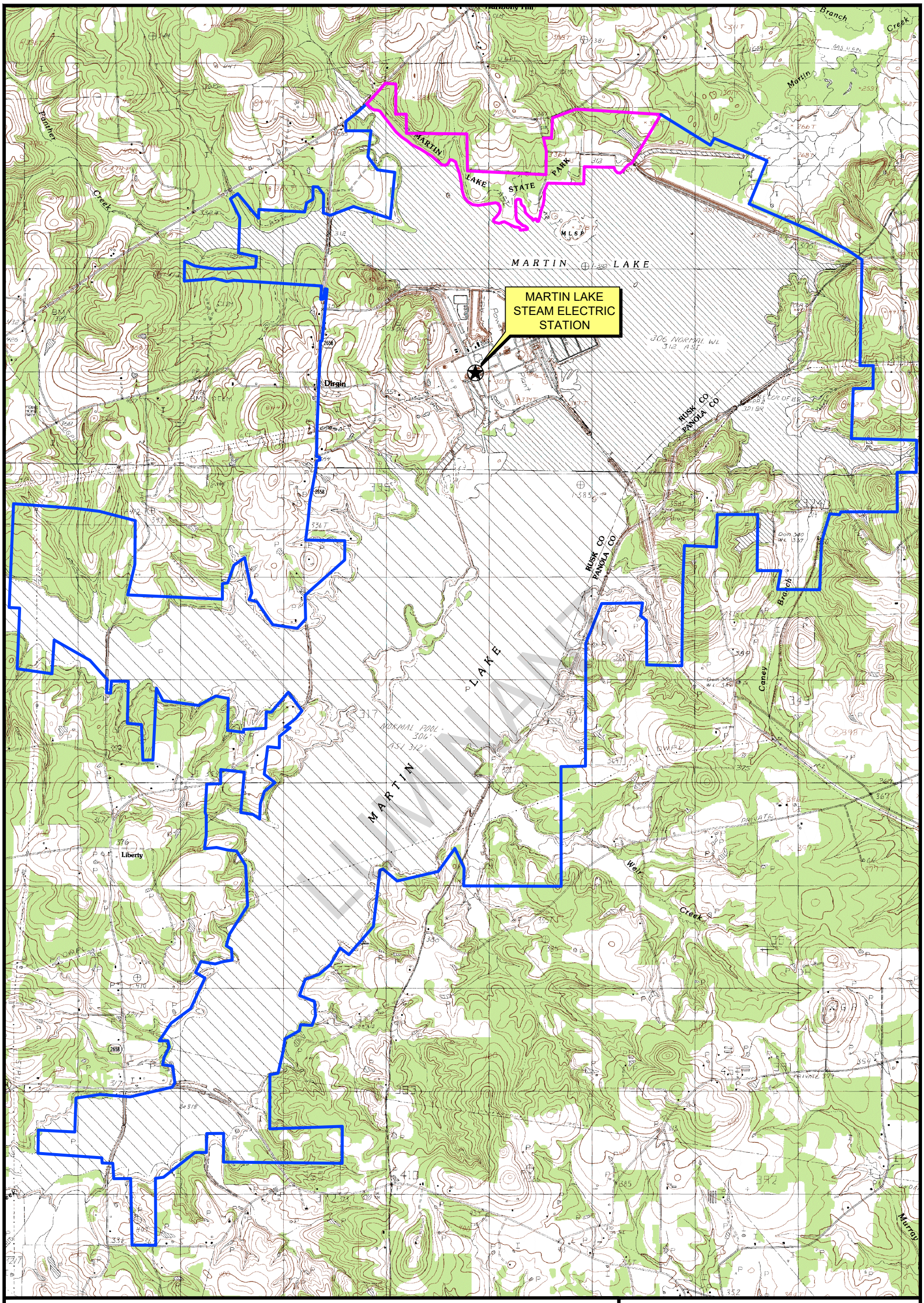
Texas Water Development Board (TWDB), 2015, *Volumetric Survey of Martin Lake*, *Prepared for Luminant Generation Company, LLC*, April.

United States Army Corps of Engineers (USACE), 1979. *Recommended Guidelines for Safety Inspections of Dams*, ER 1110-2-106, September 26.

Pastor, Behling & Wheeler, LLC, 2011. *Revised Affected Property Assessment Report, Martin Lake Steam Electric Station – Ash Pond Area, 8850 FM 2658 North, Tatum, Texas,* May 3.

Figures



Contour Interval = 10 Feet

EXPLANATION

- Approximate Luminant Property Boundary
- Approximate Limits of Martin Lake State Park

NOTES:

1.) Luminant On-Site Boundaries do not represent divestiture of Martin Lake State Park Area.

N

QUADRANGLE LOCATIONS

Scale in Feet

0 1500 3000

SOURCE:

Base map from http://www.tnris.state.tx.us Tatum and Fair Play, Texas 7.5 min. U.S.G.S. Quadrangles, 1:8000, as adapted by TXU Power with On-Site Propery Boundaries.

LUMINANT GENERATION COMPANY, LLC

MARTIN LAKE STEAM ELECTRIC STATION

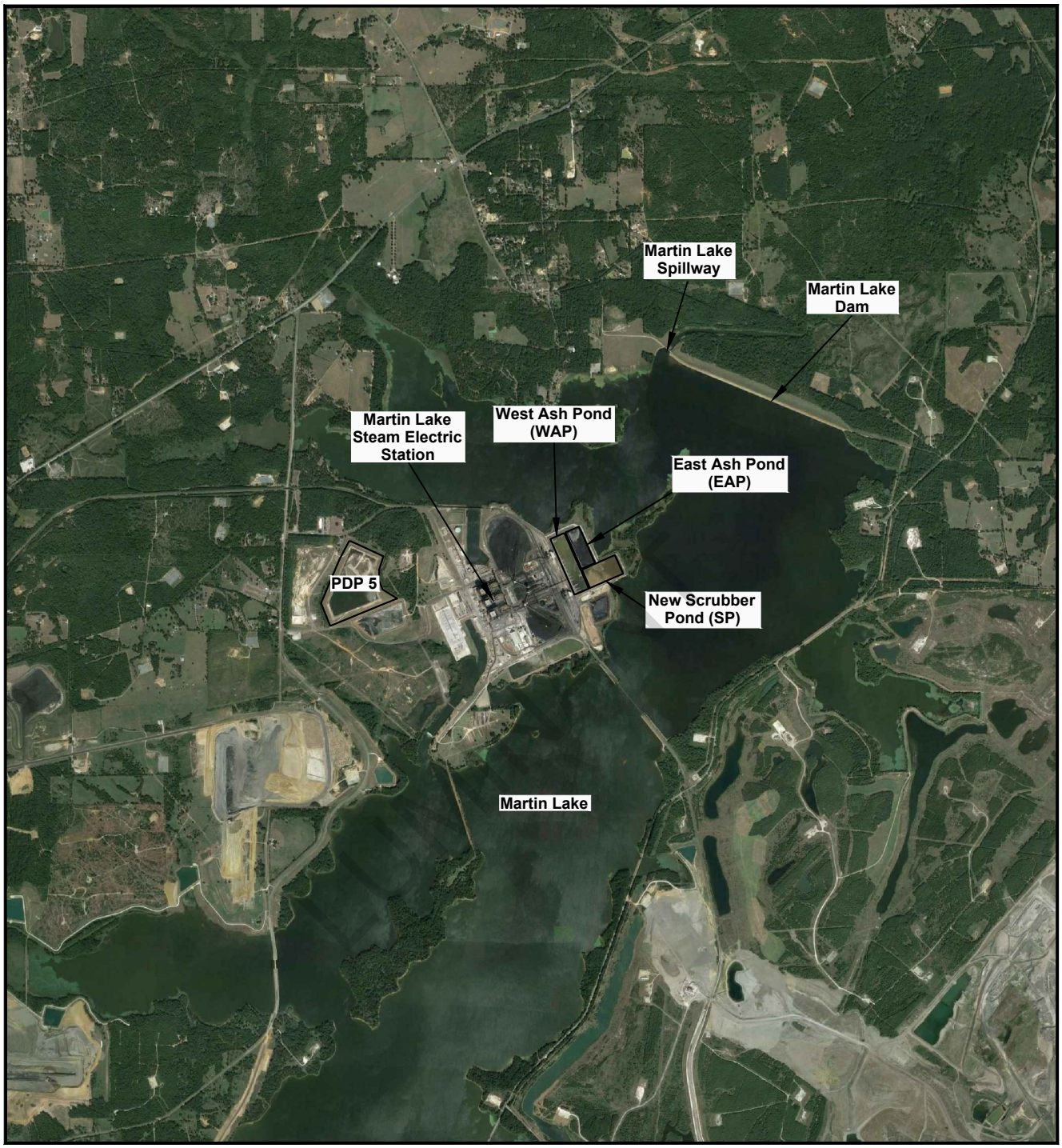
Figure 1

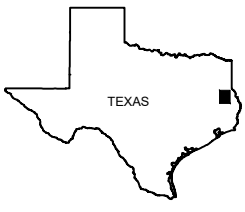
ON-SITE PROPERTY MAP

PROJECT: 516B	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: BDT	

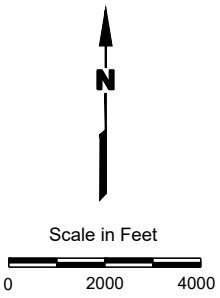
PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS





PHOTOGRAPH LOCATION



SOURCE:
Imagery from Google Earth, photography dated Octo□er 1, 2015.

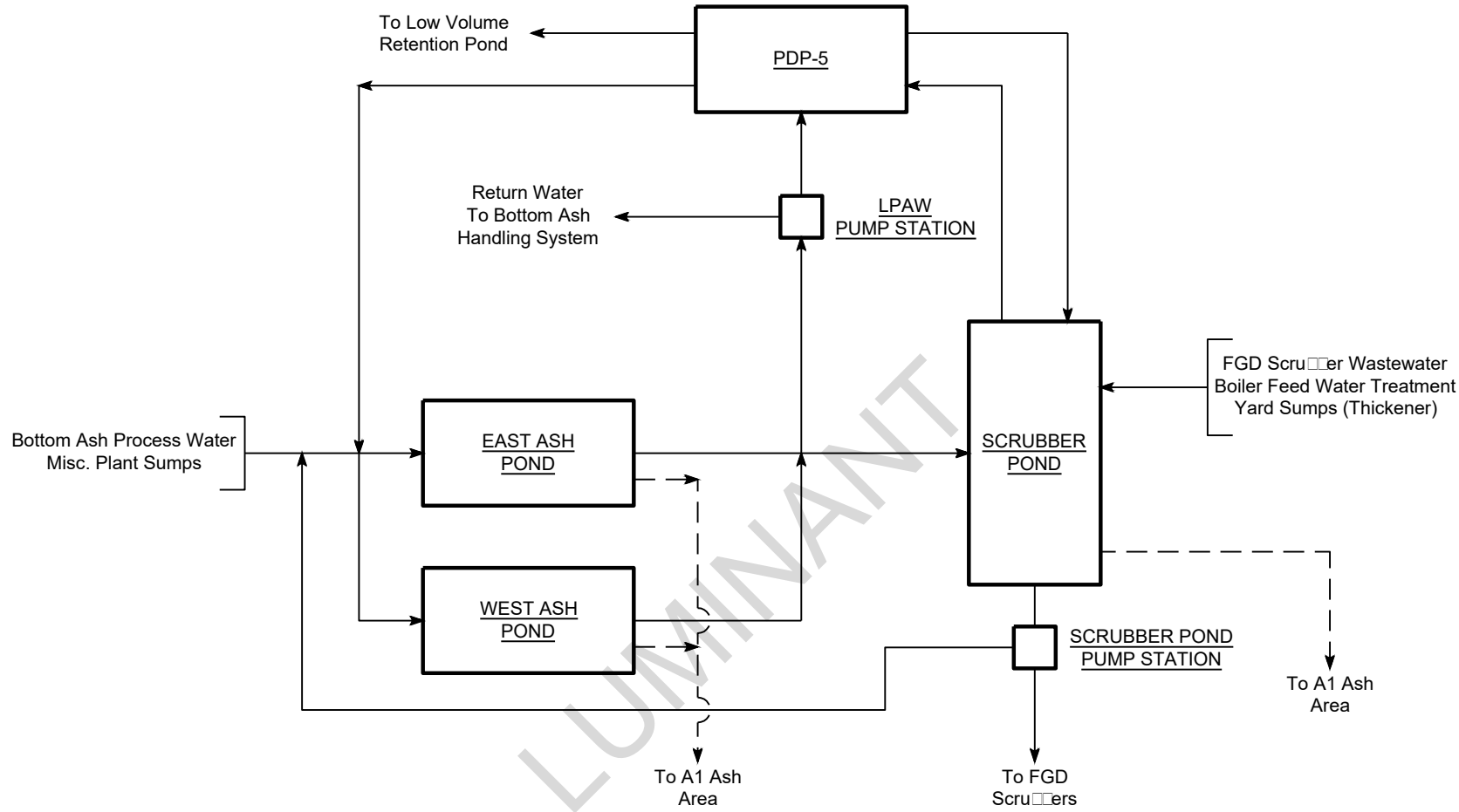
LUMINANT GENERATION COMPANY, LLC
MARTIN LAKE STEAM ELECTRIC STATION

Figure 2

SITE VICINITY MAP

PROJECT: 51□6B	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: BDT	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

Water

Solids

LUMINANT GENERATION COMPANY, LLC

MARTIN LAKE STEAM ELECTRIC STATION

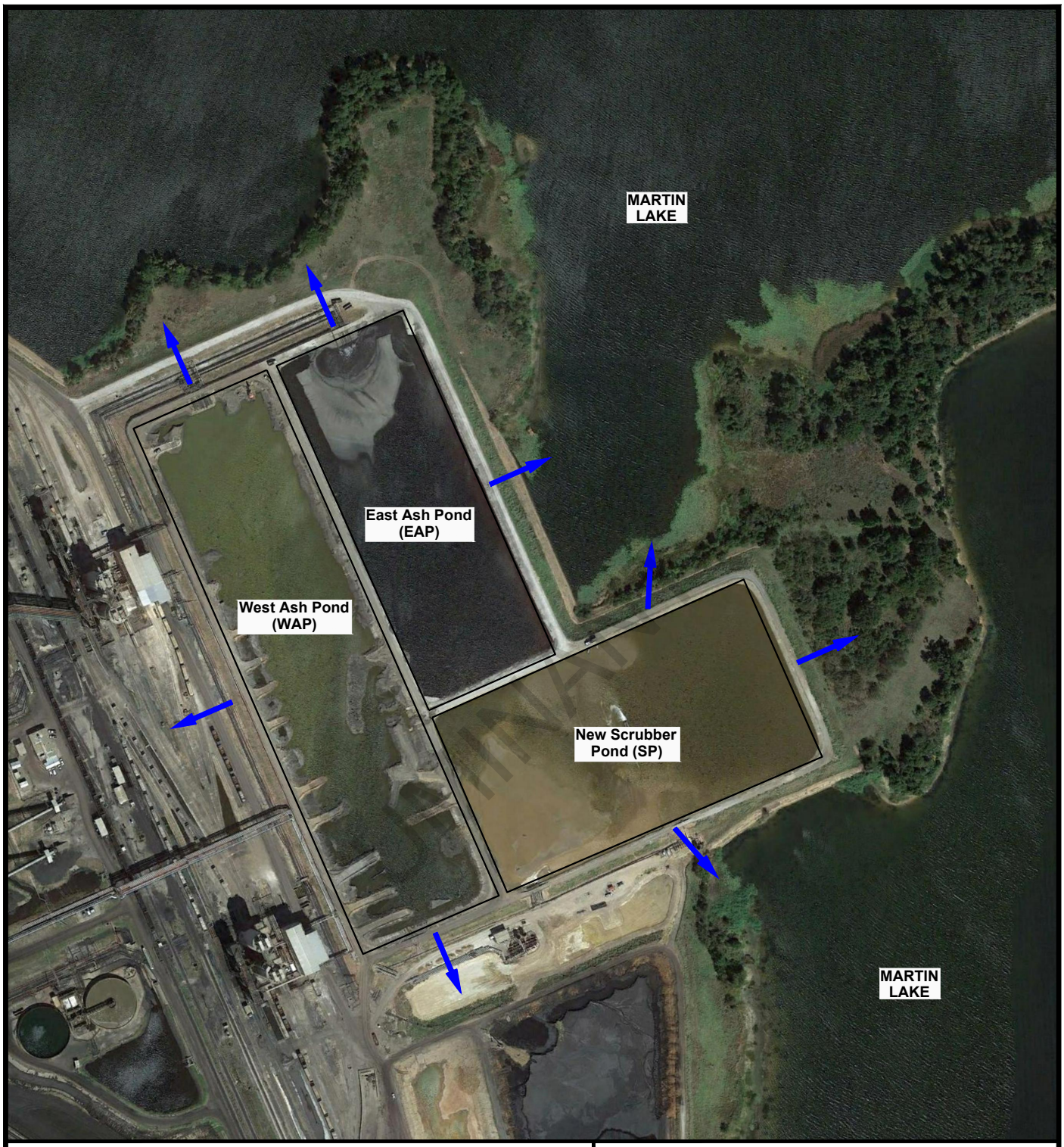
Figure □

SIMPLIFIED CCR SURFACE IMPOUNDMENT FLOW DIAGRAM

PROJECT: 51□6B	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

Surface Flow Direction

N

Scale in Feet

0 200 400

SOURCE:
Imagery from Google Earth, photography dated Octo□er 1, 2015.

LUMINANT GENERATION COMPANY, LLC

MARTIN LAKE STEAM ELECTRIC STATION

Figure 4

ASH POND AREA MAP

PROJECT: 51□6B	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: BDT	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

Surface Flow Direction

N

Scale in Feet

0 150 300

SOURCE:
Imagery from Google Earth, photography dated October 1, 2015.

LUMINANT GENERATION COMPANY, LLC

MARTIN LAKE STEAM ELECTRIC STATION

Figure 5

PDP 5 AREA MAP

PROJECT: 5196B	BY: AJD	REVISIONS
DATE: SEPT., 2016	CHECKED: BDT	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

Appendix A

2012 Dewberry Hazard Potential Classification

HAZARD POTENTIAL *(In the event the impoundment should fail, the following would occur):*

☐ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

☐ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

☒ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

☐ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

Based on the size and location of the Martin Lake Steam Electric Station PDP 5, there is no probable loss of life in the event of failure or misoperation. Economic and environmental losses are expected to be low and limited to the owner's property. The plant owner owns Martin Lake and much of the surrounding property. Martin Lake State Park located on across an arm of the lake north and down gradient from the plant. However, the park property is owned by Luminant and leased to the State for a nominal annual amount to provide public recreational access to the lake.

APPENDIX I

PDP-5 History of Construction Report

BURNS McDONNELL

History of Construction
Martin Lake Steam Electric Station
CCR Surface Impoundments

Luminant Generation Company, LLC

MLSES History of Construction
Project No. 90588

October 5, 2016

Burns & McDonnell
Engineering Firm F-845

History of Construction
Martin Lake Steam Electric Station
CCR Surface Impoundments

prepared for

Luminant Generation Company, LLC
MLSES History of Construction
Rusk County, Texas

Project No. 90588

October 5, 2016

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Luminant Generation Company, LLC
History of Construction
Martin Lake Steam Electric Station
CCR Surface Impoundments
Project No. 90588

Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Texas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by Luminant Generation Company, LLC or others without specific verification or adaptation by the Engineer.

Randell Lee Sedlacek

Randell Lee Sedlacek, P.E. (Texas License No. 99056)

Date: 10/5/16

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BMcD	Burns & McDonnell
CCR	Coal Combustion Residual
CFR	Code of Federal Regulation
EAP	East Ash Pond
EPA	Environmental Protection Agency
GM	Geomembrane
MLSES	Martin Lake Steam Electric Station
PDP5	Permanent Disposal Pond 5
RCRA	Resource Conservation and Recovery Act
NSP	New Scrubber Pond
WAP	West Ash Pond

1.0 INTRODUCTION

Luminant Generation Company, LLC (Luminant) owns and operates the Martin Lake Steam Electric Station (MLSES), located in Rusk County, Texas. MLSES is located adjacent to Martin Lake, which is used as its cooling water source. The plant consists of 3 units which burn lignite and Powder River Basin (PRB) coal. The bottom ash, fly ash, and scrubber gypsum created during electricity generation are stored, conditioned, and/or disposed of in surface impoundments and landfills on-site, or in nearby Luminant owned and operated facilities.

The EPA published the final Rule to regulate Coal Combustion Residuals (CCR) on April 17, 2015. The final Rule establishes minimum criteria for existing and new CCR Landfills and Surface Impoundments (CCR Units). Luminant is subject to the CCR Rule and as such must compile a History of Construction for existing CCR surface impoundments (to the extent feasible) per 40 CFR §257.73. The tables in this document and its attachments provide the History of Construction for the existing surface impoundments at MLSES.

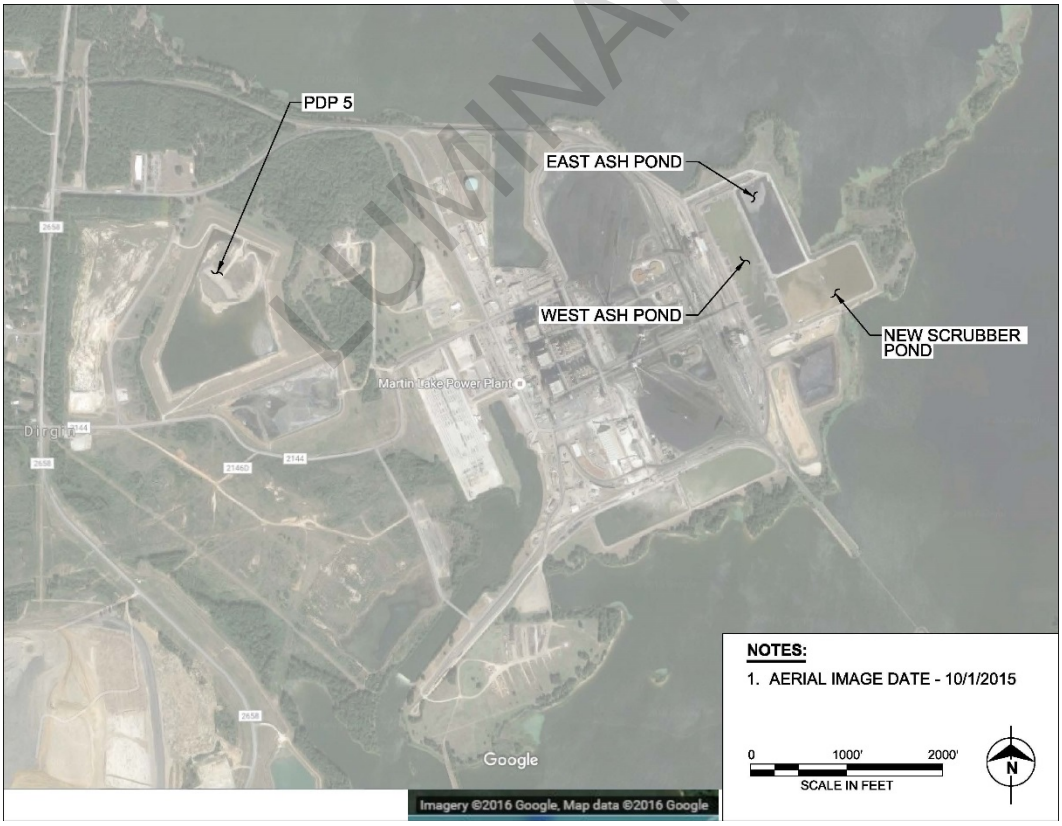


Figure 1 MLSES Site Plan

TABLE 1-1 EAST BOTTOM ASH POND HISTORY OF CONSTRUCTION DATA

Section	CCR Rule Description	Included	Information
§257.73 (c)(1) (i)	Name and address of the owner/operator of the CCR unit	Y	Luminant Generation Company, LLC 1601 Bryan Street Dallas, TX 75201
§257.73 (c)(1) (i)	Name of the CCR units	Y	East Bottom Ash Pond (EAP)
§257.73 (c)(1) (i)	Identification number of the CCR unit	Y	TCEQ WMU No. 023
§257.73 (c)(1) (ii)	Location of the CCR unit on most recent United State Geological Survey (USGS) 7½ minute or 15 minute topographical map	Y	See Attachment 1
§257.73 (c)(1) (iii)	Statement of the purpose for which the CCR unit is being used	Y	Overflow from the bottom ash dewatering bins is sent to the East and West Bottom Ash Ponds. The plant area bottom ash sumps are sluiced directly to these ponds. The East and West Bottom Ash ponds can be used one at a time.
§257.73 (c)(1) (iv)	Name and size of watershed within which the CCR unit is located	Y	HUC12=120100020803, Martin Lake Watershed, AREA in ACRES=28184
§257.73 (c)(1) (v)	Description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed	Y	Foundation Soils include poorly graded sand and silt, silty sand and clayey sand.
§257.73 (c)(1) (vi)	Statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit	Y	Embankment material includes sandy lean clay, medium dense clayey sand, and stiff fat clay.
§257.73 (c)(1) (vi)	The method of site preparation and construction of each zone or stage of the CCR unit	Y	Embankment constructed in lifts of unspecified depth, and compacted to 95% of the Standard Proctor maximum density.
§257.73 (c)(1) (vi)	The approximate dates of construction of each successive stage of construction of the CCR unit	Y	1977, Reline in 2010.
§257.73 (c)(1) (vii)	Detailed Dimensional Drawings Including the Following:	Y	See Attachment 2-East Ash Pond
§257.73 (c)(1) (vii)	Plan view and cross sections of the length and width of the CCR unit	Y	See Attachment 2-East Ash Pond
§257.73 (c)(1) (vii)	Foundation improvements	N	N/A
§257.73 (c)(1) (vii)	Drainage provisions, spillways, diversion ditches, outlets	N	N/A
§257.73 (c)(1) (vii)	Instrumentation locations	N	N/A
§257.73 (c)(1) (vii)	Slope protection	Y	See Attachment 2-East Ash Pond
§257.73 (c)(1) (vii)	Normal operating pool surface elevation	Y	EL 327.67
§257.73 (c)(1) (vii)	Maximum pool surface elevation following peak discharge from the inflow design flood	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (vii)	Expected maximum depth of CCR within the unit	Y	Approximately 20' (329'-309')
§257.73 (c)(1) (vii)	Any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation	Y	Pipe penetrations, See Attachment 2
§257.73 (c)(1) (viii)	Description of the type, purpose, and location of existing instrumentation	N	None.
§257.73 (c)(1) (ix)	Area-capacity curves for the CCR unit	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (x)	Description of each spillway and diversion design features and capacities and calculations used in their determination	N	There are no spillways.
§257.73 (c)(1) (xi)	Construction specifications	Y	Attachment 2
§257.73 (c)(1) (xi)	Provisions for surveillance, maintenance, and repair of the CCR unit	N	Weekly and Annual Inspections per §257.83.
§257.73 (c)(1) (xii)	Any record or knowledge of structural instability of the CCR unit	N	None.

TABLE 1-2 WEST BOTTOM ASH POND HISTORY OF CONSTRUCTION DATA

Section	CCR Rule Description	Included	Information
§257.73 (c)(1) (i)	Name and address of the owner/operator of the CCR unit	Y	Luminant Generation Company, LLC 1601 Bryan Street Dallas, TX 75201
§257.73 (c)(1) (i)	Name of the CCR units	Y	West Bottom Ash Pond (WAP)
§257.73 (c)(1) (i)	Identification number of the CCR unit	Y	TCEQ WMU No. 014
§257.73 (c)(1) (ii)	Location of the CCR unit on most recent United State Geological Survey (USGS) 7½ minute or 15 minute topographical map	Y	See Attachment 1
§257.73 (c)(1) (iii)	Statement of the purpose for which the CCR unit is being used	Y	Overflow from the bottom ash dewatering bins is sent to the East and West Bottom Ash Ponds. The plant area bottom ash sumps are sluiced directly to these ponds. The East and West Bottom Ash ponds can be used one at a time.
§257.73 (c)(1) (iv)	Name and size of watershed within which the CCR unit is located	Y	HUC12=120100020803, Martin Lake Watershed, AREA in ACRES=28184
§257.73 (c)(1) (v)	Description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed	Y	Foundation soils generally consisted of stiff to hard sandy clays and firm to very dense sands.
§257.73 (c)(1) (vi)	Statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit	Y	Embankment soils generally consisted of stiff to hard sandy clays and firm to very dense sands.
§257.73 (c)(1) (vi)	The method of site preparation and construction of each zone or stage of the CCR unit	N	No records available.
§257.73 (c)(1) (vi)	The approximate dates of construction of each successive stage of construction of the CCR unit	Y	1977, Relined in 1988.
§257.73 (c)(1) (vii)	Detailed Dimensional Drawings Including the Following:	Y	See Attachment 2-West Ash Pond
§257.73 (c)(1) (vii)	Plan view and cross sections of the length and width of the CCR unit	Y	See Attachment 2-West Ash Pond
§257.73 (c)(1) (vii)	Foundation improvements	N	N/A
§257.73 (c)(1) (vii)	Drainage provisions, spillways, diversion ditches, outlets	N	N/A
§257.73 (c)(1) (vii)	Instrumentation locations	N	N/A
§257.73 (c)(1) (vii)	Slope protection	Y	See Attachment 2-West Ash Pond
§257.73 (c)(1) (vii)	Normal operating pool surface elevation	Y	EL 321
§257.73 (c)(1) (vii)	Maximum pool surface elevation following peak discharge from the inflow design flood	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (vii)	Expected maximum depth of CCR within the unit	Y	20' (329'-309')
§257.73 (c)(1) (vii)	Any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation	Y	Pipe penetrations, See Attachment 2
§257.73 (c)(1) (viii)	Description of the type, purpose, and location of existing instrumentation	N	None.
§257.73 (c)(1) (ix)	Area-capacity curves for the CCR unit	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (x)	Description of each spillway and diversion design features and capacities and calculations used in their determination	N	There are no spillways.
§257.73 (c)(1) (xi)	Construction specifications	N	No records available.
§257.73 (c)(1) (xi)	Provisions for surveillance, maintenance, and repair of the CCR unit	N	Weekly and Annual Inspections per §257.83.
§257.73 (c)(1) (xii)	Any record or knowledge of structural instability of the CCR unit	N	None.

TABLE 1-3 NEW SCRUBBER POND HISTORY OF CONSTRUCTION DATA

Section	CCR Rule Description	Included	Information
§257.73 (c)(1) (i)	Name and address of the owner/operator of the CCR unit	Y	Luminant Generation Company, LLC 1601 Bryan Street Dallas, TX 75201
§257.73 (c)(1) (i)	Name of the CCR units	Y	New Scrubber Pond (NSP)
§257.73 (c)(1) (i)	Identification number of the CCR unit	Y	TCEQ WMU No. 013
§257.73 (c)(1) (ii)	Location of the CCR unit on most recent United State Geological Survey (USGS) 7½ minute or 15 minute topographical map	Y	See Attachment 1
§257.73 (c)(1) (iii)	Statement of the purpose for which the CCR unit is being used	Y	The New Scrubber Pond is used to receive thickener overflow, storm water from scrubber/scrubbers solids handling, and scrubber wash-down water. Water from this pond is used for scrubber makeup.
§257.73 (c)(1) (iv)	Name and size of watershed within which the CCR unit is located	Y	HUC12=120100020803, Martin Lake Watershed, AREA in ACRES=28184
§257.73 (c)(1) (v)	Description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed	Y	Foundation soils generally consisted of stiff to hard sandy clays and firm to very dense sands.
§257.73 (c)(1) (vi)	Statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit	Y	Clay, underlain by clayey sand and sandy clays.
§257.73 (c)(1) (vi)	The method of site preparation and construction of each zone or stage of the CCR unit	N	No records available.
§257.73 (c)(1) (vi)	The approximate dates of construction of each successive stage of construction of the CCR unit	Y	Begin Construction - 7/18/88 Complete Construction - 4/20/89
§257.73 (c)(1) (vii)	Detailed Dimensional Drawings Including the Following:	Y	See Attachment 2 - Scrubber Pond
§257.73 (c)(1) (vii)	Plan view and cross sections of the length and width of the CCR unit	Y	See Attachment 2 - Scrubber Pond
§257.73 (c)(1) (vii)	Foundation improvements	N	N/A
§257.73 (c)(1) (vii)	Drainage provisions, spillways, diversion ditches, outlets	N	N/A
§257.73 (c)(1) (vii)	Instrumentation locations	N	N/A
§257.73 (c)(1) (vii)	Slope protection	Y	See Attachment 2 - Scrubber Pond
§257.73 (c)(1) (vii)	Normal operating pool surface elevation	Y	EL 327.67
§257.73 (c)(1) (vii)	Maximum pool surface elevation following peak discharge from the inflow design flood	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (vii)	Expected maximum depth of CCR within the unit	Y	20' (329-309)
§257.73 (c)(1) (vii)	Any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation	Y	Pipe penetrations, See Attachment 2
§257.73 (c)(1) (x)	Description of each spillway and diversion design features and capacities and calculations used in their determination	N	There are no spillways.
§257.73 (c)(1) (ix)	Area-capacity curves for the CCR unit	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (viii)	Description of the type, purpose, and location of existing instrumentation	N	None.
§257.73 (c)(1) (xi)	Construction specifications	N	No records available.
§257.73 (c)(1) (xi)	Provisions for surveillance, maintenance, and repair of the CCR unit	N	Weekly and Annual Inspections per §257.83.
§257.73 (c)(1) (xii)	Any record or knowledge of structural instability of the CCR unit	N	None.

TABLE 1-4 PDP 5 HISTORY OF CONSTRUCTION DATA

Section	CCR Rule Description	Included	Information
§257.73 (c)(1) (i)	Name and address of the owner/operator of the CCR unit	Y	Luminant Generation Company, LLC 1601 Bryan Street Dallas, TX 75201
§257.73 (c)(1) (i)	Name of the CCR units	Y	Permanent Disposal Pond 5 (PDP 5)
§257.73 (c)(1) (i)	Identification number of the CCR unit	Y	TCEQ WMU No. 024
§257.73 (c)(1) (ii)	Location of the CCR unit on most recent United State Geological Survey (USGS) 7½ minute or 15 minute topographical map	Y	See Attachment 1
§257.73 (c)(1) (iii)	Statement of the purpose for which the CCR unit is being used	Y	PDP 5 receives excess storm water, excess water from the scrubber loop or the bottom ash loop.
§257.73 (c)(1) (iv)	Name and size of watershed within which the CCR unit is located	Y	HUC12=120100020803, Martin Lake Watershed, AREA in ACRES=28184
§257.73 (c)(1) (v)	Description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed	Y	Prior to the construction of PDP-5 a 3 ft clay layer was placed over top the closed ponds below the new berm. Portions of the embankment were constructed over the existing ash fill.
§257.73 (c)(1) (vi)	Statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit	Y	6-inch thick clay buffer (1x10-5 cm/sec) on top of closed PDPs 1, 2, &3 overlain by a 2 ft thick compacted clay (1x10-7 cm/sec) with leachate collection system
§257.73 (c)(1) (vi)	The method of site preparation and construction of each zone or stage of the CCR unit	Y	Subgrade was scarified 6-inches prior to placement of liner soils. Liner was constructed in 9-inch loose thickness lifts, in parallel or monolithic lifts. The liner was compacted to 95% of the maximum dry density.
§257.73 (c)(1) (vi)	The approximate dates of construction of each successive stage of construction of the CCR unit	Y	PDP 5 was constructed in 2010.
§257.73 (c)(1) (vii)	Detailed Dimensional Drawings Including the Following:	Y	See Attachment 2-PDP 5
§257.73 (c)(1) (vii)	Plan view and cross sections of the length and width of the CCR unit	Y	See Attachment 2-PDP 5
§257.73 (c)(1) (vii)	Foundation improvements	N	N/A
§257.73 (c)(1) (vii)	Drainage provisions, spillways, diversion ditches, outlets	N	N/A
§257.73 (c)(1) (vii)	Instrumentation locations	N	N/A
§257.73 (c)(1) (vii)	Slope protection	Y	See Attachment 2-PDP 5
§257.73 (c)(1) (vii)	Normal operating pool surface elevation	Y	EL 404.1
§257.73 (c)(1) (vii)	Maximum pool surface elevation following peak discharge from the inflow design flood	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (vii)	Expected maximum depth of CCR within the unit	Y	13' (405-392)
§257.73 (c)(1) (vii)	Any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation	N	None.
§257.73 (c)(1) (viii)	Description of the type, purpose, and location of existing instrumentation	N	None.
§257.73 (c)(1) (ix)	Area-capacity curves for the CCR unit	N	This information is being compiled by another consultant and will be included in the Inflow Design Flood Control System Plan published on Luminant's CCR website.
§257.73 (c)(1) (x)	Description of each spillway and diversion design features and capacities and calculations used in their determination	N	There are no spillways.
§257.73 (c)(1) (xi)	Construction specifications	Y	Soil Liner Evaluation Report performed by ETTL Engineers and Consultants.
§257.73 (c)(1) (xi)	Provisions for surveillance, maintenance, and repair of the CCR unit	N	Weekly and Annual Inspections per §257.83.
§257.73 (c)(1) (xii)	Any record or knowledge of structural instability of the CCR unit	N	None.

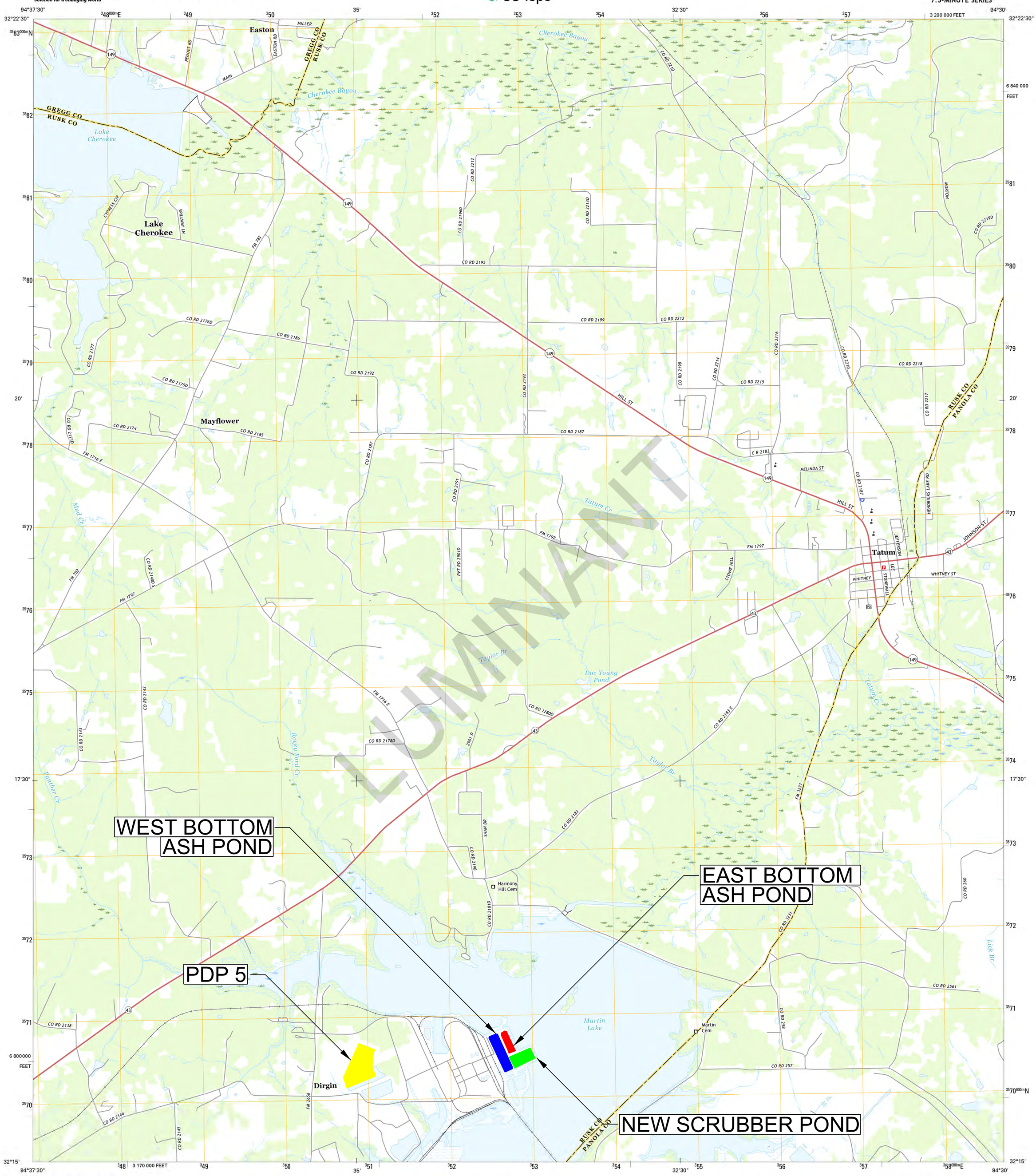
ATTACHMENT 1 - LOCATION OF UNITS ON USGS MAP

USGS science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

TATUM QUADRANGLE
TEXAS
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 15S
10 000-foot ticks: Texas Coordinate System of 1983 (north central zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, September 2014
Roads..... U.S. Census Bureau, 2014 - 2015
Names.....GNIS, 2015
Hydrography.....National Hydrography Dataset, 2014
Contours.....National Elevation Dataset, 2004
Boundaries.....Multiple sources; see metadata file 1972 - 2015

Wetlands.....FWS National Wetlands Inventory 1977 - 2014

MN 2° 8' 38 MILS
GN 0° 50' 15 MILS
UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
UR
Grid Zone Designation
15S

SCALE 1:24 000
1 KILOMETERS 1 2
1000 METERS 2000
1 MILES 1
1000 FEET 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.19

TEXAS
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

1 Lakeport
2 Easton
3 Darco
4 Elderville
5 Harris Chapel
6 Church Hill
7 Fair Play
8 Beckville
ADJOINING QUADRANGLES

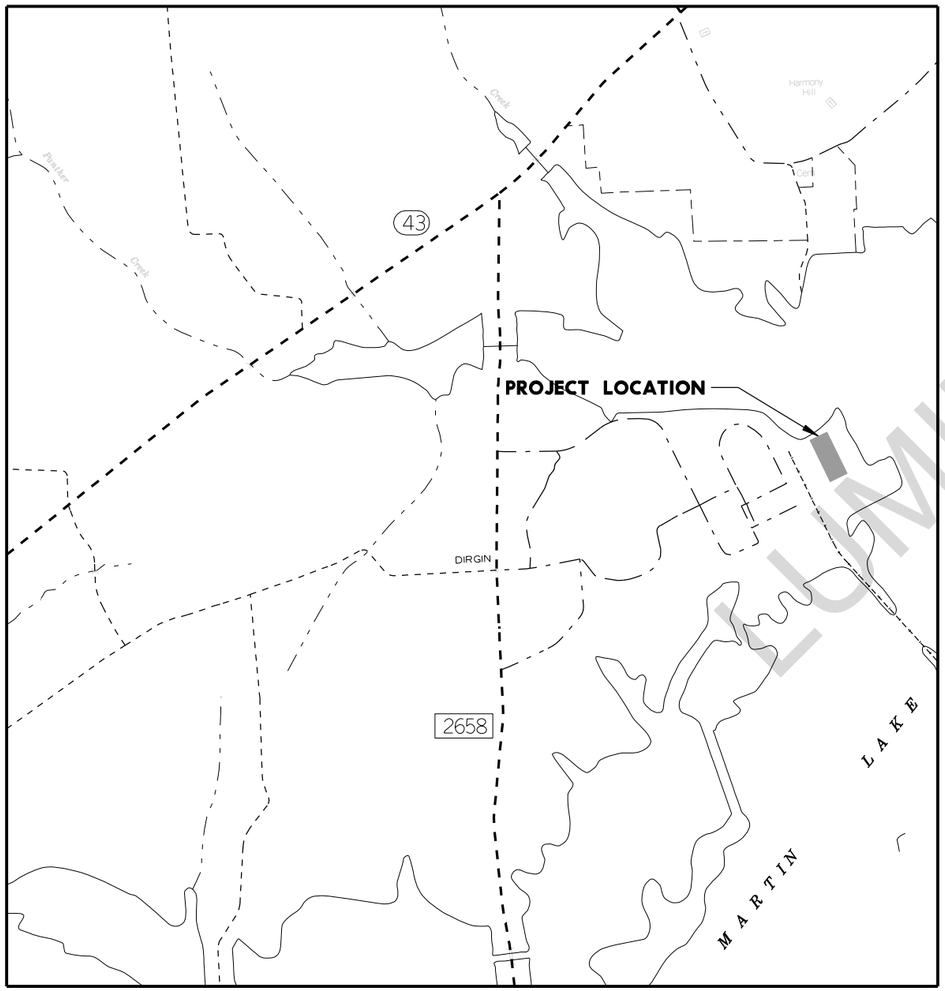
TATUM, TX
2016

NSN 7643016398531
NGA REF NO. USGSX24K4349

ATTACHMENT 2 - DETAILED DIMENSIONAL DRAWINGS

EAST ASH POND

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND AS BUILT DRAWINGS



SHEET NO.	TITLE
C-1	COVER SHEET
C-2	ABBREVIATIONS & GENERAL NOTES
C-3	SITE LAYOUT
C-4	GRADING PLAN
C-5	LINER SYSTEM LAYOUT
C-6	LINER SECTION AND DETAILS
C-7	AIR-GAS VENTING LAYOUT AND DETAIL
C-8	LEAK DETECTION SUMP SECTION AND DETAILS
C-9	DEWATERING PIPES SECTIONS AND DETAIL
C-10	PIPE RACK PLAN & NOTES
C-11	PIPE RACK SECTIONS & DETAILS
C-12	CROSS SECTIONS
C-13	AS BUILT FINAL CONTOURS
C-14	AS BUILT MISCELLANEOUS DETAILS
C-15	AS BUILT POND ACCESS TYPICAL SECTION
C-16	DEWATERING PIPE FIGURE

DATE: 8/13/2010
TIME: 11:31:55 AM
USER: rcox
FILE: Luminant_Mining_Company_LLC\ML_SES_Reline_East_Ash_Pond\13.00_CAD\Sheet Files\AS BUILTS

PLTDRVER: 11X17LASER_BW_PDF.plt
PENTABLE: 0000000000959991.tbl

Luminant

HDR
HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

COVER SHEET

FILENAME C-1.dgn
SCALE NTS

SHEET
C-1

STANDARD ABBREVIATIONS

&	AND
APPROX	APPROXIMATELY
@	AT
AVG	AVERAGE
BOE	BOTTOM OF EXCAVATION
BOL	BOTTOM OF LINER
X	BY
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CY	CUBIC YARD
DIA	DIAMETER
DET	DETAIL
DWG	DRAWING
E	EAST
ELEV	ELEVATION
EW	EACH WAY
EXIST	EXISTING
EXC	EXCAVATION
FML	FLEXIBLE MEMBRANE LINER
FT	FEET
GAL	GALLON
GND	GROUND
GDL	GRAVEL DRAINAGE LAYER
GNDL	GEONET DRAINAGE LAYER
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IN	INCHES
IE	INVERT ELEVATION
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
LCS	LEACHATE COLLECTION SYSTEM
LCP	LEACHATE COLLECTION PIPE
LCPR	LEACHATE COLLECTION PIPE RISER
LF	LINEAR FEET
LB	POUND
MH	MANHOLE
MAX	MAXIMUM
MIL	.001 INCHES
MIN	MINIMUM
MW	MONITOR WELL
MLSES	MARTIN LAKE STEAM ELECTRIC STATION
MSL	MEAN SEA LEVEL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OZ	OUNCE
%	PERCENT
PLCP	PERFORATED LEACHATE COLLECTION PIPE
PERF	PERFORATED
PGL	PROFILE GRADE LINE
PDP	PERMANENT DISPOSAL POND
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PVI	POINT OF VERTICAL INTERSECTION
PT	POINT OF TANGENT
PZ	PIEZOMETER
Q	FLOW
QTY	QUANTITY
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF	REFERENCE
REQ	REQUIRED
RD	ROAD
SCH	SCHEDULE
SDL	SAND DRAINAGE LAYER
SEC	SECTION
SHT	SHEET
S	SOUTH
SDR	STANDARD DIMENSION RATIO
SP	STEEL PIPE
SQ	SQUARE
STA	STATION
SLQCP	SOIL LINER QUALITY CONTROL PLAN
SS	SIDE SLOPE
T.A.S.	TERMINAL ANCHOR SECTION
TL	TANGENT LENGTH
TOC	TOP OF COVER
TOFC	TOP OF FINAL COVER
TOL	TOP OF LINER
TOS	TOE OF SLOPE
TS	TOP SLOPE
TEMP	TEMPORARY
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
W	WEST
W/	WITH
YD	YARD

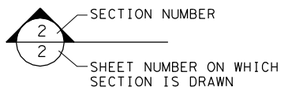
GENERAL NOTES USED DURING POND RECONSTRUCTION

1. ALL WORK UNDER THIS CONTRACT SHALL BE PERFORMED IN ACCORDANCE WITH THE PLANS AND PROJECT SPECIFICATIONS. IN THE EVENT OF A DISCREPANCY BETWEEN THE PLANS AND THE PROJECT SPECIFICATIONS, THE SPECIFICATIONS SHALL GOVERN.
2. COORDINATE SYSTEM IS BASED ON LOCAL SURVEY. THE BENCHMARKS TO BE USED FOR CONSTRUCTION ARE LOCATED AS SHOWN ON DRAWING NO. 3. EXISTING CONTOURS ARE BASED ON TOPOGRAPHICAL SURVEY TAKEN ON OCTOBER 20, 2008 FOR EAST ASH POND BY COLLINS SURVEYING AND MAPPING, LONGVIEW, TEXAS. CURRENT GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN DUE TO SITE WORK THAT HAS BEEN PERFORMED SINCE THE SURVEY WAS PERFORMED.
3. THE CONTRACTOR SHALL VERIFY EXISTING CONTOURS PRIOR TO THE START OF WORK.
4. GROUNDWATER AT THE SITE WILL VARY DEPENDING ON RAINFALL, AND SUBSURFACE CONDITIONS. THERE SHALL NOT BE ANY ADDITIONAL PAYMENT OR EXTENSION OF CONTRACT TIME FOR WORKING WITH SATURATED SOILS OR HANDLING GROUNDWATER SEEPAGE DUE TO RAINFALL, RUNOFF AND INFILTRATION.
5. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING ROADS, BENCHMARKS AND EXISTING GROUNDWATER MONITOR WELLS DURING THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL BE SOLEY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE INCURRED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PROTECT THE GROUNDWATER MONITOR WELLS, BENCHMARKS AND EXISTING ROADS.
6. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN ESTABLISHED BY THE OWNER OR HIS REPRESENTATIVES. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING PROPER SAFE WORKING DISTANCE FROM ALL UTILITY EASEMENTS OR LINES.
7. EXCAVATION BY "BLASTING" IS NOT PERMITTED ON THIS PROJECT.
8. FINISHED GROUND ELEVATIONS SHALL MATCH EXISTING GROUND ELEVATIONS EXCEPT AS SHOWN ON THE PLANS. ALL EXCESS SOIL FROM THE EXCAVATION AND GRADING SHALL BE PLACED IN DESIGNATED STOCKPILE LOCATIONS AS APPROVED BY THE OWNER. IF WASTE IS ENCOUNTERED DURING EXCAVATION, THE OWNER SHALL BE NOTIFIED AND THE WASTE REMOVED AND PLACED IN AREAS DESIGNATED AS APPROVED BY THE OWNER. TRANSPORT OF SOIL TO FILL AREAS SHALL BE CONDUCTED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
9. GEOTECHNICAL INVESTIGATION REPORTS FOR THE SITE ARE AVAILABLE FOR REVIEW AT LUMINANT'S DALLAS OFFICES. THE CONTRACTOR MAY PERFORM ADDITIONAL GEOTECHNICAL INVESTIGATIONS, AS HE DEEMS NECESSARY FOR CONSTRUCTION ACTIVITIES, PROVIDED ALL NECESSARY PERMITS AND APPROVALS ARE OBTAINED FROM LUMINANT PRIOR TO INITIATING SUCH WORK. HOWEVER, THERE SHALL BE NO ADDITIONAL PAYMENT TO THE CONTRACTOR FOR ADDITIONAL GEOTECHNICAL INVESTIGATIONS.
10. THE CONTRACTOR SHALL CONSTRUCT, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY CONSTRUCTION ACCESS ROADS. SUCH ROADS SHALL BE LOCATED AS APPROVED BY THE OWNER. DRAINAGE PATTERNS AT THE SITE SHALL NOT BE ALTERED BY ROAD CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF TEMPORARY DRAINAGE STRUCTURES, INCLUDING CULVERTS, AT NO ADDITIONAL COST TO THE OWNER.
11. THE CONTRACTOR SHALL INSTALL, MAINTAIN, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY EROSION AND SEDIMENT CONTROLS AS APPROVED BY LUMINENT ENVIRONMENTAL SERVICES AND IN ACCORDANCE WITH THE SITE SWPPP AND PURSUANT TO TPDES REQUIREMENTS. SUCH CONTROLS SHALL BE PLACED AT THE LIMITS OF DISTURBED AREAS AND AT INTERMEDIATE LOCATIONS WHERE CONCENTRATED FLOW IS LIKELY.
12. TEMPORARY CONSTRUCTION SLOPES SHALL NOT BE GREATER THAN 2H:1V. STEEPER SLOPES WILL ONLY BE ALLOWED IF THE CONTRACTOR PROVIDES A GEOTECHNICAL ENGINEERING REPORT SPECIFYING MAXIMUM SLOPES AND THE DURATION FOR WHICH SUCH SLOPES SHALL REMAIN IN PLACE.
13. THE CONTRACTOR SHALL REMOVE ALL VEGETATION WITHIN THE CONSTRUCTION LIMITS AS REQUIRED TO CONSTRUCT THE PROJECT. ALL VEGETATION SHALL BE REMOVED BY CONTRACTOR AT NO ADDITIONAL EXPENCE TO OWNER.
14. THE CONTRACTOR SHALL OBTAIN AND CONDUCT WORK CONSISTENT WITH A TPDES PERMIT FOR CONSTRUCTION, REFER TO TECHNICAL SPECIFICATIONS. PREPARATION OF A SWPPP AND OBTAINING THE TPDES PERMIT ARE THE CONTRACTORS RESPONSIBILITY.
15. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ERROR OR DISCREPANCY FOUND ONCE THE CONTRACT DOCUMENT IS CAREFULLY REVIEWED AND ALL ASPECTS OF FIELD WORK HAVE BEEN VERIFIED. IN THE EVENT THE CONTRACTOR CONTINUES TO WORK ON AN ITEM WHERE AN ERROR EXISTS, IT SHALL BE DEEMED THAT THE CONTRACTOR BID AND INTENDED TO EXECUTE THE MORE STRINGENT OR HIGHER QUALITY REQUIREMENT WITHOUT AN INCREASE IN CONTRACT SUM OR TIME. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE TO CORRECT ANY FAILURE OF COMPANY PARTS TO COORDINATE OR FIT PROPERLY INTO FINAL POSITION, AS A RESULT OF CONTRACTOR FAILURE TO RAISE OR RESOLVE A DISCREPANCY.
16. THE DRAWINGS AND SPECIFICATIONS SHOULD AGREE WITH EACH OTHER, AND WORK CALLED FOR BY DRAWINGS AND NOT MENTIONED IN SPECIFICATION, OR VICE VERSA, SHALL BE FURNISHED BY BOTH. WHEN DISCREPANCIES EXIST BETWEEN SCALE AND DIMENSIONS, THE DIMENSIONED FIGURE SHALL BE USED.
17. CONTRACTORS AND EACH SUB CONTRACTOR SHALL VERIFY ALL GRADES, LINES, LEVELS, AND DIMENSIONS AS INDICATED ON DRAWINGS, AND HE SHALL REPORT ERRORS TO THE ENGINEER BEFORE COMMENCING WORK. THE CONTRACTOR SHALL ESTABLISH BENCHMARKS IN AT LEAST TWO WIDELY SEPARATED PLACES, AND AS WORK PROGRESSES THE CONTRACTOR WILL MAINTAIN ADEQUATE HORIZONTAL AND VERTICAL CONTROL.
18. CONTRACTOR SHALL PROVIDE EROSION CONTROL BY SEEDING FOR ALL AREAS DISTURBED BY CONTRACTOR DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL NOT DISTURB ANY AREA WITHOUT THE APPROVAL OF THE ENGINEER. EROSION CONTROL BY SEEDING SHALL CONFORM TO STANDARD SPECIFICATION 02930.
19. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENT CONTROLS AS PER SPECIFICATIONS DURING CONSTRUCTION. SUCH CONTROLS SHALL BE PLACED AT LIMITS OF DISTURBED AREAS AND AT INTERMEDIATE LOCATIONS WHERE CONCENTRATED FLOW IS LIKELY.
20. STORMWATER AND GROUNDWATER WHICH HAS COME INTO CONTACT WITH THE ASH WITHIN THE EXCAVATED CELL IS TO BE CONSIDERED CONTAMINATED. CONTRACTOR WILL CONTROL THE WATER ON SITE IN COMPLIANCE WITH THE TPDES PERMIT.
21. THE CONTRACTOR IS REQUIRED TO PRESENT THE SWPPP TO LUMINANT ENVIRONMENTAL SERVICES FOR APPROVAL PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES.
22. THE CONTRACTOR IS REQUIRED TO SUBMIT THE NOTICE OF INTENT FOR THE TPDES PERMIT.
23. THE CONTRACTOR IS TO ACQUIRE A DIGGING PERMIT FROM THE PLANT BEFORE COMMENCING ANY EXCAVATION ACTIVITY.
24. ALL HDPE LINER IS TEXTURED

SYMBOLS

SECTION DETAIL INDICATORS

DRAWING ON WHICH SECTION IS CUT:



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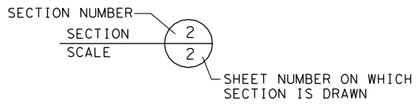

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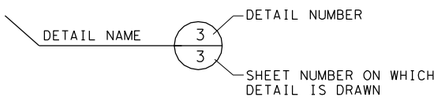

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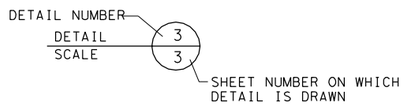
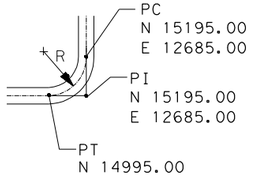
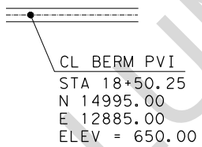
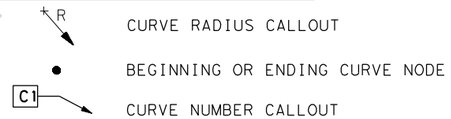


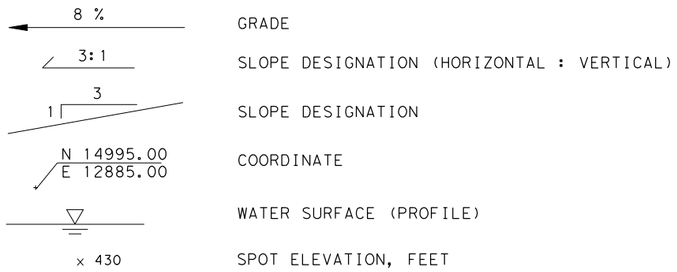




CURVE WITH HORIZONTAL CONTROL:



VERTICAL CONTROL DESIGNATION



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Luminant

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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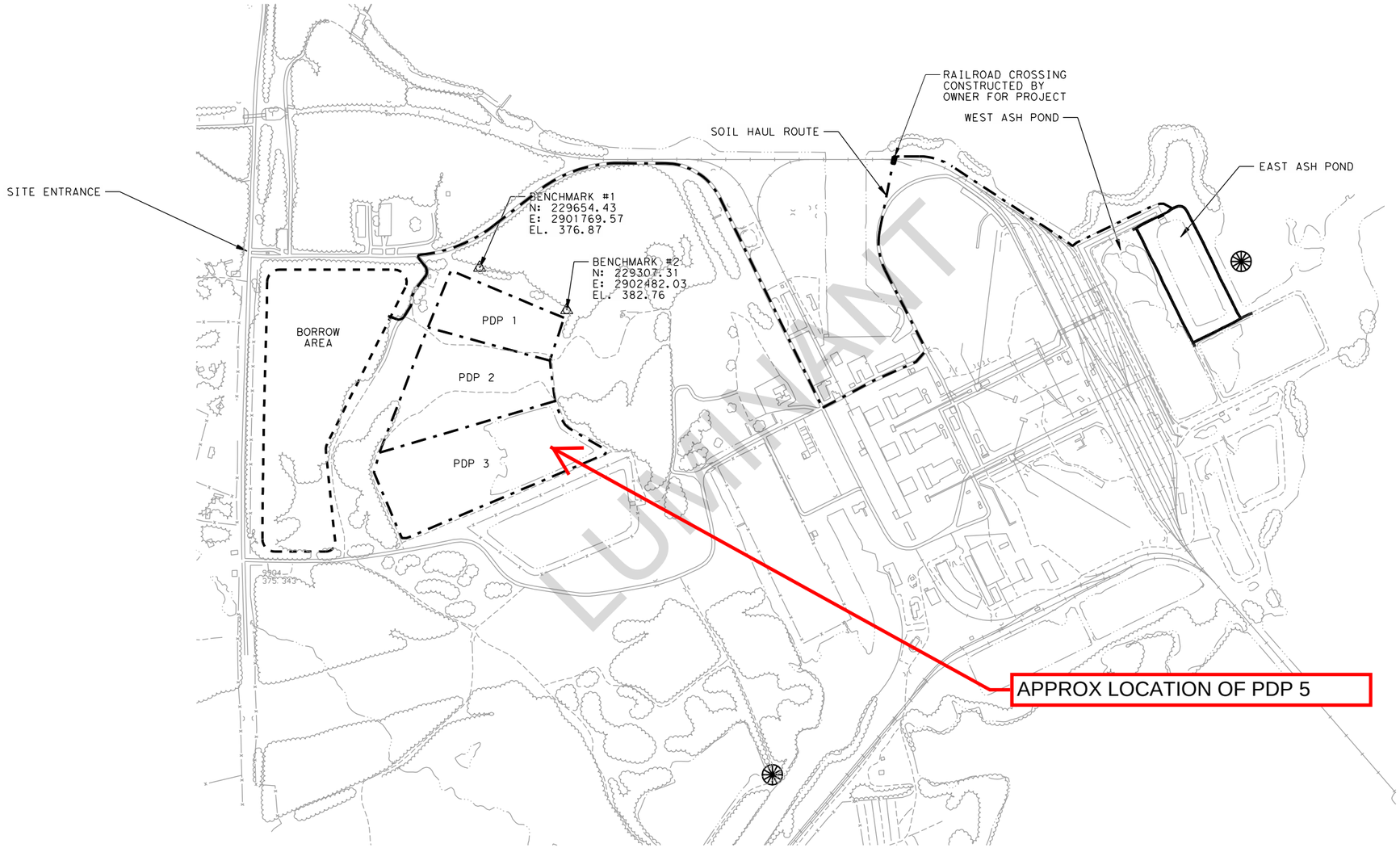
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

ABBREVIATIONS AND GENERAL NOTES

FILENAME	C-2.dgn
SCALE	NONE

SHEET **C-2**



LEGEND

- LIMITS OF CONSTRUCTION
- BORROW AREA
- WATER ACCESS LOCATIONS
- SOIL HAUL ROUTE

BENCHMARKS:

1. BM#1 N 229654.43 E 2901769.57 EL 376.87; BM#2 N 229307.31 E 2902482.03 EL 382.76

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McKinney, Texas 75070

Texaas P.E. Firm
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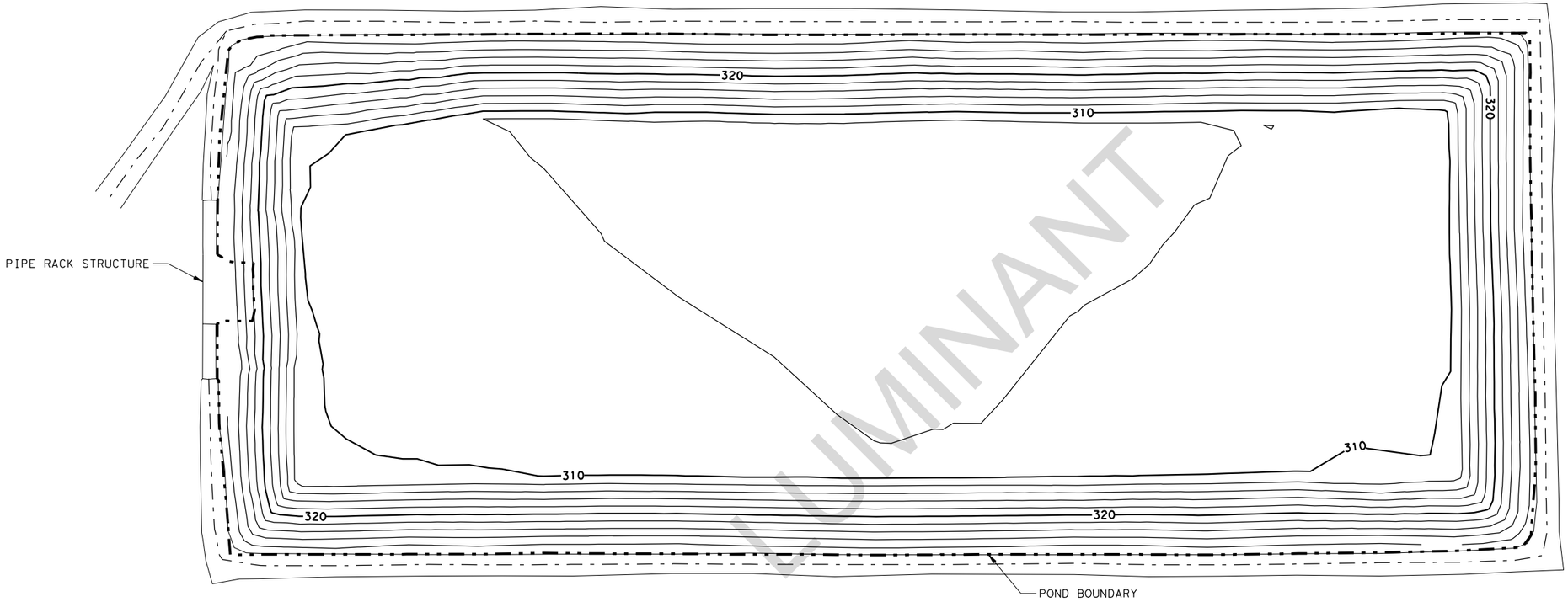
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

SITE LAYOUT

0 500' 1000'

FILENAME C-3.dgn
SCALE AS SHOWN

SHEET C-3



LEGEND

- EXISTING ROAD
- POND BOUNDARY
- FINAL CONTOURS
- CENTERLINE OF ROAD

NOTE: 1. AS BUILT CONTOURS PROVIDED BY COLLINS SURVEYING AND MAPPING, LONGVIEW, TEXAS.

2. CONTOURS SHOWN ARE TOP OF GRADING ELEVATIONS UNLESS OTHERWISE NOTED.

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HDR

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
1	05/10	AS BUILT CONTOURS

PROJECT MANAGER	D.VOGT
ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	D.MONTAGUE
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	91399

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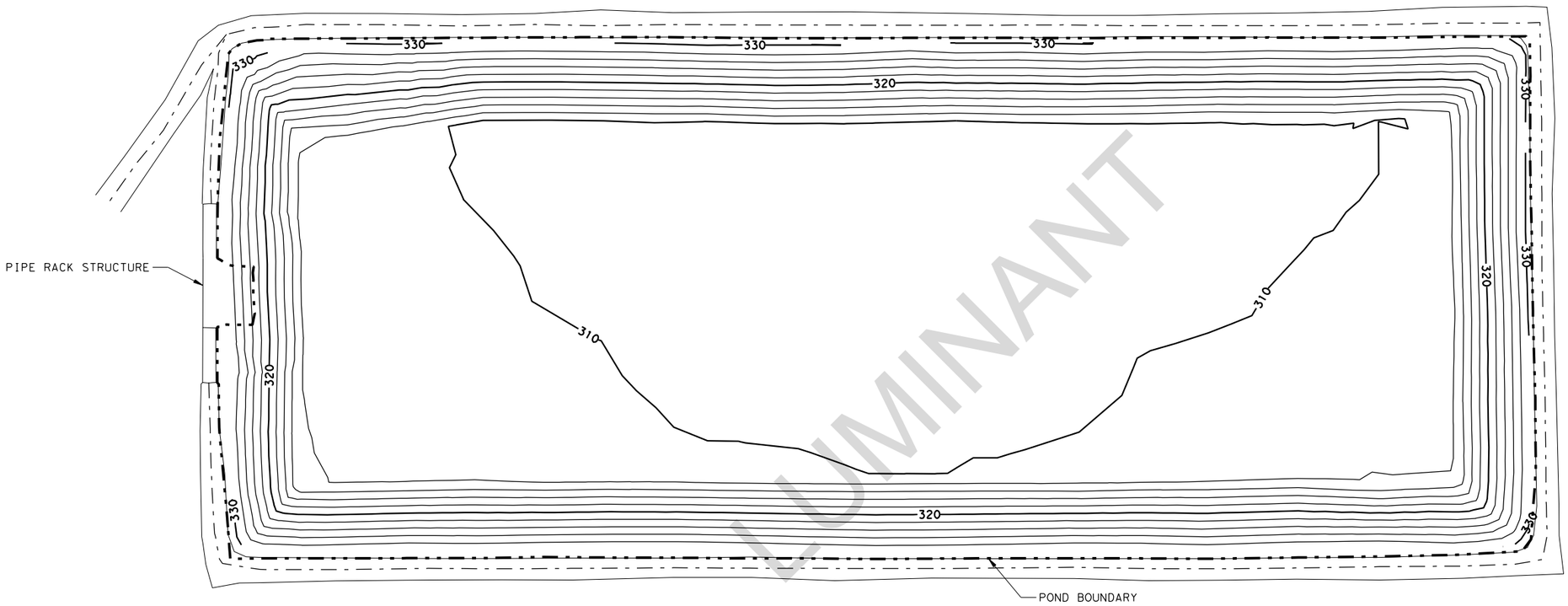
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT GRADING CONTOURS

0 50' 100'

FILENAME	C-4.dgn
SCALE	

SHEET **C-4**



LEGEND

- EXISTING ROAD
- POND BOUNDARY
- FINAL CONTOURS
- CENTERLINE OF ROAD

NOTE: 1. AS BUILT CONTOURS PROVIDED BY COLLINS SURVEYING AND MAPPING, LONGVIEW, TEXAS.

2. CONTOURS SHOWN ARE TOP OF CLAY LINER ELEVATIONS UNLESS OTHERWISE NOTED.

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Luminant

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D.VOGT
ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	D.MONTAGUE
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	91399

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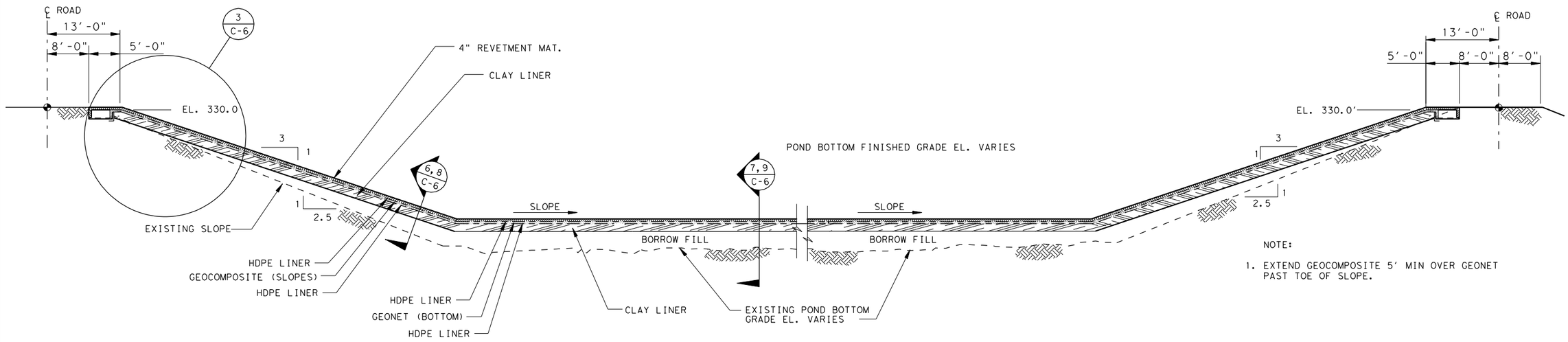
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT LINER CONTOURS

0 50' 100'

FILENAME	C-5.dgn
SCALE	

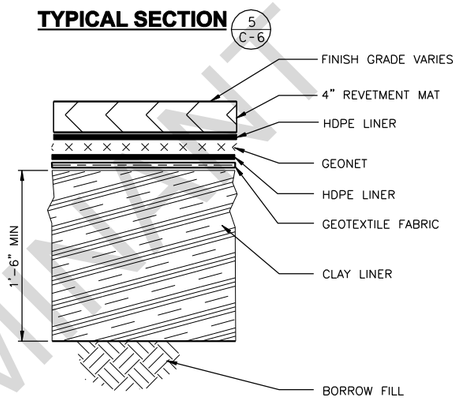
SHEET **C-5**

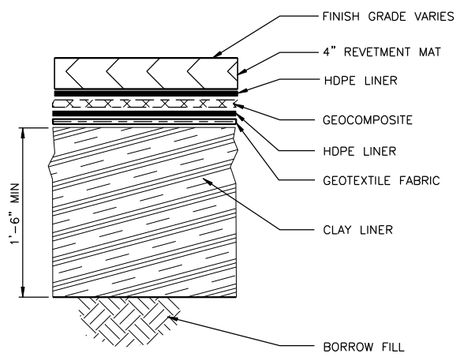


NOTE:

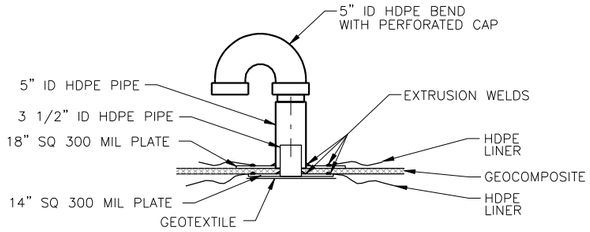
1. EXTEND GEOCOMPOSITE 5′ MIN OVER GEONET PAST TOE OF SLOPE.

TYPICAL SECTION (5 / C-6)

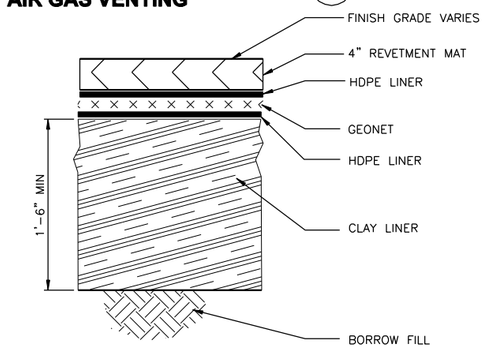




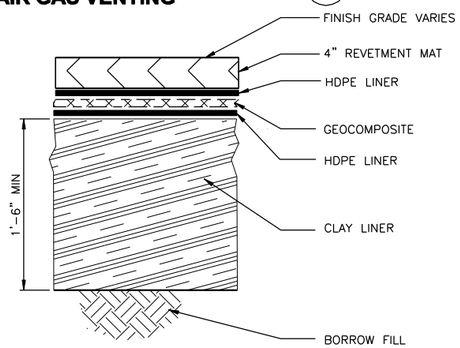
TYPICAL AIR-GAS VENT (4 / C-6)



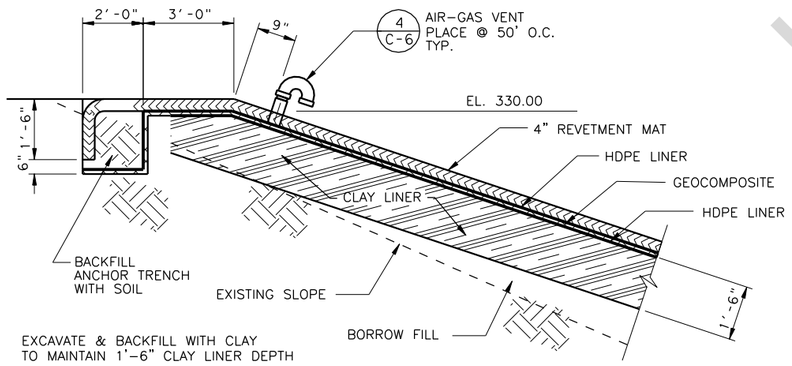
FLOOR LINER SECTION WITH AIR GAS VENTING (9 / C-6)



SLOPE LINER SECTION WITH AIR GAS VENTING (8 / C-6)



TYPICAL TOP OF SLOPE SECTION (3 / C-6)



FLOOR LINER SECTION (7 / C-6)

SLOPE LINER SECTION (6 / C-6)

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DATE: 8/15/2010
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Luminant

HDR
HDR Engineering, Inc.
4600 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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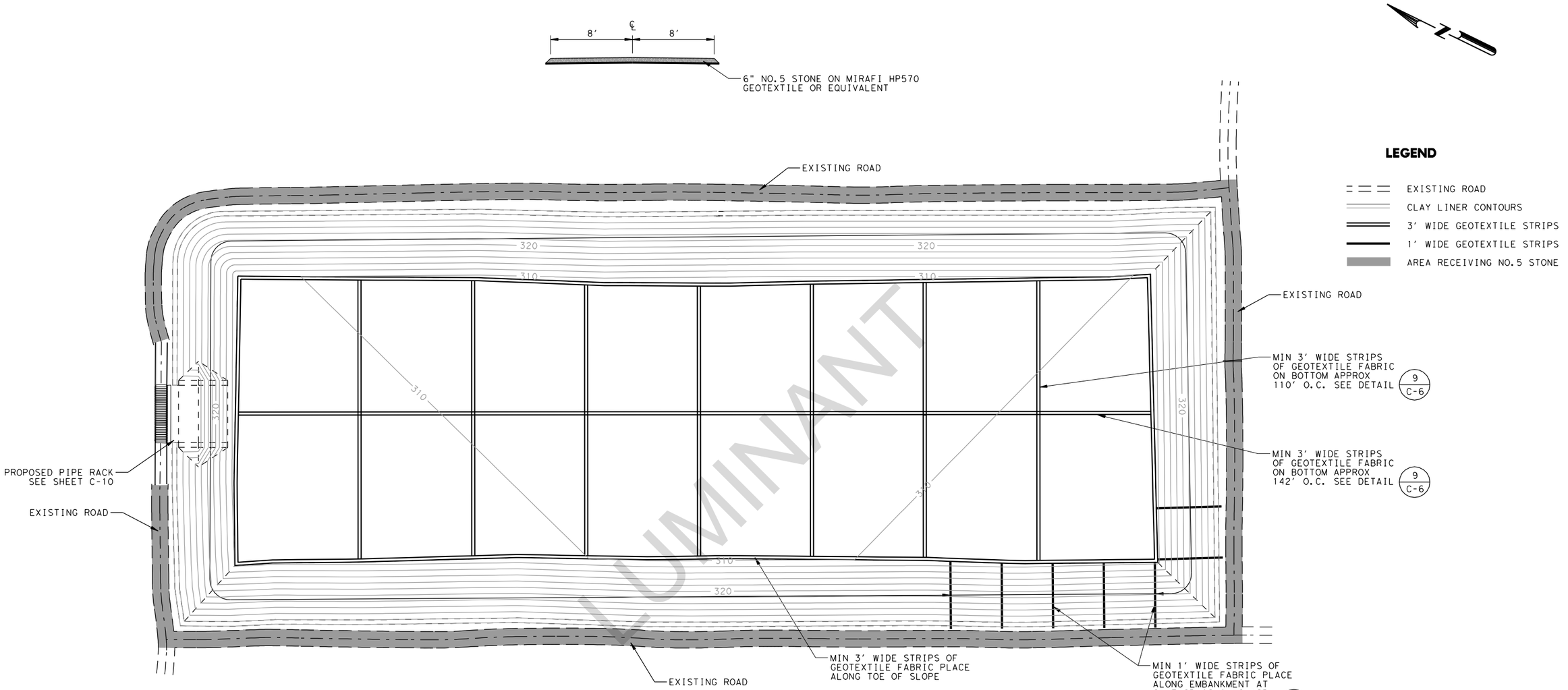
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

LINER SECTION AND DETAILS

FILENAME	C-6.dgn
SCALE	N.T.S

SHEET C-6



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HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texaas P.E. Firm
Firm Registration No.F-754

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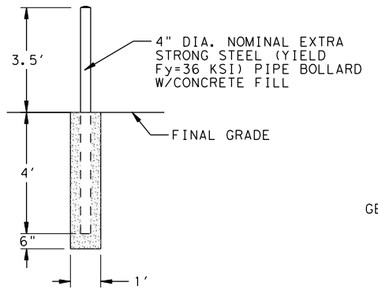
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AIR-GAS VENTING LAYOUT AND DETAIL

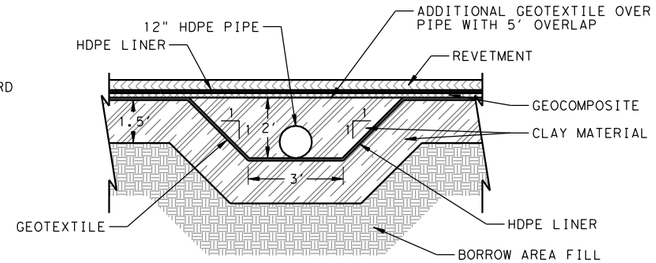
0 50′ 100′

FILENAME C-7.dgn
SCALE

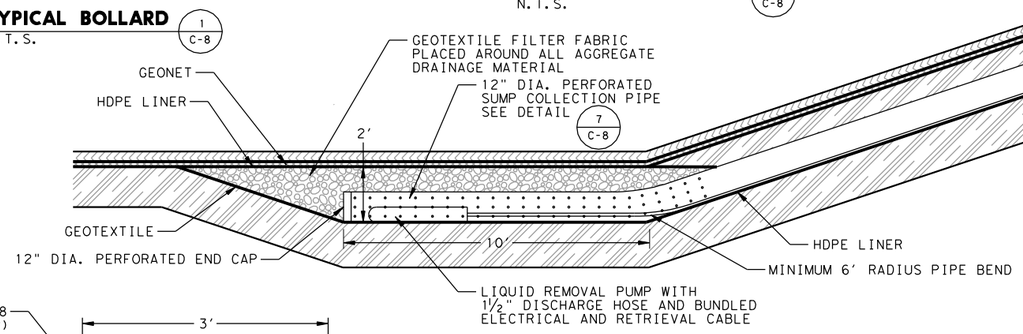
SHEET C-7

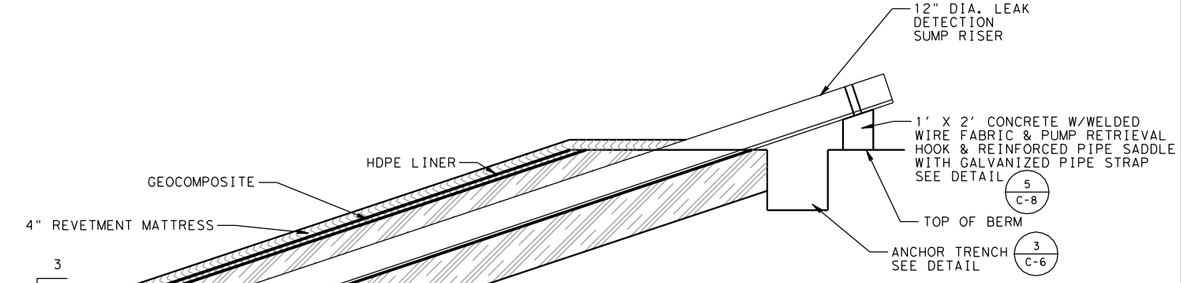


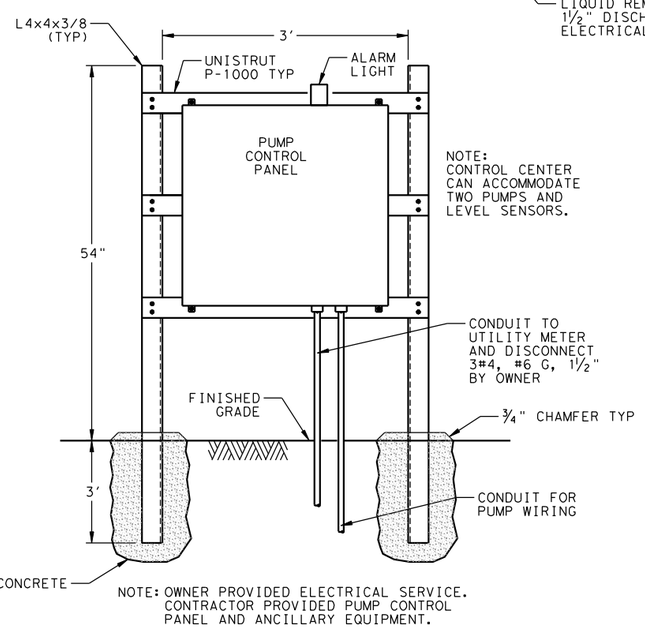
TYPICAL BOLLARD
N.T.S. (1 / C-8)



SUMP PIPE SECTION
N.T.S. (4 / C-8)

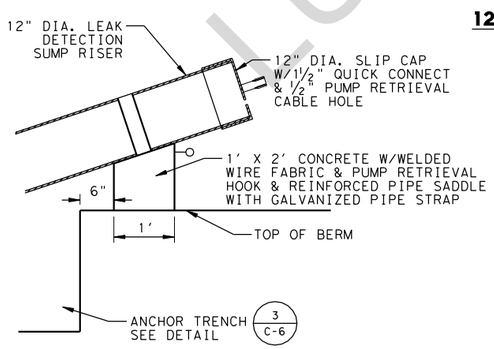




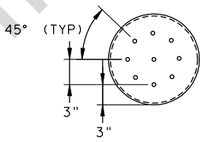


PUMP CONTROL CENTER
N.T.S. (8 / C-8)

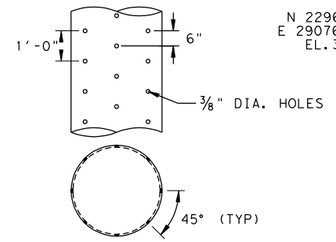
SUMP PROFILE
N.T.S. (3 / C-8)



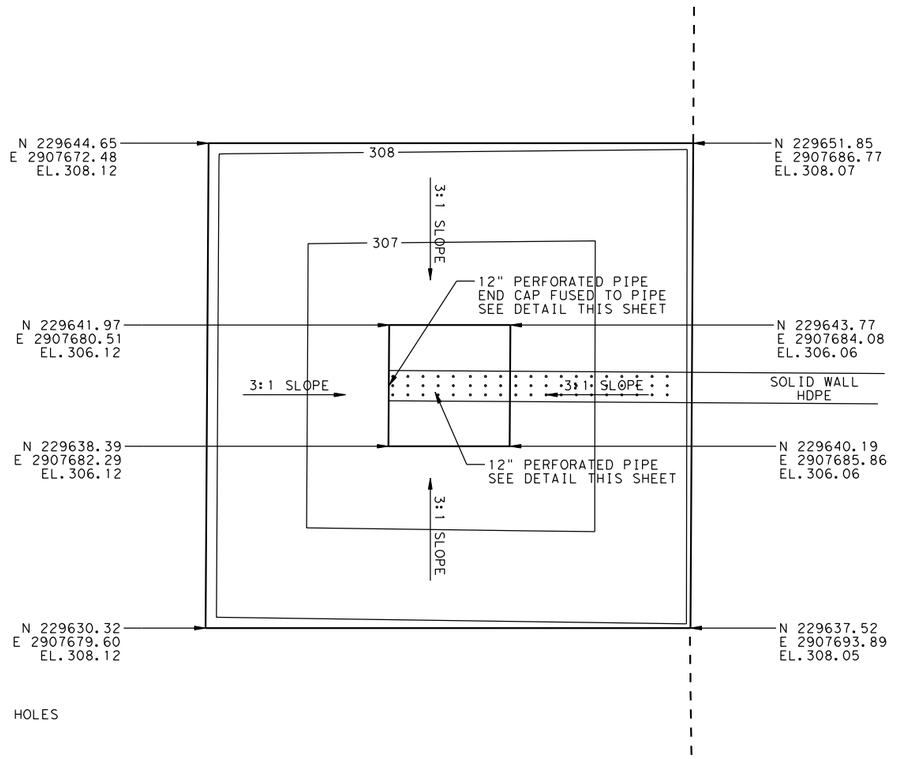
SUMP PIPE TERMINATION
N.T.S. (5 / C-8)



12" DIA. PERFORATED END CAP
N.T.S. (6 / C-8)



12" DIA. PERFORATED SUMP COLLECTION PIPE
N.T.S. (7 / C-8)



SUMP PLAN
N.T.S. (2 / C-8)

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Luminant

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DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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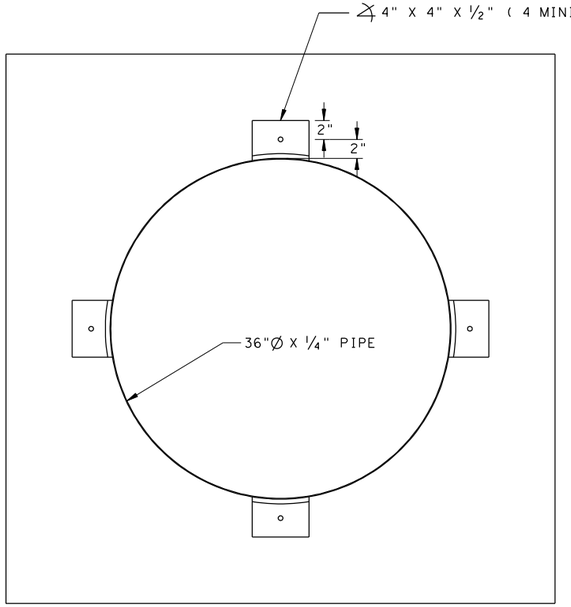
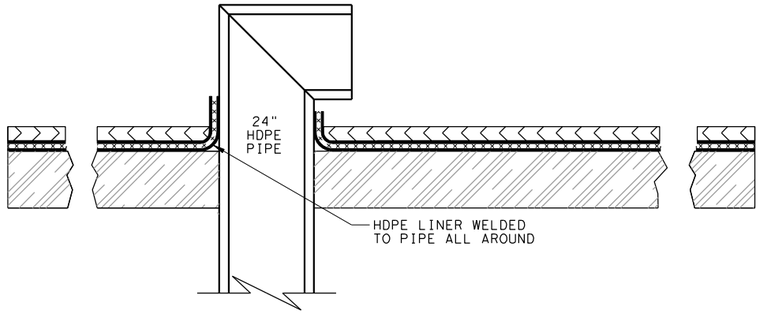
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

LEAK DETECTION SUMP
SECTION AND DETAILS

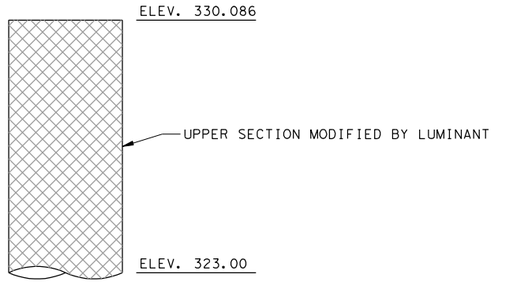
FILENAME C-8.dgn
SCALE N.T.S.
SHEET C-8

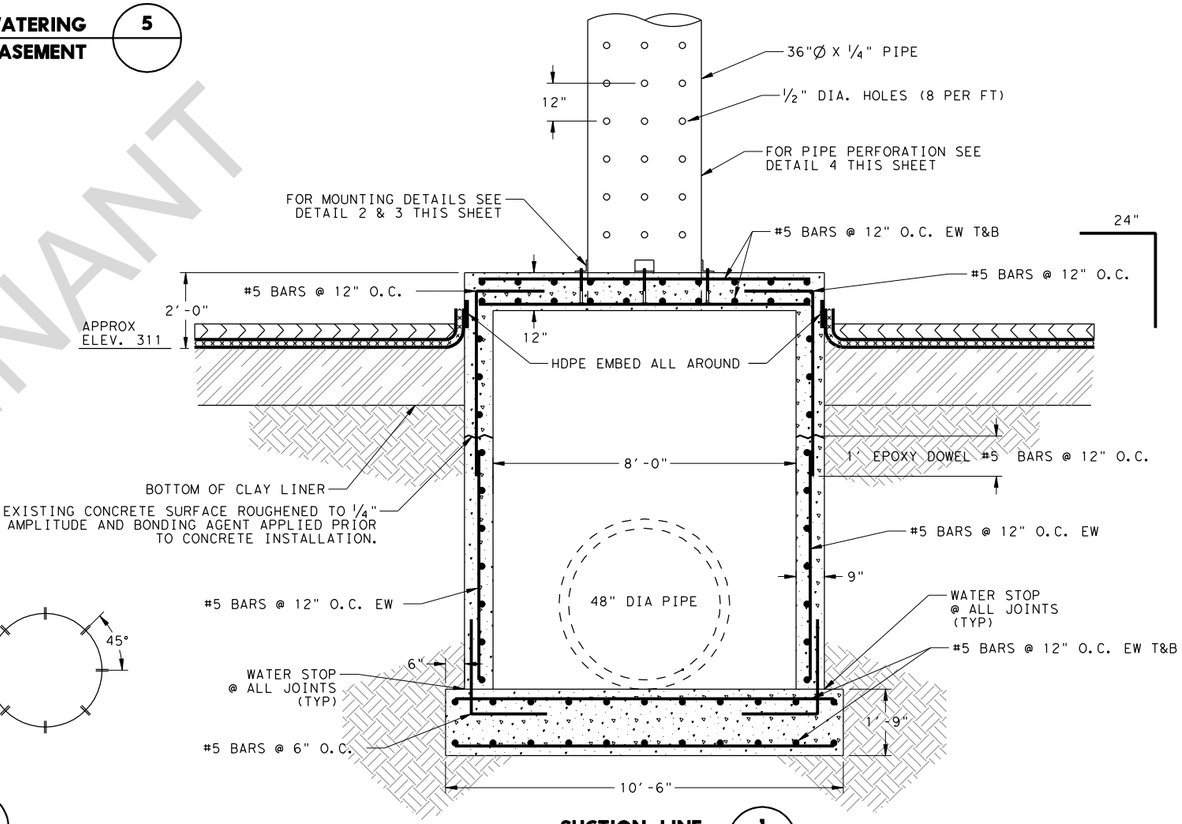


36" PIPE MOUNTING DETAIL (2)
N.T.S.



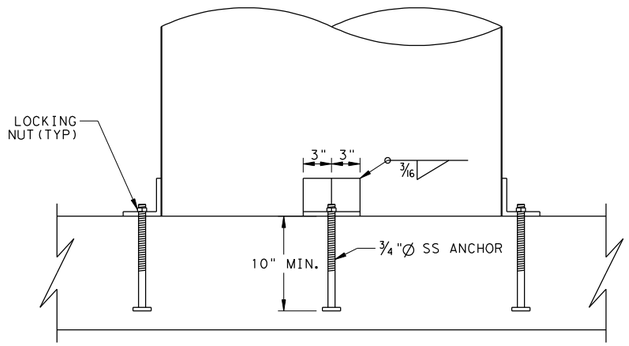
24" DEWATERING LINE ENCASEMENT (5)
N.T.S.



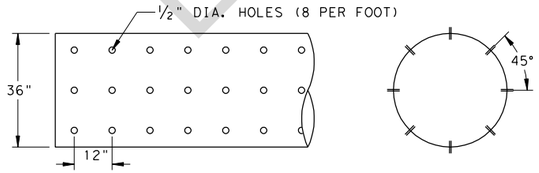


SUCTION LINE INLET STRUCTURE (1)

NOTE:
THE INTERIOR OF THE INLET STRUCTURE WAS LINED WITH AN EPOXY COATING OF RAVEN LINING 405 AT A MINIMUM THICKNESS OF 200 mils.



36" PIPE MOUNTING DETAIL (3)
N.T.S.



36" PIPE PERFORATION DETAIL (4)

NOTE:
ALL STEEL HOT DIP GALVANIZED

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TIME: 11:32:33 AM
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Luminant

HDR
HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	
DESIGNED	
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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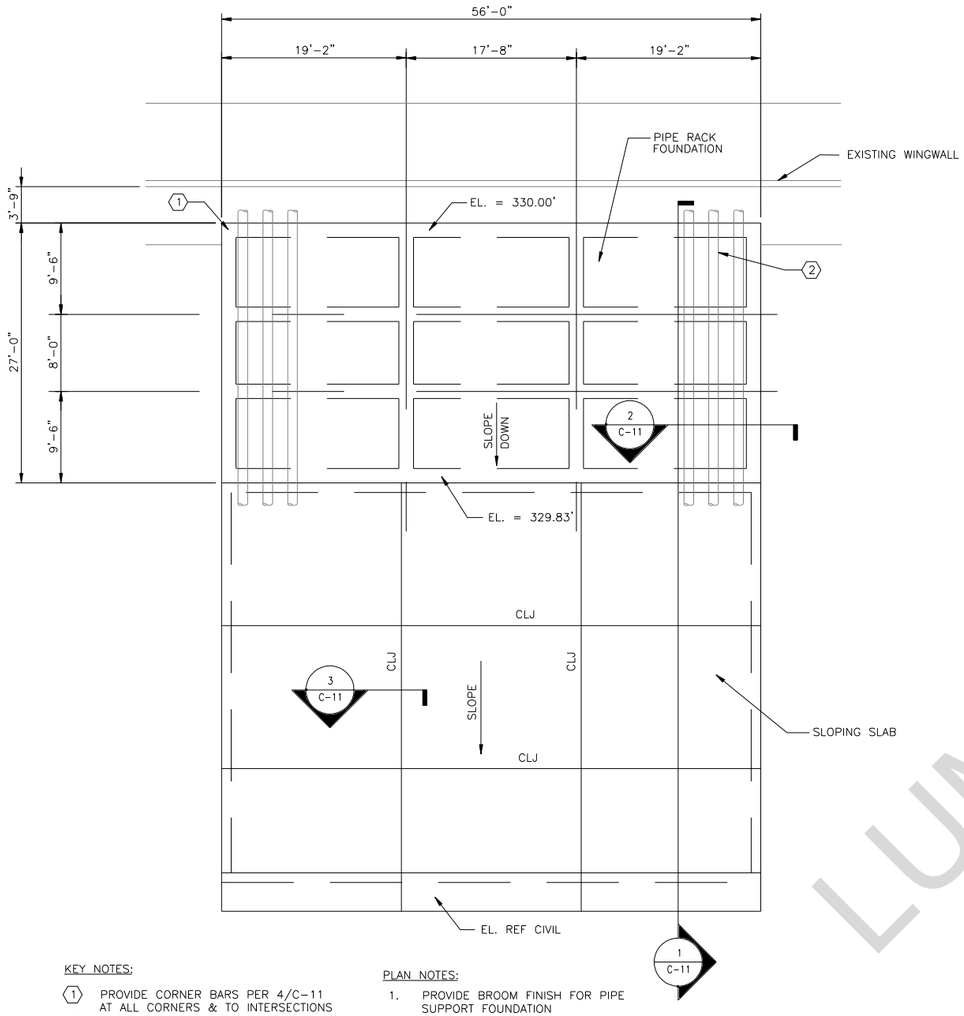
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT STRUCTURE DETAILS

0 2' 4'

FILENAME C-9.dgn
SCALE AS SHOWN

SHEET C-9



KEY NOTES:

1. PROVIDE CORNER BARS PER 4/C-11 AT ALL CORNERS & TO INTERSECTIONS
2. HDPE PIPE BY OTHERS
3. PROVIDE NON-SHRINK GROUT AT BEARING POINTS. BEARING POINTS ARE BEAM LOCATIONS ONLY.

PLAN NOTES:

1. PROVIDE BROOM FINISH FOR PIPE SUPPORT FOUNDATION
2. PROVIDE FLOAT FINISH AT SLOPING SLAB
3. THE HDPE LINER SHALL BE ANCHORED TO THE PIPE RACK FOUNDATION AND EXISTING WINGWALL AS SHOWN ON C-9

1 FOUNDATION PLAN

1/8"= 1'-0"

GENERAL STRUCTURAL NOTES (GSN)

GENERAL

G1. SCOPE
THE NOTES ON THIS SHEET ARE GENERAL AND APPLY TO THE ENTIRE PROJECT WHETHER SPECIFICALLY CALLED OUT OR NOT, EXCEPT WHERE THERE ARE SPECIFIC INDICATIONS TO THE CONTRARY ON STRUCTURAL SHEETS. IF THERE ARE QUESTIONS, THEY SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER AND ANSWERED IN WRITING PRIOR TO CONSTRUCTION.

G2. APPLICABLE SPECIFICATIONS AND CODES

A. INTERNATIONAL BUILDING CODE, IBC 2006
B. ACI 318

G3. DESIGN CRITERIA

1. APPLIES TO ALL STRUCTURES (UNO)

A. DEAD LOAD:
1. ACTUAL TRIBUTARY STRUCTURE WEIGHT
2. SUPERIMPOSED DEAD LOAD: PIPE (HDPE)

B. LIVE LOAD:
1. SLAB ON GRADE: 250 PSF

C. WIND:
1. BASIC WIND SPEED: 90 MPH
2. EXPOSURE: C
3. IMPORTANCE FACTOR: 1.15

D. SEISMIC:
1. ABOVE GRADE, NON WATER BEARING STRUCTURES:
a. OCCUPANCY CATEGORY III, USE GROUP
b. IMPORTANCE FACTOR: 1.25
c. SPECTRAL RESPONSE ACCELERATION, SS = 0.14
d. SPECTRAL RESPONSE ACCELERATION, S1 = 0.06
e. SITE CLASS: D
f. SEISMIC DESIGN CATEGORY: B
g. SPECTRAL RESPONSE COEFFICIENT, SDS = 0.149
h. SPECTRAL RESPONSE COEFFICIENT, SD1 = 0.096

G4. THE FOLLOWING NON-CONTRACTUAL GEOTECHNICAL REPORT WAS DEVELOPED FOR THIS PROJECT AND IS THE BASIS OF THIS STRUCTURAL DESIGN:

GEOTECHNICAL FIRM NAME: ETTL ENGINEERS & CONSULTANTS
REPORT NUMBER: G2972-081
REPORT DATE 12/12/2008

G5. SAFETY
SAFETY AND STRUCTURE STABILITY DURING CONSTRUCTION IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. STRUCTURES HAVE BEEN DESIGNED TO RESIST THE DESIGN LIVE LOADS ONLY AS A COMPLETED STRUCTURE.

G6. SPECIAL INSPECTIONS
SPECIAL INSPECTIONS ARE REQUIRED IN ACCORDANCE WITH CHAPTER 1 AND CHAPTER 17 OF THE IBC. PAYMENT FOR THESE INSPECTIONS IS NOT THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE FOR FULL ACCESS TO THE WORK BY THE SPECIAL INSPECTOR AND SHALL PROVIDE FOR THESE INSPECTIONS IN HIS CONSTRUCTION SCHEDULE.

EARTH WORK

E1. BEARING PRESSURE: 2000 PSF

E2. PREPARED SUB-BASE:
SCARIFY 6", AND COMPACT TO 95% MAX DRY DENSITY DETERMINED BY TX DOT METHOD TEX-113-E

E3. ENGINEERED FILL:
FLEXIBLE BASE TYPE S OR C; GRADES 1 OR 2; AS SPECIFIED BY TX DOT, STANDARD SPECIFICATIONS FOR CONSTRUCTION OF HIGHWAYS, STREETS AND BRIDGES, CURRENT EDITION, ITEM 247. COMPACT TO 95% OF MAX DRY DENSITY BY TX DOT METHOD TEX-113-E HOLD WATER CONTENTS TO WITHIN +/- 2% OF OPTIMUM W/6" MAX LIFTS

CONCRETE

C1. DESIGN STRENGTHS:
F'c = 4000 PSI
Fy = 60,000 PSI

C2. CONCRETE COVER
UNLESS OTHERWISE NOTED, PROVIDE CONCRETE COVER FOR REINFORCING AS FOLLOWS:
CONCRETE DEPOSITED AGAINST EARTH: 3"
ALL OTHER: 2"
SEE DRAWINGS FOR EXCEPTIONS

C3. SEE SPECIFICATION 03002 FOR REINFORCING PLACEMENT REQUIREMENTS.

C4. REFER TO OTHER DISCIPLINE DRAWINGS PRIOR TO CONSTRUCTION FOR EMBEDDED ITEMS AND PENETRATIONS NOT SHOWN ON STRUCTURAL DRAWINGS. AS REQUIRED TO ACCOMMODATE ALL WORK SHOWN OR SPECIFIED IN THE CONTRACT DOCUMENTS AND OTHERWISE REQUIRED FOR THE FURNISHING OF A FUNCTIONALLY COMPLETE PROJECT.

C5. PROVIDE 3/4" CHAMFERS AT ALL EXPOSED EDGES NOT ALL CHAMFERS MAY BE SHOWN ON DRAWINGS.

C6. FIELD ADJUST REINFORCING AT OPENINGS AND EMBEDDED ITEMS.

C7. ANCHOR BOLTS NOT SPECIFIED BY ENGINEER SHALL BE DESIGNED AND CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER, RETAINED BY THE CONTRACTOR, IN ACCORDANCE WITH APPLICABLE PROJECT AND CODE REQUIREMENTS. SUBMIT AS A SHOP DRAWING FOR REVIEW AND APPROVAL BY THE ENGINEER. COORDINATE LOCATION, SIZE AND EMBEDMENT PRIOR TO CASTING CONCRETE.

C8. CONTINUOUS WATERSTOP SHALL BE INSTALLED IN JOINTS SUBJECT TO STATIC WATER PRESSURE. (UNO)

C9. ABSOLUTELY NO WELDING OF REINFORCING BARS OR TORCHING TO BEND REINFORCING BARS SHALL BE ALLOWED WITHOUT SPECIFIC APPROVAL FROM THE STRUCTURAL ENGINEER.

C10. CONTRACTOR SHALL SUBMIT A CONCRETE PLACEMENT PLAN IDENTIFYING JOINT TYPES, JOINT LOCATIONS AND CONCRETE PLACEMENT SEQUENCE.

C11. ALL CAST IN PLACE AND POST-INSTALLED ANCHORS INDICATED IN THE STRUCTURAL DOCUMENTS SHALL COMPLY WITH APPENDIX D OF ACI 318 AND CHAPTER 19 OF THE IBC. ALL EXPANSION AND ADHESIVE ANCHORS SHALL HAVE THE ICC REPORT SHOWING EQUIVALENT LOAD CAPACITY. SUBMIT AND INSTALL PER THE ICC EVALUATION REPORT.

STEEL

S1. DESIGN STRENGTHS:
ALL PLATES AND SHAPES: Fy=36 KSI

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Luminant

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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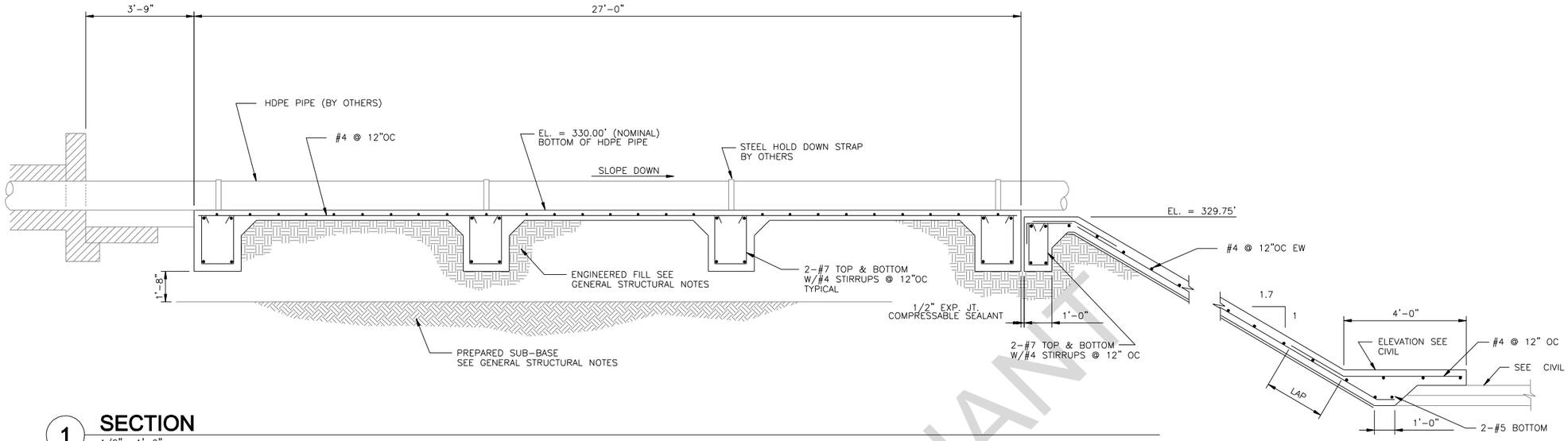
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

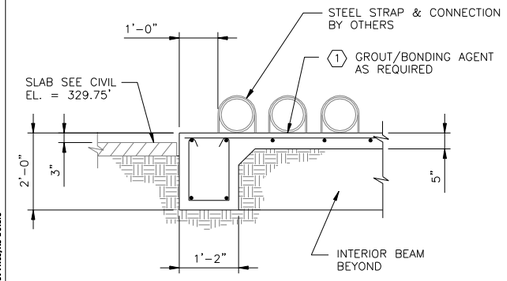
PIPE RACK PLAN & NOTES

FILENAME	C-10.dgn
SCALE	

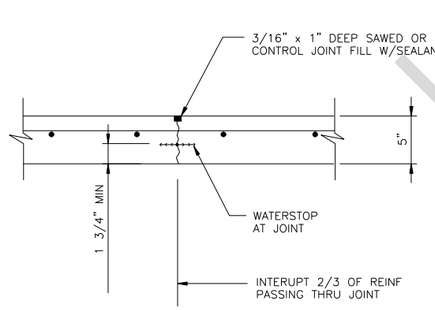
SHEET C-10



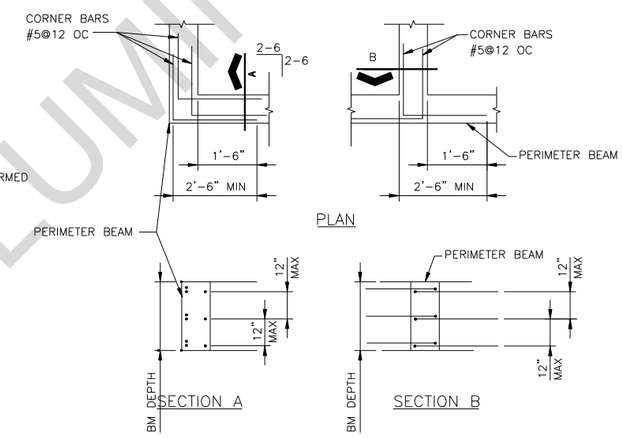
1 SECTION
1/2"= 1'-0"



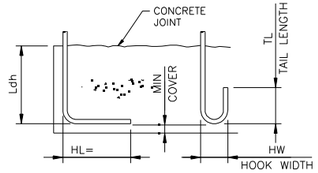
2 SECTION
1/2"= 1'-0"



3 CONTROL JOINT CLJ
1 1/2"= 1'-0"



4 PERIMETER BEAM REINFORCEMENT AT CORNERS & INTERSECTIONS
NTS



5 HOOKS
NTS

BAR SIZE GRADE 60	f'c=4000 psi		
	HL	HW	TL
#3	6"	3"	3"
#4	8"	4"	4 1/2"
#5	10"	5"	5"
#6	1'-0"	6"	6"
#7	1'-2"	7"	7"
#8	1'-4"	8"	8"
#9	1'-7"	11 3/4"	10 1/2"
#10	1'-10"	1'-1 1/4"	11 1/2"
#11	2'-0"	1'-2 3/4"	1'-1"

LAP SPLICE AND EMDEDMENT LENGTHS f'c =4.0 ksi fy = 60 ksi		
BAR	BARS SPACED GREATER THAN 4"	BARS SPACED LESS THAN OR EQUAL TO 4"
#3	14"	20"
#4	19"	32"
#5	29"	46"
#6	39"	62"
#7	55"	87"

NOTES:

1. PROVIDE MINIMUM LAP SPLICE LENGTHS AND EMBEDMENTS PER TABLE UNLESS NOTED OTHERWISE. EMBEDMENT LENGTH EQUALS THE LAP SPLICE LENGTH UNLESS OTHERWISE NOTED.
2. BAR SPACING AT LAP SPLICE IS THE MINIMUM CLEAR DISTANCE BETWEEN LAPPED BARS PLUS ONE BAR DIAMETER
3. ALL SPLICES TO BE CONTACT SPLICES AND WIRED TOGETHER UNLESS OTHERWISE APPROVED BY ENGINEER.

6 REINFORCING LAP AND EMBEDMENT SCHEDULE
NTS

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Luminant

HDR
HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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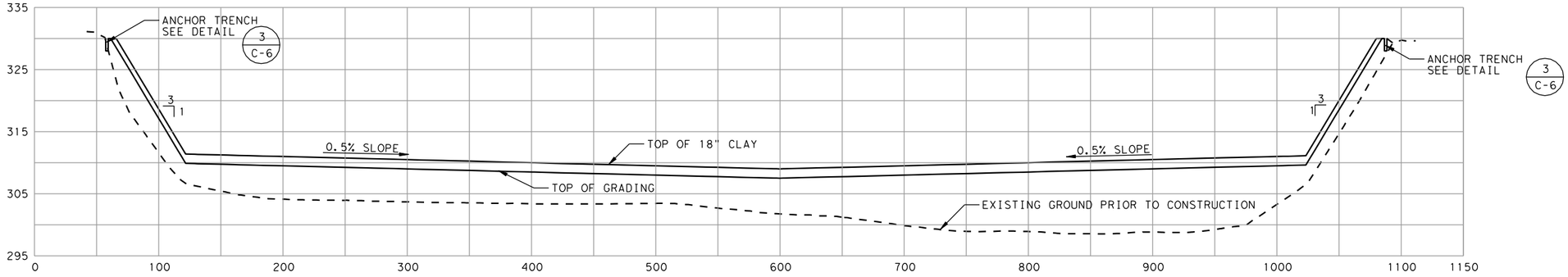
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

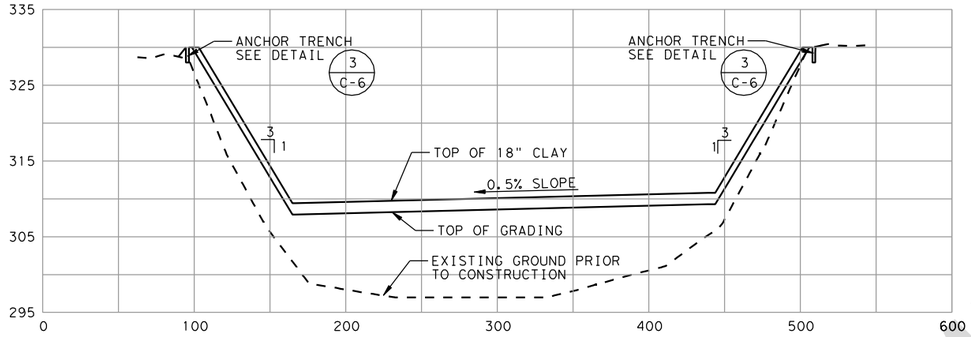
PIPE RACK SECTIONS & DETAILS

FILENAME	C-11.dgn
SCALE	

SHEET **C-11**



CROSS SECTION 1 / C-12
5H:1V



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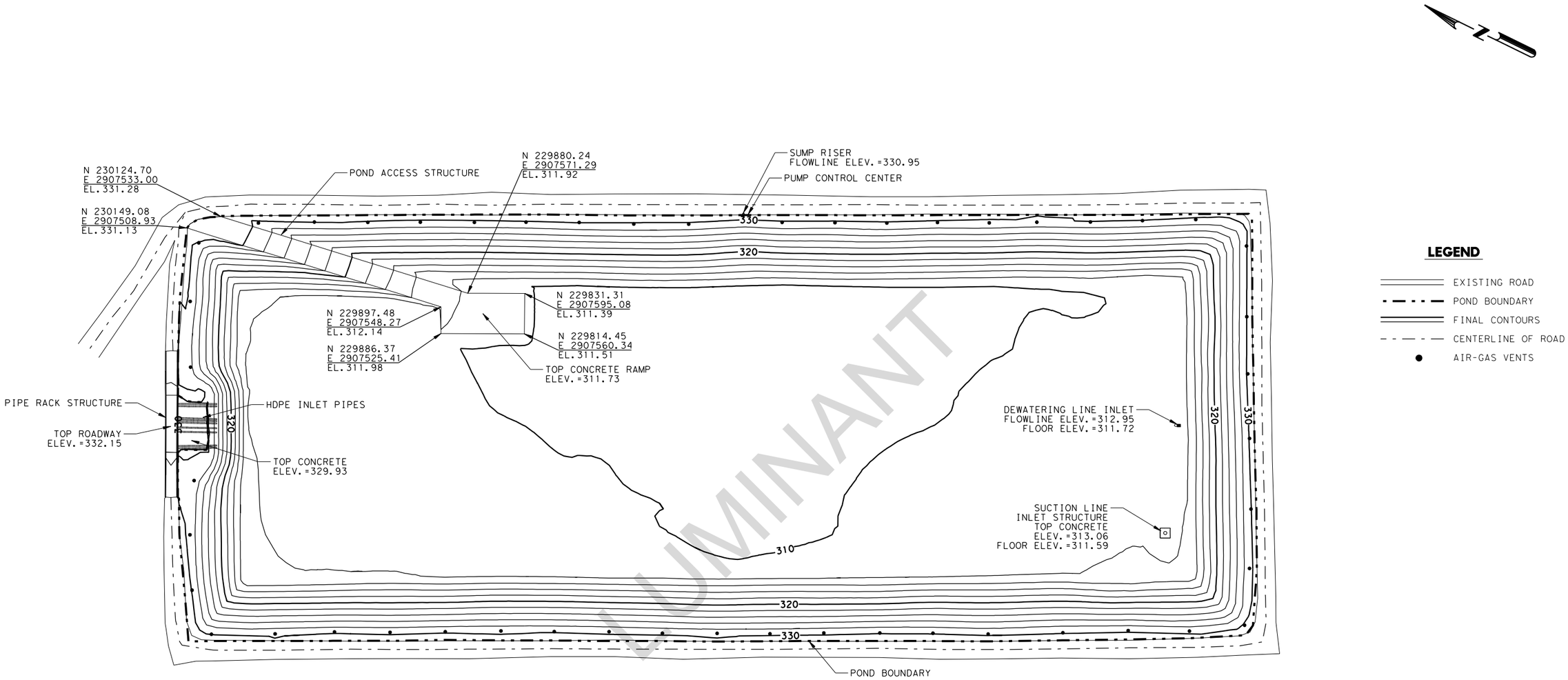
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

CROSS SECTIONS

FILENAME C-12.dgn
SCALE

SHEET C-12



LEGEND

- EXISTING ROAD
- POND BOUNDARY
- FINAL CONTOURS
- CENTERLINE OF ROAD
- AIR-GAS VENTS

NOTE: 1. AS BUILT CONTOURS PROVIDED BY COLLINS SURVEYING AND MAPPING, LONGVIEW, TEXAS.

2. CONTOURS SHOWN ARE TOP OF REVETMENT MATTRESS ELEVATIONS UNLESS OTHERWISE NOTED.

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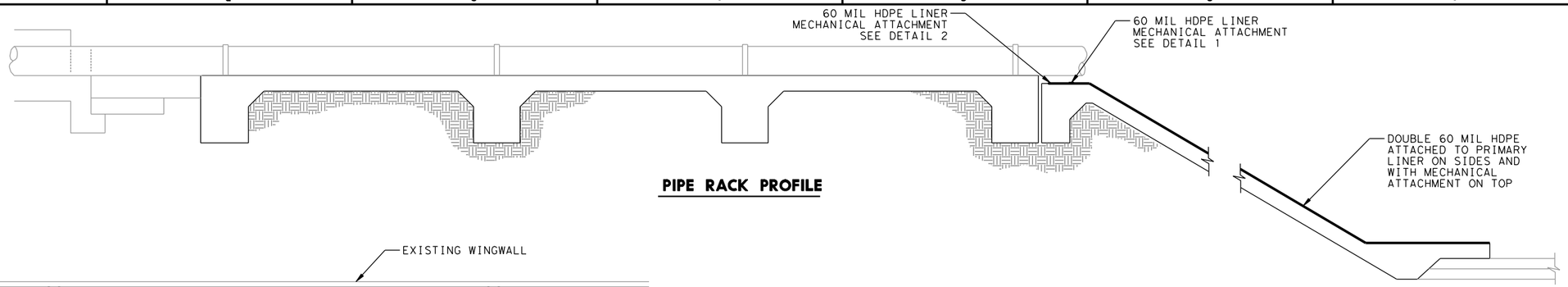
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT FINAL CONTOURS

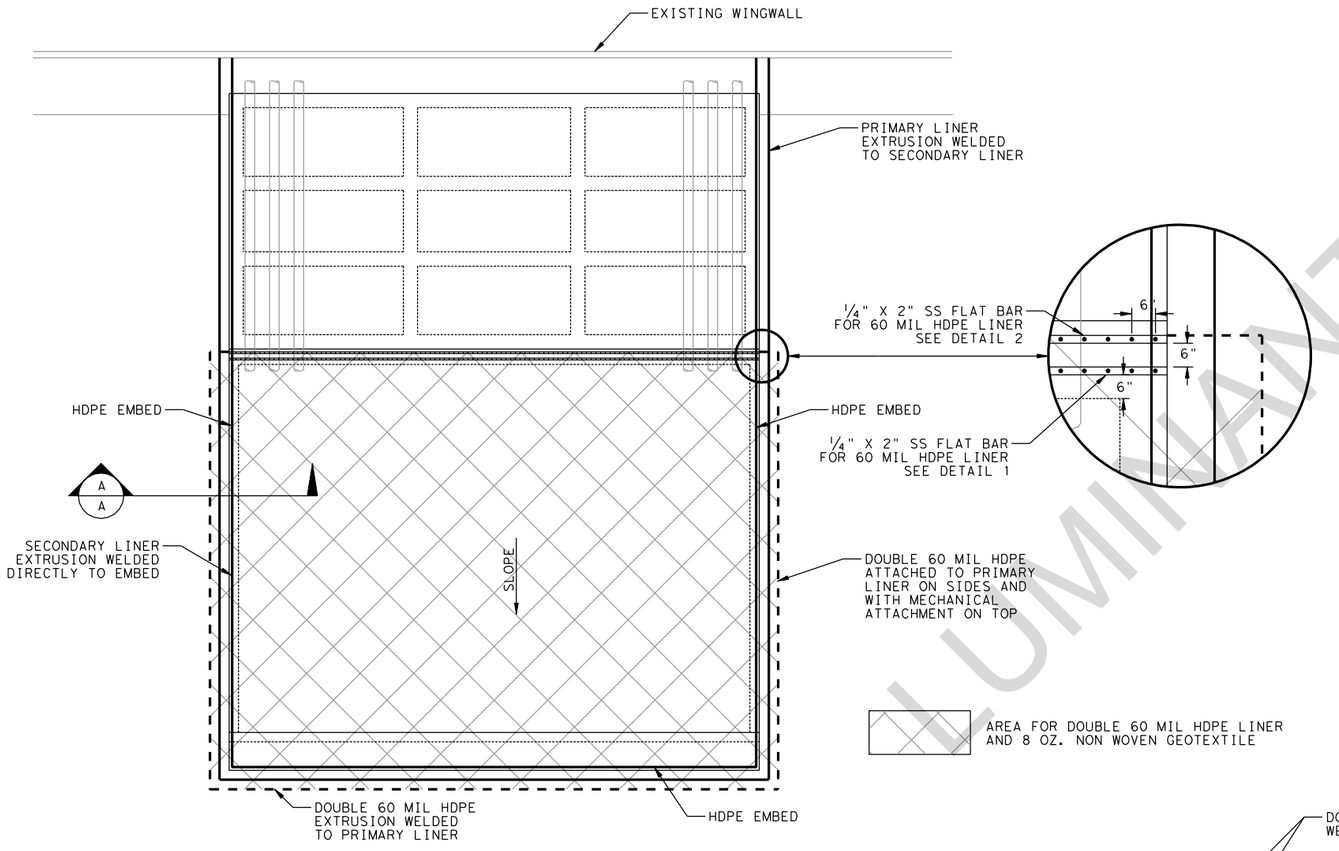
0 50' 100'

FILENAME C-13.dgn
SCALE

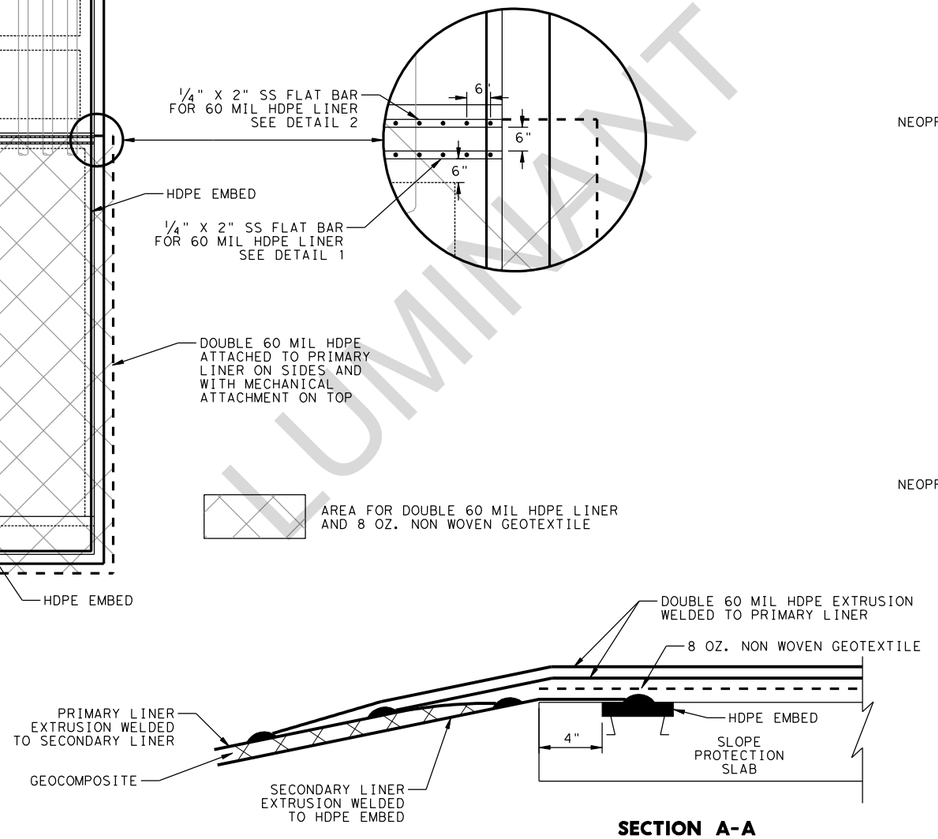
SHEET
C-13



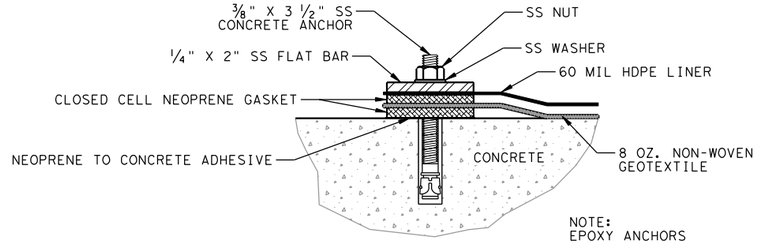
PIPE RACK PROFILE



PIPE RACK PLAN

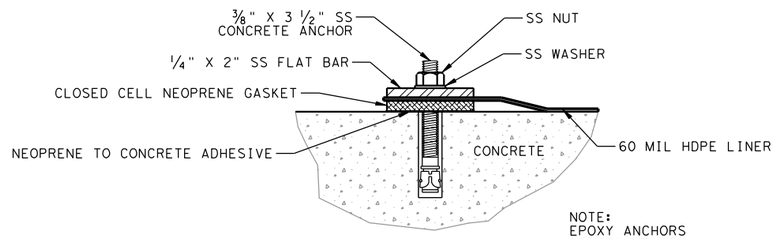


SECTION A-A



MECHANICAL ATTACHMENT TO CONCRETE 1

60 MIL HDPE LINER W/8 OZ. GEOTEXTILE



MECHANICAL ATTACHMENT TO CONCRETE 2

60 MIL HDPE LINER

NOTES:

1. DOUBLE 60 MIL HDPE LINER ADDED OVER PIPE RACK STRUCTURE ON SLOPE.
2. 8 OZ. NON WOVEN GEOTEXTILE ADDED OVER PIPE RACK STRUCTURE ON SLOPE.

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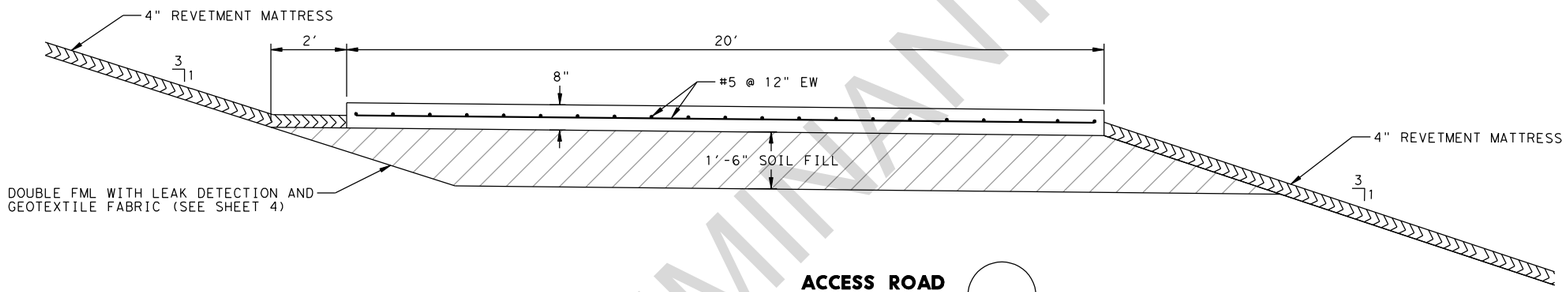
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT MISCELLANEOUS DETAILS

FILENAME	C-14.dgn
SCALE	NOT TO SCALE

SHEET C-14



ACCESS ROAD

NOTE:

8" THICK ACCESS ROAD CONCRETE SECTION USED FOR THE CONCRETE LANDING IN THE POND.

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PENTABLE: 0000000009599.tbl

Luminant

HDR

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	
DESIGNED	
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

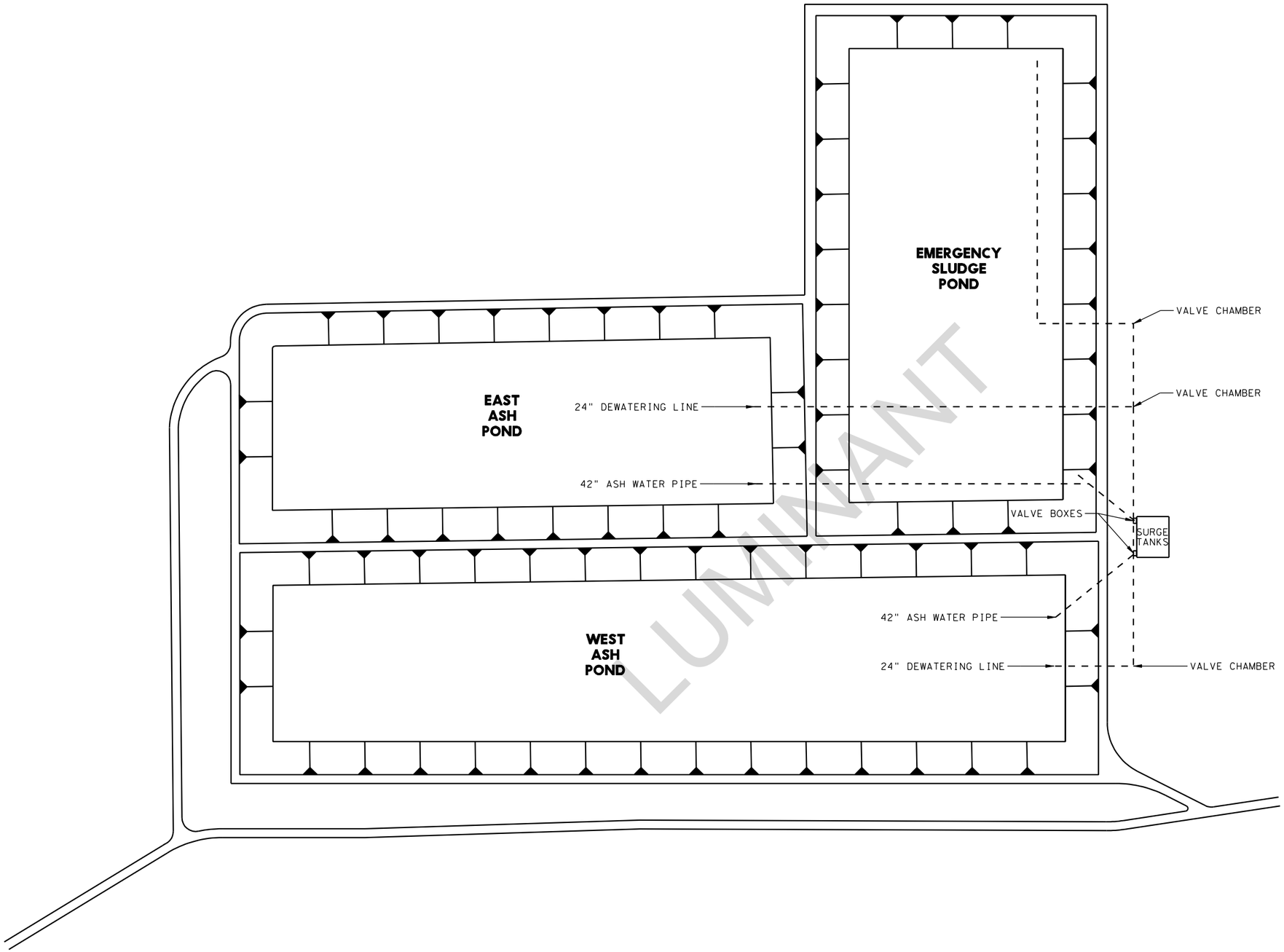
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT POND ACCESS TYPICAL SECTION

0 2' 4'

FILENAME C-15.dgn
SCALE AS SHOWN

SHEET
C-15



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Luminant

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D.VOGT
ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	D.MONTAGUE
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	91399

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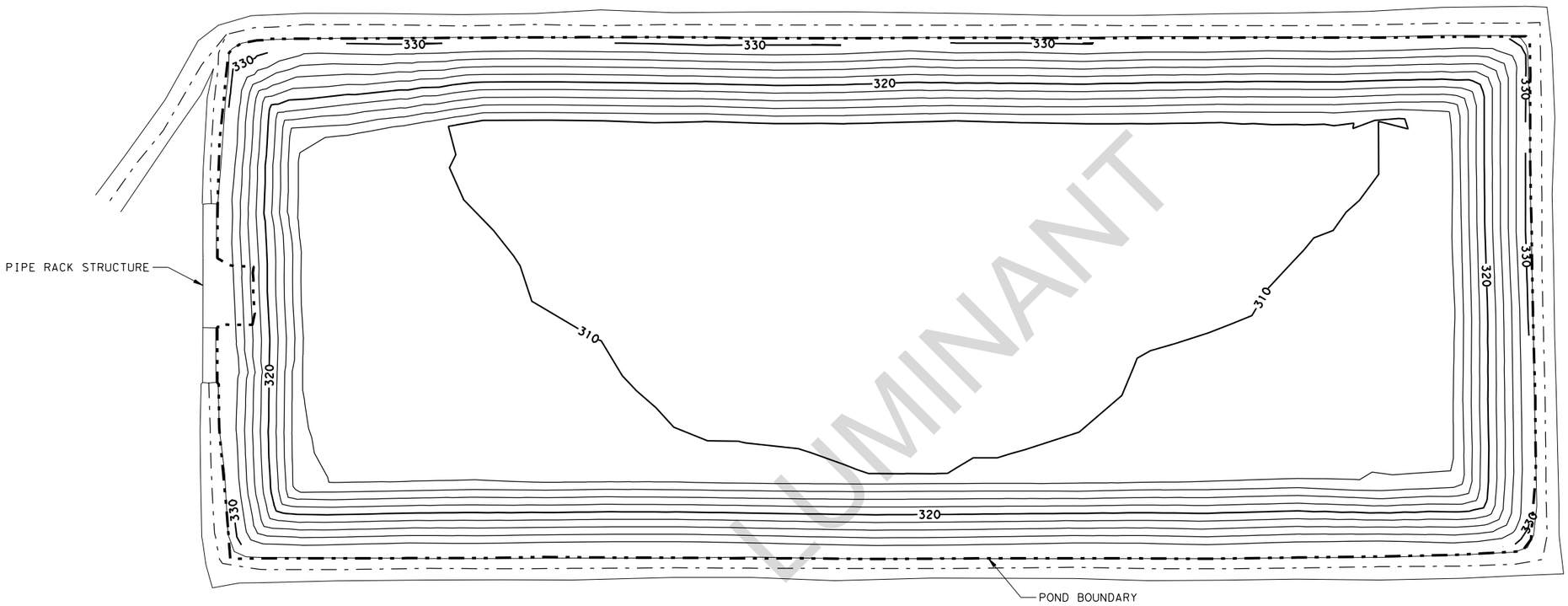
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

DEWATERING PIPE FIGURE

FILENAME	C-16.dgn
SCALE	

SHEET **C-16**



LEGEND

- EXISTING ROAD
- POND BOUNDARY
- FINAL CONTOURS
- CENTERLINE OF ROAD

NOTE: 1. AS BUILT CONTOURS PROVIDED BY COLLINS SURVEYING AND MAPPING, LONGVIEW, TEXAS.

2. CONTOURS SHOWN ARE TOP OF CLAY LINER ELEVATIONS UNLESS OTHERWISE NOTED.

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Luminant

HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D.VOGT
ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	D.MONTAGUE
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	91399

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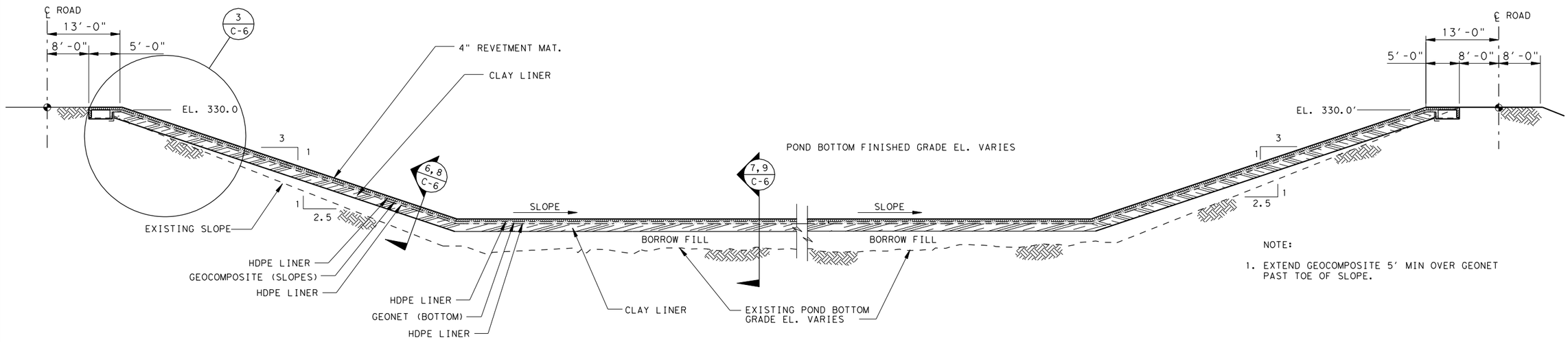
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

AS BUILT LINER CONTOURS

0 50' 100'

FILENAME	C-5.dgn
SCALE	

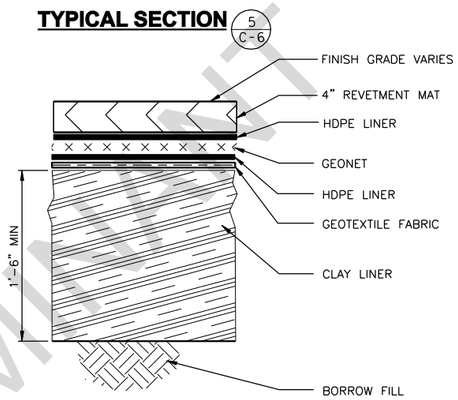
SHEET **C-5**

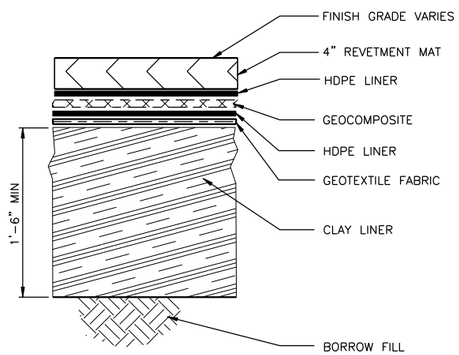


NOTE:

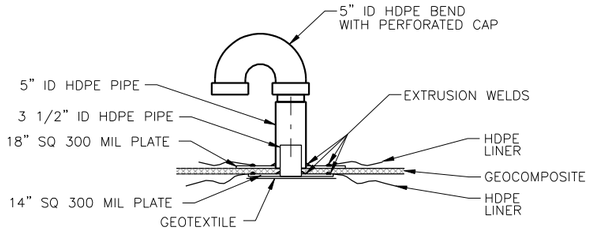
1. EXTEND GEOCOMPOSITE 5′ MIN OVER GEONET PAST TOE OF SLOPE.

TYPICAL SECTION (5 / C-6)

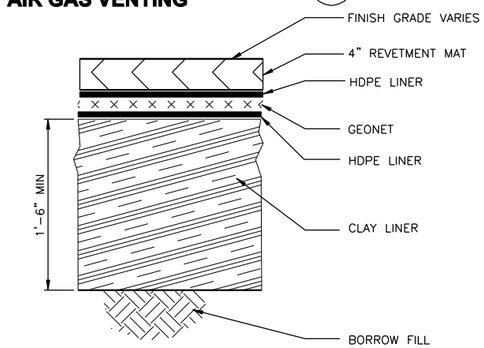




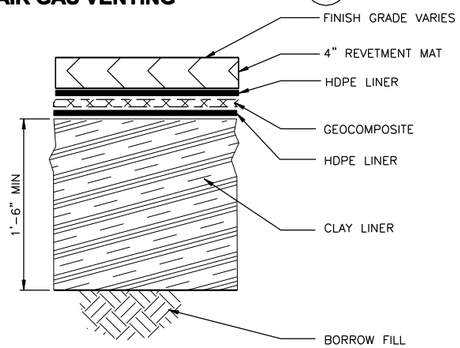
TYPICAL AIR-GAS VENT (4 / C-6)



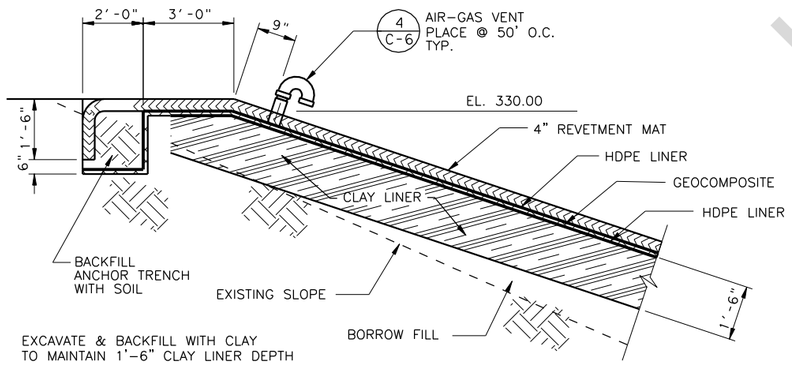
FLOOR LINER SECTION WITH AIR GAS VENTING (9 / C-6)



SLOPE LINER SECTION WITH AIR GAS VENTING (8 / C-6)



TYPICAL TOP OF SLOPE SECTION (3 / C-6)



FLOOR LINER SECTION (7 / C-6)

SLOPE LINER SECTION (6 / C-6)

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PENTABLE: 000000000095999.tbl
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TIME: 11:32:19 AM
DATE: 8/15/2010
FILE: Luminant_Mining_Company_LLC\ML_SES_Reline_East_Ash_Pond\13.00_CAD\Sheet Files\AS BUILTS

Luminant

HDR
HDR Engineering, Inc.
4600 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texaas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

LINER SECTION AND DETAILS

FILENAME	C-6.dgn
SCALE	N.T.S

SHEET C-6

HDR Engineering, Inc.

LUMINANT

DALLAS, TEXAS

RELINE EAST ASH POND

BID DOCUMENTS

CLIENT PROJECT NUMBER: Q090219DLWEASTPOND

CONSTRUCTION SPECIFICATIONS

VOLUME 1 OF 1

2/02/09

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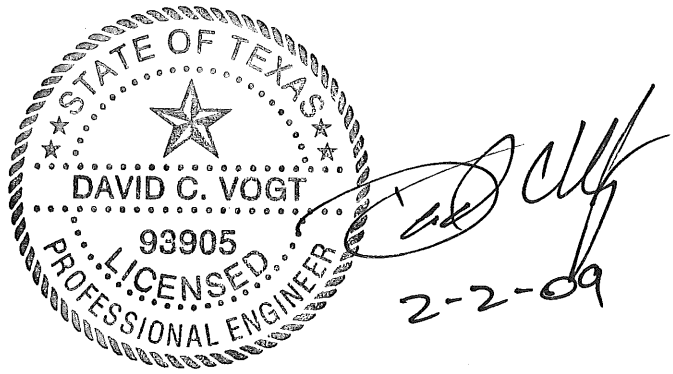
The following specifications were prepared under my direction:

Divisions 1, 2, 3, 11, 15 and the Soil Liner Quality Control Review Plan



David C. Vogt, P.E.
HDR ENGINEERING, INC.
Firm Registration No. 754

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Table of Contents

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DIVISION 1

GENERAL REQUIREMENTS

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SECTION 01024
UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Unit Price is an amount proposed by bidders and stated on the Bid Form as a price per unit of measurement for materials or services added to or deducted from Contract Sum by appropriate modification, if estimated quantities of Work required by Contract Documents are increased or decreased.

C. If quantities originally contemplated are materially changed in a proposed change order so that application of such unit prices to quantities of Work proposed will cause substantial inequity to Owner or Contractor, the applicable unit prices shall be equitably adjusted.

D. Owner will confirm in field the Contractor's measurement of work-in-place that involves use of established unit prices.
   1. If disputes arise, Owner reserves the right to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

1.2 DESCRIPTION

A. Work includes:
   1. Overhead and profit are included in Unit Prices.
   2. Unit Prices are indicated on Bid Form.
   3. Unit Prices indicated on Bid Form will be made part of Contract.

1.3 UNIT PRICES

A. Unit Price No.4: Cost per cubic yard for earthwork in accordance with Section 02200.
   1. The fee will be paid on a cubic yard basis as independently determined by the difference between the pre-excavation survey of the EAP and the post excavation survey of the EAP. The volumetric differences between the two surveys will be converted to a cubic yard quantity for payment to the Contractor.

B. Unit Price No.5: Cost per cubic yard for compacted clay liner in accordance with Section 02276C and Soil Liner Quality Control Plan.
   1. The fee will be paid on a cubic yard basis as independently determined by the difference between the pre-liner survey of the site and the liner completion survey of the site. The volumetric differences between the two surveys will be converted to a cubic yard quantity for payment to the Contractor. However, payment will not be made for additional thickness constructed in order to maintain the minimum thickness requirement.

C. Unit Price No. 7: Cost per cubic yard for concrete pad in accordance with Section 03002.
   1. The fee will be paid on a cubic yard basis as independently determined by the square footage of the area formed multiplied by the specified thickness of the pad. The volume will be converted to cubic yard quantity for payment to the Contractor. However, payment will not be made for additional thickness constructed in order to maintain the minimum thickness requirement.

D. Unit Price No. 10: Cost per square foot for textured HDPE liner in accordance with Section 02775.
   1. The fee will be paid on a square foot basis as independently determined by a survey of the lined area. The survey will be converted to square footage for payment to the Contractor. However, payment will not be made for waste liner, liner used for testing, overlap, and material installed in anchor trenches.

E. Unit Price No. 11: Cost per square foot for geocomposite in accordance with Section 02777.
   1. The fee will be paid on a square foot basis as independently determined by a survey of the area covered with geocomposite. The survey will be converted to square footage for payment to the Contractor. However, payment will not be made for waste material, material used for testing, overlap, and material installed in anchor trenches.

F. Unit Price No. 12: Cost per square foot for geonet in accordance with Section 02777.
   1. The fee will be paid on a square foot basis as independently determined by a survey of the area covered with geonet. The survey will be converted to square footage for payment to the Contractor. However, payment will not be made for waste material, material used for testing, overlap, and material installed in anchor trenches.

G. Unit Price No. 14: Cost per square foot for fabric formed 4 IN concrete revetment mat in accordance with Section 02271.
   1. The fee will be paid on a square foot basis as independently determined by a survey of the area covered with revetment mat. The survey will be converted to square footage for payment to the Contractor. However, payment will not be made for waste material, material used for testing, overlap, and material installed in anchor trenches.

H. Unit Price No. 15: Cost per square yard for flex base in accordance with the plans.
   1. The fee will be paid on a square yard basis as independently determined by a survey of the area covered with flex base. The survey will be converted to square yardage for payment to the Contractor. However, payment will not be made for flex payment installed outside the area identified by the geotechnical professional.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01026

APPLICATIONS FOR PAYMENT AND SCHEDULE OF VALUES (GC)

PART 1 - GENERAL

1.1 SUBMITTALS

A. Project information:
   1. Submittals, prior to first application for payment:
      a. Schedule of Values.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SCHEDULE OF VALUES

A. Prior to first Application for Payment, submit to Owner's Representative a Schedule of Values allocated to various portions of Work, prepared in such form and supported by such data to substantiate its accuracy as Owner and Owner's Representative may require.

B. At a minimum, subdivide into following allocated items:
   1. Mobilization/Demobilization.
   2. Site preparation.
   3. Demolition.
   4. Earthwork.
   5. Compacted clay liner.
   6. Construct pipe rack.
   7. Construct concrete slope protection at pipe rack.
   8. Construct inlet on 24 IN dewater pipe.
   9. Construct inlet on 48 IN dewater pipe.
   10. Install textured HDPE liner.
   11. Install geocomposite.
   12. Install geonet.
   13. Install leak detection sump.
   14. Install 4 IN concrete revetment mat.
   15. Install flex base on road.
   16. Vegetative cover.

C. The schedule, unless objected to by Owner or Owner's Representative, shall be used as a basis for reviewing percent complete of line items on Contractor's Applications for Payments.

3.2 APPLICATION FOR PAYMENT

A. On or before 5th day of month, Contractor submit to Owner's Representative itemized Application for Payment for work completed during previous calendar month, in accordance with schedule of values.

B. Application for Payment serves as certification of status by Contractor of Project.

3.3 RETAINAGE

A. Until Substantial Completion, 10 percent retainage will be withheld from value of Work completed.

END OF SECTION

SECTION 01060
SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. The following terms and definitions shall be used unless defined differently in other Specifications.
   1. Engineer – Consultant responsible for design of specific portions of Project.
   2. Soils Engineer – Engineer hired by Owner to provide design recommendations and Construction materials testing.
   3. Owner - Luminant Power.
   4. MLSES – Martin Lake Steam Electric Station.
   5. EAP – East Ash Pond.

1.2 SUMMARY

A. Section includes:
   1. Preconstruction Conference.
   2. Drawings and Contract Documents for Contractor Use.
   3. Testing.
   4. Order of Construction and Construction Schedule.
   5. Special Considerations.
   6. Historical and Archaeological.

1.3 SUBSTITUTIONS PRIOR TO BIDDING

A. Definitions:
   1. This Section includes administrative and procedural requirements for handling requests for substitutions made prior to bid.
   2. Any product proposed by Contractor which does not meet requirements of the Contract Documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitution.
   3. In case of non-availability of materials, contact Engineer for review and action.
   4. For bidding purposes: base all bids on materials, equipment and procedures specified or approved by Addenda.

B. Product Selection – General:
   1. Certain types of products are described in the specifications and the Drawings by means of trade names, catalog numbers and/or manufacturer's names.
      a. This is not intended to exclude from consideration other products which may be capable of accomplishing purpose indicated.
   2. Other types of products may be considered acceptable to Owner and Engineer in place of those specified.
   3. Listing of a manufacturer implies acceptance of them only as supplier of a product which complies with specified item.
   4. Voluntary alternates will be considered. Bidders will provide base bid on bid tabs and supply alternates for consideration on the alternative bid form.

C. Substitution Requests
   1. Only written requests with complete data for evaluation will be considered.
      a. Request must be received at least 5 calendar days prior to bid date.
      b. Requests received late will not be considered.
      c. Submit evaluation data with attached form to Engineer.

2. In making request for substitution, Supplier's representative:
    a. Has personally investigated proposed product, system or method, and has determined that it is equal or superior in all respects to that specified, and that it will perform intended function.
    b. Is in full compliance with applicable code.
    c. Will provide same warranty for substitute item as for product, system or method specified.
    d. Will coordinate installation of accepted substitution into Work and be responsible for such modifications as may be required for Work to be complete and functional in all respects.
    e. Certifies cost data presented is complete and includes all related costs, excluding Engineer's review and redesign cost.
    f. Waives all claims for additional costs or time extensions related to substitution which subsequently become apparent or are caused by substitution.
    g. Will pay additional costs to other trades, subcontractors or contracts caused by substitution.
    h. Will pay all Engineer's review and redesign cost, special inspections, and other costs caused by substitutions or revisions made necessary by the acts or omissions of Contractor due to: product submittal or product not being ordered in a timely manner, ease of construction progress or Work, or which are in interest of or are for convenience of supplier, subcontractor or Contractor.
    i. Acknowledge acceptance of these provisions.
3. Supplier will sign the substitution request in the space provided on the form acknowledging acceptance of terms.

D. Approval of Substitution Request:
1. No verbal or written approvals other than by Addenda will be valid.
    a. Addendum listing approved substitutions will be published prior to Bid date.

E. Rejection of Substitution Requests
1. Substitutions may not be considered if:
    a. Submitted after stipulated date or time period.
    b. Not submitted in accord with this Section.
    c. Acceptance will require substantial revision of Contract Documents
    d. Substitution request does not indicate specific item for which request is submitted.
    e. Substitution Request form is not properly executed and signed.
    f. Substitution request for manufacturer acceptance only.
    g. Insufficient information submitted.
    h. Substitution does not appear to comply with requirements of specifications for base item.

1.4 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference shall be held at the MLSES Project Office after award of Contract.
1. Engineer will notify the Contractor as to the date and time of the conference two weeks in advance of the proposed date.
2. Contractor's Project Manager, and Project Superintendent and Subcontractor Representatives shall attend.

1.5 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE

A. Contractor shall be provided three (3) copies of the plans and specification at "no charge".
1. Contractor shall pick up all "no-charge" documents within 10 days from date of Notice to Proceed.

B. Additional documents after "no-charge" documents will be furnished to Contractor at cost.

1.6 TESTING

A. Payment for Soil and Other Testing:
   1. Soils testing:
      a. The Owner will pay for "Passing" soils tests on the Project.
      b. Costs of corrective action and costs of "Failing" soils are the sole responsibility of the Contractor.
   2. Other testing:
      a. Required testing, testing procedures, reports, certificates, and costs associated with all phases of securing required satisfactory test information which may be required by individual Sections of Specifications or Drawings are the full responsibility of the Contractor.

1.7 ORDER OF CONSTRUCTION AND CONSTRUCTION SCHEDULE

A. At no time shall Contractor or his employees modify operation of the existing facilities or start construction modifications without approval of the Owner except in an emergency to prevent or minimize damage.

B. Within 15 days after award of Contract, submit a critical path type schedule (Work Schedule) for approval.
   1. Account for schedule of Subcontracts.
   2. Include proper sequence of construction, various crafts, purchasing time, Shop Drawing approval, material delivery, equipment fabrication, startup, demonstration, and similar time consuming factors.
   3. Show on schedule at a minimum, earliest starting, earliest completion, latest starting, latest finish, and free and total float for each task or item.

C. Evaluate schedule no less than once every two weeks.
   1. Update, correct, and rerun schedule and submit to Engineer in triplicate with pay application to show rescheduling necessary to reflect true job conditions.
   2. When shortening of various time intervals is necessary to correct for behind schedule conditions, indicate actions to implement to accomplish work in shorter duration.
   3. Information shall be submitted before implementation to Engineer in writing with revised schedule.

D. If Contractor does not take necessary action to accomplish work according to schedule, Contractor may be ordered by Owner in writing to take necessary and timely action to improve work progress.
   1. Order may require increased work forces, extra equipment, extra shifts or other action as necessary.
   2. Should Contractor refuse or neglect to take such action authorized, under provisions of this Contract, Owner may take necessary actions including, but not necessarily limited to, withholding of payment and termination of Contract.

E. Upon receipt of approved "Work Schedule," within 10 days, submit to Engineer an estimated payment schedule by each month of project duration.
   1. Include a composite curve to show estimated value of work complete and stored materials less specified retainage.
   2. Establish key months when work will be 50, 80, 90, and 100 percent complete.
   3. During the course of work, update with new composite curves at key months or whenever variation is expected to be more than plus or minus 10 percent.

1.8 SPECIAL CONSIDERATIONS

A. Contractor, Contractor’s employees and Subcontractors must abide by Owner’s site rules and regulations at all times.
   1. Viewing of Owner’s safety training video may be required of all Contractor, Subcontractors and employees who will be working on site on this Project.

2. Contractor and his Sub-contractor's activities must not interfere with the everyday activities of the Owner's plant.
3. Owner's Site Representative must be contacted in advance when impending interference with Owner's plant activities is anticipated by Contractor or his Subcontractors.

B. Contractor shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the site and at the contractor's expense.

C. Maintain conditions of access road to site such that access is not hindered as the result of construction related deterioration.

1.9 HISTORICAL AND ARCHAEOLOGICAL

A. If during the course of construction, evidence of deposits of historical or archeological interest are found, the Contractor shall cease operations affecting the find and shall notify Owner immediately.
1. No further disturbance of the deposits shall ensue until the Contractor has been notified by Owner that Contractor may proceed.
2. Owner will issue a notice to proceed after appropriate authorities have surveyed the find and made a determination to Owner.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)

END OF SECTION

SECTION 01340
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Mechanics and administration of the submittal process for:
      a. Shop Drawings.
      b. Samples.
      c. Miscellaneous submittals.
      d. Operation and maintenance manuals.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Sections in Divisions 2 through 16 identifying required submittals.

1.2 DEFINITIONS

A. Shop Drawings:
   1. See Specification 01060.
   2. Product data and samples are Shop Drawing information.

B. Miscellaneous Submittals:
   1. Submittals other than Shop Drawings.
   2. Representative types of miscellaneous submittal items include but are not limited to:
      a. Construction schedule.
      b. Concrete, soil compaction, and pressure test reports.
      c. Geosynthetic material manufacturer's documentation.
      d. Installed equipment and systems performance test reports.
      e. Manufacturer's installation certification letters.
      f. Warranties.
      g. Service agreements.
      h. Construction photographs.
      i. Survey data.
      j. Cost breakdown (Schedule of Values).
      k. Building components

1.3 TRANSMITTALS

A. Shop Drawings, Samples and Operation and Maintenance Manuals:
   1. Transmit all submittals to:

HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, TX 75070
ATTN: Mr. David C. Vogt, P.E.

   2. Utilize four copies of attached Exhibit "A" to transmit all Shop Drawings and samples.
   3. Utilize four copies of attached Exhibit "B" to transmit all Operation and Maintenance Manuals.
   4. All transmittals must be from Contractor and bear his approval stamp.
      a. Transmittals will not be received from or returned to subcontractors.

b. Shop Drawing transmittal stamp shall read "(Contractor's Name) has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of this submittal".
c. Operation and Maintenance Manual transmittal stamp may be Contractor's standard approval stamp.

5. Provide submittal information defining specific equipment or materials utilized on the project.
   a. Generalized product information not clearly defining specific equipment or materials to be provided will be rejected.
6. Calculations required in individual Specification Sections will be received for information purposes only and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.
7. Submittal schedule:
   a. Schedule of Shop Drawings:
      1) Submitted and approved within 14 days of receipt of Notice to Proceed.
      2) Account for multiple transmittals under any specification section where partial submittals will be transmitted.
   b. Shop drawings:
      1) Submittal and approval prior to 50 percent completion.
   c. Operation and Maintenance Manuals and Equipment Record Sheets:
      1) Initial submittal within 30 days after date shop drawings are approved.
8. A $300.00 review charge will be deducted from the contract amount, for the Engineer's review of the second and subsequent re-submittals of any Shop Drawing.

B. Miscellaneous Submittals:
1. Transmit under Contractor's standard letter of transmittal or letterhead.
2. Submit in quadruplicate or as specified in individual specification section.
3. Transmit to:

HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, TX 75070
ATTN: Mr. David C. Vogt, P.E.

4. For concrete, soils compaction and pressure test reports, send a copy of the letter of transmittal to Owner's Representative.
   a. Transmit one copy to location and individual indicated above for other miscellaneous submittals.

1.4 PREPARATION OF SUBMITTALS

A. Shop Drawings:
1. Scope of any letter of transmittal:
   a. Limited to one Specification Section.
   b. Do not submit under any Specification Section entitled (in part) "Basic Requirements".
2. Numbering letter of transmittal:
   a. Include as prefix the specification section number followed by "-xx" beginning with "01".
   b. If more than one submittal under any specification section, number transmittals consecutively.
3. Describing transmittal contents:
   a. Provide listing of each component or item in submittal capable of receiving an independent review action.
   b. Identify for each item:
      1) Manufacturer and Manufacturer's Drawing or data number.
      2) Contract Document tag number(s).

4. Resubmittals:
    a. Number with original root number and a suffix letter starting with "A" on a (new) duplicate transmittal form.
    b. Do not increase the scope of any prior transmittal.
    c. Account for all components of prior transmittal.
        1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
            a) Do not include submittal information for items with prior "A" or "B" Action in transmittal.
        2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
            a) Obtain Engineer's prior approval to exclude items.
5. For 8-1/2 x 11 IN, 8-1/2 x 14 IN, and 11 x 17 IN size sheets, provide four (4) copies of each page for Engineer plus the number required by the Contractor.
    a. The number of copies required by the Contractor will be defined at the Preconstruction Conference, but shall not exceed five (5).
6. For items not covered in paragraph 1.4-A.5 submit one reproducible original and one print of each drawing until approval is obtained.
    a. Utilize mailing tube; do not fold.
    b. The Engineer will mark and return the reproducible to the Contractor for his reproduction and distribution.
7. Provide clear space (3 IN x 3 IN) for Engineer stamping of each component submitted or resubmitted.
8. Contractor shall not use red color for marks on transmittals.
    a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
    b. Outline Contractor marks on reproducible original with a rectangular box.
9. Transmittal contents:
    a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Engineer.
    b. Identify equipment or material use, tag number, Drawing detail reference, weight, and other project specific information.
    c. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
    d. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 IN pages.
        1) Indicate exact item or model and all options proposed.
    e. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout Drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data.
        1) Arrange data and performance information in format similar to that provided in Contract Documents.
        2) Provide, at minimum, the detail provided in the Contract Documents.
    f. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.

B. Samples:
1. Identification:
    a. Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Standard Specification Section or Drawing detail reference, color, range, texture, finish and other pertinent data.

b. If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.

2. Include application specific brochures, and installation instructions.
3. Provide Contractor's stamp of approval on samples or transmittal form as indication of Contractor's checking and verification of dimensions and coordination with interrelated work.
4. Resubmit samples of rejected items.

C. Operation and Maintenance Manuals:
1. Number transmittals for Operation and Maintenance Manual with original root number of the approved shop drawing for the item.
2. Submit two copies until approval is received.
3. Identify resubmittals with the original number plus a suffix letter starting with "A."
4. Submit Operation and Maintenance Manuals printed on 8-1/2 x 11 IN size heavy first quality paper with standard three-hole punching and bound in stiff metal hinged binder constructed as a three-ring style.
   a. Provide binders with titles on front and on spine of binder.
   b. Tab each section of manuals for easy reference with plastic-coated dividers.
   c. Provide index for each manual.
   d. Provide plastic sheet lifters prior to first page and following last page.
5. Reduce drawings or diagrams bound in manuals to an 8-1/2 x 11 IN or 11 x 17 IN size.
   a. However, where reduction is not practical to ensure readability, fold larger Drawings separately and place in vinyl envelopes which are bound into the binder.
   b. Identify vinyl envelopes with drawing numbers.
6. Transmittal Content:
   a. Submission of Operation and Maintenance Manuals is applicable but not necessarily limited to:
      1) Major equipment.
      2) Equipment used with electrical motor loads of 1/6 HP nameplate or greater.
      3) Specialized equipment including valves and instrumentation and control system components for HVAC and process systems such as meters, recorders, and transmitters.
      4) Water control gates.
   b. Operation and Maintenance Manuals shall include, but not necessarily be limited to, the following detailed information, as applicable:
      1) Equipment function, normal operating characteristics, limiting operations.
      2) Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
      3) Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
      4) Lubrication and maintenance instructions.
      5) Guide to "troubleshooting."
      6) Parts list and predicted life of parts subject to wear.
      7) Outline, cross-section, and assembly Drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
      8) Test data and performance curves.
      9) A list of recommended spare parts with a price list and a list of spare parts provided under these Specifications.
      10) Copies of installation instructions, parts lists or other documents packed with equipment when delivered.
      11) Instrumentation or tag numbers relating the equipment back to the Contract Documents.

12) Include a filled-out copy of the Equipment Record Sheet, Exhibits C1 and C2 as the first page(s) of each Operation and Maintenance Manual.
    a) Complete maintenance requirements in detail.
    b) Simple reference to the Manual is not acceptable.
13) For equipment items involving components or subunits, an Equipment Record Sheet for each operating component or subunit is required.

1.5 ENGINEERS REVIEW ACTION:

A. Shop Drawings and samples:
1. Items within transmittals will be reviewed for overall design intent and will receive one of the following actions:
    a. A- FURNISH AS SUBMITTED.
    b. B- FURNISH AS NOTED (BY ENGINEER).
    c. C- REVISE AND RESUBMIT.
    d. D- REJECTED.
    e. E- ENGINEER'S REVIEW NOT REQUIRED.
2. Transmittals received will be initially reviewed to ascertain inclusion of Contractor's approval stamp.
    a. Drawings not stamped by the Contractor or stamped with a stamp containing language other than that specified in Paragraph 1.3.A.4b., will not be reviewed for technical content and will be returned without any action.
3. Transmittals returned with Action "A" or "B" is considered ready for fabrication and installation.
    a. If for any reason a transmittal that has an "A" or "B" Action is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal.
    b. Destroy, or conspicuously mark "SUPERSEDED", all documents having previously received "A" or "B" Action that are superseded by a resubmittal.
4. Transmittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
    a. The portion of the transmittals given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference).
        1) One copy of the "C" or "D" Drawings will be marked up and returned to the Contractor.
        2) Correct and resubmit items so marked.
    b. Items marked "A" or "B" will be fully distributed.
    c. If a portion of the items or system proposed are acceptable, however, the major part of the individual Drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" Action.
        1) This is at the sole discretion of the Engineer.
        2) In this case, some drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package."
        3) Distribution to the Owner and field will not be made (unless previously agreed to otherwise).
5. Failure to include any specific information specified under the submittal paragraphs of the Specifications will result in the transmittal being returned to the Contractor with "C" or "D" Action.
6. Transmittals such as submittals which the Engineer considers as "Not Required," submittals information which is supplemental to but not essential to prior submitted information , or items of information in a transmittal which have been reviewed and received "A" or "B" Action in a prior transmittal, will be returned with Action "E", (Engineer's Review Not Required).

B. Operation and Maintenance Manuals:
1. Engineer will review and indicate one of the following review actions:
    a. ACCEPTABLE.

b. FURNISH AS NOTED.
c. REVISE AND RESUBMIT.
d. REJECTED.

2. Acceptable submittals will be retained with the transmittal form returned with a request for five additional copies.
3. Deficient submittals will be returned along with the transmittal form which will be marked to indicate deficient areas.

END OF SECTION

EXHIBIT A

Shop Drawing Transmittal No. _____-_____

(Spec Section) (Series)

Project Name:		Date Received:	
Project Owner:		Checked By:	
Contractor:	HDR Engineering, Inc.	Log Page:	
Address:	Address:	HDR No.:	
		Spec Section:	
		Drawing/Detail No.:	
Attn:	Attn:	1st. Sub	ReSub.
Date Transmitted:	Previous Transmittal Date:		

Item No.	No. Copies	Description	Manufacturer	Mfr/Vendor Dwg or Data No.	Action Taken*

Remarks:

* The Action designated above is in accordance with the following legend:

A - Furnish as Submitted

B - Furnish as Noted

C - Revise and Submit
1. Not enough information for review.
2. No reproducibles submitted.
3. Copies illegible.
4. Not enough copies submitted.
5. Wrong sequence number.
6. Wrong resubmittal number.
7. Wrong spec. section.
8. Wrong form used.
9. See comments.

D - Rejected

E - Engineer's review not required
1. Submittal not required.
2. Supplemental Information. Submittal retained for informational purposes only.
3. Information reviewed and approved on prior submittal.
4. See comments.

Comments:

By Date

Distribution: Contractor ☐ File ☐ Field ☐ Owner ☐ Other ☐

EXHIBIT B

O&M Manual Transmittal No. _____-_____

(Spec Section) (Series)

Project Name:		Date Received:
Project Owner:		Checked By:
Contractor:	Owner:	Log Page:
Address:	Address:	HDR No.:
Attn:	Attn:	1st. Sub. ReSub.
Date Transmitted:	Previous Transmittal Date:	

No. Copies	Description of Item	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks:

To:

From:
HDR Engineering, Inc.

Date:

* The Action designated above is in accordance with the following legend:

A - Acceptable, provide one (1) additional paper copy and two (2) electronic copies on CD-ROM for final review.

B - ~~Furnish as Noted~~ - Not Used

C - Revise and Resubmit
This Operation and Maintenance Manual Submittal is deficient in the following area:

1. Equipment Records.
2. Functional description.
3. Assembly, disassembly, installation, alignment, adjustment & checkout instructions.
4. Operating instructions.
5. Lubrication & maintenance instructions.
6. Troubleshooting guide.
7. Parts list and ordering instructions.
8. Organization (binder, binder titles, index & tabbing).
9. Wiring diagrams & schematics specific to installation.
10. Outline, cross section & assembly diagrams.
11. Test data & performance curves.
12. Tag or equipment identification numbers.
13. Inclusion of all components & subcomponents.
14. Other - see comments.

D - ~~Rejected~~ - Not Used

Comments:

By Date

Distribution: Contractor ☐ File ☐ Field ☐ Owner ☐ Other ☐

EXHIBIT C1

Equipment Record

Equipment Data and Spare Parts Summary

Project Name			Specification Section:
Equipment Name			Year Installed:
Project Equipment Tag No(s).			
Equipment Manufacturer			Project/ Order No.
Address			Phone
Fax	Web Site	E-mail	
Local Vendor/Service Center			
Address			Phone
Fax	Web Site	E-mail	

MECHANICAL NAMEPLATE DATA

Equip.		Serial No.		
Make		Model No.		
ID No.	Frame No.	HP	RPM	Cap.
Size	TDH	Imp. Sz.	CFM	PSI
Other:				

ELECTRICAL NAMEPLATE DATA

Equip.				Serial No.				
Make				Model No.				
ID No.	Frame No.	HP	V.	Amp.	HZ	PH	RPM	SF
Duty	Code	Ins. Cl.	Type	NEMA	C Amb.	Temp. Rise	Rating	
Other:								

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity

EXHIBIT C2

Equipment Record

Recommended Maintenance Summary

Equipment Description	Project Equip. Tag No(s).

RECOMMENDED BREAK-IN MAINTENANCE (FIRST OIL CHANGES, ETC.)	INITIAL COMPLETION * FOLLOWING START-UP						
	D	W	M	Q	S	A	Hours

RECOMMENDED PREVENTIVE MAINTENANCE	PM TASK INTERVAL *						
	D	W	M	Q	S	A	Hours

* D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time Interval

EXHIBIT C3

Equipment Record

Lubrication Summary

Equipment Description	Project Equip. Tag No(s).

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

Lubricant Point

Lubricant Type		Manufacturer	Product	AGMA #	SAE #	ISO
	1					
	2					
	3					
	4					
	5					

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SECTION 01500

CONSTRUCTION FACILITIES, TEMPORARY CONTROLS AND UTILITIES

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to following:
   1. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
   2. International Building Code – Chapter 33 – Safeguards During Construction.
   3. Building code requirements.
   4. Health and safety regulations.
   5. Utility company regulations.
   6. Police, fire department, and rescue squad rules.
   7. Environmental protection regulations.
   8. Local agencies' requirements and regulations.

B. Required exits, existing structural elements, fire protection devices and sanitary safeguards shall be maintained at all times during remodeling, alterations, repairs or additions to any building or structure.
   1. When such required elements or devices are being remodeled, altered or repaired, adequate substitute provisions shall be made or performed when existing building is not occupied.

C. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use.
   1. Obtain required certifications and permits for temporary utilities and include in base bid all fees, labor and materials for necessary services.

D. Use qualified personnel for installation of temporary facilities.
   1. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of Work.
   2. Relocate and modify facilities as required.

1.2 TEMPORARY UTILITIES - GENERAL

A. All fees, labor and materials, including temporary equipment and connection thereof, required to provide temporary utility services necessary for maintaining existing services and for execution of Work and tests required in various sections of Specifications, shall be provided by Contractor at Contractor's expense, except where otherwise specified.

B. Maintain and keep temporary services and facilities clean and neat in appearance, including those furnished or provided by Owner for Contractor's use.
   1. Operate in a safe and efficient manner.
   2. Coordinate with Owner to relocate temporary services and facilities as Work progresses.
   3. Do not overload facilities or permit them to interfere with progress.
   4. Take necessary fire-prevention measures.
   5. Do not allow hazardous, dangerous, unsanitary conditions or public nuisances to develop or persist on-site.

C. Remove all temporary equipment and connections, and leave premises and existing permanent apparatus in an equivalent condition as existed prior to making temporary connections.
   1. Service utility connections shall be discontinued and capped in accordance with the approved rules and the requirements of the authority having jurisdiction.

1.3 TEMPORARY WATER

A. Make all arrangements to provide equipment, piping, and outlets for an adequate supply of clean water for construction purposes.
   1. Existing water distribution system may be used for temporary service.
   2. Provide temporary meters and pay costs of installation and use.
   3. Provide pressure backflow preventer at each connection.

B. Contractor pays for all potable water used.
   1. Contractor shall provide Owner with monthly totals of potable water used for construction purposes.

C. Furnish drinking water and paper cups for all those connected with the Work.

1.4 TEMPORARY SANITARY FACILITIES

A. Provide temporary sanitary facilities for use by construction workers during construction, remodeling or demolition activities.

B. Do not use existing toilet facilities in occupied areas or new toilet facilities in construction area without Owner's written consent.

C. Provide facilities complying with local, State and Federal sanitary laws and regulations.

D. Keep temporary sanitary facilities maintained, clean and in sanitary condition.

E. Provide adequate supplies of toilet paper, cleaning supplies and other required items.

1.5 PROTECTION OF ADJOINING PROPERTY

A. Adjoining public and private property shall be protected from damage during construction, remodeling and demolition work.
   1. Protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs.
   2. Provisions shall be made to control water runoff and erosion during construction or demolition activities.
   3. Provide written notice to owners of adjoining buildings advising them that excavation is to be made and that adjoining buildings should be protected.
      a. Said notification shall be delivered not less than 10 days prior to the scheduled start date of excavation.

1.6 TEMPORARY STORAGE AND STAGING AREAS

A. Construction equipment and materials shall be stored and placed so as not to endanger the public, construction workers or adjoining property for duration of Project.

B. Temporary use of streets or public property for storage, handling of materials or of equipment required for construction or demolition, and the protection provided to the public shall comply with the provisions of the authority having jurisdiction.

C. Construction materials and equipment shall not be placed or stored so as to obstruct access to fire hydrants, standpipes, fire or police alarm boxes, catch basins or manholes, nor shall such material or equipment be located within 20 FT of a street intersection, or placed so as to obstruct normal observations of traffic signals or to hinder the use of public transit loading platforms.

D. Building materials, fences, sheds or any obstruction of any kind shall not be placed so as to obstruct free approach to any fire hydrant, fire department connection, utility pole, manhole, fire alarm box or catch basin, or so as to interfere with the passage of water in gutter.
   1. Protection against damage shall be provided to such utility fixtures during the progress of Work, but sight of them shall not be obstructed.

E. Prior to start of Work, meet with installers to arrange and prepare plot plan defining staging, storage, field office and traffic areas.
   1. Obtain Owner's approval of plan.
   2. Except as specifically provided, working and storing outside these areas will not be permitted.
   3. Arrange and locate temporary structures and storage to avoid interfering with construction.

F. Within area designated for Contractor and Subcontractor's use, Contractor and Subcontractors provide suitable and sufficient enclosed and covered spaces, with raised flooring, to protect materials and equipment from damage by weather or construction work.
   1. Maintain storage and working areas in clean and orderly condition.

1.7 TEMPORARY PROTECTION

A. Protect Work in progress and adjoining materials in place during handling and installation.

B. Supervise construction operation to assure that Work, completed or in progress, is not subject to harmful, dangerous, damaging or otherwise harmful exposure throughout construction period.
   1. Prevent accumulation of water on site:
      a. Remove standing water.
      b. Pump or direct away from site and adjoining property.
   2. Prevent accumulation of water on slabs, adjacent to the building or foundations, or in utility trenches.
   3. Prevent damage to structural members.

C. Apply protective covering to assure protection of Work from damage or deterioration.
   1. Remove coverings at Substantial Completion.

D. Adjust, lubricate and maintain operable components to assure operability without damaging effects throughout construction period.

1.8 TEMPORARY ACCESS ROADS

A. Provide access on site as required to perform Work.

B. Construction site access roads shall be maintained free of obstruction at all times.

C. Clean up all debris, materials, etc., that falls from vehicles in route to and from site.

D. Do not block access to Owner's facilities.

E. When this access is no longer required, restore to its original condition.

1.9 TRAFFIC CONTROL

A. Provide any traffic control deemed necessary to effectively streamline Owner operations.

B. Provide and maintain adequate traffic control and flagmen's services at all points where transporting of equipment and materials engaged on Work enters and exits from Project site and on site.

1.10 SITE ACCESS AND PARKING

A. Contractor shall use the primary entrance to the facility and park at the area designated as the "Staging Area". Staging Area location will be identified to bidders at the pre-bid meeting.

1.11 COMPLETION OF WORK

A. Upon completion of Work or as progress of work dictates or sooner if directed by Owner or Owner's Representative, remove all temporary facilities, and return all improvements on or about site and adjacent property which are not shown to be altered, removed or otherwise changed, to the condition which existed previous to starting work.

END OF SECTION

SECTION 01505
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Addresses:
   1. Management of municipal solid waste, industrial waste and construction waste.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT:

A. Provide handling, containers, storage, signage, transportation, and other items as required to manage municipal solid waste, industrial waste and construction waste during the entire duration of the Contract. Comply with the following procedures:
   1. Waste bin areas are to be maintained in an orderly manner and clearly marked to avoid contamination of materials.
      a. Inspect containers and bins weekly for contamination and remove contaminated materials if found.
   2. Stockpile processed materials on site without intermixing with other materials.
      a. Place, grade, and shape stockpiles to drain surface water.
      b. Cover to prevent windblown dust.
   3. Store materials away from construction area. Do not store within drip line of remaining trees.
   4. Store components off the ground and protect from weather.
   5. Remove construction waste including, but not limited to, municipal solid waste, hazardous waste and non-hazardous waste generated during construction activities off Owner's property and transport to appropriate receiver or processor.

B. Store Hazardous Wastes in secure areas and comply with the following:
   1. Hazardous wastes shall be separated, stored and disposed of in accordance with local, state and federal regulations with additional criteria listed below:
      a. Building products manufactured with PVC or containing chlorinated compounds shall not be incinerated.
      b. Disposal of fluorescent tubes in open containers is not permitted.

C. Unused fertilizers shall not be co-mingled with construction waste.

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate, for the Work occurring at Project site.

E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied facilities.
   1. Comply with environmental controls specified in Division 01 Section 01500 Temporary Facilities, Construction Controls and Facilities.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a manner acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Disposal: Transport waste materials off Owner's property and legally dispose of them. Disposal on Owner's property is prohibited.

END OF SECTION

SECTION 01560
ENVIRONMENTAL PROTECTION AND SPECIAL CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Addresses:
   1. Minimizing the pollution of air, water, or land; control of noise; the disposal of solid waste materials; and protection of deposits of historical or archaeological interest.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.

1.2 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340.

B. Prior to the start of any construction activities, submit:
   1. A detailed proposal of all methods of control and preventive measures to be utilized for environmental protection.
   2. An estimate of the amount of water that may be needed for construction activities.
   3. A Drawing of the work area, haul routes, storage areas, access routes and current land conditions including trees and vegetation.
   4. A copy of the NPDES/TPDES permit for storm water discharges (NOI) from construction activities.
      a. Contractor will submit to Luminant's Environmental Services for approval prior to acquiring permits.
   5. A copy of the contractor's approved stormwater pollution prevention plan (SWPPP).
      a. Contractor is responsible for preparation and implementation of the requirements of SWPPP.
      b. Contractor shall submit SWPPP to Luminant's Environmental Services for approval.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Employ and utilize environmental protection methods, obtain all necessary permits, and fully observe all local, state, and federal regulations including, but not limited to the NPDES/TPDES General Permit for Storm Water Discharge and Pollution Prevention Plan, if needed.

B. Land Protection:
   1. Except for any work or storage area and access routes specifically assigned for use by the Contractor, the land areas outside the limits of construction shall be preserved in their present condition.
      a. Contractor shall confine his construction activities to areas defined for work within the Contract Documents.
   2. Manage and control all borrow areas, work or storage areas, access routes and embankments to prevent sediment from entering nearby water or land adjacent to the work site.

3. Restore all disturbed areas including borrow and haul areas and establish permanent type of locally adaptable vegetative cover.
4. Unless earthwork is immediately paved or surfaced, protect all side slopes and backslopes immediately upon completion of final grading until final acceptance by Owner.
5. Plan and execute earthwork in a manner to minimize duration of exposure of unprotected soils.
6. Except for areas designated by the Contract Documents to be cleared and grubbed, the Contractor shall not deface, injure or destroy trees and vegetation, nor remove, cut, or disturb them without approval of the Engineer.
    a. Any damage caused by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense.

C. Surface Water Protection:
1. Utilize, as necessary, erosion control methods to protect side and backslopes and minimize the discharge of sediment to the surface water leaving the construction site as soon as rough grading is complete.
    a. These controls shall be maintained until the site is ready for final grading and landscaping or until they are no longer warranted and concurrence is received from the Engineer.
        1) Physically retard the rate and volume of runon and runoff by:
            a) Implementing structural practices such as diversion swales, terraces, straw bales, compost socks, silt fences, berms, storm drain inlet protection, rocked outlet protection, sediment traps and temporary basins.
            b) Implementing vegetative practices such as temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffers, hydroseeding, anchored erosion control blankets, sodding, vegetated swales or a combination of these methods.
            c) Providing Construction sites with graveled or rocked access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads.
2. Discharges from the construction site shall not contain pollutants at concentrations that produce objectionable films, colors, turbidity, deposits or noxious odors in the receiving stream or waterway, in accordance with the Contractor’s TPDES Construction permit.

D. Fuel and Chemical Handling:
1. Store and dispose of chemical wastes in a manner approved by regulatory agencies.
2. Take special measures to prevent chemicals, fuels, oils, greases, herbicides, and insecticides from entering drainage ways.
3. Do not allow water used in onsite material processing, concrete curing, cleanup, and other waste waters to enter a drainage way(s) or stream.
4. The Contractor shall provide containment around fueling and chemical storage areas to ensure that spills in these areas do not reach waters of the state.

E. Control of Dust:
1. The control of dust shall mean that no construction activity shall take place without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne so that it remains visible beyond the limits of construction.
    a. Reasonable measures may include paving, frequent road cleaning, planting vegetative groundcover, and application of water.
2. Utilize methods and practices of construction to eliminate dust in full observance of agency regulations.
3. The Engineer will determine the effectiveness of the dust control program and may request the Contractor to provide additional measures at no additional cost to Owner.

F. Disposal of Vegetative Waste Materials:
1. Do not burn combustible materials on site without approved permits.
2. Submit approved permits to Luminant’s Environmental Services prior to performing any burning.

3. Material may temporarily be stored onsite, in locations and pile sizes approved by Luminant's Environmental Services.
4. Do not bury organic matter on site unless approved by Luminant's Environmental Services.
5. Chipped clearing debris may temporarily be stored in a location approved by Luminant's Environmental Services.

G. Control of Noise:
1. Control noise by fitting equipment with appropriate mufflers.

H. Completion of Work:
1. Upon completion of work, leave area in a clean, natural looking condition.
2. Ensure all signs of temporary construction and activities incidental to construction of required permanent work are removed.
3. Grade, fill and seed all disturbed areas outside the EAP area, including soil stockpiles.

I. Historical Protection:
1. If during the course of construction, evidence of deposits of historical or archaeological interests are found, cease work affecting find and notify Owner and Engineer immediately.
2. Do not disturb deposits until written notice from Engineer is given to proceed.

J. Site Access and Parking:
1. Contractor shall use the primary entrance to the facility and park at the area designated as the "Staging Area". Staging Area location will be identified to bidders at the pre-bid meeting.

K. Water:
1. Water for dust control, soil use and liner construction can be taken from Martin Lake in locations identified on the Plans.
    a. Contractor will keep records on the quantity of water removed from the lake and will provide these records to Owner monthly and upon project completion.

END OF SECTION

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SECTION 01600
PRODUCT DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Scheduling of product delivery.
   2. Packaging of products for delivery.
   3. Protection of products against damage from:
      a. Handling.
      b. Exposure to elements or harsh environments.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.

C. Payment:
   1. No payment will be made to Contractor for equipment or materials not properly stored and insured or without approved shop drawings.
      a. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.

1.2 DELIVERY

A. Scheduling:
   1. Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.

B. Packaging:
   1. Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.

C. Identification:
   1. Clearly and fully mark and identify as to manufacturer, item and installation location.

D. Protection and Handling:
   1. Provide manufacturer's instructions for storage and handling.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 PROTECTION, STORAGE AND HANDLING

A. Manufacturer's Instruction:
   1. Protect all products or equipment in accordance with manufacturer's written directions.
      a. Store products or equipment in location to avoid physical damage to items while in storage.
      b. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
   2. Protect equipment from exposure to elements and keep thoroughly dry.

3. Store pumps, motors, electrical equipment and other equipment having antifriction or sleeve bearings in watertight warehouses which are maintained at a temperature of at least 50° F.

3.2 FIELD QUALITY CONTROL

A. Inspect Deliveries:
   1. Inspect all products or equipment delivered to the site prior to unloading. Reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.

B. Monitor Storage Area:
   1. Monitor storage area to ensure suitable temperature and moisture conditions are maintained.

END OF SECTION

DIVISION 2

SITE WORK

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SECTION 02073
BUILDING/STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition of all structures and improvements including but not limited to:
      a. Pipe rack.
      b. Concrete slope protection at pipe rack.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 01505 – Construction Waste Management.
   4. Section 01560 – Environmental Protection and Special Controls.
   5. Section 02200 - Earthwork.

C. Health and Safety Plan:
   1. The Contractor shall complete all work in conformance with their site specific Health and Safety Plan and as applicable to the situation.

D. Material Ownership: Materials shall become Contractor's property and shall be removed from site.

1.2 QUALITY ASSURANCE

A. All work shall comply with all applicable Codes, Standards, federal, state, and local regulations including but not limited to the following:
   1. United States Environmental Protection Agency (EPA):
      a. 40 CFR 268.45, Treatment for Hazardous Debris.
   2. OSHA Requirements.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items.

B. Clean: Uncontaminated, non-hazardous as defined by applicable federal, state and local regulations.

1.4 BASIS OF PAYMENT

A. Payment for building/structure demolition shall be lump sum.

1.5 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Demolition schedule.

B. Miscellaneous Submittals:
   1. Site Specific Health and Safety Plan.
   2. Copies of permits and approvals required by law.
   3. Photographs or videotape, sufficiently detailed, of pre-existing conditions of adjacent facilities and structures that might be misconstrued as damage caused by demolition conditions.
   4. Record Drawings at Project closeout.

5. Identify and accurately locate utilities and other subsurface structural, electrical, or mechanical improvements.

1.6 SITE CONDITIONS

A. Pre-work Conditions:
   1. Buildings/structures to be demolished shall be vacated and their use discontinued before start of demolition work.
   2. Contractor shall record pre-existing conditions with photographs or video.
   3. See "Submittals" above.

B. Contractor Responsibility:
   1. Contractor shall field verify all material to be demolished prior to submitting their bid.
   2. Contractor shall obtain local demolition permits and approvals required by law.
      a. Contractor shall inform appropriate fire and health official of intended activities.

C. Owner Responsibility:
   1. Owner assumes no responsibility for actual conditions of buildings and structures to be demolished.
   2. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as far as practical.

1.7 SCHEDULING

A. Schedule Submittal and Approval Requirements:
   1. Contractor shall prepare and submit to Engineer a demolition schedule as part of the Work Schedule prepared per Section 01060.

PART 2 - PRODUCTS

2.1 ITEMS FOR SALVAGE

A. No items are scheduled for salvage.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions and correlate with requirements indicated to determine extent of demolition work.

3.2 DEMOLITION PREPARATION

A. Install construction fence as required by local building code.
   1. Contractor's limits of proposed construction fence must be approved in writing by the Owner.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, street, walks, and other adjacent structures and facilities.

C. Conduct demolition operations to prevent injury to people and damage to adjacent structures and facilities to remain.
   1. Ensure safe passage of people around demolition area.

D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of adjacent structures and facilities to remain.

E. Conduct all facility equipment disassembly and dust removal and control, and other necessary prerequisite work specified elsewhere, prior to demolition.

1. Suspect material identified by Contractor after removal activities and during demolition shall be sampled for disposal purposes by the Contractor.

F. Before demolition begins for each building or structure assure that all features and requirements for water management, dust control, and health and safety provisions are in place.

3.3 POLLUTION/DUST CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt.
   1. Clean adjacent structures, facilities, and improvements of dust, dirt, and debris caused by demolition operations.
   2. Return adjacent areas to conditions existing before start of demolition.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Fugitive Dust Emissions:
   1. At no time will a fugitive dust plume or cloud be allowed to cross the site property lines.
      a. If a complaint is received by Owner concerning fugitive dust emissions, the process will be halted immediately until the issue is investigated and a satisfactory resolution can be implemented.

D. Stockpile Protection:
   1. The surface of any stockpiled material capable of producing fugitive dusts will be covered to prevent fugitive dust.
   2. Contractor shall designate an individual to visually monitor the stockpiled materials during all operating hours for fugitive dust emissions.

E. High Wind Protection:
   1. The stockpiled material shall be situated in such a manner or control measures implemented to prevent airborne transport of materials during periods of high winds events.

F. Debris Pile Minimization: The quantity of debris shall be kept to a minimum.

G. Truck Loading:
   1. Trucks shall be loaded so that no part of the debris making contact with any sideboard, side panel or rear panel comes within six inches of the top of the enclosure.

H. Truck Tarping: All trucks transporting waste or debris shall be completely covered with tarpaulins.

I. Truck Emptying:
   1. Residue shall be cleaned from the inside of the trucks after emptying.
   2. If residue has not been completely removed after emptying truck material, tarpaulins shall be placed in the bed of the truck to cover the remaining material.

J. Debris Drop Distance: The drop distance of the material onto the pile, truck, etc., shall not exceed 6 FT.

K. Container Leakage: All equipment transporting material shall be maintained in such a way to prevent leakage and spillage.

3.4 DEMOLITION

A. Contractor shall conduct work in accordance with these specifications.
   1. Contractor shall perform demolition in a fashion that protects all on-site personnel, protects the environment, complies with all applicable laws and regulations, and preserves the structural integrity of systems necessary to maintain safe working conditions.
   2. Contractor shall demolish all buildings and structures identified in the Contract Documents.

3.5 BACKFILLING

A. Backfilling back to existing grade prior to demolition shall be as provided in Section 02200.

3.6 CHARACTERIZATION OF MATERIALS

A. Contractor is responsible for any sampling and/or analysis necessary for off-site shipment of reusable/ recyclable demolition material.
   1. This includes collection of material core/chip samples to be composited for analysis by others.
   2. Contractor shall provide manpower and equipment necessary to safely obtain sample.

B. Contractor shall sort demolition material into types identified prior to characterization or sampling.
   1. Contractor shall provide equipment and personnel to obtain samples.
   2. Contractor shall provide assistance for all samples not reachable and liftable by persons standing at grade.

3.7 UTILIZATION OF DEMOLITION MATERIALS

A. Order of preference for final disposition of demolition material shall be as follows:
   1. Off-Site reuse/recycle.
   2. Off-Site management or disposal.

3.8 DOCUMENTATION

A. Contractor shall maintain a daily log, including photos, of demolition activities.

B. Maintain copies of all required manifests for off-site shipments.

END OF SECTION

SECTION 02110
SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Site clearing, tree protection, stripping topsoil and demolition.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02200 - Earthwork.
   4. Section 02221 - Trenching, Backfilling, and Compacting for Utilities.
   5. Section 02270 - Soil Erosion and Sediment Control.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing trees and other vegetation to prevent damage.
   1. Provide temporary protection as required.

B. Contractor must obtain authority for removal and alteration work on adjoining property, if needed.

3.2 SITE CLEARING

A. Topsoil Removal:
   1. Strip topsoil to depths encountered.
      a. Remove heavy growths of grass before stripping.
      b. Stop topsoil stripping sufficient distance from such trees to prevent damage to main root system.
      c. Separate from underlying subsoil or objectionable material.
   2. Stockpile topsoil where directed at the permanent disposal pond area.
      a. Construct storage piles to freely drain surface water.
      b. Seed or cover storage piles to prevent erosion.
      c. Transport contaminated topsoil to the Permanent Disposal Pond area for disposal.
      d. Topsoil may be used as protective cover in the Permanent Disposal Pond. Coordinate with the Vertical Expansion Contractor.
   3. Do not strip topsoil in wooded areas where no change in grade occurs.
   4. Borrow topsoil:
      a. Reasonably free of subsoil, remove objects over 2 inch diameter, weeds and roots.

B. Clearing and Grubbing:
   1. Clear from within limits of construction all trees not marked to remain.
      a. Include shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, vines, rubbish, structures and debris.
   2. Grub (remove) from within limits of construction all stumps, roots, root mats, logs and debris encountered.

C. Disposal of Vegetative Waste Materials:
   1. Do not burn combustible materials on site without approved permits.
   2. Submit approved permits to Luminant's Environmental Services prior to performing any burning.
   3. Material may temporarily be stored onsite in locations and pile sizes approved by Luminant's Environmental Services.
   4. Do not bury organic matter on site unless approved by Luminant's Environmental Services.
   5. Chipped clearing debris may temporarily be stored in location approved by Luminant's Environmental Services.

3.3 ACCEPTANCE

A. Upon completion of the site clearing, obtain Engineer's acceptance of the extent of clearing, depth of stripping and rough grade.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Earthwork.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02276C – Constructed Clay Liner

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
      b. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
      c. D4254, Standard Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   3. Certifications.
   4. Test reports:
      a. Soils inspection and testing results.

B. Samples:
   1. Submit samples and source of fill and backfill materials proposed for use.
   2. Submit samples and source of borrow materials proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

1. Fill and Backfill: Selected material approved by Soils Engineer from site excavation or from off site borrow.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect existing surface and subsurface features on-site and adjacent to site as follows:
   1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing items indicated to remain in place.

2. Protect and maintain bench marks, monuments, monitor wells or other established reference points and property corners.
    a. If disturbed or destroyed, replace at own expense to full satisfaction of Owner and controlling agency.
3. Verify location of utilities.
    a. Omission or inclusion of utility items on Contract Documents does not constitute non-existence or definite location.
    b. Secure and examine local utility records for location data.
    c. Take necessary precautions to protect existing utilities from damage due to any construction activity.
    d. Repair damages to utility items at own expense.
    e. In case of damage, notify Engineer at once so required protective measures may be taken.
4. Existing structures not indicated to be removed shall be maintained free of damage.
    a. Any item known, or unknown, or not properly located that is inadvertently damaged shall be repaired to original condition.
    b. All repairs to be made and paid for by Contractor.
5. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks and other points as designated by Owner.
6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage to structures on-site or on adjoining property.
7. Avoid surcharge or excavation procedures which can result in heaving, caving or slides.

B. Salvageable Items: Carefully remove items to be salvaged, and store on Owner's premises unless otherwise directed.

C. Legally dispose of waste materials off site.
1. Burning, as a means of waste disposal, is not permitted unless approved by Luminant's Environmental Services.

3.2 SITE EXCAVATION AND GRADING

A. The work includes all operations in connection with excavation, borrow, construction of fills, rough grading and disposal of excess materials in connection with the preparation of the site(s) for construction of the proposed facilities.

B. Excavation and Grading: Perform as required by the Contract Drawings.
1. Contract Drawings may indicate both existing grade and finished grade required for construction of Project.
    a. Stake all units, structures, piping, and roads, and establish their elevations.
    b. Perform other layout work required.
    c. Replace property corner markers to original location if disturbed or destroyed.
2. Preparation of ground surface for embankments or fills:
    a. Before fill is started, scarify to a minimum depth of 6 IN in all proposed embankment and fill areas.
    b. Where ground surface is steeper than one vertical to four horizontal, plow surface in a manner to bench and break up surface so that fill material will bind with existing surface.
3. Protection of finish grade:
    a. During construction, shape and drain embankment and excavations.
    b. Maintain ditches and drains to provide drainage at all times.
    c. Protect graded areas against action of elements prior to acceptance of work.
    d. Reestablish grade where settlement or erosion occurs.
4. If lignite is exposed at the limit of excavation, the lignite will be over-excavated and replaced with fill material.

C. On-site Borrow:
1. Provide necessary amount of approved fill compacted to density equal to that indicated in this Specification.

2. Include cost of all borrow material in base proposal.
3. Fill material to be approved by Soils Engineer prior to placement.

D. Construct embankments and fills as required by the Contract Drawings:
   1. Construct embankments and fills at locations and to lines of grade indicated.
      a. Completed fill shall correspond to shape of typical cross section or contour indicated regardless of method used to show shape, size, and extent of line and grade of completed work.
   2. Provide approved fill material which is free from roots, organic matter, trash, frozen material, and stones having maximum dimension greater than 6 IN.
      a. Ensure that stones larger than 4 IN are not placed in upper 6 IN of fill or embankment.
      b. Do not place material in layers greater than 8 IN loose thickness.
      c. Place layers horizontally and compact each layer prior to placing additional fill.
   3. Compact by sheepsfoot, pneumatic rollers, vibrators or by other equipment as required to obtain specified density.
      a. Control moisture for each layer necessary to meet requirements of compaction.

3.3 ROCK EXCAVATION

A. All rock excavation shall be under one classification.
   1. This classification shall include solid ledge rock in its natural location that requires systematic quarrying or drilling for its removal and boulders that exceed 1/2 CY in volume.

B. When rock is encountered, strip free of earth.
   1. Employ an independent surveyor to determine rock quantities before removal operation begins.
   2. In computing the volumetric content of rock excavation for payment, the pay lines shall be taken as follows:
      a. For structures: 3 FT outside the exterior limits of foundations and from rock surface to 6 IN below bottom of foundations.
      b. For piping and utilities: A width 18 IN wider than the outside diameter of the pipe or conduit and from rock surface to 6 IN below bottom exterior surface of the pipe or conduit.

3.4 USE OF EXPLOSIVES

A. Blasting with any type of explosive is prohibited.

3.5 FIELD QUALITY CONTROL

A. Do not include in bid price the cost of inspection services indicated herein as being performed by the Soils Engineer.

B. Moisture density relations, to be established by the Soils Engineer, is required for all materials to be compacted.

C. Extent of compaction testing will be as necessary to assure compliance with Specifications.

D. Give minimum of 24 HR advance notice to Soils Engineer when ready for compaction or subgrade testing and inspection.

E. Should any compaction density test or subgrade inspection fail to meet Specification requirements, perform corrective work as necessary.

F. Pay for all costs associated with corrective work and retesting resulting from failing compaction density tests.

3.6 COMPACTION DENSITY REQUIREMENTS

A. Obtain approval from Soils Engineer with regard to suitability of soils and acceptable subgrade prior to subsequent operations.

B. Provide dewatering system to successfully complete compaction and construction requirements, as necessary.

C. Remove frozen, loose, wet, or soft material and replace with approved material as directed by Soils Engineer.

D. Stabilize subgrade with well graded granular materials as directed by Soils Engineer.

E. Assure by results of testing that compaction densities comply with the following requirements:
   1. Sitework:

LOCATION	COMPACTION DENSITY
Under Piping:	
Cohesive soils	>95 percent per ASTM D698
Cohesionless soils	75 percent relative density per ASTM D4253 and ASTM D4254
All Other Fill Areas (non-clay liner):	
Cohesive soils	95 percent of ASTM D698
Cohesionless soils	60 percent relative density per ASTM D4253 and ASTM D4254
Clay Liner	See Section 02276C – Compacted Clay Liner

3.7 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES

A. General:
   1. In general, work includes, but is not necessarily limited to, excavation for structures, removal of underground obstructions and undesirable material, backfilling, filling, backfill, and subgrade compaction.
   2. Obtain fill and backfill material necessary to produce grades required.
      a. Materials and source to be approved by Soils Engineer.
      b. Excavated material approved by Soils Engineer may also be used for fill and backfill.
   3. In the paragraphs of this Section of the Specifications, the word "soil" also includes any type of rock subgrade that may be present at or below existing subgrade levels.

B. Excavation Requirements for Structures:
   1. General:
      a. Do not commence excavation for structures until Soils Engineer approves:
         1) The removal of topsoil and other unsuitable and undesirable material from existing subgrade.
         2) Density and moisture content of site area compacted fill material meets requirements of specifications.
         3) Site surcharge or mass fill material can be removed from entire construction site or portion thereof.
      b. Engineer grants approval to begin excavations.
   2. Dimensions:
      a. Excavate to elevations and dimensions indicated or specified.
      b. Allow additional space as required for construction operations and inspection of foundations.
   3. Removal of obstructions and undesirable materials in excavation includes, but is not necessarily limited to, removal of old foundations, existing construction, unsuitable subgrade soils, expansive type soils, and any other materials which may be concealed beneath present grade, as required to execute work indicated on Contract Drawings.
      a. If undesirable material and obstructions are encountered during excavation, remove material and replace as directed by Soils Engineer.

4. Level off bottoms of excavations to receive compacted fill.
    a. Remove loose materials and bring excavations into approved condition to receive concrete or fill material.
    b. Where compacted fill material must be placed to bring subgrade elevation up to underside of construction, scarify existing subgrade upon which fill material is to be placed to a depth of 6 IN and then compact to density stated in this Specification Section before fill material can be placed thereon.
    c. Do not carry excavations lower than shown for foundations except as directed by Soils Engineer or Engineer.
    d. If any part of excavations is carried below required depth without authorization, maintain excavation and start foundation from excavated level with concrete of same strength as required for superimposed foundation, and no extra compensation will be made to Contractor therefore.
5. Make excavations large enough for working space, forms, dampproofing, waterproofing and inspection.
6. Notify Soils Engineer and Engineer as soon as excavation is completed in order that subgrades may be inspected.
    a. Do not commence further construction until subgrade under compacted fill material has been inspected and approved by the Soils Engineer as being free of undesirable material, being of compaction density required by this specification, and being capable of supporting the allowable design bearing pressures and superimposed fill loads to be placed thereon.
    b. Soils Engineer shall be given the opportunity to inspect subgrade below fill material both prior to and after subgrade compaction.
    c. Place fill material and equipment support pads as soon as weather conditions permit after excavation is completed, inspected and approved, and after forms and reinforcing are inspected and approved.
    d. Before concrete or fill material is placed, protect approved subgrade from becoming loose, wet, frozen, or soft due to weather, construction operations or other reasons.
7. Dewatering:
    a. Where groundwater is or is expected to be encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade below fill material, to allow fill material to be placed in the dry, and to maintain a stable excavation side slope.
    b. Groundwater shall be maintained at least 3 FT below the bottom of any excavation.
    c. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation.
    d. Employ dewatering specialist for selecting and operating dewatering system.
    e. Keep dewatering system in operation until dead load of structure exceeds possible buoyant uplift force on structure.
    f. Dispose of groundwater to the West Ash Pond or offsite in accordance with approved SWPPP and TPDES.
        1) Install groundwater monitoring wells as necessary.
    g. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
8. Subgrade stabilization:
    a. If subgrade under fill material or equipment support pads is in a loose, wet, or soft condition before construction is placed thereon, remove loose, wet, or soft material and replace with approved compacted material as directed by Soils Engineer.
    b. Provide compaction density of replacement material as stated in this specification Section.
    c. Loose, wet, or soft materials, when approved by Soils Engineer, may be stabilized by a compacted working mat of well graded crushed stone.
    d. Compact stone mat thoroughly into subgrade to avoid future migration of fines into the stone voids.
    e. Remove and replace frozen materials as directed by Soils Engineer.

f. Method of stabilization shall be performed as directed by Soils Engineer.
g. Do not place further construction on the repaired subgrades, until the subgrades have been approved by the Soils Engineer.

9. Do not set equipment support pads until subgrade below has been approved, piping has been tested and approved, reinforcement placement has been approved, and Contractor receives approval to commence construction.
   a. Do not place equipment support pads when temperature of air surrounding the slab and pads is or is expected to be below 40 DegF before structure is completed and heated to a temperature of at least 50 DegF.
10. Protection of structures:
   a. Prevent new and existing structures from becoming damaged due to construction operations or other reasons.
   b. Prevent subgrade under new and existing foundations from becoming wet and undermined during construction due to presence of surface or subsurface water, or due to construction operations.
11. Shoring:
   a. Shore, sheet pile, slope, or brace excavations as required to prevent them from collapsing.
   b. Remove shoring as backfilling progresses, but only when banks are stable and safe from caving or collapse.
12. Drainage:
   a. Control grading around structures so that ground is pitched to prevent water from running into excavated areas or damaging structures.
   b. Maintain excavations free of water where equipment support pads or fill material are to be placed.
   c. Provide pumping required to keep excavated spaces free of water during construction.
   d. Should any water be encountered in the excavation, notify Engineer and Soils Engineer.
   e. Provide free discharge of water by trenches, pumps, wells, well points, or other means as necessary and drain to point of disposal that will not damage existing or new construction or interfere with construction operations.

C. Fill and Backfill Equipment Support Pads and Piping:
1. General:
   a. Subgrade to receive fill or backfill shall be free of undesirable material as determined by Soils Engineer and scarified to a depth of 6 IN and compacted to density specified herein.
   b. Surface may be stepped at not more than 12 IN per step or may be sloped at not more than 2 percent.
   c. Do not place any fill or backfill material until subgrade under fill or backfill has been inspected and approved by Soils Engineer as being free of undesirable material and compacted to specified density.
2. Obtain approval of fill and backfill material and source from Soils Engineer prior to placing the material.
3. Fill and backfill placement:
   a. Prior to placing fill and backfill material, optimum moisture and maximum density properties for proposed material shall be obtained from Soils Engineer.
   b. Place fill and backfill material in thin lifts as necessary to obtain required compaction density.
   c. Compact material by means of equipment of sufficient size and proper type to obtain specified density.
   d. Use hand operated equipment for filling and backfilling next to walls.
   e. Do not place fill and backfill when the temperature is less than 40 DegF and when subgrade to receive fill and backfill material is frozen, wet, loose, or soft.
   f. Use vibratory equipment to compact granular material; do not use water.

D. Filling and Backfilling Outside of Structures.
   1. This paragraph of this Specification applies to fill and backfill placed outside of structures above bottom level of piping.
   2. Provide material as approved by Soils Engineer for filling and backfilling outside of structures.
   3. Fill and backfill placement:
      a. Prior to placing fill and backfill material, obtain optimum moisture and maximum density properties for proposed material from Soils Engineer.
      b. Place fill and backfill material in thin lifts as necessary to obtain required compaction density.
      c. Compact material with equipment of proper type and size to obtain density specified.
      d. Use only hand operated equipment for filling and backfilling next to walls and retaining walls.
      e. Do not place fill or backfill material when temperature is less than 40 DegF and when subgrade to receive material is frozen, wet, loose, or soft.
      f. Use vibratory equipment for compacting granular material; do not use water.

E. Backfilling Outside of Structures Under Piping:
   1. When backfilling outside of structures requires placing backfill material under piping, the material shall be placed from bottom of excavation to underside of piping at the density required for fill under piping as indicated in this Section.
   2. This compacted material shall extend transversely to the centerline of piping at a horizontal distance from each side of the exterior edges of piping equal to the depth of backfill measured from bottom of excavation to underside of piping or paving.
   3. Provide special compacted bedding or compacted subgrade material under piping as required by other sections of these Specifications.

3.8 SPECIAL REQUIREMENTS

A. Erosion Control:
   1. Conduct work to minimize erosion of site.
   2. Construct stilling areas to settle and detain eroded material.
   3. Retrieve eroded material washed off site.
   4. Clean streets daily of any spillage of dirt, rocks or debris from equipment entering or leaving site.

B. Soil stock pile
   1. Remove topsoil and store for later use.
   2. Maintain erosion control around stockpile.
   3. Upon completion, place topsoil as indicated on the plans and establish vegetation.

END OF SECTION

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SECTION 02221
TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation, trenching, backfilling and compacting for all underground utilities.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 01340 - Submittals
   4. Section 02200 - Earthwork.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

1.3 DEFINITIONS

A. Excavation: All excavation will be defined as unclassified.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   3. Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.
   4. Submit sieve analysis reports on all granular materials.

B. Miscellaneous Submittals:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Trench shield (trench box) certification if employed:
      a. Specific to Project conditions.
      b. Re-certified if members become distressed.
      c. Certification by a professional structural engineer registered in the state of Texas.
      d. Engineer is not responsible to, and will not, review and approve.

1.5 SITE CONDITIONS

A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving.
   1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.

B. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.

C. Protect and maintain bench marks, monuments or other established points and reference points. If disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

D. Verify location of existing underground utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Material: Onsite soils compacted to 95 percent standard proctor. ASTM D 698.

B. Bedding Materials: Onsite soils compacted to 100 percent standard proctor. ASTM D 698.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove and dispose of unsuitable materials as directed by Soils Engineer to site provided by Owner.

3.2 EXCAVATION

A. Unclassified Excavation: Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by Soils Engineer.

B. Excavation for Appurtenances:
   1. 12 IN (minimum) clear distance between outer surface and embankment.
   2. See Section 02200 for applicable requirements.

C. Groundwater Dewatering:
   1. Where groundwater is, or is expected to be, encountered during excavation, install a dewatering system to prevent softening and disturbance of subgrade and to allow pipe, bedding and backfill material to be placed in a dry trench, and to maintain a stable trench wall or side slope.
   2. Groundwater shall be drawn down and maintained at least 3 FT below the bottom of any trench or manhole excavation prior to excavation.
   3. Review soils investigation before beginning excavation and determine where groundwater is likely to be encountered during excavation.
      a. Employ dewatering specialist for selecting and operating dewatering system.
   4. Keep dewatering system in operation until dead load of pipe, structure and backfill exceeds possible buoyant uplift force on pipe or structure.
   5. Dispose of groundwater to an area which will not interfere with construction operations or damage existing construction.
   6. Install groundwater monitoring wells as necessary.
   7. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might weaken the subgrade.
   8. Unless a unit bid price is provided for groundwater dewatering, cost of groundwater dewatering shall be included in the price of the pipe installation.

D. Trench Excavation:
   1. Excavate trenches by open cut method to depth shown on Drawings and necessary to accommodate work.
      a. Support existing utility lines and yard piping where proposed work crosses at a lower elevation.
         1) Stabilize excavation to prevent undermining of existing utility and yard piping.
   2. Open trench outside buildings, units, and structures:
      a. No more than the distance between two structures, units, or 300 LF, whichever is less.
      b. Field adjust limitations as weather conditions dictate.

3. Any trench or portion of trench, which is opened and remains idle for seven (7) calendar days, or longer, as determined by the Owner, may be directed to be immediately refilled, without completion of work, at no additional cost to Owner.
    a. Said trench may not be reopened until Owner is satisfied that work associated with trench will be prosecuted with dispatch.
4. Observe following trenching criteria:
    a. Trench size:
        1) Excavate width to accommodate free working space.
        2) Maximum trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than what is shown in the Standard Details.
        3) Cut trench walls vertically from bottom of trench to 1 FT above top of pipe, conduit, or utility service.
        4) Keep trenches free of surface water runoff.
            a) Cost of surface water control shall be included in the price of the pipe installation.
            b) No separate payment for surface water runoff pumping will be made.

3.3 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Over-Excavation:
1. Backfill and compact to 90 percent of maximum dry density per ASTM D698.
2. Backfill with granular bedding material as option.

B. Rock Excavation:
1. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
2. Backfill to grade with suitable earth or granular material.
3. Form bell holes in trench bottom.

C. Subgrade Stabilization:
1. Stabilize the subgrade when directed by the Owner.
2. Observe the following requirements when unstable trench bottom materials are encountered.
    a. Notify Owner when unstable materials are encountered.
        1) Define by drawing station locations and limits.
    b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
        1) Replace with subgrade stabilization with no additional compensation.

3.4 BACKFILLING METHODS

A. Do not backfill until tests to be performed on system show system is in full compliance to specified requirements.

B. Carefully Compacted Backfill:
1. Furnish where indicated on Drawings, specified for trench embedment conditions and for compacted backfill conditions up to 12 IN above top of pipe or conduit.
2. Comply with the following:
    a. Place backfill in lifts not exceeding 8 IN (loose thickness).
    b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
    c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
    d. Compact each lift to specified requirements.

C. Common Trench Backfill:
1. Perform in accordance with the following:
    a. Place backfill in lift thicknesses capable of being compacted to densities specified.
    b. Observe specific manufacturer's recommendations regarding backfilling and compaction.
    c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.

D. Water flushing for consolidation is not permitted.

E. Backfilling for Electrical Installations:
   1. Observe Paragraph 3.4B. or C. or when approved by the Engineer.

3.5 COMPACTION

A. General:
   1. Place and assure bedding, backfill, and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the work.
   2. In no case shall degree of compaction below minimum compactions specified be accepted.

3.6 FIELD QUALITY CONTROL

A. Testing:
   1. Perform in-place moisture-density tests as directed by the Owner.
   2. Perform tests through recognized testing laboratory approved by Owner.
   3. Costs of "Passing" tests paid by Owner.
   4. Perform additional tests as directed until compaction meets or exceeds requirements.
   5. Cost associated with "Failing" tests shall be paid by Contractor.
   6. Reference to Engineer in this section will imply Soils Engineer when employed by Owner and directed by Engineer to undertake necessary inspections as approvals as necessary.
   7. Assure Owner has immediate access for testing of all soils related work.
   8. Ensure excavations are safe for testing personnel.

END OF SECTION

SECTION 02260
TOPSOILING AND FINISHED GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Topsoiling and finished grading.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02110 - Site Clearing.
   4. Section 02200 - Earthwork.
   5. Section 02930 - Seeding, Sodding and Landscaping.

C. Location of Work: Soils borrow area and all areas within limits of grading and all areas outside limits of grading which are disturbed in the course of the work.

1.2 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Project Data: Test reports for furnished topsoil.

1.3 SITE CONDITIONS

A. Verify amount of topsoil stockpiled and determine amount of additional topsoil, if necessary, to complete work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
   1. Original surface soil typical of the area.
   2. Existing topsoil stockpiled under Section 02110.
   3. Capable of supporting native plant growth.

2.2 TOLERANCES

A. Finish Grading Tolerance: 0.1 FT plus/minus from required elevations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Correct, adjust and/or repair rough graded areas.
   1. Cut off mounds and ridges.
   2. Fill gullies and depressions.
   3. Perform other necessary repairs.
   4. Bring all sub-grades to specified contours, even and properly compacted.

B. Loosen surface to depth of a minimum of 2 inches.

C. Remove all stones and debris over 2 IN in any dimension.

3.2 ROUGH GRADE REVIEW

A. Reviewed by Owner prior to placement of topsoil.

3.3 PLACING TOPSOIL

A. Do not place when subgrade is wet or frozen enough to cause clodding.

B. Spread to compacted depth of 4 IN for all disturbed earth areas.

C. If topsoil stockpiled is less than amount required for work, furnish additional topsoil at no cost to Owner.

D. Provide finished surface free of stones, sticks, or other material 1 IN or more in any dimension.

E. Provide finished surface smooth and true to required grades.

F. Restore stockpile area to condition of rest of finished work.

3.4 ACCEPTANCE

A. Upon completion of topsoiling, obtain Engineer's acceptance of grade and surface.

B. Make test holes where directed to verify proper placement and thickness of topsoil.

END OF SECTION

SECTION 02270
SOIL EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil erosion and sediment control.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02930 – Seeding, Sodding and Landscaping

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Erosion control standards: "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas" by the U.S. Department of Agriculture, Soil Conservation Service, College Park, Maryland.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Straw bales, twine or wire tied.

B. Compost Logs.

C. Silt Fencing.

D. Pipe Riser and Barrel: 16 GA corrugated metal pipe (CMP) of size indicated.

E. Stone for Stone Filter: 2 IN graded gravel or crushed stone.

F. Grass Seed: See Section 02930 – Seeding, Sodding and Landscaping.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carry out in accordance with SWPPP prepared by Contractor and approved by Luminant's Environmental Services.

B. Prior to General Stripping Topsoil and Excavating:
   1. Install perimeter dikes and swales.
   2. Excavate and shape sediment basins and traps.
   3. Construct pipe spillways and install stone filter where required.
   4. Machine compact all berms, dikes and embankments for basins and traps.
   5. Install straw bales where needed.
      a. Provide two stakes per bale.
      b. First stake angled toward previously installed bale to keep ends tight against each other.

C. Construct sediment traps where needed during rough grading as grading progresses.

D. Temporarily seed basin slopes and topsoil stockpiles:
   1. Rate: 1/2 LB/1000 SF.

2. Reseed as required until 70% coverage of grass is achieved.

3.2 DURING CONSTRUCTION PERIOD

A. Maintain Basins, Dikes, Traps, Stone Filters, Straw Bales, Etc.:
   1. Inspect regularly especially after rainstorms.
   2. Repair or replace damaged or missing items.

B. After rough grading, sow temporary grass cover over all exposed earth areas not draining into sediment basin or trap.

C. Construct inlets as soon as possible.
   1. Excavate and tightly secure straw bales completely around inlets.

D. Provide necessary swales and dikes to direct all water towards and into sediment basins and traps.

E. Do not disturb existing vegetation (grass and trees).

F. Excavate sediment out of basins and traps when capacity has been reduced by 50 percent.
   1. Remove sediment from behind bales to prevent overtopping.

G. Topsoil and Fine Grade Slopes and Swales, Etc.:
   1. Seed and mulch as soon as areas become ready.

3.3 NEAR COMPLETION OF CONSTRUCTION

A. Eliminate basins, dikes, traps, etc.

B. Grade to finished or existing grades.

C. Fine grade all remaining earth areas, then seed and mulch.

END OF SECTION

SECTION 02271
FABRIC-FORMED CONCRETE REVETMENT MAT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fabric-formed Concrete Revetment Mat

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02200 - Earthwork.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
      b. C33, Standard Specification for Concrete Aggregates.
      c. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      d. C150, Standard Specification for Portland Cement.
      e. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
      f. C494, Standard Specification for Chemical Admixtures for Concrete.
      g. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
      h. C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
      i. D2256, Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method.
      j. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
      k. D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
      l. D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
      m. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
      n. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
      o. D4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
      p. D4884, Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles.
      q. D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
      r. D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Material and method of installation and details for completed system.
      c. Manufacturer’s construction and quality control manual.
      d. Concrete mix design.

3. The Contractor shall submit a manufacturer's certificate that the supplied fabric forms meet the criteria of these Specifications, as measured in full accordance with the test methods and standards referenced herein.
    a. The certificates shall include the following information about each fabric form delivered:
        1) Manufacturer's name and current address,
        2) Full product name,
        3) Style and product code number,
        4) Form number(s),
        5) Composition of yarn, and
        6) Manufacturer's certification statement.
4. Fabric form layout plan with proposed size, type, number, position, and sequencing of fabric form panels.
    a. Show the location and direction of all field and factory seams.
    b. Show proposed details for making field connections of the fabric forms.
    c. Show proposed details for connecting the fabric forms to appurtenances.
5. Submit all tests and certification in a single coordinated submittal.

1.4 DELIVERY, STORAGE AND HANDLING

A. See Section 01600.

B. The fabric forms shall be kept dry and wrapped such that they are protected from the elements during shipping and storage.

C. If stored outdoors, the fabric forms shall be elevated and protected with a waterproof cover that is opaque to ultraviolet light.

D. Fabric forms labeling: per ASTM D 4873.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fabric-formed Concrete Revetment Mat:
1. Subject to compliance with the Specifications, the following are approved fabric-formed concrete revetment mat manufacturers:
    a. Donnelly Fabricators, Inc. (Texicon), Lawrenceville, GA, (770) 399-0108.
    b. Hydrotex, Atlanta, GA, (800) 253-0561.
2. The fabric form shall be uniform section lining, with the following typical dimensions and weights:
    a. Average thickness: 4.0 IN.
    b. Mass per unit area: 45 LB/FT^2.
    c. Drop point spacing: 3 x 4 IN.
    d. Concrete coverage: 75 FT^2/YD^3.
    e. Shear resistance: 18 LB/FT^2.
3. The uniform section fabric shall possess properties which meet or exceed the following minimum average roll values:

Property	Test Method	Minimum Average Roll Value
Physical		
Composition of yarns		Nylon or polyester
Mass per unit area (double-layer), oz/yd^2	ASTM D 5261	12
Thickness, mils	ASTM D 5199	25
Mill width, in		76
Mechanical		

Property	Test Method	Minimum Average Roll Value
Wide-width strip tensile strength, lb/in	ASTM D4595	
- machine		140
- cross		110
Elongation at break, %	ASTM D4595	
- machine		20
- cross		30
Trapezoidal tear strength, lb	ASTM D 4533	
- machine		150
- cross		100
Hydraulic		
Apparent opening size (AOS), U.S. Standard Sieve	ASTM D4751	40
Flow rate, gal/min/ft^2	ASTM D 4491	90

4. The fabric forms shall be composed of synthetic yarns formed into a woven fabric.
   a. Yarns used in the manufacture of the fabric shall be composed of nylon and/or polyester.
   b. Forms shall be woven with a minimum of 50% textured yarns (by weight) to improve adhesion to fine aggregate concrete and to improve filtration.
   c. Partially-oriented, drawn-textured, and/or staple yarns shall not be used in the manufacture of the fabric.
   d. Each layer of fabric shall conform to the physical, mechanical and hydraulic requirements referenced herein.
   e. The fabric forms shall be free of defects and flaws that significantly affect their physical, mechanical, or hydraulic properties.
5. Fabric forms shall consist of double-layer woven fabric joined together by spaced, interwoven cords of uniform length to form a concrete lining with a finished average thickness and nominal mass per unit area listed in part 2.1A.2.
   a. Cord minimum breaking strength: Minimum 160 lb when tested in accordance with ASTM D 2256.
   b. After the form has been filled with fine aggregate concrete, the cords' drop points shall be spaced as listed in part 2.1A.2.
   c. The cords shall connect the two layers of fabric to form a comparatively uniform surface appearance.
6. Mill widths of fabric shall be as listed in part 2.1A.3.
   a. Each selvage edge of the top and bottom layers of fabric shall be reinforced for a width of not less than 1.35 inches by adding a minimum of 6 warp yarns to each selvage construction.
   b. Mill width rolls shall be cut to the length required, and the double-layer fabric separately joined, bottom layer to bottom layer and top layer to top layer, by means of sewing thread, to form multiple mill width panels with sewn seams on not less than 72-inch centers.
7. All factory-sewn seams shall be downward facing.
   a. All seams sewn in the factory: Minimum 90 lb/in when tested in accordance with ASTM D 4884.
   b. All sewn seams and zipper attachments shall be made using a double line of U.S. Federal Standard Type 401 stitch.
   c. All stitches shall be sewn simultaneously and be parallel to each other, spaced between 0.25 inches to 0.75 inches apart.
   d. Each row of stitching shall consist of 4 to 7 stitches per inch.
   e. Thread used for seaming shall be nylon and/or polyester.

8. Baffles shall be installed at predetermined mill width intervals to regulate the distance of lateral flow of fine aggregate concrete.
    a. The baffle material shall be non-woven filter fabric.
9. Whenever plastic weep tubes for the relief of hydrostatic uplift pressure are required, they shall be inserted through the fabric forms at locations specified in the Contract Documents.
    a. The lower ends of the weep tubes shall be securely covered by filter fabric, or the fabric forms shall be placed over filter fabric.
10. Fine aggregate concrete:
    a. Mix Portland cement, fine aggregate and water to provide a readily pourable slurry.
        1) The consistency of the fine aggregate concrete delivered to the concrete pump shall be proportioned and mixed as to have an efflux time of 9 – 12 seconds when passed through the 0.75-inch orifice of the standard flow cone (ASTM C 939).
        2) Ready mix from plant which is certified by the National Ready-Mix Concrete Association. Field mixes subject to approval.
            a) Portland cement: ASTM C150, Type I or Type II.
            b) Fine aggregate: ASTM C33.
            c) Water: Clean, free from injurious amounts of oil, acid, salt, alkali, organics or other impurities.
            d) Pozzolan: ASTM C618, Class F.
            e) Plasticizing admixture: ASTM C 494, if used.
            f) Air entraining admixture: ASTM C 260, if used.
    b. Pozzolan grade fly ash shall be substituted for cement to the maximum percentage allowed by the manufacturer.
    c. Admixtures may be used with Engineer's approval.
    d. Hardened fine aggregate concrete compressive strength: Minimum 2000 psi at 28 days when specimens are made and tested in accordance with ASTM C31 and ASTM C39.

2.2 SOURCE QUALITY CONTROL

A. Perform all tests required to demonstrate source and material specifications are satisfied.

B. Contractor shall test all Fine Aggregate Concrete delivered to the site for compressive strength and air content, and provide test results to Owner and Engineer.

PART 3 - EXECUTION

3.1 FOUNDATION PREPARATION

A. General: Areas on which fabric forms are to be placed shall be constructed to the lines and grades shown on the Contract Drawings and to the tolerances specified in the Contract Documents, and approved by the Engineer.

B. Grading:
    1. Grade slope to a smooth plane surface to provide intimate contact between the slope face and the interface surface of the fabric forms.
        a. All slope deformities, roots, grade stakes and stones which project normal to the local slope face must be regraded or removed.
        b. No holes, “pockmarks”, slope board teeth marks, footprints, or other voids greater than 1 IN in depth normal to the local slope face shall be permitted.
        c. No grooves or depressions greater than 0.5 IN in depth normal to the local slope face with a dimension exceeding 1 FT in any direction shall be permitted.
        d. Compact subgrade to density specified for structural backfill in accordance with Section 02200.
    2. Correction:
        a. Defective areas shall be brought to grade by placing compacted homogeneous material.
        b. The slope and slope face shall be uniformly compacted.

c. Depth of layers, homogeneity of soil and amount of compaction shall be as specified in Section 02200.

3.2 INSTALLING FABRIC-FORMED CONCRETE REVETMENT MAT

A. General: Placed within the specified lines and grades shown on the Contract Drawings.

B. Placement on adjoining geosynthetic:
   1. Place on the geosynthetic in such a manner as to produce a smooth plane surface in intimate contact with the geosynthetic.

C. Prior to fine aggregate concrete injection, position the fabric at its approximate design location, making appropriate allowance for the contraction of the fabric in each direction which will occur as a result of fine aggregate concrete injection.
   1. Anchoring of the fabric forms shall be accomplished through the use of anchor trenches.
   2. Panels of fabric are to be factory assembled in predetermined sizes and jointed together side-by-side at the jobsite by means of a sewn seam or zipper closures attached to the upper and lower layers of fabric.
      a. Avoid field seaming to the extent possible.
      b. Machine sew seams shall be made with two lines of U.S. Federal Standard Type 101 stitches.
      c. The two (2) top layers of fabric and the two (2) bottom layers of fabric shall be separately joined so as to ensure full block thickness.
      d. Grab tensile strength of sewn seams shall be a minimum 100 LBS/IN per ASTM D4632.
      e. Face all sewn seams downward.
      f. Field seaming will only be allowed to join factory assembled panels together.
      g. There shall be no gaps in the seaming.
   3. Place fabric forms immediately following slope preparation.
   4. When conventional joining of fabric forms is impractical or where called for in the Contract Documents, adjacent forms may be overlapped a minimum of three (3) feet to form a lap joint.
      a. The lap joint shall be constructed as recommended in the manufacturers construction and quality control manual.
      b. Based on the predominant flow direction, the downstream edge of the form shall overlap the upstream edge of the next form.
      c. In no case shall simple butt joints between forms be permitted.
   5. Immediately prior to filling with fine aggregate concrete, the assembled fabric forms shall be inspected by the Engineer.
      a. No fine aggregate concrete shall be pumped into the fabric forms until their placement has been approved.
      b. At no time shall the fabric forms be exposed to ultraviolet light (including direct sunlight) for a period exceeding five (5) days.

D. Following placement and seaming of the fabric, inject fine aggregate concrete between the top and bottom layers of fabric to the specified dimensions.
   1. Tightly wrap injection pipe at injection point while pumping.
   2. Inject fine aggregate concrete in such a way that the fabric form is fully inflated and excessive pressure on the fabric forms and cold joints are avoided.
      a. A cold joint is defined as one in which the pumping of the fine aggregate concrete into a given form is discontinued or interrupted for an interval of forty-five (45) minutes or more.
      b. Repair damage to the fabric form caused by over-inflation to the satisfaction of the Engineer and at no cost to the Owner.
   3. After pumping, minimize spillage of the fine aggregate concrete on the surface of the fabric.
   4. Sequence injection of fine aggregate concrete such as to insure complete filling of the fabric form to the thickness specified.

5. Holes in the fabric forms left by the removal of the filling pipe shall be temporarily closed by inserting a piece of nonwoven fabric or similar material.
    a. The nonwoven fabric shall be removed when the concrete is no longer fluid.
    b. The concrete surface at the hole shall be cleaned and smoothed by hand.

E. Do not permit foot traffic on the freshly pumped mat when such traffic will cause permanent indentations in the mat surface.
1. Use walk boards where necessary.
2. Clean up excessive fine aggregate concrete that has been inadvertently spilled on the mat surface.
3. Do not permit the use of a water hose to remove spilled fine aggregate concrete from the surface of freshly pumped mat.

F. The backfilling and compaction of anchor and terminal trenches shall proceed in not less than one hour behind the concrete filling of the fabric formed mat.
1. Backfilling and compaction shall be as specified in Section 02200.
2. Trenches shall be backfilled and compacted to the top of the mat.
3. The trenches of completed sections of mats shall be backfilled and compacted by the end of the work day.

G. Measure block thickness during fine aggregate concrete injections.
1. Reject any block measuring less than 90 percent of the average of all thickness measurements until acceptable thickness has been attained.
    a. Average must be 4 IN or greater.

3.3 MANUFACTURER'S REPRESENTATIVE

A. A manufacturer's representative shall be present for a minimum of 10 percent of the installation of the fabric form unless the Contractor can prove adequate experience in this technology.

END OF SECTION

SECTION 02276C
CONSTRUCTED CLAY LINER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Contractor to furnish all labor, materials, tools, equipment, and services for all clay liner materials, as indicated, in accordance with provisions of Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

B. Related Sections:
   1. Division 1 - General Requirements.
   2. Section 02200 - Earthwork.
   3. Appendix A - Soils and Liner Quality Control Plan (SLQCP).

C. Location of work: All areas within limits of the East Ash Pond (EAP) and the Soils Borrow Area.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM:
      a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

B. The bottom of the clay liner must be at or below the required top of subgrade elevation.
   1. The liner will be constructed to the thickness indicated on the plans as measured perpendicular to the surface.

C. Finished grading tolerance:
   1. 0.1 FT plus from required elevations for the top of the clay liner.
   2. Clay liner thickness shall be a minimum of 18 IN.

D. The Geotechnical Professional (see SLQCP) will prequalify all materials to be used for Liner Construction.
   1. Soil borrow areas are shown on the plans. Soil stockpile locations will be identified to bidders at the pre-bid meeting.

E. The Geotechnical Professional will have final decision concerning any discrepancy between this document and the SLQCP including materials, equipment, methods, payment, etc.

1.3 JOB CONDITIONS

A. Verify conditions of subgrade prior to commencing work.

PART 2 - PRODUCTS

A. Clay:
   1. Provide and install clay materials meeting the requirements of the SLQCP.
   2. A copy of the SLQCP is attached to these specifications as Appendix A.

3. Information from previous testing of on-site material is available for review, but is not a Contract Document, and is not to be construed as assurance that on-site material will meet all Specifications.

B. The Contractor may use on-site material from the borrow area, as long as the material is prequalified by the Contractor as described in the SLQCP, and accepted by the Geotechnical Professional.
   1. The Contractor is responsible for meeting all requirements for clay liner construction regardless of the source from which clay material is obtained.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. General: Prior to placing any material for liner construction:
   1. An adequate quantity of preconditioned liner material may be stockpiled in the EAP to avoid any unnecessary delay in liner construction.
   2. A 100 FT grid marker system utilizing the existing coordinate system shall be established and maintained over the entire area to be lined.
      a. Applicable survey control methods are defined within the SLQCP.
      b. Instrument control is the only survey method allowed.
   3. Provide bottom grade necessary to control drainage in the excavation.
   4. Disturbance of the surface of the excavation, including plowed loosened ground or surface roughened by erosion or equipment travel shall be restored to the original grade by blading or other methods and, compacted by sprinkling and rolling.
   5. Trees, stumps, roots, vegetation, rocks, solid waste or other unsuitable materials shall not be placed in the constructed clay liner.
   6. Clay liners shall be constructed to the grade established in the plans.
      a. Completed liners shall correspond to the general shape of the typical sections shown on the plans.

B. Constructed Clay Liner:
   1. Constructed clay liner shall be defined as composed principally of clay material other than rock, and shall be constructed of accepted clay material from an approved borrow source.
   2. Except as otherwise specified, clay liners shall be constructed in successive layers for the full width of the cross section and in such lengths as are best suited to the moisturization and compaction methods utilized.
      a. Each completed lift shall be scarified and sprinkled as deemed necessary by the Contractor prior to the placement of successive lifts.
   3. Layers of clay liner may be formed by utilizing equipment which will spread the materials as it is dumped, or they may be formed by being spread by blading or other acceptable methods from piles or windrows dumped from excavating or hauling equipment in such amounts that material can be evenly distributed.
   4. Each layer of clay liner shall be uniform as to material, density and moisture content before beginning compaction.
      a. No material placed in the clay liner by dumping in a pile or windrow shall be incorporated in a layer in that position, but all such piles or windrows shall be moved by blading or similar methods.
      b. Clods or lumps of materials shall be reduced in size to a maximum dimension of 1 IN and the clay liner material mixed by blading, harrowing, disking or similar methods to the end that a uniform material of uniform density is secured in each layer.
      c. As described in the SLQCP, it may be necessary to reduce particle size to less than 1 IN to achieve a uniform moisture content.

d. Water required for sprinkling to bring the material to the moisture content necessary for maximum compaction shall be evenly applied and it shall be the responsibility of the Contractor to secure a uniform moisture content throughout the layer by such methods as may be necessary.
e. In order to facilitate uniform wetting of the clay liner material, the Contractor may apply water at the material source or in the stockpile area.
f. Such procedure shall be subject to the approval of the Geotechnical Professional.

C. Density of Constructed Clay Liner:
1. Compaction of clay liners shall be obtained by the method hereinafter described as the "Density Control" method.
a. Under the "Density Control" method of compaction, each layer shall be compacted to the required density utilizing either a pad/tamping foot or a sheepsfoot roller.
b. The compaction equipment must have adequate cleaning devices to allow full penetration of the lift thickness.
c. Bulldozers and other low pressure, high vibration equipment may not be used to compact clay liner.
d. The depth of layers prior to compaction shall depend upon the type of sprinkling and compacting equipment used.
e. The loose lift thickness shall not exceed the pad/foot length of the compaction equipment prior to and in conjunction with the rolling operation.
f. In no instance shall loose-lift thickness exceed eight (8) IN.
g. Each layer shall be brought to the moisture content necessary to obtain the required density and shall be kept leveled with suitable equipment to insure uniform compaction over the entire layer.
2. For each layer of clay liner material, it is the intent of this specification to provide the density as required herein.
a. Clay materials shall be sprinkled as required to provide not less than optimum moisture and compacted to at least 95 percent of Standard Proctor Density (ASTM D698).
b. After each layer of clay liner is complete, testing will be conducted by the Geotechnical Professional in accordance with the SLQCP.
c. If the clay liner layer fails to meet the minimum standard specified in the SLQCP, the layer shall be reworked as necessary to meet the minimum standards.
d. The compaction/moisturization method shall be altered on subsequent work, as necessary, to obtain minimum standards.
e. Such procedure shall be determined by, and subject to, the approval of the Geotechnical Professional.

D. Tolerances:
1. Any tests falling outside of the minimum standards established by these Specifications and in the SLQCP shall require the Contractor to rework the area not conforming to these Specifications and retest to establish conformance with these Specifications.
a. Retesting shall be paid for by the Contractor as described in the Contract Documents.

E. Construction of Clay Liner:
1. As shown in the typical section of the plans and in the SLQCP, a clay liner will be constructed in the areas identified on the plans.
a. The liner will be constructed using clay materials obtained from the borrow area.
b. The clay borrow shall meet the minimum standards described in the SLQCP.
c. The liner shall be compacted in maximum 8 IN loose lifts at a moisture content of optimum to 4 percent above and compacted to the extent necessary to obtain at least 95 percent of Standard Protector Density.
d. Equipment shall be adequately equipped to moisten or dry the soil to meet the moisture requirement.
e. Scarification and moisture application shall be provided between lifts, as necessary, to ensure adequate lift bonding.

f. The clay liner shall actually be one continuous, homogeneous soil mass without any change in soil material or discernable interfaces of any sort.
g. This method of construction shall be continued up to the lines and grades shown in the plans.
h. Equipment traffic across completed liner sections/lift should be avoided to minimize problems associated with rutting and/or over compaction.
i. Water should not be allowed to pond on completed lifts and/or liner section.
j. Lifts that become desiccated and/or disturbed shall be reworked and retested.
k. It is recommended that in periods of hot weather or impending rain that the surface of the clay liner be smooth rolled at the end of each day to minimize desiccation or introduction of excess moisture.

2. The final lift surface of the clay liner shall be free of particles larger than 3/8 IN or other objectionable material.
3. The finished clay liner shall be smooth-rolled and maintained in a moist condition.

END OF SECTION

SECTION 02405
CARE OF WATER DURING CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Addresses:
   1. Removal of surface water and groundwater as needed to perform the required construction in accordance with the specifications.
      a. It includes building and maintaining all necessary temporary impounding works, channels, and diversions, furnishing all labor and installing and operating all necessary pumps, piping trenches and other facilities.
      b. It also includes equipment and materials, and removing all such temporary works, equipment and materials after they have served their purposes in strict accordance with this Section of the Specifications and the applicable Drawings, and subject to the terms and conditions of the Contract Documents.

PART 2 - PRODUCTS

2.1 GEOTEXTILE

A. The geotextile for the dewatering trench, if needed, shall be in accordance with Specification Section 02778.

2.2 DRAIN PIPE

A. The drain pipe, if needed, shall be in accordance with Specification Section 15065 and the Contract Drawings.

2.3 AGGREGATE

A. The aggregate shall be in accordance with Specification Section 15065.

PART 3 - EXECUTION

3.1 GENERAL

A. Plans and procedures for handling flood flows and dewatering excavations shall be submitted for approval.
   1. Any construction modifications to the system shall also be submitted.
   2. Approval does not relieve the Contractor of full responsibility and liability for care of water during construction.

3.2 FLOOD FLOWS AND OTHER WATER

A. The Contractor shall be responsible for handling and diverting any flood flows, surface water, perched water, groundwater or any other water encountered during the progress of the work.

B. The Contractor shall build, maintain, and operate all channels, flumes, sumps, and other temporary works needed to pass floodwater or pass other surface water or groundwater through or around the construction site and away from construction work while it is in progress.

C. Unless otherwise approved by the Engineer, a diversion must discharge into the same natural watercourse in which its headworks are located.

D. All permanent work shall be constructed in areas free from water.

E. Full responsibility for the successful dewatering of the work areas shall rest with the Contractor.
   1. The removal of all protective works, after having served their purpose, shall be in a manner satisfactory to the Engineer.

F. Impounded water may be used for construction so long as the quality of the water does not interfere with the desired results of the product.

3.3 DEWATERING EXCAVATED AND OTHER FOUNDATION AREAS

A. The Contractor shall be responsible for dewatering foundations for all areas during construction of the works of improvement, including areas of required backfills.
   1. Those areas shall have the water table lowered to keep all areas free of standing water or excessive muddy conditions as needed for proper performance of the construction work.

B. The Contractor shall install the underdrain system, piping, filtering system and de-watering sumps at the earliest possible time in order to draw the water table down prior to construction of the clay liner.

C. The Contractor shall furnish or prepare all drains, sumps, casings, well points and other equipment needed to dewater areas for required construction work.
   1. The Contractor shall keep available standby equipment to provide the proper and continuous operation of the dewatering system.

D. The Contractor shall provide continuous monitoring (24 HRS/DAY) of the dewatering system to provide continuous operation.

3.4 DEWATERING BORROW AREAS

A. Unless otherwise specified on the Drawings, the Contractor shall maintain the borrow areas in drainable condition or otherwise provide for timely removal of surface water that accumulate, for any reason, within the borrow areas. Upon completion of the project the borrow areas shall be graded so they do not impound water.

3.5 EROSION CONTROL

A. See Specification Section 02270.

3.6 HANDLING OF ASH-WASTE CONTAMINATED WATER

A. Groundwater or runoff water which has come in contact with the coal combustion by-products shall be designated as “contaminated” and must not be allowed to enter adjacent streams or otherwise exit the site.
   1. The contractor may use any of the following three options for managing this water:
      a. Coordinate with Owner to pump water into the West Ash Pond and back into Plant operations;
      b. Treat water and release in accordance with SWPPP; or
      c. Pump to an approved designated holding area on the interior of the site, as approved by Luminant’s Environmental Services.
         1) Such designated holding areas will be located within 2,000 LF of the excavation being dewatered.

B. The Contractor shall be required to construct temporary earthen dikes or take other precautionary measures as required to contain any contaminated water when encountered and until pumped to designated contaminated water areas.
   1. Any dewatering equipment or materials used in contaminated water shall be flushed or washed with uncontaminated water prior to reusing such equipment or materials in uncontaminated water areas.
   2. All wash water shall also be pumped to an approved designated contaminated water holding areas.

3. All Contaminated water created during construction shall be treated and properly disposed at no additional cost to the Owner.

END OF SECTION

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SECTION 02515
PRECAST CONCRETE MANHOLE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Precast concrete manhole structures and appurtenant items.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02221 - Trenching, Backfilling, and Compacting for Utilities.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. ASTM International (ASTM):
      a. A48, Standard Specification for Gray Iron Castings.
      b. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
      c. D1227, Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
      d. D4586, Standard Specification for Asphalt Roof Cement, Asbestos-Free.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.

1.4 SITE CONDITIONS

A. For this project, the groundwater elevation encountered during soil boring operations was approximately 306 FT.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Manhole rings, covers and frames:
      a. Neenah Foundry.
      b. Deeter Foundry.
   2. Black mastic joint compound:
      a. Kalktite 340.
      b. Tufflex.
      c. Plastico.
   3. Premolded joint compound:
      a. Ram Nec.
      b. Kent Seal.
   4. Emulsified fibrated asphalt compound:
      a. Sonneborn Hydrocide 700B Semi-Mastic.

B. Submit request for substitution in accordance with Specification Section 01640.

2.2 MANHOLE STRUCTURE COMPONENTS

A. Manhole Components:
   1. Reinforcement: ASTM C478.
   2. Minimum wall thickness: 5 IN.
   3. Minimum base thickness: 12 IN.
   4. Provide the following components for each manhole structure:
      a. Base cast-in-place.
      b. Precast barrel section(s).
      c. Precast eccentric transition section.
      d. Precast adjuster ring(s).
      e. Precast concrete transition section.
      f. Precast flat top.
   5. Provide manhole sections with inside dimensions as noted on the plans.

B. Nonpressure Type Frames and Cover:
   1. Cast iron frame and covers: ASTM A48, Class 35 (minimum).
   2. Use only cast iron of best quality, free from imperfections and blow holes.
   3. Furnish frame and cover of heavy-duty construction a minimum total weight of 450 LBS.
   4. Machine all horizontal surfaces.
   5. Furnish unit with solid nonventilated lid that can be bolted closed, and with concealed pickholes.
   6. Ensure minimum clear opening of 24 IN DIA.

C. Special Coatings and Joint Treatment:
   1. Joints of precast sections:
      a. Black mastic compound: ASTM D4586.
   2. Vertical wall surfaces:
      a. Emulsified fibrated asphalt compound meeting ASTM D1227 Type I for all exterior vertical wall surfaces.

PART 3 - EXECUTION

3.1 MANHOLE CONSTRUCTION

A. General:
   1. Construct cast-in-place concrete base slabs.
   2. Make inverts with a semi-circular bottom conforming to the inside contour of the adjacent pipe sections.
   3. Shape inverts accurately and steel trowel finish.
      a. Pour base slab integral with bottom barrel section.

B. Build each manhole to dimensions shown on plans and at such elevation that pipe sections built into wall of manhole will be true extensions of line of pipe.

C. Install a resilient O-ring type gasket or pre-molded joint compound for all horizontal joints.

D. Seal all pipe penetrations in manhole.
   1. Form pipe openings smooth and well shaped.
   2. After installation, seal cracks with, non shrink grout.
   3. After grout cures, wire brush smooth and apply two coats emulsified fibrated asphalt compound to minimum wet thickness of 1/8 IN to ensure complete seal.

E. Set and adjust frame and cover final 6 IN (minimum) to 18 IN (maximum) to match elevation of precast flat top of manhole.

END OF SECTION

SECTION 02775

HIGH-DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Furnishing, installation, quality control, and testing of a HDPE geomembrane liner.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02200 - Earthwork.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials (ASTM):
      a. D413, Standard Test Method for Rubber Property Adhesion to Flexible Substrate.
      b. D638, Standard Test Method for Tensile Properties of Plastics.
      c. D792, Standard Test Methods for Specific Gravity and Density of Plastics by Displacement.
      d. D882, Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.
      e. D1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
      f. D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
      g. D1603, Standard Test Method for Carbon Black in Olefin Plastics.
      h. D3895, Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
      i. D4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
      j. D4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
      k. D4833, Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
      l. D4873, Identification, Storage and Handling of Geosynthetic Rolls.
      m. D5199, Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
      n. D5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
      o. D5596, Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
      p. D5641, Geomembrane Seam Evaluation by Vacuum Chamber.
      q. D5721, Standard Practice for Air-Oven Aging of Polyolefin Geomembranes.
      r. D5820, Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.
      s. D5885, Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry.
      t. D5994, Standard Test Method for Measuring the Core Thickness of Textured Geomembranes.
      u. D6392, Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
   2. Geosynthetic Research Institute (GRI):
      a. GM11, Accelerated Weathering of Geomembranes Using a Fluorescent UVA-Condensation Exposure Device.

b. GM12, Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage.
c. GM13, Test Properties, Testing Frequency and Recommended Warrant for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

B. Quality Assurance Testing by Owner:
1. The Owner or Engineer's representative will conduct independent testing to support the construction quality assurance program and to provide documentation of such.
2. Facilitate and provide opportunities as required.

C. Qualifications:
1. Manufacturer: Demonstrate 5 years continuous experience with a minimum of 10,000,000 SF of HDPE geomembranes.
2. Installer:
a. Demonstrate five (5) years continuous experience with a minimum 10,000,000 SF of HDPE geomembranes.
b. Trained by at least one of the named manufacturers in this Specification (not necessarily the Manufacturer supplying materials for this Project).
3. Independent Testing Laboratory shall demonstrate three (3) years of continuous experience in similar geosynthetic materials testing.
a. The Independent Testing Laboratory shall be employed by the Contractor, not the Installer.

D. Certifications:
1. Certifications are required for various aspects of the project related to the HDPE geomembrane liner system construction.
a. Unless alternately approved, the certificates provided at the end of this Section shall be used and no alterations, additions, deletions, or exception shall be made to the specified language.

1.3 DEFINITIONS

A. Manufacturer:
1. Manufacturer producing geomembrane sheets from resin and additives, and/or fabricating special items from HDPE materials.

B. Installer:
1. When reference is made to Installer as a person, the Installer is the crew foreman actually performing or supervising the hands-on work in the field.
2. Provide certification of Installer's training, experience and methods for welding, seaming, jointing and inspecting geosynthetic materials installations in compliance with Manufacturer's standards and with Quality Assurance requirements of this Specification (Article 1.2).

C. Independent Testing Laboratory:
1. The firm hired by the Contractor to perform destructive testing of the HDPE geomembrane.
2. Firm shall be acceptable to Engineer and the Owner.

1.4 SUBMITTALS

A. Shop Drawings:
1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
2. Submit Shop Drawings for Engineer's approval, including:
a. Manufacturer's certification that raw materials and sheet materials comply with required material properties.
1) No faxed copies.
b. Manufacturer/Fabricator/Installer quality control manuals.
c. Qualifications and experience of key personnel involved in installation/inspection of the geosynthetic materials.

d. HDPE Geomembrane layout plan with proposed size, type, number, position and sequencing of liner panels and showing the location and direction of all field or factory seams.
    1) Proposed details for connecting the geosynthetic materials to appurtenances.
    2) Proposed methods of welding, seaming or jointing geosynthetic materials.
    3) Proposed method and sequencing for placement of geocomposite and geonet on top of the lower HDPE geomembrane liner, and concrete revetment mat on the upper HDPE geomembrane liner.
    4) Proposed method of testing HDPE geomembrane and other geosynthetic materials, joints and connections at appurtenances for continuity.

B. Miscellaneous Submittals:
1. Test results:
    a. Resin tests, tests of sheet material and factory seam tests at frequency specified in respective quality control manuals.
        1) Results shall include or bracket the rolls delivered for use in the Work.
    b. Daily test seam results.
    c. Daily results of production seam testing.
    d. Destructive seam test results by Installer and Independent Testing Laboratory.
2. Warranties as described below.
3. Submit written certifications that:
    a. Utilize certification forms from this Section unless alternately approved.
        1) Make appropriate number of copies, as required.
        2) Complete and sign appropriate form daily.
    b. The HDPE geomembrane material delivered to site meets the requirements of this Specification.
    c. The HDPE geomembrane was received and accepted in undamaged condition from shipper.
    d. The subgrade has been properly prepared and acceptable for the placement of the HDPE geomembrane.
    e. The HDPE geomembrane liner was installed in accordance with this Specification and with approved Shop Drawings.
    f. The field tensiometer and gages were calibrated within six months of use on this project.
    g. The HDPE geomembrane joints were inspected, tested for strength and continuity, and passed all inspections and tests.
        1) All test and inspection data shall be incorporated into this certification.
    h. The geocomposite, geonet, geotextiles, granular material and concrete revetment mat on top of the HDPE geomembrane liner were placed properly and carefully.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handle and store HDPE geomembrane in accordance with the manufacturer's recommendations and ASTM D4873.

B. Label each roll with the manufacturers name, type, lot number, roll number, and roll dimensions (length, width, gross weight).
1. Repair or replace HDPE geomembrane or plastic wrapping damaged as a result of storage or handling, as directed.
2. Do not expose HDPE geomembrane to temperatures in excess of 71 DegC (160 DegF) and below 0 DegC (32 DegF).

C. Do not use hooks, tongs or other sharp instruments to handle the HDPE geomembrane.
1. Do not lift rolls by use of cables or chains in contact with the HDPE geomembrane.
2. Do not drag HDPE geomembrane along the ground.

1.6 WARRANTIES

A. Written warranties addressing HDPE geomembrane material and installation workmanship shall be furnished by the Contractor and shall be made out to the Owner.

B. Submit material samples and warranties prior to shipment.

C. Suitability of geosynthetic liner system shall be subject to Owner approval of warranty.
   1. The Manufacturer's warranty shall state that the furnished material meets all requirements of the Contract Drawings and Specifications and that under local atmospheric conditions the sheet material is warranted for 20 years, prorated.
   2. The Installer's warranty shall state that the materials were properly installed, properly (field and factory) welded, seamed and jointed and will not fail within two years of the installation under similar conditions.
      a. Warranty shall not be prorated.

D. Warranties shall provide for complete repair/replacement at no additional cost to the Owner for the warranty period.

1.7 PROJECT/SITE CONDITIONS

A. When the weather is of such a nature as to endanger the integrity and quality of the installation whether this is due to rain, high winds, cold temperatures, or other weather elements, stop the installation until the weather conditions are satisfactory.

B. Ensure that adequate dust control methods are in effect to prevent the unnecessary accumulation of dust and dirt on surfaces which hamper efficient field seaming or performance.

C. Maintain surface water drainage diversions around the work area and provide for the disposal of water which may collect in the work area from precipitation falling within the area or from inadequate diversion structures or practices.

D. Coordinate with the installation of the materials installed above the HDPE geomembrane.

E. When damage is suspected, uncover area, repair damage if required, and recover area at no cost to the Owner.
   1. Suspect areas may be identified by the Owner or Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents the following Manufacturers are acceptable:
   1. HDPE Geomembrane liners:
      a. GSE Lining Technology, Inc., 19103 Gundle Rd., Houston, Texas 77073.
      b. Agru America, Inc., 700 Rockmead, Suite 150, Kingwood, Texas 77339.
      c. Poly-Flex, Inc., 2000 West Marshall Drive, Grand Prairie, Texas 75051.

B. Submit request for substitution in accordance with Specification Section 01640.

2.2 MATERIALS

A. HDPE Geomembrane Liner:
   1. Consist of unreinforced polyethylene.
      a. HDPE geomembrane, smooth both sides: Thickness 60 mils.
      b. HDPE geomembrane, textured both sides: Thickness 60 mils.
      c. Manufactured from virgin, first quality resin designed and formulated specifically for liquid containment in hydraulic structures.
      d. Reclaimed polymer shall not be added to the resin; except use of polymer recycled during the manufacturing process shall be allowed provided that recycled polymer shall be clean and shall not exceed 10 percent by weight.

e. Add no fillers or post consumer resin prior to or during manufacture of the HDPE geomembrane.

2. Manufactured to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter.
   a. Any such defects shall be cause for rejection of the material.
   b. Minor defects may be repaired in accordance with Manufacturer's recommendations if approved by the Engineer.
3. Manufactured as seamless rolls or as prefabricated panels.
   a. Minimum width: 22 FT as delivered to the site.
   b. All factory seams shall be inspected and tested for strength and continuity prior to delivery to the site.
4. Contractor shall coordinate with Manufacturer to consider if roll lengths could be provided that would extend across the short length of the area to be lined without requiring a field seam.
5. Specifications:
   a. Smooth and textured HDPE geomembrane shall possess properties which meet or exceed the following minimum GRI GM-13 requirements:

PROPERTY	TEST METHOD	TEST VALUE	
		SMOOTH	TEXTURED
Thickness (min average)		60 mils	60 mils
- lowest indiv. For 8 out of 10 values	D5994/D5199	-10 %	-10%
- lowest indiv. For any of the 10 values		NA	-15%
Asperity Height (min. ave.)	GM12	NA	10 mil
Density (min. ave.)	D1505/D792	0.940 g/cc	0.940 g/cc
Tensile Properties (min. ave.) (1)	D638 Type IV		
- yield stress		126 LB/IN	126 LB/IN
- break stress		288 LB/IN	90 LB/IN
- yield elongation		12 %	12%
- break elongation		700%	100%
Tear Resistance (min. ave.)	D1004	42 LB	42 LB
Puncture Resistance (min. ave.)	D4833	108 LBS	90 LB
Stress Crack Resistance (2)	D5397 (App.)	300 HR	300 HR
Carbon Black Content (range)	D1603 (3)	2.0-3.0%	2.0-3.0%
Carbon Black Dispersion	D5596	Note (4)	Note (4)
Oxidative Induction time (OIT) (min. ave.)			
(a) Standard OIT	D3895	100 min	100 min
or			
(b) High Pressure OIT	D5885	400 min	400 min
Oven Aging at 85 DegC (5), (6)	D5721		
(a) Standard OIT (min. ave.)	D3895	55 %	55%
or			
(b) High Pressure OIT (min. ave.) % retained after 90 days	D5885	80%	80%
UV Resistance (7)	GM11		

PROPERTY	TEST METHOD	TEST VALUE	
		SMOOTH	TEXTURED
(a) High Pressure OIT (min. Ave.) % retained after 1600 HRS (8)	D5885	50%	50%

1) Machine direction (MD) and cross machine direction (XMD) average values shall be on the basis of 5 test specimens each direction:
   a) Yield elongation is calculated using a gage length of 1.3 IN.
   b) Break elongation is calculated using a gage length of 2.0 IN.
2) The SP-NCTL test shall be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
   a) The yield stress used to calculate the applied load for the SP-NCTL test shall be the manufacturer's mean value via MQC testing.
3) Other methods such as D4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to ASTM D1603 (tube furnace) has been established.
4) Carbon black dispersion for 10 different views:
   a) Minimum 8 of 10 in Categories 1 or 2.
   b) All 10 in Categories 1, 2, or 3.
5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
6) Evaluate supplies at 30 and 60 days to compare with the 90 day response.
7) The condition of the test should be 20 HR UV cycle at 75 DegC followed by 4 HR condensation at 60 DegC.
8) UV resistance is based on percent retained value regardless of the original HP-OIT value.

2.3 EQUIPMENT AND ACCESSORIES

A. Welding and Seaming Equipment:
   1. Equipped with gages showing temperatures at the nozzle (extrusion welder) or at the wedge (wedge welder).
   2. Maintained in adequate numbers to avoid delaying work.
   3. Supplied by a power source capable of providing constant voltage under a combined-line load.
   4. Do not place electric generator directly on the HDPE geomembrane.

B. Field Tensiometer:
   1. Provide a tensiometer for on-site shear and peel testing of HDPE geomembrane seams.
      a. Tensiometer shall be in good working order.
      b. Built to ASTM specifications.
      c. Accompanied by evidence of calibration of equipment and gages within the past six months.
   2. Tension meter:
      a. Motor driven.
      b. Jaws capable of traveling a measure rate of 2 IN per minute.
      c. Equipped with a gauge that measures the force in unit pounds exerted between the jaws.
      d. Digital readout:
         1) Analog dial type gauges will be accepted provided they meet the criteria in Part 2.3F of this section, and are equipped to display peak values.

C. Punch Press:
   1. Provide a punch press for the onsite preparation of specimens for testing.
   2. Capable of cutting specimens in accordance with ASTM D4437.

D. Vacuum Box:

1. Provide a vacuum box for onsite testing of HDPE geomembrane seams in accordance with ASTM D5641.

E. Equipment necessary to perform "Pressurized Air Channel Evaluation of Dual Seamed Geomembranes" in accordance with ASTM D5820.

F. Gages:
   1. Calibrated within past six months.
   2. Specified test values reading near mid-range of the gage scale.

2.4 MANUFACTURE AND FABRICATION

A. Produce geomembrane sheet which complies with this Specification.

B. Provide resin and additive quality control.

C. Fabricated Specials:
   1. Subject to same level of manufacturer's quality control.
   2. Fabricated from project rolls.
      a. Provide traceability of resin and roll stock.

PART 3 - EXECUTION

3.1 GEOSYNTHETIC LINER SYSTEM

A. Geomembrane Subgrade:
   1. Protect subgrade at all times from damage until such time as the placement of HDPE geomembrane liner and other components of the geosynthetic liner system are complete.
   2. The subgrade shall be prepared in a manner consistent with proper subgrade preparation techniques for the installation of HDPE geomembrane.
      a. The subgrade shall be properly compacted so as not to settle and cause excessive strains in the HDPE geomembrane or other synthetic liner materials.
      b. Prior to installation, ensure a surface free of debris, roots, or angular stones larger than 1/2 IN.
      c. In addition, ensure that the subgrade has been smooth rolled to provide a uniform surface.
      d. During installation, ensure that rutting or raveling is not caused by installation equipment or weathering.
   3. See Section 02200.

B. Anchorages:
   1. Geosynthetic materials placed on side slopes shall be anchored as detailed on the plans.
   2. Excavation, backfill and compaction shall be in accordance with Section 02200.

C. HDPE Geomembrane:
   1. General:
      a. Installer of HDPE geomembranes is responsible for handling, fitting, welding, seaming, jointing and testing the geomembranes.
      b. These responsibilities include but are not limited to:
         1) Acceptance (in writing) of the geomembrane materials from the transporter.
         2) Acceptance (in writing) of the soil or liner subgrade which will serve as a base for the HDPE geomembrane.
            a) This acceptance shall precede installation of the HDPE geomembrane.
            b) Shall state that the Installer has inspected the surface, and reviewed the Specifications for material and placement, and finds all conditions acceptable for placement of HDPE geomembrane liners.
            c) Shall explicitly state any and all exceptions to acceptance.

3) Handling, welding, seaming, jointing, testing and repair of HDPE geomembranes in compliance with this Specification and with written procedures manuals prepared by the Manufacturer or Fabricator.
    a) HDPE Geomembrane shall not be placed upon frozen foundation, standing water or other conditions which will result in deterioration of the foundation.
    b) HDPE Geomembrane liner materials shall be laid out according to plans previously approved by the Engineer.
    c) Adjacent rolls of HDPE geomembrane shall overlap a minimum of 4 IN, provided that greater overlap may be required to allow seaming in accordance with the Manufacturer's instructions.
4) Repair or replacement of defects in the geosynthetic materials as required by the Engineer.

2. Panel deployment:
    a. Only those panel/sheets that can be seamed in 1 day shall be deployed.
    b. Place panels with minimal handling.
        1) Orient sheets to eliminate or minimize number of horizontal seams on side slopes.
        2) Protect panels from tear, puncture or abrasion.
        3) No seams will be permitted in trenches.
        4) Do not drag sheets for deployment.
    c. Equipment used to deploy the geomembrane shall not rut the constructed clay liner.
        1) A rut is defined as a 0.1 FT depression over a 10 FT straight-edged length.
    d. Minimize foot traffic.
        1) Do not allow personnel access to wet or slippery liners without adequate safety precautions.
    e. Ballast with sandbags to prevent wind uplift as recommended by Manufacturer and based on local climatic conditions.
        1) Remove and replace all wind damaged panels at no additional cost to Owner.
        2) If wind causes panels to be displaced, displaced panel may not be reused.
        3) Do not throw or slide sandbags across geomembrane.
    f. Install HDPE geomembrane in stress free, tension free and relaxed condition.
        1) Account for temperature and weather-related impacts when deploying and covering.
        2) Stretching to fit and folding are not permitted.
    g. Do not allow HDPE geomembrane to bubble, fold, or create ripples as a result of placement of overlying liner system components.
        1) Except as noted on the plans, no folds in HDPE geomembrane will be allowed.
    h. Any panel exhibiting stretching caused by placement, covering techniques, or wind shall be removed and may not be incorporated in the final construction.
3. Field seaming:
    a. Perform in accordance with seaming recommendations furnished by the geomembrane Manufacturer.
    b. Surfaces to be seamed shall be clean and dry at the time of seaming.
        1) Precipitation and ponding of water on the HDPE geomembrane shall cause termination of seaming operations.
        2) Do not seam HDPE geomembrane when ambient temperatures are below 32º F or above 104º F, without written consent of HDPE geomembrane Manufacturer and Engineer.
    c. Seam sheets continuously without fishmouths or breaks in the seam.
        1) Where fishmouths are unavoidable, slit sheet to a point such that the sheet lies flat and with no remaining wrinkle.
        2) The two (2) edges of the slit shall be seamed together provided that the overlap for this seam shall be a minimum of 6 IN.
        3) Areas of the slit which do not achieve an overlap of 6 IN, including the terminus of the slit, shall be provided with a patch as discussed below.
    d. Seam all HDPE geomembranes with thermal fusion methods as recommended by the HDPE geomembrane manufacturer.

1) HDPE geomembrane seaming shall be double wedge weld unless otherwise approved or prohibited by construction.

e. Manufacturer's seaming instructions shall specifically address subgrade preparation, seaming materials, temporary and permanent jointing, seaming temperatures including temperatures for seaming materials, seam finishing and curing.

f. A copy of manufacturer's seaming instructions shall be available on site at all times and shall not be deviated from without written approval of the Manufacturer and Engineer.

g. All panels/sheets should be overlapped a minimum of 4 IN.
   1) If horizontal seams are required on side slopes, lap the upper panel over the lower panel.

h. Do not conduct seaming in the presence of standing water and/or soft subgrades.
   1) Clean the seamed area of dust, dirt and foreign material prior to and during the seaming operation.

i. Extend seaming to the outside edge of panels/sheets to be placed in anchor and/or drainage trenches.

j. Tack welds shall conform with Manufacturer's seaming techniques and shall not damage underlying membrane.

4. Patching:
   a. Repair defects in and damage to HDPE geomembrane sheets by seaming a patch over the defect.
      1) Use an undamaged piece of HDPE geomembrane cut to provide a minimum of 6 IN of overlap in all directions from the defect.
      2) Round the corners on all patches.
      3) Replace torn or permanently twisted HDPE geomembrane at no expense to the Owner.
   b. Test all patch seams using one of the following nondestructive tests: vacuum tests, spark tests, or ultrasonic tests.
      1) Test patch seams destructively as directed by the Engineer.
      2) This destructive testing may be accomplished using demonstration seams performed adjacent to the liner installation.

3.2 FIELD QUALITY CONTROL

A. Trial Seam Testing:
   1. Trial seams shall be made each half-day prior to production seaming, or seaming is interrupted for more than 10 minutes, and at other times as the discretion of the Installer and Engineer.
      a. The location of trial seam shall be in an area proposed for the day's production seaming.
      b. Equipment, methods and personnel shall be the same as proposed for the day's seaming.
   2. Samples shall be cut and tested in accordance with ASTM D6392 and tested in accordance with ASTM D413 and ASTM D882.
      a. To be acceptable, five (5) of five (5) replicate test specimens must meet specified seam strength requirements and failures shall be Film Tear Bond.
      b. If the field tests fail to meet these requirements, the entire operation shall be repeated.
      c. If the additional test seams fail, the seaming apparatus or seamer shall not be accepted or used for seaming until the deficiencies are corrected and two consecutive successful test seams are achieved.

B. Non-Destructive Seam Testing:
   1. All field seams shall be non-destructively tested over their full length.
      a. Seam testing shall be performed as the seaming work progresses, not at the completion of field seaming.
      b. All testing shall be documented.
      c. Any seams which fail shall be repaired and documented.
   2. Non-destructively test all field seams continuously using one of the following nondestructive seam tests: Vacuum box, ultrasonic tests, spark tests, or pressurized air channel test.

C. Destructive Seam Testing:
   1. Frequency of samples:
      a. Not exceeding one (1) test per 500 LF of seamed length.
      b. Other samples as Engineer determines appropriate, shall be obtained at locations specified by the Engineer.
      c. The sample frequency may be increased or decreased, based on the Engineer's review of the Work, installer's quality control procedures and test results.
   2. Sample locations shall not be identified prior to seaming.
      a. The samples shall be a minimum of 12 IN wide by 48 IN long with the seam centered lengthwise.
      b. All destructive seam sample holes shall be repaired the same day as cut.
      c. Cut each sample into three equal pieces with one piece retained by the Installer, one piece given to an Independent Testing Laboratory, and the remaining piece given to the Engineer for quality assurance testing and/or permanent record.
      d. Each sample shall be numbered and recorded on the final panel layout record drawing, and cross-referenced to a field log which identifies:
         1) Panel/sheet number.
         2) Seam number.
         3) Top of sheet.
         4) Date and time cut.
         5) Ambient temperature.
         6) Seaming unit designation.
         7) Name of seamer.
         8) Seaming apparatus temperature and pressures (where applicable).
   3. Cut a minimum of ten (10) 1 IN wide replicate specimens from the Installer's sample.
      a. Test a minimum of five (5) specimens for shear strength and five (5) for peel adhesion using an approved field quantitative tensiometer.
      b. Jaw separation speed shall be 2 IN per minute.
      c. To be acceptable, four (4) out of five (5) replicate test specimens must meet the specified seam strength requirements and fail as Film Tear Bond.
   4. The minimum required seam strengths:
      a. 60 mil HDPE geomembrane:

MODE	TEST METHOD	MINIMUM VALUE (LBS/IN)
Peel	ASTM D6392	78
Shear	ASTM D6392	120

   5. If the field tests pass, five (5) specimens shall be tested at the Independent Testing Laboratory for shear strength and five (5) for peel adhesion in accordance with ASTM D6392.
      a. Test both sides of a dual-track weld.
      b. To be acceptable, four (4) out of five (5) replicate test specimens must meet the specified seam strength requirements and fail as Film Tear Bond.
      c. If the field or laboratory tests fail, the seam shall be repaired in accordance with the Manufacturer's Quality Control manual.
      d. Certified test results on all field seams shall be submitted to and approved by the Engineer prior to acceptance of the seam.
   6. The Engineer may separately conduct destructive testing for quality assurance.
      a. If samples tested by Engineer fail based on above criteria, seam will be classified as failed.
   7. A map showing the locations, number, date and type of all patches shall be prepared and provided to the Owner.

3.3 HDPE GEOMEMBRANE LINER ACCEPTANCE

A. Contractor shall retain all ownership and responsibility for the HDPE geomembrane liner until final acceptance by the Owner. The Owner will accept the HDPE geomembrane liner installation when the installation is finished and all required warranties, test results, and documentation from the Contractor, Manufacturer, and Installer has been received and approved, and verification of the adequacy of all field seams and repairs, including associated testing, is complete.

B. Submittal of such documentation shall be a condition precedent to Substantial Completion.

3.4 SCHEDULE OF CERTIFICATIONS

A. The schedule of required certifications and signing parties follows the end of this Section.

B. The certificates following the end of this Section shall be completed and signed by the required parties, and the original certificates delivered to the Engineer's representative as a part of the completion of that particular phase of the geosynthetic liner system installation.

END OF SECTION

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

	CERTIFICATE	**SIGNATURES REQUIRED**
1.	Certification of Raw and Fabricated Material	Manufacturer Fabricator
2.	Certification of Material Acceptance from Shipper	Installer Contractor
3.	Certification of Acceptance of Subgrade	Installer Contractor
4.	Certification of Material Installation	Installer Contractor
5.	Certification of Material Joints	Installer Contractor
6.	Certification of Placement of Adjacent Liner Components	Installer Contractor

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATION OF RAW AND FABRICATED MATERIAL
(To Accompany Each Shipment) (Circle Material Type)

DATE:_____

MATERIAL DESCRIPTION:_____

_____
(include lot and roll/panel numbers)

WE THE UNDERSIGNED CERTIFY THAT THE RAW MATERIAL AND FINISHED [*HDPE GEOMEMBRANE MATERIAL, GEOCOMPOSITE, GEONET, GEOTEXTILES*] FURNISHED FOR THE EAST ASH POND COMPLY WITH SPECIFICATION SECTION 02775, 02777, 02778 FOR RELINING THE EAST ASH POND.

_____
MANUFACTURER NAME

_____
MANUFACTURER SIGNATURE (Authorized Representative)

_____
FABRICATOR NAME

_____
FABRICATOR SIGNATURE (Authorized Representative, if different from Manufacturer)

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATION OF MATERIAL ACCEPTANCE FROM SHIPPER
(Per shipment; each roll or container) (Circle Material Type)

REPORT NO.:_____ DATE:_____

PANEL, ROLL, AND CONTAINER NUMBER REFERENCES_____

_____

WE THE UNDERSIGNED ACCEPT THE [*HDPE GEOMEMBRANE MATERIALS (ROLLS, SHEETS, BLANKETS), GEOCOMPOSITE, GEONET, GEOTEXTILES*] FROM THE TRANSPORTER. THESE MATERIALS WERE RECEIVED IN UNDAMAGED CONDITION BASED UPON OUR VISUAL INSPECTION.

_____
INSTALLER SIGNATURE

_____
CONTRACTOR SIGNATURE

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATION OF ACCEPTANCE OF SUBGRADE - Daily Certification
(Circle Material Type)

REPORT NO.:_____ DATE:_____

AREA REFERENCED:_____

_____

LINER PANEL NUMBERS INSTALLED OVER REFERENCED AREA THIS DATE:

_____

WE THE UNDERSIGNED CERTIFY THAT WE HAVE INSPECTED THE ENTIRE SURFACE, AND HAVE REVIEWED THE SPECIFICATION SECTION [*02775, 02777, 02778*] AND RELATED SHOP DRAWINGS FOR MATERIAL AND PLACEMENT, AND FIND ALL CONDITIONS ACCEPTABLE FOR PLACEMENT OF THE [*HDPE GEOMEMBRANE LINER, GEOCOMPOSITE, GEONET, GEOTEXTILE*].

WE SPECIFICALLY TAKE THE FOLLOWING EXCEPTIONS TO THE ACCEPTANCE OF THE SUBGRADE ON THIS DATE:

_____

_____

_____

(Note: All exceptions shall be approved by Owner or Engineer prior to geosynthetic installation)

_____
INSTALLER SIGNATURE

_____
CONTRACTOR SIGNATURE

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATE OF MATERIAL INSTALLATION - Daily Certification
(Circle Material Type)

REPORT NO.:_____ DATE:_____

AREA REFERENCED:_____

_____

LINER PANEL NUMBERS INSTALLED THIS DATE:_____

_____

_____

WE THE UNDERSIGNED CERTIFY THAT THE [*HDPE GEOMEMBRANE LINER, GEOCOMPOSITE, GEONET, GEOTEXTILES*] WAS INSTALLED IN ACCORDANCE WITH THE SPECIFICATION SECTION [*02775, 02777, 02778*] AND WITH APPROVED SHOP DRAWINGS.

_____
INSTALLER SIGNATURE

_____
CONTRACTOR SIGNATURE

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATION OF MATERIAL JOINTS - Daily Certification Per Test
(As Shop Drawings and as a Compiled Report at the end of Project)
(Circle Material Type)

TEST REPORT NO.:_____ DATE:_____

FIELD LOG NO.:_____

LIST OF ALL DEFICIENCIES AND SUBSEQUENT REPAIRS, COPIES OF ALL FIELD AND FACTORY TESTS AND INSPECTION DATA INCLUDING RECORDS OF ALL NON-DESTRUCTIVE TESTING (Field Logs) AND REPAIRS ARE ATTACHED.

WE THE UNDERSIGNED CERTIFY THAT THE [*HDPE GEOMEMBRANE AND ITS JOINTS WERE INSPECTED AND TESTED FOR STRENGTH AND CONTINUITY, GEOCOMPOSITE/GEONET SEAMS WERE TESTED FOR CONTINUITY, GEOTEXTILE SEAMS WERE INSPECTED FOR CONTINUITY, CONCRETE REVETMENT MAT SEAMS WERE TESTED FOR CONTINUITY]* AND PASSED ALL INSPECTIONS AND TESTS. WHERE FAILING TESTS OR DEFICIENCIES OCCURRED, THE AREA OF FAILURE WAS IDENTIFIED IN ACCORDANCE WITH THE APPROVED QUALITY CONTROL PROGRAM FOR THE PROJECT AND REPAIRED. THE AREAS OF FAILING TESTS, DEFICIENCIES AND THE SUBSEQUENT RETESTS OR TESTS TO DELINEATE THE LIMITS OF FAILURE ARE IDENTIFIED IN THE ATTACHED SEAM TESTS AND INSPECTION DATA.

_____
INSTALLER SIGNATURE

_____
CONTRACTOR SIGNATURE

LUMINENT MARTIN LAKE STEAM ELECTRIC STATION
RELINE EAST ASH POND
RUSK COUNTY, TEXAS

CERTIFICATION OF PLACEMENT OF ADJACENT LINER COMPONENTS –
Daily Certifications; Per Material and Location (Circle Material Type)

REPORT NO.:_____ DATE:_____

COMPONENT BEING PLACED:_____

SUBSTRATE:_____

LOCATION:_____

WE THE UNDERSIGNED CERTIFY THAT THE [*HDPE GEOMEMBRANE, GEOCOMPOSITE, GEONET, LEAKAGE COLLECTION SUMP, CONCRETE REVETMENT MAT]* ON TOP OF THE [*CONSTRUCTED CLAY LINER, HDPE GEOMEMBRANE, GEOTEXTILE, GEOCOMPOSITE, GEONET]* WAS CAREFULLY PLACED UNDER MY DIRECT SUPERVISION/OBSERVATION THIS DATE, AND WITHOUT DAMAGING ANY OF THE UNDERLYING OR ADJACENT SUBSTRATE.

_____
INSTALLER SIGNATURE

_____
CONTRACTOR SIGNATURE

SECTION 02777
GEOCOMPOSITE/GEONET

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Geocomposite for use as a leak detection layer.
   2. Geonet-only for use as a leak detection layer.

B. Related sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02775 - High-Density Polyethylene (HDPE) Geomembrane Liner.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. D4355, Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
      b. D4491, Water Permeability of Geotextiles by Permittivity.
      c. D4533, Trapezoid Tearing Strength of Geotextiles.
      d. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
      e. D4716, Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.
      f. D4751, Determining Apparent Opening Size of A Geotextile.
      g. D4833, Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
      h. D4873, Identification, Storage and Handling of Geosynthetic Rolls.
      i. D5035, Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
      j. D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
      k. D5261, Test Method for Measuring Mass Per Unit Area of Geotextiles.
      l. D7005, Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites.

B. Qualifications:
   1. Each manufacturing firm shall demonstrate 5 years continuous experience, including a minimum of 5,000,000 SF of geocomposite and geonet production in the past 3 years.
   2. Installer shall attend pre-construction conference.

C. Certifications:
   1. Certifications are required for various aspects of the project related to the geocomposite and geonet.
      a. Unless alternately approved, the certificates provided at the end of Section 02775 shall be used and no alterations, additions, deletions, or exception shall be made to the specified language.

1.3 DEFINITIONS

A. Manufacturer: Manufacturer producing geocomposites from geonet cores and geotextiles, and manufacturer producing geonet.

B. Installer: The Installers are the individuals actually performing the hands-on work in the field.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340.
   2. Shop Drawings:
      a. Manufacturer's documentation that raw materials and roll materials comply with required geocomposite and geonet physical properties.
         1) No faxed copies.
      b. Manufacturer and Installer quality control manuals.
      c. Test results for resins and roll material at frequency specified in respective quality control manuals.
         1) Include or bracket the rolls delivered for use in the Work.
         2) No faxed copies.
      d. Proposed details of anchor trench if different than included in Contract Documents.

B. Miscellaneous Submittals:
   1. Qualification documentation specified in Article 1.2.
   2. Submit written certifications that:
      a. Utilize certification forms from Section 02775 unless alternately approved.
         1) Make appropriate number of copies, as required.
         2) Complete and sign appropriate form daily.
      b. The geocomposite and geonet material delivered to site meets the requirements of this Specification.
      c. The geocomposite and geonet were received and accepted in undamaged condition from shipper.
      d. The subgrade has been properly prepared and acceptable for the placement of the geocomposite and geonet.
      e. The geocomposite and geonet were installed in accordance with this Specification and with approved Shop Drawings.
      f. The HDPE geomembrane liner on top of the geocomposite and geonet was placed properly and carefully.

1.5 DELIVERY, STORAGE AND HANDLING

A. See Section 01600.

B. Label, handle, and store geocomposites and geonets in accordance with ASTM D4873 and as specified herein.

C. Wrap each roll in an opaque and waterproof layer of plastic during shipment and storage.
   1. Do not remove the plastic wrapping until deployment.

D. Label each roll with the manufacturer’s name, material type, lot number, roll number, and roll dimensions (length, width, gross weight).

E. Repair or replace, as directed by the Engineer, geocomposite, geonet, or plastic wrapping damaged as a result of storage or handling.

F. Do not expose geocomposite or geonet to temperatures in excess of 71 DegC (160 DegF) or below 0 DegC (32 DegF) unless recommended by the Manufacturer.

G. Do not use hooks, tongs or other sharp instruments for handling the geocomposite or geonet.

H. Do not lift rolls by use of cables or chains in contact with the geocomposite or geonet.

I. Do not drag geocomposite or geonet along the ground or across textured geomembranes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
   1. Agru America, Inc., 800-373-2478.
   2. GSE Lining Technology, Inc., 800-435-2008.
   3. Poly-Flex, Inc., 888-765-9359.

2.2 MATERIALS AND MANUFACTURE

A. Geonet:
   1. Use nonthermally degraded polyethylene polymer which is clean and free of any foreign contaminants.
   2. Manufactured geonet to conform to the minimum average roll values (MARV) requirements listed in Table 1 and be free of defects including tears, nodules or other manufacturing defects which may affect its serviceability.

Table 1 - Geonet Properties

PROPERTY	TEST METHOD	MARV	
		Geonet Core	Geonet-only
Thickness	ASTM D 5199	200 mil	275 mil
Transmissivity	ASTM D 4716	1 x 10^{-3} m^2/sec	6 x 10^{-3} m^2/sec
Tensile Strength (MD)	ASTM D 5035	45 LB/IN	65 LB/IN

B. Geotextile:
   1. For geocomposites, cover the geonet core on both sides with a non-woven geotextile complying with the minimum average roll values (MARV) requirements listed in Table 2 and be free of defects including tears or other manufacturing defects which may affect its serviceability.

Table 2 – Nonwoven Geotextile Properties

PROPERTY	TEST METHOD	MARV
Mass per Unit Area, oz/yd^2	ASTM D5261	≥ 6
AOS, U.S. Sieve	ASTM D4751	≤#70
Permittivity, SEC-1	ASTM D4491	≥ 1.3
Puncture, LBS	ASTM D4833	≥ 90
Grab Tensile, LBS	ASTM D4632	≥ 160
Trapezoidal Tear, LBS	ASTM D4533	≥ 65
Ultraviolet Degradation % retained @ 500 HRS	ASTM D4355	≥ 70

   2. Testing frequencies are outlined in Appendix A – SLQCP.

C. Geocomposite:
   1. Create a composite by heat bonding geotextiles to the geonet.
      a. Ply adhesion MARV: 1.0 LB/IN when tested in accordance with ASTM D 7005.
   2. Transmissivity MARV: ≥1x10^{-4} m^2/sec when tested in accordance with ASTM D 4716.
      a. Gradient of 0.1, normal load of 10,000 LB/FTt^2, water at 70° F, seating period of 15 minutes.
      b. Attach geotextiles to the geonet in the same configuration as will be used in the field for transmissivity testing.
      c. Sandwich the geocomposite between rigid platens on the bottom and on the top.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to placement of the geocomposite and geonet, clean the surface of the HDPE geomembrane of all soil, rock, and other materials which could damage the geocomposite or geonet.

3.2 INSTALLATION

A. Deploy the geocomposite and geonet ensuring that the geocomposite, geonet, and underlying materials are not damaged.
   1. Replace or repair faulty or damaged geocomposite or geonet as directed by Engineer.

B. Unroll geocomposite and geonet downslope keeping in slight tension to minimize wrinkles and folds.

C. Maintain free of dirt, mud, or any other foreign materials at all times during construction.
   1. Clean or replace rolls which are contaminated.

D. Place adequate loading (e.g. sandbags) to prevent uplift by wind.

E. Overlap adjacent rolls a minimum of 6 IN.

F. Use manufacturer's fasteners to join adjacent rolls. Metallic fasteners will not be allowed.
   1. Space fasteners a maximum of 5 FT along downslope roll overlaps and a maximum of 2 FT along cross slope roll overlaps.
   2. Use fasteners of contrasting color from the geocomposite and geonet to facilitate visual inspection.
   3. Do not weld geocomposite or geonet to geomembranes.

G. Heat tack overlap of the upper geotextile to the upper geotextile of the adjacent rolls.

H. Repairs holes or tears in the geocomposite or geonet by placing a patch of geocomposite or geonet (as appropriate) extending a minimum of 2 FT beyond the edges of the hole or tear.
   1. Use approved fasteners, spaced every 6 IN around the patch, to fasten the patch to the original roll.

I. Penetration details shall be as recommended by the Manufacturer and as approved by the Engineer.

J. Cover the geocomposite and geonet within 14 days.

3.3 FIELD QUALITY CONTROL

A. The Owner will accept the geocomposite and geonet installation when the installation is finished and all required test results, and documentation from the Contractor, Manufacturer, Inspector and Installer has been received and approved, and verification of the adequacy of all field seams and repairs, is complete.

B. Submittal of such documentation shall be a condition precedent to Substantial Completion.

END OF SECTION

SECTION 02778
GEOTEXTILES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-woven geotextile material, used separately from a geocomposite.

B. Related Sections:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02240 – Leak Detection System.
   4. Appendix A – Soil and Liner Quality Control Plan (SLQCP).

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method.
      b. D4355, Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
      c. D4491, Water Permeability of Geotextiles by Permittivity.
      d. D4533, Trapezoid Tearing Strength of Geotextiles.
      e. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
      f. D4751, Determining Apparent Opening Size of A Geotextile.
      g. D4833, Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
      h. D5261, Test Method for Measuring Mass Per Unit Area of Geotextiles.

B. Qualifications:
   1. Each manufacturing, fabricating firm shall demonstrate 5 years continuous experience, including a minimum of 10,000,000 SF of geotextile installation in the past 3 years.
   2. Installer shall attend pre-construction conference.

1.3 DEFINITIONS:

A. Manufacturer: Manufacturer producing geotextile sheets from resin and additives.

B. Installer: The Installers are the individuals actually performing the hands-on work in the field.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340.
   2. Manufacturer's documentation that raw materials and roll materials comply with required geotextile physical properties.
   3. Manufacturer and Installer quality control manuals.
   4. Original test results for resins, roll material and factory seam tests at frequency specified in respective quality control manuals.
      a. Results shall include or bracket the rolls delivered for use in the Work.
   5. Proposed details of anchoring and overlapping if different than included in Contract Documents.

B. Miscellaneous Submittals:
   1. Qualification documentation specified in Article 1.2.

1.5 DELIVERY, STORAGE AND HANDLING

A. See Section 01600.

B. Label, handle, and store geotextiles in accordance with SLQCP (Appendix A).

C. Wrap each roll in an opaque and waterproof layer of plastic during shipment and storage.
   1. Do not remove the plastic wrapping until deployment.

D. Label each roll with the manufacturer's name, geotextile type, lot number, roll number, and roll dimensions (length, width, gross weight).

E. Repair or replace geotextile or plastic wrapping damaged as a result of storage or handling.

F. Do not expose geotextile to temperatures in excess of 71 DegC (160 DegF) or less than 0 DegC (32 DegF) unless recommended by the manufacturer.

G. Do not use hooks, tongs or other sharp instruments for handling geotextile.
   1. Do not lift rolls lifted by use of cables or chains in contact with the geotextile.
   2. Do not drag geotextile along the ground.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
   1. GSE Lining Technology, Inc., 800-435-2008.
   2. Propex Geosynthetics, 800-621-1273.
   3. TenCate Mirafi, 706-693-2226.
   4. Other manufactures whose materials meet these Specifications and are accepted by the Engineer.

B. Submit requests for substitution in accordance with Specification Section 01640.

2.2 MATERIALS AND MANUFACTURE

A. Geotextile:
   1. Geotextile materials shall consist of non-woven polypropylene, filament material manufactured from virgin, first quality resin stabilized for exposure to ultra-violet light.
   2. The geotextile shall be manufactured to be free of holes, undispersed raw materials, any sign of contamination by foreign matter.
      a. Any such defect shall be cause for rejection of the defective geotextile.
      b. Minor defects may be repaired in accordance with the manufacturer's recommendations if the repair is approved by the Engineer.
   3. The geotextile physical properties shall equal or exceed the minimum average roll values listed below. Values shown are for the weaker principal direction.

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUE
Mass per Unit Area, oz/yd^2	ASTM D5261	$\geq$ 8
AOS, U.S. Sieve	ASTM D4751	$\leq$0.18mm (#80 sieve)
Permittivity, SEC-1	ASTM D4491	$\geq$ 1.1
Permeability (min. avg.)	ASTM D4491	0.30
Puncture, LBS	ASTM D4833	$\geq$ 110
Grab Tensile, LBS	ASTM D4632	$\geq$ 205
Grab Elongation (%) (min. avg.)	ASTM D4632	50%

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUE
Trapezoidal Tear, LBS	ASTM D4533	≥ 80
Burst Strength, lb/in^2	ASTM D3786	≥ 350
Ultraviolet Degradation % retained @ 500 HRS	ASTM D4355	≥ 70

4. Testing frequencies are outlined in Appendix A – SLQCP.

PART 3 - EXECUTION

3.1 PREPARATION

A. Construct the surface underlying the geotextiles smooth and free of ruts or protrusions which could damage the geotextiles.

3.2 INSTALLATION

A. Install geotextiles in accordance with manufacturer's written recommendations.

B. Create geotextile sleeves to place around geotextile penetrations.
   1. Finished sleeves shall be large enough to fit around the outer diameter of the pipe with a maximum sleeve diameter to be no greater than 1 IN of the outer diameter of the appropriate pipe fittings for that size.

C. Seam Construction:
   1. Sew seams continuously unless otherwise recommended by the manufacturer and approved by Engineer.
   2. Tie off thread at the end of each seam to prevent unraveling.
   3. Sew skipped stitches or discontinuities with an extra line of stitching with 18 IN of overlap.

D. Place overlying material in accordance with SLQCP.

E. Protect geotextiles from clogging, tears, and other damage during installation.

F. Geotextile Repair:
   1. Place a patch of the same type of geotextile which extends a minimum of 12 IN beyond the edge of the damage or defect.
   2. Fasten patches continuously using a sewn seam or other approved method.
   3. Align machine direction of the patch with the machine direction of the geotextile being repaired.
   4. Replace geotextile which cannot be repaired.

G. Do not leave geotextile uncovered for more than 14 days.

END OF SECTION

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SECTION 02930
SEEDING, SODDING AND LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Seeding, sodding and landscape planting:
      a. Soil preparation.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 02270 – Soil Erosion and Sediment Control

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Nursery and Landscape Association/American National Standards Institute (ANLA/ANSI):
      a. Z60.1, American Standard for Nursery Stock.
   2. AOAC International (AOAC).
   3. ASTM International (ASTM):
      a. D2028, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
      b. D5276, Standard Test Method for Drop Test of Loaded Containers by Free Fall.

B. Quality Control:
   1. Fertilizer:
      a. Upon completion of Project, a final check of total quantities of fertilizer used will be made against total area seeded.
      b. If minimum rates of application have not been met, Contractor will be required to distribute additional quantities to make up minimum application specified.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
      c. Signed copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.
      d. Type of herbicide to be used during first growing season to contain annual weeds and application rate.
   3. Certification that each container of seed delivered will be labeled in accordance with Federal and State Seed Laws and equals or exceeds Specification requirements.

B. Miscellaneous Submittals:
   1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
   2. Copies of delivery tickets for fertilizer used on Project showing grade furnished, along with certification of quality and warranty.

1.4 SEQUENCING AND SCHEDULING

A. Installation Schedule:
   1. Show schedule of when lawn type and other grass areas are anticipated to be planted.
   2. Indicate anticipated dates Engineer will be required to review installation for initial acceptance and final acceptance.

B. Pre-installation Meeting:
   1. Meet with Engineer and other parties as necessary to discuss schedule and methods, unless otherwise indicated by Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Native Grass Seeding: Certified seed of locally adapted strains.

B. Application:
   1. Broadcast seeding.
   2. Apply as hydro-mulch mixture.

C. Water:
   1. Water free from substances harmful to grass or sod growth.
   2. Provide water from source approved prior to use.

D. Acceptable seeding rates:
   1. Spring: March - September (Combination of Bermuda and Bahia).
      a. Bahia Seed – 20LB/acre.
      b. Bermuda Seed “hulled” – 25 LB/acre.
      c. Fertilizer – 600 LB/acre.
   2. Fall: October – February:
      a. Rye (use in critical areas that require a quick growing time) – 20 LB/acre.
      b. Wheat – 120 LB/acre.
      c. Fertilizer – 400 LB/acre.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. General:
   1. Limit preparation to areas which will be planted soon after.
   2. Provide facilities to protect and safeguard all persons on or about premises.
   3. Protect existing trees designated to remain.
   4. Verify location and existence of all underground utilities.
      a. Take necessary precaution to protect existing utilities from damage due to construction activity.
      b. Repair all damages to utility items at sole expense.

B. Preparation for Seeding:
   1. Loosen surface to minimum depth of 4 IN.
   2. Remove stones over 1 IN in any dimension and sticks, roots, rubbish, and other extraneous matter.
   3. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted.
   4. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
   5. Distribute fertilizer uniformly over areas to be seeded.

6. Incorporate fertilizer into soil to a depth of at least 2 IN by disking, harrowing, or other approved methods.
7. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
8. Grade to a smooth, even surface with a loose, uniformly fine texture.
    a. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
    b. Limit fine grading to areas which can be planted soon after preparation.
9. Restore areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3.2 INSTALLATION

A. Pasture Seeding:
1. Do not use seed which is wet, moldy, or otherwise damaged.
2. Perform seeding work from April 20 to May 15 for spring planting, and August 1 to September 15 for fall planting, unless otherwise approved by Engineer.
3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, mechanical hand seeders, or other approved equipment.
4. Distribute seed evenly over entire area with 50 percent sown in one direction, and the remainder at right angles sown to first sowing.
5. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors.
    a. Resume work only when favorable conditions develop.
6. Lightly rake seed into soil followed by light rolling or cultipacking.
7. Immediately protect seeded areas against erosion by mulching.
    a. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.
    b. Anchor as required to prevent displacement.
8. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.
    a. Protect seeded areas against traffic or other use by erecting barricades and placing warning signs.

3.3 MAINTENANCE AND REPLACEMENT

A. General:
1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
2. As required provide and maintain temporary piping, hoses, and watering equipment to convey water from water sources and to keep planted areas uniformly moist for proper growth.
3. Protection of new materials:
    a. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain.
    b. Repair and pay for all damaged items.
4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

B. Seeded Areas:
1. Maintain seeded areas for a minimum of 90 days, minimum, after installation and acceptance of entire project area to be planted.
2. Maintenance period begins at completion of planting and establishment of at least 70% coverage.
3. Engineer will review seeded area after installation for initial acceptance.
4. Maintain seeded area by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform area, free of weeds and eroded or bare areas.

5. Lay out temporary watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas.
    a. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
6. Mow seeded area as soon as there is enough top growth to cut with mower set at recommended height for principal species planted.
    a. Repeat mowing as required to maintain height.
    b. Do not delay mowing until grass blades bend over and become matted.
    c. Do not mow when grass is wet.
    d. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 IN.
    e. Do not mow lower than 1-1/2 IN.
7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations until disturbed areas have been sufficiently covered.
    a. Anchor as required to prevent displacement.
8. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
9. Replant bare areas using same materials specified.
10. Engineer will review final acceptability of installed areas at end of maintenance period.
11. Maintain repaired areas until remainder of maintenance period or approved by Engineer, whichever is the longer period.

END OF SECTION

DIVISION 3

CONCRETE

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SECTION 03002
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete and grout.
   2. Concrete mixes, proportioning, and source quality control for precast concrete.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Concrete Institute (ACI):
      a. 116R, Cement and Concrete Terminology.
      b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 212.3R, Chemical Admixtures for Concrete.
      d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
      e. 304.2R, Placing Concrete by Pumping Methods.
      f. 305R, Hot Weather Concreting.
      g. 306R, Cold Weather Concreting.
      h. 318, Building Code Requirements for Structural Concrete.
      i. 347R, Recommended Practice for Concrete Formwork.
   2. ASTM International (ASTM):
      a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
      b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
      c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      d. A775, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
      e. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
      f. C33, Standard Specification for Concrete Aggregates.
      g. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      h. C94, Standard Specification for Ready-Mixed Concrete.
      i. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
      j. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
      k. C150, Standard Specification for Portland Cement.
      l. C157, Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete.
      m. C172, Standard Practice for Sampling Freshly Mixed Concrete.
      n. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      o. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      p. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
      q. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

r. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
s. C494, Standard Specification for Chemical Admixtures for Concrete.
t. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
u. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
v. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
w. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
x. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
y. D1709, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
z. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
aa. E96, Standard Test Methods for Water Vapor Transmission of Materials.
bb. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
cc. E1745, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

3. Corps of Engineers (COE):
   a. CRD-C572, Specifications for Polyvinylchloride Waterstops.
   b. CRD-C621, Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink).

B. Quality Control:
1. Concrete testing agency:
   a. Contractor to employ and pay for services of a testing laboratory to:
      1) Perform materials evaluation.
      2) Design concrete mixes.
      3) Perform testing of concrete placed during construction.
   b. Concrete testing agency to meet requirements of ASTM E329.
2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
   a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
   a. Do not use revised concrete mixes until submitted to and approved by Engineer.
4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon.

C. Qualifications:
1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).
2. Formwork, shoring and reshoring for slabs and beams, except where cast on ground, is to be designed by a professional engineer currently registered in the state where the project is located.

1.3 DEFINITIONS

A. Per ACI 116R except as modified herein:
1. Concrete fill: Non-structural concrete.
2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
3. Exposed concrete: Exposed to view after construction is complete.

4. Indicated: Indicated by Contract Documents.
5. Lean concrete: Concrete with low cement content.
6. Nonexposed concrete: Not exposed to view after construction is complete.
7. Required: Required by Contract Documents.
8. Specified strength: Specified compressive strength at 28 days.
9. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

A. Shop Drawings:
1. See Section 01340 for requirements for the mechanics and administration of the submittal process.
2. Concrete mix designs proposed for use.
   a. Concrete mix design submittal to include the following information:
      1) Sieve analysis and source of fine and coarse aggregates.
      2) Test for aggregate organic impurities.
      3) Test for deleterious aggregate per ASTM C289.
      4) Proportioning of all materials.
      5) Type of cement with mill certificate for cement.
      6) Type of fly ash with certificate of conformance to specification requirements.
      7) Slump.
      8) Air content.
      9) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
      10) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
      11) Shrinkage test results.
      12) Standard deviation value for concrete production facility.
3. Product technical data including:
   a. Acknowledgement that products submitted meet requirements of standards referenced.
   b. Manufacturer's installation instructions.
   c. Manufacturers and types:
      1) Joint fillers.
      2) Curing agents.
      3) Chemical sealer.
      4) Bonding and patching mortar.
      5) Construction joint bonding adhesive.
      6) Non-shrink grout with cure/seal compound.
      7) Waterstops.
4. Reinforcing steel:
   a. Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
   b. Include sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
   c. Obtain approval of Shop Drawings by Engineer before fabrication.
   d. Mill certificates.
5. Strength test results of in place concrete including slump, air content and concrete temperature.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:
1. Cement and fly-ash:
   a. Store in moistureproof, weathertight enclosures.
   b. Do not use if caked or lumpy.
2. Aggregate:
   a. Store to prevent segregation and contamination with other sizes or foreign materials.
   b. Obtain samples for testing from aggregates at point of batching.

c. Do not use frozen or partially frozen aggregates.
d. Do not use bottom 6 IN of stockpiles in contact with ground.
e. Allow sand to drain until moisture content is uniform prior to use.

3. Admixtures:
   a. Protect from contamination, evaporation, freezing, or damage.
   b. Maintain within temperature range recommended by manufacturer.
   c. Completely mix solutions and suspensions prior to use.
4. Reinforcing steel: Support and store all rebars above ground.

B. Delivery:
1. Concrete:
   a. Prepare a delivery ticket for each load for ready-mixed concrete.
   b. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
   c. Ticket to show:
      1) Mix identification mark.
      2) Quantity delivered.
      3) Amount of each material in batch.
      4) Outdoor temperature in the shade.
      5) Time at which cement was added.
      6) Numerical sequence of the delivery.
      7) Amount of water added.
2. Reinforcing steel:
   a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
   b. Mark numbers to match Shop Drawing mark number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following products and manufacturers are acceptable:
1. Nonshrink, nonmetallic grout:
   a. Sika "SikaGrout 212."
   b. Euclid Chemial "NS Grout."
   c. BASF Admixtures, Inc. "Masterflow 713."
2. Expansion joint fillers:
   a. Permaglaze Co.
   b. Rubatex Corp.
   c. Williams Products, Inc.
3. Form coating:
   a. Richmond "Rich Cote."
   b. Industrial Lubricants "Nox-Crete Form Coating."
   c. Euclid Chemical "Eucoslip VOX."
4. Prefabricated forms:
   a. Simplex "Industrial Steel Frame Forms."
   b. Symons "Steel Ply."
   c. Universal "Uniform."
5. Chemical sealer:
   a. L & M Construction Chemicals, Inc.
   b. Euclid Chemical Company.
   c. Dayton Superior.
6. Bonding agent:
   a. Euclid Chemical Co.
   b. BASF Admixtures, Inc.
   c. L & M Construction Chemicals Inc.

2.2 MATERIALS

A. Portland Cement: Conform to ASTM C150 Type II.

B. Fly Ash:
   1. ASTM C618, Class F or Class C.
   2. Nonstaining.
      a. Hardened concrete containing fly ash to be uniform light gray color.
   3. Maximum loss on ignition: 4 percent
   4. Compatible with other concrete ingredients.
   5. Obtain proposed fly ash form a source approved by the Texas State Highway Department for use in concrete for bridges.
   6. PCY: Minimum cement content in pounds per cubic yard to be provided in the mix. Increase cement content if necessary to satisfy the strength and slump requirements listed for the mix. As option, the contractor/supplier may use fly ash for partial replacement of cement. Each unit of cement removed shall be replaced with two units of Class F fly ash or one unit of Class C fly ash. The maximum amount of cement replaced shall not exceed 40% of the minimum content listed for the mix.

C. Water: Potable, clean, free of oils, acids and organic matter.

D. Aggregates:
   1. Normal weight concrete: ASTM C33, except as modified below.
   2. Fine aggregate:
      a. Clean natural sand.
      b. No manufactured or artificial sand.
   3. Coarse aggregate:
      a. Crushed rock, natural gravel, or other inert granular material.
      b. Maximum amount of clay or shale particles: 1 percent.
   4. Gradation of coarse aggregate:
      a. Lean concrete and concrete topping: Size #7.
      b. All other concrete: Size #57 or #67.

E. Concrete Grout:
   1. Nonshrink nonmetallic grout:
      a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
      b. Grout to produce a positive but controlled expansion.
      c. Mass expansion not to be created by gas liberation.
      d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
      e. In accordance with COE CRD-C621.
   2. Epoxy grout:
      a. 3-component epoxy resin system.
         1) Two liquid epoxy components.
         2) One inert aggregate filler component.
      b. Each component packaged separately for mixing at jobsite.

F. Reinforcing Steel:
   1. Reinforcing bars: ASTM A615, Grade 60.
   2. Welded wire reinforcement: ASTM A185.
      a. Minimum yield strength: 60,000 psi.
   3. Column spirals: ASTM A82.

G. Forms:
   1. Prefabricated or job built.
   2. Wood forms:
      a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
      b. Built-in-place or prefabricated type panel.
      c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.

d. When approved, plywood may be reused.

3. Metal forms:
   a. Metal forms excluding aluminum may be used.
   b. Forms should be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
4. Chamfer strips: Clear white pine with planed surface against concrete.
5. Form ties:
   a. Removable end, permanently embedded body type with cones on outer ends not requiring auxiliary spreaders.
   b. Cone diameter: 3/4 IN minimum to 1 IN maximum.
   c. Embedded portion 1-1/2 IN minimum back from concrete face.
   d. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
   e. Provide ties with built-in waterstops at all walls that will be in contact with process liquid during plant operation.
6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

H. Expansion Joint Filler:
1. In contact with water:
   a. Closed cell neoprene.
   b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression deflection (Grade SCE41).

2.3 CONCRETE MIXES

A. General:
1. All concrete to be ready mixed concrete conforming to ASTM C94.
2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.
3. All concrete to be normal weight concrete.

B. Strength:
1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
Precast concrete	Normal weight and lightweight	5000 psi
All other general use concrete	Normal weight	4000 psi

- Minimum 28-day compressive strength.

C. Substitution of fly ash: Maximum 25% by weight of cement at rate of 1 LB fly ash to 1 LB of cement.

D. Slump - 4 IN maximum, 1 IN minimum:
1. Measured at point of discharge of the concrete into the concrete construction member.
2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
3. Pumped concrete:
   a. Provide additional water at batch plant to allow for slump loss due to pumping.
   b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
4. Determine slump per ASTM C143.

E. Selection of Proportions:
1. General:
   a. Proportion ingredients to:

1) Produce proper workability, durability, strength, and other required properties.
2) Prevent segregation and collection of excessive free water on surface.

2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

SPECIFIED STRENGTH	MINIMUM CEMENT, LB/CY MAXIMUM AGGREGATE SIZE			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	1/2 IN	3/4 IN	1 IN	
4000	611	611	611	0.45
5000	---	686	665	0.40

3. Sand cement grout:
   a. Three parts sand.
   b. One part Portland cement.
   c. Entrained air: Six percent plus or minus one percent.
   d. Sufficient water for required workability.
   e. Minimum 28-day compressive strength: 3,000 psi.
4. Normal weight concrete:
   a. Proportion mixture to provide desired characteristics using one of methods described below:
      1) Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
         a) Record and report temperature of trial mixes.
         b) Proportion trial mixes per ACI 211.1.
      2) Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
         a) Field test records must be acceptable to Engineer to use this method.
         b) Test records shall represent materials, proportions and conditions similar to those specified.
5. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in Paragraph 5.3.1 of ACI 318.

F. Allowable Shrinkage: 0.048 percent per ASTM C157.

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. Formwork:
1. Contractor is responsible for design and erection of formwork.
2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
   a. Allowable tolerances: As recommended in ACI 347R.
3. Provide slabs and beams of minimum indicated depth when sloping foundation base slabs or elevated floor slabs to drains.
   a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
   b. Do not place floor drains through beams.
4. Openings: Provide openings in formwork to accommodate work of other trades.
   a. Accurately place and securely support items built into forms.
5. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
6. Clean and adjust forms prior to concrete placement.
7. Tighten forms to prevent mortar leakage.
8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

B. Reinforcement:

1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
5. Extend reinforcement to within 2 IN of concrete perimeter edges.
   a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
6. Minimum concrete protective covering for reinforcement: As shown on Drawings.
7. Unless otherwise indicated, provide minimum concrete cover as follows:
   a. Concrete deposited against earth: 3 IN.
   b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
   c. Formed surfaces exposed to or located above any liquid: 2 IN.
8. Do not weld reinforcing bars.
9. Welded wire reinforcement:
   a. Install welded wire reinforcement in maximum practical sizes.
   b. Splice sides and ends with a splice lap length measured between outermost cross wires of each fabric sheet not less than:
      1) One spacing of cross wires plus 2 IN.
      2) 1.5 x development length.
      3) 6 IN.
   c. Development length: ACI 318 basic development length for the specified fabric yield strength.

C. Construction, Expansion, and Contraction Joints:
1. Provide at locations indicated.
2. Locate wall vertical construction joints at 30 FT maximum centers and wall horizontal construction joints at 10 FT maximum centers.
3. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF.
4. Install construction joints perpendicular to main reinforcement with all reinforcement continued across construction joints.
5. At least 48 HRS shall elapse between placing of adjoining concrete construction.
6. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
7. Before new concrete is placed, coat all construction joints with an approved bonding adhesive used and applied in accordance with manufacturer's instructions.

D. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
2. Use setting diagrams, templates and instructions for locating and setting.

E. Placing Concrete:
1. Place concrete in compliance with ACI 304R and ACI 304.2R.
2. Place in a continuous operation within planned joints or sections.
3. Begin placement when work of other trades affecting concrete is completed.
4. Place concrete by methods which prevent aggregate segregation.
5. Do not allow concrete to free fall more than 4 FT.
6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

F. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand rodding and tamping, so that concrete is worked around reinforcement and embedded items into all parts of forms.

G. Protection:

1. Protect concrete from physical damage or reduced strength due to weather extremes.
2. In cold weather, comply with ACI 306R except as modified herein.
   a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
   b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 DegF	70 DegF
Between 30-45 DegF	60 DegF
Above 45 DegF	50 DegF

   c. Do not place heated concrete that is warmer than 80 DegF.
   d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
   e. Do not allow concrete to cool suddenly.
3. In hot weather, comply with ACI 305R except as modified herein.
   a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
   b. Do not allow concrete temperature to exceed 90 DegF at placement.
   c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
   d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

H. Curing:
1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
4. Provide curing for minimum of 7 days.
5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
6. In hot weather, follow curing procedures outlined in ACI 305R.
7. In cold weather, follow curing procedures outlined in ACI 306R.
8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
9. Curing vertical surfaces with a curing compound:
   a. Cover vertical surfaces with a minimum of two coats of the curing compound.
   b. Allow the preceding coat to completely dry prior to applying the next coat.
   c. Apply the first coat of curing compound immediately after form removal.
   d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
   e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

I. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has reached its specified 28-day compressive strength.

3.2 CONCRETE FINISHES

A. Tolerances:
1. 1/4 IN in 10 FT.

B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:

a. To be covered with a coating or covering material applied directly to concrete.
b. Scheduled for grout cleaned finish.

2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
3. Fill tie holes with nonshrink nonmetallic grout.

C. Surfaces Not Exposed to View:
1. Patch voids, air pockets and honeycomb areas with cement grout.
2. Fill tie holes with nonshrink nonmetallic grout.

D. Slab Float Finish:
1. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
2. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation.
3. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.
4. Cut down all high spots and fill all low spots during this procedure to produce a surface within Class B tolerance throughout.
5. Refloat slab immediately to a uniform sandy texture.

E. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

3.3 GROUT

A. Preparation:
1. Nonshrinking nonmetallic grout:
a. Clean concrete surface to receive grout.
b. Saturate concrete with water for 24 HRS prior to grouting.

B. Application:
1. Nonshrinking nonmetallic grout:
a. Mix in a mechanical mixer.
b. Use no more water than necessary to produce flowable grout.
c. Place in accordance with manufacturer's instructions.
d. Completely fill all spaces and cavities below the bottom of baseplates.
e. Provide forms where baseplates and bedplates do not confine grout.
f. Where exposed to view, finish grout edges smooth.
g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
i. Wet cure grout for 7 days, minimum.

3.4 FIELD QUALITY CONTROL

A. Owner will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.
1. Contractor to cooperate with Owner in obtaining and testing samples.

B. Tests During Construction:
1. Strength test - procedure:
a. Three cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and ASTM C31.
b. Cylinders will be tested per ASTM C39:
1) One at 7 days.
2) Two at 28 days.
2. Strength test - frequency:
a. Not less than one test for each concrete structure.
3. Slump test:

a. Per ASTM C143.
b. Determined for each strength test sample.
c. Additional slump tests may be taken.

4. Temperature: Determined for each strength test sample.

C. Evaluation of Tests:
1. Strength test results:
a. Average of 28-day strength of two cylinders from each sample.
1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
2) If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:
1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

A. Form Types:
1. Surfaces exposed to view:
a. Prefabricated or job-built wood forms.
b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
d. Construct forms sufficiently tight to prevent leakage of mortar.
2. Surfaces normally submerged or not normally exposed to view: Wood or steel forms sufficiently tight to prevent leakage of mortar.
3. Other types of forms may be used:
a. For surfaces not restricted to plywood or lined forms.
b. As backing for form lining.

B. Grout:
1. Nonshrinking nonmetallic grout: General use.

C. Concrete:
1. All concrete can be cast in place or precast.

D. Concrete Finishes:
1. Grout cleaned finish: Where indicated on Drawings.

END OF SECTION

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DIVISION 11

EQUIPMENT

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SECTION 11076

PUMPING EQUIPMENT: SUBMERSIBLE LEACHATE PUMP

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submersible pumps, controls, and accessories for dewatering sumps.
   2. Control panel for pumps.

B. Related Sections include but are not necessarily limited to:
   1. Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.

C. Manufacturer shall warrant all equipment specified in this section for a period of not less than one year from acceptance by owner.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Iron and Steel Institute (AISI):
      a. Steel Products Manual.
   2. American National Standard Institute (ANSI).
   3. American Society for Testing and Materials (ASTM):
      a. A48, Standard Specification for Gray Iron Castings.
   4. Factory Mutual (FM).
   5. Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps (HI).
   6. National Electrical Manufacturer's Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. ICS 6, Enclosures for Industrial Controls.
   7. National Fire Protection Agency (NFPA):
      a. 70, National Electrical Code (NEC).
   8. Underwriters Laboratories, Inc.(UL).

1.3 SUBMITTALS

A. Shop Drawings:
   1. General for all equipment:
      a. See Section 01340 for requirements for the mechanics and administration of the submittal process.
      b. Data sheets that include manufacturer's name and complete product model number.
         1) Clearly identify all optional accessories that are included.
      c. Acknowledgement that products submitted comply with the requirements of the standards referenced.
      d. Manufacturer's delivery, storage, handling, and installation instructions.
      e. Equipment identification utilizing numbering system and name utilized in Drawings.
      f. Equipment installation details:
         1) Manufacturer's installation instructions.
      g. Equipment area classification rating.
      h. Shipping and operating weight.
      i. Equipment physical characteristics:
         1) Dimensions (both horizontal and vertical).
      j. Manufacturer's recommended spare parts list.
      k. Equipment lining and coatings.
      l. Equipment electrical utility requirements.

2. Electrical and control equipment:
    a. Electric motor information:
        1) Nameplate data as required by the NEC.
            a) Manufacturer's name.
            b) Rated voltage.
            c) Full load current.
            d) Rated frequency.
            e) Number of phases.
            f) Rated full load speed.
            g) Time rating: 5, 15, 30 or 60 minutes or continuous.
            h) Rated HP.
    b. Electrical gear:
        1) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.
    c. Control panels:
        1) Panel construction.
        2) Point-to-point ladder diagrams.
        3) Scaled panel face and subpanel layout.
        4) Technical product data on panel components.
        5) Panel and subpanel dimensions and weights.
        6) Panel access openings.
        7) Nameplate schedule.
        8) Panel anchorage.
3. Systems schematics and data:
    a. Provide system schematics where required in system specifications.
        1) Acknowledge all system components being supplied as part of the system.
        2) Provide technical data for each system component showing compliance with the Contract Document requirements.
4. Source quality control test reports.

B. Operation and Maintenance Manuals:
    1. See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
    1. Submersible dewatering sump pumps:
        a. EPG Companies, Inc.
        b. Grundfos.
        c. Or approved equal

B. Submit requests for substitution in writing in accordance with Specification Section 01060.

2.2 MATERIALS

A. Pumps:
    1. Major components to be constructed from 304 Stainless Steel.
    2. Bearings and Seals: E-Glide
    3. O-rings: Teflon or approved equal.
    4. Bolts and nuts: 304 Stainless Steel.
    5. Lifting chains and cables: 304 Stainless Steel.

2.3 EQUIPMENT

A. Performance and Configuration Requirements:

1. Design condition: 40 gpm at 55 FT TDH with minimum pump efficiency of 70 percent, for each pump.
2. Shutoff condition: 0 gpm at 55 FT TDH, for each pump.
3. Pump configuration:
   a. Submersible
4. Nominal pump speed: 3450 rpm.
5. Nameplate driver horsepower: 1.0 HP.
6. Drive type: Constant speed.
7. Suction screened, discharge 1.5 IN DIA minimum.
8. Motor Requirements:
   a. Minimum motor efficiency: 50 percent.
   b. Minimum power factor: 50 percent.
   c. Power supply voltage: 230 volts, single phase, 60 Hertz.
9. The sump drainer shall be supplied as a sealed unit which draws all liquid past the motor. A vent shall be provided to assist with the evacuation of air from the sump drainer.

2.4 ACCESSORIES

A. Power Cable:
   1. Provide power and control cable from pump control panel to pump suitable for submersible and control applications in leachate and indicate same by a code or legend permanently embossed on cable.
   2. Size cable in accordance with applicable NEC specifications.
   3. Provide power cable and control cable as needed.
   4. Provide each cable with a strain relief and cord grip.

B. Level Controls:
   1. Provide level indicator system and automatic control to pump and provide alarm signal.
   2. Level and pump control system shall provide the following:
      a. Start and stop pump automatically or manually.
      b. Automatic stop pump on low sump level.
      c. Provide high level alarm.
   3. Level Sensor(s) shall be capable of being removed in conjunction with removal of pump.
   4. A panel mounted controller with digital readout displays shall provide level indication of the sump. The pump "ON-OFF-HIGH LEVEL" selection shall be through setpoint current relays located on the inner door. The digital controller shall be equipped with a "HIGH-HIGH" shutdown feature which will lock out the pump(s) if the level exceeds 288 inches.
   5. A submersible transducer shall be provided with a suitable cable. The transducer shall be all 316 stainless steel and shall be mounted in the center axis of the pump carriage at the suction end. The unit shall provide a 4-20 ma signal output to the control unit over the entire range at levels encountered in the sump. Static accuracy rating shall be no less than 1%.
   6. A filter dryer with seal pressure/temperature compensation diaphragm shall be provided to be mounted in the control panel or junction box to prevent moisture in the level sensor vent tube. Unit shall extend the operating life of the desiccant filter.

C. Control Panel:
   1. Connect pump to control panel.
   2. The control panel shall be supplied by the same manufacturer as the pump and will be sized to house the level control, pump operation, and motor protection. The control panel will have space for an additional pump to be installed at a later date.
   3. The control panel shall be NEMA 4X stainless steel and have an enclosure with a rain guard and lockable outer cover. The door shall open a minimum of 180 degrees.
   4. The inner door shall be painted steel. The inner door shall contain cutouts for the mounted equipment and operator accessible equipment and provide protection of personnel from live internal wiring.

5. The back plate shall consist of 12 gauge sheet steel and finished with a primer coat and two coats of baked on enamel. All hardware mounted to the subpanel shall be accomplished with the machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified by labels.
6. The panel power distribution shall include all necessary components and shall be completely wired with standard copper conductors rated at 90 degrees C. Control wiring shall be a minimum of 16 gauge and installed in Panduit type wiring trays.
7. Individual fuses shall be provided for main power, pump, and control circuits.
8. A control transformer shall be used to provide the 120V AC power for control circuits.
    a. Provide primary and secondary fusing for the circuit.
9. Provide surge protection and voltage protection.
10. Provide a transducer simulator, to check transducer operation.
11. Provide a thermostat controlled heater to control the inside temperature below the dew point and alleviate the buildup of condensate in the control enclosure.
12. Provide a corrosion inhibitor within the enclosure.
13. Provide a weatherproof top-mounted rotating, red visual high level alarm beacon.
14. Provide a 120 V duplex GFCI outlet and 100 watt switchable light fixture inside control panel.
15. Provide an elapsed time meter.
16. Provide a padlock hasp.

D. Discharge Hose and Fittings:
1. Provide a 2" ID HDPE discharge pipe with a 6” max bend radius from the pump to the sump access structure.
    a. Discharge pipe shall have a length adequate to allow the pump to rest on the bottom of the sump collection pipe, travel through the riser pipe, connect to a 2” quick connector at the top of the riser pipe and extend a minimum of 5 feet into the East Ash Pond.
2. Provide all fittings, including 2-inch stainless steel sliding discharge adapter with threaded stem that extends through the thickness of the riser pipe.
    a. All fittings to be stainless steel.

E. Wheeled Drainers:
1. Pump shall be installed in a 300-series stainless steel, wheeled, sump drainer for use in a 12” HDPE riser pipe with a constant diameter set at a 3:1 H:V slope.
2. The sump drainer shall be supplied as a sealed unit which draws all liquid past the motor. A vent valve shall be provided to assist with the evacuation of air from the sump drainer.
3. The pump shall be designed to allow easy removal of unit should it be required.
4. Provide a retrieval cable of 300 series stainless steel complete with stainless steel clamps and associated hardware.
5. A submersible level sensor mount shall be located at the center bottom of the sump drainer at the suction end for liquid level monitoring and pump control.

F. Break Out Junction Boxes
1. Breakout boxes, for power leads, level sensor leads, flow sensor leads, and float leads shall be provided for installation near the top of the riser pipe or sump.
2. Breakout boxes to be NEMA 4X fiberglass and include proper sized cord restraint and ½” conduit gastight seal fitting.

G. Flow Meter System
1. A Flow Meter System shall be provided to register liquid flow rate and to record total flow.

H. Backflow Preventer
1. Provide backflow preventer on each pump discharge.

2.5 FABRICATION

A. General:
1. Provide pumps capable of handling industrial landfill leachate.

2. Design pump to allow for removal without entering the sump and without removal of bolts, nuts or other fastenings.
3. Provide pump unit connecting to discharge connection with a simple downward motion without rotation.
4. Where watertight sealing is required, machine and fit mating surfaces with O-rings.

B. Impeller:
1. Provide wear ring as necessary to assure efficient sealing between volute and impeller.
2. Provide closed impeller in accordance with Hydraulic Institute Standards.

C. Wheeled Well Pump Carriage:
1. Manufactured from a pipe type 304 Stainless Steel Schedule 40 Welded Pipe of sufficient diameter to hold the pump, casters and wheels while maintaining adequate space to allow for pump placement in and retrieval from the 12" riser pipe.
2. Length of pipe to be equal to pump length minus 2 IN.
3. Suspend pump in center of carriage by attaching Stainless Steel vertical pipe support clamps to carriage pipe wall at each end.
4. Attach four (4) casters at 90 Deg, on each end of carriage pipe. Casters to be constructed of type 304 Stainless Steel with a 200 lbs capacity. No lubrication required, rust resistant bearings. Wheels constructed of urethane. Bolt casters to carriage pipe.
5. Provide stainless steel lifting cable of sufficient strength to permit removal of the unit.
   a. Cable shall be of sufficient length to allow the pump to rest on the bottom of the 12" sump collection pipe, travel through the 12" riser pipe and terminate approximately 1 ft beyond the 1/2" diameter retrieval hole in the sump riser.
   b. Terminate cable with a knot and attach to access structure to prevent cable from slipping back into riser pipe.

D. Shaft:
1. Design pump shaft of sufficient size to transmit full driver output.
2. Use shaft which is accurately machined and constructed with 304 stainless steel and rotates on E-Glide bearings.
3. Design shaft for a maximum deflection of 0.002 IN measured at the stuffing box.

E. Shaft Seal:
1. Provide seals requiring neither routine maintenance nor adjustment, but capable of being easily inspected and replaced.
2. Hold interface in contact by its own spring system.

F. Bearings:
1. Support shaft on upper and lower permanently lubricated bearings.

G. Motors:
1. Provide motor of totally submersible design, constructed with epoxy or poly-seal encapsulated windings, air-filled or dielectric oil filled, with Class F insulation and rated for continuous duty operation.
2. Motor shall be 1 HP, 60 cycle, 230 V 3-phase.
3. Motor windings shall be hermetically sealed within the casing and epoxy coated.

H. Coatings:
1. To the exterior of the pump casing and motor housing, apply polyamidoamine epoxy system.
2. Protect all metallic surfaces coming into contact with leachate except stainless steel and bronze by a corrosion-resistant coating.

2.6 SOURCE QUALITY CONTROL

A. Secure from the pump manufacturer the following inspections and tests on each pump before shipment from factory:
1. Check impeller, motor rating and electrical connections for compliance with Specification.
2. Test motor and cable insulation for moisture content or insulation defects.

3. Run pump for 30 minutes submerged, a minimum of 4 FT under water.
4. After operational test #3 above, perform insulation test (#2 above) again.

B. Factory test of head (FT) versus flow (gpm) for one pump of each service category.

C. System Ground
1. Factory trained installer shall ground system, measuring impedance to ground, to less than or equal to 1.0 Ohms using 780 Series Ground Resistance Tester, Model #61-781, as manufactured by Ideal Industries, Inc., Sycamore, IL.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installer shall be factory certified by the pump manufacturer.

B. Seal pump cable end with a high quality protective covering, to make it impervious to moisture or water seepage prior to electrical installation.

3.2 FIELD QUALITY CONTROL

A. Provide services of equipment manufacturer's field service representative(s) to:
1. Inspect equipment covered by the Specifications.
2. Supervise pre-start adjustments and installation checks, including grounding.
3. Conduct initial startup of equipment and perform operational checks.
4. Provide a written statement from the manufacturer that the equipment has been installed properly, started up and is ready for operation by Owner's personnel.

END OF SECTION

DIVISION 15

MECHANICAL

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SECTION 15065
HDPE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
   1. Furnish all labor, materials, tools, equipment and services for all pipe in accordance with provisions of the Contract Documents.
   2. Completely coordinate with work of all other trades.
   3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound and complete installation.

B. Work included consists of, but is not necessarily limited to:
   1. Leak detection system riser pipes.

C. Related Sections include, but are not necessarily limited to:
   1. Bidding Requirements, Contract Forms and Conditions of the Contract.
   2. Section 02221 – Trenching, Backfilling, and Compacting for Utilities.
   3. Section 02777 – Geocomposite/Geonet.
   4. Section 02278 – Geotextiles.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials International (ASTM):
      a. C33, Standard Specification for Concrete Aggregate.
      b. C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
      c. D638, Test Method for Tensile Properties of Plastics.
      d. D696, Linear Thermal Expansion Coefficient.
      e. D746, Brittleness Temp.
      f. D790, Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
      g. D1238, Test Method for Flow Rates of Thermal Plastics by Extrusion Plastometer.
      h. D1248, Specification for Polyethylene Plastics Molding and Extrusion Materials.
      i. D1505, Text Method for Density of Plastics by the Density Gradient Technique.
      j. D1525, Vicat Softening Temp.
      k. D1603, Carbon Black in Olefin Plastics.
      l. D2122, Method for Determining Dimensions of Thermal Plastic Pipe and Fittings.
      m. D2240, Standard Test Method for Rubber Property - Durometer Hardness
      n. D2837, Method for obtaining Hydrostatic Design Basis for Thermal Plastic Pipe Materials.
      o. D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      p. D3350, Specification for Polyethylene Platic Pipe and Fittings Material.
      q. F714, Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter.
      r. F1473, Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins

B. The pipe manufacturer shall provide certifications and test reports indicating that samples of the production pipe from which the furnished materials were obtained have been tested in accordance with ASTM D2837.
   1. The minimum hydrostatic design basis shall be 1600 psi at 73.4 DegF and 800 psi at 140 DegF.

1.3 SUBMITTALS

A. See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
   1. Pipe:
      a. Driscopipe/Plexco.
      b. Polypipe.
      c. Approved equal.

B. Submit request for substitutions in accordance with Specification Section 01640.

2.2 PIPE AND APPURTENANCES

A. Materials:
   1. Pipe: High Density Polyethylene Pipe, perforated and solid wall shall conform to requirements of ASTM D1248.
   2. Polyethylene for the manufacture of pipe shall be high-density polyethylene conforming to the following minimum physical requirements:

PROPERTY	UNIT	TEST[(1)] PROCEDURE	TYPICAL VALUE
Material Designation	--	PPI/ASTM	PE 3408
Material Classification	--	D1248	III C 5 P34
Cell Classification	--	D3350	345464C
Density (3)	gm/cm^3	D1505	0.955
Melt Flow (4)	gm/10 min.	D1238	0.1
Flexural Modulus (5)	psi	D790	>110,000
Tensile Strength (4)	psi	D638	3,200
PENT	hrs	F1473	>100
UV Stabilizer (C)	%Carb. Blck	D1603	2 TO 3
Elastic Modulus	psi	D638	125,000
Brittleness Temperature	DegF	D746	<-100
Vicat Softening Temp.	DegF	D1525	255
Thermal Expansion	in/in/DegF	D696	1.2×10^{-4}
Hardness	Shore D	D2240	62
Molecular Weight Category	--		EXTRA HIGH
Average Molecular Weight	--	GPC	330,000
HDB @ 73.4 DegF	psi	D2837	1600
HDB @ 140 DegF	psi	D2837	800

[(1)] Test procedures are ASTM unless otherwise noted. (PPI – Plastic Pipe Institute; GCP Permeation Chromatography.)

   3. Pipe and fittings shall be butt fusible at 440 DegF or 500 DegF.
   4. Pipe shall be manufactured in accordance with ASTM F714.
   5. Fittings shall be butt fusion type, meeting the requirements of ASTM D3261 and this Specification.
      a. All fittings shall be pressure rated to match the system piping to which they are fused.

b. At the point of fusion, the outside diameter and minimum wall thickness Specifications of ASTM F714 for the same size of pipe.
c. The side slope riser fittings shall be factory fabricated and shall have a smooth interior surface.

6. The 12 IN Sump Riser Pipe shall be perforated by the Manufacturer as shown on the Drawings.
   a. Above the floor of the sump, the Sump Riser Pipe shall be solid wall SDR 17.
   b. The End Cap shall be perforated by the Manufacturer as shown on the Drawings and fusion welded to the Sump Riser Pipe.
7. All bends shall be "long sweep" with 6 FT minimum radius.

B. Requirements:
1. Workmanship:
   a. Exterior and interior surfaces shall be smooth with no sharp projections.
   b. The surfaces shall be free of foreign inclusions and major surface defects.
   c. Polyethylene pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.
   d. The product function shall be considered when judging external defects.

C. Plastic Pipe:
1. Plastic pipe shall consist of nominal HDPE pipe manufactured from virgin, first quality resin and designed and formulated specifically for hydraulic transmission.
2. Riser pipe shall be SDR 17 polyethylene pipe conforming to ASTM D1248, of the size and configuration shown on the Construction Drawings.

2.3 GRANULAR DRAINAGE MATERIAL

A. Granular drainage material will consist of gravel installed in the sump as shown on the plans.
1. Gravel used shall consist of washed rounded river-run gravel meeting the requirements of ASTM C-33 for coarse aggregate.
   a. Crushed material will not be acceptable.
   b. The gravel should meet the gradation requirements of Size No. 6 (Nominal size 3/4 to 1/2 IN) or coarser.
   c. In addition, the gravel will have a permeability of $1x10^{-2}$ CM/SEC or greater, and the percent of calcium carbonate by weight will not exceed 15 percent per J&L Test Designation S-105-89.
   d. The aggregate can be tested at a modified pH of 4 for the J&L Test.
2. As an alternative to the rounded, river-run gravel, washed rotary kiln produced light-weight aggregates (ASTM C-330) of a rounded shape with no sharp edges may be considered by the Engineer.
   a. However, the material must also meet ASTM C-33 requirements for gradation, durability, and soundness.
   b. The material shall have a minimum size of 3/8 IN, a permeability of $1x\ 10^{-2}$ CM/SEC or greater and the percent of calcium carbonate not exceeding 15 percent by weight.
   c. The aggregate can be tested at a modified pH of 4 for the J&L Test.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Install buried pipe as indicated on Drawings.
2. The Contractor shall insure that kinking or excessive bend diameters of the pipe do not occur during the installation process.
3. The Contractor shall insure that the pipe installed in the trench is firmly supported.
4. The Contractor shall cap all open pipe ends at the end of the work day.

5. Contractor shall remove any cave-in portions of the trench prior to placing sand bagging around the pipe.
6. HDPE pipe and fittings shall be by the same manufacturer.
    a. The minimum strength of the fittings shall not be less than that of the pipe.
7. Changes in direction of HDPE Pipe:
    a. Pipe may be cold-bent to minimum radius of 20 times the pipe diameter as it is installed.
    b. If fittings or fusions are present in the bend, the minimum recommended cold bending radius is 125 times the outside diameter of the pipe.
8. Remove cutting and threading burrs.

B. Joining Procedures:
1. HDPE pipe joints shall be fused on the surface prior to installation into the trench.
    a. Alternative methods of fusing shall be approved by the Engineer.
    b. HDPE pipe 1 IN and under shall be socket fused.
    c. HDPE pipe joints 1-1/2 IN and over shall be buttfused.
2. Fusion joiner must be qualified by type of fusion (i.e., butt fusion, socket fusion or sidewall fusion) and fuse pipe only as qualified.
3. Each joint must be visually inspected inside and outside for damage, dirt, moisture, or any other abnormalities prior to fusing.
4. All joint fusion shall be performed in strict accordance with the manufacturer's specifications.
5. All fusion equipment must be approved by the manufacturer and operated by qualified and certified operators.
    a. Cost for testing and certifying personnel shall be born by the Contractor.

C. Granular Drainage Material:
1. Gravel shall be placed in the sump.
    a. The Contractor shall utilize care to avoid damage to any underlying component.
    b. Any damaged component shall be replaced in accordance with manufacturer’s recommendations.
2. Fill around pipes shall be placed so that deflection or load damage to the pipe does not occur.
3. The granular material shall be protected from fine soil contamination including slope wash down.
    a. The Contractor shall replace the granular material at his expense should contamination occur.
4. The granular material shall be sampled and tested for gradation and permeability.
5. The granular material in the sump shall be wrapped with a minimum 8 OZ geotextile.
    a. The geotextile shall be placed by hand and appropriately lapped and secured with stitching in accordance with the geotextile manufacturer’s recommendations.

3.2 FIELD QUALITY CONTROL

A. The first butt fusion of each day, for each fusion machine, shall be destructively tested by the "bent strap" test.
1. This test method is presented in PLEXCO Bulletins Nos. 105Y and 106.

3.3 PIPE SUPPORTS

A. Construct sump access structure to provide support as shown on the Drawings.

B. Provide additional supports as required to support piping such that its weight is not supported by pumps or equipment.

3.4 CLEANING

A. Keep inside of all pipe, fittings, and valves clean and free from dirt and debris.

B. Thoroughly clean piping as specified by manufacturer.

3.5 INSPECTION AND TESTING

A. Piping shall be tested as described in Paragraph 3.2.

END OF SECTION

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APPENDIX A

SOIL AND LINER QUALITY CONTROL PLAN

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Soil and Liner Quality Control Plan

for

Luminant Martin Lake SES
Reline East Ash Pond
Rusk County, Texas

February 2009

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Luminant Martin Lake SES
Reline East Ash Pond
Soil and Liner Quality Control Plan

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1.0 GENERAL

1.1 General

This Soil and Liner Quality Control Plan (SLQCP) presents engineering and quality control requirements for construction of the Luminant Martin Lake SES Reline East Ash Pond in conformance with the requirements of the Texas Commission of Environmental Quality (TCEQ) Technical Guideline No. 4 "Nonhazardous Industrial Solid Waste Surface Impoundment."

The SLQCP shall be used in conjunction with the final construction drawings and specifications. The SLQCP shall address the following:

- Lines of communication, responsibilities and role of Quality Assurance team and other related project personnel.
- A Quality Assurance Program and the Quality Assurance Procedures to be implemented during the clay liner construction including field observation, laboratory and field testing, and acceptance criteria for constructed work.
- Recording and documenting procedures to demonstrate that the constructed liners meet the requirements of project plans and specifications.
- Report submittals.

The construction and testing of all elements of the landfill liner will be in accordance with the SLQCP.

1.2 Definitions

This section provides the definitions for terms used in this SLQCP.

Contractor or General Contractor– The firm or agency responsible for performance of the construction contract, including the performance of all subcontractors.

Earthwork Contractor - The firm or agency responsible for subgrade preparation and clay liner construction.

Geocomposite – Drainage conductor consisting of geonet and geotextile components assembled by the manufacturer.

Geonet - A netlike configuration of extruded HDPE ribs used as a planar conductor of drainage.

Geotechnical Professional (GP) - Person(s) or firm(s) authorized by the Owner to manage and oversee the execution of the work. This includes a professional engineer licensed in the State of Texas who possesses professional experience in geotechnical engineering and testing. The GP is also responsible for observing, testing and documenting activities related to liner quality assurance during the installation of the lining systems, and for issuing the final report. The GP or his representative will be on site continuously for all liner construction or testing. All completed work is subject to approval of the GP. The GP will sign the Construction Documentation Report. For clay liners only, a Texas Professional Geologist or Texas Professional Engineer may serve as GP and sign the Construction Documentation Report. A licensed engineer must sign all work involving geosynthetics.

Geotextile - A permeable synthetic textile used with soil, rock, sand, gravel or any other similar materials as an integral part of the drainage system. It serves as a filter interface between two types of soil materials, as a drainage conductor, or as soil reinforcement.

Manufacturer - Firm(s) responsible for the production of geomembrane, geotextile and geonet materials, pipe, fittings and other equipment.

Owner –Luminant Power.

Project Documents - All contractor submittals, construction plans, as-built plans, construction specifications, QA plan, safety plan and project schedule.

Project Plans and Specifications - All project related plans and specifications including design modifications and as-built plans.

Qualified Engineering Technician - The qualified representative of the GP who meets the qualifications of a NICET- Certified in Geotechnical Engineering Technology at Level 2 or higher, who is an engineering technician with a minimum of four years of directly related experience or a graduate engineer/geologist with one year of directly related experience.

Quality Assurance - Actions taken by the GP to assure conformity of the liner system production and installation with the Quality Assurance Plan, drawings and specifications. QA is provided by a party independent of installation.

Quality Assurance Laboratory - The firm responsible for conducting tests on clay liner and geosynthetic samples taken from the site. The laboratory shall be independent of the Owner, Manufacturer, Earthwork Contractor and any party involved with the manufacture and/or installation of any part of the liner system.

Work - All tools, equipment, supervision, labor and material or supplies necessary to complete the project as specified herein and as shown on the plans.

2.0 CONSTRUCTED CLAY LINER

2.1 General

Construction of the clay liner will begin after the subgrade has been finished to the proper lines and grade. The depth of the subgrade prior to liner construction shall coincide with the bottom of the liner. All constructed clay liners will be constructed on stable subgrade, keyed into an underlying formation of sufficient strength, or otherwise constructed to ensure stability. Those portions of the pond below the water table will be properly dewatered to resist hydrostatic uplift and ensure constructability. Operating dewatering systems, if installed, will not be discontinued until construction is complete and approved by the Owner. Prior to liner construction, the pond grid coordinate system will be established in and around the construction area. The markers will be visible to personnel in the construction area. The minimum constructed clay liner thickness, measured perpendicular to the surface being lined, will be 1 ½ feet. New liner sections will be properly tied back into previous liner sections to ensure continuous liner coverage. The surface of the finished clay liner will be smooth rolled and kept moist prior to installation of the remaining components of the lining systems.

If stormwater ponds on the clay liner during construction, the Contractor will remove it as rapidly as possible. Stormwater that collects over any portion of the liner system will be removed as quickly as possible, until the liner system has been accepted by the Owner.

For excavation surfaces with a slope of 3 Horizontal to 1 Vertical (3H:1V) or flatter, liner construction may utilize lifts parallel to the finished surface. For excavation surfaces that have steeper than 3H:1V slopes, linings will be placed in successive horizontal soil lifts; however, such lifts must be sufficiently wide to safely accommodate both the construction equipment and the related placement and compaction operations.

2.2 Preliminary Sampling and Testing Procedures

Preliminary soil sampling and testing will be performed on clay soils before they are used for construction of liners. Additional tests will be performed for each borrow source and if the soil characteristics change within a borrow source. Only clayey soils which meet the minimum

requirements of a coefficient of permeability of no more than 1.0 x 10^{-5} cm/sec., a liquid limit of no less than 30, a plasticity index of no less than 15, and percent passing No. 200 sieve of no less than 30 will be used for liner construction. Quality control of the soil plasticity will be closely adhered to and maintained during material selection for liner construction. All soil material must pass the one-inch sieve and will not contain rocks or stones that total more than 10 percent by weight.

Composite samples will be obtained by collecting equal volumes of soil from a number of locations within the soil source. If soil characteristics appear to change within the stockpile or borrow source, one composite sample will be obtained from each soil type. Samples will be sealed, labeled, and delivered to the laboratory for evaluation.

The laboratory will test each sample for Atterberg Limits, percent passing the No. 40 and 200 sieves, and the moisture-density relationship. The test procedures to be used are ASTM D4318, ASTM D422 and ASTM D698, respectively. A moisture-density relationship will be determined for each borrow source to be used in soil liner construction. The moisture-density compaction curve will include a zero-air-voids line based upon an estimated or measured specific gravity of the compacted soil.

Once the maximum dry density and the optimum moisture content of the soil samples have been determined for each borrow source and each soil type, a sample will be compacted to 95 percent of the maximum compacted dry density at the optimum moisture content, or wetter, as necessary to meet density requirements. A Falling Head permeability test (Appendix VII of the Corps of Engineers Manual, EM 1110-2-1906, May 1, 1980, or more current version, Laboratory Soils Testing) will then be performed on this sample. A Constant Head permeability test (ASTM D5084 or EM 1110-2-1906, Appendix VII) may be used as an alternative. The permeant fluid must be tap water or water with a 0.05N solution of $CaSO_4$. The maximum acceptable coefficient of permeability value will not be greater than 1.0 x 10^{-5} cm/sec. When a coefficient of 1.0 x 10^{-5} cm/sec is achieved, the density value of the compacted sample and its moisture content are considered the minimum acceptable for checks of that liner material during construction. In no

instance will the percentage of maximum compacted Standard Proctor Density be less than 95 or the moisture content be less than optimum.

2.3 Sampling and Testing for Constructed Clay Liners

Sidewall liner evaluations for lifts constructed parallel to the surface of the excavation will be evaluated by using the same criteria and frequency of testing as for the bottom. All holes dug or created during any sampling and/or testing shall be backfilled with a mixture of at least 20% bentonite-enriched liner soil and compacted by hand tamping, or filled with an appropriate bentonite grout. Each sidewall and floor area must be separately evaluated unless the two areas are constructed in a continuous monolithic fashion. All soil samples will be visually inspected for compaction planes, permeable zones, poor compaction, or other problems as well as to determine soil type. Any liner sections not meeting the minimum standards on the first test will be reworked, or replaced and retested until they meet the minimum standards. All test and sample locations will be identified by lift number and pond grid coordinates on a drawing of the construction area.

2.3.1 Density and Moisture Content

For parallel lifts, one test will be conducted per each 8,000 square feet, or less, of surface area of lining for each 6 inches of depth (but no less than 3 density tests per 6 inch lift). For horizontal lifts, one test will be conducted for each 100 lineal feet for each 12 inches of thickness. The test locations will be evenly distributed across each lift being tested. Any area appearing to be of questionable quality will be tested instead of, or in addition to, the area previously planned for testing. Test procedures for determining moisture-density relationships in the laboratory will utilize ASTM D 698 (Standard Proctor density). The density obtained in the field must be at least 95 percent of the maximum Standard Proctor value with a moisture content at or above optimum, as determined using a nuclear density gauge in accordance with ASTM D2922. Sections of compacted soil liner which do not pass the density and moisture requirements shall be reworked and retested until the section in question passes.

2.3.2 Sieve Analysis and Atterberg Limits

Bulk samples will be collected for analysis to determine the Atterberg limits and the percent passing the No. 40 and 200 sieves. For parallel lifts, a minimum of one test sample will be conducted for each 100,000 square feet of surface per lift, or major fraction thereof, but no less than one test per 6 inch lift of parallel liner. For horizontal lifts, a minimum of one test per 2,000 lineal feet per 12 inches of horizontal liner. Test procedures to be followed in the laboratory will be ASTM D422 for Sieve Analysis (+1, +200, and -200) and ASTM D4318, for Atterberg Limits. The liner soil must have a liquid limit of no less than 30, a plasticity index of no less than 15, and percent passing No. 200 sieve of no less than 30. If either the LL or PI varies by 10 or more points when compared against the appropriate moisture/density curve used for that soil borrow source, the soil is considered as a distinct soil borrow source and a new test series including moisture/density, compaction relationship, sieve analysis and coefficient of permeability will be determined and these results used for field construction control.

2.3.3 Coefficient of Permeability

Undisturbed samples of the constructed liner will be collected for permeability testing. These samples will be collected using a 3-inch or larger diameter sampling device. All permeability test data shall be submitted regardless of test method used. At a minimum, the calculations of the last data set reported for each sample and the resultant coefficient of permeability shall be reported as supporting data. Any deviation from the methods in the approved SLQCP will be fully justified and explained to the GP and his permission granted prior to their use. These variations will also be noted and GP authorization documented in the Construction Documentation Report.

For parallel lifts, a minimum of one test sample for each 100,000 square feet of surface per lift, or major fraction thereof, but no less than one test per 6 inch lift of parallel liner will be performed. For horizontal lifts, a minimum of one test per 2,000 lineal feet per 12 inches of horizontal liner will be performed. Each sample will be tested in the laboratory using a Falling Head procedure (Appendix VII of the Corps of Engineers Manual, EM1110-2-1906, Laboratory Soils Testing, or more recent version), or a Constant Head procedure (ASTM D 5084 or EM

1110-2-1906, Appendix VII). The permeant fluid will be tap water or water with a 0.05N solution of $CaSO_4$. The liner coefficient of permeability will not exceed 1×10^{-5} cm/sec.

2.3.4 Thickness Verification

Elevation of grid points taken before and after clay placement with field surveying equipment will be used to determine constructed liner thickness. Elevations will be taken at a minimum of one per 5,000 square feet of surface area or major fraction thereof. If the lined area under evaluation is less than 5,000 square feet, a minimum of two reference points are required for verification. Probe holes that disturb finished clay liner may not be used to determine thickness.

2.4 Construction of Clay Liners

Construction of clay liners will be monolithic - sidewalls and floor will be constructed as one unit. This construction method will eliminate the need for a sidewall keyway. Placement of clay liners will be performed in accordance with the following guidelines:

1. Prior to placement of clay liner material, the subgrade in the bottom and sidewall (3 Horizontal to 1 Vertical slope or flatter) areas will be brought within design lines and grades. The liner subgrade area will be proof rolled with heavy construction equipment to detect soft or unstable areas. Unstable areas will be undercut to stable materials and filled with suitable earth materials. The fill will be recompacted to at least 95 percent of maximum Standard Proctor density at a moisture content within plus or minus 3 percent of optimum moisture content. Recompacted subgrade sections are not part of the constructed liner section. All surface areas shall be properly scarified a minimum of two (2) inches and prepared to receive the liner. The surface of each lift shall not contain particles greater than 3/8-inch in size.

2. Liner borrow source soil shall be hydrated by adding water after clod size reduction by discing, pulverizing, or screening as necessary to thoroughly break up and blend the liner soil. Watered and mixed soil shall be stockpiled if necessary to allow proper hydration. Water will be clean and not have come into contact with waste or any objectionable material.

3. All soil liners will be constructed in compacted layers or lifts using a maximum loose lift thickness of eight inches (6-inch nominal compacted thickness). Layers may be formed by utilizing equipment which will spread the material as it is dumped, or the layers may be formed by spreading or blading from piles or windrows previously dumped from excavating or hauling equipment in such amounts that the material is evenly distributed. Water used for sprinkling will be clean and will not have been in contact with solid waste or other objectionable matter. Water required to bring the material to the moisture content necessary for maximum compaction will be sprinkled evenly at the bottom of each lift so as to achieve a uniform moisture content throughout each lift. The liner soil material will not contain rocks or stones larger than one inch or have more than 10 percent rock by weight. The maximum clod size shall be one inch in diameter. In all cases, soil clods will be reduced to the smallest size necessary to achieve the coefficient of permeability reported by the testing laboratory and to destroy any macrostructure after the compaction of the clods under density-controlled conditions. The surface of each lift shall not contain particles greater than 3/8-inch in size.

4. Each constructed soil lift, or layer of liner, shall not exceed eight inches of loose depth, and will be compacted to at least 95% Standard Proctor maximum dry density at or above the optimum moisture content. Each lift will be compacted with a pad/tamping-foot or sheeps-foot roller. The lift thickness will be controlled so that there is total penetration through the loose lift under compaction into the top of the previously compacted lift; therefore, the loose lift thickness must not be greater than the pad or prong length. This is necessary to achieve adequate bonding between lifts and reduce seepage pathways. Adequate cleaning devices will be in place and maintained on the compaction roller so that the prongs or pad feet do not become clogged with clay soils to the point that they cannot achieve full penetration during initial compaction. The footed roller is necessary to achieve bonding and to reduce the individual clods and achieve a blending of the soil matrix through its kneading action. In addition to the kneading action, weight of the compaction equipment is important. The minimum weight of the compaction equipment will be 1,500 pounds per linear foot of drum length. A minimum of eight passes over the liner section is recommended for the compaction equipment. The top of each lift shall be scarified to a shallow depth prior to the placement of the next lift of soil for compaction.

5. New liner sections shall be properly tied back into previous liner sections to ensure continuous liner cover. Continuous floor liners shall not be constructed by butting the entire thickness of a new liner segment to the previous section with a vertical or near vertical joint between the two sections. Proper tie-in of the two sections will use a stair-step construction method with benches, no steeper than a five horizontal to one vertical face. This procedure will tie the two sections together without superimposed construction joints.

6. The clay liner will be keyed into an underlying formation of sufficient strength to ensure stability of the constructed lining.

7. Survey control shall be maintained throughout placement of clay liner material. This will be accomplished by the use of instrument survey method only.

8. The top surface of the completed soil liner will be proof rolled with a smooth-wheel roller prior to final liner thickness surveying. The surface of the soil liner will be proof rolled when construction is shut down for more than 24 hours to mitigate the effects of desiccation. This will be done on a routine basis at the end of each day's liner construction during the summer months.

9. Soil liner construction and testing will be conducted in a systematic and timely fashion. Delays will be avoided in liner completion. Construction and testing of soil liners should not exceed 60 working days from beginning to completion. There will be no more than a 14-day interruption in construction unless adverse weather prevents construction progress. The reasons for any liner construction project taking more than 60 working days to complete will be fully explained in the Construction Documentation Report.

10. All quality testing of soil liners will be performed during the construction of the liner. In no instance will any quality control field or laboratory testing be undertaken after completion of liner construction, except for that testing required of the final constructed lift or confirmation of liner thickness.

11. All soil testing and evaluation of constructed soil liners shall be complete prior to installing an overlying component of the liner system.

3.0 GEOMEMBRANE LINING

3.1 General

This Section covers the work necessary to construct and test the geomembrane lining (geomembrane) system, which will consist of a 60 mil High Density Polyethylene (HDPE) liner. The overall objective is to provide an effective lining system at the completion of the work.

3.2 Submittals

The Contractor will submit written certification by the lining Manufacturer that the lining materials conform to the requirements of the SLQCP; are similar and of same formulation as that for which certification is submitted; and has been demonstrated by actual usage to be satisfactory for the intended application.

The lining Manufacturer and the Contractor, each, will submit a complete description of its quality control program, as applicable, for manufacturing, handling, installing, testing, repairing and providing a completed lining in accordance with requirements of the SLQCP. The description will include, but not be limited to, polymer resin supplier, product identification, acceptance testing, fabrication and production testing, installation testing, documentation of changes, alterations and repairs, retests and acceptance.

The Contractor will submit installation drawings, description of installation procedures, and a schedule for performing/completing the Work. Installation drawings will show a lining sheet layout with proposed size, number, position, and sequence of placing of all sheets and indicating the location of all field seams. Installation drawings will also show complete details and/or methods for anchoring the lining at its perimeter, making field seams, and making anchors/seals to pipes and structures.

The Contractor will submit for approval by the GP samples of lining material(s) and field seams prior to the start of construction.

The Contractor will submit a complete description of welding procedures for making field seams and repairs. The welding procedures will conform to the latest procedures recommended by the lining Manufacturer and to the SLQCP.

The Contractor will submit, for approval by the GP, certification that the surface(s) on which the lining will be placed is acceptable. Installation of the lining will not commence until this certification is furnished to the GP.

The lining Manufacturer will furnish a written lining material warranty on a pro-rata basis for a period of 20 years. The warranty will be against manufacturing defects or workmanship and against deterioration due to ozone, ultraviolet or other normal weather aging.

The Contractor will furnish a written guarantee that the entire lining work constructed by him to be free of defects in material and workmanship and installed pursuant to the SLQCP for a period of two (2) years following the date of acceptance of the Work by the GP. During the 23rd month, a pre-guarantee expiration inspection will be conducted to identify any necessary repair work covered by the guarantee. The Contractor will agree to make any repairs or replacements made necessary by defects in materials or workmanship in the work, which become evident within said guarantee period. The Contractor will make repairs and/or replacements promptly. If the Owner does so, and the Contractor will be liable to the Owner for the cost of such repairs and/or replacements.

3.3 Quality Assurance

Prior to start of work, the lining Manufacturer and the Contractor, each, will submit for approval by the GP, documented evidence of its ability and capacity to perform this Work. Each will have successfully manufactured and/or installed a minimum of two (2) million square feet of similar lining material in containment structures. The Contractor can meet these criteria by teaming with a subcontractor who is identified in the bid along with the firm's experience.

The Contractor will submit the name and qualifications of its project superintendent that will be on the project whenever lining materials are being handled/installed plus the names and qualifications of senior installation personnel on the project.

The Quality Control Plan(s) to be implemented for the Work by the lining Manufacturer and the Contractor will be in accordance with applicable paragraphs of the SLQCP.

The GP will initiate a pre-installation meeting with the Contractor and subcontractor (if applicable) prior to installation of the lining system. Topics for review/discussion will include, as a minimum, project plans and specifications, approved submittals, training and qualification procedures for Contractor personnel, and demonstration of making a field welded seam(s) including peel and shear tests.

Prior to installation of the lining system, the Contractor will instruct the workmen of the hazards of installation, such as handling sheets of lining material in high winds; use of equipment; application of solvents, adhesives and caulks; and walking on lining surfaces. All work will be performed in accordance with OSHA work standards.

The GP will notify the Contractor if he observes what he believes to be improper installation procedures or other activity that may result in a defective liner.

The Contractor and subcontractor (if applicable), shall submit for approval by the GP, written certification that the lining system was installed in accordance with the Manufacturer's recommendation, the SLQCP, project specifications and drawings, and approved submittals.

3.4 Delivery, Storage and Handling

The Contractor will submit for approval by the GP, a method(s) for handling and storage of lining material(s) that have been delivered to the project site. These materials will be stored in accordance with the Manufacturer's recommendation.

Lining materials delivered to the site will be inspected for damage, unloaded, and stored with a minimum of handling. Materials will not be stored directly on the ground. The storage area will be such that all materials are protected from mud, soil, dirt and debris. The stacking of lining materials will not be higher than five rolls.

Under no circumstances will the lining be subjected to materials, sandbags, equipment or other items being dragged across its surface. Personnel shall not down slopes atop the lining. Smoking on the geomembrane liner area is strictly prohibited. All scuffed surfaces resulting from abuse of any kind caused by the Contractor in performance of the Work will be repaired at the GP's direction.

The Contractor will be completely responsible for shipping, storage, handling, and installation of all lining materials in compliance with the SLQCP.

3.5 Products

The HDPE lining materials shall be new, first quality products designed and manufactured specifically for the purposes of the Work and will have satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes. The geomembrane shall be an unmodified HDPE containing no plasticizers, fillers, chemical additives, reclaimed polymers, or extenders. For ultraviolet resistance, the geomembrane material will contain not less than 2.0 percent carbon black as determined by ASTM D 1603. The only other compound ingredients to be added to the geomembrane resin will be anti-oxidants and heat stabilizers required for manufacturing. The geomembrane will be supplied as a single ply continuous sheet with no factory seams and in rolls with a minimum width of 15 FT. The roll length will be maximized to provide the largest manageable sheet for the fewest field seams.

Prior to use at the site, the tests outlined in Table 1 will be performed on the geomembrane materials.

Table 1: Standard Tests on HDPE Geomembrane Material

Test	Type of Test	Standard Test Method	Frequency of Testing
Resin	Specific Gravity/Density	ASTM D 1505/ D792	per 100,000 ft ^{2} and every resin lot
	Melt Flow Index	ASTM D1238	per 100,000 ft ^{2} and every resin lot
	Oven Aging at 85°	ASTM D 5721 ASTM D 3895 ASTM D 5885	per each formula
	UV Resistance	GM 11 ASTM D 3895 ASTM D 5885	per each formula
Manufacturer's Quality Control	Thickness	ASTM D 5199 (smooth) or D 5994[A] (textured)	per roll
	Specific Gravity/Density	ASTM D 1505/ D 792	per 200,000 lb. and every resin lot
	Carbon Black Content	ASTM D 1603	per 20,000 lb
	Carbon Black Dispersion	ASTM D 5596[B]	per 45,000 lb.
	Tensile Properties	ASTM D 6693 Type IV [C]	per 20,000 lb.
	Tear	ASTM D 1004	per 45,000 lb.
	Puncture	ASTM D 4833	per 45,000 lb.
	Dimensional Stability (Shrinkage)	ASTM D 1204 NSF 54 Modified	per 100,000 ft ^{2} and every resin lot
	Stress Crack Resistance	ASTM D 5397	Per GRI-GM10
	Oxidative Induction Time	ASTM D 3895 or D 5885	Per 200,000 lb.
	Asperity Height (Textured Only)	GM 12	Every 2nd roll
Conformance Testing by 3rd Party Independent Laboratory	Thickness [D]	ASTM D 5199 (smooth) or D 5994[A] (textured)	per 50,000 ft ^{2} and every resin lot
	Specific Gravity/Density	ASTM D 1505 / D 792	per 100,000 ft ^{2} and every resin lot
	Carbon Black Content	ASTM D 1603	per 100,000 ft ^{2} and every resin lot
	Carbon Black Dispersion	ASTM D 5596[B]	per 100,000 ft ^{2} and every resin lot
	Tensile Properties	ASTM D 638 Type IV [C]	per 100,000 ft ^{2} and every resin lot

Notes: All test values in accordance with GRI Test Method GM13

A - For textured liners acceptable alternative procedure in accordance with industry standard is to use micrometer with 1/32 radius points

B - NSF 54 Modified (microtome sample preparation procedure)

C - NSF 54 Modified with 2 initial gauge length assumed for elongation at break

D - Field thickness measurements for each panel must be conducted. Use ASTM D374 and perform one series of measurements along the leading edge of each panel, with individual measurements no greater than five feet apart. No single measurements shall be less than 10%below the required nominal thickness in order for the panel to be acceptable.

Extrusion welding rod will be HDPE produced from the same resin as the HDPE sheet resin. Physical properties will be the same as HDPE lining sheets.

3.6 Installation Procedures

Prior to installation of the geomembrane, a site inspection will be conducted by the GP and the Contractor to verify measurements, structures and surface conditions necessary to support the geomembrane. The surface of the subgrade will contain no particles greater than 3/8 inch in size.

The Contractor will provide written documentation to the GP that surfaces to receive the geomembrane have been inspected and are acceptable for installation of the lining.

All earth subgrade surfaces will be maintained in a smooth, uniform, and compacted condition during installation of the lining. Excessive cracking (defined as cracks of a least 1” in depth and at least 1' in length) of the surfaces will be repaired as directed by the GP. Immediately prior to installation of the lining, any erosion or other damage to the subgrade which has occurred since completion of earthwork will be corrected. Adequate drainage of the subgrade will be provided and maintained until installation of the lining is completed. No vehicles will be permitted to travel the completed subgrade.

Before the work begins, the Contractor will inspect all lining materials for damage from transit. Materials that cannot be repaired will be rejected and removed from the work area and site.

During unwrapping of lining materials for use and placement, the Contractor will visually inspect all materials, particularly surfaces of lining sheets, for imperfections and faulty areas. All such defective places will be marked and repaired in accordance with approved methods.

The geomembrane will be installed as shown on the project plans and approved installation drawings. Placement of the geomembrane will be done such that good fit, without bridging, is provided on all covers and grade changes. Excessive slack will be avoided to minimize rippling during the soil cover operation.

Sheets of geomembrane materials will be of such lengths and widths and will be placed in such a manner as to reduce field seaming to a minimum. The lining will be anchored in accordance with details shown on approved plans and drawings. Backfill will be compacted to at least 95% maximum standard proctor density, plus or minus 3% of optimum moisture. The lining will be anchored and sealed to structures, pipes and other types of penetrations, (if any), in accordance with details shown on approved plans and drawings. All changes in approved installation drawings and procedures must be approved by the GP.

Extreme care will be taken during installation of the lining to be certain no damage is done to any part of the lining. Dragging of the geomembrane material on the subgrade will be avoided. Smoking by installation personnel will be prohibited. All handling and installation procedures will be performed by workers wearing shoes with smooth soles. Shoes with soles that have patterns in relief will be prohibited. No foot traffic will be allowed on the geomembrane except with approved shoes. No vehicular traffic will be allowed on the lining. All motor driven equipment using fuel will have spark arrestors. No gasoline driven generators or cans of gas or solvent will be placed directly on the lining material. Under no circumstances will the lining be used as a work area to prepare patches or to store tools and supplies. If needed, a tarpaulin of approved material will be spread out as a work area.

During installation, the Contractor will be responsible for protecting the lining against adverse effects of high winds such as uplift. Sand bags will be used as required to hold the lining material in position during installation. Sand bags will be sufficiently close-knit to preclude fines from working through any portion of the bag. Paper bags, whether or not lined with plastic, will not be permitted. Burlap bags, if used, must be lined with plastic. Sand bags will contain not less than 40 or more than 60 pounds of sand having 100 percent passing a number 8 screen and will be tied closed after filling, using only plastic ties. Metal or wire ties will not be used. Bags that are split, torn, or otherwise losing their contents will be immediately removed from the work area and any spills immediately cleaned up.

The geomembrane material will not be installed under adverse climatic conditions, unless the Contractor can demonstrate that his installation techniques adequately compensate for such adverse conditions and quality of workmanship is not compromised. Adverse climatic conditions occur when the air temperature measured 6 inches above the geomembrane surface is less than 32°F and decreasing, or greater than 104°F; when it is raining; when there is frost on the ground; or during conditions of high winds.

Field seams between sheets of geomembrane material will be made using approved fusion welding systems, equipment and techniques. Approved fusion welding systems include extrusion weld and lap weld using single or double wedge welder.

Geomembrane field seams will be lap seams as shown on approved plans and drawings. The lap seams will be formed by lapping the edges of geomembrane sheets a minimum of 4 inches. The contact surfaces of the sheets will be wiped clean to remove dirt, dust, moisture, and other foreign materials. For extrusion weld seams, bevel edge of geomembrane and clean oxidation from surfaces to receive extrudate by disk grinding or equivalent not more than one hour before seaming.

Lap seam intersections involving more than 3 thicknesses of lining material will be avoided, and all seam intersections will be offset at least 2 ft. No horizontal field seams will be allowed on the slope. Sheets of lining material on the slopes will extend down slope out onto bottom a minimum of 5 ft from toe of slope.

Any necessary repairs to the geomembrane will be made with the lining material itself, using approved fusion welding systems, equipment and techniques. The patch size will be 6 inches larger in all directions than the area to be patched. All corners of the patch will be rounded with a 1 inch minimum radius.

All seams and seals of the geomembrane will be tightly bonded on completion of the work. Any lining surface showing damage due to scuffing or penetration by foreign objects or showing distress will be replaced or repaired as directed by the GP.

Cleanup within the work area will be an ongoing responsibility of the Contractor. Particular care will be taken to insure that no trash, tools, and other unwanted materials are trapped beneath the lining. Care will be taken to insure that all scraps of lining material are removed from the work area prior to completion of the installation.

3.7 Field Quality Control

3.7.1 Observation

Inspection and testing of the installation of the geomembrane will involve the full time observation by the GP or his representative. This will include observing the making and testing of lining seams and patches and periodic measurement of the liner material thickness to insure compliance. The contractor who does field sampling and testing shall act in compliance with the provision of the Texas Engineering Practices Act.

The Contractor shall make visual inspection of the lining sheets, seams, anchors, seals, and repairs as the installation progresses and again on completion of the installation. Defective and questionable areas will be clearly marked and repaired. Final approval of repairs will be given by the GP.

3.7.2 Thickness Measurement

Field thickness measurements must be taken for each panel before it is seamed. The material thickness will be checked using a micrometer at a minimum frequency of one measurement per five feet along the leading edge of each panel but at least, at a minimum, five measurements along the leading edge of the panel. No single measurement will be less than 10% below the required nominal thickness in order for the panel to be accepted.

3.7.3 Trial Seams

Trial seams will be made to verify that adequate conditions exist for field seaming to proceed. Each seamer and machine will produce a trial seam at the beginning of each shift to determine the peel and tensile strength of the seam. The GP may require a trial seam be made at any time during seaming production to verify equipment/operator performance and seam integrity. In addition, if a seaming operation has been suspended for more than 1/2 hour or if a breakdown of the seaming equipment occurs, a trial seam will be produced prior to resumption of seaming operations.

The trial seams will be made of the same HDPE sheet, welding rods, and equipment using the same installation procedures as the geomembrane installation itself. Five samples (coupons) will be taken from each trial seam. The coupons will have a width of 1 inch and length of 12 inches. Each coupon will be tested for shear and peel strength. All coupons will fail by Film Tear Bond. At a minimum, the peel adhesion and bonded shear strength must be 62% and 95%, respectively, of the strength of the parent material, but no less than 78 ppi and 120 ppi respectively. All five coupons must pass the tests, or else the trial seam fails. In that case a new trial seam must be made and tested. This process will continue until all five coupons from the trial seam pass.

3.7.4 Non-Destructive Testing

Depending on seam welding equipment used, all seams and repairs will be tested by a vacuum testing device, a spark testing device and/or air pressure. Standards for vacuum testing and air pressure testing are given in Table 2:

Table 2: Standard Non-Destructive Seam Field Tests on HDPE Geomembrane Material

Type of Test	Standard Test Method	Frequency of Testing	Criteria
Air Pressure	GR1 GM6	All dual-track fusion	27 lb/in^2 (min.) 30 lb/in^2 (max.)
Vacuum	ASTM 4437-99	All non-air pressure tested seams when possible	no bubbles at 3" to 5" suction for 10 sec.

If an extrusion weld or single hot-wedge fusion lap weld is used to weld seams, the Contractor will test the seams by vacuum box. All vacuum box testing will be done in the presence of the GP or his representative. The area to be tested will be cleaned of all dust, debris, dirt and other foreign matter. A soap solution will be applied to the test area and a vacuum of 10 inches Mercury (Hg) will be induced and held at least 10 seconds to mark for repair any suspicious areas as evidenced by bubbles in the soap solution.

As an alternative for testing extrusion welds, the Contractor may test all seams and repairs in the geomembrane by using a high voltage spark detector. The setting of the detector will be 20,000 volts. In order to conduct this test, all seams to be tested will be provided with gauge 24-30 copper wires properly embedded in the seams and grounded. All spark testing will be done in the presence of the GP. All defective areas will be marked for repair.

If the double hot-wedge is used, the Contractor will test all seams in the geomembrane by using the air pressure test. This test consists of inserting a needle with gauge in the air space between welds. Air will be pumped into the space to 30 psi and held for 5 minutes. If the pressure does not drop more than 4 psi, then the seam is acceptable.

All costs of retesting of the geomembrane including reruns of field weld tests and all repairs will be at the Contractor's expense.

3.7.5 Destructive Testing

During the field seaming operation, the Contractor will remove destructive samples from field seams at locations selected by the GP. A minimum of one sample per 500 linear feet of field seam will be made. Additional destructive test samples may be taken if deemed necessary by the GP or his representative. Destructive seam-testing locations will be cap-stripped with the same liner material being sampled (and from the same roll, if available) and of 8 inches minimum width. It will be positioned over the center of the field seam and welded to the lining using an extrusion weld. Capped sections will be non-destructively tested. The destructive sample will have a width of 12 inches plus the seam width and length of 48 inches. From this sample, a 12-inch length will be given to the Owner, another 12-inch length kept for independent laboratory

testing, and the remainder kept by the Contractor. Ten (10) coupons will be cut from the Contractor's length from which five (5) will be field tested for peel adhesion and five (5) will be field tested for shear strength. Four out of five coupons must pass each test as described in Section 3.7.3.

For field destructive samples which have failed the passing criterion, the Contractor shall reconstruct all the field seams between any two previous passed seam locations which include the failed seam or will go on both sides of the failed seam location (10 feet minimum), take another sample from each side and test both. If both pass, the Contractor will reconstruct the field seam between the two locations. If either fails, the Contractor will repeat the process of taking additional samples for testing. In all cases, acceptable field seams must be bounded by two passed test locations. The decision of the GP will be final.

Once a seam is shown to pass the field test, the 12-inch length kept for the laboratory will be shipped to an independent laboratory to confirm these results. The passing criterion for independent laboratory testing is that four of five samples must pass in shear and four of five must pass in peel, as well as fail in FTB. Testing by the independent laboratory will be paid for by the Owner. The independent testing agency will save all test samples including specimens tested until notified by the GP relative to their disposal. All specimens which have failed under testing will be shipped immediately by express delivery to the GP for determination of corrective measures to be taken, which includes retest or repair of failed section.

For nondestructive samples that have failed, the Contractor will cap all field seams represented by the failed sample and a new test sample submitted for retest. The decision of the GP will be final. All costs of retesting of the geomembrane including reruns of field weld tests and all repairs will be at the Contractor's expense.

3.7.6 Liner Acceptance

The Contractor will retain responsibility for the integrity of the geomembrane system until acceptance by the GP. The geomembrane will be accepted by the GP when:

a) Written certification letters including as built drawings, have been received by the GP.
b) Installation is completed.
c) Documentation of completed installation, including all reports, is complete.
d) Verification of adequacy of field seams and repairs, including associated testing, is complete.

Acceptance of the completed work will include receipt of all submittals and all work completed to the satisfaction of the GP.

4.0 LEAK DETECTION SYSTEM

The leak detection system (LDS) shall be designed and constructed to detect leaks that may occur in the overlying geomembrane lining. The system will be physically and chemically resistant to field conditions.

The LDS will be placed above the constructed composite liner system. The LDS installation will be monitored by the GP or his representative on a full time basis. Testing will be conducted by a third party independent laboratory on a full time basis. On the side slopes, the LDS will consist of a heat bonded HDPE geonet/geotextile drainage composite (geocomposite) hand placed on the geomembrane. The geotextile will be bonded on both sides of the geonet. The geotextile on both sides of the geonet will be a minimum 6-ounce non-woven material. On the floor, the LDS will consist of a geonet only, which will also be hand placed on the geomembrane. The geonet will be constructed of polyethylene polymer. The thickness of the geonet in the geocomposite will be 200 mil and the thickness of the geonet-only will be 275 mil. A second geomembrane will be laid above the LDS following the procedures in Section 3. The LDS will include a sump with an embedded sump discharge pipe. The sump will consist of rounded, river-run gravel meeting the requirements of ASTM C-33 for coarse aggregate. Crushed material will not be acceptable. The gravel will meet the gradation requirements of Size No. 6 (Nominal size 3/4 inch to 3/8 inch) or coarser with a maximum gravel size of 2 inches. A minimum 8-ounce non-woven geotextile filter will be hand-placed around the gravel sump.

Placement of granular materials in the sump will generally not proceed at ambient temperatures below 32ºF or above 104ºF, but should be conducted at the coolest part of the day to minimize the development of wrinkles or folding of the geosynthetic materials below the sump. The placement of the LDS will be controlled to avoid damage to the liner; however, the granular material in the sump does not need to be density controlled.

Granular materials will be selected to meet the specifications described above. At least one set of pre-construction tests will be conducted on the granular material from the proposed source. Gravel sources will include a complete grain-size analysis, including Minus No. 200 Sieve, by

ASTM D 422. The required thickness of the granular material in the sump will be verified by survey methods.

The tests described in Table 3 will be required on the geotextile materials.

Table 3: Standard Tests on Geotextile Materials

Test	Type of Test	Standard Test Method	Frequency of Testing
Manufacturer's Quality Control	Fabric Weight	ASTM D 3776	per 100,000 ft^2
	Thickness	ASTM D1777	per 100,000 ft^2
	Grab Tensile Strength (lbs)(MD/CD) [1]	ASTM D4632	per 100,000 ft^2
	Grab Elongation (%)(MD/CD) [1]	ASTM D4632	per 100,000 ft^2
	Puncture Resistance (lbs)	ASTM D4833	per 100,000 ft^2
	Permeability	ASTM D4491	per 100,000 ft^2
Conformance	Thickness	ASTM D1777	per 100,000 ft^2
Testing by 3rd Party	Fabric Weight	ASTM D3776	per 100,000 ft^2
Independent Laboratory	Grab Tensile Strength	ASTM D4632	per 100,000 ft^2
	Grab Elongation	ASTM D4632	per 100,000 ft^2
	Puncture Resistance	ASTM D4833	per 100,000 ft^2
	Permeability	ASTM D 4491	per 100,000 ft^2

1. MD/CD = MD – Machine Direction/CD – Cross Direction

The tests described in Table 4 will be required on the geonet materials:

Table 4: Standard Tests on Geonet Material

Test	Type of Test	Standard Test Method	Frequency of Testing
Resin	Specific Gravity/Density	ASTM D 1505	per 100,000 ft^2 and every resin lot
	Melt Flow Index	ASTM D 1238	per 100,000 ft^2 and every resin lot
Manufacturer's Quality Control	Thickness	ASTM D 1777	per manufacturer's quality control specifications
	Mass per Unit Area	ASTM D 3776 (Option C)	per 100,000 ft^2 and every resin lot
	Polyethylene Content	--	per 100,000 ft^2 and every resin lot
	Density (black resin)	ASTM D 1505	per 100,000 ft^2 and every resin lot
	Carbon Black Content	ASTM D 1603	per 100,000 ft^2 and every resin lot
	Melt Index	ASTM D 1238 (Condition 190/216)	per 100,000 ft^2 and every resin lot
	Tensile Strength	ASTM D 1682	per 100,000 ft^2 and every resin lot
	Transmissivity	ASTM D 4716	per 100,000 ft^2 and every resin lot
Conformance Testing by 3rd Party Independent Laboratory	Thickness	ASTM D 751	per 100,000 ft^2 and every resin lot
	Mass per unit area	ASTM D 3776	per 100,000 ft^2 and every resin lot
	Carbon black content	ASTM D 1603	per 100,000 ft^2 and every resin lot
	Tensile Strength	ASTM D 1682	per 100,000 ft^2 and every resin lot
	Transmissivity	ASTM D 4716	per 100,000 ft^2 and every resin lot

5.0 FABRIC-FORMED CONCRETE REVETMENT MAT

A four-inch thick fabric-formed concrete revetment mat will be placed on top of the upper geomembrane liner on the floor and sidewall areas.

Placement of the revetment mat fabric forms will generally not proceed at ambient temperatures below 32ºF or above 104ºF, but should be conducted at the coolest part of the day to minimize the development of wrinkles or folding of the geosynthetic materials below the revetment mat. Care will be exercised in placement and filling the revetment mats so as not to shift, wrinkle, or damage the underlying geosynthetic layers. Placement methods will be documented.

6.0 FIELD PROCEDURES FOR GEOTECHNICAL PROFESSIONAL

The following actions will be taken by the GP to validate that the excavation foundation is suitable for construction of the clay liner.

- The GP will walk the entire floor of the excavation and visually look for cracking, fissures, seeps, depressions, and foreign objects that would indicate unsatisfactory conditions to construct the clay liner. In addition, the GP will thoroughly review the final survey data to verify that the proper excavation grades have been achieved prior to beginning clay liner construction.
- The GP will document the conditions of the foundation of the inspected areas.
- If any of the foundation appears to exhibit any of the characteristics noted above, then the GP will notify the Contractor to take appropriate actions to correct the problems. Actions the Contractor may take include 1) grubbing and re-grading areas that do not meet proper excavation grades, or 2) scarifying and re-compacting the sub-grade to achieve adequate density prior to clay lining.

Areas that are repaired will be re-surveyed to verify the appropriate grades have been achieved prior to constructing the clay liner.

7.0 CONSTRUCTION DOCUMENTATION REPORT

Upon completion of all required liner construction and evaluation, the GP will prepare and submit a Construction Documentation Report. This report will contain a narrative describing the conduct of work and testing programs required by the Contract Docouments, record drawings, and appendices of field and laboratory data. Because the volume of data for these projects can be quite large, the documents may be subdivided for ease of review. The preferred document format will include the narrative, record drawings, and summaries of test results in a single volume. The remaining appendices will be placed in accompanying volumes. The Construction Documentation Report and will be signed and sealed by the GP, and countersigned by the Site Manager or an authorized representative.

The Construction Documentation Report will contain or discuss the following information, at a minimum, for geosynthetics:

- Roll shipment and receipt information
- Manufacturer's quality control certificates and results
- Storage and handling information
- Conformance test sampling and test results
- Subgrade acceptance
- 100 percent visual inspection for defects, damage, etc.
- Destructive testing methods, criteria and results
- Material properties and placement of all geosynthetics and drainage materials
- Seamer's names and resume of experience and qualifications
- Anchor trench preparation and backfilling
- Panel deployment, identification and placement
- Panel wrinkling and manufacturer's creases
- Seam preparation, orientation and identification
- Weather and ambient temperatures
- Equipment placed on the geomembrane
- Trial seams for each combination of seaming equipment and personnel
- Seaming methods, times, temperature, equipment shutdowns and start-ups
- Continuous 100 percent non-destructive seam testing, methods, criteria and results
- Repairs including preparation procedures, failure delineation, patch size and shape, and retesting

The reports will also include pertinent record drawings including:

- Record drawings showing elevations of constructed soil liner layers to confirm its thickness.
- Plan view map showing soil liner field test and sample locations for each six-inch lift.

- Record panel layout drawings showing location of destructive test samples, patches and repairs.
- Record drawings showing final elevations of the completed liner system.

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EXHIBIT A

Example Geomembrane/Geosynthetic Liner Evaluation Report

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
MUNICIPAL SOLID WASTE FACILITY
GEOMEMBRANE/GEOSYNTHETIC LINER
EVALUATION REPORT

*****READ THESE INSTRUCTIONS BEFORE COMPLETING THIS FORM******

This form is to be completed by a knowledgeable professional engineer experienced in geotechnical engineering and is experienced in geosynthetic clay liner testing, the interpretation of these test results, and the proper methods of constructing impermeable geomembrane/geosynthetic clay liners that meet the requirements of the Texas Commission on Environmental Quality (TCEQ) rules.

The certifying engineer or a member of his or her staff qualified by training and experience shall monitor liner construction, but the final evaluation must be made by the aforementioned engineer.

The purpose of the geomembrane/geosynthetic clay liner evaluation report is to assure that groundwater, as defined in the TCEQ rules, is protected from contamination resulting from the storage, processing, and disposal of municipal solid waste. This liner evaluation report is required to document that the liner was constructed as designed in accordance with the issued registration or permit and meets the TCEQ regulatory requirements prior to unit operation.

This report is to be supplemented with those quality-assurance/quality-control (QA/QC) tests as detailed in the liner quality control plan (LQCP) and shall be the basis of documentation of the quality control and acceptance of the constructed liner.

The term "GCL" as used in this report form refers to geosynthetic clay liner. The term "GCLER" refers to geosynthetic clay liner evaluation report and is synonymous with the term "SLER" as described in the TCEQ rules when GCL is used to replace or supplement a soil liner as part of an alternative liner design.

Attach additional sheets as needed, and on each sheet identify the appropriate Part and Paragraph number for each reference.

If the geosynthetic clay liner is to be covered by a geomembrane, complete Part F and G of this form with the geomembrane liner evaluation report.

Provide an interim status report within six (6) months completion of the protective cover as stated in Part E.3 and each 6 months thereafter until the entire liner system is covered by municipal solid waste. This report should be developed by a qualified independent consultant and submitted to the TCEQ. No formal report form exists for this purpose. The integrity and required thickness of the protective cover must be verified. If erosion of the protective cover has occurred, then it must be replaced and reported as such and verified by the consultant that it meets the thickness requirement. If repairs are necessary on the synthetic liner, then these repairs must be completed in accordance with the approved LQCP and reported to the TCEQ in a supplemental liner evaluation report.

Important: Three signed, sealed, and dated copies of this form which includes one original copy and all attachments (drawings, comments, etc.) must be provided to the TCEQ.

(SUBMIT THIS REPORT TO THE TCEQ IN TRIPLICATE)

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
MUNICIPAL SOLID WASTE FACILITY
GEOMEMBRANE/GEOSYNTHETIC LINER
EVALUATION REPORT

PART A: FACILITY IDENTIFICATION

Permittee: _____

Permit No.: _____ Operational Classification Type: _____

County: _____

PART B: GENERAL INFORMATION

1. What type of liner system is required by the permit and is detailed in the site development plan (SDP)? _____

2. Is this the first liner element of a composite liner system? _____

3. Does the SDP require a leachate collection system (LCS) for this liner system? _____

4. Date of the current approved LQCP that was used to develop this GLER/GCLER? _____

   a. Was this plan followed? _____

   b. If not followed, why not? _____

PART C: LOCATIONS AND/OR DESCRIPTON OF AREAS CURRENTLY BEING EVALUATED

1. Attach to this report a copy of the latest approved sectorized fill layout plan showing the areas or sectors of the landfill or waste management unit currently under evaluation and noting areas previously filled. The required grid system must be shown on this drawing.

2. On a sketch(es) or drawing(s) of the area or areas under evaluation, indicate the following:

   a. Boundary lines distinguishing the bottom and sidewall areas of the trenches or fill areas being evaluated and SLER/GCLER/GLER boundary markers.

   b. Geomembrane/GCL panel layout with number designation and location of all repairs.

   c. As-built elevations of subgrade or liner.

3. Are boundary markers in place at the time of this submittal? _____ (See 30 TAC §330.143).

4. Present evaluation location and area of coverage:

   a. Trench, sector, or area identification or number (include SLER/GCLER/GLER boundary coordinates) of this evaluation: _____

   b. Excavation depth _____ft.; Actual elevation of trench at: top _____ ft.; bottom _____ ft.; Width of excavation at: top _____ ft.; bottom _____ ft.; and ration of side slopes _____ H: _____V.

   c. total square footage of liner construction for the floor _____ $ft.^2$ and for each individual side slope: (1) _____$ft.^2$; (2) _____ $ft.^2$; (3) _____ $ft.^2$; (4) _____ $ft.^2$ (if evaluated area has more than four sides, list all others below) _____

PART D: LINER MATERIALS

1. Geomembrane Liner

   a. Indicate type of geomembrane used on floor and sidewalls _____

   b. Indicate geomembrane roll dimensions _____

   c. Does the geomembrane material meet the specifications and the requirements given in the SDP and the LQCP? _____. If not, please explain _____ Attach roll delivery documentation, manufacturer's certification, and conformance testing results. Provide information on a geosynthetics inventory table 6 if not provided elsewhere.

2. Geosynthetic Clay Liner

   a. Indicate type of GCL used on floor and sidewalls:

   _____ Needle-punched geotextile-encased GCL placed with nonwoven side up and woven side down.

   _____ Needle-punched geotextile-encased GCL placed with woven side up and non-woven side down.

   _____ Needle-punched GCL with nonwoven geotextile on both sides.

   _____ Adhesive-bonded GCL with woven geotextile on both sides.

   _____ Stitch-bonded GCL with woven geotextile on both sides.

   _____ Geomembrane-backed adhesive bonded GCL placed with geomembrane side down.

   _____ Geomembrane-backed adhesive-bonded GCL placed with geomembrane side up.

   _____ Other (describe) _____

b. GCL roll dimensions _____

c. Does the GCL material meet the specifications and the requirements given in the SDP and LQCP? _____. If not, please explain _____

Attach roll delivery documentation and manufacturer's certification and test results. Provide information on geosynthetics inventory form (attached) if not provided elsewhere.

PART E: INSTALLATION OF THE GEOMEMBRANE/GEOSYNTHETIC CLAY LINER

Describe concisely on attached sheets the field and laboratory activities performed by the certifying engineer and/or the engineer's staff to accomplish this evaluation. Please indicate the method used to determine testing locations, testing procedures, testing locations and repairs, and field and laboratory methods that were followed.

1. Dates geomembrane/geosynthetic clay liner was installed. _____

2. Dates the engineer visited the site. _____

3. Dates the protective cover was installed. _____

4. Name(s) of the engineer's technician and dates on site. _____

_____

5. Submit subgrade acceptance certificates.

6. Were all the QA/QC tests and the rate of testing preformed in conformance with the current LQCP? _____. If not, please explain. _____

7. Attach any independent laboratory conformance test results for geomembrane liner or GCL if performed. These data must include copies of all laboratory permeability test data sheets. Also, include any miscellaneous tests such as any required field density tests on subgrade.

8. Submit geomembrane/geosynthetic clay liner panel development summary and geomembrane seam summary.

9. Geomembrane installation.

a. Types of field seaming used? _____

b. Start-Up Testing

Were peel and shear test seams made by each seamer each day at the start-up of each seaming period and after the mid-day break, for each seaming apparatus he or she used that day? _____. Did each seamer make at least one test seam each day he or she performed seaming? _____. Submit applicable geomembrane fusion trial seam summary and geomembrane extrusion trial seam summary tables.

c. Non-Destructive Testing

1) Was continuous, non-destructive testing performed on all seams? _____

2) Type of non-destructive testing: vacuum box _____, air pressure _____, other (please explain) _____

_____

3) Submit air pressure test summary table and other non-destructive test documentation on the applicable geomembrane seam summary and geomembrane repair summary table.

d. Destructive Testing (if performed)

1) Number of locations where destructive tests were performed. _____ Total length of seaming _____ feet. Attach destructive tests results.

2) Minimum number of peel tests required to be performed by quality control laboratory. _____. Number actually performed? _____ (Dual track welds must be tested independently).

3) Minimum number of shear tests required to be performed by quality control laboratory. _____. Number actually performed? _____

4) Where are samples from each destructive testing archived? _____

5) Submit destructive test summary table and laboratory destructive test data.

e. Repairs

Were all seams which failed destructive or non-destructive testing and other areas requiring repairs repaired in accordance with the LQCP? _____ Submit geomembrane repair summary table.

10. Geosynthetic Clay Liner Installation

a. How much overlap was provided at the edges of the GCL panels? _____. Was granular bentonite placed in the overlaps? _____ If so, please describe the placement procedure, the rate of bentonite placement, and the procedure used to verify the amount of bentonite placed. _____

b. Were the GCL panels placed by unrolling or by dragging the rolls across the subgrade? _____

c. Did any GCL hydrate prematurely prior to covering with geomembrane or protective cover? _____. If so, were the hydrated areas removed and replaced? _____. If not, please explain. _____ _____

d. How was the GCL tied into existing liner from any adjacent lined areas? _____
_____.
Attach sketch showing tie-in if necessary.

PART F: LEACHATE COLLECTION SYSTEM/PROTECTIVE COVER

1. Gradient of bottom of evaluated area. _____.

2. Gradient of leachate collection lines. _____.

3. What method of placement was used for the LCS and/or protective cover over the geomembrane liner/GCL? _____

_____

_____.

4. Was the liner system (including LCS/protective cover placement) completed prior to the engineer's final field visit? _____.

5. Do protective cover soil and leachate collection system materials (trench backfill; leachate collection layer soil; drainage, filter or cushion geosynthetics; collector pipes) meet the required specifications? _____.

6. Attach result of any required permeability, grain size, and calcium carbonate content tests on soil drainage and protective cover materials by suppliers and independent laboratory. For geosynthetic materials; attach roll delivery documentation, suppliers' certifications and test results, and results of any conformance tests required by the LQCP.

7. Attach survey documentation from a registered surveyor for thickness verification of LCS and protective cover. Also attach a sketch showing the liner/LCS/protective cover cross-section.

PART G: BALLAST

Does this liner system require any ballast to overcome hydrostatic pressure? _____.
Include a demonstration of stability during construction (or post-construction BER if desired) with this GLER/GCLER. This documentation must include: (1) the seasonal high water table and how it was derived (a table showing the groundwater elevations from monitor wells or piezometers is sufficient); (2) the depth of the excavation (Part C.2.c above); and (3) a narrative explaining why ballasting is required with respect to the depth of excavation and the seasonal high water table elevation.

PART H: SIGNATURE OF THE PROFESSIONAL OF RECORD

I certify that the liner and associated components have been constructed as designed in accordance with the issued permit and in general compliance with the regulations.

AFFIX PROFESSIONAL ENGINEER'S SEAL (Date & Sign)

_____
(Typed or printed name)

_____
(Phone number)

_____ _____
(Date signed) (Fax number)

_____
(Company or business name)

_____
(Address, city, zip code)

Note: A professional engineer must be registered in Texas.

PART I: SIGNATURE OF PERMITTEE

1. I have read and fully understand the findings of this GLER/GCLER submittal.
2. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ _____
(Signature) (Typed or Printed Name)

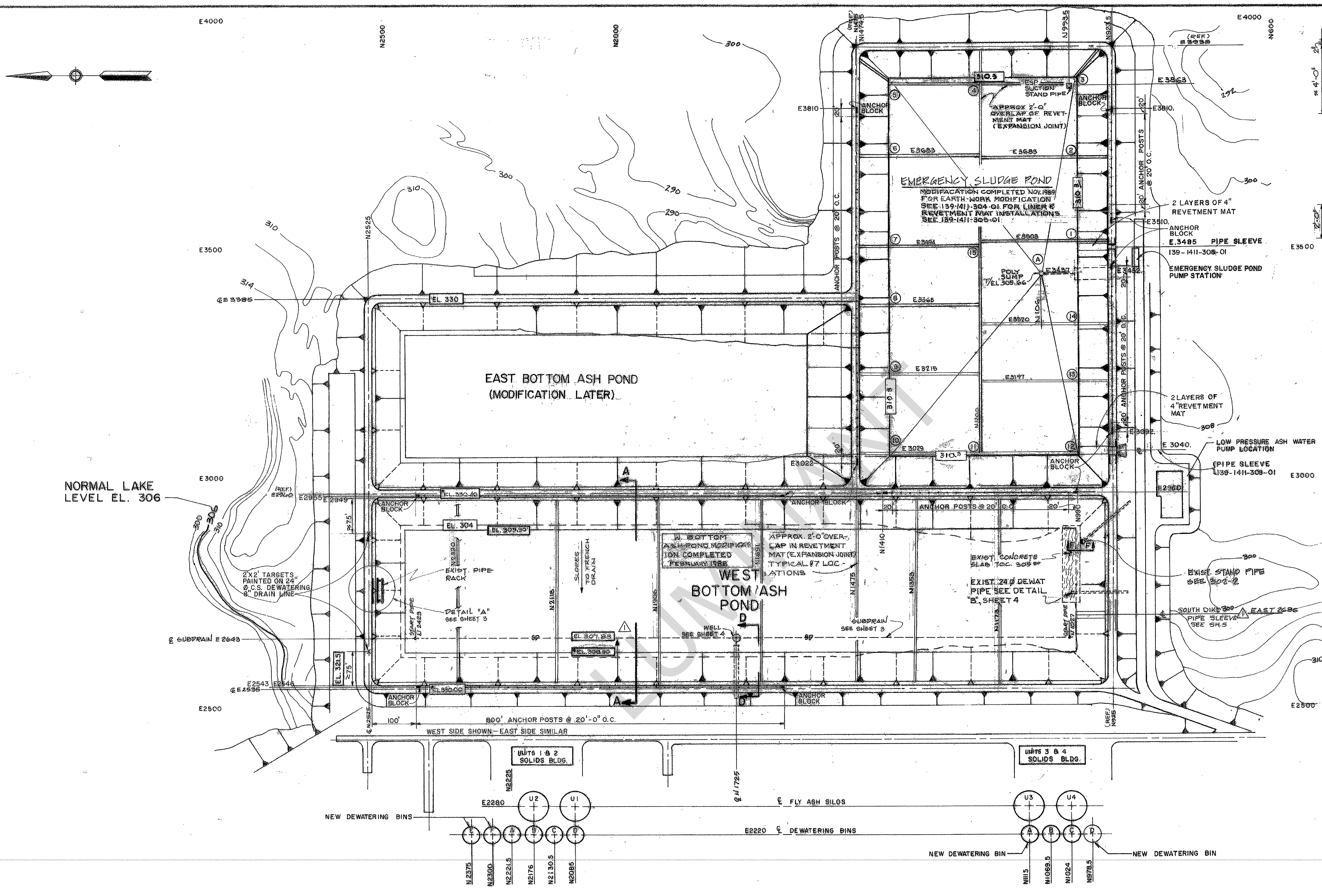
_____ _____
(Title) (Date Signed)

_____ _____
(Phone Number) (Fax Number)

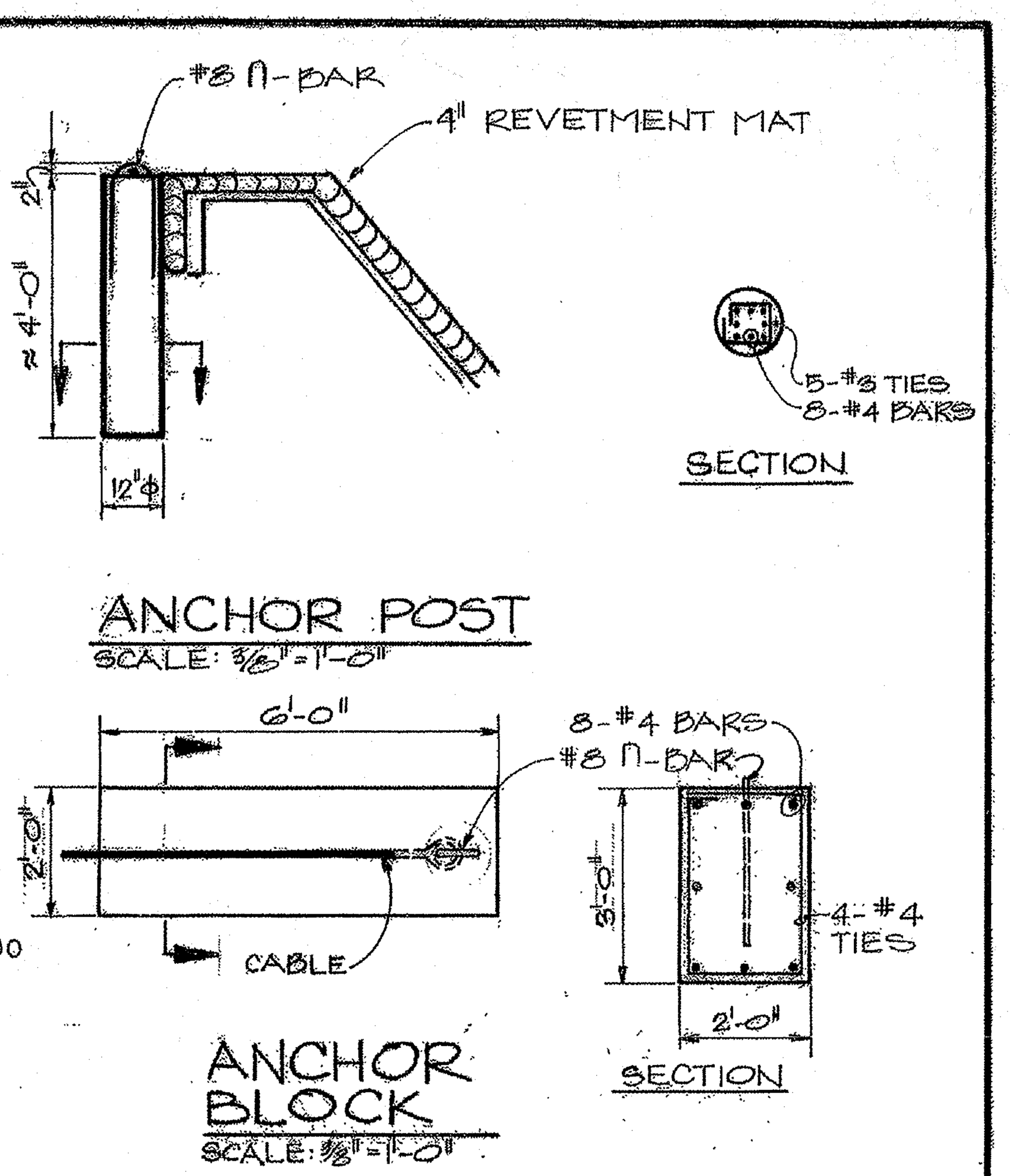
_____
(Company or Business Name)

_____
(Address, City, Zip Code)

WEST ASH POND



EMERGENCY SLUDGE POND
MODIFACATION COMPLETED NOV. 1989
FOR EARTH-WORK MODIFICATION SEE 139-1411-304-01. FOR LINER & REVETMENT MAT INSTALLATIONS SEE 139-1411-305-01
EAST BOTTOM ASH POND
(MODIFICATION LATER)
WEST BOTTOM ASH POND
W. BOTTOM ASH POND MODIFICATION COMPLETED FEBRUARY 1988
APPROX. 2'-0" OVERLAP IN REVETMENT MAT (EXPANSION JOINT) TYPICAL @ 7 LOCATIONS
APPROX. 2'-0" OVERLAP OF REVETMENT MAT (EXPANSION JOINT)
ESP SUCTION STAND PIPE
NORMAL LAKE LEVEL EL. 306
2 LAYERS OF 4" REVETMENT MAT
ANCHOR BLOCK
E.3485 PIPE SLEEVE 139-1411-308-01
EMERGENCY SLUDGE POND PUMP STATION
LOW PRESSURE ASH WATER PUMP LOCATION
(PIPE SLEEVE 139-1411-308-01
EXIST. STAND PIPE SEE 302-2
SOUTH DIKE PIPE SLEEVE SEE SH.5
EAST 2686
EXIST. CONCRETE SLAB T.O.C. 305.00
EXIST. 24" Ø DEWAT PIPE SEE DETAIL "B", SHEET 4
SUBDRAIN SEE SHEET 3
WELL SEE SHEET 4
EXIST. PIPE RACK
DETAIL "A" SEE SHEET 3
SLOPES TO FRENCH DRAIN
2'X2' TARGETS PAINTED ON 24" Ø C.S. DEWATERING 8" DRAIN LINE
℄ SUBDRAIN E 2648
800' ANCHOR POSTS @ 20'-0" O.C.
WEST SIDE SHOWN — EAST SIDE SIMILAR
ANCHOR POSTS @ 20' O.C.
UNITS 1 & 2 SOLIDS BLDG.
UNITS 3 & 4 SOLIDS BLDG.
℄ FLY ASH SILOS
E2220 ℄ DEWATERING BINS
NEW DEWATERING BINS
NEW DEWATERING BIN
EL. 330
EL. 330.40
EL. 304
EL. 309.90
EL. 307.95
EL. 308.90
EL. 330.00
EL. 321.5



LEGEND:

INSIDE POND AREA ONLY

- ▷- - - DASHED LINES — ORIGINAL
- ▶—— SOLID LINES — NEW CONSTRUCTION.
- —SP— SUBDRAIN.
- ▭ FINISH FLOOR ELEVATIONS ⚠1 (TOP OF REVETMENT MAT)
- ○ *TOP ELEVATION @ REVETMENT MAT LAPS

LOCATION	ELEVATION
A	306.2'
1	309.6'
2	309.4'
3	310.6'
4	310.0'
5	310.0'
6	310.3'
7	310.3'
8	310.2'
9	309.8'
10	310.7'
11	309.9'
12	311.8'
13	309.6'
14	309.3'
15	308.0'

FOR WEST B.A. POND ONLY

NOTE: ⚠1 FOR PHASE III CONTRACT WORK. THIS DRAWING SUPERSEDES DRAWING 139-1411-301-01 REV.6

*ELEVATION SHOWN REPRESENTS THE AVERAGE ELEVATION TAKEN ON TOP OF THE REVETMENT MAT OVER LAP. (EXPANSION JOINT)

— REFERENCE DRAWINGS CTM - DWG. # 2925-1-311400 REV 10

UNIT 1, 2, & 3

TASK NO'S: 139-1411, 139-1219, 133-1220

REV.	DATE	DESCRIPTION	BY	CHK.	APP.
5	11-18-91	"AS BUILT" P.I.D. 139-1411 EMERGENCY SLUDGE POND	WLR	[illegible]	[illegible]
4	8-31-89	FOR CONSTRUCTION	JTT	[illegible]	[illegible]
4	6-12-89	FOR BIDS, FOR ESP PHASE 3 REVETMENT INSTALLATION	WLR	[illegible]	[illegible]
3	11-2-88	FOR BIDS, FOR ESP PHASE 2 AS-BUILT WEST B.A. POND P.I.D. # 139-1411	WLR	[illegible]	[illegible]
2	6-14-88	FOR CONSTRUCTION ESP PHASE 1	AGB	[illegible]	[illegible]
2	4-26-88	FOR BIDS, FOR ESP PHASE 1	AGB	[illegible]	[illegible]
1	4-7-87	ADD SOUTH DIKE PIPE SLEEVE REVISED POND BOTTOM ELEVATIONS	G.S.	[illegible]	[illegible]
0	2-20-87	FOR CONSTRUCTION	GCN	[illegible]	[illegible]

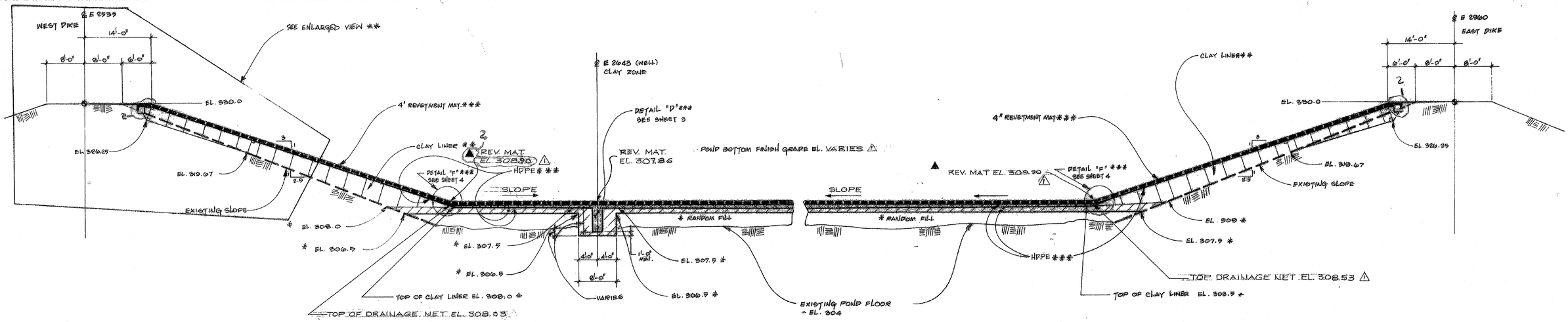
MARTIN LAKE S.E.S.

BOTTOM ASH COLLECTING EQUIPMENT LAYOUT & POND MODIFICATION.

HDPE LINER

TEXAS UTILITIES GENERATING Co.

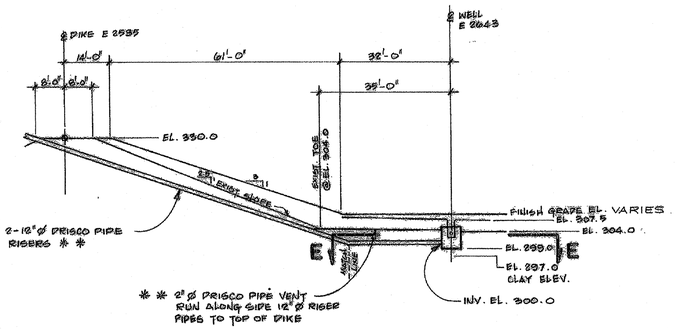
DRAWN BY	APPROVED		
GCN	[signature]		
DATE	CHECKED BY	SCALE	
2-20-87	[signature]	1" = 100'	
DRAWING No.		SHEET	REV.
139-1411-302		01	5

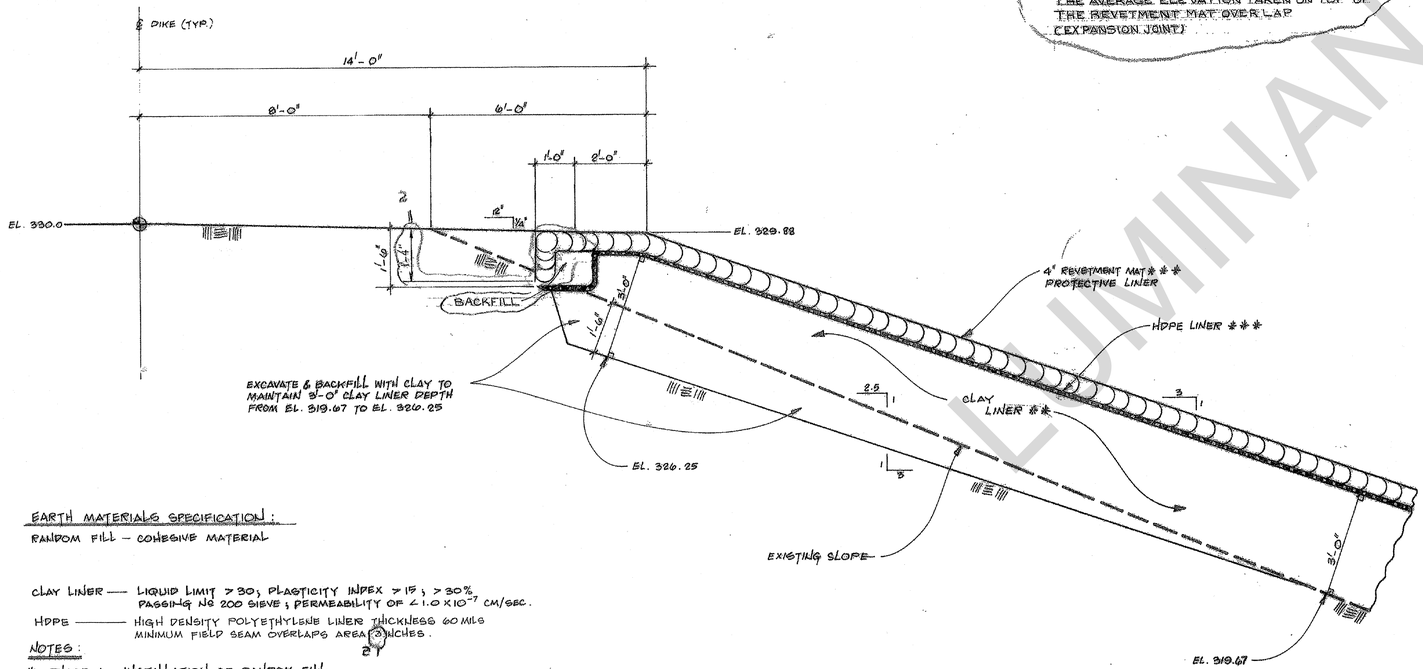


SECTION A-A

POND CROSS SECTION LOOKING NORTH
(SCALE : 1"=10'-0")

⚠ THE REVETMENT MAT ELEVATION REPRESENTS THE AVERAGE ELEVATION TAKEN ON TOP OF THE REVETMENT MAT OVERLAP (EXPANSION JOINT)





ENLARGED VIEW (TYP) **

SCALE : ½" = 1'-0"

EARTH MATERIALS SPECIFICATION :

RANDOM FILL — COHESIVE MATERIAL

CLAY LINER — LIQUID LIMIT > 30; PLASTICITY INDEX > 15 ; > 30% PASSING NO 200 SIEVE ; PERMEABILITY OF $< 1.0 \times 10^{-7}$ CM/SEC.

HDPE — HIGH DENSITY POLYETHYLENE LINER THICKNESS 60 MILS MINIMUM FIELD SEAM OVERLAPS AREA 3 INCHES.

NOTES :

* PHASE 1. INSTALLATION OF RANDOM FILL
INSTALLATION OF CLAY LINER FOR BOTTOM OF POND
INSTALLATION OF CLAY ZONE FOR SUBDRAIN.

* * PHASE 2. INSTALLATION OF CLAY LINER FOR SLOPES.
EXCAVATE AND BACKFILL MATERIALS FOR 2"ø AND 12"ø DRISCO PIPES. (DRISCO PIPES INSTALLED BY MARTIN LAKE S.E.S. PLANT — PANISL).

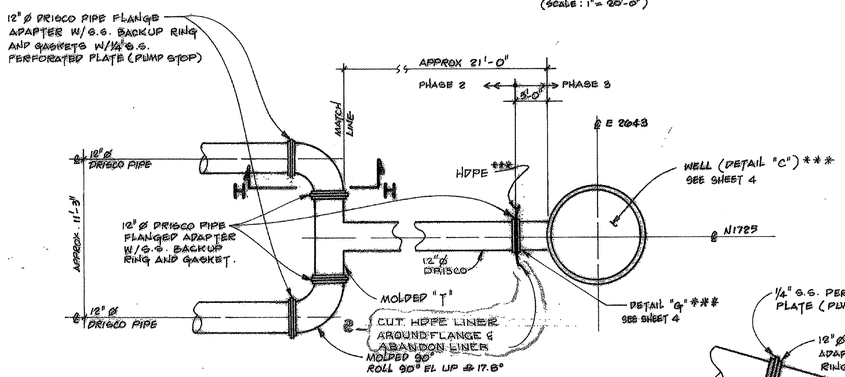
* * * PHASE 3. INSTALLATION OF DRAINAGE NET SUBDRAIN, LATERALS SUBDRAIN WELL, HDPE, AND REVETMENT MAT; ALSO INCLUDING MODIFICATIONS AT THE PIPE RACK, STANDPIPE, 24" DEWATERING PIPE, AND APPLICATION OF HERBICIDE.

4. FOR GENERAL NOTES FOR HDPE LINER SEE DWG. 139-1411-302-04.

5. FOR DRAINAGE NET DETAILS SEE DWG. 139-1411-302-05

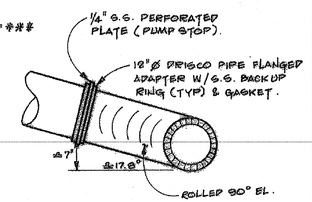
SECTION D-D * *

(scale : 1"= 20'-0")



SECTION E-E * *

NTS.



SECTION H-H

NTS.

UNITS 1, 2, & 3

⚠ NOTE:
FOR PHASE III CONTRACT WORK
THIS DRAWING SUPERSEDES
DRAWING NO. 139-1411-301-01 REV.3

NOTE FOR RISER PIPES (PHASE 2)

1. ALL PRISCO PIPE TO BE 8600 SERIES (110 PSI) - SDR 17.5
2. ALL PRISCO PIPE FURNISHED BY OWNER & INSTALLED BY PANEL CONSTRUCTION
3. EXCAVATION AND BACKFILL BY PHASE 2 CONTRACTOR.

REV.	DATE	DESCRIPTION	BY	CHK	APP
2	11-1-88	ADDED NOTES, REV'S, & "AS BUILTS"	WR	[illegible]	[illegible]
1	4-8-87	DELETED SAND BLANKET-ADD DRAINAGE NET	G.S.	[illegible]	[illegible]
0	2-20-87	FOR CONSTRUCTION	GCN	[illegible]	[illegible]

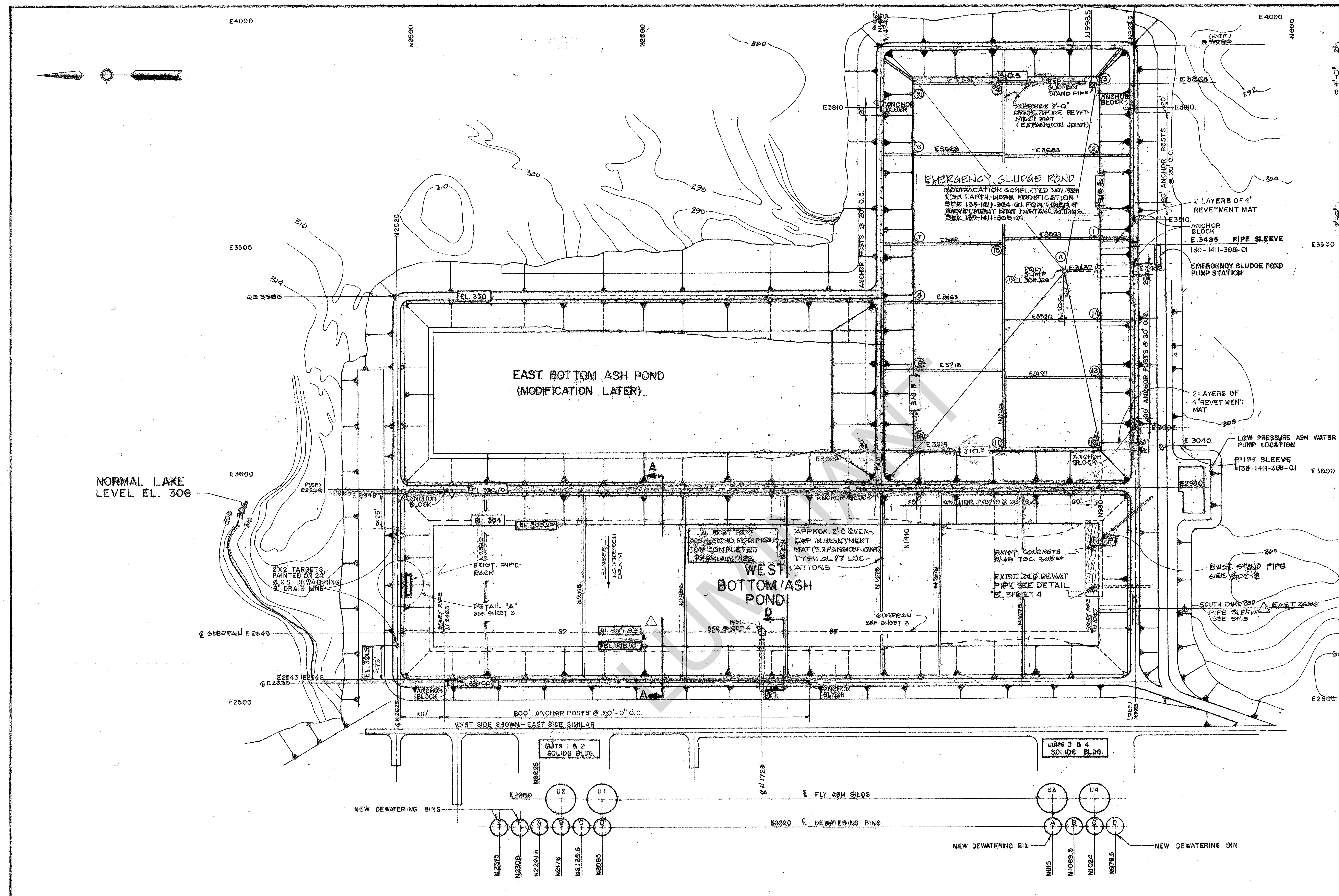
MARTIN LAKE S.E.S.

MODIFICATION TO BOTTOM ASH POND EARTHWORK PHASE 1 & 2
CROSS SECTIONS (HDPE LINER)

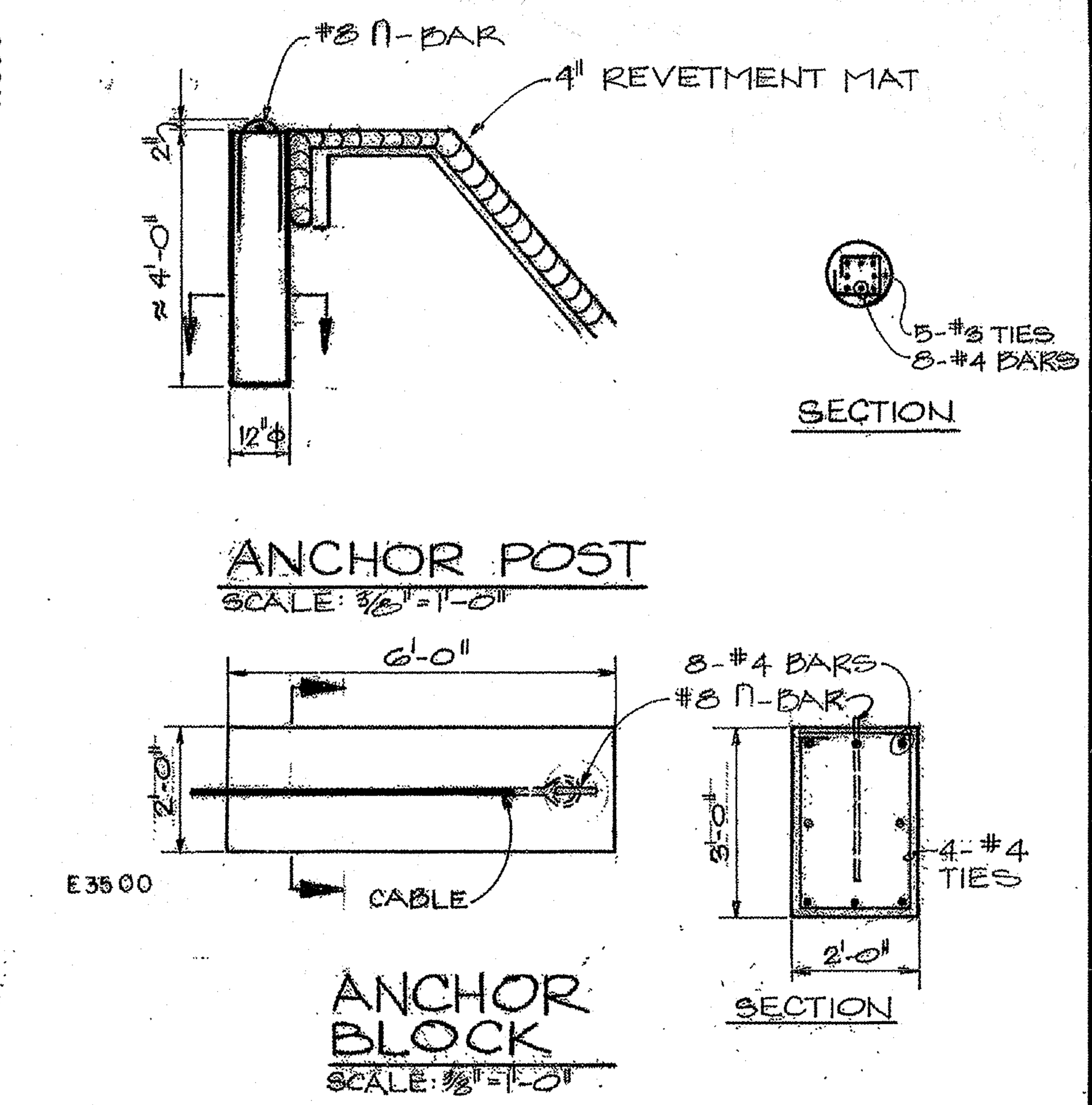
TEXAS UTILITIES GENERATING Co.

DRAWN BY: GCN		APPROVED: [signature]	
DATE: 2-19-87	CHECKED BY: [signature]	SCALE: AS SHOWN	
DRAWING No. 139-1411-302	SHEET 02	REV. 2	

NEW SCRUBBER POND



EAST BOTTOM ASH POND (MODIFICATION LATER)
WEST BOTTOM ASH POND
W. BOTTOM ASH POND MODIFICATION COMPLETED FEBRUARY 1988
EMERGENCY SLUDGE POND
MODIFACATION COMPLETED NOV.1989 FOR EARTH-WORK MODIFICATION SEE 139-1411-304-01 FOR LINER & REVETMENT MAT INSTALLATIONS SEE 139-1411-305-01
NORMAL LAKE LEVEL EL. 306
ANCHOR BLOCK
ANCHOR POSTS @ 20' O.C.
800' ANCHOR POSTS @ 20'-0" O.C.
WEST SIDE SHOWN - EAST SIDE SIMILAR
2 LAYERS OF 4" REVETMENT MAT
E.3485 PIPE SLEEVE 139-1411-308-01
EMERGENCY SLUDGE POND PUMP STATION
LOW PRESSURE ASH WATER PUMP LOCATION
(PIPE SLEEVE 139-1411-308-01
EXIST. STAND PIPE SEE 302-2
SOUTH DIKE PIPE SLEEVE SEE SH.5
EAST 2696
EXIST. CONCRETE SLAB T.O.C. 303
EXIST. 24" Ø DEWAT PIPE SEE DETAIL "B", SHEET 4
APPROX. 2'-0" OVER-LAP IN REVETMENT MAT (EXPANSION JOINT) TYPICAL @ 7 LOCATIONS
APPROX. 2'-0" OVERLAP OF REVETMENT MAT (EXPANSION JOINT)
ESP SUCTION STAND PIPE
POLY SUMP T/EL 305.66
2'x2' TARGETS PAINTED ON 24" Ø.C.S. DEWATERING 8" DRAIN LINE
EXIST. PIPE RACK
DETAIL "A" SEE SHEET 3
SLOPES TO FRENCH DRAIN
WELL SEE SHEET 4
SUBDRAIN SEE SHEET 3
℄ SUBDRAIN E 2648
EL. 330
EL. 330.40
EL. 304
EL. 309.90
EL. 307.95
EL. 308.90
EL. 330.00
EL. 321.5
UNITS 1 & 2 SOLIDS BLDG.
UNITS 3 & 4 SOLIDS BLDG.
℄ FLY ASH SILOS
℄ DEWATERING BINS
NEW DEWATERING BINS
NEW DEWATERING BIN
U1
U2
U3
U4



LEGEND:

INSIDE POND AREA ONLY

- ▷- - - DASHED LINES — ORIGINAL
- ▶—— SOLID LINES — NEW CONSTRUCTION.
- —SD— SUBDRAIN.
- ▭ FINISH FLOOR ELEVATIONS ⚠ (TOP OF REVETMENT MAT)
- ○ *TOP ELEVATION @ REVETMENT MAT LAPS

LOCATION	ELEVATION
A	306.2'
1	309.6'
2	309.4'
3	310.6'
4	310.0'
5	310.0'
6	310.3'
7	310.3'
8	310.2'
9	309.8'
10	310.7'
11	309.9'
12	311.8'
13	309.6'
14	309.3'
15	308.0'

NOTE: ⚠ FOR WEST B.A. POND ONLY FOR PHASE III CONTRACT WORK. THIS DRAWING SUPERSEDES DRAWING 139-1411-301-01 REV.6

*ELEVATION SHOWN REPRESENTS THE AVERAGE ELEVATION TAKEN ON TOP OF THE REVETMENT MAT OVER LAP. (EXPANSION JOINT)

— REFERENCE DRAWINGS CTM-DWG. # 2925-1-311400 REV 10

UNIT 1, 2, & 3
TASK NO'S: 139-1411, 139-1219, 133-1220

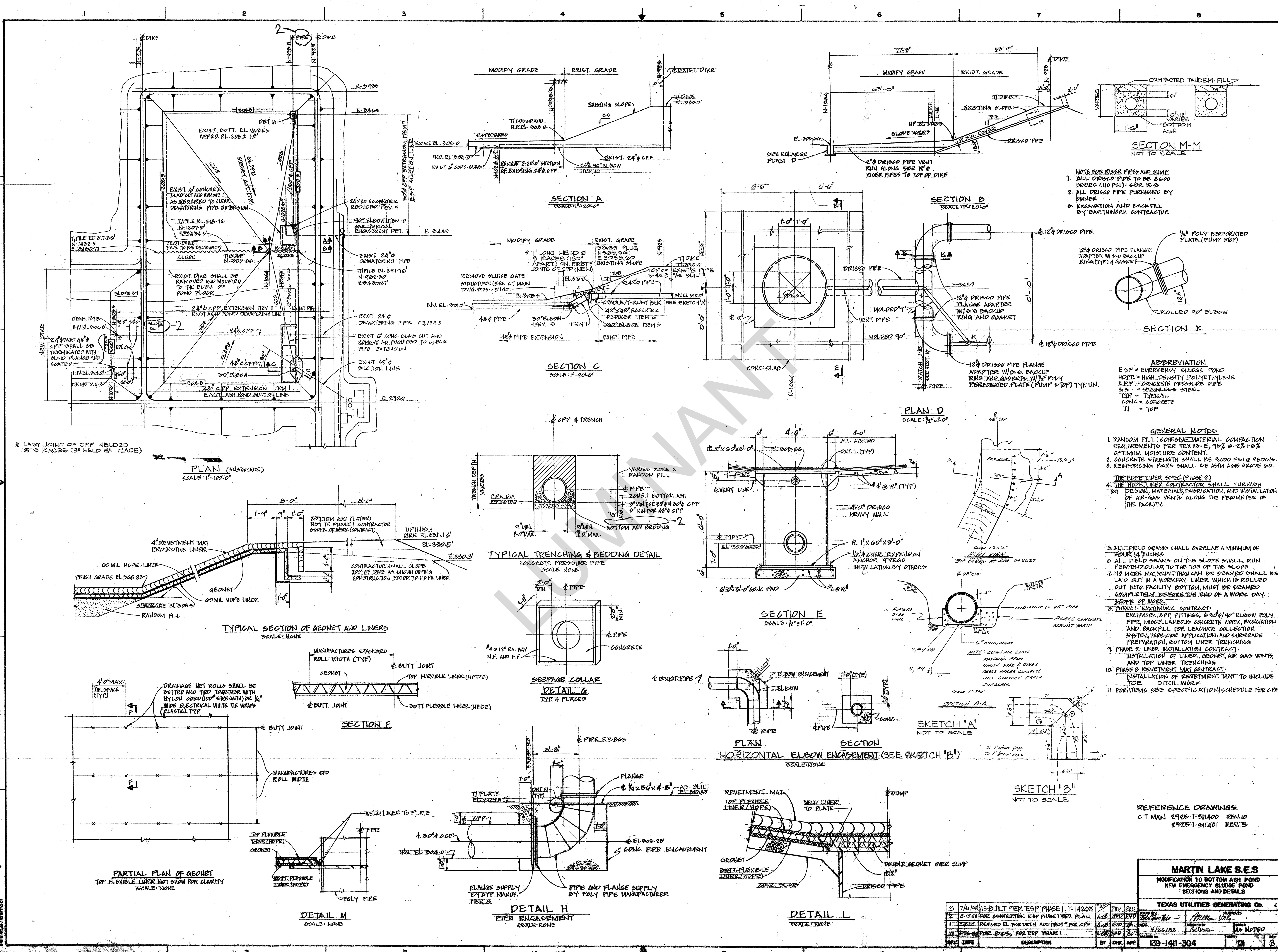
REV.	DATE	DESCRIPTION	BY	CHK.	APP.
5	11-18-91	"AS BUILT" P.I.D.139-1411 EMERGENCY SLUDGE POND	WLR	[illegible]	[illegible]
4	8-31-89	FOR CONSTRUCTION	JTT	[illegible]	[illegible]
4	6-12-89	FOR BIDS, FOR ESP PHASE 3 REVETMENT INSTALLATION	WLR	RHO	[illegible]
3	11-2-88	FOR BIDS, FOR ESP PHASE 2 AS-BUILT WEST B.A. POND P.I.D.#139-1411	WLR	[illegible]	[illegible]
2	6-14-88	FOR CONSTRUCTION ESP PHASE 1	AGB	[illegible]	[illegible]
2	4-26-88	FOR BIDS, FOR ESP PHASE 1	AGB	[illegible]	[illegible]
1	4-7-87	ADD SOUTH DIKE PIPE SLEEVE REVISED POND BOTTOM ELEVATIONS	G.S.	[illegible]	[illegible]
0	2-20-87	FOR CONSTRUCTION	GCN	[illegible]	[illegible]

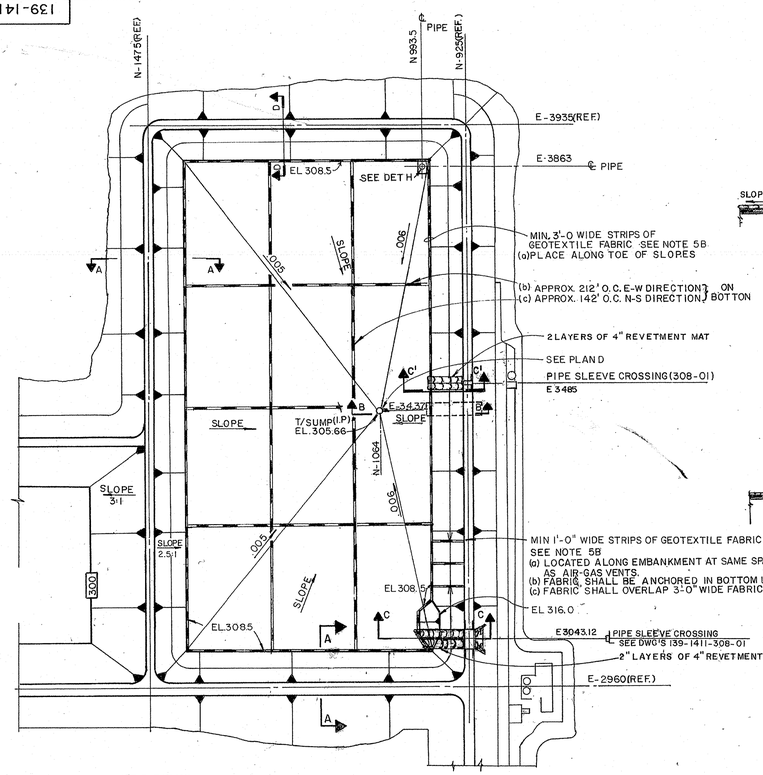
MARTIN LAKE S.E.S.

BOTTOM ASH COLLECTING EQUIPMENT LAYOUT & POND MODIFICATION. HDPE LINER

TEXAS UTILITIES GENERATING Co.

DRAWN BY: GCN	APPROVED: Milton Vila		
DATE: 2-20-87	CHECKED BY: [illegible]	SCALE: 1" = 100'	
DRAWING No.: 139-1411-302		SHEET: 01	REV.: 5

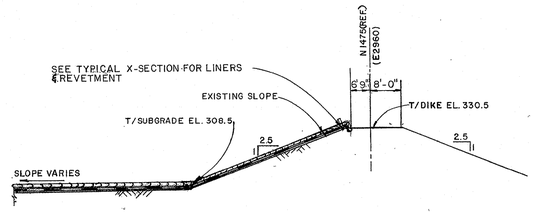

PLAN (SUBGRADE)
SCALE: 1"=100'-0"
℄ DIKE
℄ PIPE
N-1475
N-993.5
N-925
E-3935
E-3863
E-3485
E-2960
308.5
DET H
EXIST. BOTT. EL. VARIES APPRO. EL. 305 ± 1.5'
MODIFY BOTTOM
SLOPE
.005
.006
30"Φ CPP
EXIST. 6" CONCRETE SLAB CUT AND REMOVE AS REQUIRED TO CLEAR DEWATERING PIPE EXTENSION
24"x30 ECCENTRIC REDUCER ITEM 9
90° ELBOW ITEM 10 SEE TYPICAL ENCASEMENT DET.
30"Φ CPP EXTENSION ITEM 7 ESP SUCTION LINE
T/PILE EL. 318.76 N-1207.5' E-3434.5'
T/PILE EL. 317.86' N-1432.5 E-3430.77
EXIST. SHEET PILE TO BE REMOVED
T/SUMP EL. 305.66
E-3437
EXIST. 24"Φ DEWATERING PIPE
T/PILE EL 321.76' N-982.50' E-3430137'
EXIST. DIKE SHALL BE REMOVED AND MODIFIED TO THE ELEV. OF POND FLOOR
SLOPE 3:1
N-1064
24"Φ CPP EXTENSION ITEM 11 EAST ASH POND DEWATERING LINE
EXIST. PIPE
ITEMS 12&13
INV. EL. 304.5'
SLOPE 2.5:1
24"Φ CPP
NEW DIKE
24"Φ AND 48"Φ CPP SHALL BE TERMINATED WITH BLIND FLANGE AND COATED
APPROX 3.00
DET. G
48"Φ CPP
30° ELBOW
INV. EL. 301.0'
ITEMS 2 & 3
48" CPP EXTENSION ITEM 1 EAST ASH POND SUCTION LINE
EXIST. 24"Φ DEWATERING PIPE E3,172.5
EXIST. 6" CONC. SLAB CUT AND REMOVE AS REQUIRED TO CLEAR PIPE EXTENSION
EXIST. 42"Φ SUCTION LINE
* LAST JOINT OF CPP WELDED @ 3 PLACES (3" WELD EA. PLACE)
SECTION A
SCALE 1"=20'-0"
MODIFY GRADE
EXIST. GRADE
℄ EXIST. DIKE
T/DIKE EL. 330.0'
EXISTING SLOPE
T/SUBGRADE H.P. EL 308.5
SLOPE VARIES
EXIST. EL. 305.0
INV. EL 304.5
EXIST. 6" CONC. SLAB
REMOVE 2-20'-0" SECTION OF EXISTING 24"Φ CPP
24"Φ 90° ELBOW ITEM 10
EXIST. 24"Φ CPP
SECTION C
SCALE 1"=20'-0"
* 1" LONG WELD @ 3 PLACES (120° APART) ON FIRST 5 JOINTS OF CPP (NEW)
BRASS PLUG N965.96 E 3053.20 EXISTING SLOPE
REMOVE SLUICE GATE STRUCTURE (SEE CT MAIN DWG. 2925-1-311401)
EL 316.0'
EL 308.5
TOP OF EXIST'G PIPE 314.25 "AS BUILT"
℄ 42"Φ PIPE
INV. EL 310.0'
INV. EL. 301.0'
CRADLE/THRUST BLK. SEE SKETCH "A"
42"x48" ECCENTRIC REDUCER ITEM 6
30° ELBOW ITEM 5
48Φ PIPE
30° ELBOW ITEM 5
ITEM 1
48Φ PIPE EXTENSION
EXIST. PIPE
SECTION B
SCALE 1"=20'-0"
77'-3"
53'-9"
65'-0"
℄ DIKE
T/DIKE
EXISTING SLOPE
HP EL 308.5
SLOPE VARIES
MATCH LINE
2' MIN. COVER
DRISCO PIPE
EL. 305.66
SEE ENLARGE PLAN D
2"Φ DRISCO PIPE VENT RUN ALONG SIDE 12"Φ RISER PIPES TO TOP OF DIKE
SECTION M-M
NOT TO SCALE
COMPACTED TANDEM FILL
VARIES
0"-12" VARIES
BOTTOM ASH
1'-6"
NOTE FOR RISER PIPES AND SUMP
1. ALL DRISCO PIPE TO BE 8600 SERIES (110 PSI) - SDR 15.5
2. ALL DRISCO PIPE FURNISHED BY OWNER
3. EXCAVATION AND BACK FILL BY EARTHWORK CONTRACTOR
PLAN D
SCALE: 1/2"=1'-0"
6'-6"
1'-0"
OPNG.
PL 2"
CONC. SLAB
DRISCO PIPE
MOLDED "T"
VENT PIPE
MOLDED 90°
E-3437
℄ 12"Φ DRISCO PIPE
12"Φ DRISCO PIPE FLANGE ADAPTER W/S.S. BACKUP RING AND GASKET
10'-10"
12"Φ DRISCO PIPE FLANGE ADAPTER W/S.S. BACKUP RING AND GASKETS W/ 1/2" POLY PERFORATED PLATE (PUMP STOP) TYP. UN.
SECTION K
1/2" POLY PERFORATED PLATE (PUMP STOP)
12"Φ DRISCO PIPE FLANGE ADAPTER W/ S.S BACK UP RING (TYP.) & GASKET
ROLLED 90° ELBOW
ABBREVIATION
E.S.P. = EMERGENCY SLUDGE POND
HDPE = HIGH DENSITY POLYETHYLENE
C.P.P. = CONCRETE PRESSURE PIPE
S.S. = STAINLESS STEEL
TYP. = TYPICAL
CONC. = CONCRETE
T/ = TOP
GENERAL NOTES
1. RANDOM FILL COHESIVE MATERIAL COMPACTION REQUIREMENTS PER TEX113-E, 95% @-2%+6% OPTIMUM MOISTURE CONTENT.
2. CONCRETE STRENGTH SHALL BE 3,000 PSI @ 28 DAYS.
3. REINFORCING BARS SHALL BE ASTM A615 GRADE 60.
THE HDPE LINER SPEC. (PHASE 2)
4. THE HDPE LINER CONTRACTOR SHALL FURNISH
(a) DESIGN, MATERIALS, FABRICATION, AND INSTALLATION OF AIR-GAS VENTS ALONG THE PERIMETER OF THE FACILITY.
5. ALL FIELD SEAMS SHALL OVERLAP A MINIMUM OF FOUR (4") INCHES
6. ALL FIELD SEAMS ON THE SLOPE SHALL RUN PERPENDICULAR TO THE TOE OF THE SLOPE
7. NO MORE MATERIAL THAN CAN BE SEAMED SHALL BE LAID OUT IN A WORKDAY. LINER WHICH IS ROLLED OUT INTO FACILITY BOTTOM, MUST BE SEAMED COMPLETELY BEFORE THE END OF A WORK DAY.
SCOPE OF WORK
8. PHASE 1 - EARTHWORK CONTRACT:
EARTHWORK, CPP, FITTINGS, & 30"Φ/90° ELBOW POLY PIPE, MISCELLANEOUS CONCRETE WORK, EXCAVATION AND BACKFILL FOR LEACHATE COLLECTION SYSTEM, HERBICIDE APPLICATION, AND SUBGRADE PREPARATION, BOTTOM LINER TRENCHING
9. PHASE 2 - LINER INSTALLATION CONTRACT:
INSTALLATION OF LINER, GEONET, AIR GAS VENTS, AND TOP LINER TRENCHING
10. PHASE 3 REVETMENT MAT CONTRACT:
INSTALLATION OF REVETMENT MAT TO INCLUDE TOE DITCH WORK
11. FOR ITEMS SEE SPECIFICATION/SCHEDULE FOR CPP
TYPICAL TRENCHING & BEDDING DETAIL
CONCRETE PRESSURE PIPE
SCALE: NONE
℄ CPP & TRENCH
TRENCH DEPTH VARIES
PIPE DIA. AS NOTED
VARIES ZONE 2 RANDOM FILL
℄ PIPE
ZONE 1 BOTTOM ASH
3" MIN. FOR 24"Φ & 30"Φ CPP
5" MIN. FOR 48"Φ CPP
BOTTOM ASH BEDDING
9" MIN. 1'-0" MAX.
SECTION E
SCALE: 1/2"=1'-0"
PL 2"x60"x5'-0"
EL. 305.66
ALL AROUND
DET. L (TYP)
℄ VENT LINE
#4 @ 12" (TYP)
4'-0" DRISCO HEAVY WALL
℄ PIPE
EL. 300.66
PL 1"x60"x5'-0"
1/2"Φ CONC. EXPANSION ANCHOR 9 REQD INSTALLATION BY OTHERS
6'-0"x6'-0" CONC. PAD
#4 @ 12"
TYPICAL SECTION OF GEONET AND LINERS
SCALE: NONE
BOTTOM ASH (LATER) NOT IN PHASE 1 CONTRACTOR SCOPE OF WORK (CONTRACT)
T/FINISH DIKE EL 331.16'
EL. 330.5'
EL 330.3'
4" REVETMENT MAT PROTECTIVE LINER
60 MIL HDPE LINER
FINISH GRADE EL 308.83
GEONET
60 MIL HDPE LINER
SUBGRADE EL 308.5
RANDOM FILL
CONTRACTOR SHALL SLOPE TOP OF DIKE AS SHOWN DURING CONSTRUCTION PRIOR TO HDPE LINER
SEEPAGE COLLAR
DETAIL G
TYP. 4 PLACES
2'-0" MIN.
#4 @ 12" EA. WAY N.F. AND F.F.
CONCRETE
SECTION F
MANUFACTURES STANDARD ROLL WIDTH (TYP.)
GEONET
℄ BUTT JOINT
TOP FLEXIBLE LINER (HPDE)
BOTT. FLEXIBLE LINER (HPDE)
PARTIAL PLAN OF GEONET
TOP FLEXIBLE LINER NOT SHOW FOR CLARITY
SCALE: NONE
4'-0" MAX. TIE SPACE (TYP.)
DRAINAGE NET ROLLS SHALL BE BUTTED AND TIED TOGETHER WITH NYLON CORD (100# STRENGTH) OR 1/4" WIDE ELECTRICAL WHITE TIE WRAPS (PLASTIC) TYP.
MANUFACTURES STD. ROLL WIDTH
HORIZONTAL ELBOW ENCASEMENT (SEE SKETCH "B")
SCALE: NONE
PLAN
SECTION
℄ EXIST. PIPE
ELBOW ENCASEMENT
ELBOW
CONC.
SKETCH "A"
NOT TO SCALE
PLAN VIEW
30° ELBOW AT STA. 0+20.27
SECTION A-A
MID-POINT OF 48" PIPE
PLACE CONCRETE AGAINST EARTH
FORMED SIDE WALL
6" MINIMUM
NOTE: CLEAN ALL LOOSE MATERIAL FROM UNDER PIPE & OTHER AREAS WHERE CONCRETE WILL CONTACT EARTH SUBGRADE
SKETCH "B"
NOT TO SCALE
≈ 1' above pipe
≈ 1' below pipe
DETAIL M
SCALE: NONE
WELD LINER TO PLATE
TOP FLEXIBLE LINER (HDPE)
GEONET
BOTT. FLEXIBLE LINER (HDPE)
POLY PIPE
DETAIL H
PIPE ENCASEMENT
SCALE: NONE
℄ PIPE E3863
FLANGE
PL 1/4x56"x4'-8"
AS-BUILT EL 310.83
T/PLATE EL 309.8
DET. M (TYP)
℄ 30"Φ CCP
INV. EL. 304.0
℄ EL 305.25'
CONC. PIPE ENCASEMENT
FLANGE SUPPLY BY CPP MANUF. ITEM 8
PIPE AND FLANGE SUPPLY BY POLY PIPE MANUFACTURER
DETAIL L
SCALE: NONE
REVETMENT MAT
TOP FLEXIBLE LINER (HDPE)
WELD LINER TO PLATE
℄ SUMP
GEONET
BOTT. FLEXIBLE LINER (HDPE)
CONC. SLAB
DOUBLE GEONET OVER SUMP
DRISCO PIPE
REFERENCE DRAWINGS
CT MAIN 2925-1-311400 REV. 10
2925-1-311401 REV. 3
3 7/31/95 AS-BUILT PER ESP PHASE I, T-14203
2 6-14-88 FOR CONSTRUCTION ESP PHASE I REV. PLAN
1 5-4-88 REVISED EL. FOR DET. H ADD ITEM # FOR CPP
0 4-26-88 FOR BIDS, FOR ESP PHASE I
REV. DATE DESCRIPTION BY CHK. APP.
MARTIN LAKE S.E.S
MODIFICATION TO BOTTOM ASH POND
NEW EMERGENCY SLUDGE POND
SECTIONS AND DETAILS
TEXAS UTILITIES GENERATING Co.
DATE 4/26/88
SCALE AS NOTED
DRAWING No. 139-1411-304
SHEET 01
REV. 3

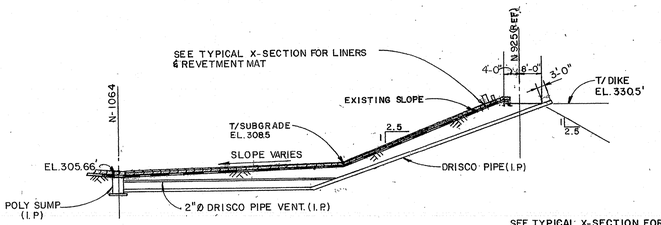


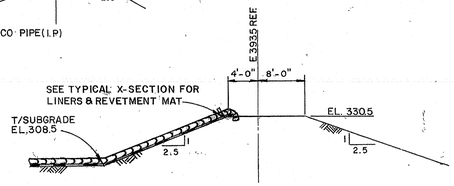
NOTE:
1. EL 308.5 ARE TOP OF SUBGRADE ELEVATION
2. ADD 4" TO SUBGRADE ELEVATIONS FOR FINISH GRADE FOR REVETMENT MAT

NORTH

PLAN (SUBGRADE GEOTEXTILE FABRIC LAYOUT)
SCALE: 1"= 100'-0"

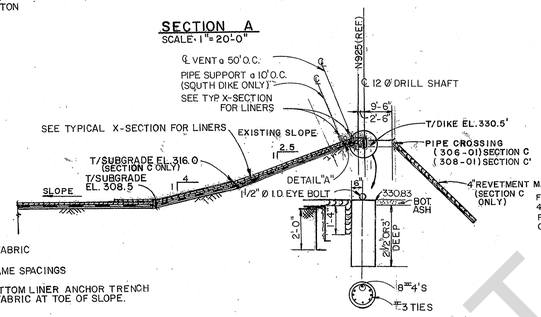






SECTION D

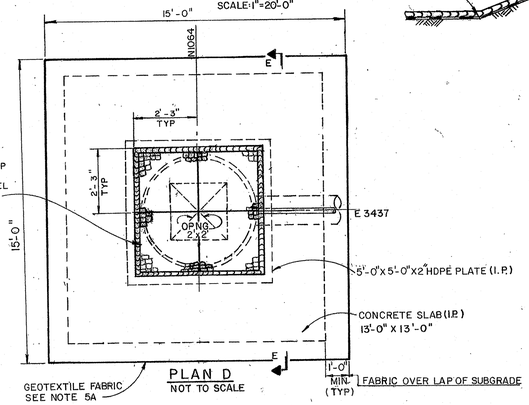
SECTION A
SCALE: 1"= 20'-0"



SECTION C
SCALE: 1"= 20'-0"

SECTION C'
SIMILAR

SECTION B
SCALE: 1"= 20'-0"



PLAN D
NOT TO SCALE

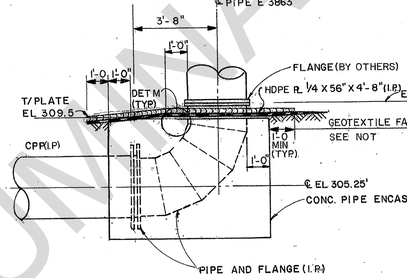
ABREVIATION

ESP = EMERGENCY SLUDE POND
HDPE = HIGH DENSITY POLYETHYLENE
CPP = CONCRETE-PRESSURE PIPE
I.P = IN PLACE
TYP = TYPICAL
CONC = CONCRETE
T/ = TOP

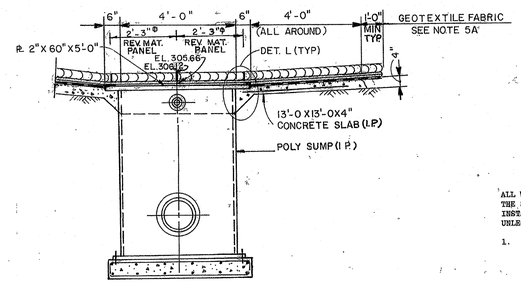
PHASE 3

NOTES

1. REVETMENT MAT INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION FOR NEW EMERGENCY SLUDGE POND PHASE 3 INSTALLATION OF REVETMENT MAT.



DETAIL H
PIPE ENCASEMEMENT
SCALE: NONE

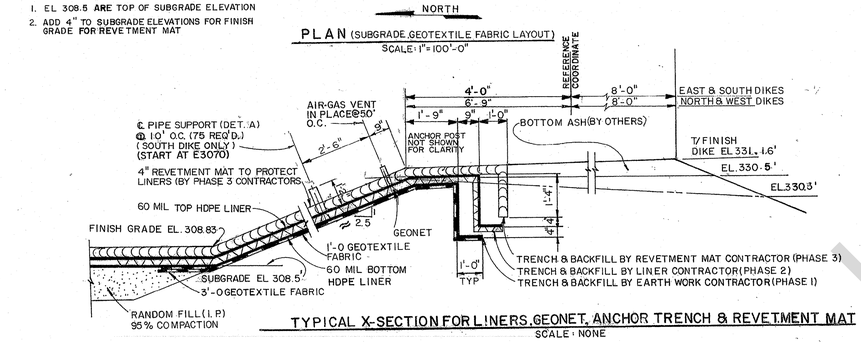


PHASE 2

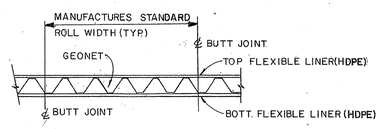
NOTES

ALL WORK SHOWN ON THIS DRAWING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS FOR NEW EMERGENCY SLUDGE POND - PHASE 2 INSTALLATION OF HIGH DENSITY POLYETHYLENE MEMBRANE LINERS, UNLESS NOTED.

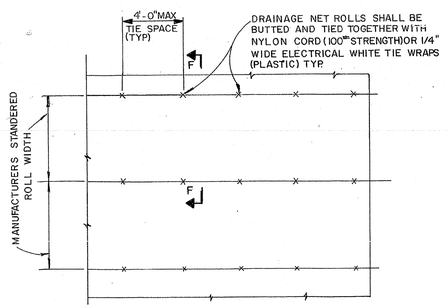
1. THE HDPE LINER CONTRACTOR SHALL FURNISH:
   - (A) MATERIALS, FABRICATION, AND INSTALLATION OF 60 MILS HDPE FLEXIBLE MEMBRANE LINERS.
   - (B) MATERIALS AND INSTALLATION OF .25" HDPE DRAINAGE NET (GEONET).
   - (C) DESIGN, MATERIALS, FABRICATION, AND INSTALLATION OF AIR-GAS VENTS.
     - (1) THE AIR-GAS VENTS SHALL BE INSTALLED ALONG A STRAIGHT LINE ON OR NEAR THE CREST OF THE EMBANKMENT. THE VENTS SHALL EXTEND THROUGH THE 4 INCH REVETMENT MAT.
     - (2) THE AIR-GAS VENTS SHALL BE DESIGNED TO ALLOW AIR OR GAS TO ESCAPE FROM BENEATH THE BOTTOM LINER AND BETWEEN THE BOTTOM LINER AND THE TOP LINER.
   - (D) MATERIALS AND INSTALLATION OF GEOTEXTILE FABRIC
2. ALL LINER FIELD SEAMS SHALL OVERLAP A MINIMUM OF FOUR (4") INCHES.
3. ALL LINER FIELD SEAMS ON THE SLOPE SHALL RUN PERPENDICULAR TO THE TOE OF THE SLOPE.
4. NO MORE MATERIAL THAN CAN BE SEAMED SHALL BE LAID OUT IN A WORKDAY. LINER PANELS THAT ARE ROLLED OUT INTO FACILITY, MUST BE SEAMED OR LEISTERED COMPLETELY BEFORE THE END OF A WORK DAY.
5. GEOTEXTILE FABRIC TO BE USED AS:
   - (A) A CUSHION BETWEEN CONCRETE SURFACES AND THE BOTTOM LINER.
   - (B) A GAS VENTILATION BETWEEN SUBGRADE AND THE BOTTOM LINER.



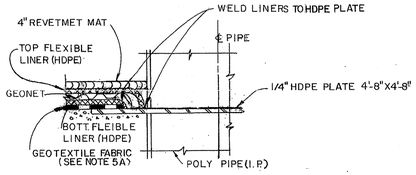
TYPICAL X-SECTION FOR LINERS, GEONET, ANCHOR TRENCH & REVETMENT MAT
SCALE: NONE



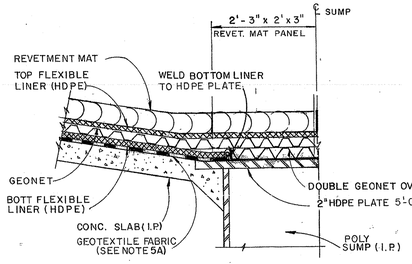
SECTION F



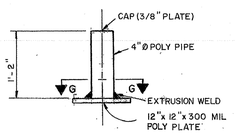
PARTIAL PLAN OF GEONET
TOP FLEXIBLE LINER NOT SHOW FOR CLARITY
SCALE: NONE



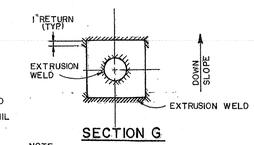
DETAIL M
SCALE: NONE



DETAIL L
SCALE: NONE

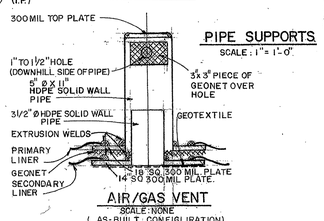


DETAIL A



SECTION G

NOTE: EXTRUSION WELD 3/8" POLY TOP (PRIMARY) HDPE TO SECURE SUPPORTS & ASSURE ALIGNMENT DURING REVETMENT MAT INSTALLATION.



PIPE SUPPORTS
SCALE: 1"= 1'-0"

AIR/GAS VENT
SCALE: NONE
(AS-BUILT CONFIGLIRATION)

REFERENCE DRAWINGS

139-1411-302-01
139-1411-306-01
139-1411-308-01

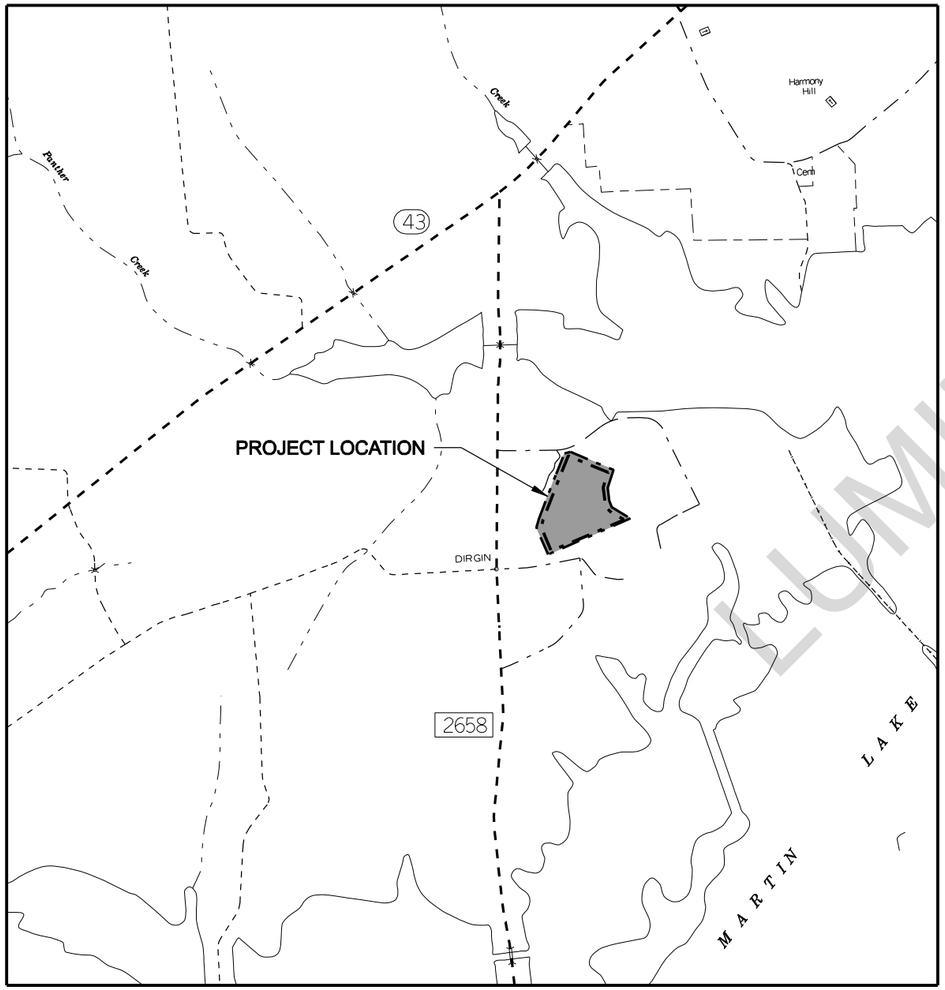
REV.	DATE	DESCRIPTION	BY	CHK.	APP.
4	11-18-91	"AS BUILT" P.I.D. 139-1411	WLR	RWS	DWD
3	8-31-89	FOR CONSTR. CHG. PER AD.1 PR NO ST. 00036	JTT		
2	6-12-89	FOR BID, FOR ESP PHASE 3 REV. MAT INSTAL	WLR		
1	1-11-89	FOR CONSTR FOR ESP PHASE 2 LIN. INST	WR		
0	11-2-88	FOR BIDS, FOR ESP PHASE 2 LIN. INST	WR		

MARTIN LAKE S.E.S. UNIT 1,283
MODIFICATION TO BOTTOM ASH POND
NEW EMERGENCY SLUDE POND
HDPE LINERS, GEONET & REVETMENT MAT SECT. & DETAILS
TEXAS UTILITIES GENERATING Co.

DRAWN BY: W.L.R. | APPROVED | CHECKED BY: 11-2-88 | DATE: 11-2-88 | SCALE: AS NOTE | DRAWING No. 139-1411-305 | SHEET 01 | REV. 4

PDP 5

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
PERMANENT DISPOSAL POND #5
AS RECORDED DRAWINGS



SHEET NO.	TITLE
C-1	COVER SHEET
C-2	ABBREVIATIONS & GENERAL NOTES
C-3	SITE PLAN
C-4	KEY MAP & CROSS SECTION LOCATIONS
C-5	HORIZONTAL CONTROL DATA
C-6	AS BUILT LINER CONTOUR PLAN
C-7	AS BUILT LINER CONTOUR PLAN
C-8	AS BUILT LINER CONTOUR PLAN
C-9	AS BUILT FINAL CONTOUR PLAN
C-10	AS BUILT FINAL CONTOUR PLAN
C-11	AS BUILT FINAL CONTOUR PLAN
C-12	AS BUILT CAUSEWAY CONTOUR PLAN
C-13	OVERFLOW STANDPIPE & DETAILS
C-14	BORROW AREA EXCAVATION PLAN
C-15	BORROW AREA BORING LOGS(OMITTED FOR AS BUILTS)
C-16	BORROW AREA BORING LOGS(OMITTED FOR AS BUILTS)
C-17	ACCESS ROAD 1 PLAN & PROFILE
C-18	ACCESS ROAD 2 PLAN & PROFILE
C-19	LEACHATE LINE 1 PLAN & PROFILE
C-20	LEACHATE LINE 1 PLAN & PROFILE
C-21	LEACHATE LINE 1 PLAN & PROFILE
C-22	LEACHATE LINE 2 PLAN & PROFILE
C-23	LEACHATE LINE 2 PLAN & PROFILE
C-24	SLURRY CHANNEL PLAN & SECTION
C-25	LEACHATE COLLECTION SYSTEM SUMP PLAN
C-26	DEWATERING SYSTEM SUMP PLAN
C-27	TYPICAL CROSS SECTIONS
C-28	TYPICAL CROSS SECTIONS
C-29	MISCELLANEOUS DETAILS
C-30	MISCELLANEOUS DETAILS
C-31	MISCELLANEOUS DETAILS
C-32	WATER ACCESS LOCATION
C-33	GRID LAYOUT
E-1	LEACHATE COLLECTION PLAN - ELECTRICAL
E-2	ELECTRICAL DETAILS
E-3	PANELBOARD SCHEDULES
139-E001-301	DECANT PUMP & OVERFLOW DRAIN SUPPORT & ACCESS STRUCTURE
139-E001-301	DECANT PUMP & OVERFLOW DRAIN SUPPORT & ACCESS STRUCTURE

PLTDRVER: 11X17LASER_BW_PDF.plt
PENTABLE: 139-E001-305(as built).tbl
FILENAME: ML-COV01-AB.dgn
FILE: Luminant_Generation_Company_LLC/TXU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/139-E001-305/AS BUILTS
USER: rcox
TIME: 12:47:35 PM
DATE: 2/9/2011

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D. VOGT
CIVIL ENGINEER	D. VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

COVER SHEET
139-E001-305
AS RECORDED

FILENAME	ML-COV01-AB.dgn
SCALE	NTS

SHEET
C-1

STANDARD ABBREVIATIONS

&	AND
APPROX	APPROXIMATELY
@	AT
AVG	AVERAGE
BOE	BOTTOM OF EXCAVATION
BOL	BOTTOM OF LINER
X	BY
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CY	CUBIC YARD
DIA	DIAMETER
DET	DETAIL
DWG	DRAWING
E	EAST
ELEV	ELEVATION
EW	EACH WAY
EXIST	EXISTING
EXC	EXCAVATION
FML	FLEXIBLE MEMBRANE LINER
FT	FEET
GAL	GALLON
GND	GROUND
GDL	GRAVEL DRAINAGE LAYER
GNDL	GEONET DRAINAGE LAYER
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IN	INCHES
IE	INVERT ELEVATION
LCRS	LEACHATE COLLECTION AND REMOVAL SYSTEM
LCS	LEACHATE COLLECTION SYSTEM
LCP	LEACHATE COLLECTION PIPE
LCPR	LEACHATE COLLECTION PIPE RISER
LF	LINEAR FEET
LB	POUND
MH	MANHOLE
MAX	MAXIMUM
MIL	.001 INCHES
MIN	MINIMUM
MW	MONITOR WELL
MLSES	MARTIN LAKE STEAM ELECTRIC STATION
MSL	MEAN SEA LEVEL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OZ	OUNCE
%	PERCENT
PLCP	PERFORATED LEACHATE COLLECTION PIPE
PERF	PERFORATED
PGL	PROFILE GRADE LINE
PDP	PERMANENT DISPOSAL POND
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PVI	POINT OF VERTICAL INTERSECTION
PT	POINT OF TANGENT
PZ	PIEZOMETER
Q	FLOW
QTY	QUANTITY
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REF	REFERENCE
REQ	REQUIRED
RD	ROAD
SCH	SCHEDULE
SDL	SAND DRAINAGE LAYER
SEC	SECTION
SHT	SHEET
S	SOUTH
SDR	STANDARD DIMENSION RATIO
SP	STEEL PIPE
SQ	SQUARE
STA	STATION
SLQCP	SOIL LINER QUALITY CONTROL PLAN. SEE APPENDIX A OF SPECIFICATION
SS	SIDE SLOPE
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
TDLR	TEXAS DEPARTMENT OF LICENSING AND REGULATIONS
TPDES	TEXAS POLLUTION DISCHARGE ELIMINATION SYSTEM
TL	TANGENT LENGTH
TOC	TOP OF COVER
TOFC	TOP OF FINAL COVER
TOL	TOP OF LINER
TOS	TOE OF SLOPE
TS	TOP SLOPE
TEMP	TEMPORARY
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
W	WEST
W/	WITH
YD	YARD

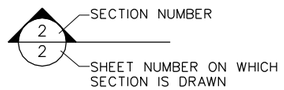
GENERAL NOTES

1. HISTORICAL OPERATIONS AT PERMANENT DISPOSAL PONDS 1, 2 AND 3 INCLUDED LIMITED SOLID DISPOSAL OF REGULATED AND NON-REGULATED ASBESTOS-CONTAINING MATERIALS. THESE MATERIALS WERE COVERED DAILY AND IT IS NOT ANTICIPATED THAT EXPOSURE TO THESE MATERIALS WILL BE ENCOUNTERED DURING CONSTRUCTION OF THE VERTICAL EXPANSION OF PDP'S • 1, 2, & 3. SHOULD THE CONSTRUCTION CONTRACTOR UNCOVER SUSPECTED ASBESTOS-CONTAINING MATERIALS, WORK IN THE AREA SHOULD CEASE AND THE CONSTRUCTION MANAGER AND LUMINANT SHOULD IMMEDIATELY BE NOTIFIED FOR FURTHER INVESTIGATION AND POTENTIAL EVALUATION.
2. ALL WORK UNDER THIS CONTRACT SHALL BE PERFORMED IN ACCORDANCE WITH THE PLANS AND PROJECT SPECIFICATIONS. IN THE EVENT OF A DISCREPANCY BETWEEN THE PLANS AND THE PROJECT SPECIFICATIONS, THE SPECIFICATIONS SHALL GOVERN.
3. COORDINATE SYSTEM IS BASED ON LOCAL SURVEY. THE BENCHMARKS TO BE USED FOR CONSTRUCTION ARE LOCATED AS SHOWN ON DRAWING NO. C-3. EXISTING CONTOURS ARE BASED ON TOPOGRAPHICAL SURVEY TAKEN ON SEPTEMBER 20, 2007 FOR PDP •1 & PDP •2, AND OCTOBER 21, 2008 FOR PDP •3, BY COLLINS SURVEYING & MAPPING INC., LONGVIEW, TEXAS. INTERIOR SURVEY PERFOMED BY CSM ON JULY 20 & 21, 2009. CURRENT GROUND ELEVATIONS MAY VARY FROM THOSE SHOWN DUE TO SITE WORK THAT HAS BEEN PERFORMED SINCE THE SURVEY WAS PERFORMED.
4. GROUNDWATER AT THE SITE WILL VARY DEPENDING ON RAINFALL, AND SUBSURFACE CONDITIONS. THERE SHALL NOT BE ANY ADDITIONAL PAYMENT OR EXTENSION OF CONTRACT TIME FOR WORKING WITH SATURATED SOILS OR HANDLING GROUNDWATER SEEPAGE DUE TO RAINFALL, RUNOFF AND INFILTRATION.
5. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING ROADS, BENCHMARKS AND EXISTING GROUNDWATER MONITOR WELLS DURING THE CONSTRUCTION PERIOD. THE CONTRACTOR SHALL BE SOLEY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE INCURRED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PROTECT THE GROUNDWATER MONITOR WELLS, BENCHMARKS AND EXISTING ROADS.
6. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES HAVE NOT BEEN ESTABLISHED BY THE OWNER OR HIS REPRESENTATIVES. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING PROPER SAFE WORKING DISTANCE FROM ALL UTILITY EASEMENTS OR LINES.
7. EXCAVATION BY "BLASTING" IS NOT PERMITTED ON THIS PROJECT.
8. FINISHED GROUND ELEVATIONS SHALL MATCH EXISTING GROUND ELEVATIONS EXCEPT AS SHOWN ON THE PLANS. ALL EXCESS SOIL FROM THE EXCAVATION AND GRADING SHALL BE PLACED IN DESIGNATED STOCKPILE LOCATIONS AS AS APPROVED BY THE OWNER. IF WASTE IS ENCOUNTERED DURING EXCAVATION, THE OWNER SHALL BE NOTIFIED AND THE WASTE REMOVED AND PLACED IN AREAS DESIGNATED AS APPROVED BY THE OWNER. TRANSPORT OF SOIL TO FILL AREAS SHALL BE CONDUCTED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.
9. GEOTECHNICAL INVESTIGATION REPORTS FOR THE SITE ARE AVAILABLE FOR REVIEW AT LUMINANT'S DALLAS OFFICES, AND CAN BE MADE AVAILABLE ON SITE IF NEEDED. THE CONTRACTOR MAY PERFORM ADDITIONAL GEOTECHNICAL INVESTIGATIONS, AS HE DEEMS NECESSARY FOR CONSTRUCTION ACTIVITIES, PROVIDED ALL NECESSARY PERMITS AND APPROVALS ARE OBTAINED FROM LUMINANT PRIOR TO INITIATING SUCH WORK. HOWEVER, THERE SHALL BE NO ADDITIONAL PAYMENT TO THE CONTRACTOR FOR ADDITIONAL GEOTECHNICAL INVESTIGATIONS.
10. THE CONTRACTOR SHALL CONSTRUCT, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY CONSTRUCTION ACCESS ROADS. SUCH ROADS SHALL BE LOCATED AS APPROVED BY THE OWNER. DRAINAGE PATTERNS AT THE SITE SHALL NOT BE ALTERED BY ROAD CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF TEMPORARY DRAINAGE STRUCTURES, INCLUDING CULVERTS, AT NO ADDITIONAL COST TO THE OWNER.
11. TEMPORARY CONSTRUCTION SLOPES SHALL NOT BE GREATER THAN 2H:1V. STEEPER SLOPES WILL ONLY BE ALLOWED IF THE CONTRACTOR PROVIDES A GEOTECHNICAL ENGINEERING REPORT SPECIFYING MAXIMUM SLOPES AND THE DURATION FOR WHICH SUCH SLOPES SHALL REMAIN IN PLACE.
12. THE CONTRACTOR SHALL REMOVE ALL VEGETATION WITHIN THE CONSTRUCTION LIMITS AS REQUIRED TO CONSTRUCT THE PROJECT. ALL VEGETATION SHALL BE REMOVED BY CONTRACTOR AT NO ADDITIONAL EXPENSE TO OWNER.
13. THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE ENGINEER ANY ERROR OR DISCREPANCY FOUND ONCE THE CONTRACT DOCUMENT IS CAREFULLY REVIEWED AND ALL ASPECTS OF FIELD WORK HAVE BEEN VERIFIED. IN THE EVENT THE CONTRACTOR CONTINUES TO WORK ON AN ITEM WHERE AN ERROR EXISTS, IT SHALL BE DEEMED THAT THE CONTRACTOR BID AND INTENDED TO EXECUTE THE MORE STRINGENT OR HIGHER QUALITY REQUIREMENT WITHOUT AN INCREASE IN CONTRACT SUM OR TIME. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE TO CORRECT ANY FAILURE OF COMPANY PARTS TO COORDINATE OR FIT PROPERLY INTO FINAL POSITION, AS A RESULT OF CONTRACTOR'S FAILURE TO RAISE OR RESOLVE A DISCREPANCY.
14. THE DRAWINGS AND SPECIFICATIONS SHOULD AGREE WITH EACH OTHER, AND WORK CALLED FOR BY DRAWINGS AND NOT MENTIONED IN SPECIFICATION, OR VICE VERSA, SHALL BE FURNISHED BY BOTH. WHEN DISCREPANCIES EXIST BETWEEN SCALE AND DIMENSIONS, THE DIMENSIONED FIGURE SHALL BE USED.
15. CONTRACTORS AND EACH SUB CONTRACTOR SHALL VERIFY ALL GRADES, LINES, LEVELS, AND DIMENSIONS AS INDICATED ON DRAWINGS, AND HE SHALL REPORT ERRORS TO THE ENGINEER BEFORE COMMENCING WORK. THE CONTRACTOR SHALL ESTABLISH BENCHMARKS IN AT LEAST TWO WIDELY SEPARATED PLACES, AND AS WORK PROGRESSES THE CONTRACTOR WILL MAINTAIN ADEQUATE HORIZONTAL AND VERTICAL CONTROL.
16. THE CONTRACTOR IS REQUIRED TO PRESENT THE SWPPP TO LUMINANT ENVIRONMENTAL SERVICES FOR APPROVAL PRIOR TO THE COMENCEMENT OF CONSTRUCTION ACTIVITIES.
17. THE CONTRACTOR IS REQUIRED TO SUBMIT THE NOTICE OF INTENT FOR THE TPDES PERMIT.
18. THE CONTRACTOR SHALL OBTAIN AND CONDUCT WORK CONSISTENT WITH A TPDES PERMIT FOR CONSTRUCTION, REFER TO TECHNICAL SPECIFICATIONS. PREPARATION OF A SWPPP AND OBTAINING THE TPDES PERMIT ARE THE CONTRACTORS RESPONSIBILITY.
19. CONTRACTOR SHALL INSTALL EROSION AND SEDIMENT CONTROLS AS PER SPECIFICATIONS DURING CONSTRUCTION. SUCH CONTROLS SHALL BE PLACED AT LIMITS OF DISTRUBED AREAS AND AT INTERMEDIATE LOCATIONS WHERE CONCENTRATED FLOW IS LIKELY.
20. STORMWATER AND GROUNDWATER WHICH HAS COME INTO CONTACT WITH THE ASH WITHIN THE EXPANSION IS TO BE CONSIDERED CONTAMINATED. CONTRACTOR WILL CONTROL THE WATER ON-SITE IN COMPLIANCE WITH THE TPDES PERMIT.
21. THE CONTRACTOR SHALL INSTALL, MAINTAIN, AND UPON COMPLETION OF THE PROJECT, REMOVE TEMPORARY EROSION AND SEDIMENT CONTROLS AS APPROVED BY LUMINANT ENVIRONMENTAL SERVICES AND IN ACCORDANCE WITH THE SITE SWPPP AND PURSUANT TO TPDES REQUIREMENTS. SUCH CONTROLS SHALL BE PLACED AT THE LIMITS OF DISTURBED AREAS AND AT INTERMEDIATE LOCATIONS WHERE CONCENTRATED FLOW IS LIKELY.
22. CONTRACTOR SHALL PROVIDE EROSION CONTROL BY SEEDING FOR ALL AREAS DISTURBED BY CONTRACTOR DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL NOT DISTURB ANY AREA WITHOUT THE APPROVAL OF THE ENGINEER. EROSION CONTROL BY SEEDING SHALL CONFORM TO STANDARD SPECIFICATION 02930.
23. LUMINANT INTENDS TO RAISE THE HEIGHT OF THE IMPOUNDMENT BERM IN THE FUTURE. ALL REFERENCES TO "PHASE II" REFER TO A FUTURE PROJECT THAT IS NOT INCLUDED IN THE CONTRACT FOR THIS PROJECT (PHASE I).
24. CONTRACTOR TO FIELD VERIFY LIMITS OF EXISTING FILL PRIOR TO STARTING WORK. CARE SHOULD BE TAKEN NOT TO DAMAGE THE EXISTING CLAY LINERS OF PDPS• 2 & 3 AND THE SYNTHETIC LINER OF PDP• 1. ANY DAMAGE CAUSED BY CONTRATOR IS TO BE REPAIRED BY CONTRACTOR AT CONTRACTORS EXPENSE.
25. CONTRACTOR TO ACQUIRE A DIGGING PERMIT FROM THE PLANT BEFORE COMMENCING ANY EXCAVATION ACTIVITY.
26. PROTECT PREVIOUSLY COMPLETED CLAY LINER AND PROTECTIVE COVER.
27. DETERMINE EXTENTS OF SUBSURFACE LINER PRIOR TO BEGINNING LINER EXTENSION TO BERM AND CONSTRUCTION OF DEWATERING SUMPS.

SYMBOLS

SECTION DETAIL INDICATORS

DRAWING ON WHICH SECTION IS CUT:



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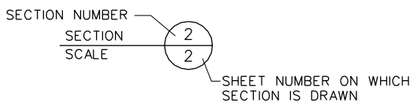

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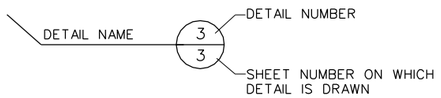

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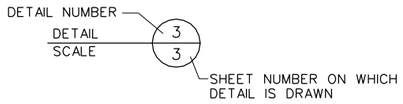
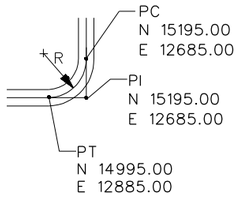
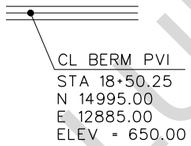
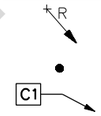


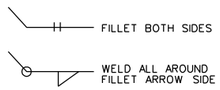




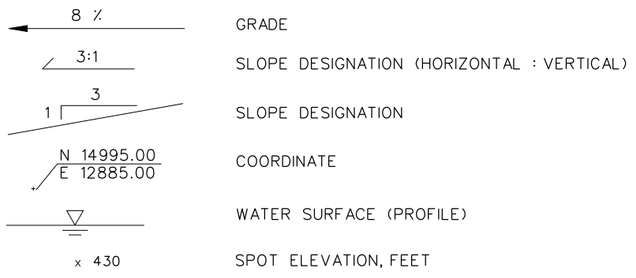
CURVE WITH HORIZONTAL CONTROL:



WELDING SYMBOLS



VERTICAL CONTROL DESIGNATION



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DATE: 2/9/2011
TIME: 12:47:40 PM
USER: rcox

Luminant

HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

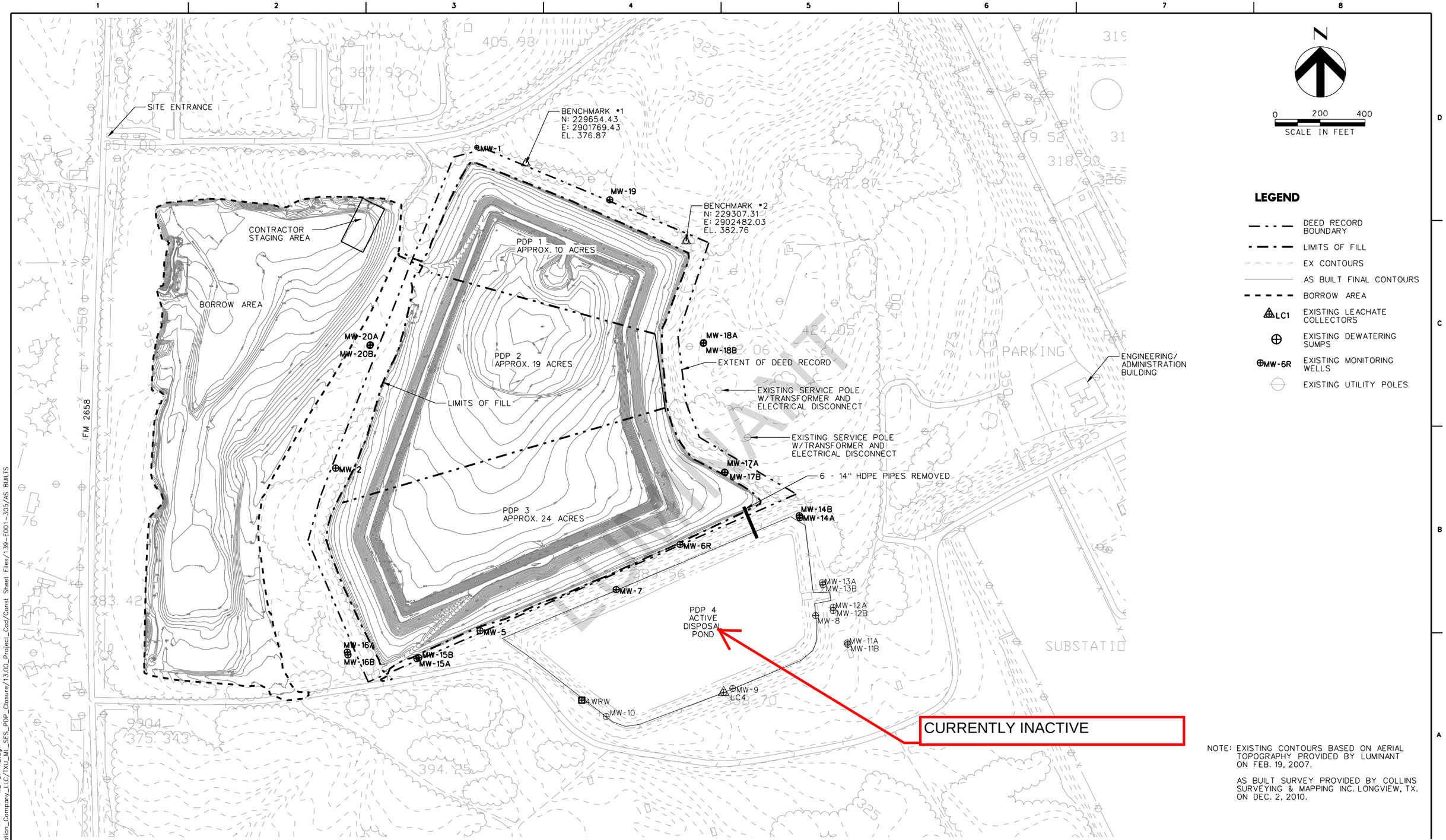
PERMANENT DISPOSAL POND #5
PHASE I

ABBREVIATIONS AND GENERAL NOTES

139-E001-305
AS RECORDED

FILENAME	ML-GN-AB.dgn
SCALE	NOT TO SCALE

SHEET C-2



NOTE: EXISTING CONTOURS BASED ON AERIAL TOPOGRAPHY PROVIDED BY LUMINANT ON FEB. 19, 2007.

AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX. ON DEC. 2, 2010.

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

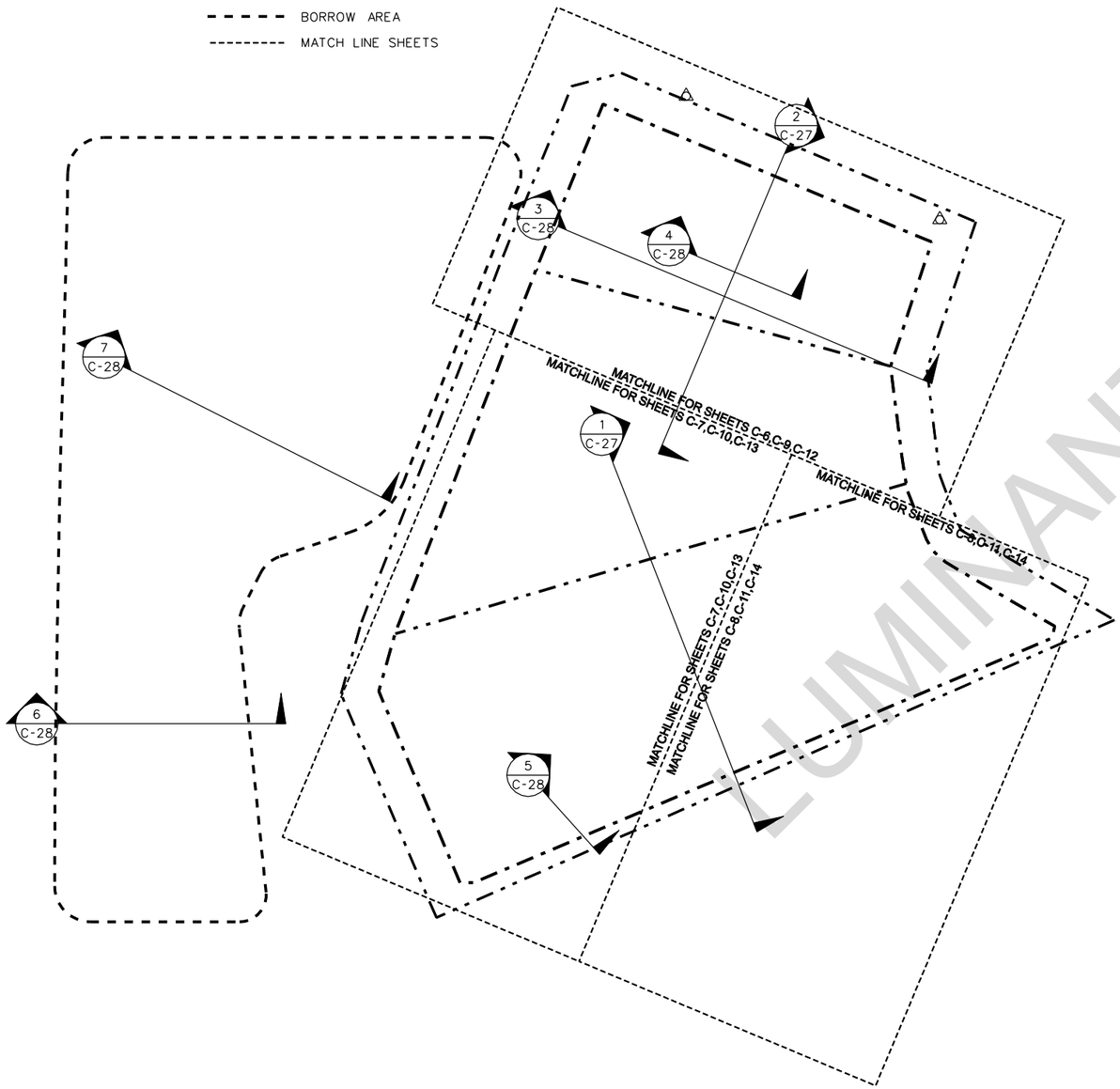
SITE PLAN
139-E001-305
AS RECORDED

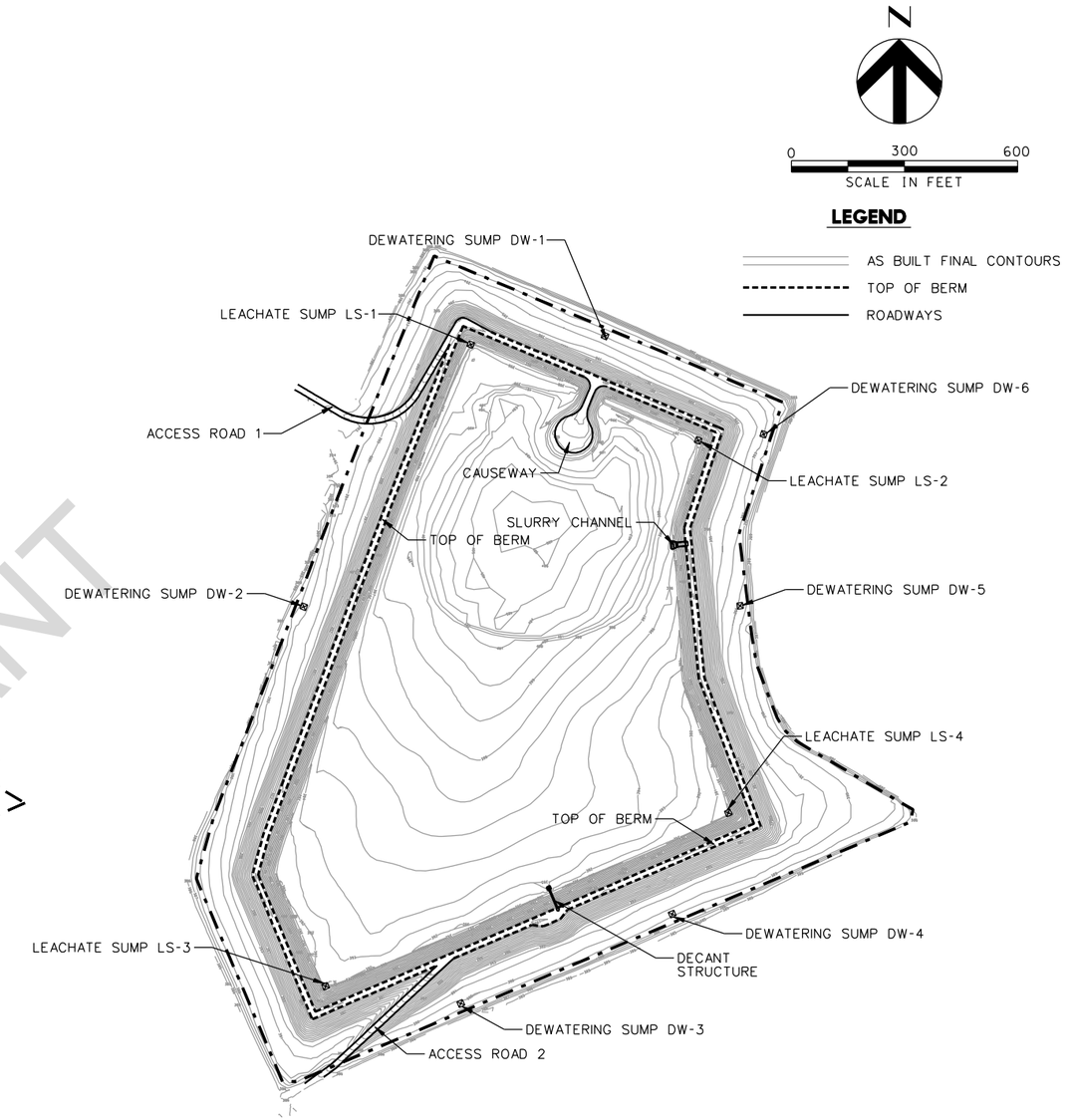
FILENAME	ML-SP-AB.dgn
SCALE	AS SHOWN

SHEET
C-3

LEGEND

- DEED RECORD BOUNDARY
- LIMITS OF FILL
- BORROW AREA
- MATCH LINE SHEETS





AS BUILT POND CAPACITY W/2' FREEBOARD = 62,000,000 GALLONS

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

KEY MAP & CROSS SECTION LOCATIONS

139-E001-305
AS RECORDED

FILENAME	ML-KM-AB.dgn
SCALE	AS SHOWN

SHEET **C-4**

Beginning chain BERM description

Point B100 N 229,164.45 E 2,902,283.00 Sta 10+00.00
Course from B100 to B101 N 67° 13' 05.59" W Dist 727.25

Point B101 N 229,446.06 E 2,901,612.49 Sta 17+27.25
Course from B101 to B102 S 21° 42' 49.81" W Dist 503.88

Point B102 N 228,977.93 E 2,901,426.07 Sta 22+31.13
Course from B102 to B103 S 20° 22' 56.34" W Dist 939.90

Point B103 N 228,096.88 E 2,901,098.72 Sta 31+71.03
Course from B103 to B104 S 15° 19' 55.34" W Dist 108.30

Point B104 N 227,992.43 E 2,901,070.08 Sta 32+79.33
Course from B104 to B105 S 22° 34' 51.12" E Dist 393.01

Point B105 N 227,629.56 E 2,901,220.99 Sta 36+72.34
Course from B105 to B106 N 66° 48' 13.00" E Dist 1,264.55

Point B106 N 228,127.64 E 2,902,383.32 Sta 49+36.89
Course from B106 to B107 N 20° 46' 34.13" W Dist 410.67

Point B107 N 228,511.61 E 2,902,237.64 Sta 53+47.56
Course from B107 to B108 N 5° 31' 02.85" W Dist 401.28

Point B108 N 228,911.03 E 2,902,199.06 Sta 57+48.83
Course from B108 to B109 N 18° 19' 36.70" E Dist 266.96

Point B109 N 229,164.45 E 2,902,283.00 Sta 60+15.80

Ending chain BERM description

Beginning chain ACCESS ROAD1 description

Point H12 N 229,284.47 E 2,901,170.24 Sta 10+00.00

Course from H12 to PC HAUL-1 S 59° 24' 40.79" E Dist 134.32

Curve Data

Curve HAUL-1
P.I. Station 12+84.20 N 229,139.84 E 2,901,414.89
Delta = 89° 57' 21.83" (LT)
Degree = 38° 11' 49.87"
Tangent = 149.89
Length = 235.50
Radius = 150.00
External = 62.05
Long Chord = 212.05
Mid. Ord. = 43.89
P.C. Station 11+34.32 N 229,216.12 E 2,901,285.86
P.T. Station 13+69.82 N 229,268.81 E 2,901,491.26
C.C. N 229,345.24 E 2,901,362.19
Back = S 59° 24' 40.79" E
Ahead = N 30° 37' 57.38" E
Chord Bear = N 75° 36' 38.29" E

Course from PT HAUL-1 to H13 N 30° 37' 57.38" E Dist 206.74

Point H13 N 229,446.70 E 2,901,596.60 Sta 15+76.56

Ending chain ACCESS ROAD1 description

Beginning chain ACCESS ROAD2 description

Point H200 N 227,447.47 E 2,901,218.06 Sta 10+00.00

Course from H200 to PC HAUL2-1 N 53° 57' 30.87" E Dist 57.57

Curve Data

Curve HAUL2-1
P.I. Station 10+66.74 N 227,486.74 E 2,901,272.03
Delta = 7° 00' 10.75" (LT)
Degree = 38° 11' 49.87"
Tangent = 9.18
Length = 18.33
Radius = 150.00
External = 0.28
Long Chord = 18.32
Mid. Ord. = 0.28
P.C. Station 10+57.57 N 227,481.34 E 2,901,264.61
P.T. Station 10+75.90 N 227,493.00 E 2,901,278.74
C.C. N 227,602.62 E 2,901,176.36
Back = N 53° 57' 30.87" E
Ahead = N 46° 57' 20.12" E
Chord Bear = N 50° 27' 25.50" E

Course from PT HAUL2-1 to H201 N 46° 57' 20.12" E Dist 392.50

Point H201 N 227,760.91 E 2,901,565.59 Sta 14+68.40

Ending chain ACCESS ROAD2 description

Beginning chain LEACHATE1 description

Point L10 N 229,432.03 E 2,901,922.86 Sta 10+00.00

Course from L10 to PC LEACH1-1 N 67° 14' 51.56" W Dist 347.26

Curve Data

Curve LEACH1-1
P.I. Station 13+98.43 N 229,586.12 E 2,901,555.44
Delta = 91° 19' 03.90" (LT)
Degree = 114° 35' 29.61"
Tangent = 51.16
Length = 79.69
Radius = 50.00
External = 21.54
Long Chord = 71.52
Mid. Ord. = 15.05
P.C. Station 13+47.26 N 229,566.33 E 2,901,602.62
P.T. Station 14+26.95 N 229,538.50 E 2,901,536.74
C.C. N 229,520.22 E 2,901,583.28
Back = N 67° 14' 51.56" W
Ahead = S 21° 26' 04.53" W
Chord Bear = S 67° 05' 36.48" W

Course from PT LEACH1-1 to PC LEACH1-2 S 21° 26' 04.53" W Dist 1,506.61

Curve Data

Curve LEACH1-2
P.I. Station 29+36.03 N 228,133.80 E 2,900,985.27
Delta = 5° 37' 59.16" (LT)
Degree = 114° 35' 29.61"
Tangent = 2.46
Length = 4.92
Radius = 50.00
External = 0.06
Long Chord = 4.91
Mid. Ord. = 0.06
P.C. Station 29+33.57 N 228,136.09 E 2,900,986.16
P.T. Station 29+38.48 N 228,131.43 E 2,900,984.60
C.C. N 228,117.81 E 2,901,032.71
Back = S 21° 26' 04.53" W
Ahead = S 15° 48' 05.37" W
Chord Bear = S 18° 37' 04.95" W

Course from PT LEACH1-2 to PC LEACH1-3 S 15° 48' 05.37" W Dist 135.19

Curve Data

Curve LEACH1-3
P.I. Station 30+91.30 N 227,984.38 E 2,900,942.98
Delta = 38° 51' 28.57" (LT)
Degree = 114° 35' 29.61"
Tangent = 17.64
Length = 33.91
Radius = 50.00
External = 3.02
Long Chord = 33.26
Mid. Ord. = 2.85
P.C. Station 30+73.67 N 228,001.35 E 2,900,947.78
P.T. Station 31+07.58 N 227,968.16 E 2,900,949.89
C.C. N 227,987.74 E 2,900,995.90
Back = S 15° 48' 05.37" W
Ahead = S 23° 03' 23.20" E
Chord Bear = S 3° 37' 38.92" E

Course from PT LEACH1-3 to PC LEACH1-4 S 23° 03' 23.20" E Dist 483.99

Curve Data

Curve LEACH1-4
P.I. Station 36+41.44 N 227,476.94 E 2,901,158.97
Delta = 89° 51' 31.58" (LT)
Degree = 114° 35' 29.61"
Tangent = 49.88
Length = 78.42
Radius = 50.00
External = 20.62
Long Chord = 70.62
Mid. Ord. = 14.60
P.C. Station 35+91.56 N 227,522.83 E 2,901,139.44
P.T. Station 36+69.98 N 227,496.36 E 2,901,204.91
C.C. N 227,542.41 E 2,901,185.44
Back = S 23° 03' 23.20" E
Ahead = N 67° 05' 05.22" E
Chord Bear = S 67° 59' 08.99" E

Course from PT LEACH1-4 to L11 N 67° 05' 05.22" E Dist 764.96

Point L11 N 227,794.21 E 2,901,909.50 Sta 44+34.94

Ending chain LEACHATE1 description

Beginning chain LEACHATE2 description

Point L3000 N 229,069.70 E 2,902,365.16 Sta 10+00.00

Course from L3000 to PC LEACH2-1 S 18° 14' 24.79" W Dist 168.91

Curve Data

Curve LEACH2-1
P.I. Station 11+80.29 N 228,898.48 E 2,902,308.73
Delta = 25° 38' 53.23" (LT)
Degree = 114° 35' 29.61"
Tangent = 11.38
Length = 22.38
Radius = 50.00
External = 1.28
Long Chord = 22.20
Mid. Ord. = 1.25
P.C. Station 11+68.91 N 228,909.29 E 2,902,312.30
P.T. Station 11+91.29 N 228,887.19 E 2,902,310.20
C.C. N 228,893.64 E 2,902,359.78
Back = S 18° 14' 24.79" W
Ahead = S 7° 24' 28.44" E
Chord Bear = S 5° 24' 58.17" W

Course from PT LEACH2-1 to PC LEACH2-2 S 7° 24' 28.44" E Dist 337.89

Curve Data

Curve LEACH2-2
P.I. Station 15+35.12 N 228,546.23 E 2,902,354.53
Delta = 13° 33' 02.15" (LT)
Degree = 114° 35' 29.61"
Tangent = 5.94
Length = 11.83
Radius = 50.00
External = 0.35
Long Chord = 11.80
Mid. Ord. = 0.35
P.C. Station 15+29.18 N 228,552.12 E 2,902,353.77
P.T. Station 15+41.01 N 228,540.68 E 2,902,356.66
C.C. N 228,558.56 E 2,902,403.35
Back = S 7° 24' 28.44" E
Ahead = S 20° 57' 30.59" E
Chord Bear = S 14° 10' 59.52" E

Course from PT LEACH2-2 to PC LEACH2-3 S 20° 57' 30.59" E Dist 465.43

Curve Data

Curve LEACH2-3
P.I. Station 20+54.75 N 228,060.92 E 2,902,540.42
Delta = 88° 02' 35.81" (RT)
Degree = 114° 35' 29.61"
Tangent = 48.32
Length = 76.83
Radius = 50.00
External = 19.53
Long Chord = 69.49
Mid. Ord. = 14.05
P.C. Station 20+06.43 N 228,106.04 E 2,902,523.14
P.T. Station 20+83.27 N 228,042.10 E 2,902,495.91
C.C. N 228,088.16 E 2,902,476.44
Back = S 20° 57' 30.59" E
Ahead = S 67° 05' 05.22" W
Chord Bear = S 23° 03' 47.32" W

Course from PT LEACH2-3 to L3001 S 67° 05' 05.22" W Dist 636.66

Point L3001 N 227,794.21 E 2,901,909.50 Sta 27+19.92

Ending chain LEACH2 description

PLTDRVER: 11X17LASER_BW_PDF.plt
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DATE: 2/9/2011
TIME: 12:48:05 PM
USER: rcox

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

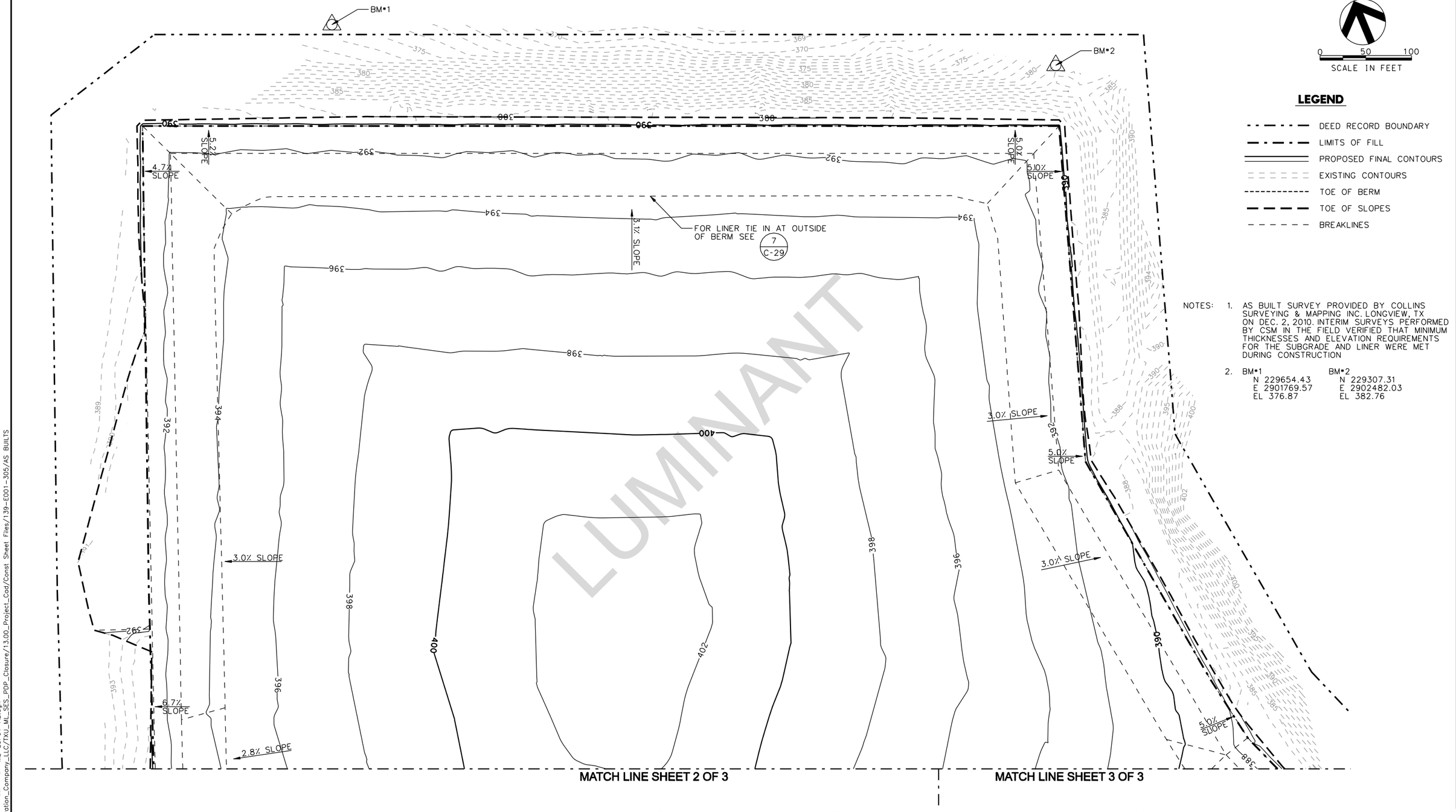
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

HORIZONTAL CONTROL DATA
139-E001-305
AS RECORDED

FILENAME	ML-HCD-AB.dgn
SCALE	AS SHOWN

SHEET C-5



NOTES:

1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010. INTERIM SURVEYS PERFORMED BY CSM IN THE FIELD VERIFIED THAT MINIMUM THICKNESSES AND ELEVATION REQUIREMENTS FOR THE SUBGRADE AND LINER WERE MET DURING CONSTRUCTION
2. BM-1 N 229654.43 E 2901769.57 EL 376.87; BM-2 N 229307.31 E 2902482.03 EL 382.76

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DATE: 2/9/2011
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USER: rcox

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McKinney, Texas 75070
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PROJECT MANAGER	D.VOGT
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CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

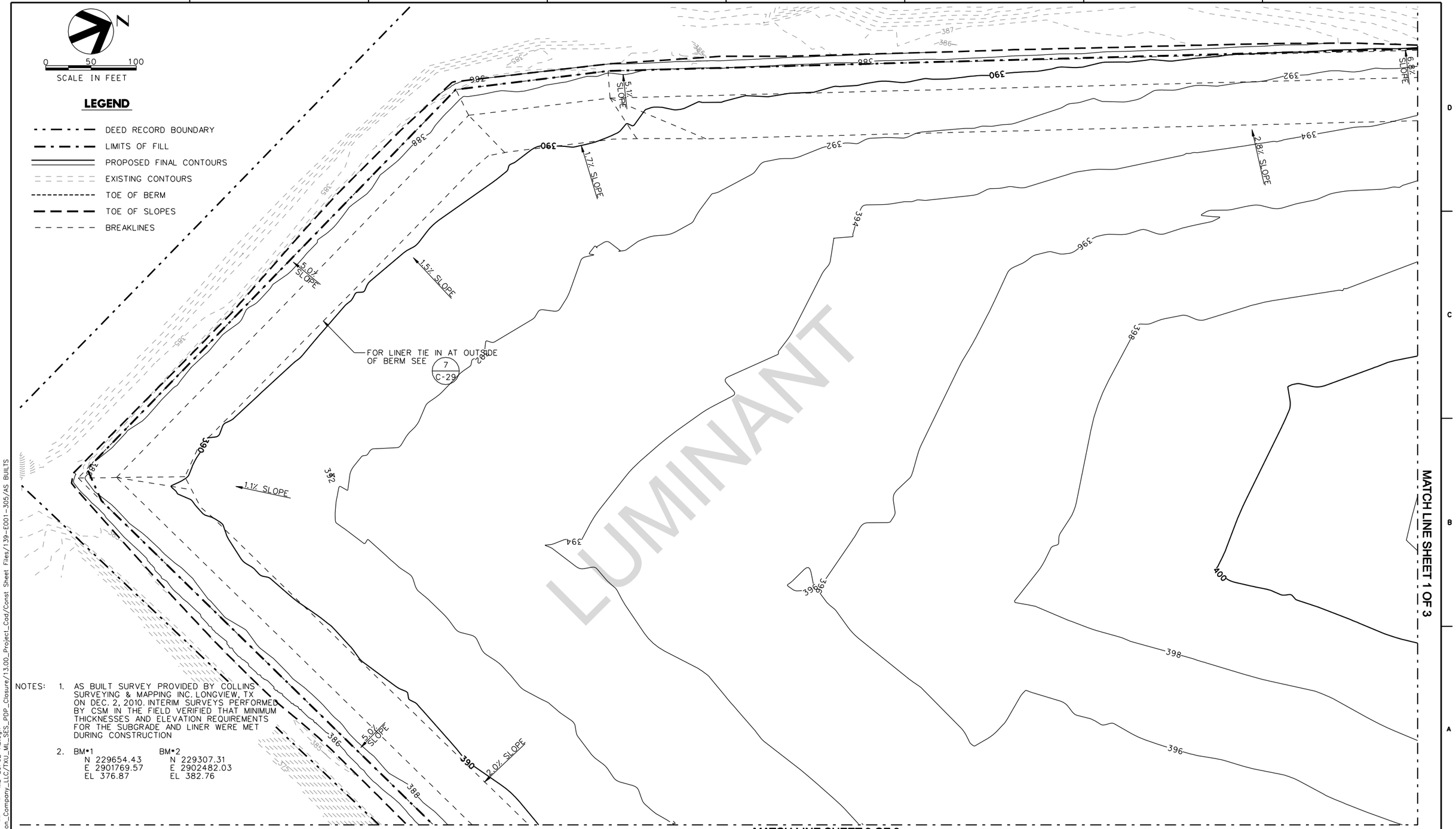
PERMANENT DISPOSAL POND #5
PHASE I

LINER CONTOUR PLAN

SHEET 1 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-LCP01-AB.dgn
SCALE	AS SHOWN

SHEET C-6



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HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

LINER CONTOUR PLAN
SHEET 2 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-LCP02-AB.dgn
SCALE	AS SHOWN

SHEET C-7

MATCH LINE SHEET 2 OF 3

MATCH LINE SHEET 1 OF 3

N

0 50 100
SCALE IN FEET

LEGEND

- DEED RECORD BOUNDARY
- LIMITS OF FILL
- PROPOSED FINAL CONTOURS
- EXISTING CONTOURS
- TOE OF BERM
- TOE OF SLOPES
- BREAKLINES

NOTES:
1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010. INTERIM SURVEYS PERFORMED BY CSM IN THE FIELD VERIFIED THAT MINIMUM THICKNESSES AND ELEVATION REQUIREMENTS FOR THE SUBGRADE AND LINER WERE MET DURING CONSTRUCTION
2. BM•1 N 229654.43 E 2901769.57 EL 376.87; BM•2 N 229307.31 E 2902482.03 EL 382.76

FOR LINER TIE IN AT OUTSIDE OF BERM SEE 7 C-29

6 - 14" HDPE PIPES WERE REMOVED AND BERM RESTORED TO ORIGINAL CONDITIONS BEFORE LINER WAS PLACED IN THIS AREA

PLTDRVER: 11X17LASER_BW_PDF.plt
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4500 W. Eldorado Parkway
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McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

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CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

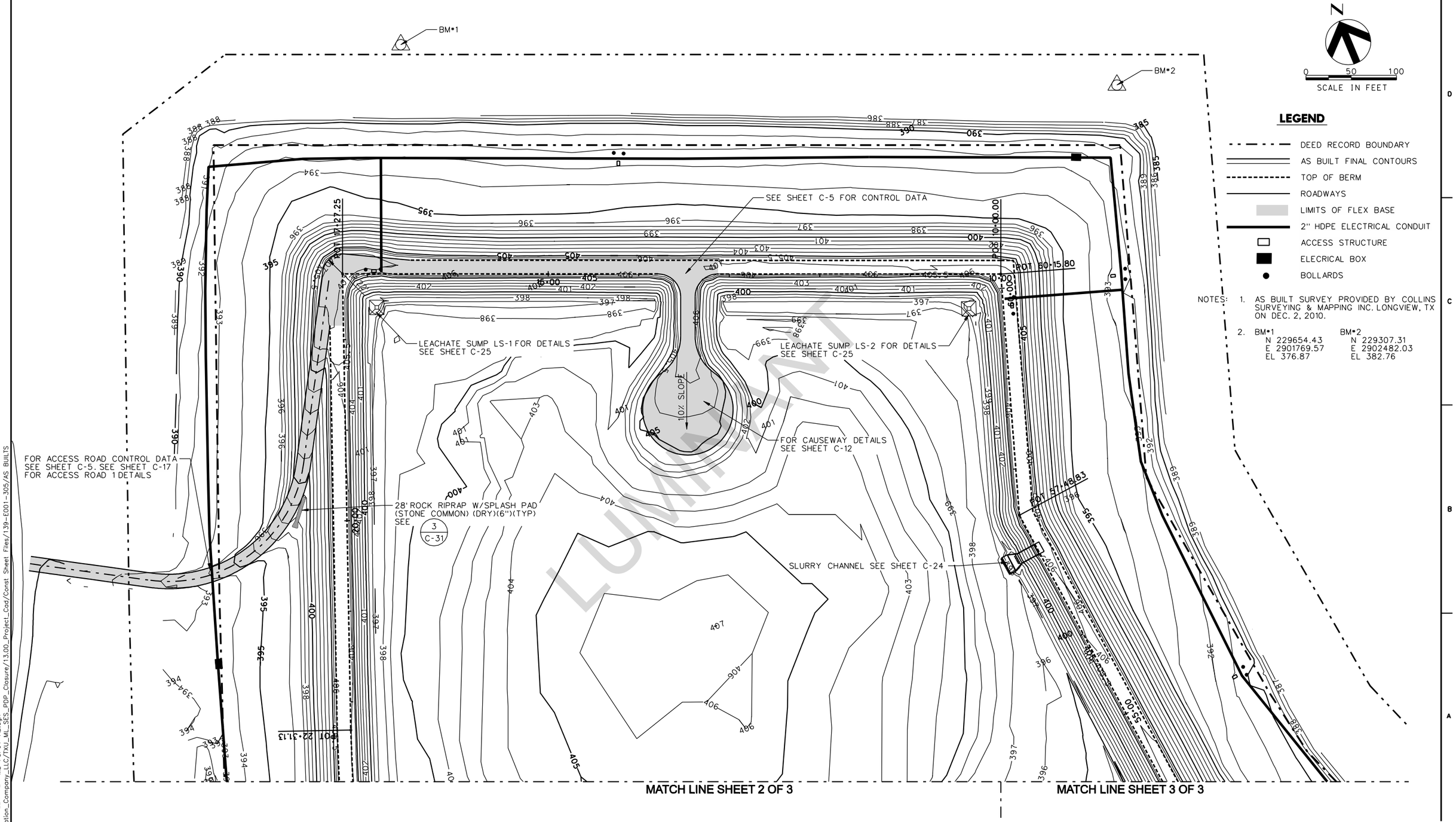
PERMANENT DISPOSAL POND #5
PHASE I

LINER CONTOUR PLAN

SHEET 3 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-LCP03-AB.dgn
SCALE	AS SHOWN

SHEET C-8



LEGEND

- DEED RECORD BOUNDARY
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LIMITS OF FLEX BASE
- 2" HDPE ELECTRICAL CONDUIT
- ACCESS STRUCTURE
- ELECRICAL BOX
- BOLLARDS

NOTES:
1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010.
2. BM•1 N 229654.43 E 2901769.57 EL 376.87; BM•2 N 229307.31 E 2902482.03 EL 382.76

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McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
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CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

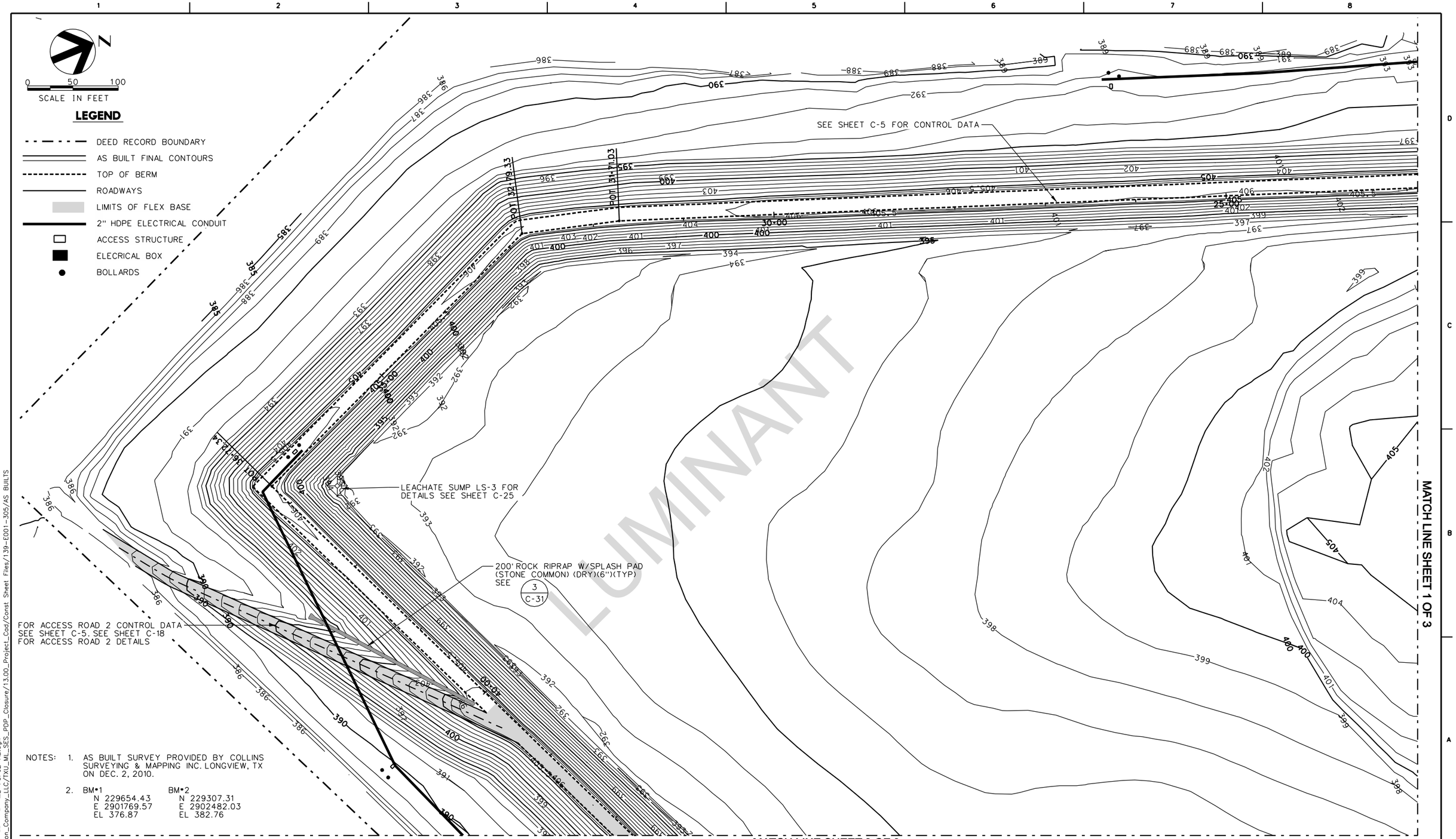
PERMANENT DISPOSAL POND #5
PHASE I

FINAL CONTOUR PLAN

SHEET 1 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-FCP01-AB.dgn
SCALE	AS SHOWN

SHEET C-9



NOTES:
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2. BM•1 N 229654.43 E 2901769.57 EL 376.87; BM•2 N 229307.31 E 2902482.03 EL 382.76

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4500 W. Eldorado Parkway
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Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
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CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

FINAL CONTOUR PLAN

SHEET 2 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-FCP02-AB.dgn
SCALE	AS SHOWN

SHEET C-10

MATCH LINE SHEET 2 OF 3

MATCH LINE SHEET 1 OF 3

N

0 50 100

SCALE IN FEET

LEGEND

- DEED RECORD BOUNDARY
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LIMITS OF FLEX BASE
- 2" HDPE ELECTRICAL CONDUIT
- ACCESS STRUCTURE
- ELECRICAL BOX
- BOLLARDS

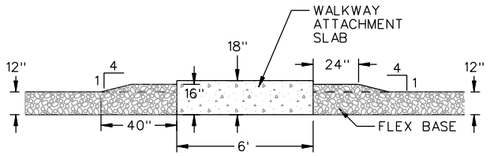
NOTES:

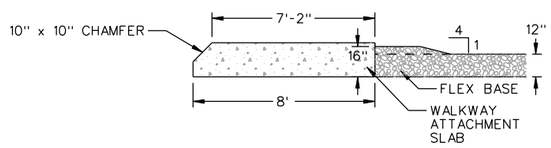
1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010.
2. BM#1 N 229654.43 E 2901769.57 EL 376.87; BM#2 N 229307.31 E 2902482.03 EL 382.76

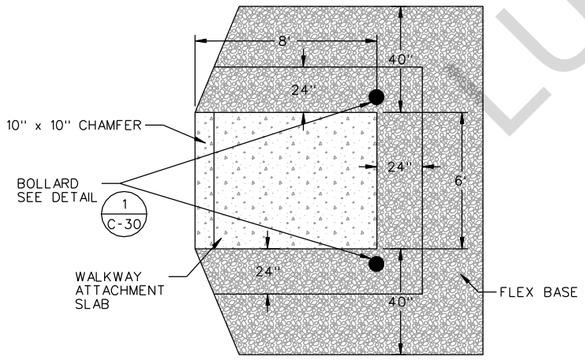
DECANT STRUCTURE & WALKWAY SEE SHEETS 1& 2 OF DWG. 139-E001-301

WALKWAY ATTACHMENT SLAB SEE DETAIL THIS SHEET AND SHEETS 1& 2 OF DWG. 139-E001-301

LEACHATE SUMP LS-4 FOR DETAILS SEE SHEET C-25







WALKWAY ATTACHMENT SLAB — 1 / C-11

N.T.S.

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Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

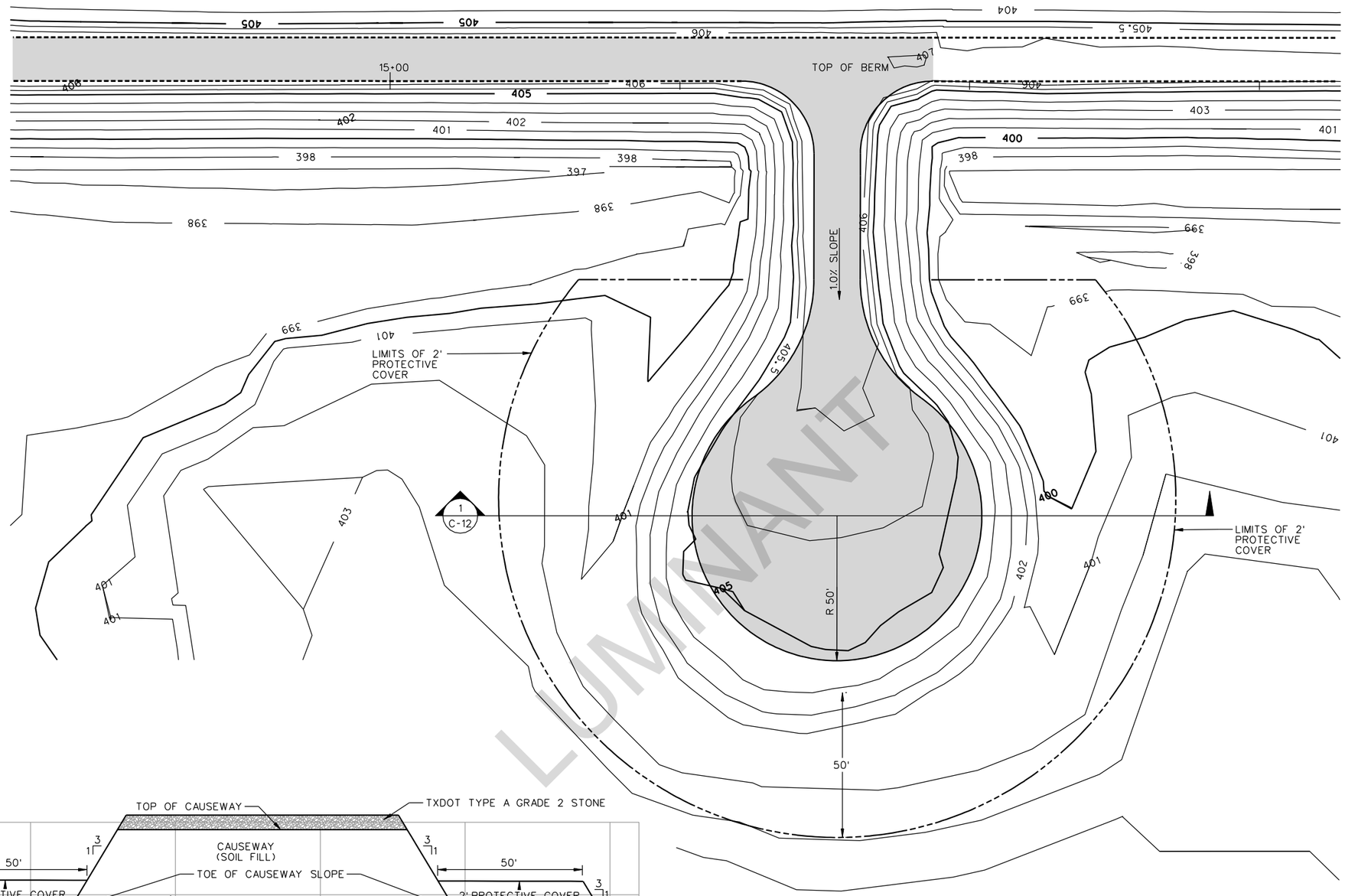
PERMANENT DISPOSAL POND #5
PHASE I

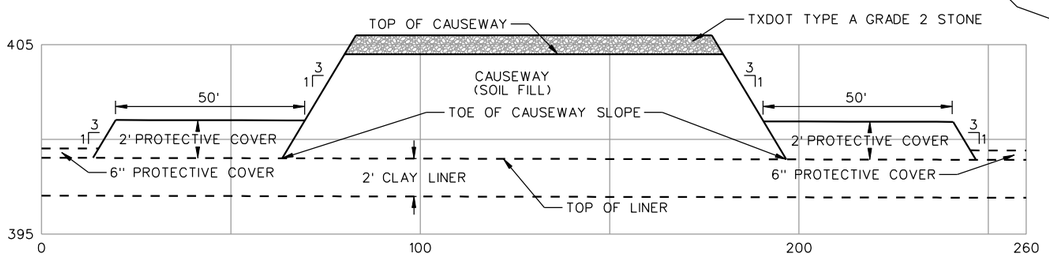
FINAL CONTOUR PLAN

SHEET 3 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-FCP03-AB.dgn
SCALE	AS SHOWN

SHEET C-11





CROSS SECTION 1 / C-12

5V:1H

LEGEND

- DEED RECORD BOUNDARY
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LIMITS OF FLEX BASE

NOTES:
1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010.
2. BM#1 N 229654.43 E 2901769.57 EL 376.87; BM#2 N 229307.31 E 2902482.03 EL 382.76

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DATE: 2/9/2011
TIME: 12:48:43 PM

Luminant

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ISSUE	DATE	DESCRIPTION

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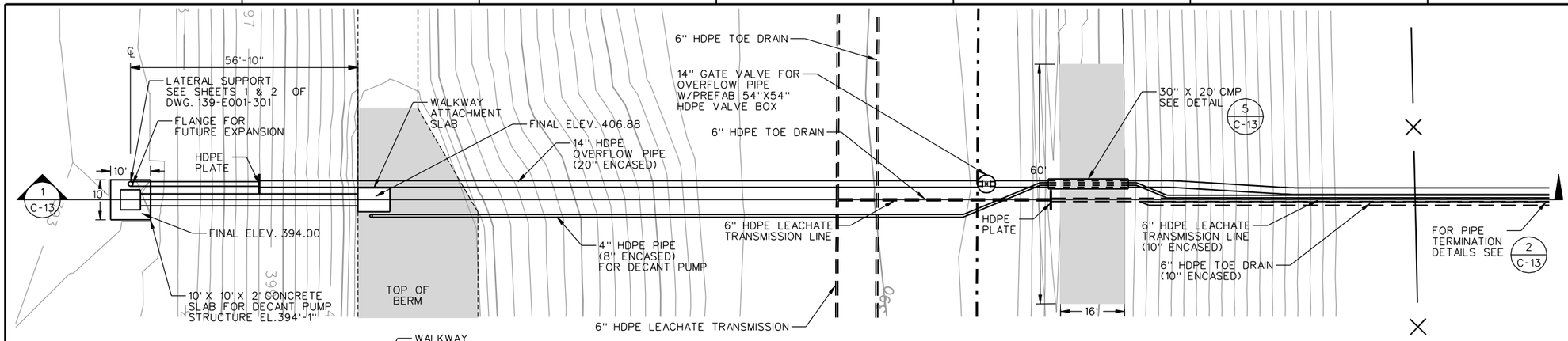
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

CAUSEWAY CONTOUR PLAN
139-E001-305
AS RECORDED

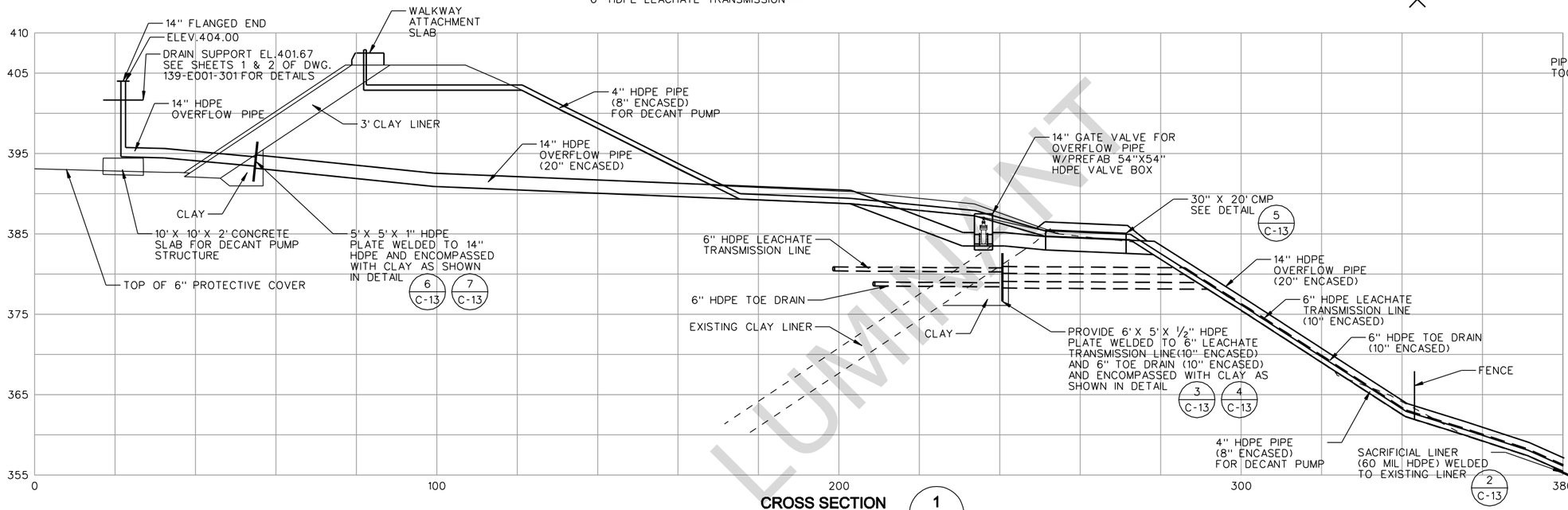
FILENAME	ML-CD01-AB.dgn
SCALE	AS SHOWN

SHEET C-12



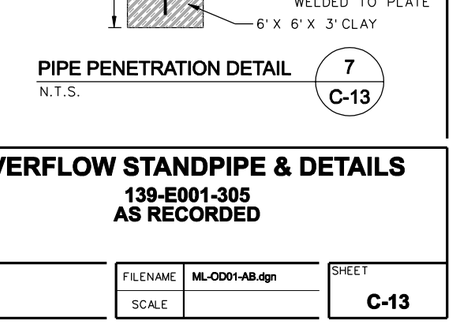
LEGEND

- LIMITS OF FILL
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- TOE OF SLOPES
- ROADWAYS
- LIMITS OF FLEX BASE



CROSS SECTION 1 C-13

2V:1H



PIPE TERMINATION DETAIL 2 C-13

N.T.S.

TRENCH DETAIL FOR PIPE CROSSINGS

PIPE PENETRATION DETAIL 3 C-13

N.T.S.

PIPE PENETRATION DETAIL 4 C-13

N.T.S.

CMP PIPE DETAIL 5 C-13

N.T.S.

PIPE PENETRATION DETAIL 6 C-13

N.T.S.

PIPE PENETRATION DETAIL 7 C-13

N.T.S.

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Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

OVERFLOW STANDPIPE & DETAILS

139-E001-305
AS RECORDED

FILENAME	ML-OD01-AB.dgn
SCALE	

SHEET C-13

NOTES:

1. AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010.
2. SEE GEOTECHNICAL REPORT FOR BORROW AREA.
3. 2" HDPE FORCE MAIN LOCATION IS APPROXIMATE, CONTRACTOR FIELD VERIFIED AND PROTECTED AS NEEDED.

Luminant

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HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
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McKinney, Texas 75070
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ISSUE	DATE	DESCRIPTION
0	04/10	ISSUED FOR CONSTRUCTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
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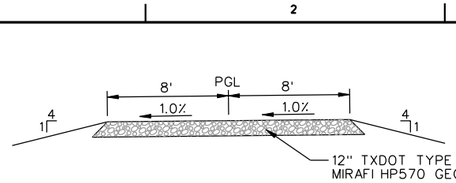
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

BORROW AREA EXCAVATION PLAN
139-E001-305
AS RECORDED

FILENAME	ML-BA-AB.dgn
SCALE	AS SHOWN

SHEET C-14



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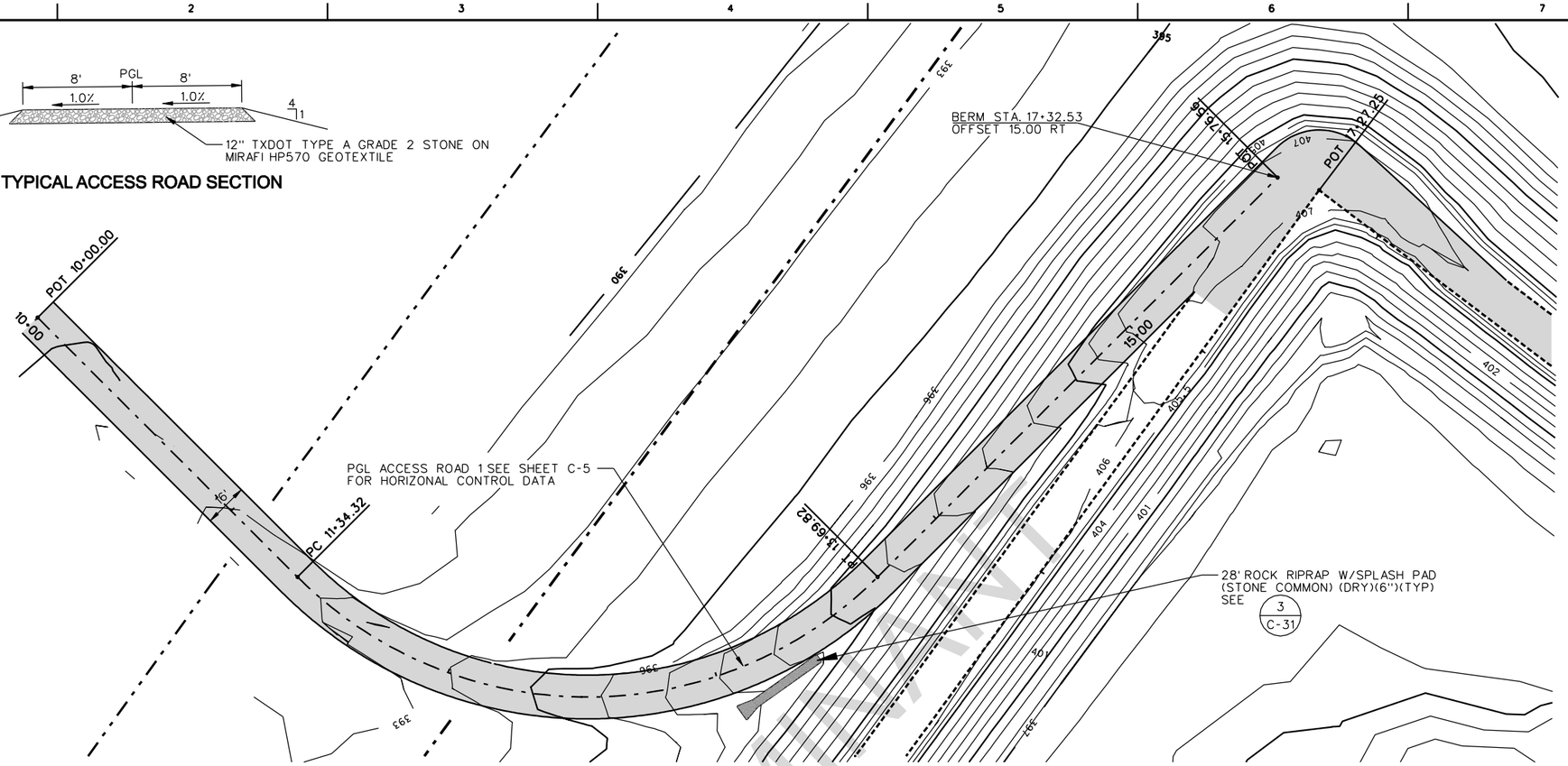
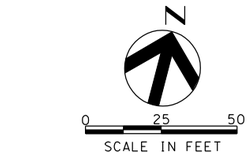
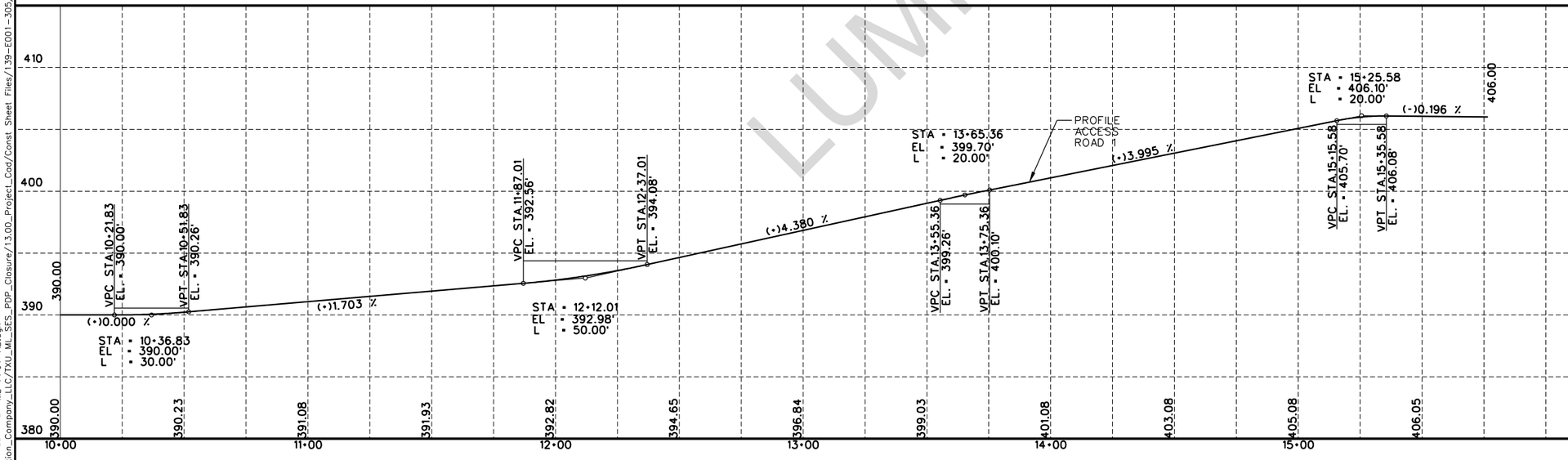




LEGEND

- DEED RECORD BOUNDARY
- LIMITS OF FILL
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LIMITS OF FLEX BASE

AS BUILT SURVEY PROVIDED BY COLLINS SURVEYING & MAPPING INC. LONGVIEW, TX ON DEC. 2, 2010.



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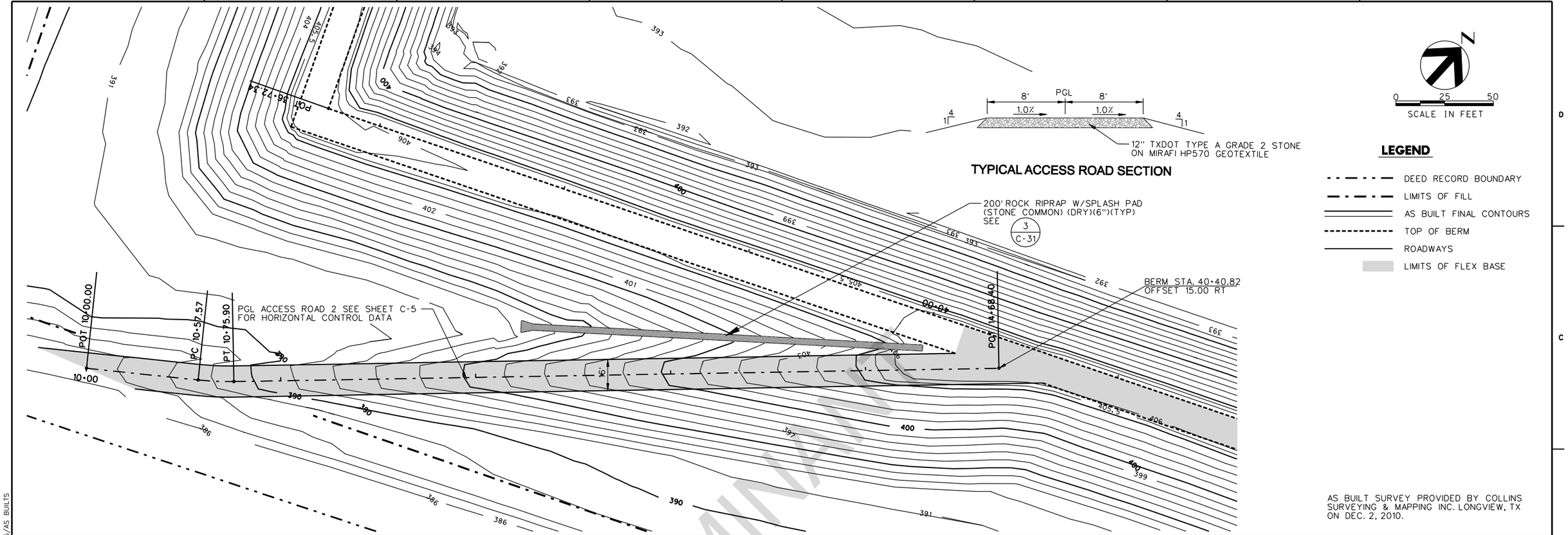
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

ACCESS ROAD 1 PLAN & PROFILE
139-E001-305
AS RECORDED

FILENAME	ML-PP01-AB.dgn
SCALE	AS SHOWN

SHEET **C-17**



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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

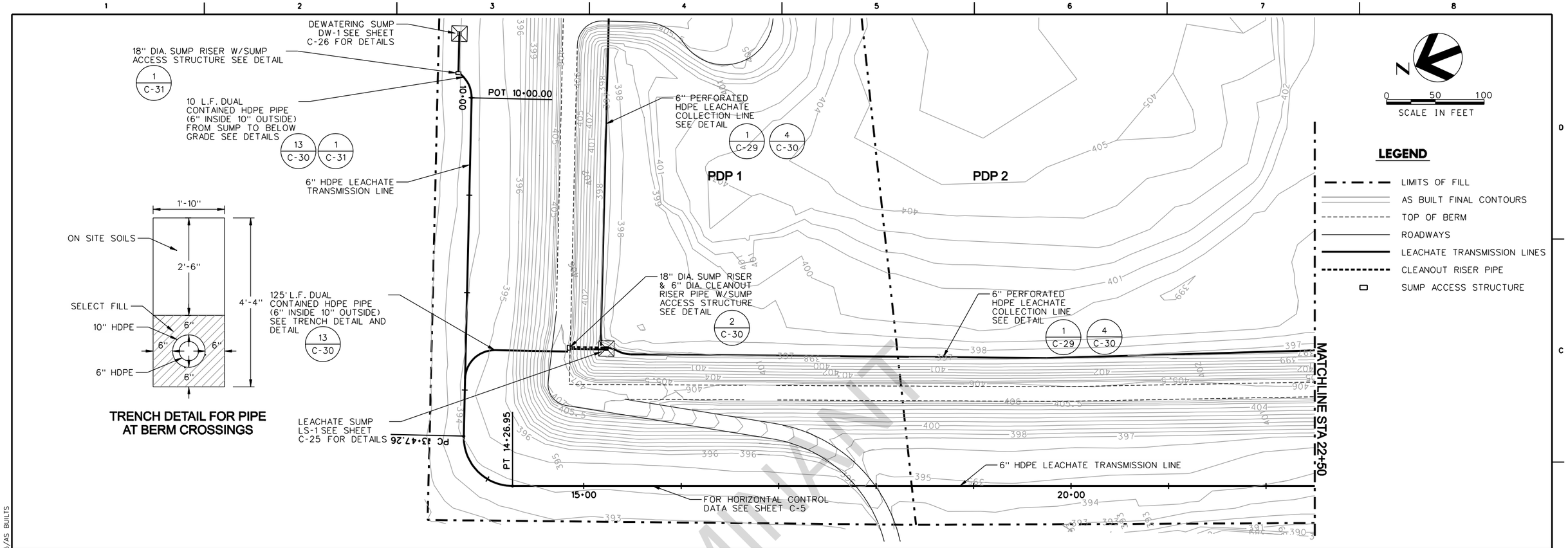
PERMANENT DISPOSAL POND #5
PHASE I

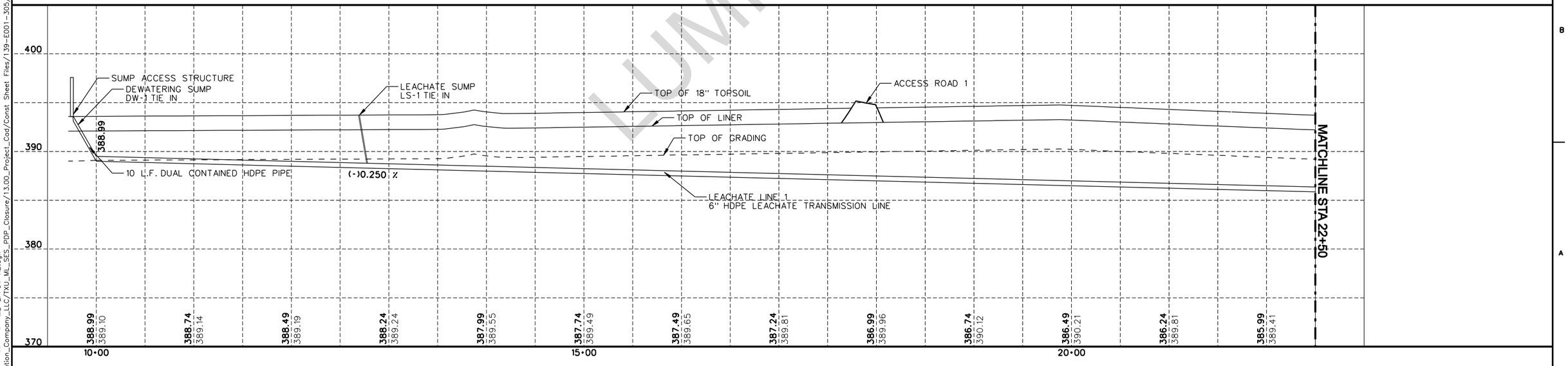
ACCESS ROAD 2 PLAN & PROFILE

139-E001-305
AS RECORDED

FILENAME	ML-PP02-AB.dgn
SCALE	AS SHOWN

SHEET **C-18**





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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

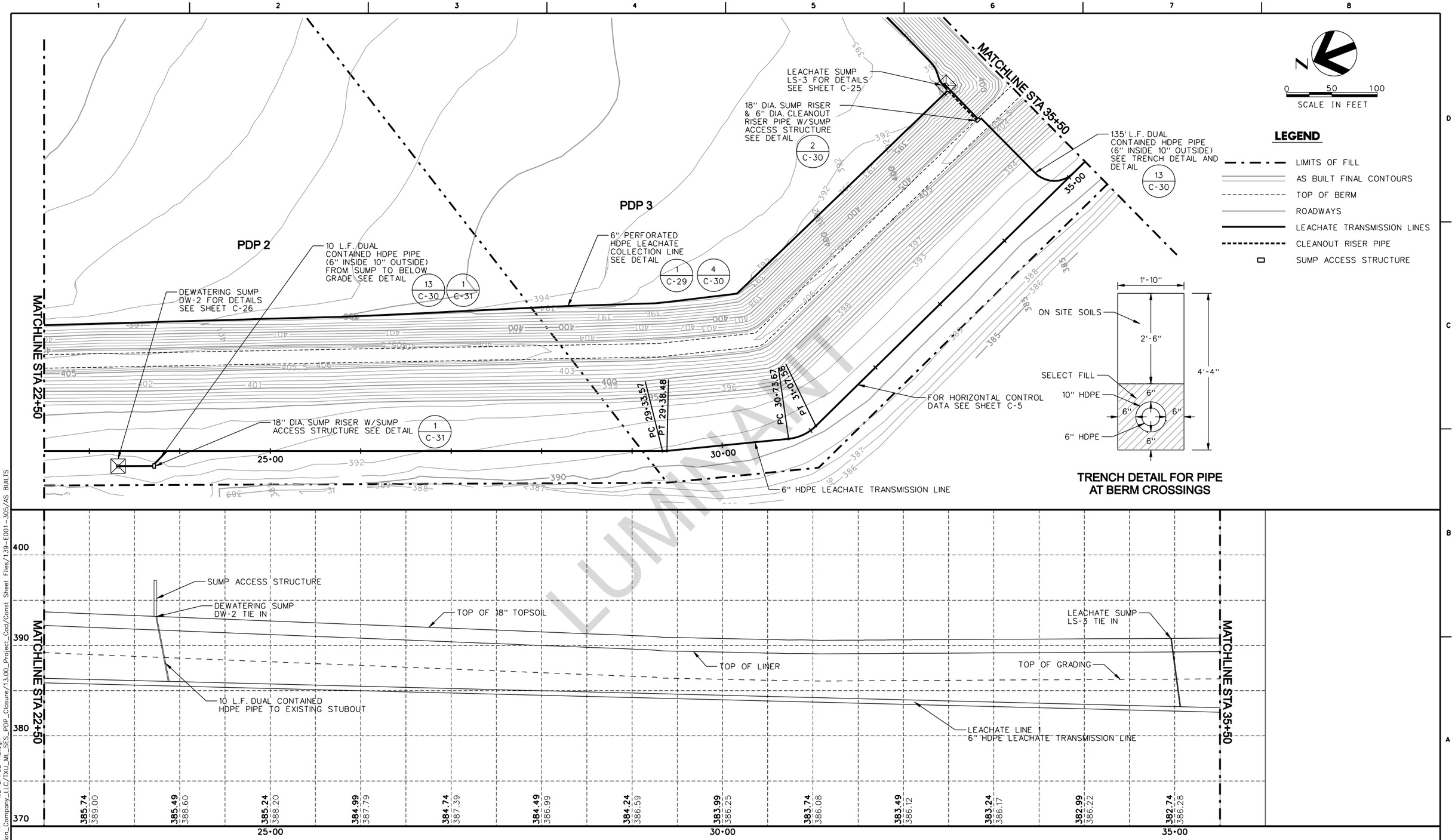
PERMANENT DISPOSAL POND #5
PHASE I

LEACHATE LINE 1 PLAN & PROFILE

SHEET 1 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-LPP01-AB.dgn
SCALE	

SHEET **C-19**



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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

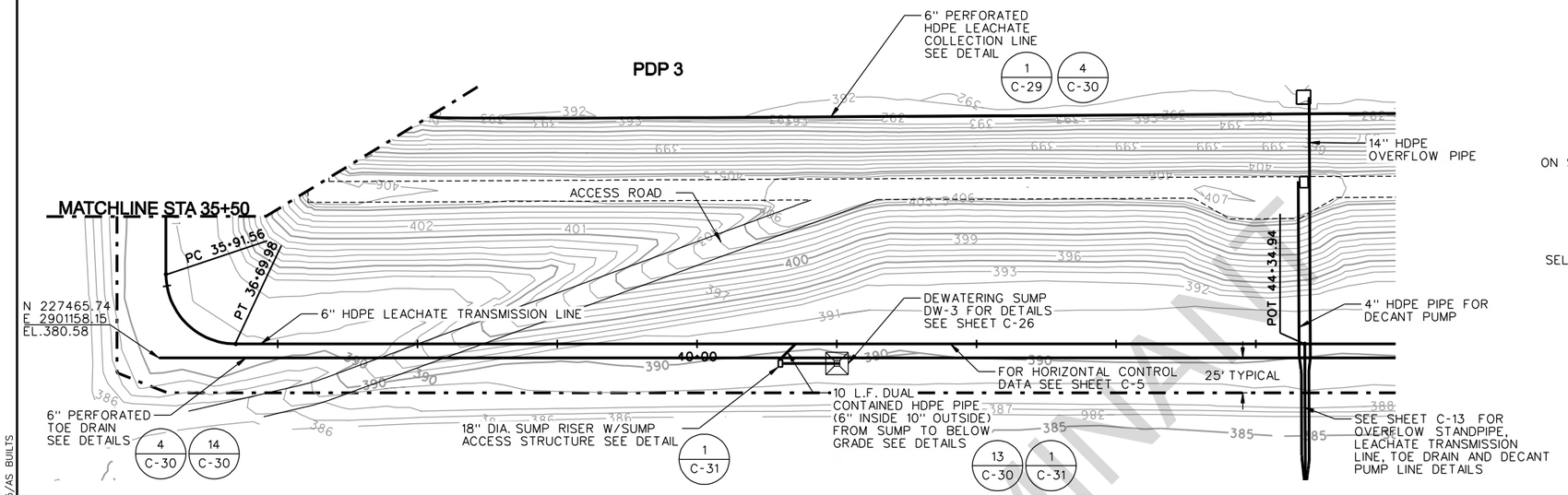
PERMANENT DISPOSAL POND #5
PHASE I

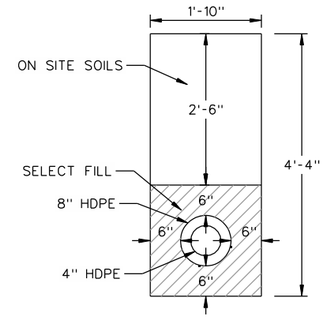
LEACHATE LINE 1 PLAN & PROFILE

SHEET 2 OF 3
139-E001-305
AS RECORDED

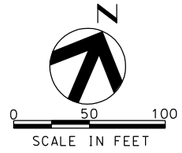
FILENAME	ML-LPP02-AB.dgn
SCALE	

SHEET **C-20**



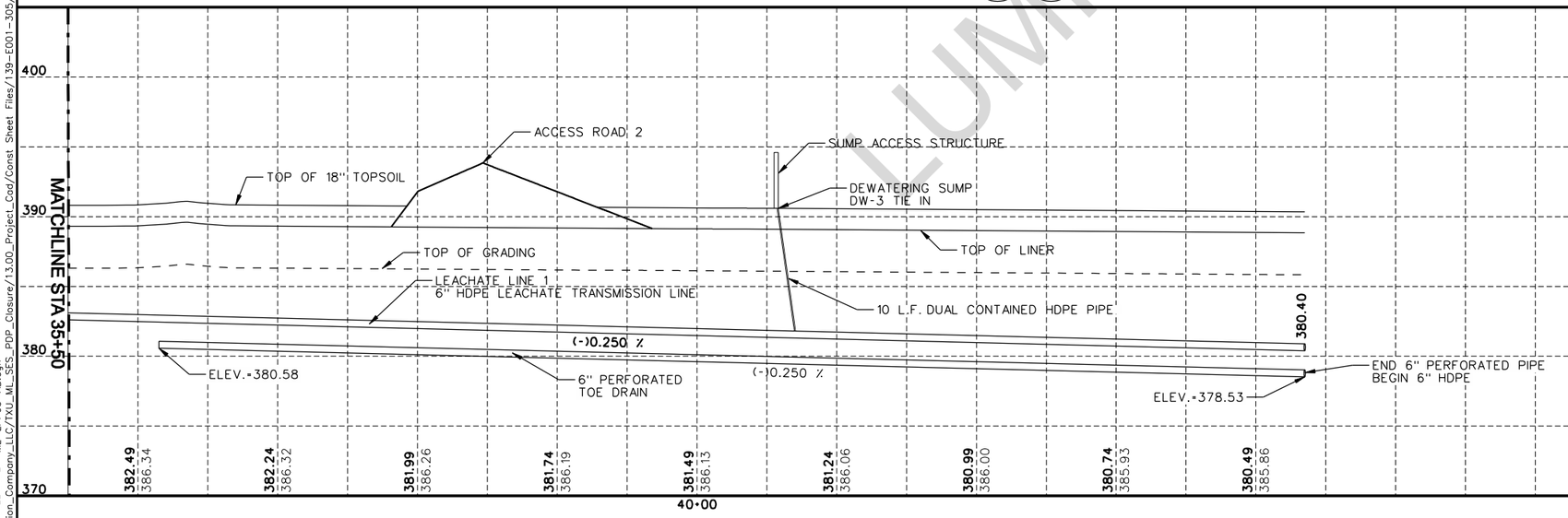


TRENCH DETAIL FOR PIPE AT BERM CROSSINGS



LEGEND

- LIMITS OF FILL
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LEACHATE TRANSMISSION LINES
- CLEANOUT RISER PIPE
- SUMP ACCESS STRUCTURE



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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

LEACHATE LINE 1 PLAN & PROFILE

SHEET 3 OF 3
139-E001-305
AS RECORDED

FILENAME	ML-LPP03-AB.dgn
SCALE	

SHEET **C-21**

DEWATERING SUMP DW-6 FOR DETAILS SEE SHEET C-26

LEACHATE SUMP LS-2 FOR DETAILS SEE SHEET C-25

75 L.F. DUAL CONTAINED HDPE PIPE (6" INSIDE 10" OUTSIDE) FROM SUMP TO BELOW GRADE SEE DETAILS (13/C-30) (1/C-31)

PROCESS LINE 18

125' L.F. DUAL CONTAINED HDPE PIPE (6" INSIDE 10" OUTSIDE) SEE TRENCH DETAIL AND DETAIL (13/C-30)

POT 10+00.00

10+00

VALVE VAULTS

PROCESS LINE 18

PC 11+68.91

PT 11+91.29

150' L.F. DUAL CONTAINED HDPE PIPE (10" INSIDE 14" OUTSIDE)

DEWATERING SUMP DW-5 FOR DETAILS SEE SHEET C-26

PC 15+29.18

PT 15+41.01

15+00

18" DIA. SUMP RISER & 6" DIA. CLEANOUT RISER PIPE W/SUMP ACCESS STRUCTURE SEE DETAIL (2/C-30)

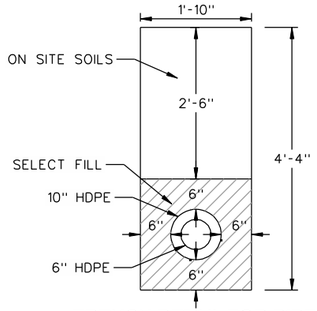
6" PERFORATED HDPE LEACHATE COLLECTION LINE SEE DETAIL (1/C-29) (4/C-30)

10 L.F. DUAL CONTAINED HDPE PIPE (6" INSIDE 10" OUTSIDE) FROM SUMP TO BELOW GRADE SEE DETAILS (13/C-30) (1/C-31)

PDP 1

PDP 2

PDP 3



TRENCH DETAIL FOR PIPE AT BERM CROSSINGS

N 228151.03
E 2902779.26
EL.380.88

6" PERFORATED TOE DRAIN SEE DETAILS (4/C-30) (14/C-30)

PC 20+06.43

20+00

FOR HORIZONTAL CONTROL DATA SEE SHEET C-5

6" HDPE LEACHATE TRANSMISSION LINE

25' TYP.

PT 20+83.27

MATCHLINE STA 21+00

LEACHATE SUMP LS-4 FOR DETAILS SEE SHEET C-25

18" DIA. SUMP RISER & 6" DIA. CLEANOUT RISER PIPE W/SUMP ACCESS STRUCTURE SEE DETAIL (2/C-30)

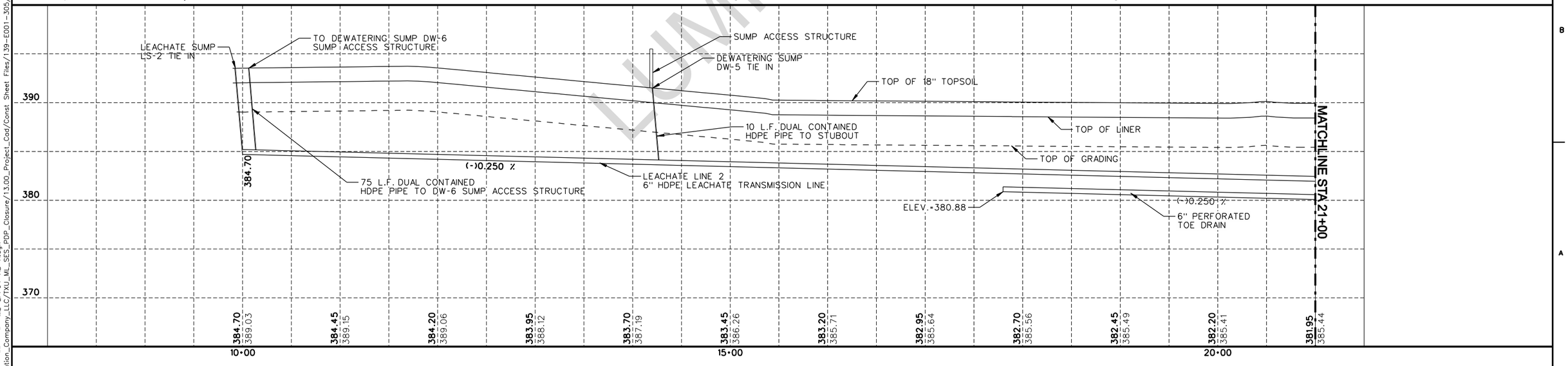
N

0 50 100

SCALE IN FEET

LEGEND

- LIMITS OF FILL
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LEACHATE TRANSMISSION LINES
- CLEANOUT RISER PIPE
- SUMP ACCESS STRUCTURE



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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

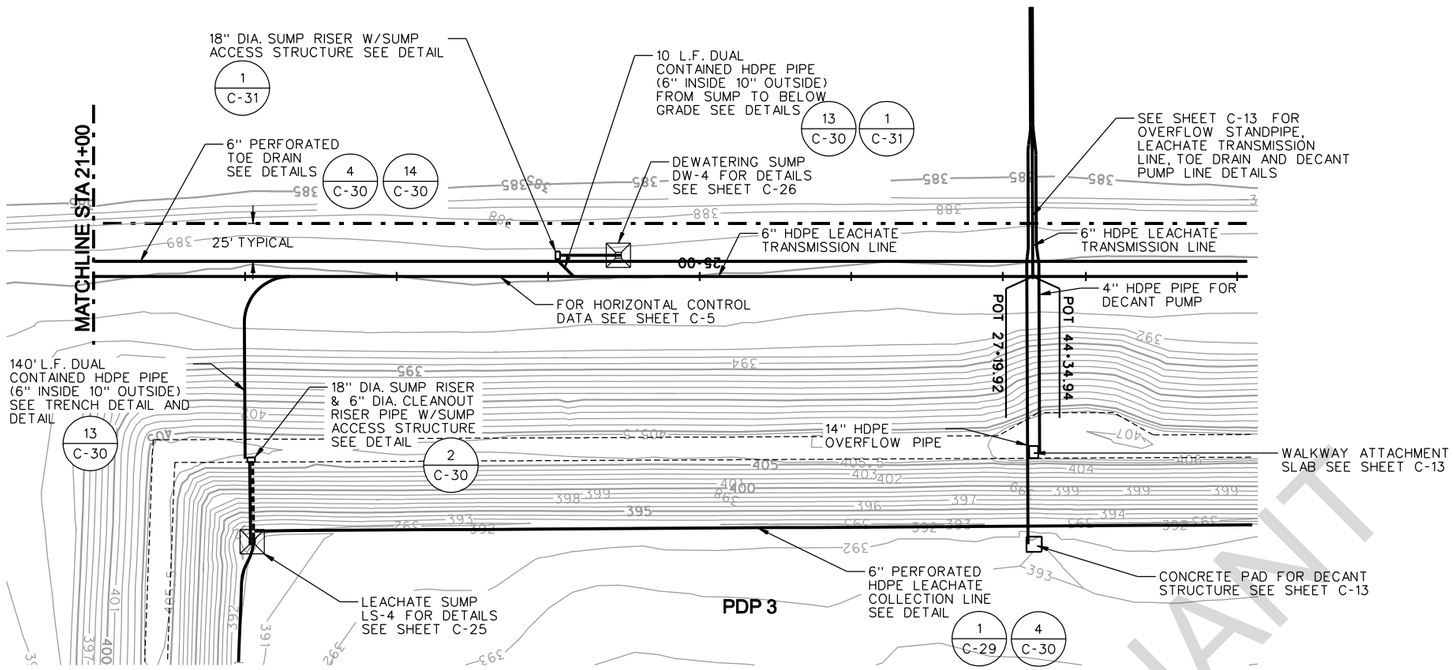
PERMANENT DISPOSAL POND #5
PHASE I

LEACHATE LINE 2 PLAN & PROFILE

SHEET 1 OF 2
139-E001-305
AS RECORDED

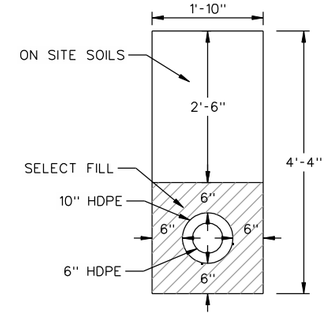
FILENAME	ML-LPP04-AB-A.dgn
SCALE	

SHEET C-22

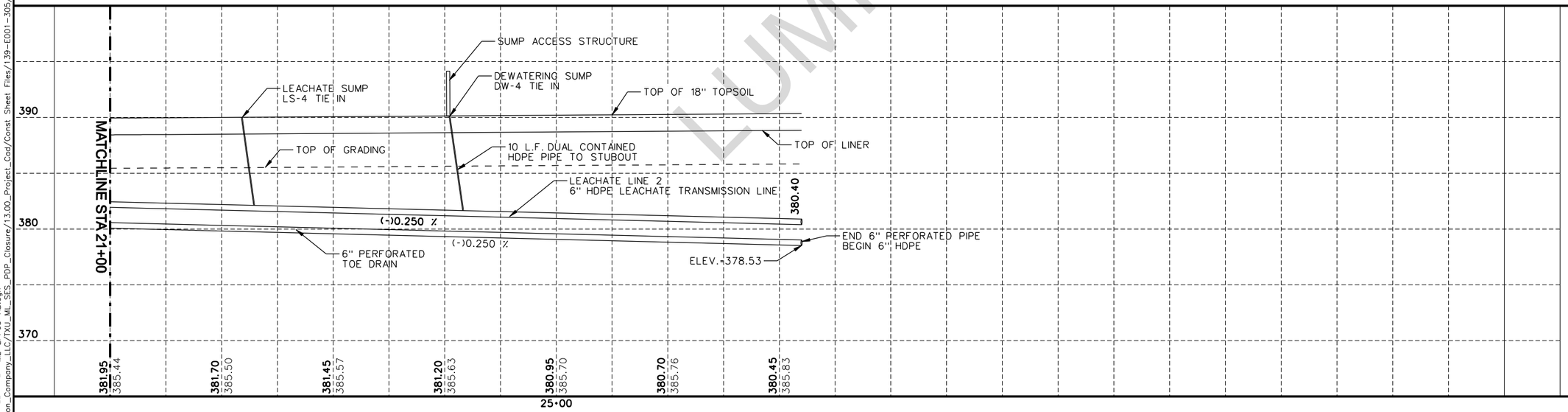


LEGEND

- LIMITS OF FILL
- AS BUILT FINAL CONTOURS
- TOP OF BERM
- ROADWAYS
- LEACHATE TRANSMISSION LINES
- CLEANOUT RISER PIPE
- SUMP ACCESS STRUCTURE



TRENCH DETAIL FOR PIPE AT BERM CROSSINGS



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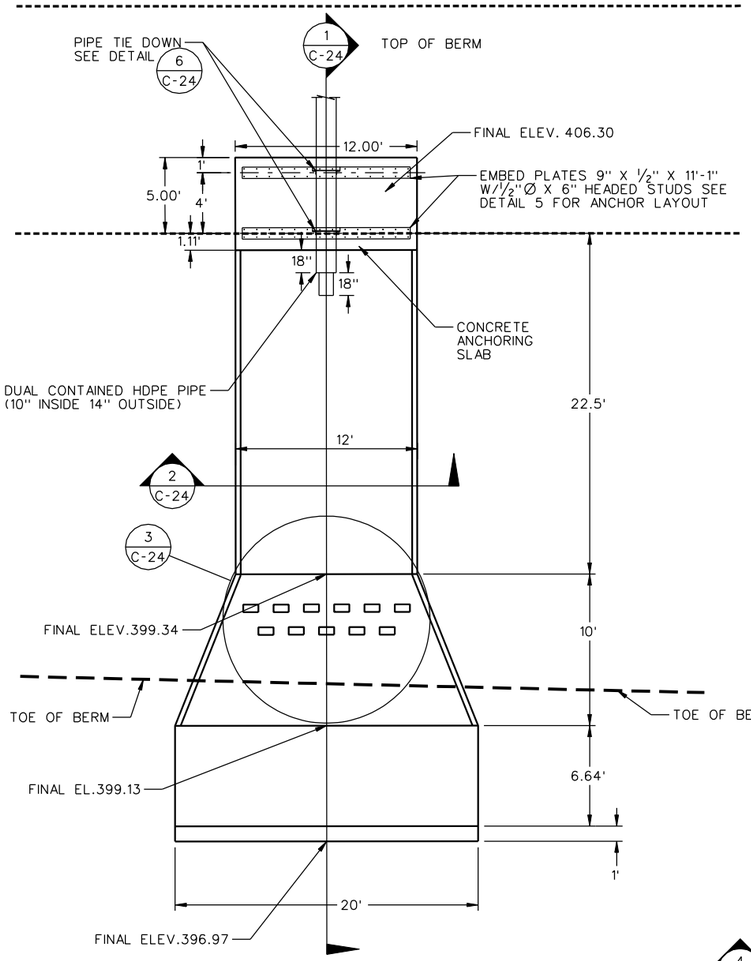
PERMANENT DISPOSAL POND #5
PHASE I

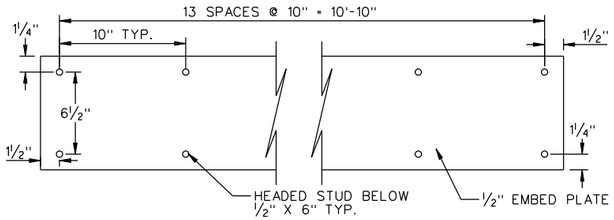
LEACHATE LINE 2 PLAN & PROFILE

SHEET 2 OF 2
139-E001-305
AS RECORDED

FILENAME	ML-LPP05-AB.dgn
SCALE	

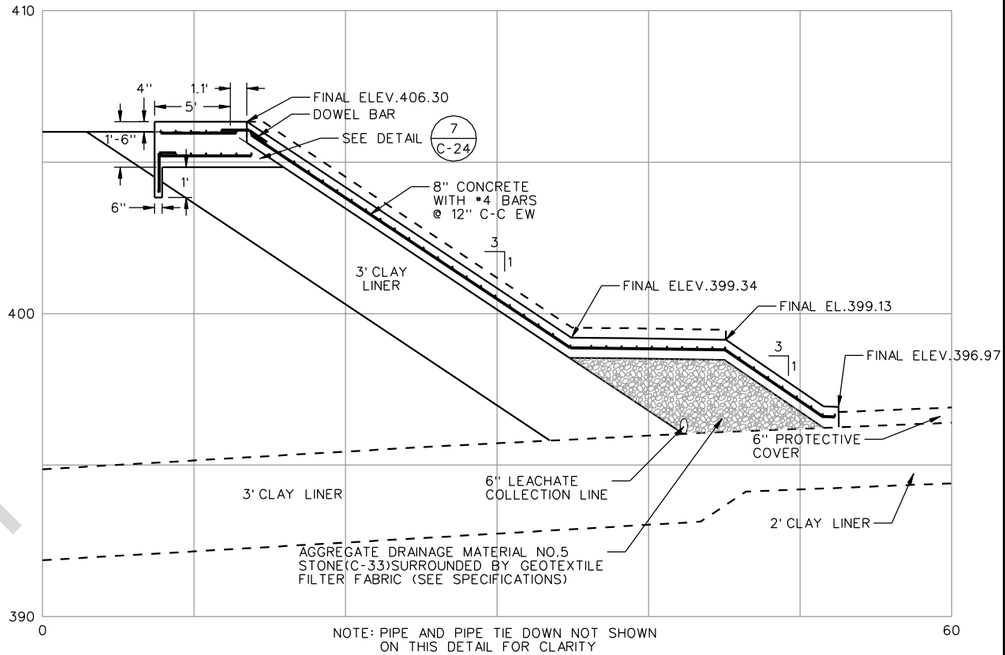
SHEET **C-23**





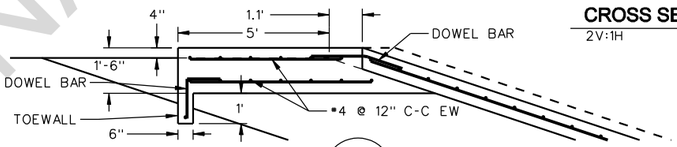
NOTE: PIPE AND PIPE TIE DOWN NOT SHOWN ON THIS DETAIL FOR CLARITY

DETAIL 5 N.T.S. C-24

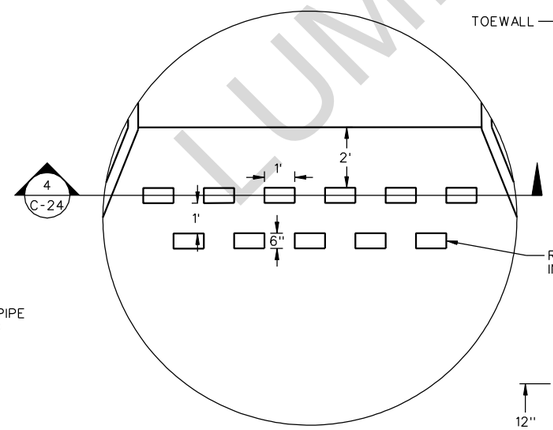


NOTE: PIPE AND PIPE TIE DOWN NOT SHOWN ON THIS DETAIL FOR CLARITY

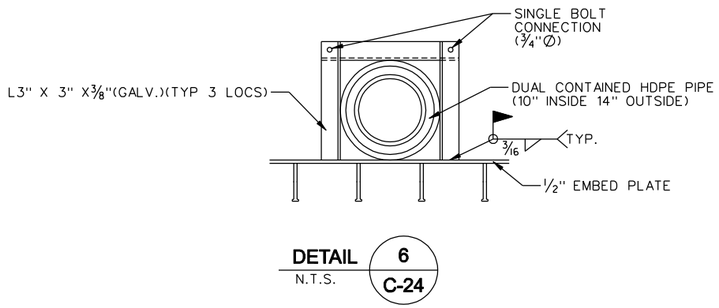
CROSS SECTION 1 2V:1H C-24



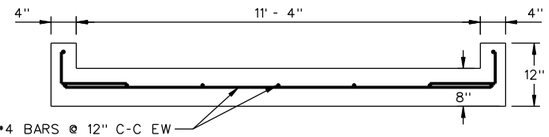
DETAIL 7 N.T.S. C-24



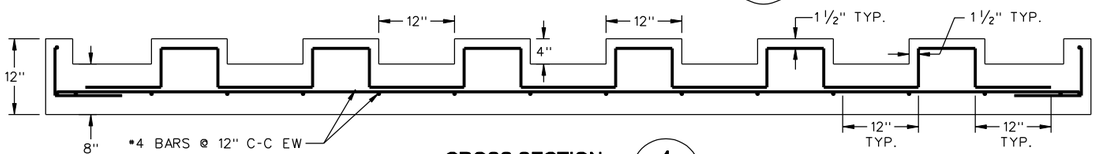
DETAIL 3 N.T.S. C-24



DETAIL 6 N.T.S. C-24



CROSS SECTION 2 N.T.S. C-24



CROSS SECTION 4 N.T.S. C-24

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Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

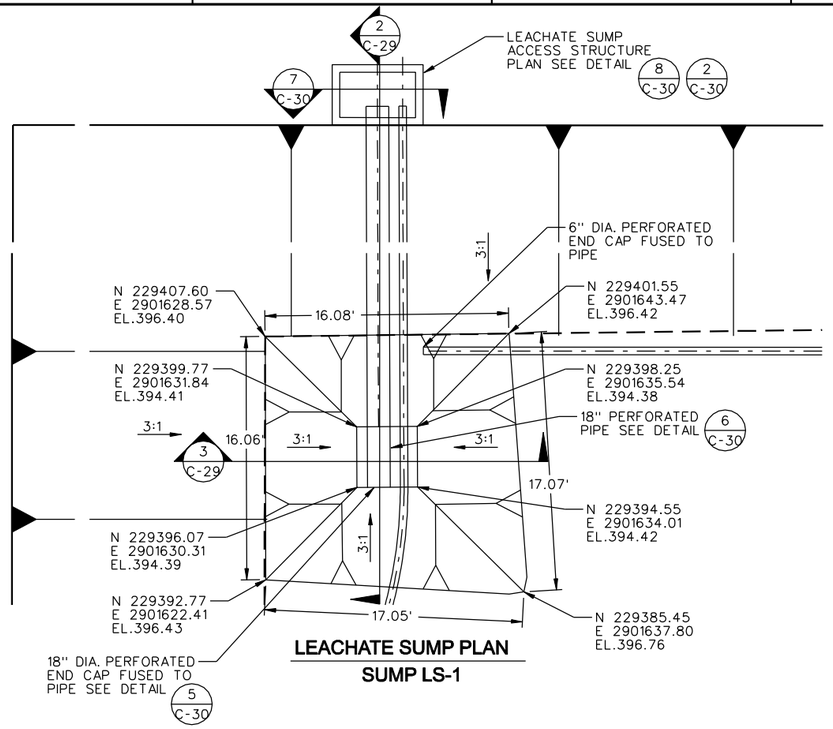
PERMANENT DISPOSAL POND #5
PHASE I

SLURRY CHANNEL PLAN & SECTION

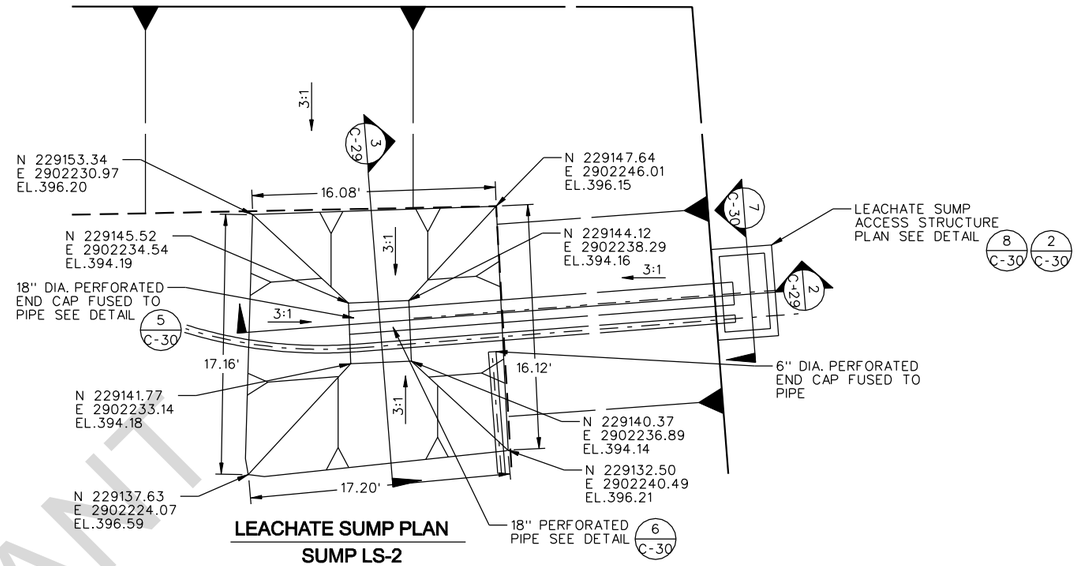
139-E001-305
AS RECORDED

FILENAME	ML-SC01-AB.dgn
SCALE	AS SHOWN

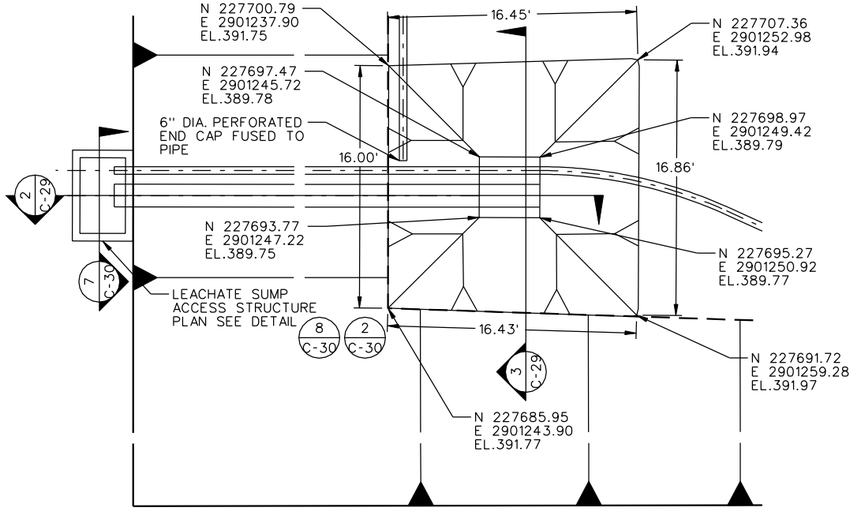
SHEET **C-24**



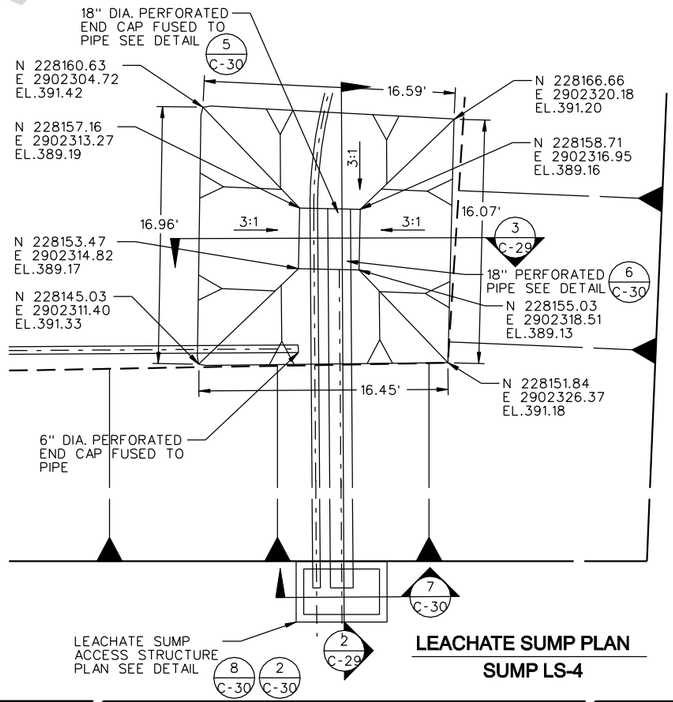
LEACHATE SUMP PLAN
SUMP LS-1



LEACHATE SUMP PLAN
SUMP LS-2



LEACHATE SUMP PLAN
SUMP LS-3



LEACHATE SUMP PLAN
SUMP LS-4

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Luminant

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Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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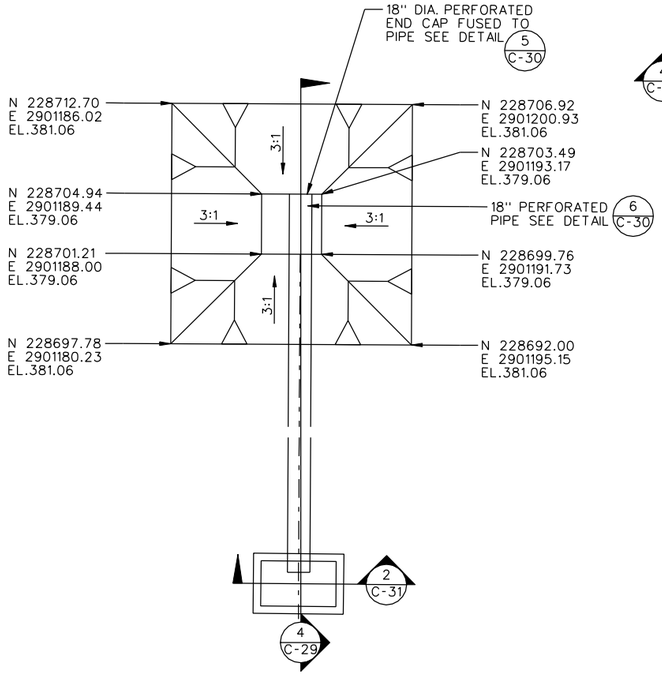
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

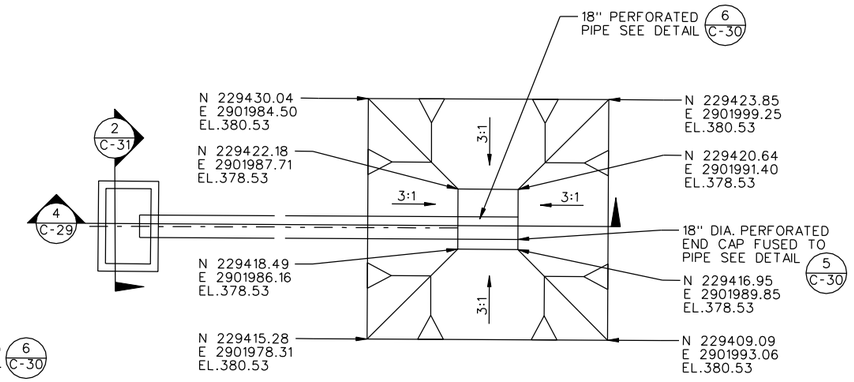
LEACHATE COLLECTION SYSTEM
SUMP PLAN
139-E001-305
AS RECORDED

FILENAME	ML-LS01-AB.dgn
SCALE	1" = 5'

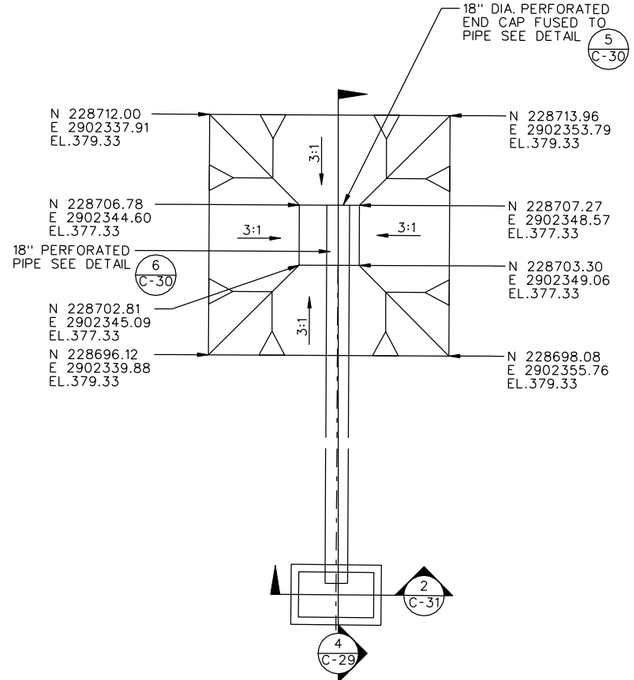
SHEET **C-25**



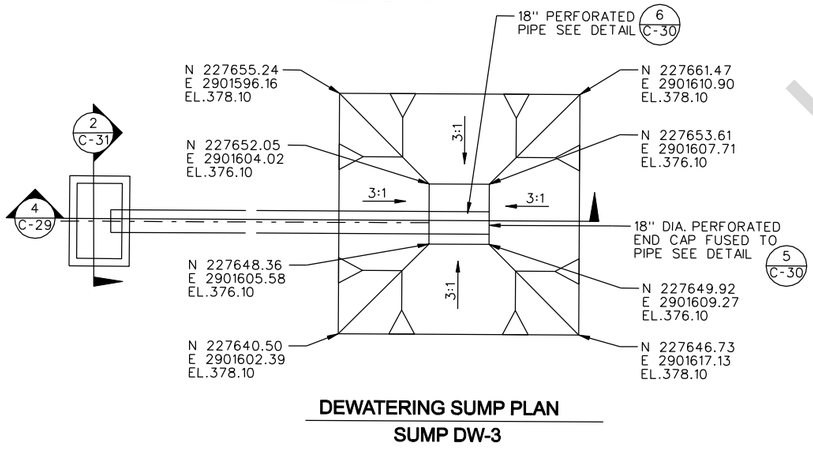
DEWATERING SUMP PLAN
SUMP DW-2



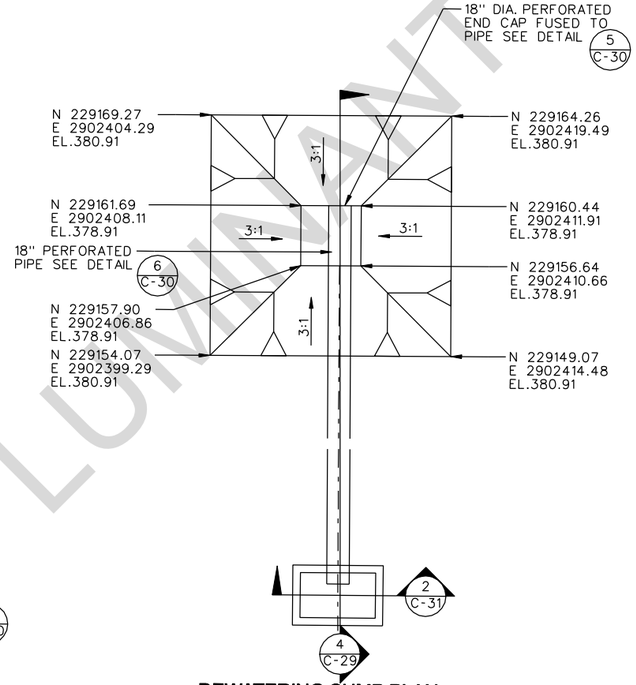
DEWATERING SUMP PLAN
SUMP DW-1



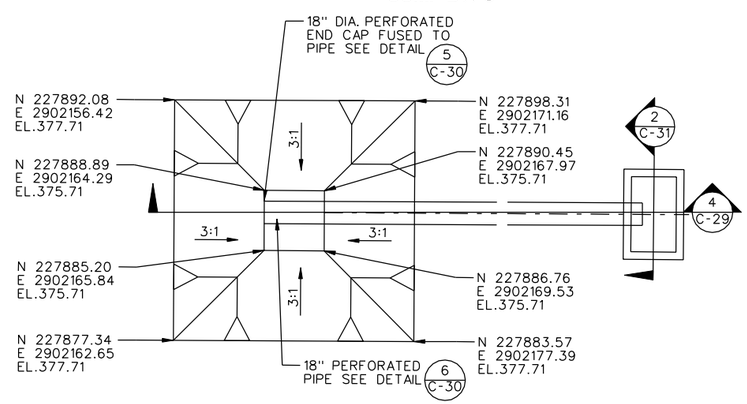
DEWATERING SUMP PLAN
SUMP DW-5



DEWATERING SUMP PLAN
SUMP DW-3



DEWATERING SUMP PLAN
SUMP DW-6



DEWATERING SUMP PLAN
SUMP DW-4

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DATE: 2/9/2011

Luminant

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4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

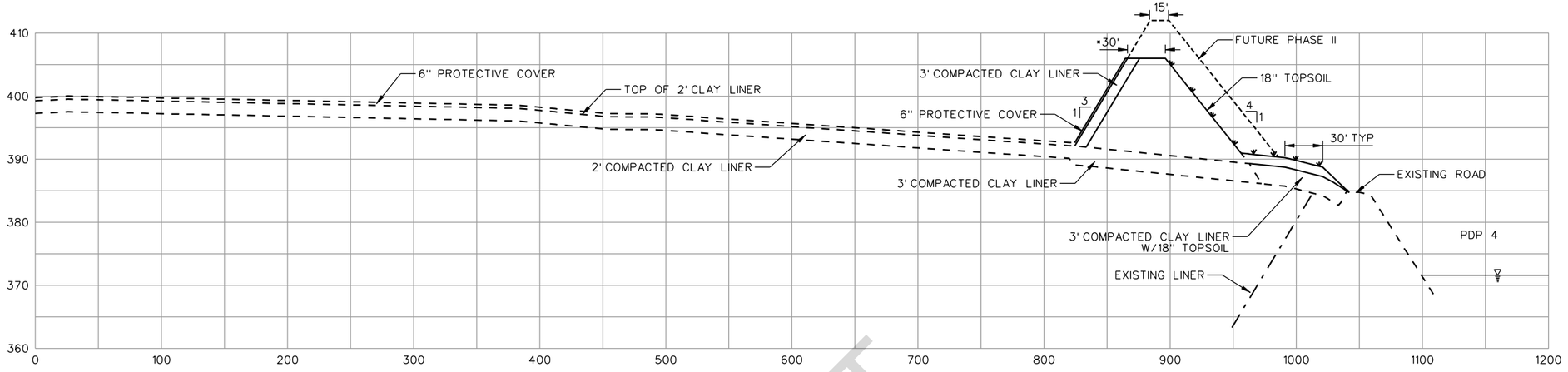
DEWATERING SYSTEM SUMP PLAN

139-E001-305

AS RECORDED

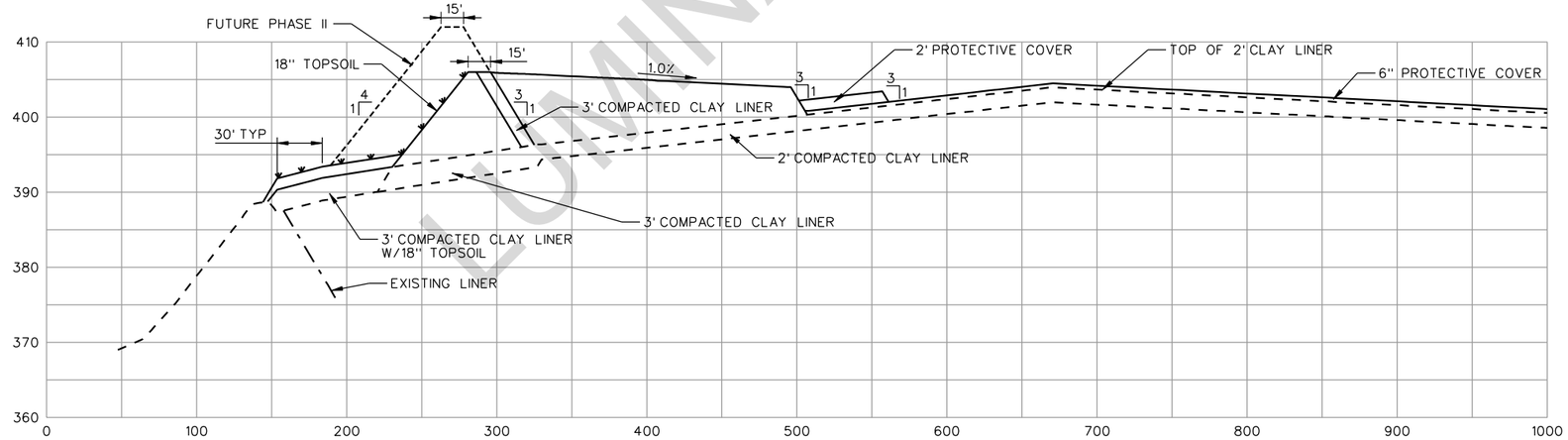
FILENAME	ML-DWS01-AB-A.dgn
SCALE	

SHEET **C-26**



CROSS SECTION 1 — C-27
5V:1H

* 30' FOR TURNAROUND AREA (15' TYP.)



CROSS SECTION 2 — C-27
5V:1H

NOTES:
1. 3' COMPACTED CLAY LINER CONSTRUCTED FROM FILL LIMITS TO OUTSIDE TOE OF BERM. 18" OF TOPSOIL AND VEGETATION CONSTRUCTED FROM OUTSIDE OF BERM TO LIMITS OF DISTURBANCE.
2. FOR CROSS SECTION LOCATIONS SEE SHEET C-4 .

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Luminant

HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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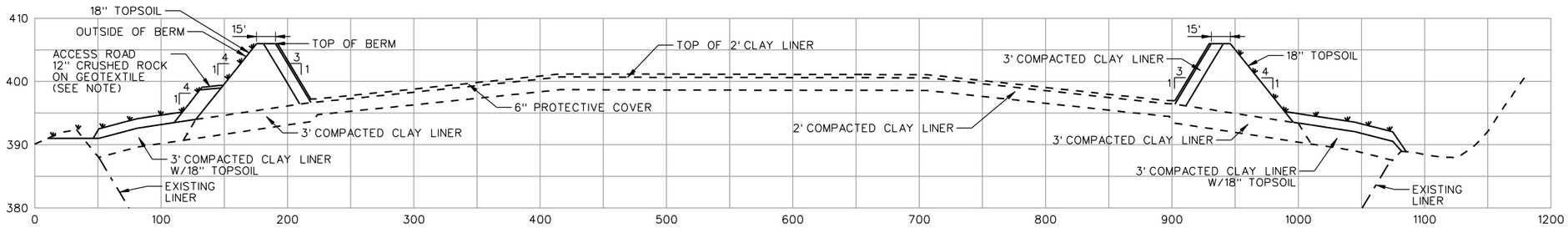
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

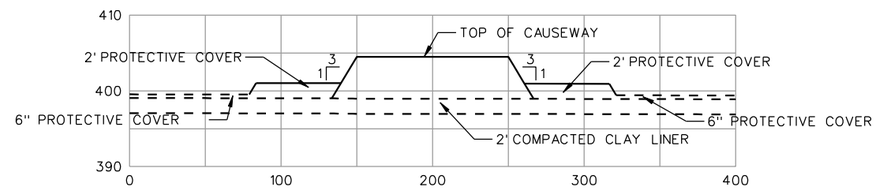
TYPICAL CROSS SECTIONS
139-E001-305
AS RECORDED

FILENAME	ML-TCS01-AB.dgn
SCALE	

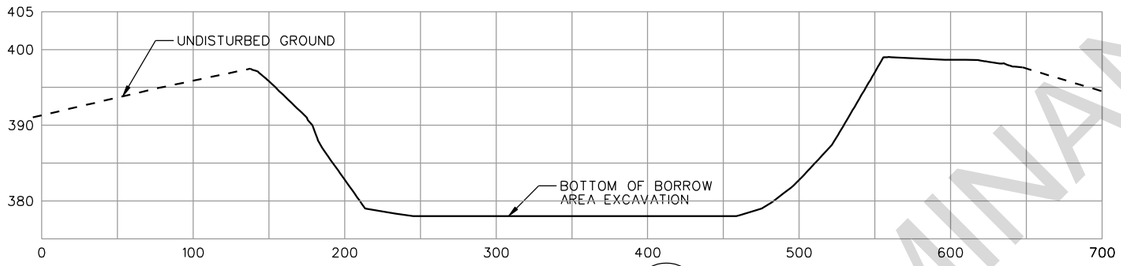
SHEET C-27



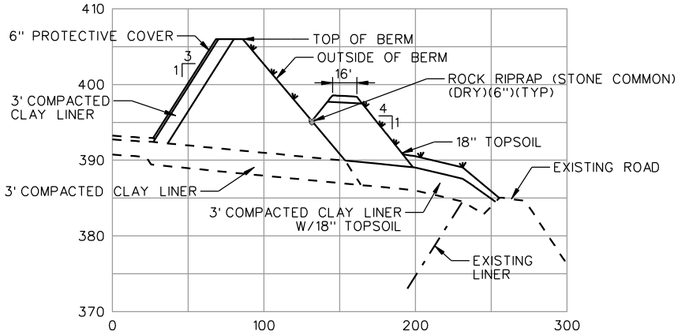
CROSS SECTION 3 — C-28
5V:1H



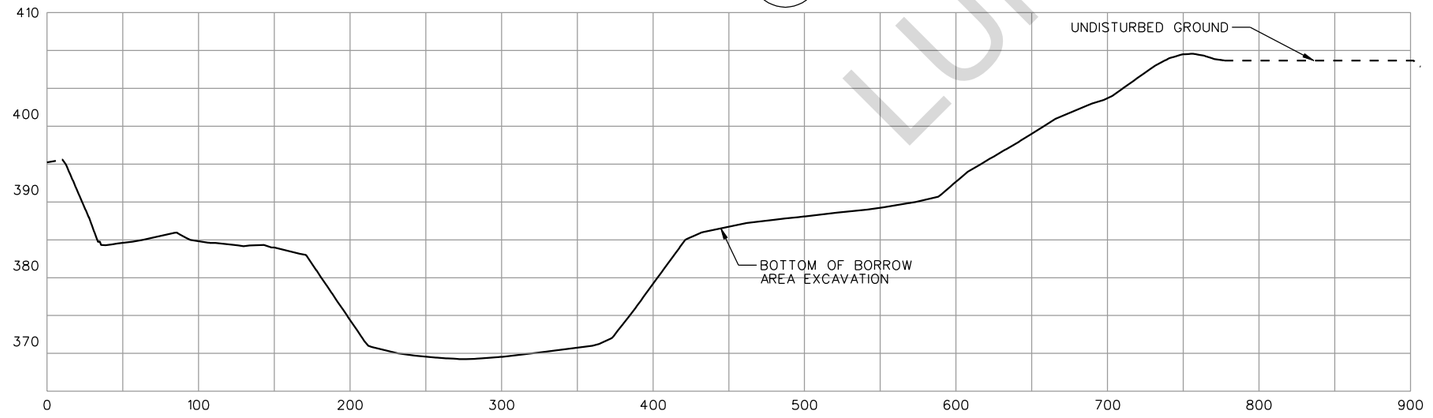
CROSS SECTION 4 — C-28
5V:1H



CROSS SECTION 6 — C-28
5V:1H



CROSS SECTION 5 — C-28
5V:1H



CROSS SECTION 7 — C-28
5V:1H

NOTE: 1. 3' COMPACTED CLAY LINER CONSTRUCTED FROM FILL LIMITS TO OUTSIDE TOE OF BERM. 18" OF TOPSOIL AND VEGETATION CONSTRUCTED FROM OUTSIDE OF BERM TO LIMITS OF DISTURBANCE.

2. 12" THICK TXDOT TYPE A GRADE 2 ROCK ON GEOTEXTILE - 16' WIDE BY LENGTH OF ACCESS ROAD PLUS ADDITIONAL 10' ON UPPER AND LOWER ENDS.

3. FOR CROSS SECTION LOCATIONS SEE SHEET C-4 .

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Luminant

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Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

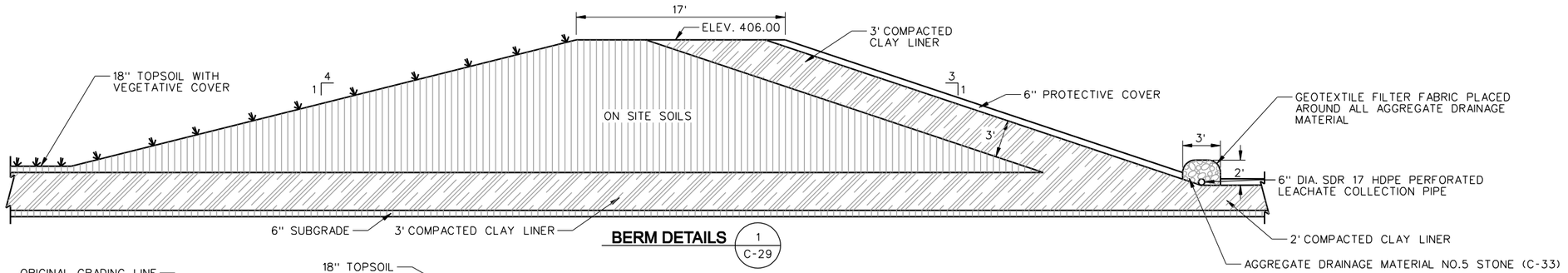
PERMANENT DISPOSAL POND #5
PHASE I

TYPICAL CROSS SECTIONS

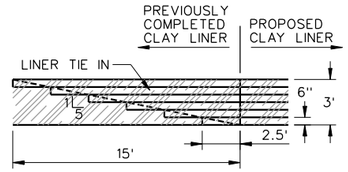
139-E001-305
AS RECORDED

FILENAME	ML-TCS02-AB.dgn
SCALE	

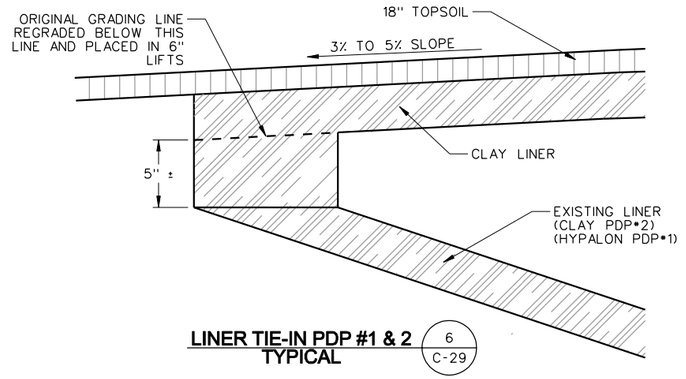
SHEET **C-28**



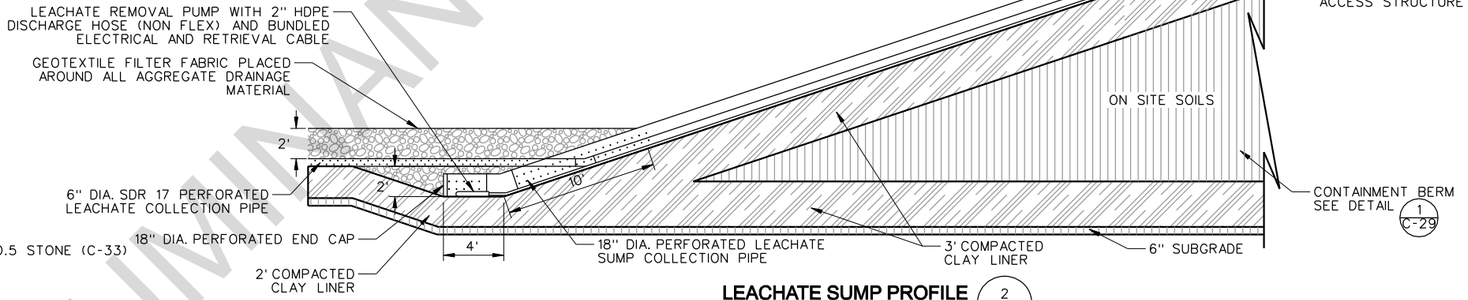
BERM DETAILS 1 / C-29



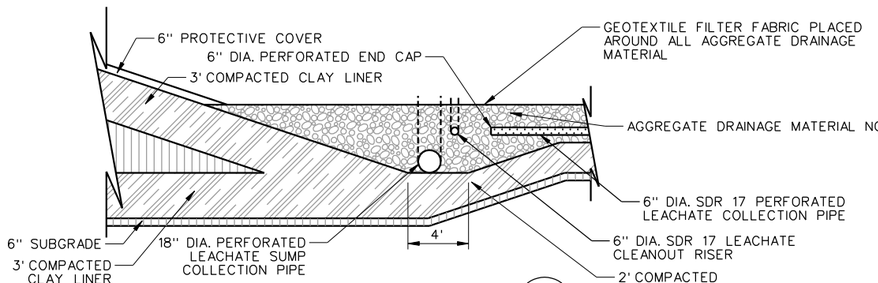
LINER TIE-IN AT OUTSIDE OF BERM TYPICAL 7 / C-29



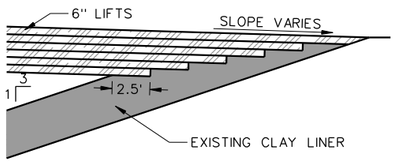
LINER TIE-IN PDP #1 & 2 TYPICAL 6 / C-29



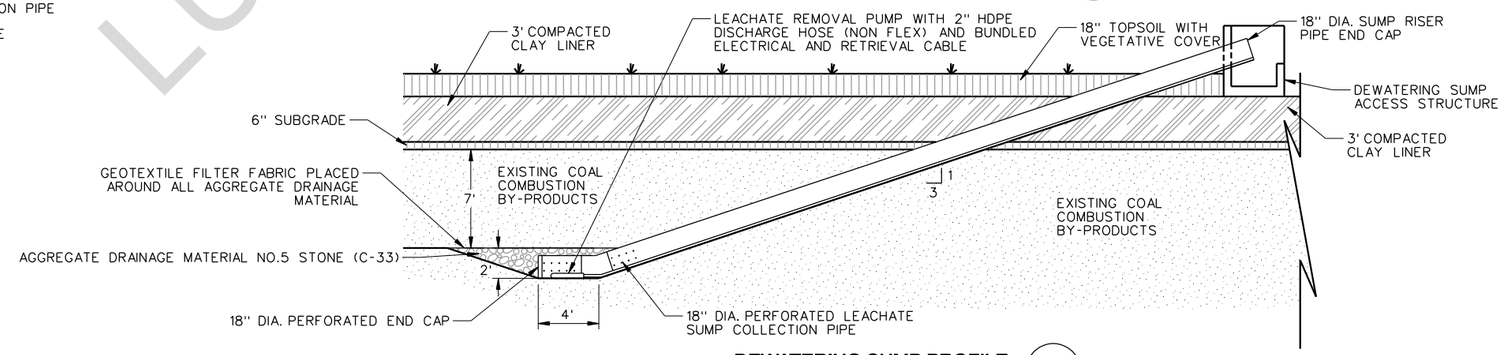
LEACHATE SUMP PROFILE 2 / C-29



LEACHATE SUMP SECTION 3 / C-29



LINER TIE-IN PDPS #2 & 3 TYPICAL 5 / C-29



DEWATERING SUMP PROFILE 4 / C-29

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DATE: 2/9/2011
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CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

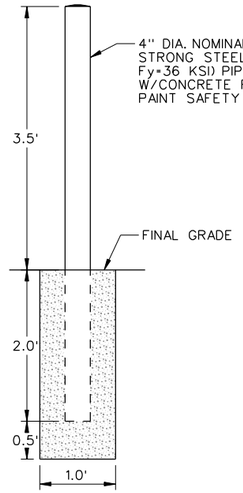
PERMANENT DISPOSAL POND #5
PHASE I

MISCELLANEOUS DETAILS

139-E001-305
AS RECORDED

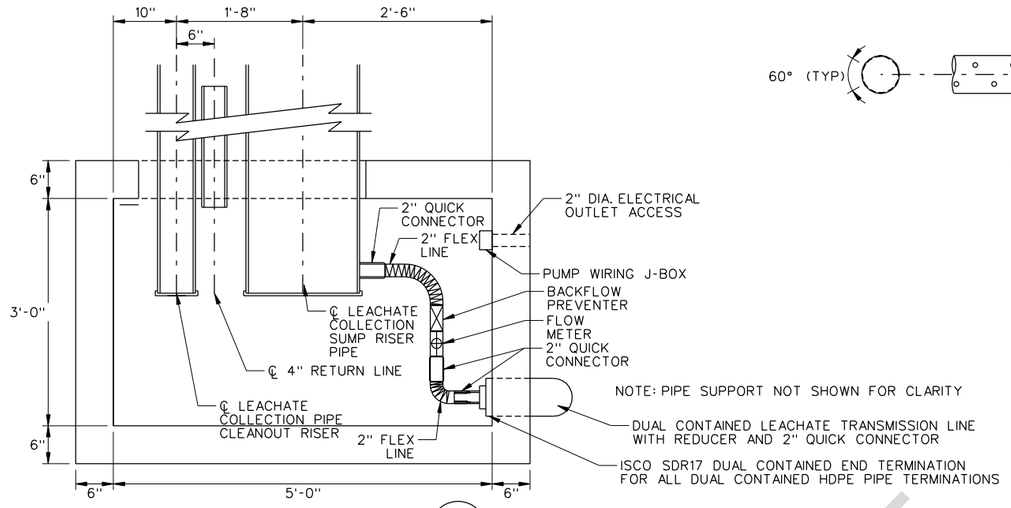
FILENAME	ML-DET01-AB.dgn
SCALE	N.T.S.

SHEET **C-29**

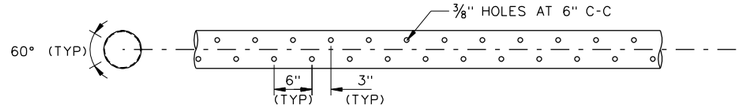


TYPICAL BOLLARD 1 / C-30

NOTE: TWO PROVIDED FOR EACH SUMP ACCESS STRUCTURE.



LEACHATE SUMP ACCESS STRUCTURE PLAN 2 / C-30



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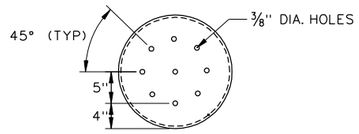
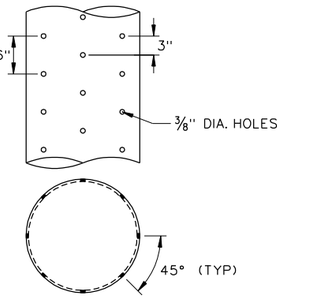


18" DIA. PERFORATED END CAP 5 / C-30



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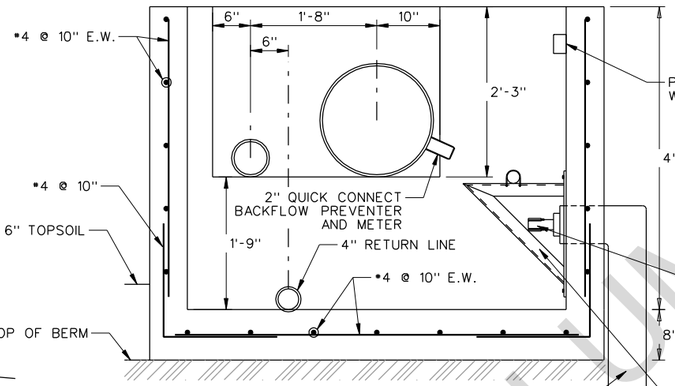

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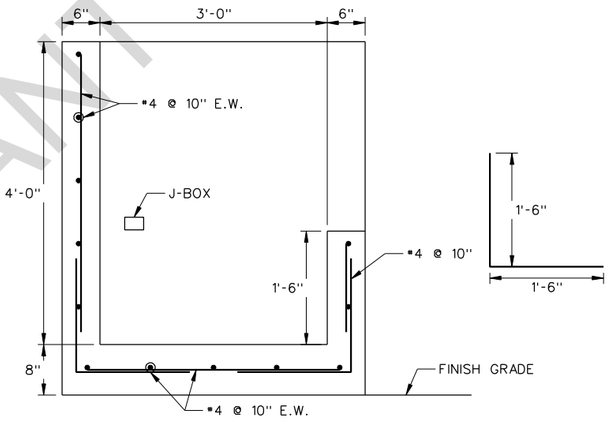
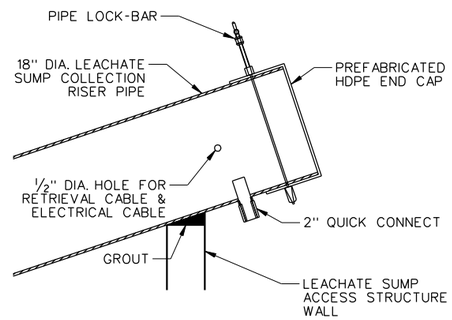


LEACHATE SUMP ACCESS STRUCTURE SECTION 8 / C-30



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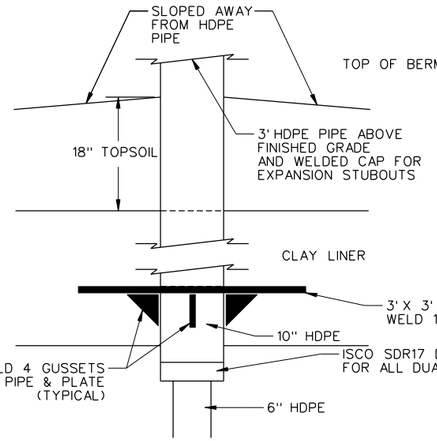

DUAL CONTAINED HDPE PIPE TERMINATION 13 / C-30
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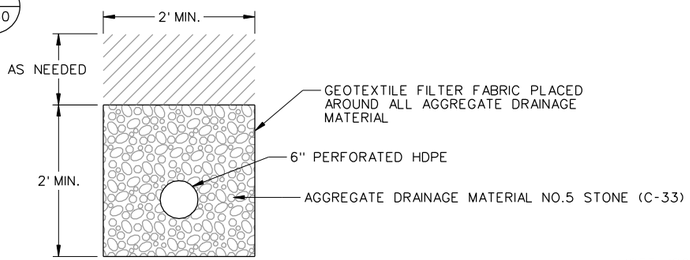
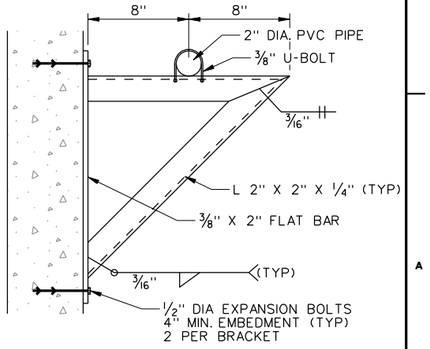


TOE DRAIN TRENCH SECTION 14 / C-30

NOTE: ISCO SDR17 DUAL CONTAINED END TERMINATION (OR APPROVED EQUAL) FOR ALL DUAL CONTAINED HDPE PIPE TERMINATIONS



TYPICAL PIPE SUPPORT BRACKET 12 / C-30
N.T.S.

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Luminant

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HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

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CIVIL ENGINEER	D. VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

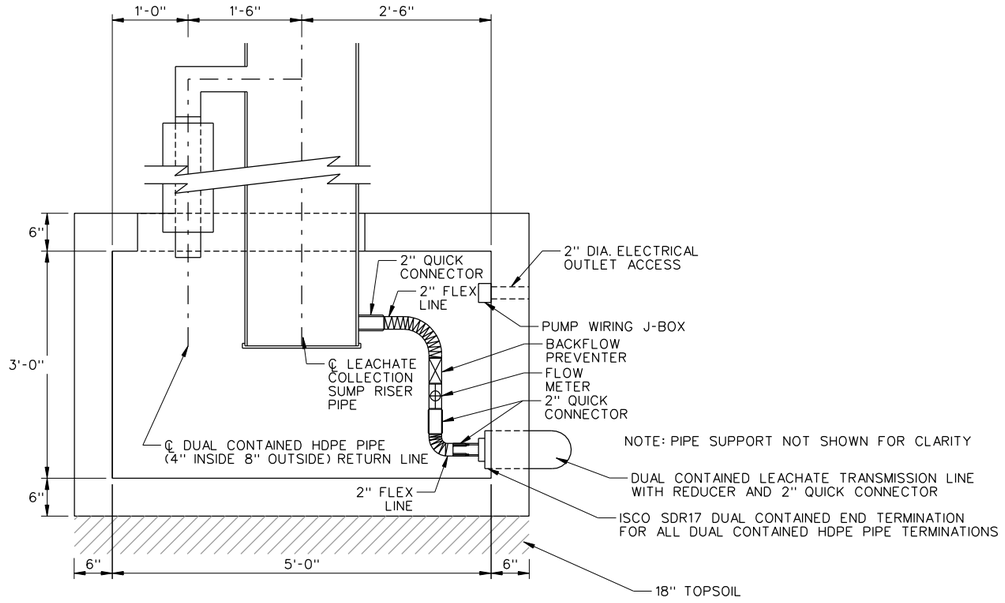
PERMANENT DISPOSAL POND #5
PHASE I

MISCELLANEOUS DETAILS

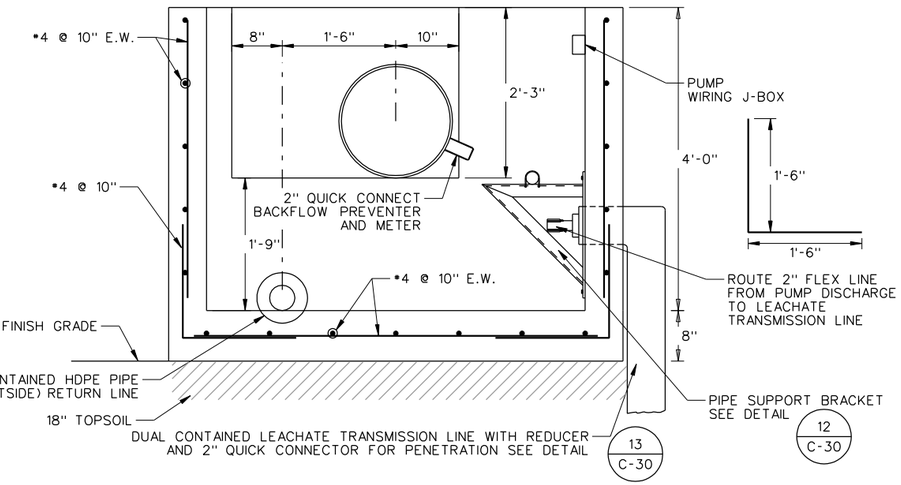
139-E001-305
AS RECORDED

FILENAME	ML-DET03-AB.dgn
SCALE	1" = 1'

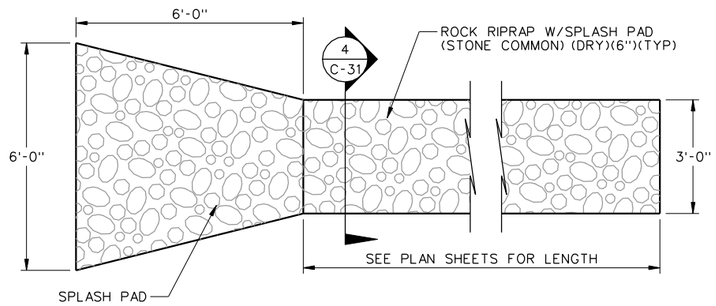
SHEET **C-30**



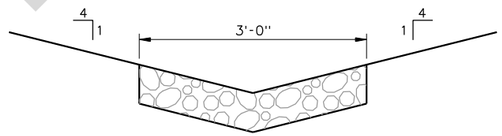
DEWATERING SUMP ACCESS STRUCTURE PLAN (1 / C-31)



DEWATERING SUMP ACCESS STRUCTURE - SECTION (2 / C-31)



ROCK RIPRAP AT ACCESS ROADS (3 / C-31)



RIPRAP SECTION (4 / C-31)

NOTE: ISCO SDR17 DUAL CONTAINED END TERMINATION FOR ALL DUAL CONTAINED HDPE PIPE TERMINATIONS

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FILENAME: ML-DET04-AB.dgn

Luminant

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Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

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DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

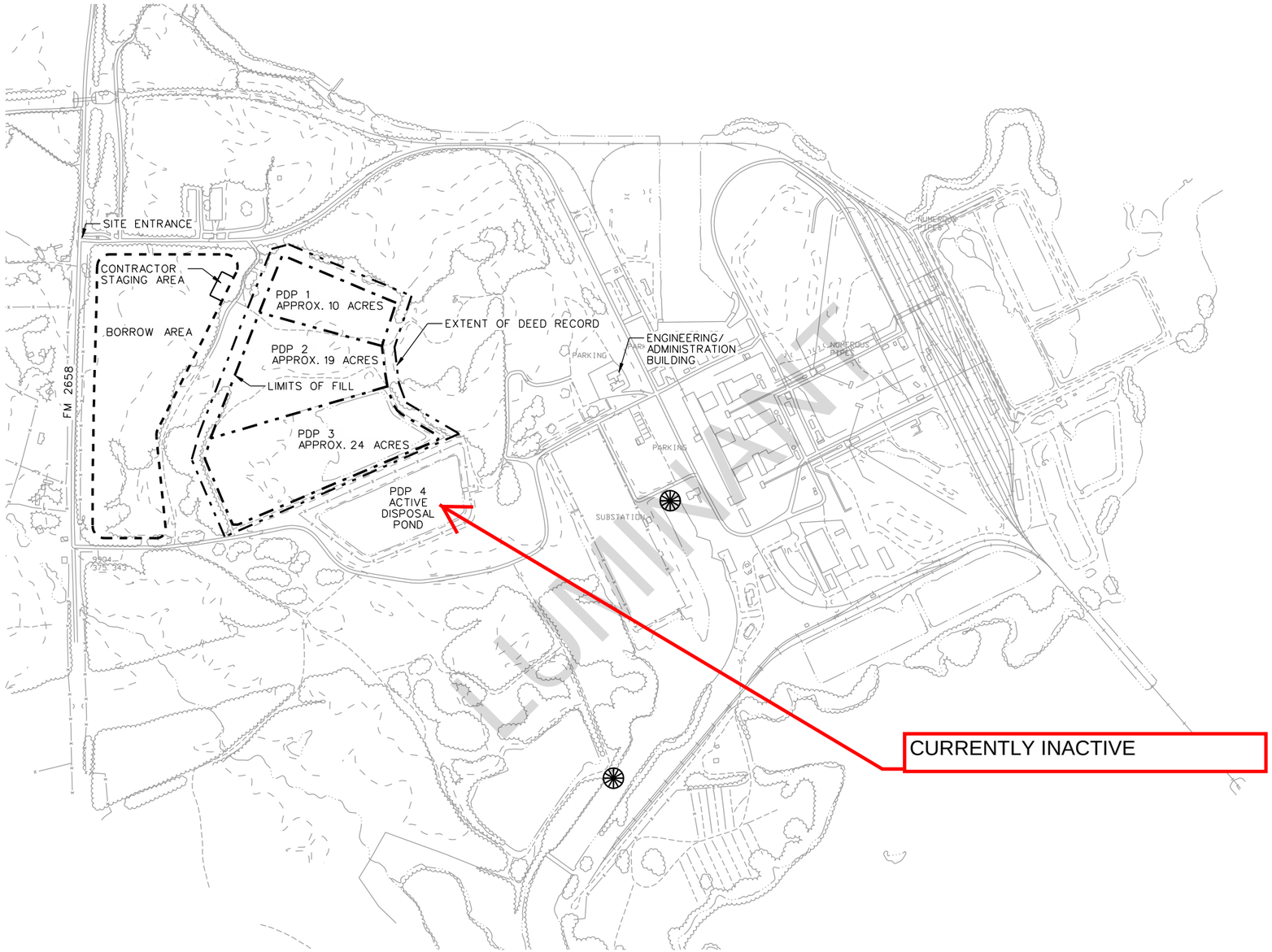
PERMANENT DISPOSAL POND #5
PHASE I

MISCELLANEOUS DETAILS

139-E001-305
AS RECORDED

FILENAME	ML-DET04-AB.dgn
SCALE	1" = 1'

SHEET **C-31**



N

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SCALE IN FEET

LEGEND

- DEED RECORD BOUNDARY
- LIMITS OF FILL
- BORROW AREA
- WATER ACCESS LOCATIONS

NOTE: CONTOURS BASED ON AERIAL TOPOGRAPHY PROVIDED BY LUMINANT ON 2/19/07.

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Luminant

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Texas P.E. Firm
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ISSUE	DATE	DESCRIPTION

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CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

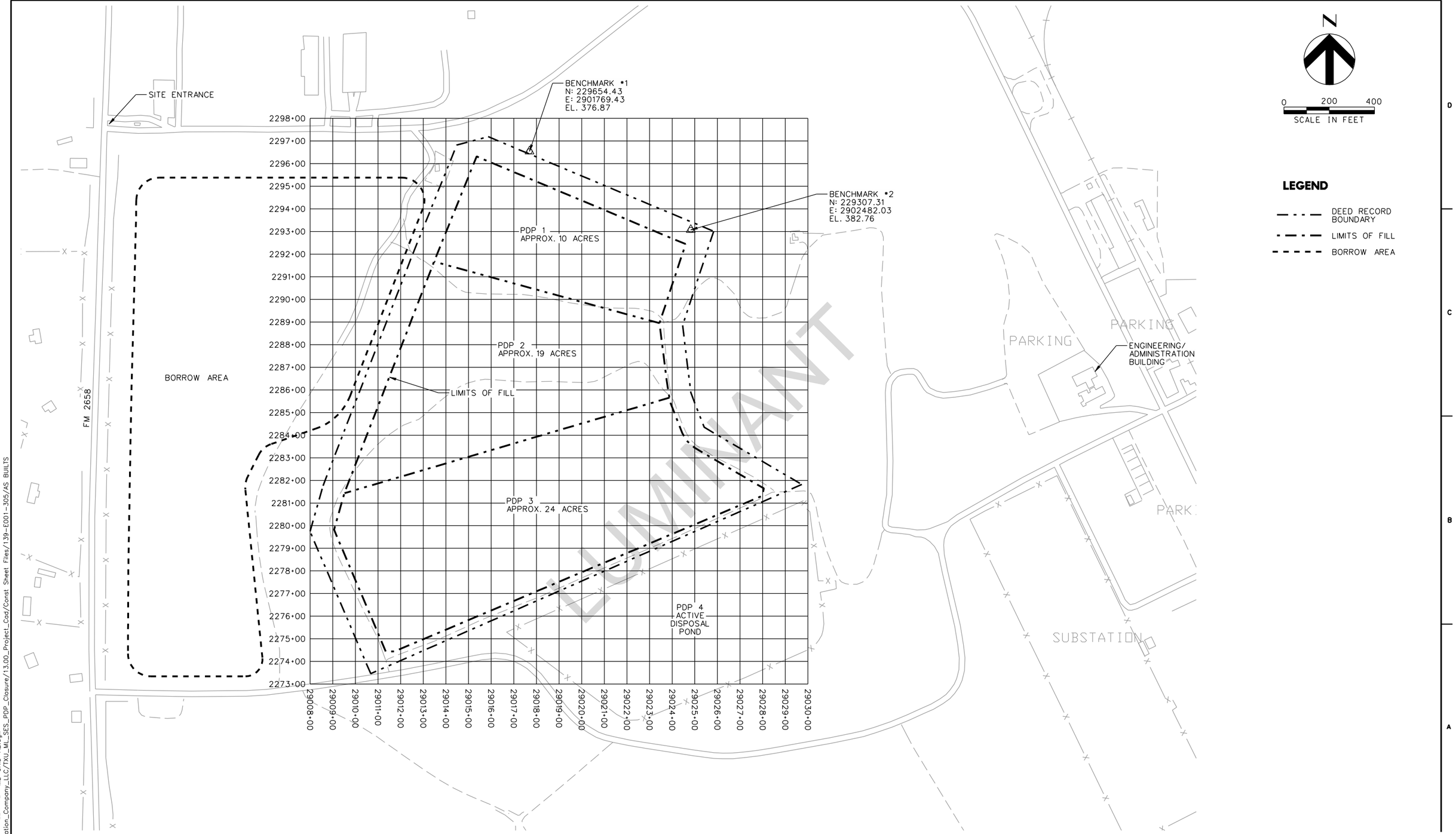
PERMANENT DISPOSAL POND #5
PHASE I

WATER ACCESS LOCATION

139-E001-305
AS RECORDED

FILENAME	ML-WAL-AB.dgn
SCALE	AS SHOWN

SHEET **C-32**



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Luminant

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Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M.ODEN
PROJECT NUMBER	

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MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

GRID LAYOUT
AS RECORDED

FILENAME	ML-GRID-AB.dgn
SCALE	

SHEET
C-33

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

APPENDIX J

PDP-5 Summary of Liner Construction Report

Summary of Liner Construction
Martin Lake Impoundments

Luminant Generating Company, LLC

Martin Lake Steam Electric Station CCR Documentation
Project No. 90588

09/16/2016

Summary of Liner Construction Martin Lake Impoundments

prepared for

Luminant Generating Company, LLC
Martin Lake Steam Electric Station CCR Documentation
Rusk County, Texas

Project No. 90588

09/16/2016

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

Luminant Generating Company, LLC
Summary of Liner Construction
Martin Lake Impoundments
Project No. 90588

Report Index

Certification

I hereby certify, as a Professional Engineer in the state of Texas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by Luminant Generating Company, LLC or others without specific verification or adaptation by the Engineer.

Randell Lee Sedlacek, P.E. (Texas License No. 99056)

Date: 9/16/16

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
BMcD	Burns & McDonnell
CCR	Coal Combustion Residual
CFR	Code of Federal Regulation
EAP	East Ash Pond
EPA	Environmental Protection Agency
GM	Geomembrane
MLSES	Martin Lake Steam Electric Station
PDP5	Permanent Disposal Pond 5
RCRA	Resource Conservation and Recovery Act
SP	New Scrubber Pond
WAP	West Ash Pond

1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the final version of the federal Coal Combustion Residual Rule (CCR Rule) to regulate the disposal of coal combustion residual (CCR) materials generated at coal-fired units. The rule will be administered as part of the Resource Conservation and Recovery Act [RCRA, 42 United States Code (U.S.C.) §6901 et seq.], using the Subtitle D approach.

Luminant Power (Luminant) is subject to the CCR Rule and as such must document the liner construction for existing surface impoundments per 40 Code of Federal Regulations (CFR) §257.71. This document provides the liner construction documentation for the following existing CCR surface impoundments at Martin Lake Steam Electric Station (MLSES):

- West Ash Pond (WAP)
- East Ash Pond (EAP)
- New Scrubber Pond (SP)
- Permanent Disposal Pond 5 (PDP-5)

Figure 1 MLSES Site Plan

An existing surface impoundment is classified as lined if the liner was constructed with any of the following:

- A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second.
- A composite liner that meets the requirements of §257.70(b).
- An alternative composite liner that meets the requirements of §257.70(c).

2.0 LINER CONSTRUCTION

The following sections describe the liners at the CCR Impoundments at MLSES.

2.1 Bottom Ash Ponds

Based on drawings provided by Luminant, these ponds have high density polyethylene (HDPE) geomembrane (GM) liners. Drawing No.139-1411-302 Sheet 2, Rev 2 (See Appendix A) indicates side slopes of the West Ash Pond have a 60 mil HDPE GM over three feet of clay soil. The GM is covered by four inches of revetment. On the same drawing, the bottom of the West Ash Pond is shown to be two layers of 60 mil HDPE GM, separated by geonet. There are 18 inches of clay shown to be under the bottom GM, and four inches of revetment covering the top GM.

Drawing "Liner Section and Details" No. C-6, IFC 5/10 (See Appendix B), shows the sides and bottom of the East Ash Pond to consist of two layers of HDPE GM, separated by geonet. There are 18 inches of clay shown to be under the bottom HDPE GM, and four inches of revetment covering the top HDPE GM. A layer of geotextile fabric separates the bottom HDPE GM and the 18 inches of clay. The project specification provided for the East Ash Pond Reline Project indicates that the HDPE GM was 60 mil in thickness.

Within the preamble of the Rule, EPA documented the following concerns associated with a double synthetic liner system such as the system currently used in the state of Florida:

- Leaks through geomembrane imperfections and punctures
- Potential for slippage along the interface between the geomembrane layers
- Geomembrane embrittlement over time

The presence of the concrete revetment mat in the Luminant design increases the survivability of the membrane over the Florida liner system referenced in the preamble of the Rule by minimizing the potential for punctures. The Luminant liner system also includes a geonet between the two membranes, which when coupled with the anchor system decreases the slip potential between the membranes compared to having two membranes in contact with one another as described in the preamble.

Luminant has also provided a copy of a leak locations and repair procedures performed by Southwest Research Institute. This document indicates location and size of holes/tears, and the date which the hole/tear was repaired and vacuum tested. This was performed on the first HDPE liner installed in the West Ash Pond.

Based on the drawings provided, and the GM/soil system described on those drawings, BMcD' s opinion is the West and East Ash Ponds would be considered unlined per the Rule. BMcD's opinion is based on the following:

1. The drawings show a dual GM system underlain by 18" of clay soil. This does not meet the Rule because there is less than two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec,

2. The drawings show a dual GM system underlain by 18" of clay soil. This does not meet the Rule because there is not a GM underlain by at least two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec,

3. The drawings show a dual GM system underlain by 18" of clay soil. This does not meet the Rule because it is not an alternative liner, which is defined as a GM underlain by a liner component that has a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec.

In addition, for the East Ash Pond, the drawings show that a geotextile fabric separates the GM and the soil layer below. The Rule states "If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil." Therefore the presence of the geotextile fabric does not meet the definition of the alternative liner.

2.2 New Scrubber Pond

Based on drawings provided, the SP has a two GM liner system. Drawing No.139-1411-305 Sheet 1, Rev 4 (See Appendix C), shows the sides and bottom of the SP to consist of two layers of 60 mil HDPE GM, separated by geonet. The drawing shows random fill compacted to 95% under the bottom HDPE GM, and four inches of revetment covering the top HDPE GM. Note 5(B) on the same drawing states a layer of geotextile fabric separates the bottom HDPE GM and the subgrade.

Within the preamble of the Rule, EPA documented the following concerns associated with a double synthetic liner system such as the system currently used in the state of Florida:

- Leaks through geomembrane imperfections and punctures
- Potential for slippage along the interface between the geomembrane layers
- Geomembrane embrittlement over time

The presence of the concrete revetment mat in the Luminant design increases the survivability of the membrane over the Florida liner system referenced in the preamble of the Rule by minimizing the potential for punctures. The Luminant liner system also includes a geonet between the two membranes, which when coupled with the anchor system decreases the slip potential between the membranes compared to having two membranes in contact with one another as described in the preamble.

Luminant provided BMcD a copy of a report provided by Southwest Research Institute which documents the leak location survey for the primary liner of the New Scrubber Pond. In addition, Luminant has provided BMcD a memo dated August 9, 1989 describing the construction of the liner system described above.

Based on the drawings provided, and the GM/soil system described on those drawings, BMcD's opinion is the SP would be considered unlined per the Rule. BMcD's opinion is based on the following:

1. The drawings show a dual GM system underlain by random fill. This does not meet the Rule because there is not two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec,

2. The drawings show a dual GM system underlain by random fill. This does not meet the Rule because there is not a GM underlain by at least two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec,

3. The drawings show a dual GM system underlain by random fill. This does not meet the Rule because there is not an alternative liner, which is defined as a GM underlain by a liner component that has a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec.

In addition, the drawing makes note of a geotextile fabric which separates the GM and the soil layer below. The Rule states "the GM must be installed in direct and uniform contact with the compacted soil." Therefore the presence of the geotextile fabric does not meet the definition of the alternative liner.

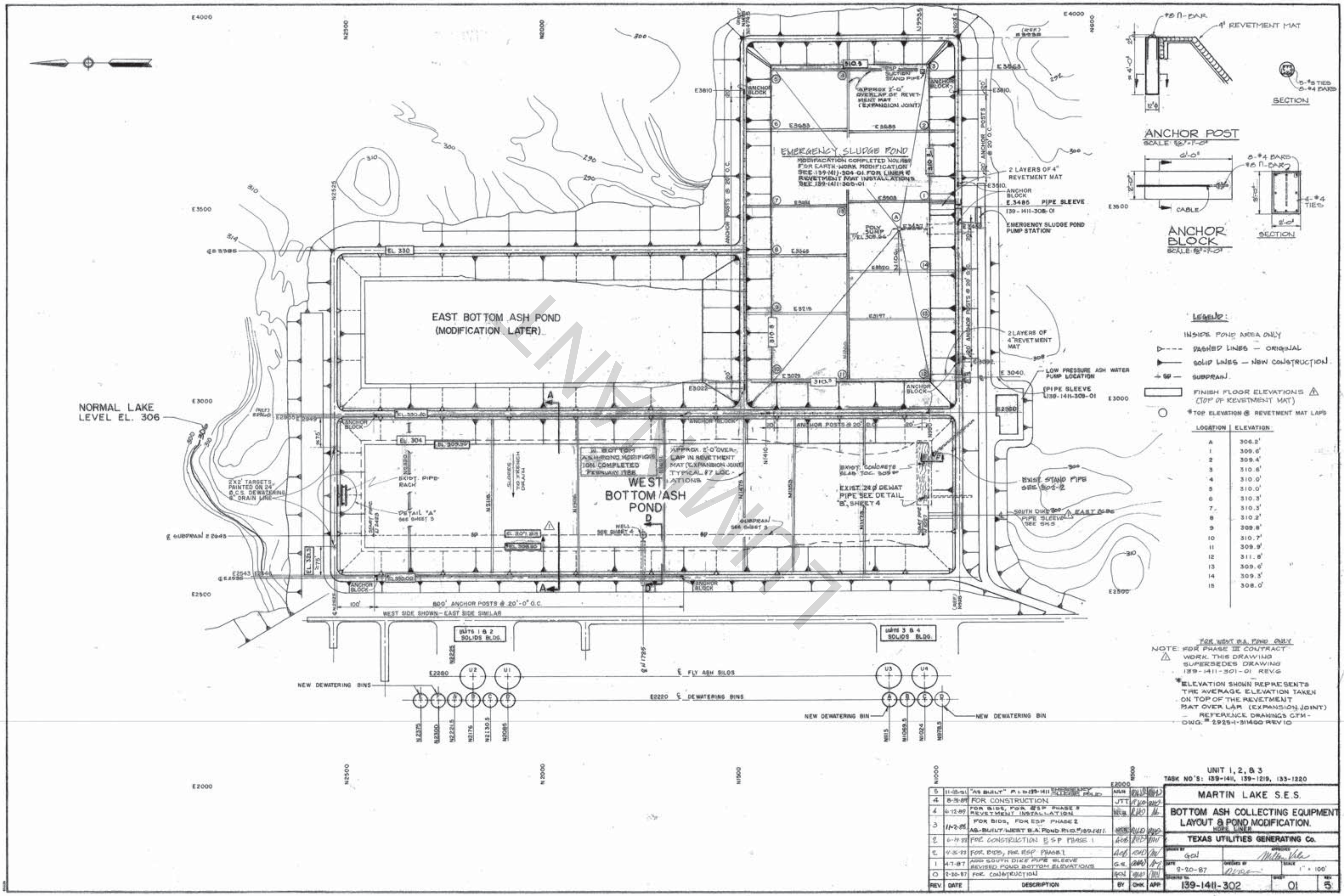
2.3 PDP 5

Based on drawings and other documentation provided by Luminant, the sides and bottom of consist of compacted soil. Drawing No.139-E001-305, Sheet C-29, "As Recorded" (See Appendix E) shows the side slopes of PDP 5 to consist of 3 foot of compacted clay. The bottom of PDP 5 consists of two feet of compacted clay. The Soil and Liner Quality Control Plan, which was provided in the project specification, calls for clay that has a coefficient of permeability of no more than $1.0x10^{-7}$ cm/sec.

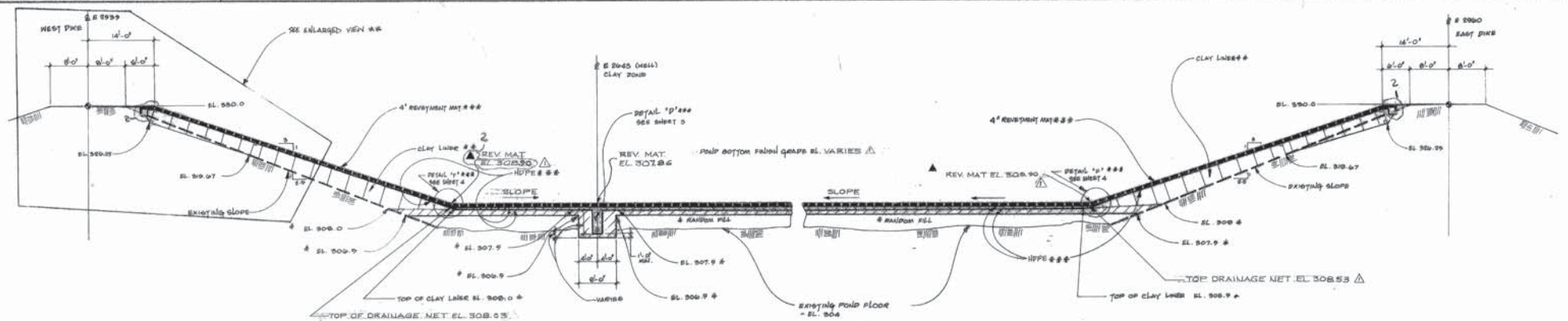
Based on the drawings and specifications provided, and the soil system described on those documents, BMcD's opinion is PDP 5 would be considered lined per the Rule. BMcD' s opinion is based on the drawing and Soil Liner Quality Control Plan indicating that there is two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec. Therefore, PDP 5 at MLSES is being classified as an existing, lined CCR surface impoundment pursuant to §257.71(a)(1)(i).

APPENDIX A - WEST BOTTOM ASH POND

DRAWING NO. 139-1411-302 SHEET 01 REV. 5
DRAWING NO. 139-1411-302 SHEET 02 REV. 2



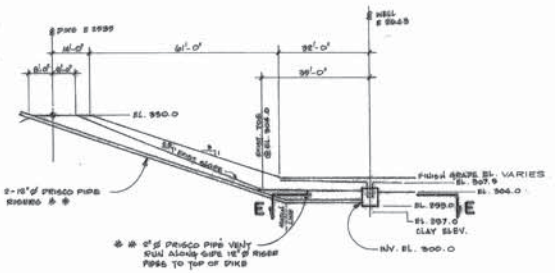
NORMAL LAKE LEVEL EL. 306
EAST BOTTOM ASH POND (MODIFICATION LATER)
WEST BOTTOM ASH POND
W. BOTTOM ASH POND MODIFICATION COMPLETED FEBRUARY 1988
APPROX. 2'-0" OVERLAP IN REVETMENT MAT (EXPANSION JOINT) TYPICAL 7 LOCATIONS
EMERGENCY SLUDGE POND
MODIFICATION COMPLETED NOV. 1989 FOR EARTH-WORK MODIFICATION SEE 139-1411-304-01 FOR LINER & REVETMENT MAT INSTALLATIONS SEE 139-1411-305-01
APPROX 2'-0" OVERLAP OF REVETMENT MAT (EXPANSION JOINT)
ESP SUCTION STAND PIPE
POLY SUMP T/EL 308.64
2 LAYERS OF 4" REVETMENT MAT
ANCHOR BLOCK
E 3485 PIPE SLEEVE 139-1411-308-01
EMERGENCY SLUDGE POND PUMP STATION
LOW PRESSURE ASH WATER PUMP LOCATION
PIPE SLEEVE 139-1411-309-01
EXIST. STAND PIPE SEE 302-2
SOUTH DIKE PIPE SLEEVE SEE SH.5
EXIST. CONCRETE SLAB TOC. 309
EXIST. 24" Ø DEWAT PIPE SEE DETAIL "B", SHEET 4
EXIST. PIPE RACK
DETAIL "A" SEE SHEET 5
SLOPES TO FRENCH DRAIN
WELL SEE SHEET 4
SUBDRAIN SEE SHEET 3
2'X2' TARGETS PAINTED ON 24" Ø C.S. DEWATERING 8" DRAIN LINE
800' ANCHOR POSTS @ 20'-0" O.C.
WEST SIDE SHOWN—EAST SIDE SIMILAR
ANCHOR POSTS @ 20' O.C.
UNITS 1 & 2 SOLIDS BLDG.
UNITS 3 & 4 SOLIDS BLDG.
FLY ASH SILOS
DEWATERING BINS
NEW DEWATERING BINS
NEW DEWATERING BIN
EL. 330
EL. 304
EL. 321.5
ANCHOR POST SCALE 3/8"=1'-0"
4" REVETMENT MAT
#8 Π-BAR
SECTION
5-#8 TIES 8-#4 BARS
ANCHOR BLOCK SCALE 3/8"=1'-0"
CABLE
8-#4 BARS #8 Π-BAR
4-#4 TIES
LEGEND:
INSIDE POND AREA ONLY
DASHED LINES — ORIGINAL
SOLID LINES — NEW CONSTRUCTION
SUBDRAIN
FINISH FLOOR ELEVATIONS (TOP OF REVETMENT MAT)
*TOP ELEVATION @ REVETMENT MAT LAPS
LOCATION | ELEVATION
A 306.2'
1 309.6'
2 309.4'
3 310.6'
4 310.0'
5 310.0'
6 310.3'
7 310.3'
8 310.2'
9 309.8'
10 310.7'
11 309.9'
12 311.8'
13 309.6'
14 309.3'
15 308.0'
NOTE: FOR WEST B.A. POND ONLY FOR PHASE III CONTRACT WORK. THIS DRAWING SUPERSEDES DRAWING 139-1411-301-01 REV.6
*ELEVATION SHOWN REPRESENTS THE AVERAGE ELEVATION TAKEN ON TOP OF THE REVETMENT MAT OVER LAP (EXPANSION JOINT)
REFERENCE DRAWINGS CTM-DWG. # 2925-1-31460 REV 10
UNIT 1, 2, & 3
TASK NO'S: 139-1411, 139-1219, 133-1220
MARTIN LAKE S.E.S.
BOTTOM ASH COLLECTING EQUIPMENT LAYOUT & POND MODIFICATION. HDPE LINER
TEXAS UTILITIES GENERATING Co.
5 11-18-91 "AS BUILT" P.I.D. 139-1411 EMERGENCY SLUDGE POND
4 8-31-89 FOR CONSTRUCTION
4 6-12-89 FOR BIDS, FOR ESP PHASE 3 REVETMENT INSTALLATION
3 11-2-88 FOR BIDS, FOR ESP PHASE 2 AS-BUILT/WEST B.A. POND P.I.D. 139-1411
2 6-14-88 FOR CONSTRUCTION ESP PHASE 1
2 4-15-88 FOR BIDS, FOR ESP PHASE 1
1 4-7-87 ADD SOUTH DIKE PIPE SLEEVE REVISED POND BOTTOM ELEVATIONS
0 2-20-87 FOR CONSTRUCTION
REV. DATE DESCRIPTION BY CHK APP
DATE 2-20-87
SCALE 1" = 100'
139-1411-302
SHEET 01
REV. 5



SECTION A-A

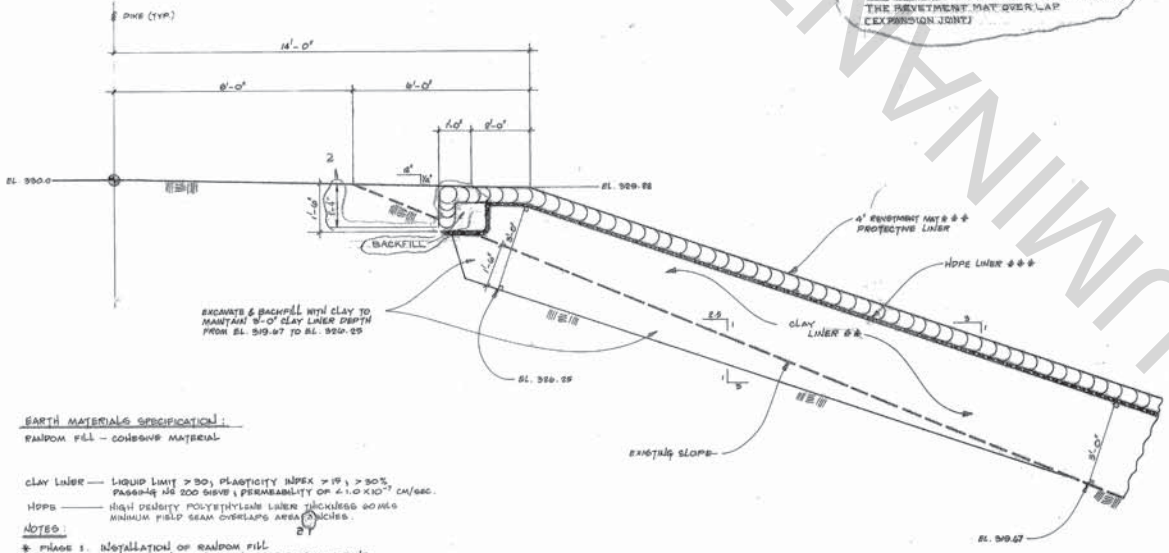
POND CROSS SECTION LOOKING NORTH
(scale : 1" = 10'-0")

▲ THE REVETMENT MAT ELEVATION REPRESENTS THE AVERAGE ELEVATION TAKEN ON TOP OF THE REVETMENT MAT OVERLAP EXPANSION JOINT.



SECTION D-D **

(scale : 1" = 20'-0")



EARTH MATERIALS SPECIFICATION :
RANDOM FILL — COHESIVE MATERIAL

CLAY LINER — LIQUID LIMIT > 30, PLASTICITY INDEX > 15, > 30% PASSING NO. 200 SIEVE, PERMEABILITY OF $< 1.0 \times 10^{-7}$ CM/SEC.

HDPE — HIGH DENSITY POLYETHYLENE LINER THICKNESS 60 MIL MINIMUM FIELD SEAM OVERLAPS AREA 3 INCHES.

NOTES :

\# PHASE 1. INSTALLATION OF RANDOM FILL
INSTALLATION OF CLAY LINER FOR BOTTOM OF POND
INSTALLATION OF CLAY ZONE FOR SUBDRAIN.

ENLARGED VIEW (TYP) **

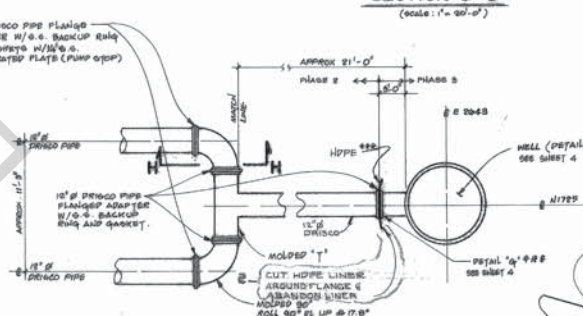
Scale : ½" = 1'-0"

\## PHASE 2. INSTALLATION OF CLAY LINER FOR SLOPES.
EXCAVATE AND BACKFILL MATERIALS FOR 2" ø AND 12" ø DRISCO PIPES. (DRISCO PIPES INSTALLED BY MARTIN LAKE S.E.S. PLANT — PANHL).

\### PHASE 3. INSTALLATION OF DRAINAGE NET. SUBDRAIN LATERALS SUBDRAIN WELL, HDPE, AND REVETMENT MAT; ALSO INCLUDING MODIFICATIONS AT THE PIPE RACK, STANDPIPE, 30" DEWATERING PIPE, AND APPLICATION OF HERBICIDE.

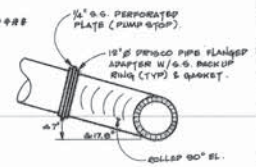
4. FOR GENERAL NOTES FOR HDPE LINER SEE DWG. 139-1411-302-04.

5. FOR DRAINAGE NET DETAILS SEE DWG. 139-1411-302-05



SECTION E-E **

NTS.



SECTION H-H

NTS.

⚠ NOTE:
FOR PHASE III CONTRACT WORK THIS DRAWING SUPERSEDES DRAWING NO. 139-1411-301-01 REV. 3

NOTES FOR RISER PIPES (PHASE 2)

1. ALL DRISCO PIPE TO BE 8000 SERIES (110 PSI) - SDR 19.5
2. ALL DRISCO PIPE FURNISHED BY OWNER & INSTALLED BY PANHL CONSTRUCTION.
3. EXCAVATION AND BACKFILL BY PHASE 2 CONTRACTOR.

UNITS 1, 2, & 3

MARTIN LAKE S.E.S.

MODIFICATION TO BOTTOM ASH POND EARTHWORK PHASE 1 & 2
CROSS SECTIONS (HDPE LINER)

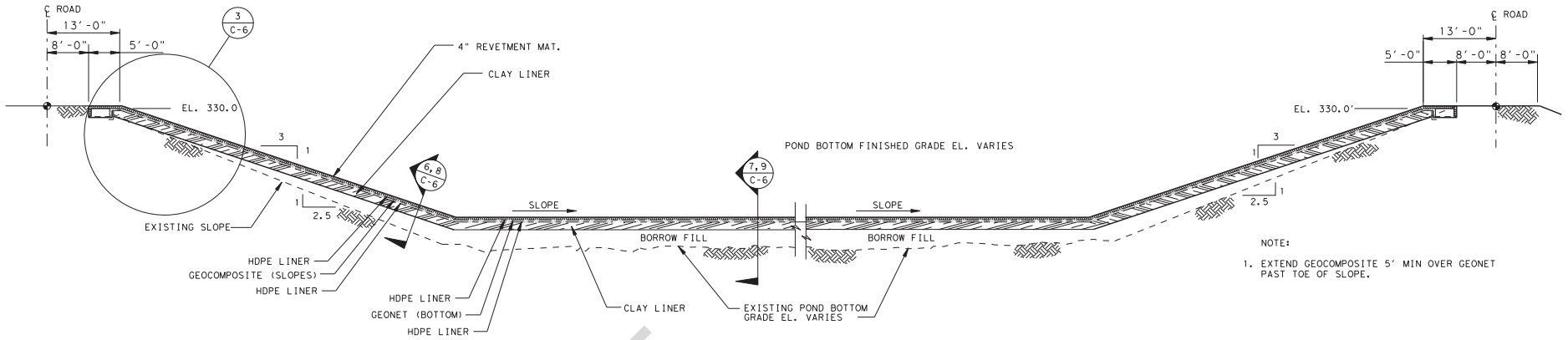
TEXAS UTILITIES GENERATING Co.

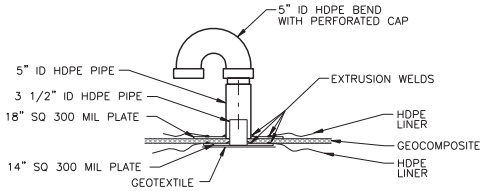
REV.	DATE	DESCRIPTION	BY	CHK	APP
2	11-1-88	ADDED NOTES, REV'S, & "ADDED" AS BUILTS	NR		
1	4-8-87	DELETED SAND BLANKET-ADD DRAINAGE NET	G.S.		
0	2-10-87	FOR CONSTRUCTION	GCN		

DESIGNED BY GCN — APPROVED
DATE 2-10-87 — CHECKED BY — SCALE As Shown
DRAWING NO. 139-1411-302 — SHEET 02 — REV. 2

APPENDIX B - EAST BOTTOM ASH POND

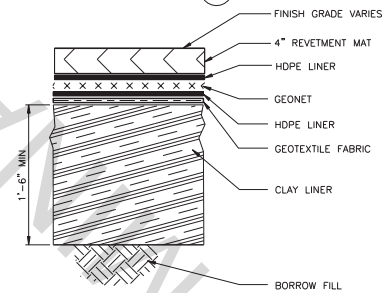
SHEET C-6

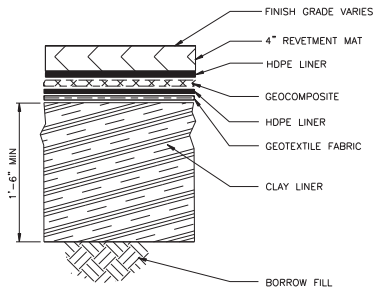


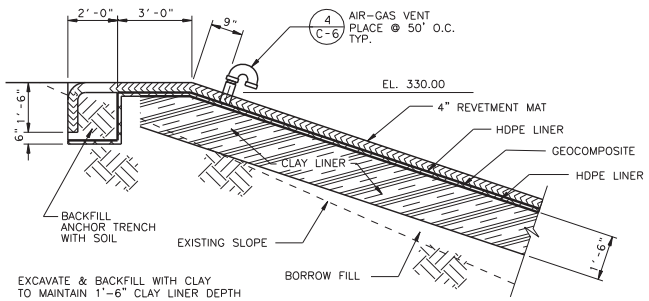


TYPICAL AIR-GAS VENT 4 C-6

TYPICAL SECTION 5 C-6

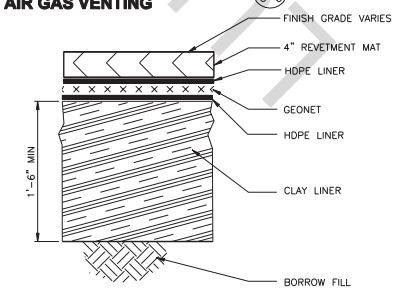






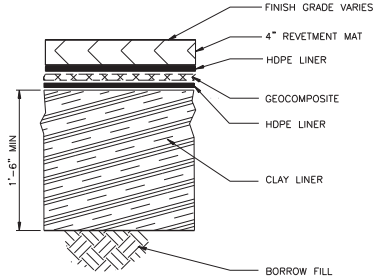
TYPICAL TOP OF SLOPE SECTION 3 C-6

FLOOR LINER SECTION WITH AIR GAS VENTING 9 C-6



FLOOR LINER SECTION 7 C-6

SLOPE LINER SECTION WITH AIR GAS VENTING 8 C-6



SLOPE LINER SECTION 6 C-6

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PLOTTED BY: VENTLADEN, JEFF
FILE: Luminant_Mining_Company_LLC\RL_SRS_Reline_East_Ash_Pond\C6.DGN_CAD\Sheet Files\AS BUILTS

Luminant

HDR
HDR Engineering, Inc.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION
	05/10	AS BUILT

PROJECT MANAGER	D. VOGT
ENGINEER	D. VOGT
CHECKED BY	J. PALUTIS
DESIGNED	D. MONTAGUE
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	91399

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS
RELINE EAST ASH POND

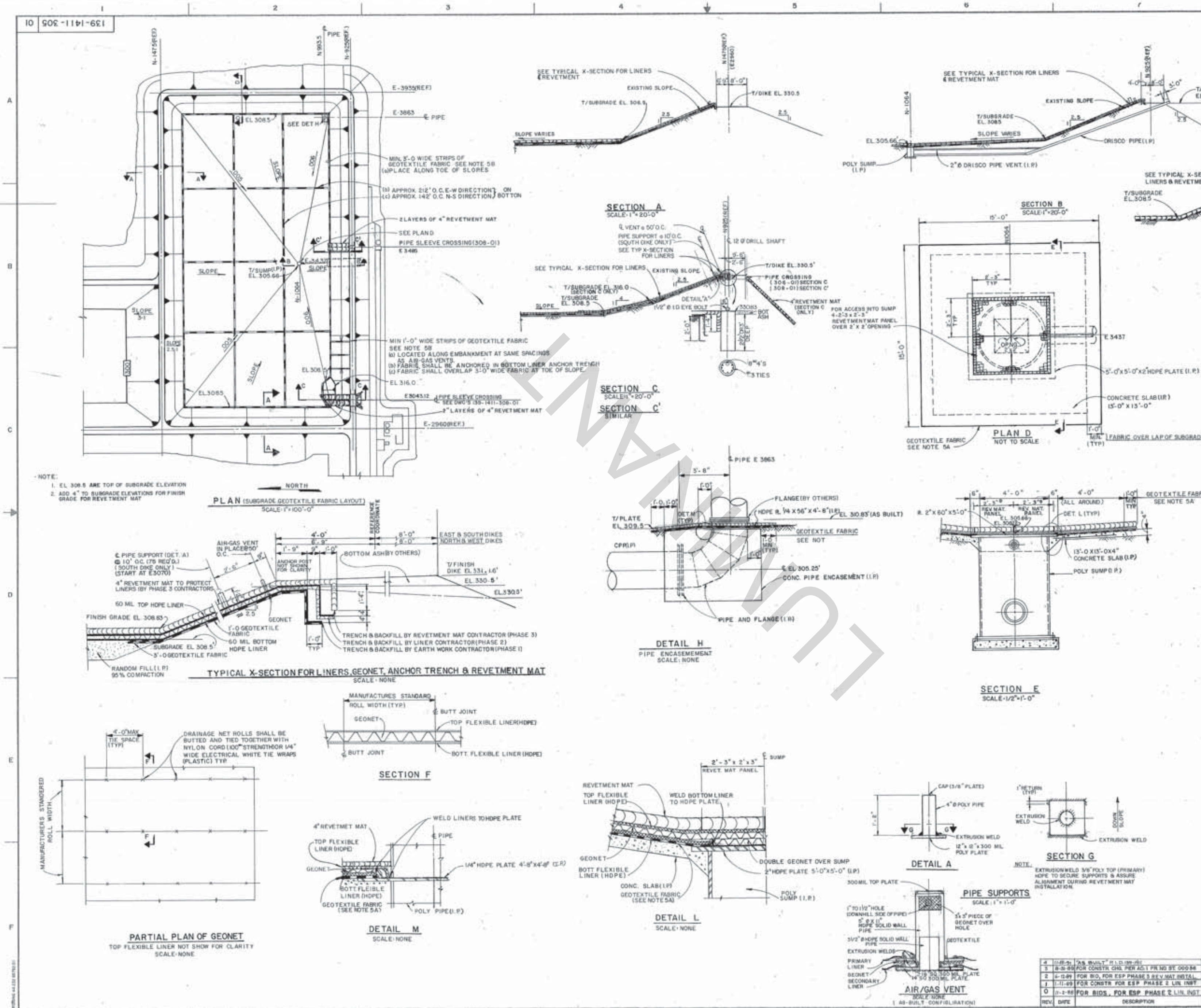
LINER SECTION AND DETAILS

FILENAME	C-6.dgn
SCALE	N.T.S

SHEET C-6

APPENDIX C - NEW SCRUBBER POND

DRAWING NO. 139-1411-305 SHEET 01 REV. 4



NOTE:
EXTRUSION WELD 3/8" POLY TOP (PRIMARY) HDPE TO SECURE SUPPORTS & ASSURE ALIGNMENT DURING REVETMENT MAT INSTALLATION.

ABREVIATION

ESP = EMERGENCY SLUDE POND
HDPE = HIGH DENSITY POLYETHYLENE
CPP = CONCRETE-PRESSURE PIPE
I.P = IN PLACE
TYP = TYPICAL
CONC = CONCRETE
T/ = TOP

PHASE 3

NOTES

1. REVETMENT MAT INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION FOR NEW EMERGENCY SLUDGE POND PHASE 3 INSTALLATION OF REVETMENT MAT.

PHASE 2

NOTES

ALL WORK SHOWN ON THIS DRAWING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS FOR NEW EMERGENCY SLUDGE POND - PHASE 2 INSTALLATION OF HIGH DENSITY POLYETHYLENE MEMBRANE LINERS, UNLESS NOTED.

1. THE HDPE LINER CONTRACTOR SHALL FURNISH:
   (A) MATERIALS, FABRICATION, AND INSTALLATION OF 60 MILS HDPE FLEXIBLE MEMBRANE LINERS.
   (B) MATERIALS AND INSTALLATION OF .25" HDPE DRAINAGE NET (GEONET).
   (C) DESIGN, MATERIALS, FABRICATION, AND INSTALLATION OF AIR-GAS VENTS.
      (1) THE AIR-GAS VENTS SHALL BE INSTALLED ALONG A STRAIGHT LINE ON OR NEAR THE CREST OF THE EMBANKMENT. THE VENTS SHALL EXTEND THROUGH THE 4 INCH REVETMENT MAT.
      (2) THE AIR-GAS VENTS SHALL BE DESIGNED TO ALLOW AIR OR GAS TO ESCAPE FROM BENEATH THE BOTTOM LINER AND BETWEEN THE BOTTOM LINER AND THE TOP LINER.
   (D) MATERIALS AND INSTALLATION OF GEOTEXTILE FABRIC
2. ALL LINER FIELD SEAMS SHALL OVERLAP A MINIMUM OF FOUR (4") INCHES.
3. ALL LINER FIELD SEAMS ON THE SLOPE SHALL RUN PERPENDICULAR TO THE TOE OF THE SLOPE.
4. NO MORE MATERIAL THAN CAN BE SEAMED SHALL BE LAID OUT IN A WORKDAY. LINER PANELS THAT ARE ROLLED OUT INTO FACILITY, MUST BE SEAMED OR LEISTERED COMPLETELY BEFORE THE END OF A WORK DAY.
5. GEOTEXTILE FABRIC TO BE USED AS:
   (A) A CUSHION BETWEEN CONCRETE SURFACES AND THE BOTTOM LINER.
   (B) A GAS VENTILATION BETWEEN SUBGRADE AND THE BOTTOM LINER.

REFERENCE DRAWINGS

139-1411-302-01
139-1411-306-01
139-1411-308-01

REV.	DATE	DESCRIPTION	BY	CHK.	APR.
4	11-18-91	"AS BUILT" P.I.D. 139-1411	W.L.R.	[illegible]	[illegible]
3	8-31-89	FOR CONSTR. CHG. PER AC.1 PR NO ST 00086	JTT	[illegible]	[illegible]
2	6-12-89	FOR BID, FOR ESP PHASE 3 REV MAT INSTAL.	WLR	[illegible]	[illegible]
1	1-11-89	FOR CONSTR. FOR ESP PHASE 2 LIN. INST.	WR	[illegible]	[illegible]
0	11-2-88	FOR BIDS, FOR ESP PHASE 2 LIN. INST.	WR	[illegible]	[illegible]

MARTIN LAKE S.E.S. UNIT 1,2&3

MODIFICATION TO BOTTOM ASH POND
NEW EMERGENCY SLUDE POND
HDPE LINERS, GEONET & REVETMENT MAT SECT. & DETAILS

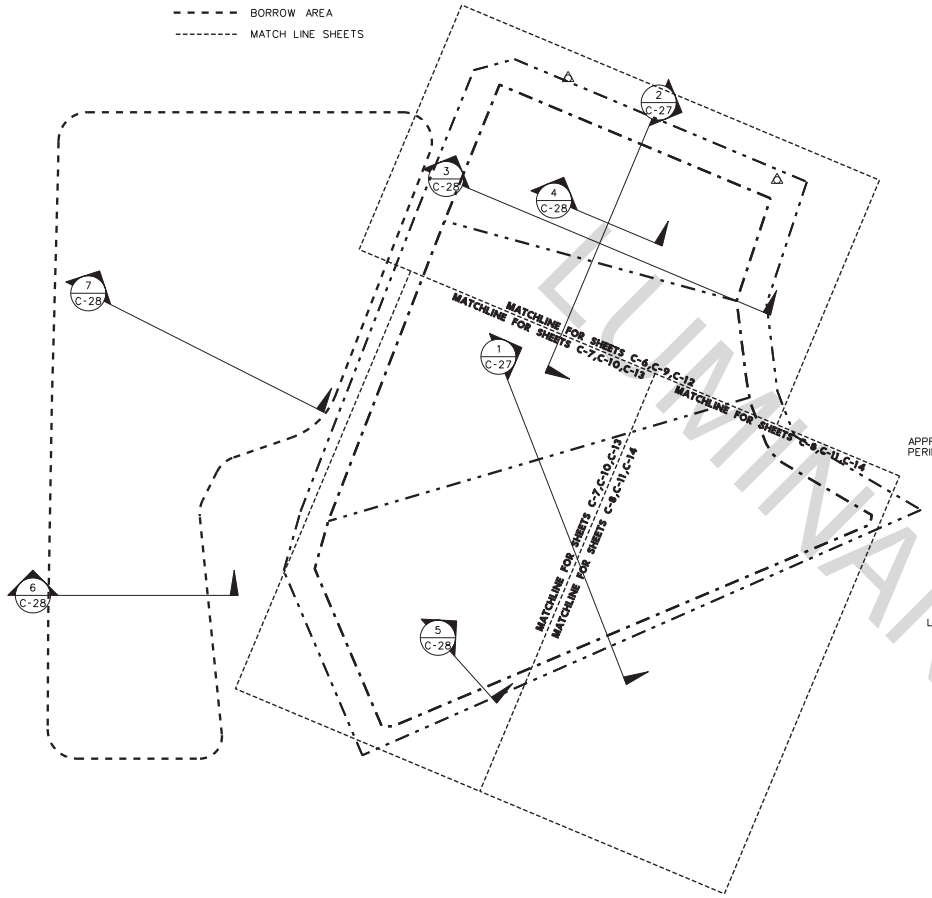
TEXAS UTILITIES GENERATING Co.

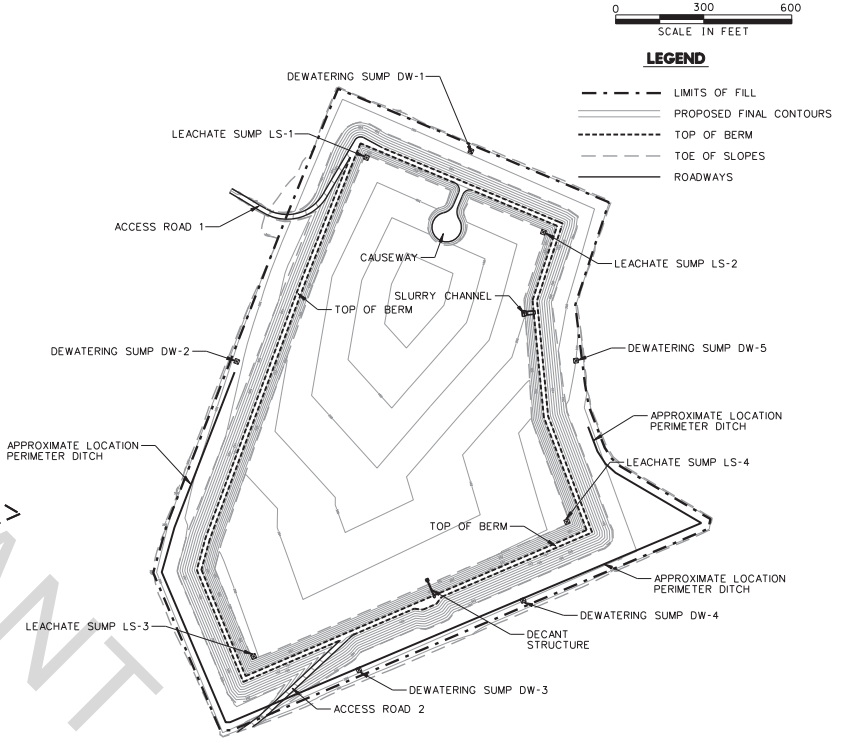
DRAWN BY: W.L.R. | APPROVED: [signature]
DATE: 11-2-88 | CHECKED BY: [illegible] | SCALE: AS NOTE
DRAWING No. 139-1411-305 | SHEET 01 | REV. 4

APPENDIX D - NOT USED

APPENDIX E - PERMANENT DISPOSAL POND 5

DRAWING NO. 139-E001-305 SHEET C-4 REV. 0
DRAWING NO. 139-E001-305 SHEET C-27 REV. 0
DRAWING NO. 139-E001-305 SHEET C-28 REV. 0





APPROXIMATE POND CAPACITY W/2' FREEBOARD = 66,000,000 GALLONS

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DATE: 4/21/2010
TIME: 08:45:45 AM
USER: rcox

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.754

ISSUE	DATE	DESCRIPTION
0	04/10	ISSUED FOR CONSTRUCTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53825

DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER
4/21/10

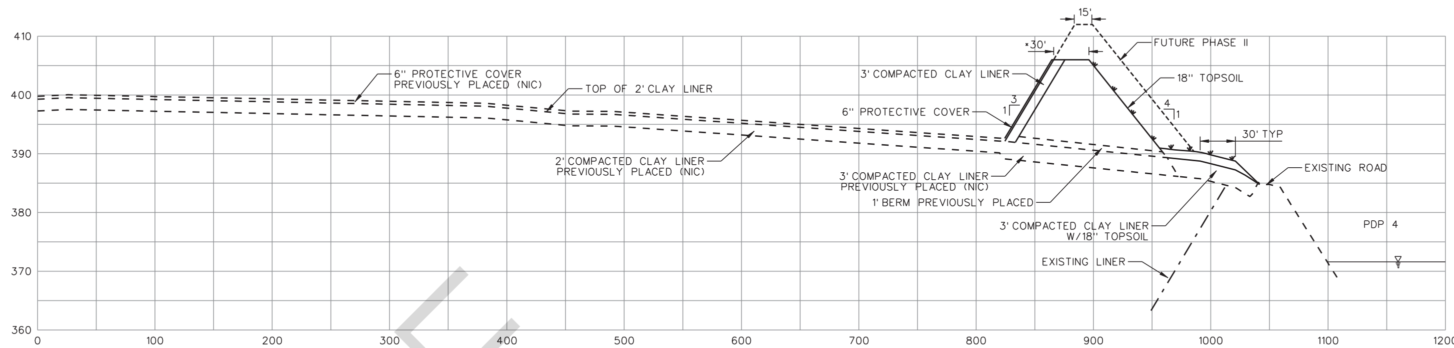
MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

VERTICAL EXPANSION OF PDP'S # 1, 2 AND 3
PHASE I

KEY MAP & CROSS SECTION LOCATIONS
139-E001-305

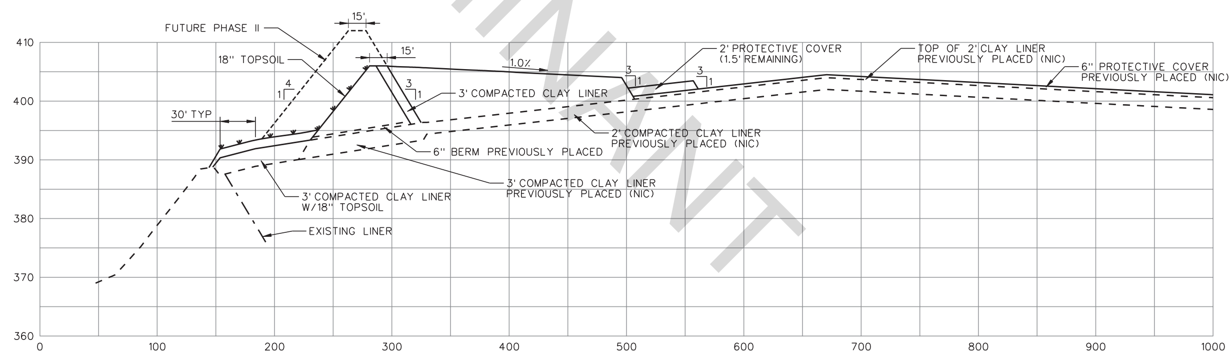
FILENAME	ML-KM-R1.dgn
SCALE	AS SHOWN

SHEET C-4



CROSS SECTION 1 / C-27
5V:1H

* 30' FOR TURNAROUND AREA (15' TYP.)



CROSS SECTION 2 / C-27
5V:1H

NOTES:
1. PROVIDE 3' COMPACTED CLAY LINER FROM FILL LIMITS TO OUTSIDE TOE OF BERM. PROVIDE 18" OF TOPSOIL AND VEGETATION FROM OUTSIDE OF BERM TO LIMITS OF DISTURBANCE.
2. FOR CROSS SECTION LOCATIONS SEE SHEET C-4.

DATE: 4/21/2010 TIME: 10:52:57 AM USER: rcox FILE: Luminant_Generation_Company_LLC/TXU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/139-E001-305
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Luminant

HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.754

ISSUE	DATE	DESCRIPTION
0	04/10	ISSUED FOR CONSTRUCTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

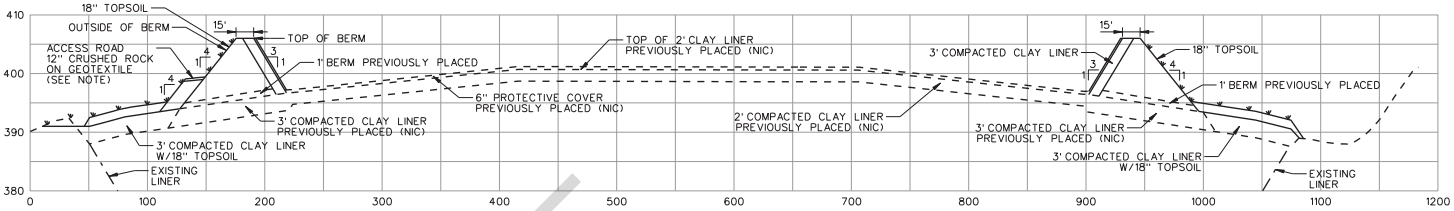
STATE OF TEXAS DAVID C. VOGT 93905 LICENSED PROFESSIONAL ENGINEER 4/21/10

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

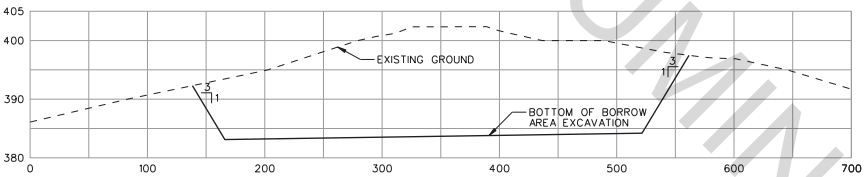
VERTICAL EXPANSION OF PDP'S # 1, 2 AND 3
PHASE I

TYPICAL CROSS SECTIONS
139-E001-305

FILENAME: ML-TCS01-R1.dgn
SCALE
SHEET C-27



CROSS SECTION 3 (C-28)
5V:1H



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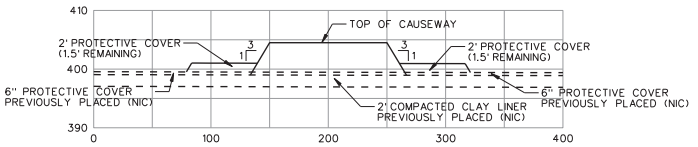

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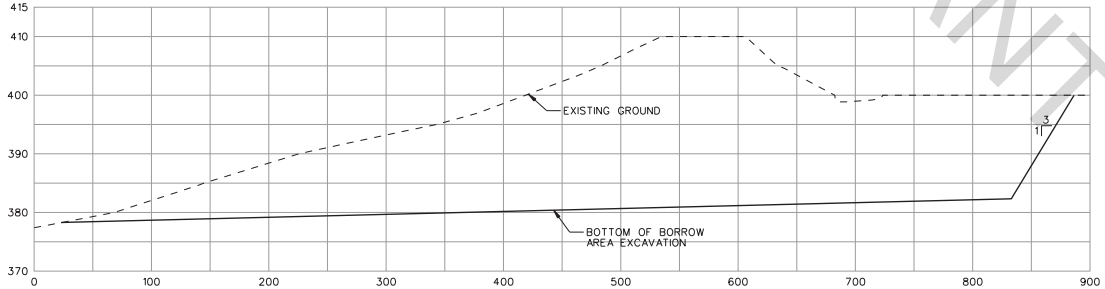

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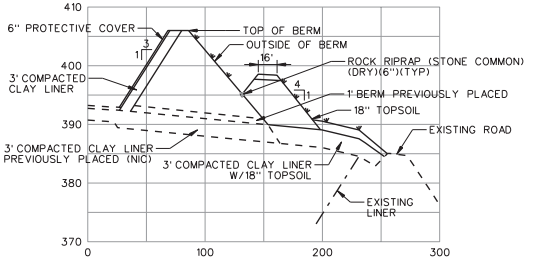

CROSS SECTION 5 (C-28)
5V:1H

NOTE:
1. PROVIDE 3' COMPACTED CLAY LINER FROM FILL LIMITS TO OUTSIDE TOE OF BERM. PROVIDE 18" OF TOPSOIL AND VEGETATION FROM OUTSIDE OF BERM TO LIMITS OF DISTURBANCE.
2. PROVIDE 12" THICK TXDOT TYPE A GRADE 2 ROCK ON GEOTEXTILE - 16' WIDE BY LENGTH OF ACCESS ROAD PLUS ADDITIONAL 10' ON UPPER AND LOWER ENDS.
3. FOR CROSS SECTION LOCATIONS SEE SHEET C-4 .

DATE: 4/21/2010
TIME: 10:53:01 AM
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Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.754

ISSUE	DATE	DESCRIPTION
0	04/10	ISSUED FOR CONSTRUCTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	M. ODEN
PROJECT NUMBER	53625

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL
ENGINEER
4/21/10

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

VERTICAL EXPANSION OF PDP'S # 1, 2 AND 3
PHASE I

TYPICAL CROSS SECTIONS
139-E001-305

FILENAME: ML-TCS02-R1.dgn
SCALE:
SHEET: C-28

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

APPENDIX K

PDP-5 Soil and Liner Evaluation Report

SLER

Luminant - Martin Lake S.E.S.
Permanent Disposal Pond 5
Rusk County, Texas
TCEQ Solid Waste Registration No. 31277
ETTL Job Number L213-09

Prepared for:

HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, Texas 75070-5757

Prepared by:

SLER
Luminant Martin Lake S.E.S.
Permanent Disposal Pond 5
Rusk County, Texas
TCEQ Solid Waste Registration No. 31277
ETTL Job Number L213-09

Submitted to

Mike Zieminski
Luminant
500 North Akard Street
Dallas, Texas 75201

Prepared for:

HDR Engineering, Inc.
4500 West Eldorado Parkway, Suite 3500
McKinney, Texas 75070-5757

Prepared by:

ETTL Engineers & Consultants Inc.
Tyler, Texas 75702-6346

Rev.	Date	Reason for Revision	By	Check	P.E.
00	3/2/2011	Preliminary Draft	JL	DV	BQ
01	3/25/2011	Per HDR Review	JL	DV	BQ

TABLE OF CONTENTS

SECTION

Section 1

SECTION 1 - INTRODUCTION

This report documents the construction quality assurance (CQA) effort conducted on the compacted clay liner (CCL) and earth embankment within Permanent Disposal Pond 5. The CQA program is defined within the Soil and Liner Quality Control Plan (SLQCP), dated January 2009 by HDR Engineering, Inc, and in conformance with Texas Commission on Environmental Quality (TCEQ) Technical Guideline No. 4, "Nonhazardous Industrial Solid Waste Surface Impoundments".

This project was originally referred to as the Vertical Expansion of Permanent Disposal Ponds (PDP's) #1, 2 and 3. Upon conclusion of the project, the pond was formally renamed PDP #5. All references to the Vertical Expansion of PDP's #1-3 in original reports, tables and figures are equivalent to the formal designation PDP #5.

The attached Soil and Liner Evaluation Report (SLER) is separated into eleven sections for ease of review. Each section is marked with a numbered divider tab. The SLER form (TCEQ-00674) is located in Section 2. The remaining sections support the SLER form and address the applicable parts of the SLQCP.

Section 2

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
MUNICIPAL SOLID WASTE LANDFILL SITE
SOIL LINER EVALUATON REPORT

PART A: FACILITY IDENTIFICATION

Permittee: Luminant Martin Lake S.E.S.

Permit No.: 31277 Operational Classification Type: Class 2 Industrial Waste

County: Rusk

PART B: GENERAL INFORMATION

1. What type of liner is required by the permit and is detailed in the site development plan?
A 2' and 3' thick compacted clay liner with a hydraulic conductivity of 1x10^-7 cm/sec

2. Does the site development plan require a leachate collection system for this liner system?
Yes

3. Date of the current liner quality control plan used to develop this SLER. January 2009

PART C: LOCATIONS AND/OR DESCRIPTION OF AREAS CURRENTLY BEING EVALUATED

1. Attach to this report a copy of the latest approved sectorized fill layout plan showing the areas or sectors of the landfill site currently under evaluation and showing areas previously filled and currently receiving waste. The required grid system must be shown on this drawing.

2. On a sketch or drawing of the area(s) under evaluation, indicate the following:

   a. Location and pertinent identifying information relating to all soil borings, core samples, observation trenches, and in-situ soil tests that were collected or conducted to accomplish this evaluation. **See Section 6**

   b. Boundary lines distinguishing the bottom and sidewall areas of the trenches or fill areas being evaluated. **See Section 6**

   c. Location and proper designation of constructed or in-situ liners. **See Sections 4 and 6**

3. Present evaluation location and area of coverage.

   a. Trench, sector, or area identification or number (give station, grid coordinates, boundary limits of this evaluation). See attached page 6 & clarifications

   b. Excavation depth 9 - 14 ft., length at top of excavation 1028 - 1822 ft., width at top of excavation 665 - 1175 ft., and ratio of side slopes 3:1 int., 4:1 ext.

c. Total number of square feet of liner evaluated for the floor, see below ft.^{2}, and for each individual side slope: (1) 22,610 ft.^{2}; (2) 34,952 ft.^{2}; (3) 39, 950 ft.^{2}; (4) 62,288 ft.^{2}; (if evaluated area has more than four sides, list all other below). The total area for base lifts 1-4, 2,396,786 ft^2, for exterior base lifts 5-6, 1,143,831 ft^2, The total area of interior slopes, 159,800 ft^2

PART D: SOIL EVALUATIONS CONDUCTED DURING THE CURRENT STUDY

1. Were all the soils tests and the rate of testing preformed in accordance with the current liner quality control plan? Yes

If not, please explain. _____

2. Dates liner was under construction. October 10, 2009 - October 18, 2010

3. Dates the professional of record (POR) visited the site. May 19, 2009 - November 10, 2010

4. Name & dates of the POR's technician was on-site. June 3, 2009 - October 20, 2010

5. Summarize the test results of in-situ soils only, if tested, provided they are allowed as an alternate liner by the permit.

IN-SITU SIDEWALL AREAS

Test locations must be noted on the sketch required by Part C, Paragraph 2 and are identified as follows: N/A

Number Done	Tests Conducted on Sidewalls	Range of Values (where appropriate)
	Soil Classification (USC)	
	Fraction Passing No. 200 Sieve (%)	
	Moisture Content (%)	
	Liquid Limit (Minus No. 40 Sieve)	
	Plasticity Index (Minus No. 40 Sieve)	
	Dry Density	
	Coefficient of Permeability (cm/sec.)	
	Number of samples tested oriented in the horizontal direction?	
	Method used to determine permeability?	

IN SITU BOTTOM AREAS

Test locations must be noted on the sketch required by Part C, Paragraph 2 and are identified as follows: N/A

Number Done	Tests Conducted on Bottom	Range of Values (where appropriate)
	Soil Classification (USC)	
	Fraction Passing No. 200 Sieve (%)	
	Moisture Content (%)	
	Liquid Limit (Minus No. 40 Sieve)	
	Plasticity Index (Minus No. 40 Sieve)	
	Dry Density	
	Coefficient of Permeability (cm/sec.)	
	Method used to determine permeability?	

PART E: EVALUATION RESULTS

1. STATUS OF IN-SITU SOILS

a. Do the test results of samples taken from the bottom and sidewalls of the disposal area evaluated satisfy the requirements for in-situ liners, or does the presence of joints, fractures or bedding planes, indicate the need for a constructed liner to meet the requirements of the commission's rules? (Note: The use of in-situ soils as an alternative liner system must be so indicated within the permit to be considered acceptable regardless of the results of the tests).
N/A

b. If the answer to a. above is no, give a detailed explanation based on test data and depth documentation that will support this conclusion.
N/A

(Please use additional paper if necessary for full explanation)

2. STATUS OF INSTALLED LINERS

a. Was the approved liner quality control plan followed? Yes

b. If not followed, why? _____

c. Was the liner construction completed prior to the certifying engineer's or geoscientist's final field visit? Yes

d. How much overlap length is incorporated in the "tie-in" of this liner with the previously constructed liner? 9+ ft. Was the tie-in done in "stair-step" fashion with maximum step heights of 12 inches? Yes. If not, describe tie-in. Existing clay liner tie-in was stair-stepped with new clay liner in 6"-9" lifts or placed on 3 - 4.5:1 slope also in 6" - 9" lifts

e. How were sample holes and nuclear-density gauge pin/probe holes backfilled?
Powdered bentonite was poured and tamped in test holes made in the clay liner

f. Does this liner require any ballast to overcome hydrostatic pressure? No
If so, how much was placed? _____. (If ballast is placed, submit groundwater elevation data to substantiate the adequacy of its thickness. Note: Ballast thickness must be based on highest seasonal water table elevation).

g. Has the protective cover been constructed, if required? Yes

h. Attach all field test and laboratory test data concerning soil liner construction. This data must include copies of all laboratory permeability test work sheets, including a sample calculation of the permeability values obtained in accordance with the utilized method(s) (please show all calculations), and documentation of the thickness of the liner, protective cover where required, leachate collection system, and ballast. **See Sections 6 and 7**

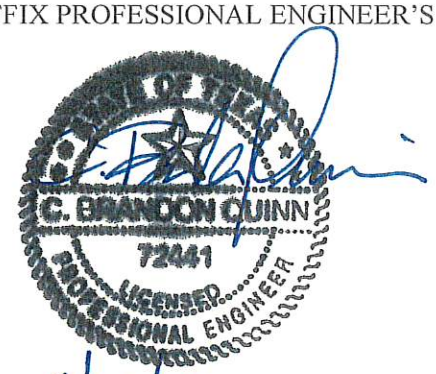
3. EVALUATION OF LINER BOUNDARY MARKERS

Are boundary markers in place at the time of this SLER submittal? N/A
(See Chapter 330.143 Rules).

PART F: SIGNATURE OF THE PROFESSIONAL OF RECORD

I certify that the liner has been constructed as designed in accordance with the issued permit and in general compliance with the regulations.

AFFIX PROFESSIONAL ENGINEER'S SEAL (Date & Sign)



8/12/10
(Date signed)

C. Brandon Quinn, P.E., P.G., C.P.G.
(Typed or printed name)

903-595-4421
(Phone number)

903-595-6113
(Fax number)

ETTL Engineers & Consultants, Inc.
(Company or business name)

1717 E. Erwin Street; Tyler, Texas 75702
(Address, city, zip code)

Note: A professional engineer must be registered in Texas.

PART G: SIGNATURE OF PERMITTEE

1. I have read and fully understand the findings of this SLER submittal.
2. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(Signature)

Jacob Gonzales
(Typed or Printed Name)

Senior Engineer Technical Support
(Title)

(Date Signed)

214-875-8057
(Phone Number)

214-875-5155
(Fax Number)

Luminant
(Company or Business Name)

500 Akard Street; Dallas, Texas 75201
(Address, City, Zip Code)

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
MUNICIPAL SOLID WASTE LANDFILL SITE
SOIL LINER EVALUATON REPORT

PART C: LOCATIONS AND/OR DESCRIPTION OF AREAS CURRENTLY BEING EVALUATED

3. Present evaluation location and area of coverage.

a. Trench, sector, or area identification or number (give station, grid coordinates, boundary limits of this evaluation).

PDP 1-3 has the following boundary limit coordinates starting at the Northeastern corner and proceeding clockwise:

N 229247.17 E 2902465.53, N 228894.09 E 2902350.85, N 228547.70 E 2902397.67,

N 228376.08 E 2902473.94, N 228350.74 E 2902502.74, N 228167.35 E 2902810.99,

N 228130.90 E 2902804.51, N 228100.00 E 2902743.02, N 227565.31 E 2901508.62,

N 227508.11 E 2901385.40, N 227448.90 E 2901223.13, N 227421.89 E 2901143.05,

N 227822.39 E 2900960.19, N 227975.75 E 2900903.71, N 227981.15 E 2900896.95,

N 227987.67 E 2900903.11, N 228015.59 E 2900907.29, N 228146.80 E 2900944.55,

N 229125.40 E 2901317.40, N 229150.50 E 2901274.72, N 229224.04 E 2901292.49,

N 229236.22 E 2901312.74, N 229338.31 E 2901394.33, N 229384.00 E 2901414.67,

N 229630.32 E 2901528.78, N 229551.47 E 2901753.95, N 229422.87 E 2902058.39

b. Clarifications

PDP #5 was built on top of existing PDP's #1-3. The dimensions given indicate overall dimensions of PDP #5 (i.e. length, width, and height). There was no "excavation" into natural or existing ground except as needed to provide dewatering wells and leachate sumps.

Section 3

SECTION 3 - SOIL & LINER EVALUATION REPORT

Authorization & Purpose

This study was performed in accordance with a request for services and authorization to proceed granted by Ramon F. Miguez, P.E. with HDR, Engineering, Inc. The purpose of this study is to evaluate the construction of a 2-foot and 3-foot thick compacted clay liner (CCL) and installation of a leachate collection system (LCS) for the vertical expansion, or above-ground surface impoundment in an area designated as Permanent Disposal Pond #5 by on-site inspection, field and laboratory testing, and to document the results in a written report.

Project Description

Permanent Disposal Pond #5 (PDP 5) is the proposed Class 2 Industrial Waste above-ground surface impoundment area currently under evaluation. PDP 1-3 was originally constructed as a below-ground surface impoundment that has been filled with Class 2 Industrial Waste, and closed (capped). This project is the vertical expansion (above-ground) construction of PDP 5. PDP 5 surface impoundment contains 2,396,786 ft^2 (55 acres) in base lifts 1-4, 1,143,831 ft^2 (26.26 aces) in exterior base lifts 5-6, and 159,800 ft^2 (3.67 acres) in the interior slopes. The constructed CCL is 2-foot thick around the interior base (floor) of the expansion, 3-foot thick at the base and interior slope of the earth embankment berm, and outside the perimeter of the berm. The CCL within PDP 5 was constructed monolithically or in parallel lifts. Project components consist of the CCL floor, CCL slopes, berm structural fill, berm CCL exterior, leachate collection system, and groundwater dewatering system. Refer to **Section 6** for a summary of the test results and test location drawings for each lift.

The new CCL ties-in to the existing CCL around the perimeter of PDP 1-3. Refer to the Site Plan located in **Section 4** and liner tie-in details in **Section 8** for further information.

Project Participants

Project participants for ETTL Engineers and Consultants Inc. included the Geotechnical Quality Control Professional (GQCP), C. Brandon Quinn, P.E., P.G., C.P.G., Vice President and Manager of Engineering Services, and the Qualified Engineering Technician, Jacob LeNoir, EIT. A copy of each participant's resume is located at the end of **Section 7**.

Plans & Specifications

The GQCP has reviewed the Soil and Liner Quality Control Plan (SLQCP), technical specifications and drawings related to the construction and testing of the CCL and LCS. All work for this study was conducted in accordance with the specific requirements of the SLQCP at PDP 5 dated January 2009 as prepared by HDR Engineering, Inc.

Subgrade Inspection

The GQCP or his representative performed subgrade inspections prior to and during construction of the CCL beginning on May 19, 2009 and continuing to October 10, 2010.

The subgrade surface was surveyed by Collins Survey and Mapping (CSM) of Longview, Texas prior to placement of the first lift of clay liner to document and verify proper subgrade elevations according to the plans and specifications. The subgrade was scarified a minimum of six inches to help provide bonding between the subgrade soils and first lift of CCL.

Preconstruction Testing - Liner Conformance Samples

All material used to construct the clay liner for the PDP 1-3 originated from an on-site borrow source (see **Section 11** for borrow investigation documentation). Any material proposed for the clay liner was sampled for Atterberg Limits and percent passing the No. 200 Sieve. If the liquid limit (LL) of the sample was 30 or greater, the plasticity index (PI) was 15 or greater, and at least 30% passed the No. 200 Sieve; then a moisture-density relationship was performed. A remolded sample of the proposed liner material was tested for ASTM D 5084 falling head permeability at 95% maximum dry density of standard proctor (ASTM D 698) at or above the optimum moisture content. The equipment used for this test and the equations used in calculating permeability (hydraulic conductivity) are presented in **Section 10**. If the tested hydraulic conductivity (k) value was $1x10^{-7}$ cm/sec or less then the material was not used for the clay liner. Seven conformance samples were originally collected for testing prior to clay liner construction. The eighth and ninth conformance samples were selected and approved for this site after initial soil classification testing during construction of the liner confirmed additional conformance samples were required. See **Section 6** - Summary of Test Results for remolded permeability results and other test results.

Liner Construction

A third party licensed surveyor (CSM) verified the correct subgrade elevations prior to placement of the clay liner. The soil liner was constructed in parallel or monolithic lifts. Off road dump trucks and scrapers transported the clay liner material to PDP 5 from the borrow area. CAT D6 tracked dozers and CAT maintainers were used to spread the soil in uniform layers not exceeding nine inches loose. A CAT D6 dozer pulling a rome disc processed the soil by reducing soil clods to approximately one inch. CAT 5,000 gallon water wagons were utilized to moisture condition the clay liner as necessary. Equipment capable of providing a minimum 12,400 ft-lb/ft^3 (CAT 815) was used for compaction to at least 95% of maximum dry density at or above optimum moisture content. Prong lengths of the CAT 815 measured 9 inches on the compactor and were cleaned by attached cleaning devices. The top of each lift was scarified prior to the placement of the next lift.

If inclement weather was forecast, the top of the lift under construction would be either bladed smooth or rolled with a flat steel roller to seal the surface. The top of each lift was scarified prior to the placement of the next lift.

Liner Quality Assurance

An experienced engineering technician under the direct supervision of the GQCP provided continuous on-site inspection and performed field-testing of the soil liner during and after completion of the liner. Representative borrow samples were obtained and tested as stated under the Preconstruction Testing - Liner Conformance Samples section. Nine (9) ASTM D 698 proctors were used at this site for the clay liner.

Samples of the liner were collected during construction for Atterberg Limit values of plasticity index, liquid limit and plastic limit, as well as percent passing the No. 200 Sieve values at the rate of at least one test per 100,000 square feet for each six inch lift of compacted clay to select the applicable proctor curve. If liner material varied by more than 10 points in either liquid limit or plasticity index from previous approved conformance materials, an additional preconstruction evaluation was made.

In place moisture-density tests were performed at a rate of one test per 8,000 square feet for each six inch compacted lift with a nuclear gauge calibrated daily (ASTM D 2922). Hydraulic conductivity tests were performed at a rate of one test per 100,000 square feet for each six inch compacted lift of constructed liner. Two Shelby tubes were collected from each hydraulic conductivity test location to provide primary and backup samples. All test penetration locations were backfilled with bentonite and hand tamped.

A portable hand held GPS unit was used to locate each test location within PDP 5. All test locations are referenced on drawings for each constructed lift.

The soil material was visually monitored to ensure that no rocks or stones larger than one inch in diameter were used in the soil liner.

PDP 5 was constructed monolithically and evaluated as one area that measured 2,396,786 ft^2 (55 acres) for liner lifts 1-4, 1,143,831 ft^2 (26.26 acres) for liner lifts 5-6, and 159,800 ft^2 (3.67 acres) for lifts 1-6 of the interior slopes. The minimum number of field density-moisture content tests required by the SLQCP per six-inch compacted lift was 300 for liner lifts 1-4, 143 for liner lifts 5-6, and 20 for slope lifts 1-6. The minimum number of Atterberg Limits, sieve analysis and permeability tests required by the SLQCP per six-inch compacted lift was 24 for liner lifts 1-4, 12 for liner lifts 5-6, and 2 for slope lifts 1-6. The field tests and laboratory samples tested within PDP 5 meet or exceed the requirements of the SLQCP. Results of individual laboratory tests are shown in **Section 7**, and all tests are summarized in tables found in **Section 6**. Test locations are shown in the lift drawings, also found in **Section 6**. Test results reported in **Section 6** reference each test location to a coordinate system established by the permit documents.

Liner Thickness Verification

The top of the clay liner was smooth-wheeled rolled using a smooth drum roller prior to final liner-thickness surveying. Liner thickness was measured by superimposing a 100 feet by 100 feet grid over PDP 5 and measuring the elevation at each point, referencing known benchmark elevations. Thickness verification was performed by instrument survey methods at a minimum rate of one verification point per 10,000 square feet of surface area. The interior liner has a minimum liner thickness of 2 feet. The exterior liner, interior berm slopes, and interior berm base have a minimum liner thickness of 3 feet. The clay liner surface was moisture conditioned daily until the protective cover was installed by the earthwork contractor.

Leachate Collection System

The leachate collection system (LCS) includes the sumps, pipes, aggregate material, geotextile filter fabric and leachate dewatering systems. CQA personnel observed the installation of the leachate collection system on a full-time basis. The LCS included embedded leachate collection pipes in the sump and pipe trench areas. The leachate collection pipes consisted of six-inch diameter HDPE pipe with 3/8-inch diameter holes on six-inch centers. To avoid piping losses into the collection pipes, the granular drainage layer consisted of rounded, river-run gravel meeting the requirements of ASTM C-33 for coarse aggregate. The gravel met the gradation requirements of Size No. 6 (nominal size 3/4 inch to 3/8 inch), with a maximum gravel size of less than 1.5 inches. The gravel also met the permeability requirements, with a hydraulic conductivity value of 1.11 x 10^-2 cm/sec. Lab tests are shown in **Section 7**. A non-woven geotextile filter was wrapped around the granular drainage layer.

Summary

A chronology of events summarizing project progress follows in **Section 5**. The table of tests required by SLQCP in **Section 6** lists the quantities required by the SLQCP and the actual quantities of tests that passed.

The results of field observation and field and laboratory testing indicate that the compacted clay liner has a minimum thickness of 2 feet for the interior liner and 3 feet for the exterior liner, interior berm slopes, and interior berm base. All clay liner tested has a permeability value equal to or less than $1x10^{-7}$ cm/sec, as required by the SLQCP. As constructed, the CCL meets or exceeds the requirements set forth in the SLQCP for PDP 5, Solid Waste Registration No. 31277.

Section 4

LEGEND

LIMITS OF CONSTRUCTION

BORROW AREA

SOIL HAUL ROUTE

BENCHMARKS:

1. BM#1
   N 229654.43
   E 2901769.57
   EL 376.87

   BM#2
   N 229307.31
   E 2902482.03
   EL 382.76

STATE OF TEXAS
C. BRANDON QUINN
72441
REGISTERED PROFESSIONAL ENGINEER

ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	L213-09 SITE PLAN	APPROVED BY: B. Quinn
		JOB. NO.: L213-09	DRAWN BY: J. LeNOIR
		DATE: FEB 2011 / SCALE: AS SHOWN	

Section 5

SECTION 5 - CHRONOLOGY OF EVENTS

The following chronology of events summarizes the major project activities as related to the inspection, testing, and assessment of the constructed clay liner.

04/25/09	Contractor (Pickett Industries, LLC) mobilizes and begins site preparation
06/06/09	Contractor (Pickett Industries, LLC) continues to prepare the sub-grade
09/09/09	Contractor (Pickett Industries, LLC) begins demobilization
10/07/09	Contractor (Rodman, LLC) mobilizes and begins surveying and sub-grade preparation
10/16/09	Contractor (Rodman, LLC) continues sub-grade preparation, clears drainage ditches, and begins leachate collection system
11/02/09	Contractor (Rodman, LLC) begins placing clay liner and continues prepping sub-grade
11/14/09	Contractor (Rodman, LLC) continues placing and processing clay liner
11/25/09	Contractor (Rodman, LLC) continues placing and processing clay liner
12/10/09	Contractor (Rodman, LLC) continues placing and processing clay liner
12/29/09	Contractor (Rodman, LLC) continues placing and processing clay liner
01/05/10	Contractor (Rodman, LLC) continues placing and processing clay liner and begins placing and processing berm structural fill
01/21/10	Contractor (Rodman, LLC) drying and processing clay liner and berm structural fill
02/04/10	No active equipment due to inclement weather
02/22/10	Contractor (Rodman, LLC) continues placing and processing clay liner and berm structural fill
03/05/10	Contractor (Rodman, LLC) continues placing and processing clay liner and berm structural fill
03/08/10	Contractor (Rodman, LLC) processing and sealing clay liner and berm structural fill
03/23/10	Contractor (Rodman, LLC) continues placing and processing clay liner and berm structural fill
04/03/10	Contractor (Mine Services, LTD) begins mobilization

04/11/10	Contractor (Mine Services, LTD) begins placing and processing clay liner
04/22/10	Contractor (Mine Services, LTD) continues placing and processing clay liner
05/03/10	Contractor (Mine Services, LTD) placing protective cover over completed areas of clay liner
05/19/10	Contractor (Mine Services, LTD) placing and processing berm structural fill
06/01/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill
06/18/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill
06/30/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill
7/13/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill. Contractor begins establishing exterior sub-grade
07/15/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill. Contractor begins constructing “Key” trench to tie in new clay liner to existing clay cap
07/22/10	Contractor (Mine Services, LTD) continues placing and processing berm structural fill. Contractor continues constructing “Key” trench
08/04/10	Contractor (Mine Services, LTD) begins placing and processing clay liner on interior berm slopes. Contractor begins placing and processing exterior clay liner
08/17/10	Contractor (Mine Services, LTD) continues placing and processing exterior clay liner and interior berm slope liner
08/26/10	Contractor (Mine Services, LTD) continues placing and processing exterior clay liner and interior berm slope liner
09/08/10	Contractor (Mine Services, LTD) continues placing and processing exterior clay liner. Contractor installing leachate system
09/20/10	Contractor (Mine Services, LTD) continues placing and processing exterior clay liner. Contractor continues installing leachate system
10/04/10	Contractor (Mine Services, LTD) grading perimeter liner
10/12/10	Contractor (Mine Services, LTD) continues grading perimeter clay liner. Contractor begins placing and processing road base

10/20/10 Contractor (Mine Services, LTD) completes grading perimeter protective cover. Contractor completes placing and processing road base

11/19/10 Final inspection by GQCP

Section 6

SECTION – 6 SUMMARY TABLES & TEST LOCATIONS

Location	Lift	Permeability, % Passing #200 Sieve, Atterberg Limits		In Place Moisture-Density	
		Required	Taken	Required	Taken
Base	1	24	26	300	300
	2	24	24	300	300
	3	24	24	300	304
	4	24	24	300	300
	5	12	14	143	144
	6	12	12	143	146
Slope	1	2	2	20	20
	2	2	3	20	20
	3	2	2	20	20
	4	2	2	20	20
	5	2	2	20	25
	6	2	2	20	24

Tests Required by SLQCP

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/03/09	8801	D	1	N 228393.5	E	2902302.4	20.7	104.9	96.2	45	26	76	1.44E-08	
11/03/09	8801	D	2	N 228190.5	E	2902332.8	22.1	104.4	95.7					
11/03/09	8894	D	3	N 228284.3	E	2902302.4	22.5	103.6	100.4					
11/03/09	8801	D	4	N 228355.4	E	2902371.5	21.4	105.8	97.0					
11/03/09	8801	D	5	N 228450.1	E	2902245.2	22.2	104.2	95.5					
11/03/09	8801	D	6	N 228528.1	E	2902301.8	18.6	109.7	100.5					
11/03/09	8801	D	7	N 228602.4	E	2902222.4	22.6	106.8	97.9					
11/03/09	8801	D	8	N 228632.8	E	2902271.1	23.4	105.6	96.8					
11/04/09	8801	D	9	N 228122.7	E	2902381.1	19.8	109.1	100.0					
11/04/09	8801	D	10	N 228088.3	E	2902453.2	21.6	106.9	98.0					
11/04/09	8801	D	11	N 228033.0	E	2902297.0	22.3	104.5	95.8					
11/04/09	8801	D	12	N 228057.9	E	2902144.8	22.8	103.9	95.2					
11/04/09	8801	D	13	N 227969.3	E	2902097.8	20.3	105.9	97.1	48	27	69	1.42E-08	
11/04/09	8801	D	14	N 227995.9	E	2902007.3	18.5	107.3	98.4					
11/04/09	8801	D	15	N 227874.3	E	2901955.1	20.2	105.2	96.4					
11/04/09	8801	D	16	N 227937.0	E	2901854.4	18.7	107.0	98.1					
11/06/09	8801	D	17	N 227704.0	E	2901455.7	22.5	105.2	96.4	44	28	67	2.58E-08	
11/06/09	8894	D	18	N 227963.0	E	2901083.6	21.0	103.1	99.9	44	28	65	1.35E-08	
11/07/09	8894	D	19	N 229310.9	E	2902051.2	24.8	99.8	96.7	41	22	75	1.78E-07	
11/11/09	8910	D	19B	N 229310.9	E	2902051.2	20.3	105.9	96.4	39	23	71	1.93E-08	X
11/07/09	8910	D	20	N 228908.6	E	2902241.7	20.2	109.0	99.3	36	18	71	4.17E-08	
11/07/09	8894	D	21	N 228014.1	E	2901877.0	21.0	104.2	101.0	44	23	73	3.73E-08	
11/07/09	8801	D	22	N 227857.7	E	2901881.3	18.1	107.4	98.4					
11/07/09	8801	D	23	N 227886.7	E	2901744.4	18.6	107.5	98.5					
11/07/09	8801	D	24	N 227779.9	E	2901701.0	17.7	109.1	100.0					
11/07/09	8801	D	25	N 227805.0	E	2901555.0	17.1	109.8	100.6					
11/07/09	8801	D	26	N 227639.7	E	2901370.9	18.4	110.7	101.5					
11/07/09	8801	D	27	N 227666.3	E	2901280.5	20.8	106.8	97.9					
11/07/09	8801	D	28	N 227576.6	E	2901193.3	17.2	111.1	101.8					
11/07/09	8801	D	29	N 227703.6	E	2901180.5	19.4	108.0	99.0					
11/07/09	8801	D	30	N 227755.9	E	2901098.6	18.8	108.6	99.5					
11/07/09	8801	D	31	N 227880.6	E	2901132.3	21.2	104.5	95.8					
11/07/09	8801	D	32	N 227917.9	E	2901035.4	20.7	104.6	95.9					
11/07/09	8895	D	33	N 228039.3	E	2901081.5	25.7	96.6	97.9					
11/08/09	8894	D	34	N 227772.9	E	2901317.7	20.1	104.7	101.5					
11/08/09	8910	D	35	N 227866.2	E	2901401.7	21.3	104.8	95.4					
11/08/09	8910	D	36	N 227844.7	E	2901544.6	19.5	106.8	97.3					
11/08/09	8910	D	37	N 227955.5	E	2901600.3	20.2	106.4	96.9					
11/08/09	8910	D	38	N 227922.7	E	2901731.1	20.9	105.7	96.3					
11/08/09	8910	D	39	N 228040.2	E	2901768.0	22.5	104.9	95.5					
11/08/09	8910	D	40	N 228018.7	E	2901910.8	21.0	106.3	96.8					
11/08/09	8910	D	41	N 228114.1	E	2901939.1	22.1	105.1	95.7					
11/08/09	8910	D	42	N 228059.5	E	2902070.5	21.5	105.9	96.4					
11/08/09	8910	D	43	N 228177.0	E	2902107.5	21.8	108.2	98.5					
11/08/09	8910	D	44	N 228130.6	E	2902139.7	20.2	109.0	99.3					
11/08/09	8910	D	45	N 228235.6	E	2902251.2	21.4	106.1	96.6					
11/08/09	8894	D	46	N 228674.5	E	2902198.8	23.2	100.9	97.8					
11/08/09	8894	D	47	N 228788.6	E	2902245.1	21.6	102.0	98.8					

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/08/09	8894	D	48	N	228841.4	E 2902178.7	24.3	99.9	96.8					
11/08/09	8894	D	49	N	229020.5	E 2902207.7	23.4	99.9	96.8					
11/08/09	8894	D	50	N	229107.3	E 2902319.7	22.3	101.4	98.3					
11/08/09	8801	D	51	N	229189.8	E 2902274.1	22.1	104.3	95.6					
11/08/09	8801	D	52	N	229267.4	E 2902185.4	22.0	104.4	95.7					
11/08/09	8801	D	53	N	229225.1	E 2902106.2	21.2	106.6	97.7					
11/08/09	8801	D	54	N	229325.5	E 2902050.8	20.1	107.8	98.8					
11/08/09	8801	D	55	N	229300.1	E 2901921.6	20.6	106.5	97.6					
11/08/09	8801	D	56	N	229389.4	E 2901863.5	20.0	105.7	96.9					
11/08/09	8801	D	57	N	229233.3	E 2901744.1	21.3	103.8	95.1					
11/11/09	8894	D	92	N	228309.7	E 2901120.4	22.4	101.3	98.2					
11/11/09	8894	D	93	N	228452.6	E 2901153.5	21.8	102.7	99.5					
11/11/09	8894	D	94	N	228348.8	E 2901215.2	20.7	104.0	100.8					
11/11/09	8894	D	95	N	228517.8	E 2901272.3	21.7	104.1	100.9					
11/11/09	8894	D	96	N	228622.0	E 2901226.1	21.7	102.3	99.1					
11/11/09	8894	D	97	N	228672.3	E 2901333.0	21.0	102.5	99.3	43	26	67	1.73E-08	
11/11/09	8894	D	98	N	228772.8	E 2901283.8	20.3	102.6	99.4					
11/11/09	8894	D	99	N	228815.8	E 2901387.7	25.7	98.8	95.7					
11/11/09	8894	D	100	N	228912.7	E 2901338.7	23.9	101.1	98.0					
11/11/09	8894	D	101	N	228955.3	E 2901433.3	22.9	103.6	100.4					
11/11/09	8894	D	102	N	229056.1	E 2901393.4	24.8	101.9	98.7					
11/11/09	8801	D	103	N	229088.2	E 2901500.8	21.7	108.0	99.0					
11/11/09	8894	D	104	N	229195.9	E 2901448.3	22.6	103.2	100.0					
11/11/09	8894	D	105	N	229227.6	E 2901540.2	23.8	101.5	98.4	43	25	75	1.14E-08	
11/11/09	8894	D	106	N	229328.2	E 2901494.1	22.4	104.2	101.0					
11/11/09	8894	D	107	N	229371.2	E 2901601.1	22.4	103.4	100.2					
11/11/09	8801	D	108	N	229464.4	E 2901549.1	21.0	105.0	96.2					
11/11/09	8801	D	109	N	229485.6	E 2901656.7	21.5	105.0	96.2					
11/11/09	8801	D	110	N	229385.7	E 2901727.5	18.8	106.7	97.8					
11/11/09	8801	D	111	N	229417.2	E 2901813.2	20.4	105.4	96.6					
11/11/09	8801	D	112	N	229355.7	E 2901960.3	20.5	105.6	96.8					
11/11/09	8801	D	113	N	229244.5	E 2902019.0	20.4	106.1	97.3					
11/11/09	8801	D	114	N	229200.3	E 2902128.5	19.4	107.7	98.7					
11/11/09	8801	D	115	N	229253.5	E 2902210.5	19.6	107.2	98.3					
11/11/09	8801	D	116	N	229159.8	E 2902244.0	19.1	107.5	98.5					
11/13/09	8801	D	145	N	228347.4	E 2902214.0	19.8	109.9	100.7					
11/13/09	8801	D	146	N	228392.0	E 2902116.9	18.3	110.4	101.2					
11/13/09	8801	D	147	N	228480.9	E 2902173.2	18.8	109.6	100.5					
11/13/09	8801	D	148	N	228554.8	E 2902081.5	19.5	108.0	99.0					
11/13/09	8801	D	149	N	228633.4	E 2902159.7	18.5	109.6	100.5					
11/13/09	8801	D	150	N	228696.8	E 2902083.7	21.1	105.7	96.9	48	29	69	8.75E-08	
11/13/09	8801	D	151	N	228785.7	E 2902140.0	20.0	108.1	99.1					
11/13/09	8801	D	152	N	228856.6	E 2902073.1	19.0	105.8	97.0					
11/13/09	8801	D	153	N	228945.8	E 2902138.7	18.0	109.5	100.4					
11/13/09	8801	D	154	N	229020.8	E 2902087.1	21.7	105.4	96.6					
11/13/09	8894	D	155	N	229085.1	E 2902175.0	22.4	103.9	100.7					
11/13/09	8894	D	156	N	229135.2	E 2902145.8	23.9	101.8	98.6					
11/13/09	8801	D	166	N	227912.6	E 2901103.6	20.7	108.5	99.5					

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/13/09	8801	D	167	N	228117.3	E 2901138.1	22.8	104.4	95.7					
11/18/09	8801	D	223	N	229344.1	E 2901673.0	21.4	104.7	96.0					
11/18/09	8910	D	224	N	229313.0	E 2901602.8	16.6	110.6	100.7					
11/18/09	8910	D	225	N	229219.3	E 2901633.2	17.3	111.4	101.5					
11/18/09	8894	D	226	N	229184.6	E 2901566.1	22.3	102.6	99.4					
11/18/09	8894	D	227	N	229090.5	E 2901584.2	22.6	101.5	98.4	42	23	76	3.53E-08	
11/18/09	8910	D	228	N	229044.5	E 2901498.9	20.7	104.4	95.1					
11/18/09	8910	D	229	N	228935.9	E 2901520.5	20.1	105.4	96.0					
11/18/09	8910	D	230	N	228897.1	E 2901435.0	19.3	106.7	97.2					
11/18/09	8910	D	231	N	228814.3	E 2901465.1	17.9	111.1	101.2					
11/18/09	8910	D	232	N	228768.6	E 2901392.1	18.6	108.3	98.6					
11/18/09	8801	D	233	N	228696.9	E 2901431.2	19.4	107.1	98.2					
11/18/09	8801	D	234	N	228654.5	E 2901348.9	19.2	107.3	98.4					
11/18/09	8801	D	235	N	228575.3	E 2901379.0	19.4	106.6	97.7					
11/18/09	8801	D	236	N	228533.5	E 2901315.2	19.8	104.8	96.1					
11/18/09	8801	D	237	N	228450.6	E 2901345.3	19.9	104.6	95.9					
11/18/09	8801	D	238	N	228422.9	E 2901262.6	19.8	105.2	96.4					
11/18/09	8801	D	239	N	228350.9	E 2901292.4	18.2	109.8	100.6					
11/18/09	8801	D	240	N	228309.2	E 2901231.7	20.0	108.5	99.5					
11/18/09	8910	D	241	N	228211.8	E 2901262.3	21.1	105.2	95.8					
11/18/09	8910	D	242	N	228177.2	E 2901198.3	20.5	106.5	97.0	42	25	74	1.75E-08	
11/18/09	8910	D	243	N	228098.0	E 2901228.3	21.1	106.8	97.3					
11/18/09	8801	D	244	N	228041.6	E 2901161.8	21.5	104.8	96.1					
11/18/09	8801	D	245	N	227981.0	E 2901209.9	20.9	106.5	97.6					
11/18/09	8928	D	246	N	227903.6	E 2901174.9	19.1	111.4	97.9					
11/18/09	8928	D	247	N	227869.1	E 2901240.8	17.5	112.1	98.5					
12/05/09	8801	D	328	N	229206.9	E 2901973.7	19.8	107.5	98.5					
12/05/09	8801	D	329	N	229215.5	E 2901890.0	20.5	106.6	97.7					
12/05/09	8801	D	330	N	229107.1	E 2901917.7	22.0	105.7	96.9					
12/05/09	8801	D	331	N	229053.2	E 2901814.1	21.5	106.1	97.3					
12/05/09	8910	D	332	N	228930.6	E 2901854.6	20.9	106.4	96.9	36	17	68	5.59E-08	
12/05/09	8801	D	333	N	228899.1	E 2901768.9	21.5	106.0	97.2					
12/05/09	8801	D	334	N	228804.4	E 2901765.3	21.8	105.2	96.4					
12/05/09	8801	D	335	N	228744.3	E 2901699.0	18.8	107.7	98.7					
12/05/09	8801	D	336	N	228614.0	E 2901724.2	19.1	106.8	97.9					
12/05/09	8894	D	337	N	228564.2	E 2901632.8	25.2	99.7	96.6					
12/05/09	8910	D	338	N	228455.1	E 2901639.0	20.5	104.4	95.1	38	22	68	3.12E-08	
12/05/09	8894	D	339	N	228420.1	E 2901556.4	24.5	101.0	97.9					
12/05/09	8801	D	340	N	228322.7	E 2901587.0	18.5	107.7	98.7					
12/05/09	8894	D	341	N	228280.2	E 2901498.5	20.6	104.8	101.6					
12/05/09	8894	D	342	N	228201.2	E 2901537.8	24.7	102.1	98.9					
12/05/09	8894	D	343	N	228234.8	E 2901437.9	22.3	103.0	99.8					
12/05/09	8894	D	344	N	228325.1	E 2901410.6	21.3	103.6	100.4					
12/05/09	8894	D	345	N	228374.8	E 2901498.9	23.3	101.5	98.4					
12/05/09	8894	D	346	N	228453.7	E 2901456.5	23.8	100.2	97.1					
12/05/09	8894	D	347	N	228518.1	E 2901547.5	24.6	99.4	96.3					
12/05/09	8895	D	348	N	228645.8	E 2901559.4	24.0	100.4	101.7	41	24	74	7.17E-08	
12/05/09	8894	D	349	N	228677.0	E 2901632.8	22.3	101.1	98.0					

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
12/05/09	8894	D	350	N 228770.9	E	2901608.5	21.0	102.4	99.2					
12/05/09	8894	D	351	N 228828.2	E	2901705.9	22.2	103.0	99.8					
12/05/09	8894	D	352	N 228962.1	E	2901677.4	20.6	102.4	99.2					
12/05/09	8894	D	353	N 229008.5	E	2901775.1	21.0	104.1	100.9					
12/05/09	8801	D	354	N 229069.6	E	2901748.7	20.4	104.7	96.0	39	28	78	2.53E-08	
12/05/09	8894	D	355	N 229122.2	E	2901806.0	21.5	102.3	99.1					
12/05/09	8894	D	356	N 229208.8	E	2901781.9	24.4	101.5	98.4					
12/05/09	8894	D	357	N 229226.0	E	2901874.2	22.7	100.6	97.5					
12/05/09	8894	D	358	N 229297.7	E	2901835.1	25.7	99.5	96.4					
12/05/09	8894	D	359	N 229299.7	E	2901776.3	24.2	100.7	97.6					
12/05/09	8894	D	360	N 229261.3	E	2901706.2	23.9	100.6	97.5					
12/05/09	8894	D	361	N 229167.4	E	2901730.5	25.1	100.9	97.8					
12/05/09	8801	D	362	N 229099.9	E	2901661.2	21.2	105.5	96.7	49	30	70	7.89E-08	
12/05/09	8801	D	363	N 229055.0	E	2901616.1	21.1	105.1	96.3					
12/05/09	8894	D	364	N 228953.9	E	2901643.7	20.7	103.0	99.8					
12/05/09	8894	D	365	N 228900.1	E	2901543.1	22.5	101.3	98.2					
12/05/09	8894	D	366	N 228791.1	E	2901549.2	21.2	102.6	99.4					
12/05/09	8894	D	367	N 228734.5	E	2901476.6	22.5	101.4	98.3					
12/05/09	8894	D	368	N 228640.1	E	2901485.4	22.2	101.4	98.3					
12/05/09	8894	D	369	N 228576.4	E	2901419.1	21.3	103.9	100.7					
12/05/09	8910	D	370	N 228503.8	E	2901424.2	20.2	104.3	95.0	37	17	83	1.51E-08	
12/05/09	8894	D	371	N 228462.1	E	2901366.6	19.5	103.9	100.7					
12/05/09	8894	D	372	N 228386.6	E	2901399.7	20.4	101.0	97.9					
12/05/09	8894	D	373	N 228344.5	E	2901323.5	19.7	101.6	98.4					
12/05/09	8894	D	374	N 228258.2	E	2901363.0	20.6	102.6	99.4					
12/21/09	8928	D	479	N 228206.2	E	2901587.1	17.2	108.7	95.5					
12/21/09	8928	D	480	N 228306.6	E	2901661.6	18.7	109.4	96.1					
12/21/09	8928	D	481	N 228430.5	E	2901670.6	17.8	112.3	98.7					
12/21/09	8910	D	482	N 228509.3	E	2901755.0	19.7	107.1	97.5					
12/21/09	8910	D	483	N 228640.2	E	2901751.3	19.2	108.7	99.0					
12/21/09	9405	D	484	N 228716.1	E	2901860.5	22.1	103.0	98.8					
12/21/09	9405	D	485	N 228880.2	E	2901874.5	23.1	102.2	98.0	38	22	61	1.78E-08	
12/21/09	8894	D	486	N 228933.4	E	2901956.6	24.7	99.2	96.1					
12/21/09	9405	D	487	N 229067.7	E	2901943.5	24.1	101.6	97.4					
12/21/09	8894	D	488	N 229121.2	E	2902034.8	24.0	102.1	98.9					
12/21/09	8894	D	489	N 229219.0	E	2902016.7	23.3	99.2	96.1					
12/21/09	8894	D	490	N 229177.4	E	2902092.0	22.7	100.9	97.8					
12/21/09	8894	D	491	N 229070.5	E	2902042.4	23.0	101.7	98.5					
12/21/09	8910	D	492	N 228953.5	E	2902024.0	19.7	107.5	97.9					
12/21/09	8910	D	493	N 228860.5	E	2901952.4	19.7	106.6	97.1					
12/21/09	8910	D	494	N 228748.2	E	2901971.0	20.7	106.1	96.6					
12/21/09	8910	D	495	N 228669.9	E	2901902.0	18.9	106.8	97.3					
12/21/09	8910	D	496	N 228591.6	E	2901833.1	20.6	105.9	96.4					
12/21/09	8910	D	497	N 228497.0	E	2901835.7	20.2	107.4	97.8	43	24	79	5.06E-08	
12/21/09	8896	D	498	N 228417.2	E	2901847.2	22.6	100.7	100.3					
12/21/09	8896	D	499	N 228363.7	E	2901752.8	24.4	99.4	99.0					
12/21/09	8896	D	500	N 228255.0	E	2901771.3	23.4	100.8	100.4					
12/21/09	8896	D	501	N 228212.3	E	2901676.6	23.0	98.7	98.3					

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
12/21/09	8896	D	502	N 228137.1	E	2901718.9	22.0	100.6	100.2					
12/22/09	9405	D	503	N 228092.1	E	2901803.7	22..5	100.2	96.1					
12/22/09	9405	D	504	N 228148.9	E	2901882.5	23.9	99.6	95.5					
12/22/09	9405	D	505	N 228191.2	E	2901964.8	21.0	102.9	98.7					
12/22/09	9405	D	506	N 228241.0	E	2902053.1	21.5	102.1	97.9					
12/22/09	9405	D	507	N 228343.8	E	2902084.3	23.4	99.8	95.7					
12/22/09	9405	D	508	N 228319.1	E	2901982.9	23.2	100.5	96.4					
12/22/09	9405	D	509	N 228261.6	E	2901879.4	22.8	100.3	96.2					
12/22/09	9405	D	510	N 228352.5	E	2901873.7	21.7	99.3	95.2					
12/22/09	9405	D	511	N 228384.2	E	2901968.7	22.8	101.6	97.4					
12/22/09	9405	D	512	N 228444.3	E	2902035.1	21.1	105.3	101.0					
12/22/09	9405	D	513	N 228463.9	E	2901954.1	23.0	104.1	99.8	40	19	71	4.01E-08	
12/22/09	9405	D	514	N 228429.4	E	2901890.2	22.7	103.0	98.8					
12/22/09	9405	D	515	N 228540.4	E	2901958.2	22.7	102.4	98.2					
12/22/09	9405	D	516	N 228561.3	E	2902053.5	22.7	99.3	95.2					
12/22/09	9405	D	517	N 228614.2	E	2901993.3	23.2	99.5	95.4					
12/22/09	9405	D	518	N 228683.6	E	2902003.7	22.7	103.2	98.9					
12/22/09	9405	D	519	N 228804.6	E	2902034.4	23.0	103.2	98.9					
03/06/10	8894	D	692	N 228238.0	E	2901289.4	24.2	98.6	95.5					
03/06/10	8894	D	693	N 228154.0	E	2901279.3	24.5	98.9	95.8					
03/06/10	9405	D	694	N 228062.7	E	2901269.5	19.8	103.5	99.2					
03/06/10	9405	D	695	N 227986.0	E	2901259.2	19.1	103.7	99.4					
03/06/10	8894	D	696	N 227903.2	E	2901292.5	23.3	101.3	98.2					
03/06/10	9405	D	697	N 227991.6	E	2901330.2	19.4	101.8	97.6					
03/06/10	9405	D	698	N 228057.4	E	2901337.7	20.9	104.3	100.0					
03/06/10	9405	D	699	N 228130.7	E	2901357.3	21.8	100.8	96.6					
03/06/10	8895	D	700	N 228176.8	E	2901445.7	24.2	98.5	99.8					
03/06/10	9405	D	701	N 228056.0	E	2901421.2	20.0	105.3	101.0					
03/06/10	9405	D	702	N 227931.6	E	2901396.8	21.1	103.1	98.8					
03/06/10	8895	D	703	N 227999.2	E	2901472.3	27.3	96.6	97.9					
03/06/10	8895	D	704	N 228094.5	E	2901497.4	27.1	97.2	98.5	45	28	56	1.42E-08	
03/06/10	9405	D	705	N 228144.4	E	2901588.8	21.0	103.9	99.6					
03/06/10	9405	D	706	N 228026.7	E	2901545.7	20.7	105.0	100.7					
03/06/10	9405	D	707	N 228050.7	E	2901622.4	22.5	100.8	96.6					
03/06/10	8895	D	708	N 228071.4	E	2901711.5	23.3	99.3	100.6					
08/09/10	8895	D-P	1	N 229500.1	E	2901786.2	23.0	97.9	99.2	39	20	77	3.02E-08	
08/10/10	8895	D-P	2	N 228833.7	E	2901248.1	24.5	94.2	95.4					
08/10/10	9405	D-P	3	N 229090.8	E	2901330.6	19.7	100.6	96.5					
08/10/10	9405	D-P	4	N 229157.5	E	2901375.2	19.7	101.8	97.6					
08/10/10	9405	D-P	5	N 229370.8	E	2901452.7	22.3	104.4	100.1					
08/10/10	8895	D-P	34	N 229540.7	E	2901543.9	28.0	95.0	96.3					
08/10/10	9405	D-P	6	N 229483.9	E	2901727.9	21.4	103.6	99.3					
08/10/10	8895	D-P	7	N 229443.2	E	2901834.2	27.0	96.2	97.5					
08/10/10	9405	D-P	8	N 229390.9	E	2902045.9	20.6	101.4	97.2					
08/10/10	9405	D-P	9	N 229283.2	E	2902231.3	18.7	102.1	97.9					
09/03/10	8910	D-P	67	N 229196.9	E	2902400.7	19.2	106.6	97.1					
09/03/10	9405	D-P	68	N 228910.7	E	2902315.9	18.4	103.7	99.4					
09/16/10	8895	D-P	75	N 228487.5	E	2901229.9	23.9	97.2	98.5	43	23	89	1.77E-08	

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/01/10	8895	D-P	77	N	228619.5	E 2902314.7	28.9	97.1	98.4					
10/01/10	9405	D-P	78	N	228489.9	E 2902367.8	20.1	106.1	101.7					
10/01/10	8895	D-P	79	N	228298.5	E 2902419.5	26.9	95.2	96.5					
10/01/10	8895	D-P	80	N	228286.7	E 2902518.8	25.8	94.7	95.9					
10/01/10	9405	D-P	81	N	228200.0	E 2902672.7	23.5	99.8	95.7					
10/01/10	8895	D-P	82	N	228116.5	E 2902551.4	23.2	98.1	99.4	39	18	91	4.96E-08	
10/01/10	8895	D-P	83	N	228009.1	E 2902353.3	24.6	97.7	99.0					
10/01/10	9405	D-P	84	N	227921.9	E 2902225.9	21.7	102.8	98.6					
10/01/10	9405	D-P	85	N	227861.2	E 2902008.0	23.0	102.2	98.0					
10/01/10	8895	D-P	86	N	227728.8	E 2901826.1	24.8	97.3	98.6					
10/01/10	8895	D-P	87	N	227682.5	E 2901601.7	25.5	96.7	98.0					
10/01/10	9405	D-P	88	N	227549.8	E 2901277.5	23.7	104.0	99.7					
10/01/10	8895	D-P	89	N	227509.5	E 2901136.4	26.7	98.1	99.4					
10/01/10	8895	D-P	90	N	227638.4	E 2901061.7	27.8	97.8	99.1	47	26	85	2.42E-08	
10/01/10	8895	D-P	91	N	227794.6	E 2901048.1	29.1	96.1	97.4					
10/01/10	9405	D-P	92	N	227945.4	E 2900975.9	21.3	104.6	100.3					
10/01/10	9405	D-P	93	N	228007.5	E 2900983.4	23.5	99.8	95.7					
10/01/10	9405	D-P	94	N	228301.5	E 2901086.6	23.0	104.0	99.7					
10/01/10	9405	D-P	95	N	228473.7	E 2901128.2	20.8	102.5	98.3					
10/01/10	9405	D-P	96	N	228661.7	E 2901212.7	23.3	102.0	97.8					
10/08/10	9405	D-P	212	N	229600.6	E 2901582.2	20.8	102.5	98.3					
10/08/10	8895	D-P	213	N	229558.7	E 2901678.3	28.9	97.1	98.4					
10/08/10	8895	D-P	214	N	229461.8	E 2901920.7	23.2	98.1	99.4					
10/08/10	9405	D-P	215	N	229389.2	E 2901973.9	21.5	102.1	97.9					
10/08/10	9405	D-P	216	N	229347.4	E 2902137.7	22.7	103.2	98.9					
10/08/10	9405	D-P	217	N	229282.2	E 2902341.4	21.1	105.3	101.0					
10/08/10	9405	D-P	218	N	229087.1	E 2902397.2	23.2	99.5	95.4					
10/08/10	9405	D-P	219	N	228975.4	E 2902358.5	23.2	100.5	96.4					
10/08/10	8895	D-P	220	N	228820.6	E 2902344.2	27.0	95.4	96.7					
10/08/10	9405	D-P	221	N	228726.9	E 2902308.4	22.0	102.1	97.9					
10/08/10	9405	D-P	222	N	228592.8	E 2902373.1	21.1	103.0	98.8					
10/08/10	8895	D-P	223	N	228433.9	E 2902425.1	26.2	97.4	98.7					
10/08/10	9405	D-P	224	N	228369.5	E 2902406.6	20.0	105.3	101.0					
10/08/10	9405	D-P	225	N	228278.1	E 2902585.5	21.3	103.8	99.5					
10/08/10	9405	D-P	226	N	228205.4	E 2902492.2	20.1	103.6	99.3					
10/08/10	9405	D-P	227	N	228170.2	E 2902603.5	21.0	105.1	100.8					
10/08/10	9405	D-P	228	N	228075.9	E 2902625.6	22.3	102.7	98.5					
10/08/10	8910	D-P	229	N	228052.2	E 2902475.1	17.7	107.0	97.4					
10/08/10	9405	D-P	230	N	227940.0	E 2902325.2	22.3	103.2	98.9					
10/08/10	9405	D-P	231	N	227855.0	E 2902136.7	19.7	104.6	100.3					
10/08/10	9405	D-P	232	N	227776.9	E 2901943.5	23.7	100.0	95.9					
10/08/10	9405	D-P	233	N	227731.8	E 2901707.5	21.6	101.8	97.6					
10/08/10	9405	D-P	234	N	227594.2	E 2901527.3	23.8	100.4	96.3					
10/08/10	9405	D-P	235	N	227594.1	E 2901391.3	24.6	100.3	96.2					
10/08/10	9405	D-P	236	N	227476.8	E 2901228.9	23.0	102.2	98.0					
10/08/10	9405	D-P	237	N	227601.6	E 2901120.5	21.4	103.7	99.4					
10/08/10	9405	D-P	238	N	227727.2	E 2901047.2	22.6	103.0	98.8					
10/08/10	8910	D-P	239	N	227858.8	E 2900972.7	20.3	104.7	95.4					

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/08/10	9405	D-P	240	N	228072.8	E 2900939.6	22.3	101.8	97.6					
10/08/10	9405	D-P	241	N	228199.6	E 2900985.1	21.3	99.3	95.2					
10/08/10	9405	D-P	242	N	228254.2	E 2901039.2	21.6	102.7	98.5					
10/08/10	9405	D-P	243	N	228411.5	E 2901102.8	22.5	102.3	98.1					
10/08/10	8910	D-P	244	N	228600.4	E 2901137.6	16.7	109.7	99.9					
10/08/10	9405	D-P	245	N	228766.1	E 2901204.5	21.0	102.8	98.6					
10/08/10	9405	D-P	246	N	228919.4	E 2901262.6	23.6	100.2	96.1					
10/08/10	9405	D-P	247	N	229017.7	E 2901351.1	21.0	103.4	99.1					
10/08/10	9405	D-P	248	N	229167.1	E 2901408.3	24.7	99.8	95.7					
10/08/10	9405	D-P	249	N	229305.7	E 2901466.2	20.7	102.7	98.5					
10/08/10	9405	D-P	250	N	229420.1	E 2901512.4	20.9	104.3	100.0					
10/08/10	9405	D-P	251	N	229500.8	E 2901499.9	22.0	102.1	97.9					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/08/09	8801	D	58	N 228351.5	E	2902362.4	20.7	104.6	95.9	43	25	67	5.38E-08	
11/08/09	8801	D	59	N 228255.1	E	2902297.0	22.9	103.6	95.0					
11/08/09	8801	D	60	N 228236.6	E	2902418.1	22.1	104.5	95.8					
11/08/09	8801	D	61	N 228439.0	E	2902236.2	20.5	105.3	96.5					
11/08/09	8801	D	62	N 228535.6	E	2902307.8	22.0	104.7	96.0					
11/08/09	8801	D	63	N 228598.8	E	2902225.6	21.9	105.6	96.8					
11/09/09	8910	D	64	N 228000.4	E	2902038.1	22.6	106.0	96.5	38	22	63	4.88E-08	
11/09/09	8801	D	65	N 227940.6	E	2902114.0	21.7	105.4	96.6					
11/09/09	8801	D	66	N 228043.5	E	2902148.3	21.5	104.3	95.6					
11/09/09	8801	D	67	N 228003.1	E	2902266.9	20.3	106.9	98.0					
11/09/09	8801	D	68	N 228109.1	E	2902282.5	22.1	103.8	95.1					
11/09/09	8801	D	69	N 228049.7	E	2902373.9	23.0	104.2	95.5					
11/09/09	8801	D	70	N 228170.9	E	2902413.8	19.7	107.4	98.4					
11/10/09	8894	D	71	N 227742.4	E	2901399.0	21.5	102.3	99.1	47	28	78	6.80E-08	
11/10/09	8894	D	72	N 227941.1	E	2901869.7	22.4	102.4	99.2					
11/10/09	8894	D	73	N 227831.4	E	2901851.1	22.0	101.5	98.4					
11/10/09	8801	D	74	N 227890.0	E	2901732.0	20.2	108.0	99.0					
11/10/09	8801	D	75	N 227765.0	E	2901686.0	20.5	106.5	97.6					
11/10/09	8801	D	76	N 227796.9	E	2901524.3	19.0	108.5	99.5					
11/10/09	8894	D	77	N 227694.4	E	2901505.5	24.2	100.4	97.3					
11/10/09	8894	D	78	N 227635.7	E	2901355.6	22.8	101.3	98.2					
11/10/09	8894	D	79	N 227695.2	E	2901270.4	23.8	101.3	98.2					
11/10/09	8910	D	80	N 228055.7	E	2901016.1	19.6	106.7	97.2	39	21	74	4.25E-08	
11/10/09	8894	D	81	N 227592.9	E	2901257.8	27.2	98.9	95.8					
11/10/09	8894	D	82	N 227612.4	E	2901173.8	26.5	99.5	96.4					
11/10/09	8894	D	83	N 227708.1	E	2901211.3	24.1	101.3	98.2					
11/10/09	8894	D	84	N 227774.2	E	2901101.2	23.7	100.1	97.0					
11/11/09	8801	D	85	N 227910.0	E	2901140.8	20.5	105.2	96.4					
11/11/09	8894	D	86	N 227986.1	E	2900999.5	23.3	101.8	98.6					
11/11/09	8894	D	87	N 228058.4	E	2901111.9	24.1	100.9	97.8					
11/11/09	8894	D	88	N 228109.3	E	2901110.5	22.9	101.8	98.6					
11/11/09	8894	D	89	N 228157.3	E	2901137.0	21.4	104.2	101.0					
11/11/09	8894	D	90	N 228213.7	E	2901070.5	21.2	104.9	101.6					
11/11/09	8801	D	91	N 227733.6	E	2901606.4	20.2	106.5	97.6					
11/12/09	8801	D	131	N 228679.7	E	2902254.3	20.1	108.0	99.0					
11/12/09	8801	D	132	N 228718.1	E	2902194.5	20.0	108.6	99.5					
11/12/09	8801	D	133	N 228785.5	E	2902263.7	20.8	108.0	99.0					
11/12/09	8801	D	134	N 228856.0	E	2902181.4	18.7	110.5	101.3					
11/12/09	8801	D	135	N 228908.7	E	2902244.8	18.6	107.6	98.6					
11/12/09	8801	D	136	N 228984.1	E	2902208.7	18.5	106.1	97.3					
11/12/09	8801	D	137	N 229033.6	E	2902284.7	21.7	104.3	95.6	47	30	71	1.64E-08	
11/12/09	8801	D	138	N 229081.6	E	2902311.2	21.7	104.5	95.8					
11/12/09	8801	D	139	N 229149.4	E	2902262.9	22.0	104.6	95.9					
11/12/09	8801	D	140	N 229173.5	E	2902342.6	18.8	108.3	99.3					
11/14/09	8801	D	168	N 228228.0	E	2902239.0	21.8	104.0	95.3					
11/14/09	8801	D	169	N 228117.7	E	2902201.9	22.3	104.3	95.6					
11/14/09	8801	D	170	N 228162.0	E	2902092.4	20.7	106.0	97.2					
11/14/09	8801	D	171	N 228065.8	E	2902033.2	21.6	105.2	96.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/14/09	8801	D	172	N	228102.2	E 2901905.4	19.9	104.4	95.7					
11/14/09	8801	D	173	N	227988.3	E 2901865.3	18.3	107.0	98.1					
11/14/09	8801	D	174	N	227999.9	E 2901759.8	17.6	106.7	97.8	54	37	77	2.40E-08	
11/14/09	8801	D	175	N	227982.7	E 2901664.4	18.3	108.5	99.5					
11/14/09	8801	D	176	N	227887.7	E 2901651.6	18.0	108.1	99.1					
11/14/09	8801	D	177	N	227928.3	E 2901539.2	19.2	107.6	98.6					
11/14/09	8801	D	178	N	227817.0	E 2901464.9	17.9	108.5	99.5					
11/14/09	8801	D	179	N	227833.4	E 2901399.6	19.5	108.0	99.0					
11/14/09	8801	D	180	N	227846.3	E 2901340.4	18.7	108.2	99.2					
11/14/09	8801	D	181	N	227746.4	E 2901281.4	20.7	105.0	96.2					
11/14/09	8801	D	183	N	228689.6	E 2901301.6	20.5	104.8	96.1	41	24	72	8.71E-08	
11/18/09	8801	D	195	N	228287.1	E 2901223.1	19.8	107.2	98.3					
11/18/09	8801	D	196	N	228341.1	E 2901203.0	19.2	107.9	98.9					
11/18/09	8801	D	197	N	228427.1	E 2901154.2	20.0	106.8	97.9					
11/18/09	8801	D	198	N	228416.3	E 2901157.6	18.7	108.9	99.8					
11/18/09	8801	D	199	N	228469.8	E 2901248.9	19.6	104.4	95.7					
11/18/09	8801	D	200	N	228552.4	E 2901209.5	19.5	104.2	95.5					
11/18/09	8801	D	201	N	228591.4	E 2901304.3	19.4	105.1	96.3					
11/18/09	8801	D	202	N	228684.9	E 2901261.5	19.3	105.0	96.2					
11/18/09	8801	D	203	N	228712.7	E 2901347.3	19.7	107.0	98.1					
11/18/09	8801	D	204	N	228802.7	E 2901310.8	21.3	105.2	96.4					
11/18/09	8801	D	205	N	228873.7	E 2901376.9	21.3	105.4	96.6					
11/18/09	8801	D	206	N	228968.5	E 2901383.5	22.5	104.7	96.0					
11/18/09	8801	D	207	N	229083.9	E 2901476.2	21.3	106.2	97.3					
11/18/09	8801	D	208	N	229174.5	E 2901464.4	19.3	107.8	98.8					
11/18/09	8801	D	209	N	229252.6	E 2901524.0	19.8	107.2	98.3					
11/18/09	8801	D	210	N	229357.9	E 2901514.9	20.2	107.1	98.2					
11/18/09	8801	D	211	N	229392.9	E 2901594.4	19.3	108.1	99.1					
11/18/09	8801	D	212	N	229487.3	E 2901585.6	21.8	105.1	96.3					
11/18/09	8801	D	213	N	229438.9	E 2901679.7	20.3	107.2	98.3	39	22	69	1.84E-08	
11/18/09	8801	D	214	N	229382.0	E 2901727.6	22.3	104.5	95.8					
11/18/09	8801	D	215	N	229413.1	E 2901797.9	18.5	108.6	99.5					
11/18/09	8801	D	216	N	229341.8	E 2901852.4	20.1	107.8	98.8					
11/18/09	8801	D	217	N	229362.1	E 2901929.2	18.3	109.7	100.5					
11/18/09	8801	D	218	N	229287.1	E 2901980.7	18.6	108.6	99.5					
11/18/09	8928	D	219	N	229380.3	E 2902058.6	17.7	111.1	97.6					
11/18/09	8928	D	220	N	229225.6	E 2902121.6	17.4	111.8	98.2					
11/18/09	8928	D	221	N	229260.7	E 2902207.2	18.9	109.8	96.5	39	22	73	8.39E-08	
11/18/09	8801	D	222	N	229155.9	E 2902234.9	19.0	109.8	100.6					
01/06/10	9405	D	545	N	229223.1	E 2902035.1	22.5	102.3	98.1					
01/06/10	9405	D	546	N	229150.6	E 2902043.3	20.8	103.8	99.5					
01/06/10	9405	D	547	N	229112.0	E 2901964.0	24.2	99.5	95.4					
01/06/10	9405	D	548	N	229007.1	E 2901988.5	21.7	102.9	98.7					
01/06/10	9405	D	549	N	228950.2	E 2901903.5	21.3	103.8	99.5					
01/06/10	9405	D	550	N	228863.2	E 2901918.3	23.2	100.4	96.3	42	22	85	8.91E-08	
01/06/10	9405	D	551	N	228806.5	E 2901839.5	24.3	99.9	95.8					
01/06/10	9405	D	552	N	228719.8	E 2901863.5	24.2	99.5	95.4					
01/06/10	9405	D	553	N	228663.3	E 2901794.0	23.0	102.2	98.0					
01/06/10	9405	D	554	N	228565.2	E 2901799.8	22.1	101.9	97.7					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
01/06/10	9405	D	555	N	228519.1	E 2901714.5	20.7	103.8	99.5					
01/06/10	9405	D	556	N	228425.4	E 2901748.0	23.7	101.2	97.0					
01/06/10	9405	D	557	N	228397.5	E 2901659.1	22.3	101.8	97.6	38	19	73	7.49E-08	
01/06/10	9405	D	558	N	228311.0	E 2901689.3	23.4	101.2	97.0					
01/06/10	9405	D	559	N	228287.0	E 2901612.7	20.8	103.0	98.8					
01/06/10	9405	D	560	N	228196.4	E 2901627.6	21.6	102.9	98.7					
01/06/10	9405	D	561	N	228179.9	E 2901556.9	23.0	100.3	96.2					
01/14/10	8801	D	581	N	229218.5	E 2901868.2	20.1	104.3	95.6					
01/14/10	8801	D	582	N	229168.5	E 2901770.7	21.6	104.4	95.7					
01/14/10	8801	D	583	N	229067.7	E 2901810.6	20.0	104.8	96.1					
01/14/10	9410	D	584	N	229024.9	E 2901712.8	25.3	95.0	96.4					
01/14/10	9410	D	585	N	228916.7	E 2901746.7	25.1	95.9	97.4					
01/14/10	9410	D	586	N	228870.5	E 2901655.3	25.4	96.0	97.5					
01/14/10	9410	D	587	N	228762.1	E 2901683.0	25.5	97.5	99.0					
01/14/10	9410	D	588	N	228715.5	E 2901579.2	24.5	98.6	100.1	51	30	79	4.61E-08	
01/14/10	9410	D	589	N	228667.1	E 2901540.3	25.5	95.8	97.3					
01/14/10	9410	D	590	N	228573.8	E 2901586.2	24.6	98.3	99.8					
01/14/10	9410	D	591	N	228535.1	E 2901503.8	25.7	96.2	97.7					
01/14/10	9410	D	599	N	228430.0	E 2901519.1	23.9	98.3	99.8					
01/14/10	9410	D	600	N	228395.0	E 2901439.6	23.1	98.6	100.1					
01/14/10	9410	D	601	N	228293.7	E 2901461.0	24.0	98.4	99.9					
01/14/10	9410	D	602	N	228247.9	E 2901384.9	25.0	99.3	100.8					
01/28/10	8910	D	626	N	229221.1	E 2901960.9	21.3	104.3	95.0					
01/28/10	8910	D	627	N	229186.4	E 2901890.8	20.7	107.4	97.8					
01/28/10	8910	D	628	N	229088.9	E 2901918.2	19.4	107.2	97.6					
01/28/10	8928	D	629	N	229038.9	E 2901820.7	19.3	110.1	96.7					
01/28/10	8928	D	630	N	228959.7	E 2901853.8	20.0	109.7	96.4	42	26	71	1.74E-08	
01/28/10	8910	D	631	N	228906.5	E 2901771.8	22.6	104.7	95.4					
01/28/10	8910	D	632	N	228790.5	E 2901787.4	22.2	105.3	95.9					
01/28/10	9405	D	633	N	228729.5	E 2901690.1	22.5	103.4	99.1					
01/28/10	9405	D	634	N	228617.4	E 2901714.9	22.8	104.6	100.3					
01/28/10	8910	D	635	N	228538.2	E 2901615.0	21.4	106.3	96.8					
01/28/10	9405	D	636	N	228447.9	E 2901639.2	22.1	102.8	98.6					
01/28/10	9405	D	637	N	228379.7	E 2901545.2	22.5	103.4	99.1	47	29	70	8.03E-08	
01/28/10	9405	D	638	N	228282.0	E 2901563.4	21.6	104.4	100.1					
01/28/10	9405	D	639	N	228254.5	E 2901489.9	24.5	99.9	95.8					
01/28/10	9405	D	640	N	228193.9	E 2901534.9	23.0	101.0	96.8					
02/22/10	9405	D	647	N	229152.3	E 2902105.1	21.0	100.2	96.1					
02/22/10	9405	D	648	N	229073.6	E 2902153.7	21.3	99.3	95.2					
02/22/10	9405	D	649	N	229019.1	E 2902158.3	21.8	100.6	96.5					
02/22/10	9405	D	650	N	229006.1	E 2902081.3	20.5	103.9	99.6					
02/22/10	8910	D	651	N	228956.8	E 2902011.6	17.5	110.7	100.8					
02/22/10	9405	D	652	N	228917.9	E 2902052.9	20.5	102.2	98.0					
02/22/10	8894	D	653	N	228893.8	E 2902103.0	23.5	101.5	98.4	52	31	80	6.31E-08	
02/22/10	9405	D	654	N	228818.3	E 2902136.0	20.5	100.5	96.4					
02/22/10	8910	D	655	N	228808.7	E 2902049.7	16.7	109.7	99.9					
02/22/10	8910	D	656	N	228810.0	E 2901966.2	18.6	107.2	97.6					
02/22/10	9405	D	657	N	228727.0	E 2901993.2	19.3	102.0	97.8					
02/22/10	9405	D	658	N	228681.5	E 2902056.3	21.0	102.8	98.6					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
02/22/10	9405	D	659	N	228616.7	E 2902082.9	22.1	101.6	97.4					
02/22/10	8910	D	660	N	228595.8	E 2901984.5	18.0	105.3	95.9					
02/22/10	8910	D	661	N	228607.5	E 2901882.1	18.1	108.7	99.0					
02/22/10	8910	D	662	N	228530.8	E 2901871.9	18.1	108.0	98.4	38	20	81	7.02E-08	
02/22/10	8910	D	663	N	228514.4	E 2901937.3	17.7	107.0	97.4					
02/22/10	8910	D	664	N	228464.8	E 2901988.1	16.8	106.2	96.7					
02/22/10	9405	D	665	N	228426.4	E 2901915.0	21.1	103.0	98.8					
02/22/10	8910	D	666	N	228448.9	E 2901809.2	19.0	105.9	96.4					
02/22/10	9405	D	667	N	228372.8	E 2901817.5	20.0	105.3	101.0					
02/22/10	9405	D	668	N	228335.2	E 2901905.1	23.8	100.8	96.6					
02/22/10	9405	D	669	N	228254.8	E 2901895.0	20.2	103.7	99.4					
02/22/10	9405	D	670	N	228259.5	E 2901802.1	22.0	102.1	97.9					
02/22/10	8910	D	671	N	228253.5	E 2901715.7	17.0	107.0	97.4					
02/22/10	9405	D	672	N	228180.6	E 2901714.6	22.5	101.3	97.1					
02/22/10	8910	D	673	N	228134.9	E 2901771.6	17.8	106.6	97.1	39	21	72	2.85E-08	
02/22/10	9405	D	674	N	228130.5	E 2901873.7	20.7	102.7	98.5					
03/08/10	8801	D	709	N	229297.5	E 2901699.1	20.6	104.2	95.5					
03/08/10	9405	D	710	N	229196.9	E 2901745.1	21.0	103.4	99.1					
03/08/10	8894	D	711	N	229154.1	E 2901647.4	24.4	98.6	95.5					
03/08/10	8894	D	712	N	229049.5	E 2901681.2	22.5	100.7	97.6					
03/08/10	9405	D	713	N	228995.9	E 2901583.7	19.7	104.6	100.3					
03/08/10	8894	D	714	N	228912.8	E 2901604.6	22.0	100.6	97.5					
03/08/10	8895	D	715	N	228827.5	E 2901548.2	26.7	96.5	97.8					
03/08/10	8894	D	716	N	228764.5	E 2901509.8	23.1	102.1	98.9	48	28	83	1.25E-08	
03/08/10	8894	D	717	N	228703.2	E 2901530.0	21.8	102.7	99.5					
03/08/10	8895	D	718	N	228653.7	E 2901451.0	25.0	98.2	99.5					
03/08/10	8895	D	719	N	228574.1	E 2901465.6	24.9	98.2	99.5					
03/08/10	8895	D	720	N	228660.1	E 2901419.9	26.2	97.5	98.8					
03/08/10	8895	D	721	N	228476.7	E 2901366.2	23.2	98.8	100.1					
03/08/10	8895	D	722	N	228393.5	E 2901384.0	26.8	96.1	97.4					
03/08/10	8895	D	723	N	228351.7	E 2901320.2	26.4	96.0	97.3					
03/08/10	8895	D	724	N	228283.2	E 2901343.8	26.2	96.8	98.1					
03/13/10	9405	D	725	N	228327.5	E 2901237.4	22.9	102.5	98.3					
03/13/10	8895	D	726	N	228384.4	E 2901319.3	26.6	98.6	99.9					
03/13/10	8895	D	727	N	228459.7	E 2901277.0	27.7	97.3	98.6					
03/13/10	9405	D	728	N	228516.7	E 2901365.1	21.2	104.3	100.0					
03/13/10	8895	D	729	N	228603.0	E 2901328.7	27.2	97.9	99.2					
03/13/10	9405	D	730	N	228660.2	E 2901423.0	22.6	103.4	99.1					
03/13/10	9405	D	731	N	228754.0	E 2901392.5	24.7	100.5	96.4					
03/13/10	9405	D	732	N	228814.6	E 2901477.4	24.6	100.8	96.6					
03/13/10	9405	D	733	N	228934.1	E 2901455.6	23.3	101.9	97.7					
03/13/10	9405	D	734	N	229002.3	E 2901552.6	22.0	103.9	99.6					
03/13/10	9405	D	735	N	229092.1	E 2901509.9	25.1	100.8	96.6					
03/13/10	9405	D	736	N	229138.7	E 2901613.8	24.0	102.5	98.3					
03/13/10	8895	D	737	N	229232.1	E 2901571.0	25.4	98.5	99.8					
03/13/10	8895	D	738	N	229263.8	E 2901662.9	27.2	97.9	99.2					
03/13/10	8895	D	739	N	229353.5	E 2901617.1	27.1	96.2	97.5					
03/13/10	8895	D	740	N	229374.3	E 2901712.4	28.1	96.2	97.5					
03/15/10	9405	D	774	N	228902.1	E 2902139.9	21.3	102.6	98.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/15/10	9405	D	775	N 228822.1	E 2902139.0	24.2	100.3	96.2					
03/15/10	9405	D	776	N 228766.1	E 2902091.1	23.2	99.5	95.4					
03/15/10	9405	D	777	N 228713.6	E 2902163.7	22.9	101.2	97.0					
03/15/10	9405	D	778	N 228660.7	E 2902094.0	20.2	102.5	98.3					
03/15/10	8928	D	779	N 228611.8	E 2902039.7	18.8	109.2	96.0					
03/15/10	9405	D	780	N 228585.5	E 2902139.4	23.1	101.4	97.2					
03/15/10	9405	D	781	N 228506.4	E 2902172.5	19.7	103.6	99.3					
03/15/10	8910	D	782	N 228525.2	E 2902063.8	19.6	105.6	96.2					
03/15/10	8910	D	783	N 228501.4	E 2901993.3	18.9	106.2	96.7	39	20	86	8.00E-08	
03/15/10	8910	D	784	N 228444.0	E 2902155.7	18.8	104.8	95.4					
03/15/10	8928	D	785	N 228383.6	E 2902206.9	18.5	110.0	96.7					
03/15/10	9405	D	786	N 228408.7	E 2902063.9	22.0	100.9	96.7					
03/15/10	9405	D	787	N 228383.6	E 2901947.1	21.2	101.3	97.1					
03/15/10	8910	D	788	N 228320.7	E 2902041.6	18.8	105.2	95.8					
03/15/10	8910	D	789	N 228317.0	E 2902168.5	17.6	106.3	96.8					
03/15/10	8895	D	790	N 228238.4	E 2902090.3	22.6	100.2	101.5					
03/15/10	8895	D	791	N 228274.5	E 2901950.1	23.4	98.4	99.7					
03/15/10	9405	D	792	N 228225.4	E 2901883.5	25.3	99.1	95.0					
03/15/10	9405	D	793	N 228203.0	E 2901995.4	23.8	100.3	96.2					
03/15/10	9405	D	794	N 228137.7	E 2901870.4	24.0	99.8	95.7					
03/15/10	9405	D	795	N 228269.1	E 2901229.7	20.2	102.8	98.6					
03/15/10	8928	D	796	N 228242.6	E 2901323.2	19.6	110.7	97.3					
03/15/10	9405	D	797	N 228202.3	E 2901445.0	21.8	102.1	97.9					
03/15/10	9405	D	798	N 228165.0	E 2901545.0	20.1	104.8	100.5					
03/15/10	9405	D	799	N 228134.7	E 2901632.4	21.9	100.3	96.2					
03/15/10	9405	D	800	N 228097.8	E 2901744.7	19.3	100.5	96.4					
03/15/10	9405	D	801	N 228058.7	E 2901646.9	21.4	101.7	97.5					
03/15/10	9405	D	802	N 228084.5	E 2901528.6	20.4	100.2	96.1					
03/15/10	9405	D	803	N 228120.1	E 2901369.9	18.9	101.7	97.5					
03/15/10	9405	D	804	N 228139.0	E 2901264.3	19.9	99.1	95.0					
03/15/10	9405	D	805	N 228114.5	E 2901169.1	18.8	102.6	98.4					
03/15/10	9405	D	806	N 228048.7	E 2901288.4	21.3	102.6	98.4					
03/15/10	9405	D	807	N 228019.6	E 2901419.1	18.7	100.0	95.9	44	24	72	5.33E-08	
03/15/10	9405	D	808	N 228001.1	E 2901540.2	18.9	100.6	96.5					
03/15/10	9405	D	809	N 227928.4	E 2901412.4	21.5	99.9	95.8					
03/15/10	9405	D	810	N 227939.6	E 2901291.5	21.2	102.4	98.2					
03/15/10	9405	D	811	N 228002.5	E 2901196.9	20.9	102.1	97.9					
03/15/10	9405	D	812	N 227886.4	E 2901209.4	19.6	103.7	99.4					
03/15/10	9405	D	813	N 227863.8	E 2901315.2	19.7	104.0	99.7					
08/10/10	8895	D-P	10	N 228952.3	E 2901325.2	22.4	98.8	100.1					
08/10/10	9405	D-P	11	N 229168.2	E 2901365.6	20.4	101.0	96.8					
08/10/10	8895	D-P	12	N 229297.9	E 2901451.7	27.1	94.6	95.8	50	28	80	5.93E-08	
08/10/10	8895	D-P	13	N 229495.8	E 2901498.7	23.8	97.2	98.5					
08/10/10	8895	D-P	14	N 229554.2	E 2901636.3	28.4	95.9	97.2					
08/10/10	8895	D-P	15	N 229435.0	E 2901930.3	27.1	95.6	96.9					
08/10/10	9405	D-P	16	N 229306.2	E 2902141.0	18.3	103.1	98.8					
08/10/10	8895	D-P	17	N 229264.4	E 2902340.1	25.3	98.3	99.6					
09/03/10	9405	D-P	69	N 229203.5	E 2902375.8	19.6	103.7	99.4					
09/03/10	9405	D-P	70	N 228870.3	E 2902304.7	21.0	102.4	98.2					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/02/10	9405	D-P	97	N 228539.2	E	2902383.2	22.7	103.0	98.8					
10/02/10	9405	D-P	98	N 228451.5	E	2902369.6	22.1	101.6	97.4					
10/02/10	9405	D-P	99	N 228396.8	E	2902439.9	23.8	100.8	96.6					
10/02/10	8895	D-P	100	N 228289.2	E	2902478.5	24.7	95.1	96.4	43	22	83	2.29E-08	
10/02/10	8895	D-P	101	N 228287.8	E	2902567.1	26.9	95.2	96.5					
10/02/10	8895	D-P	102	N 228206.4	E	2902498.5	24.4	95.9	97.2					
10/02/10	9405	D-P	103	N 228198.2	E	2902602.1	23.5	99.8	95.7					
10/02/10	9405	D-P	104	N 228162.5	E	2902762.2	20.1	106.1	101.7					
10/02/10	9405	D-P	105	N 228141.4	E	2902661.7	21.7	103.0	98.8					
10/02/10	8895	D-P	106	N 228061.8	E	2902605.3	24.8	97.1	98.4					
10/02/10	8895	D-P	107	N 228112.5	E	2902527.6	26.2	97.5	98.8					
10/02/10	9405	D-P	108	N 228050.3	E	2902456.3	22.5	100.2	96.1					
10/02/10	9405	D-P	109	N 227973.4	E	2902404.6	21.7	99.3	95.2					
10/02/10	9405	D-P	110	N 227977.8	E	2902299.1	24.1	100.5	96.4					
10/02/10	9405	D-P	111	N 227895.0	E	2902228.5	23.0	100.3	96.2					
10/02/10	8895	D-P	112	N 227913.6	E	2902131.0	25.5	96.7	98.0					
10/02/10	9405	D-P	113	N 227830.5	E	2902079.4	24.4	100.9	96.7					
10/02/10	8895	D-P	114	N 227846.3	E	2901989.2	29.1	96.1	97.4					
10/02/10	9405	D-P	115	N 227766.5	E	2901935.6	23.4	99.8	95.7					
10/02/10	9405	D-P	116	N 227766.4	E	2901820.8	23.0	102.2	98.0					
10/07/10	8910	D-P	197	N 228994.9	E	2902335.2	22.9	104.8	95.4	38	20	83	5.97E-08	
10/07/10	8910	D-P	198	N 227721.3	E	2901687.2	20.4	105.3	95.9	42	20	85	4.72E-08	
10/09/10	9405	D-P	252	N 227705.2	E	2901780.0	21.1	103.0	98.8					
10/09/10	8910	D-P	253	N 227651.1	E	2901654.7	21.5	106.2	96.7					
10/09/10	9405	D-P	254	N 227610.8	E	2901531.6	20.5	102.2	98.0					
10/09/10	9405	D-P	255	N 227586.7	E	2901374.8	24.3	99.9	95.8					
10/09/10	8910	D-P	256	N 227502.2	E	2901274.8	22.1	105.6	96.2					
10/09/10	8910	D-P	257	N 227529.5	E	2901116.8	17.8	106.6	97.1					
10/09/10	9405	D-P	258	N 227646.2	E	2901109.8	22.5	101.4	97.2					
10/09/10	8910	D-P	259	N 227730.2	E	2901028.2	22.1	106.1	96.6					
10/09/10	9405	D-P	260	N 227839.5	E	2901025.5	24.2	99.6	95.5					
10/09/10	8910	D-P	261	N 227922.5	E	2900940.0	20.1	108.7	99.0					
10/09/10	9405	D-P	262	N 228049.8	E	2900984.9	23.5	103.6	99.3					
10/09/10	8910	D-P	263	N 228174.4	E	2900972.1	20.2	109.4	99.6					
10/09/10	8910	D-P	264	N 228253.2	E	2901049.6	20.2	109.3	99.5					
10/09/10	9405	D-P	265	N 228375.1	E	2901054.7	20.7	103.8	99.5					
10/09/10	8910	D-P	266	N 228457.2	E	2901130.1	18.9	110.8	100.9					
10/09/10	8910	D-P	267	N 228584.1	E	2901125.1	19.6	109.6	99.8					
10/09/10	8910	D-P	268	N 228651.2	E	2901212.0	17.1	111.9	101.9					
10/09/10	8910	D-P	269	N 228774.8	E	2901205.5	19.6	109.9	100.1					
10/09/10	8895	D-P	270	N 228881.7	E	2901298.1	27.4	97.4	98.7					
10/09/10	9405	D-P	271	N 228952.3	E	2901325.2	23.3	100.5	96.4					
10/09/10	9405	D-P	272	N 229081.5	E	2901321.2	24.0	101.2	97.0					
10/09/10	8895	D-P	273	N 229238.1	E	2901433.3	24.8	97.3	98.6					
10/09/10	9405	D-P	274	N 229409.9	E	2901452.7	18.9	101.7	97.5					
10/09/10	8910	D-P	275	N 229604.9	E	2901557.4	18.5	109.1	99.4					
10/09/10	8910	D-P	276	N 229482.1	E	2901762.7	19.1	109.0	99.3					
10/09/10	8895	D-P	277	N 229492.2	E	2901841.6	25.5	96.7	98.0					
10/09/10	8910	D-P	278	N 229374.2	E	2902017.1	20.3	104.7	95.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/09/10	8895	D-P	279	N	229335.3	E 2902223.7	24.6	97.7	99.0					
10/09/10	9405	D-P	280	N	229139.4	E 2902411.2	20.2	102.1	97.9					
10/09/10	9405	D-P	281	N	229084.6	E 2902350.8	23.8	100.4	96.3					
10/09/10	9028	D-P	282	N	228810.3	E 2902345.4	26.0	96.2	96.7					
10/09/10	9028	D-P	283	N	228728.8	E 2902306.1	26.9	94.9	95.4					
10/09/10	9405	D-P	284	N	228663.8	E 2902363.6	22.6	101.6	97.4					
10/09/10	9028	D-P	285	N	228597.9	E 2902328.7	23.8	100.0	100.5					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/12/09	8801	D	117	N	227957.9	E 2901949.6	21.5	104.1	95.4					
11/12/09	8801	D	118	N	227935.2	E 2902049.2	20.2	106.3	97.4					
11/12/09	8801	D	119	N	228042.3	E 2902105.0	19.0	106.7	97.8					
11/12/09	8801	D	120	N	228004.5	E 2902186.5	21.8	105.5	96.7	42	24	77	2.09E-08	
11/12/09	8801	D	121	N	228017.4	E 2902257.2	19.0	107.2	98.3					
11/12/09	8801	D	122	N	228120.5	E 2902300.8	20.9	104.6	95.9					
11/12/09	8801	D	123	N	228068.5	E 2902395.0	21.2	106.0	97.2					
11/12/09	8801	D	124	N	228164.4	E 2902441.8	19.9	107.4	98.4					
11/12/09	8801	D	125	N	228208.1	E 2902310.7	21.3	104.8	96.1					
11/12/09	8801	D	126	N	228326.4	E 2902375.4	19.9	107.6	98.6					
11/12/09	8801	D	127	N	228366.8	E 2902256.8	22.7	104.5	95.8					
11/12/09	8801	D	128	N	228466.5	E 2902309.7	21.2	105.4	96.6	48	32	68	3.87E-08	
11/12/09	8801	D	129	N	228525.9	E 2902221.5	21.1	105.0	96.2					
11/12/09	8801	D	130	N	228585.8	E 2902281.6	22.9	107.0	98.1					
11/13/09	8801	D	141	N	228315.0	E 2902227.3	20.2	105.5	96.7					
11/13/09	8801	D	142	N	228235.7	E 2902387.2	21.3	105.5	96.7					
11/13/09	8801	D	143	N	228081.3	E 2902199.8	19.3	107.0	98.1					
11/13/09	8801	D	144	N	227899.5	E 2902204.9	20.0	106.6	97.7					
11/13/09	8801	D	157	N	227941.8	E 2901894.4	21.8	107.4	98.4					
11/13/09	8801	D	158	N	227838.5	E 2901844.7	19.1	105.1	96.3					
11/13/09	8910	D	159	N	227872.1	E 2901744.8	18.7	107.5	97.9					
11/13/09	8910	D	160	N	227779.2	E 2901673.2	18.7	107.9	98.3					
11/13/09	8910	D	161	N	227805.6	E 2901576.6	20.0	107.2	97.6	37	20	97	4.17E-08	
11/13/09	8801	D	162	N	227713.8	E 2901548.2	19.2	104.9	96.2					
11/13/09	8801	D	163	N	227751.2	E 2901454.4	18.9	108.4	99.4					
11/13/09	8801	D	164	N	227647.9	E 2901401.6	18.1	109.2	100.1					
11/13/09	8801	D	165	N	227660.7	E 2901339.4	20.4	106.6	97.7					
11/14/09	8801	D	182	N	227919.1	E 2901078.7	20.6	105.6	96.8	42	24	84	3.84E-08	
11/18/09	8928	D	184	N	227610.2	E 2901223.3	18.5	110.0	96.7					
11/18/09	8928	D	185	N	227669.6	E 2901135.1	18.9	109.8	96.5					
11/18/09	8928	D	186	N	227765.7	E 2901188.1	18.9	109.5	96.2					
11/18/09	8801	D	187	N	227810.0	E 2901078.6	19.1	108.7	99.6					
11/18/09	8801	D	188	N	227930.8	E 2901106.2	22.4	106.1	97.3					
11/18/09	8801	D	189	N	227931.7	E 2901007.2	19.4	108.3	99.3					
11/18/09	8801	D	190	N	228011.0	E 2901110.1	22.4	104.3	95.6					
11/18/09	8801	D	191	N	228074.1	E 2901021.8	19.3	108.5	99.5					
11/18/09	8801	D	192	N	228109.2	E 2901107.4	18.7	108.6	99.5					
11/18/09	8801	D	193	N	228199.3	E 2901074.0	21.0	106.5	97.6					
11/18/09	8801	D	194	N	228205.2	E 2901157.3	19.2	108.8	99.7					
11/19/09	8801	D	248	N	229208.4	E 2902289.1	21.2	106.8	97.9					
11/19/09	8801	D	249	N	229136.4	E 2902318.9	21.1	105.3	96.5					
11/19/09	8801	D	250	N	229083.2	E 2902236.9	22.1	104.5	95.8					
11/19/09	8801	D	251	N	229007.6	E 2902266.8	21.6	106.2	97.3					
11/19/09	8910	D	252	N	228951.1	E 2902197.3	21.4	105.9	96.4	38	20	72	4.62E-08	
11/19/09	8801	D	253	N	228877.7	E 2902177.7	19.6	107.4	98.4					
11/19/09	8894	D	254	N	228817.7	E 2902244.3	22.1	102.5	99.3					
11/19/09	8894	D	255	N	228739.9	E 2902193.9	23.5	101.0	97.9					
11/19/09	8801	D	256	N	228680.1	E 2902269.7	22.4	104.4	95.7					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/19/09	8801	D	257	N 228598.4	E 2902210.2	22.7	104.9	96.2					
11/25/09	8801	D	298	N 228237.9	E 2901156.4	22.0	104.3	95.6					
11/25/09	8801	D	299	N 228313.4	E 2901120.3	21.4	106.5	97.6					
11/25/09	8801	D	300	N 228369.7	E 2901183.7	21.4	105.9	97.1					
11/25/09	8801	D	301	N 228463.8	E 2901162.5	21.1	106.5	97.6					
11/25/09	8801	D	302	N 228495.5	E 2901257.5	21.0	104.4	95.7					
11/25/09	8801	D	303	N 228585.7	E 2901230.2	21.0	105.0	96.2					
11/25/09	8801	D	304	N 228650.1	E 2901321.2	19.4	107.0	98.1					
11/25/09	8910	D	305	N 228743.9	E 2901290.8	20.1	108.0	98.4	38	21	59	9.41E-08	
11/25/09	8801	D	306	N 228800.4	E 2901360.3	19.9	107.0	98.1					
11/25/09	8801	D	307	N 228876.2	E 2901336.6	20.6	107.3	98.4					
11/25/09	8801	D	308	N 228940.3	E 2901415.2	22.3	103.7	95.1					
11/25/09	8801	D	309	N 229012.1	E 2901382.3	20.4	106.5	97.6					
11/25/09	8801	D	310	N 229047.3	E 2901471.0	20.6	106.5	97.6					
11/25/09	8894	D	311	N 229144.5	E 2901431.2	25.8	98.6	95.5					
11/25/09	8894	D	312	N 229190.4	E 2901510.3	27.1	99.0	95.9					
11/25/09	8894	D	313	N 229280.8	E 2901489.2	28.2	98.8	95.7					
11/25/09	8894	D	314	N 229319.2	E 2901562.4	24.9	99.4	96.3					
11/25/09	9405	D	315	N 229398.4	E 2901529.3	24.9	99.1	95.0	39	21	65	9.01E-08	
11/25/09	8894	D	316	N 229315.1	E 2901939.8	26.1	99.8	96.7	54	35	80	1.01E-08	
12/01/09	8801	D	317	N 229170.4	E 2902231.4	20.4	106.1	97.3					
12/01/09	8801	D	318	N 229271.0	E 2902185.3	19.3	106.9	98.0					
12/01/09	8801	D	319	N 229257.2	E 2902080.5	20.4	106.5	97.6					
12/01/09	8801	D	320	N 229339.4	E 2902028.8	22.7	107.4	98.4					
12/01/09	8801	D	321	N 229296.7	E 2901931.0	22.9	107.3	98.4					
12/01/09	8801	D	322	N 229383.4	E 2901906.9	23.2	104.8	96.1					
12/01/09	8801	D	323	N 229397.1	E 2901878.7	22.9	104.1	95.4					
12/01/09	8801	D	324	N 229365.5	E 2901786.8	21.6	107.2	98.3					
12/01/09	8801	D	325	N 229462.2	E 2901731.6	22.0	106.8	97.9					
12/01/09	8801	D	326	N 229437.1	E 2901614.8	20.7	104.9	96.2					
12/01/09	8801	D	327	N 229494.8	E 2901594.6	21.7	104.1	95.4					
03/06/10	9405	D	675	N 228188.9	E 2902274.1	21.6	103.0	98.8					
03/06/10	9405	D	676	N 228199.7	E 2902137.8	19.8	105.6	101.2					
03/06/10	9405	D	677	N 228083.0	E 2902131.7	23.1	103.3	99.0					
03/06/10	9405	D	678	N 228134.9	E 2902034.4	22.2	102.7	98.5					
03/06/10	9405	D	679	N 228033.1	E 2902037.2	20.4	103.7	99.4					
03/06/10	9405	D	680	N 228113.3	E 2901911.3	21.5	103.2	98.9					
03/06/10	9405	D	681	N 227992.3	E 2901877.6	22.0	102.0	97.8	37	21	67	1.20E-08	
03/06/10	9405	D	682	N 228050.8	E 2901755.3	20.1	103.6	99.3					
03/06/10	9405	D	683	N 228261.6	E 2901746.4	19.1	103.9	99.6					
03/06/10	9405	D	684	N 227992.9	E 2901639.4	23.5	102.0	97.8					
03/06/10	9405	D	685	N 227879.5	E 2901617.8	20.1	106.2	101.8					
03/06/10	8910	D	686	N 227927.8	E 2901520.6	16.7	107.2	97.6					
03/06/10	9405	D	687	N 227828.5	E 2901483.2	24.6	100.6	96.5					
03/06/10	8910	D	688	N 227872.8	E 2901376.8	17.6	108.9	99.2	37	23	67	1.31E-08	
03/06/10	8910	D	689	N 227770.7	E 2901367.3	17.3	106.4	96.9					
03/06/10	9405	D	690	N 227823.1	E 2901288.5	21.8	103.0	98.8					
03/06/10	9405	D	691	N 227734.8	E 2901256.9	21.6	101.8	97.6					
03/13/10	9405	D	741	N 229255.9	E 2901904.3	25.1	101.5	97.3					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/13/10	9405	D	742	N 229147.9	E 2901947.5	23.7	101.4	97.2					
03/13/10	9405	D	743	N 229101.5	E 2901846.7	26.0	100.7	96.5					
03/13/10	9405	D	744	N 229022.5	E 2901886.1	23.5	101.2	97.0					
03/13/10	8895	D	745	N 228994.6	E 2901800.2	27.9	94.7	95.9					
03/13/10	9405	D	746	N 228900.4	E 2901815.2	24.2	101.1	96.9					
03/13/10	9405	D	747	N 228839.9	E 2901733.4	25.7	100.0	95.9					
03/13/10	9405	D	748	N 228731.7	E 2901767.3	25.8	101.3	97.1					
03/13/10	9405	D	749	N 228688.8	E 2901666.5	25.3	100.0	95.9					
03/13/10	9405	D	750	N 228606.2	E 2901705.9	25.2	100.1	96.0	43	24	77	6.10E-08	
03/13/10	9405	D	751	N 228567.5	E 2901623.5	24.8	101.2	97.0					
03/13/10	9405	D	752	N 228473.7	E 2901650.8	23.7	100.7	96.5					
03/13/10	9405	D	753	N 228431.3	E 2901568.5	25.9	100.1	96.0					
03/13/10	9405	D	754	N 228344.8	E 2901598.7	25.5	99.6	95.5					
03/13/10	9405	D	755	N 228313.6	E 2901522.3	26.3	99.8	95.7					
03/13/10	9405	D	756	N 228251.6	E 2901517.8	24.1	101.3	97.1					
03/13/10	9405	D	757	N 228212.1	E 2901537.5	24.3	100.7	96.5					
03/13/10	9405	D	758	N 228199.2	E 2901596.6	24.0	101.9	97.7					
03/13/10	9405	D	759	N 228241.4	E 2901672.7	26.1	99.2	95.1					
03/13/10	9405	D	760	N 228335.0	E 2901639.2	24.4	100.4	96.3					
03/13/10	9405	D	761	N 228374.2	E 2901737.1	24.7	99.8	95.7					
03/13/10	9405	D	762	N 228453.0	E 2901694.7	21.4	105.1	100.8					
03/13/10	9405	D	763	N 228523.9	E 2901754.6	25.0	101.2	97.0					
03/13/10	9405	D	764	N 228591.3	E 2901823.8	24.9	100.8	96.6					
03/13/10	9405	D	765	N 228667.9	E 2901831.0	24.9	100.1	96.0					
03/13/10	9405	D	766	N 228769.7	E 2901828.1	22.4	102.9	98.7					
03/13/10	9405	D	767	N 228836.8	E 2901885.0	24.5	102.4	98.2					
03/13/10	9405	D	768	N 228878.5	E 2901942.6	23.2	102.0	97.8					
03/13/10	9405	D	769	N 228958.6	E 2901946.6	22.5	103.7	99.4					
03/13/10	9405	D	770	N 229016.8	E 2901945.0	24.0	101.9	97.7	40	22	84	5.73E-08	
03/13/10	9405	D	771	N 229093.6	E 2901958.3	24.5	100.8	96.6					
03/13/10	9405	D	772	N 229125.8	E 2902068.7	23.2	102.3	98.1					
03/13/10	9405	D	773	N 229182.1	E 2901999.1	25.1	102.1	97.9					
03/19/10	9405	D	830	N 228084.1	E 2901776.1	20.7	103.2	98.9					
03/19/10	9405	D	831	N 228171.3	E 2901770.5	21.3	99.5	95.4					
03/19/10	9405	D	832	N 228230.9	E 2901821.5	22.3	101.2	97.0					
03/19/10	9405	D	833	N 228294.5	E 2901881.5	22.0	101.4	97.2					
03/19/10	8895	D	834	N 228371.1	E 2901888.7	25.7	96.1	97.4					
03/19/10	9405	D	835	N 228458.4	E 2901886.3	21.1	104.2	99.9					
03/19/10	9405	D	836	N 228528.9	E 2901936.9	22.4	100.3	96.2					
03/19/10	9405	D	837	N 228574.4	E 2902000.5	23.0	101.0	96.8					
03/19/10	8895	D	838	N 228665.4	E 2902001.1	25.0	93.8	95.0					
03/19/10	9405	D	839	N 228745.1	E 2901989.6	21.1	104.3	100.0					
03/19/10	9405	D	840	N 228801.7	E 2902062.3	22.4	103.1	98.8	44	24	84	2.16E-08	
03/19/10	9405	D	841	N 228861.1	E 2902103.9	23.4	100.7	96.5					
03/19/10	9405	D	842	N 228934.1	E 2902111.2	21.7	101.8	97.6					
03/19/10	9405	D	843	N 229003.0	E 2902103.1	21.1	104.0	99.7					
03/19/10	8895	D	844	N 229059.3	E 2902163.3	25.7	95.0	96.3					
03/19/10	9405	D	845	N 229115.5	E 2902220.5	21.9	104.3	100.0					
03/28/10	9405	D	846	N 228657.7	E 2902118.8	22.1	102.2	98.0					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/28/10	9405	D	847	N 228917.6	E 2902040.5	20.5	104.7	100.4	37	18	74	4.62E-08	
03/29/10	9405	D	848	N 228134.8	E 2901635.5	23.5	101.0	96.8					
03/29/10	9405	D	849	N 228147.3	E 2901564.0	21.9	102.5	98.3					
03/29/10	9405	D	850	N 228174.7	E 2901501.4	21.0	102.3	98.1					
03/29/10	9405	D	851	N 228201.6	E 2901420.3	19.5	103.8	99.5					
03/29/10	9405	D	852	N 228221.3	E 2901345.5	20.6	103.1	98.8					
03/29/10	9405	D	853	N 228247.9	E 2901252.0	22.5	99.9	95.8					
03/29/10	9405	D	854	N 228171.3	E 2901247.9	21.7	101.8	97.6					
03/29/10	9405	D	855	N 228141.0	E 2901335.3	20.7	102.7	98.5					
03/29/10	9405	D	856	N 228114.3	E 2901422.7	21.3	100.9	96.7					
03/29/10	9405	D	857	N 228091.5	E 2901519.2	20.3	104.3	100.0					
03/29/10	9405	D	858	N 228079.7	E 2901618.5	19.8	103.7	99.4					
03/29/10	9405	D	859	N 228010.0	E 2901598.7	19.8	104.3	100.0					
03/29/10	9405	D	860	N 228028.9	E 2901493.1	21.3	99.7	95.6					
03/29/10	9405	D	861	N 228069.5	E 2901380.6	19.6	102.3	98.1					
03/29/10	9405	D	862	N 228113.8	E 2901274.3	18.5	105.4	101.1					
03/29/10	9405	D	863	N 228143.6	E 2901168.3	19.9	102.7	98.5					
03/29/10	9405	D	864	N 228058.8	E 2901260.3	20.7	104.3	100.0					
03/29/10	9405	D	865	N 228028.9	E 2901363.2	20.3	103.1	98.8	43	22	82	3.35E-08	
03/29/10	9405	D	866	N 227984.3	E 2901460.3	21.8	99.9	95.8					
03/29/10	9405	D	867	N 227982.8	E 2901274.8	21.0	101.8	97.6					
03/29/10	9405	D	868	N 228016.9	E 2901190.4	19.0	105.2	100.9					
03/29/10	9405	D	869	N 227952.5	E 2901232.3	21.0	101.5	97.3					
03/30/10	9405	D	870	N 227839.5	E 2901226.2	18.7	105.3	101.0					
03/30/10	9405	D	871	N 228018.7	E 2901648.0	22.8	100.0	95.9					
03/30/10	9405	D	872	N 228126.3	E 2901855.3	22.5	102.5	98.3					
03/30/10	9405	D	873	N 228211.0	E 2901890.0	20.0	105.2	100.9					
03/30/10	9405	D	874	N 228292.0	E 2901924.9	20.5	103.9	99.6					
03/30/10	8910	D	875	N 228384.1	E 2901965.6	18.1	108.4	98.7					
03/30/10	9405	D	876	N 228468.8	E 2902000.4	20.5	103.4	99.1					
03/30/10	8910	D	877	N 228553.5	E 2902035.1	16.7	110.5	100.6					
03/30/10	8910	D	878	N 228682.1	E 2902081.0	18.0	108.0	98.4					
03/30/10	8910	D	879	N 228818.2	E 2902129.8	17.9	110.2	100.4					
03/30/10	8910	D	880	N 228658.0	E 2902128.1	18.0	109.1	99.4					
03/30/10	8910	D	881	N 228573.3	E 2902093.4	17.8	108.8	99.1					
03/30/10	8910	D	882	N 228440.7	E 2902035.2	17.4	109.4	99.6					
03/30/10	8910	D	883	N 228311.8	E 2901980.0	16.7	109.5	99.7					
03/30/10	9405	D	884	N 228179.7	E 2901943.5	19.8	102.8	98.6					
03/30/10	9405	D	885	N 228254.3	E 2902009.4	18.4	104.5	100.2					
03/30/10	9405	D	886	N 228350.0	E 2902047.0	19.6	104.3	100.0	45	23	91	9.35E-08	
03/30/10	9405	D	887	N 228405.2	E 2902070.2	16.8	107.0	102.6					
03/30/10	9405	D	888	N 228523.2	E 2902125.7	19.9	103.6	99.3					
03/30/10	9405	D	889	N 228484.4	E 2902170.0	17.0	105.8	101.4					
03/30/10	8910	D	890	N 228399.8	E 2902135.3	17.0	107.3	97.7					
03/30/10	8910	D	891	N 228315.1	E 2902100.5	19.5	104.6	95.3					
03/30/10	8910	D	892	N 228261.6	E 2902139.1	18.0	106.5	97.0					
03/30/10	8910	D	893	N 228331.5	E 2902168.1	18.1	105.7	96.3					
03/30/10	8910	D	894	N 228434.2	E 2902196.2	17.4	106.2	96.7					
03/30/10	8910	D	895	N 228336.9	E 2902229.8	16.9	108.2	98.5					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/30/10	9405	D	896	N 228151.9	E 2901727.8	22.3	99.1	95.0					
03/30/10	9405	D	897	N 228220.6	E 2901710.4	20.0	103.5	99.2					
03/30/10	9405	D	898	N 228273.2	E 2901770.8	20.5	102.4	98.2					
03/30/10	9405	D	899	N 228371.1	E 2901758.8	20.0	106.1	101.7					
03/30/10	9405	D	900	N 228450.0	E 2901846.3	21.0	102.2	98.0					
03/30/10	9405	D	901	N 228526.2	E 2901838.0	20.1	104.3	100.0					
03/30/10	9405	D	902	N 228571.6	E 2901901.7	18.6	105.2	100.9					
03/30/10	9405	D	903	N 228684.1	E 2901889.3	19.7	104.1	99.8					
03/30/10	8910	D	904	N 228744.5	E 2901968.0	18.1	107.7	98.1					
03/30/10	8910	D	905	N 228867.9	E 2901955.3	18.2	106.3	96.8					
03/30/10	8910	D	906	N 228906.3	E 2902028.4	19.6	106.4	96.9					
03/30/10	8910	D	907	N 228971.3	E 2902008.1	20.0	105.4	96.0					
03/30/10	8910	D	908	N 229013.3	E 2902078.0	18.2	107.5	97.9					
03/30/10	8910	D	909	N 229074.4	E 2902051.6	18.1	106.7	97.2					
03/30/10	8910	D	910	N 229134.5	E 2902118.0	18.2	105.1	95.7					
03/30/10	8910	D	911	N 229184.9	E 2902098.0	19.6	107.5	97.9					
03/30/10	8910	D	912	N 229201.2	E 2902162.5	20.9	105.3	95.9					
03/31/10	9405	D	913	N 228971.6	E 2901757.6	22.3	102.2	98.0					
03/31/10	9405	D	914	N 228842.5	E 2901566.4	22.4	100.6	96.5	45	25	85	5.64E-08	
03/31/10	9405	D	915	N 228516.0	E 2901340.4	20.5	102.8	98.6	41	22	81	3.74E-08	
04/06/10	9405	D	916	N 228940.7	E 2901693.5	21.8	102.5	98.3	42	24	84	9.40E-08	
04/06/10	9405	D	917	N 228996.9	E 2901750.7	19.9	103.4	99.1					
04/06/10	9405	D	918	N 229065.3	E 2901724.1	21.7	100.1	96.0					
04/06/10	9405	D	919	N 229121.7	E 2901790.5	20.3	103.9	99.6					
04/06/10	9405	D	920	N 229190.8	E 2901788.6	22.8	100.2	96.1					
04/06/10	9405	D	921	N 229247.4	E 2901861.2	21.6	99.8	95.7					
04/06/10	9405	D	922	N 229322.7	E 2901819.0	22.2	104.4	100.1					
04/08/10	9405	D	923	N 229266.4	E 2901758.7	22.1	103.0	98.8					
04/08/10	9405	D	924	N 229230.9	E 2901660.7	24.0	100.4	96.3					
04/08/10	9405	D	925	N 229169.6	E 2901677.9	21.6	103.8	99.5					
04/08/10	9405	D	926	N 229064.1	E 2901680.8	22.9	100.4	96.3					
04/08/10	9405	D	927	N 229008.0	E 2901626.7	21.3	103.0	98.8					
04/08/10	9405	D	928	N 228955.5	E 2901569.4	21.7	102.7	98.5					
04/08/10	9405	D	929	N 228882.4	E 2901559.1	22.1	103.5	99.2					
04/08/10	9405	D	930	N 228802.6	E 2901570.6	21.6	102.0	97.8					
04/08/10	9405	D	931	N 228735.5	E 2901513.7	24.0	100.2	96.1					
04/08/10	9405	D	932	N 228668.4	E 2901456.8	23.3	102.3	98.1					
04/08/10	9405	D	933	N 228588.5	E 2901462.1	22.4	101.9	97.7					
04/09/10	9405	D	934	N 229310.7	E 2901649.2	22.9	102.0	97.8					
04/09/10	9405	D	935	N 229273.0	E 2901600.8	21.2	104.5	100.2					
04/09/10	9405	D	936	N 229199.0	E 2901559.5	20.3	106.2	101.8					
04/09/10	9405	D	937	N 229118.7	E 2901549.4	22.1	101.9	97.7					
04/09/10	8910	D	938	N 229035.1	E 2901554.8	21.7	104.5	95.2					
04/09/10	8910	D	939	N 228952.8	E 2901473.6	20.8	106.4	96.9					
04/09/10	8910	D	940	N 228879.2	E 2901444.7	20.3	105.6	96.2					
04/09/10	8910	D	941	N 228810.2	E 2901449.7	23.1	104.4	95.1					
04/09/10	8910	D	942	N 228715.6	E 2901452.4	19.9	107.1	97.5					
04/09/10	9405	D	943	N 228663.1	E 2901395.1	20.1	106.2	101.8					
04/09/10	9405	D	944	N 228622.2	E 2901365.3	20.1	104.8	100.5					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
04/09/10	9405	D	945	N 228487.8	E 2901372.1	21.9	103.1	98.8					
04/09/10	8910	D	946	N 228442.3	E 2901308.4	20.0	107.9	98.3					
04/09/10	8910	D	947	N 228383.0	E 2901269.9	18.9	106.6	97.1					
04/09/10	8910	D	948	N 228292.5	E 2901287.8	21.4	105.1	95.7					
04/09/10	8910	D	949	N 228235.9	E 2901215.2	19.2	108.1	98.5					
04/09/10	8910	D	950	N 228151.2	E 2901177.4	19.9	106.8	97.3					
04/09/10	9405	D	951	N 228158.8	E 2901319.4	19.9	106.3	101.9					
04/09/10	8910	D	952	N 228229.0	E 2901357.6	20.2	106.6	97.1					
04/09/10	9405	D	953	N 228306.8	E 2901408.1	21.7	104.8	100.5					
04/09/10	9405	D	954	N 228371.9	E 2901393.9	22.4	100.3	96.2					
04/09/10	9405	D	955	N 228433.9	E 2901398.3	22.8	103.1	98.8					
04/09/10	8910	D	956	N 228514.3	E 2901408.5	20.5	104.8	95.4					
04/09/10	8910	D	957	N 228559.4	E 2901462.9	21.2	104.3	95.0					
04/09/10	9405	D	958	N 228626.8	E 2901529.0	20.5	104.6	100.3					
04/09/10	9405	D	959	N 228707.0	E 2901533.0	20.2	103.5	99.2					
04/09/10	9405	D	960	N 228768.4	E 2901518.9	21.4	102.2	98.0					
04/11/10	9405	D	961	N 228838.0	E 2901665.4	22.4	103.3	99.0					
04/11/10	9405	D	962	N 228750.8	E 2901670.9	22.3	103.5	99.2					
04/11/10	9405	D	963	N 228671.9	E 2901580.4	21.9	104.4	100.1					
04/11/10	9405	D	964	N 228581.7	E 2901607.6	22.8	100.8	96.6					
04/11/10	9405	D	965	N 228550.2	E 2901525.0	21.2	102.6	98.4					
04/11/10	9405	D	966	N 228452.7	E 2901549.3	20.8	104.3	100.0					
04/11/10	9405	D	967	N 228395.7	E 2901464.3	23.3	100.4	96.3					
04/11/10	9405	D	968	N 228301.7	E 2901488.6	20.3	105.2	100.9					
04/11/10	9405	D	969	N 228241.3	E 2901409.9	20.5	105.4	101.1					
04/11/10	9405	D	970	N 228154.6	E 2901430.8	19.8	106.8	102.4					
08/13/10	8895	D-P	18	N 228878.6	E 2901293.2	25.6	95.4	96.7					
08/13/10	8895	D-P	19	N 229025.0	E 2901323.2	23.2	97.3	98.6					
08/13/10	9405	D-P	20	N 229228.3	E 2901435.0	21.9	102.6	98.4					
08/13/10	9405	D-P	21	N 229477.7	E 2901502.3	22.4	101.2	97.0					
08/13/10	9405	D-P	22	N 229531.5	E 2901735.8	21.0	102.9	98.7	43	20	87	1.59E-07	
08/17/10	9405	D-P	22A	N 229531.5	E 2901735.8	24.6	101.0	96.8	40	19	89	9.86E-08	X
08/13/10	9405	D-P	23	N 229435.1	E 2901936.4	21.1	103.5	99.2					
08/13/10	8895	D-P	24	N 229368.0	E 2902139.3	23.5	98.8	100.1					
08/13/10	9405	D-P	25	N 229284.8	E 2902290.0	21.0	103.8	99.5					
09/03/10	8910	D-P	71	N 229144.5	E 2902349.6	21.5	108.9	99.2					
09/03/10	9405	D-P	72	N 228826.6	E 2902302.8	21.5	103.4	99.1					
10/04/10	9405	D-P	117	N 228671.7	E 2902363.1	20.6	104.2	99.9					
10/04/10	9405	D-P	118	N 228532.6	E 2902342.5	23.2	100.4	96.3					
10/04/10	9405	D-P	119	N 228417.2	E 2902432.5	23.0	103.2	98.9					
10/04/10	9405	D-P	120	N 228282.9	E 2902443.3	21.8	99.7	95.6					
10/04/10	8895	D-P	121	N 228236.0	E 2902641.3	25.7	95.0	96.3					
10/04/10	9405	D-P	122	N 228113.5	E 2902573.1	23.3	100.7	96.5	46	24	79	4.35E-08	
10/04/10	9405	D-P	123	N 227978.4	E 2902426.4	23.4	99.6	95.5					
10/04/10	9405	D-P	124	N 227953.1	E 2902229.1	22.7	103.0	98.8					
10/04/10	9405	D-P	125	N 227843.3	E 2902120.3	21.5	101.9	97.7					
10/04/10	9405	D-P	126	N 227836.4	E 2901957.9	20.4	104.2	99.9					
10/04/10	8894	D-P	127	N 227717.4	E 2901820.0	23.1	102.1	98.9					
10/04/10	9405	D-P	128	N 227674.7	E 2901565.5	23.5	99.8	95.7					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/04/10	8895	D-P	129	N 227526.2	E 2901356.4	26.4	96.0	97.3					
10/04/10	8895	D-P	130	N 227528.3	E 2901112.8	27.8	97.8	99.1					
10/04/10	8894	D-P	131	N 227752.5	E 2901064.3	24.4	98.6	95.5					
10/04/10	9405	D-P	132	N 227940.4	E 2900941.2	20.8	102.8	98.6					
10/04/10	9405	D-P	133	N 228238.9	E 2901047.4	22.3	101.2	97.0					
10/04/10	8894	D-P	134	N 228425.6	E 2901068.5	22.0	100.6	97.5					
10/04/10	9405	D-P	135	N 228609.9	E 2901183.0	21.1	104.3	100.0					
10/04/10	8895	D-P	136	N 228786.7	E 2901213.2	24.9	98.2	99.5					
10/07/10	8910	D-P	199	N 228986.9	E 2902307.6	20.6	106.1	96.6	34	17	71	6.16E-08	
10/07/10	8910	D-P	200	N 227731.8	E 2901671.4	19.3	109.2	99.5	33	16	62	4.81E-08	
10/07/10	8895	D-P	201	N 228068.4	E 2900947.7	26.4	99.4	100.7	45	25	92	2.50E-08	

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples												
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
11/19/09	8801	D	258	N 228545.2	E	2902261.1	20.7	106.9	98.0					
11/19/09	8801	D	259	N 228477.6	E	2902315.6	20.7	106.3	97.4					
11/19/09	8801	D	260	N 228388.7	E	2902259.3	19.3	107.6	98.6	42	26	57	8.96E-08	
11/19/09	8894	D	261	N 228301.9	E	2902280.3	21.3	100.9	97.8					
11/19/09	8801	D	262	N 228290.4	E	2902388.8	22.0	104.5	95.8					
11/19/09	8801	D	263	N 228201.3	E	2902326.3	22.2	103.7	95.1					
11/20/09	8894	D	264	N 227638.1	E	2901182.3	23.6	102.1	98.9					
11/20/09	8894	D	265	N 227596.8	E	2901267.0	20.5	103.8	100.6					
11/20/09	9028	D	266	N 227692.3	E	2901298.3	26.6	97.6	98.1					
11/20/09	8801	D	267	N 227644.5	E	2901411.0	20.6	106.2	97.3					
11/20/09	8801	D	268	N 227743.7	E	2901445.3	21.5	105.1	96.3					
11/20/09	8801	D	269	N 227710.6	E	2901563.8	18.8	107.9	98.9					
11/20/09	8801	D	270	N 227788.7	E	2901623.5	19.0	105.8	97.0	41	22	73	1.56E-08	
11/20/09	8894	D	271	N 227851.8	E	2901668.1	23.8	102.2	99.0					
11/20/09	8894	D	272	N 227821.7	E	2901764.8	22.5	102.8	99.6					
11/20/09	8894	D	273	N 227888.2	E	2901800.1	23.1	102.0	98.8					
11/20/09	8801	D	274	N 227861.5	E	2901887.4	20.1	106.7	97.8					
11/20/09	8801	D	275	N 227946.2	E	2901922.1	22.0	104.0	95.3					
11/20/09	8801	D	276	N 227927.2	E	2902024.7	20.9	104.8	96.1					
11/20/09	8801	D	277	N 228019.8	E	2902080.9	19.7	105.8	97.0					
11/20/09	8894	D	278	N 227979.3	E	2902196.4	22.5	102.4	99.2	22	5	56	1.21E-07	
11/25/09	8801	D	278B	N 227979.3	E	2902196.4	20.6	106.9	98.0	42	24	76	5.93E-08	X
11/20/09	8801	D	279	N 228006.2	E	2902248.3	20.3	105.1	96.3					
11/20/09	8801	D	280	N 228112.4	E	2902273.1	21.3	106.2	97.3					
11/20/09	8801	D	281	N 228057.2	E	2902379.8	20.8	107.1	98.2					
11/20/09	8801	D	282	N 228124.1	E	2902430.5	21.3	106.8	97.9					
11/22/09	8801	D	283	N 227966.4	E	2901077.3	19.6	107.1	98.2	35	19	57	4.11E-07	
11/25/09	8801	D	283B	N 227966.4	E	2901077.3	18.4	109.0	99.9	35	20	59	1.00E-07	X
11/25/09	8801	D	284	N 228175.3	E	2901130.3	19.8	107.3	98.4					
11/25/09	8801	D	285	N 228136.4	E	2901038.6	20.7	106.3	97.4					
11/25/09	8801	D	286	N 228032.3	E	2901091.0	22.3	105.1	96.3					
11/25/09	8801	D	287	N 227849.4	E	2901055.8	21.9	106.3	97.4					
11/25/09	8801	D	288	N 227815.8	E	2901158.8	22.3	105.6	96.8					
11/25/09	8801	D	289	N 227687.4	E	2901122.2	21.7	106.0	97.2					
11/25/09	8801	D	290	N 227657.5	E	2901225.1	21.6	106.6	97.7					
11/25/09	8801	D	291	N 227565.5	E	2901187.4	21.5	107.5	98.5					
11/25/09	8801	D	292	N 227889.2	E	2901967.0	20.8	108.5	99.5					
11/25/09	8801	D	293	N 227988.1	E	2901989.0	20.2	107.0	98.1					
11/25/09	8801	D	294	N 227969.3	E	2902097.8	20.6	107.3	98.4					
11/25/09	8801	D	295	N 228069.7	E	2902175.4	20.9	107.2	98.3					
11/25/09	8801	D	296	N 228025.9	E	2902300.3	21.3	106.2	97.3					
11/25/09	8801	D	297	N 228124.2	E	2902303.7	20.3	106.8	97.9					
12/10/09	8894	D	375	N 229215.3	E	2902276.5	26.5	98.9	95.8					
12/10/09	8894	D	376	N 229125.1	E	2902303.8	23.1	103.5	100.3					
12/10/09	8894	D	377	N 229082.9	E	2902227.6	24.2	102.8	99.6					
12/10/09	8894	D	378	N 229007.8	E	2902276.1	23.1	102.0	98.8					
12/10/09	8894	D	379	N 228954.5	E	2902191.0	24.0	101.8	98.6					
12/10/09	8894	D	380	N 228868.8	E	2902249.0	24.0	101.0	97.9	42	25	72	6.85E-08	

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
12/10/09	8894	D	381	N 228805.1	E 2902182.8	22.9	102.4	99.2					
12/10/09	8894	D	382	N 228734.8	E 2902274.4	23.0	102.1	98.9					
12/10/09	8894	D	383	N 228667.1	E 2902192.8	24.6	98.4	95.3					
12/10/09	8894	D	384	N 228633.2	E 2902283.4	24.9	98.1	95.1					
12/19/09	9410	D	437	N 228749.4	E 2901358.7	28.3	95.5	97.0	53	31	85	1.54E-08	
12/20/09	9410	D	452	N 228220.2	E 2901172.3	24.1	99.9	101.4					
12/20/09	9410	D	453	N 228284.9	E 2901142.7	24.0	99.9	101.4					
12/20/09	8894	D	454	N 229429.3	E 2901726.3	23.6	99.1	96.0	53	32	85	2.08E-08	
12/20/09	9410	D	455	N 229222.8	E 2902152.6	24.6	96.5	98.0	52	25	85	6.38E-08	
12/21/09	9410	D	456	N 228374.0	E 2901208.3	26.0	99.4	100.9					
12/21/09	9410	D	457	N 228456.8	E 2901175.1	25.2.	99.2	100.7					
12/21/09	9410	D	458	N 228513.5	E 2901250.8	27.2	96.7	98.2					
12/21/09	9405	D	459	N 228600.6	E 2901242.2	25.3	99.2	95.1					
12/21/09	9405	D	460	N 228672.2	E 2901329.9	21.4	104.3	100.0					
12/21/09	9405	D	461	N 228765.9	E 2901296.3	22.5	100.6	96.5					
12/21/09	9405	D	462	N 228818.6	E 2901359.8	23.1	100.0	95.9					
12/21/09	9405	D	463	N 228913.0	E 2901351.0	22.2	101.8	97.6					
12/21/09	9405	D	464	N 228969.9	E 2901432.9	21.5	102.5	98.3					
12/21/09	9405	D	465	N 229089.4	E 2901414.2	22.9	101.5	97.3					
12/21/09	9410	D	466	N 229146.4	E 2901499.2	25.4	97.9	99.4					
12/21/09	9410	D	467	N 229240.3	E 2901474.9	25.5	97.9	99.4					
12/21/09	9410	D	468	N 229297.6	E 2901572.3	24.7	99.3	100.8					
12/21/09	9410	D	469	N 229387.4	E 2901529.6	24.0	98.7	100.2					
12/21/09	9410	D	470	N 229480.3	E 2901598.1	24.1	98.3	99.8					
12/21/09	9410	D	471	N 229423.8	E 2901658.4	24.2	99.5	101.0					
12/21/09	9410	D	472	N 229361.7	E 2901780.8	25.2	99.5	101.0					
12/21/09	9410	D	473	N 229400.8	E 2901878.6	24.0	101.3	102.8					
12/21/09	9410	D	474	N 229289.7	E 2901940.5	24.5	100.0	101.5					
12/21/09	9410	D	475	N 229332.3	E 2902035.2	23.2	100.4	101.9					
12/21/09	9410	D	476	N 229242.8	E 2902087.1	25.2	98.5	100.0					
12/21/09	9410	D	477	N 229187.8	E 2902203.1	24.7	98.9	100.4					
12/21/09	9410	D	478	N 229222.1	E 2902260.9	26.3	97.9	99.4					
03/19/10	9405	D	814	N 228156.6	E 2902290.5	20.8	102.8	98.6					
03/19/10	9405	D	815	N 228230.3	E 2902192.6	20.8	104.1	99.8					
03/19/10	9405	D	816	N 228109.4	E 2902161.9	22.4	102.0	97.8					
03/19/10	9405	D	817	N 228106.5	E 2902059.9	23.4	99.2	95.1					
03/19/10	9405	D	818	N 228114.3	E 2901945.3	22.8	99.8	95.7					
03/19/10	9405	D	819	N 228036.4	E 2901894.9	21.3	99.7	95.6					
03/19/10	9405	D	820	N 227969.3	E 2901838.0	22.8	101.0	96.8					
03/19/10	9405	D	821	N 227981.4	E 2901748.0	21.9	100.9	96.7					
03/19/10	9405	D	822	N 227986.5	E 2901670.5	20.4	104.2	99.9					
03/19/10	9405	D	823	N 227919.7	E 2901622.9	20.1	104.3	100.0					
03/19/10	9405	D	824	N 227849.2	E 2901575.4	19.6	103.3	99.0					
03/19/10	9405	D	825	N 227857.8	E 2901491.6	22.4	101.7	97.5	41	22	81	7.46E-08	
03/19/10	9405	D	826	N 227878.0	E 2901432.3	19.3	101.4	97.2					
03/19/10	9405	D	827	N 227829.3	E 2901381.1	19.2	103.0	98.8					
03/19/10	9405	D	828	N 227758.9	E 2901336.7	21.5	101.9	97.7					
03/19/10	9405	D	829	N 227781.9	E 2901249.4	18.8	101.8	97.6					
04/11/10	9405	D	971	N 228760.8	E 2901769.6	23.7	102.9	98.7					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
04/11/10	9405	D	972	N 228884.5	E	2901766.2	20.6	106.0	101.6					
04/11/10	9405	D	973	N 228915.8	E	2901845.7	20.5	101.9	97.7					
04/11/10	9405	D	974	N 229010.0	E	2901830.7	24.0	99.7	95.6					
04/11/10	9405	D	975	N 229059.5	E	2901909.8	21.5	102.5	98.3	42	22	75	9.86E-08	
04/11/10	9405	D	976	N 229126.3	E	2901954.3	21.8	103.4	99.1					
04/11/10	9405	D	977	N 229219.5	E	2901902.2	22.3	100.9	96.7					
04/11/10	9405	D	978	N 229215.0	E	2902004.4	25.0	99.4	95.3					
04/11/10	9405	D	979	N 229260.2	E	2901928.9	24.2	100.1	96.0					
04/15/10	8910	D	980	N 228792.7	E	2901737.8	20.6	104.5	95.2					
04/15/10	9405	D	981	N 228726.4	E	2901708.7	22.3	102.2	98.0					
04/15/10	9405	D	982	N 228671.7	E	2901704.1	21.7	102.2	98.0					
04/15/10	9405	D	983	N 228591.8	E	2901712.5	23.6	101.0	96.8					
04/15/10	9405	D	984	N 228546.9	E	2901667.3	20.6	104.1	99.8					
04/15/10	9405	D	985	N 228508.8	E	2901606.5	22.7	99.6	95.5					
04/15/10	9405	D	986	N 228432.5	E	2901608.7	22.9	100.2	96.1					
04/15/10	9405	D	987	N 228356.4	E	2901620.1	23.5	99.4	95.3					
04/15/10	9405	D	988	N 228321.9	E	2901559.2	23.4	100.1	96.0					
04/15/10	9405	D	989	N 228284.3	E	2901513.8	21.6	102.9	98.7					
04/15/10	9405	D	990	N 228215.5	E	2901528.1	22.6	99.6	95.5					
04/16/10	9405	D	991	N 229199.1	E	2902085.2	23.3	102.0	97.8					
04/16/10	9405	D	992	N 229160.8	E	2902018.3	23.8	99.5	95.4					
04/16/10	9405	D	993	N 229097.4	E	2901964.4	23.5	99.8	95.7					
04/16/10	9405	D	994	N 229028.1	E	2901957.0	23.0	99.8	95.7					
04/16/10	9405	D	995	N 228970.2	E	2901967.9	22.5	100.8	96.6					
04/16/10	8910	D	996	N 228910.4	E	2901913.9	19.6	107.3	97.7					
04/16/10	9405	D	997	N 228865.2	E	2901856.4	22.6	101.1	96.9					
04/16/10	9405	D	998	N 228811.1	E	2901876.5	21.4	103.3	99.0					
04/16/10	9405	D	999	N 228731.2	E	2901881.8	21.5	102.2	98.0					
04/16/10	9405	D	1000	N 228667.6	E	2901818.6	21.7	102.8	98.6	43	24	88	9.66E-08	
04/16/10	9405	D	1001	N 228637.0	E	2901766.9	21.3	104.3	100.0					
04/16/10	8910	D	1002	N 228578.9	E	2901771.6	17.3	112.0	102.0					
04/16/10	8910	D	1003	N 228517.4	E	2901785.7	19.2	107.7	98.1					
04/16/10	9405	D	1004	N 228440.5	E	2901766.2	20.8	102.5	98.3					
04/16/10	9405	D	1005	N 228395.2	E	2901708.7	21.8	102.1	97.9					
04/16/10	9405	D	1006	N 228353.4	E	2901644.9	20.1	106.1	101.7					
04/16/10	9405	D	1007	N 228295.0	E	2901640.3	22.4	101.8	97.6					
04/16/10	9405	D	1008	N 228229.9	E	2901654.5	23.5	99.5	95.4					
04/20/10	9405	D	1009	N 229199.7	E	2902106.9	22.5	102.3	98.1					
04/20/10	9405	D	1010	N 229145.9	E	2902136.2	21.8	100.8	96.6					
04/20/10	9405	D	1011	N 229072.1	E	2902101.1	22.8	100.2	96.1					
04/20/10	9405	D	1012	N 229030.3	E	2902037.4	22.5	100.5	96.4					
04/20/10	9405	D	1013	N 228946.8	E	2902045.9	21.6	102.1	97.9					
04/20/10	9405	D	1014	N 228870.7	E	2902054.2	24.4	99.4	95.3					
04/20/10	9405	D	1015	N 228821.7	E	2901993.7	23.8	102.5	98.3					
04/20/10	9405	D	1016	N 228783.7	E	2901939.1	23.4	102.4	98.2					
04/20/10	9405	D	1017	N 228707.0	E	2901928.8	23.3	101.0	96.8					
04/20/10	9405	D	1018	N 228630.7	E	2901931.0	21.9	104.2	99.9					
04/20/10	9405	D	1019	N 228567.6	E	2901889.4	24.6	99.9	95.8					
04/20/10	9405	D	1020	N 228529.9	E	2901841.0	22.4	101.8	97.6	35	20	66	1.48E-08	

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
04/20/10	9405	D	1021	N 228481.8	E 2901811.4	21.3	104.2	99.9					
04/20/10	9405	D	1022	N 228424.1	E 2901831.5	20.7	105.3	101.0					
04/20/10	9405	D	1023	N 228366.1	E 2901839.3	20.9	105.1	100.8					
04/20/10	9405	D	1024	N 228320.5	E 2901769.5	22.8	102.8	98.6					
04/20/10	8910	D	1025	N 228261.0	E 2901724.8	19.1	108.4	98.7					
04/20/10	8910	D	1026	N 228178.1	E 2901754.9	18.8	108.7	99.0					
04/20/10	8894	D	1027	N 229147.8	E 2902204.2	23.6	100.1	97.0					
04/20/10	8894	D	1028	N 229082.3	E 2902206.0	24.1	99.3	96.2					
04/20/10	9028	D	1029	N 229030.3	E 2902167.2	23.7	99.5	100.0					
04/20/10	9028	D	1030	N 228948.9	E 2902120.0	24.0	98.2	98.7					
04/20/10	9028	D	1031	N 228894.4	E 2902121.5	28.4	95.3	95.8					
04/20/10	9028	D	1032	N 228829.2	E 2902132.6	23.7	100.9	101.4					
04/20/10	9028	D	1033	N 228758.4	E 2902075.8	25.5	100.4	100.9					
04/20/10	9028	D	1034	N 228698.9	E 2902028.0	26.1	97.9	98.4					
04/20/10	9028	D	1035	N 228618.9	E 2902030.2	24.7	97.6	98.1	55	36	72	6.33E-09	
04/20/10	9028	D	1036	N 228549.9	E 2902035.2	25.9	98.7	99.2					
04/20/10	9028	D	1037	N 228500.7	E 2901968.6	26.2	96.7	97.2					
04/20/10	9405	D	1038	N 228455.7	E 2901920.4	22.6	101.7	97.5					
04/20/10	9028	D	1039	N 228383.4	E 2901937.8	25.0	97.9	98.4					
04/20/10	9028	D	1040	N 228303.1	E 2901930.8	22.7	100.0	100.5					
04/20/10	9028	D	1041	N 228247.1	E 2901879.8	25.9	99.4	99.9					
04/20/10	9028	D	1042	N 228194.6	E 2901822.5	27.9	97.0	97.5					
04/24/10	8910	D	1043	N 228807.7	E 2902145.6	20.9	104.4	95.1					
04/24/10	9405	D	1044	N 228698.2	E 2902133.2	24.0	100.3	96.2					
04/24/10	9028	D	1045	N 228621.4	E 2902122.9	25.9	95.1	95.6					
04/24/10	9405	D	1046	N 228511.4	E 2902092.0	20.9	104.6	100.3					
04/24/10	9405	D	1047	N 228419.4	E 2902057.4	21.0	102.5	98.3					
04/24/10	9405	D	1048	N 228327.7	E 2902029.1	21.8	100.2	96.1					
04/24/10	9405	D	1049	N 228237.4	E 2902056.3	21.9	102.9	98.7					
04/24/10	8910	D	1050	N 228347.7	E 2902096.5	21.3	105.9	96.4					
04/24/10	8910	D	1051	N 228443.2	E 2902124.8	22.0	104.6	95.3					
04/24/10	9405	D	1052	N 228549.5	E 2902152.8	23.2	101.3	97.1					
04/24/10	9405	D	1053	N 228419.3	E 2902184.2	22.6	101.3	97.1					
04/24/10	9028	D	1054	N 228331.2	E 2902155.7	24.5	98.1	98.6					
04/24/10	9405	D	1055	N 228243.3	E 2902136.5	22.9	100.4	96.3					
04/24/10	9405	D	1056	N 228158.7	E 2902104.9	22.9	100.5	96.4					
04/24/10	8910	D	1057	N 228160.6	E 2902172.9	20.0	105.8	96.4					
04/24/10	8910	D	1058	N 228233.8	E 2902186.3	20.3	105.9	96.4					
04/24/10	8910	D	1059	N 228303.6	E 2902209.1	20.3	105.6	96.2					
04/24/10	8910	D	1060	N 228387.9	E 2902231.5	20.6	106.7	97.2					
04/24/10	8910	D	1061	N 228404.3	E 2902166.1	20.9	106.0	96.5	38	20	60	6.00E-08	
04/24/10	8910	D	1062	N 228237.1	E 2902043.9	18.0	107.5	97.9					
04/24/10	8910	D	1063	N 228181.1	E 2901992.9	18.9	109.5	99.7					
04/24/10	8910	D	1064	N 228186.0	E 2901906.2	19.6	107.0	97.4					
04/24/10	9405	D	1065	N 228180.1	E 2901826.0	21.1	104.8	100.5					
04/24/10	9405	D	1066	N 228149.1	E 2901758.8	21.9	102.3	98.1					
04/24/10	9405	D	1067	N 228096.8	E 2901710.8	22.2	100.3	96.2					
04/24/10	9405	D	1068	N 228033.5	E 2901656.9	21.7	103.8	99.5					
04/24/10	9405	D	1069	N 228016.8	E 2901580.0	22.4	103.5	99.2					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
04/24/10	8801	D	1070	N 227992.4	E 2901487.9	20.0	105.3	96.5	47	25	73	2.92E-08	
04/24/10	8910	D	1071	N 228286.0	E 2901968.4	22.3	106.4	96.9					
04/24/10	8910	D	1072	N 228171.8	E 2901922.1	19.2	108.4	98.7					
04/26/10	8910	D	1073	N 227947.1	E 2901430.4	19.9	109.4	99.6					
04/26/10	8910	D	1074	N 228007.5	E 2901376.2	18.4	110.0	100.2					
04/26/10	8910	D	1075	N 228031.5	E 2901322.9	19.5	109.9	100.1					
04/26/10	8910	D	1076	N 227979.3	E 2901278.0	17.5	111.1	101.2					
04/26/10	8910	D	1077	N 227907.7	E 2901320.2	22.4	105.3	95.9					
04/26/10	8910	D	1078	N 227855.2	E 2901266.0	18.2	109.9	100.1					
04/26/10	9405	D	1079	N 227937.7	E 2901223.5	20.8	104.8	100.5					
04/26/10	9405	D	1080	N 227983.8	E 2901178.9	22.7	99.1	95.0					
04/26/10	9405	D	1081	N 227860.3	E 2901188.5	20.5	105.0	100.7					
04/26/10	9405	D	1082	N 228198.4	E 2901435.8	22.4	100.7	96.5					
04/26/10	8910	D	1083	N 228274.4	E 2901421.3	16.8	108.4	98.7					
04/26/10	8910	D	1084	N 228330.5	E 2901475.4	20.0	104.5	95.2					
04/26/10	8910	D	1085	N 228386.4	E 2901523.4	19.1	105.2	95.8					
04/26/10	9405	D	1086	N 228463.1	E 2901533.6	18.6	104.3	100.0					
04/26/10	9405	D	1087	N 228550.4	E 2901531.2	20.1	103.7	99.4					
04/26/10	9405	D	1088	N 228617.2	E 2901575.7	20.9	102.6	98.4					
04/26/10	9405	D	1089	N 228669.9	E 2901639.2	19.2	106.1	101.7					
04/26/10	8801	D	1090	N 228750.3	E 2901652.4	20.1	105.4	96.6	50	30	72	5.04E-08	
04/26/10	8910	D	1091	N 228830.6	E 2901659.5	20.4	105.8	96.4					
04/26/10	8910	D	1092	N 228915.8	E 2901712.8	21.5	105.0	95.6					
04/26/10	8910	D	1093	N 228990.0	E 2901766.3	20.8	106.1	96.6					
04/26/10	8910	D	1094	N 229077.6	E 2901773.2	21.5	104.3	95.0					
04/26/10	8910	D	1095	N 229176.8	E 2901807.5	18.9	107.7	98.1					
04/26/10	9405	D	1096	N 229236.6	E 2901864.6	22.4	103.8	99.5					
04/26/10	9405	D	1097	N 229312.6	E 2901850.2	22.1	103.9	99.6					
04/26/10	9405	D	1098	N 228673.4	E 2901503.0	23.2	101.2	97.0	36	16	73	8.53E-08	
04/27/10	9405	D	1099	N 229070.3	E 2901643.5	23.5	102.0	97.8	38	21	61	4.83E-08	
04/29/10	8928	D	1100	N 228130.0	E 2901332.6	16.9	113.3	99.6					
04/29/10	8928	D	1101	N 228209.8	E 2901324.2	17.6	111.5	98.0					
04/29/10	8910	D	1102	N 228311.3	E 2901309.0	20.0	107.9	98.3					
04/29/10	8910	D	1103	N 228356.7	E 2901369.6	19.7	107.5	97.9					
04/29/10	8910	D	1104	N 228427.8	E 2901441.8	20.2	107.9	98.3					
04/29/10	8910	D	1105	N 228497.0	E 2901443.0	20.5	106.7	97.2					
04/29/10	9405	D	1106	N 228591.3	E 2901431.1	21.1	101.3	97.1					
04/29/10	9405	D	1107	N 228651.0	E 2901485.1	20.6	102.8	98.6					
04/29/10	9405	D	1108	N 228707.7	E 2901560.8	19.1	105.8	101.4					
04/29/10	8910	D	1109	N 228776.4	E 2901543.4	19.6	106.2	96.7					
04/29/10	8910	D	1110	N 228885.3	E 2901534.2	19.7	106.9	97.4					
04/29/10	8910	D	1111	N 228942.1	E 2901613.1	18.2	109.5	99.7					
04/29/10	8910	D	1112	N 228991.0	E 2901670.5	19.0	109.0	99.3					
04/29/10	8910	D	1113	N 229092.8	E 2901664.5	19.5	106.9	97.4					
04/29/10	8910	D	1114	N 229161.5	E 2901650.3	19.6	108.0	98.4					
04/29/10	8910	D	1115	N 229217.7	E 2901707.5	20.9	106.5	97.0					
04/29/10	8910	D	1116	N 229260.0	E 2901789.8	20.6	106.6	97.1					
04/29/10	8910	D	1117	N 229309.5	E 2901738.9	19.3	109.0	99.3					
04/29/10	9405	D	1118	N 228063.8	E 2901176.7	20.2	103.0	98.8					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
04/29/10	9405	D	1119	N	228143.4	E 2901159.0	21.3	104.4	100.1					
04/29/10	9405	D	1120	N	228217.5	E 2901206.4	23.2	99.9	95.8					
04/29/10	9405	D	1121	N	228288.0	E 2901254.0	21.5	104.7	100.4					
04/29/10	9405	D	1122	N	228364.8	E 2901270.4	20.3	104.2	99.9	44	16	68	9.76E-09	
04/29/10	9405	D	1123	N	228467.0	E 2901279.9	20.0	105.3	101.0					
04/29/10	9405	D	1124	N	228548.3	E 2901324.0	21.4	102.4	98.2					
04/29/10	9405	D	1125	N	228633.7	E 2901383.5	21.5	104.8	100.5					
04/29/10	9405	D	1126	N	228717.5	E 2901387.4	21.4	102.4	98.2					
04/29/10	9405	D	1127	N	228805.1	E 2901397.3	23.3	100.1	96.0					
04/29/10	9405	D	1128	N	228901.5	E 2901462.7	21.0	103.1	98.8					
04/29/10	9405	D	1129	N	228972.1	E 2901513.3	19.3	105.4	101.1					
04/29/10	9405	D	1130	N	229070.9	E 2901532.2	22.1	104.0	99.7					
04/29/10	9405	D	1131	N	229169.3	E 2901538.7	23.2	103.0	98.8					
04/29/10	9405	D	1132	N	229251.0	E 2901595.2	23.5	99.9	95.8					
04/29/10	9405	D	1133	N	229328.9	E 2901648.7	19.3	105.8	101.4					
04/29/10	9405	D	1134	N	229387.0	E 2901644.0	20.6	103.6	99.3					
08/13/10	8895	D-P	26	N	228889.6	E 2901296.0	23.0	97.5	98.8					
08/13/10	9405	D-P	27	N	229062.1	E 2901346.9	22.9	101.8	97.6					
08/13/10	9405	D-P	28	N	229290.7	E 2901454.9	21.8	102.7	98.5	33	17	62	5.49E-08	
08/13/10	8895	D-P	29	N	229555.4	E 2901549.6	24.5	96.8	98.1					
08/13/10	9405	D-P	30	N	229486.8	E 2901829.9	22.0	100.0	95.9					
08/13/10	8895	D-P	31	N	229372.6	E 2902043.3	26.1	94.3	95.5					
08/13/10	9405	D-P	32	N	229312.0	E 2902221.3	21.5	103.7	99.4					
08/13/10	8895	D-P	33	N	229247.1	E 2902371.5	24.2	97.2	98.5					
09/03/10	9405	D-P	73	N	229115.4	E 2902347.3	20.3	103.7	99.4					
09/03/10	8910	D-P	74	N	228746.9	E 2902314.3	19.6	106.1	96.6					
10/05/10	9405	D-P	137	N	228746.9	E 2902314.3	22.9	100.8	96.6					
10/05/10	9405	D-P	138	N	228583.9	E 2902369.0	24.2	99.5	95.4					
10/05/10	9405	D-P	139	N	228426.8	E 2902369.2	23.3	101.7	97.5					
10/05/10	9405	D-P	140	N	228274.7	E 2902478.9	20.5	101.0	96.8	44	22	95	2.88E-08	
10/05/10	8910	D-P	141	N	228248.1	E 2902625.8	20.5	109.0	99.3					
10/05/10	8910	D-P	142	N	228186.8	E 2902526.7	21.0	104.8	95.4					
10/05/10	9405	D-P	143	N	228145.4	E 2902687.0	21.9	103.6	99.3					
10/05/10	8895	D-P	144	N	228030.2	E 2902533.0	25.2	100.3	101.6					
10/05/10	9405	D-P	145	N	227974.9	E 2902303.9	22.8	101.7	97.5					
10/05/10	8910	D-P	146	N	227863.1	E 2902161.4	20.8	107.2	97.6					
10/05/10	9405	D-P	147	N	227830.6	E 2901957.3	20.8	103.0	98.8					
10/05/10	8910	D-P	148	N	227695.6	E 2901773.3	21.4	106.2	96.7					
10/05/10	8910	D-P	149	N	227667.6	E 2901571.2	19.6	106.2	96.7					
10/05/10	9405	D-P	150	N	227551.7	E 2901435.6	20.8	103.8	99.5					
10/05/10	9405	D-P	151	N	227534.5	E 2901243.3	20.2	107.3	102.9					
10/05/10	9405	D-P	152	N	227572.9	E 2901092.5	22.2	102.7	98.5					
10/05/10	9405	D-P	153	N	227719.0	E 2901072.0	23.3	101.4	97.2					
10/05/10	8910	D-P	154	N	227819.3	E 2900983.5	17.4	110.9	101.0					
10/05/10	8910	D-P	155	N	227936.3	E 2900984.2	19.8	107.4	97.8					
10/05/10	9405	D-P	156	N	228050.4	E 2900931.6	23.1	102.0	97.8					
10/07/10	9405	D-P	202	N	228936.6	E 2902330.6	21.4	104.3	100.0	38	21	90	2.77E-08	
10/07/10	8895	D-P	203	N	227716.5	E 2901644.0	25.7	98.6	99.9	43	22	86	2.17E-08	
10/07/10	8895	D-P	204	N	228013.6	E 2900943.0	26.1	98.8	100.1	43	23	95	2.94E-08	

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/14/10	8910	D-P	286	N 229482.4	E	2901488.2	21.7	106.8	97.3					
10/14/10	8910	D-P	287	N 229221.4	E	2901381.5	22.1	106.3	96.8					
10/14/10	9405	D-P	288	N 228818.8	E	2901271.6	22.3	104.0	99.7					
10/14/10	8910	D-P	289	N 228663.1	E	2901159.1	20.2	108.1	98.5					
10/14/10	9405	D-P	290	N 228472.8	E	2901139.5	24.3	101.4	97.2					
10/14/10	9405	D-P	291	N 228327.5	E	2901033.3	25.6	99.3	95.2					
10/14/10	8910	D-P	292	N 228182.7	E	2901021.7	22.7	105.4	96.0					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
12/10/09	8894	D	385	N	228536.0	E 2902193.3	24.6	101.4	98.3					
12/10/09	8894	D	386	N	228484.5	E 2902303.0	24.3	99.7	96.6					
12/10/09	8894	D	387	N	228388.3	E 2902246.9	24.4	99.4	96.3					
12/10/09	8894	D	388	N	228325.9	E 2902356.9	25.9	98.6	95.5					
12/10/09	9405	D	389	N	228237.2	E 2902309.9	25.8	99.8	95.7	39	22	71	9.01E-08	
12/10/09	8894	D	390	N	228175.1	E 2902432.2	22.2	104.4	101.2					
12/10/09	8894	D	391	N	228122.0	E 2902353.3	24.3	102.4	99.2					
12/10/09	8894	D	392	N	228135.6	E 2902451.9	25.6	100.8	97.7					
12/11/09	9410	D	393	N	228031.0	E 2902352.7	28.5	95.2	96.6					
12/11/09	9410	D	394	N	228104.9	E 2902264.1	28.0	95.3	96.8					
12/11/09	9410	D	395	N	227994.7	E 2902226.9	26.9	96.7	98.2					
12/11/09	9410	D	396	N	228038.7	E 2902108.2	28.3	94.8	96.2					
12/11/09	9410	D	397	N	227954.0	E 2902070.4	27.9	95.3	96.8					
12/11/09	9410	D	398	N	227980.2	E 2901967.6	26.2	96.1	97.6	42	20	83	7.82E-08	
12/11/09	9410	D	399	N	227881.3	E 2901945.6	23.2	96.2	97.7					
12/11/09	9410	D	400	N	227918.5	E 2901842.5	23.5	97.2	98.7					
12/11/09	9410	D	401	N	227815.1	E 2901789.7	23.9	95.4	96.9					
12/11/09	9410	D	402	N	227834.3	E 2901693.3	24.9	94.1	95.5					
12/11/09	9410	D	403	N	227749.3	E 2901646.2	27.0	94.9	96.3					
12/11/09	9410	D	404	N	227786.6	E 2901549.3	27.8	94.9	96.3					
12/11/09	9410	D	405	N	227701.7	E 2901505.3	24.3	98.4	99.9	46	24	75	2.66E-08	
12/11/09	9410	D	406	N	227746.3	E 2901408.2	28.1	94.8	96.2					
12/11/09	9410	D	407	N	227636.4	E 2901383.4	26.5	95.2	96.6					
12/11/09	9410	D	408	N	227670.6	E 2901302.0	30.3	93.6	95.0					
12/11/09	9410	D	409	N	227585.2	E 2901242.5	30.3	95.1	96.5					
12/11/09	9410	D	410	N	227630.3	E 2901160.9	29.8	95.6	97.1					
12/11/09	9410	D	411	N	227736.6	E 2901188.9	30.8	94.6	96.0					
12/11/09	9410	D	412	N	227799.5	E 2901094.3	26.9	96.7	98.2					
12/11/09	9410	D	413	N	227916.5	E 2901112.7	27.2	93.6	95.0	54	29	90	6.57E-08	
12/18/09	9410	D	421	N	228658.8	E 2902288.9	24.2	98.1	99.6					
12/18/09	9410	D	422	N	228728.5	E 2902178.7	24.4	98.2	99.7					
12/18/09	9410	D	423	N	228772.3	E 2902183.7	23.3	100.3	101.8					
12/18/09	9405	D	424	N	228868.6	E 2902242.9	23.1	102.2	98.0					
12/18/09	8910	D	425	N	228950.5	E 2902178.7	21.5	106.2	96.7	38	18	77	9.63E-08	
12/18/09	9405	D	426	N	229003.9	E 2902266.9	21.8	103.3	99.0					
12/18/09	8896	D	427	N	229100.8	E 2902214.8	23.3	98.3	97.9					
12/18/09	8801	D	428	N	229103.6	E 2902316.7	21.8	104.4	95.7					
12/18/09	8801	D	429	N	229204.1	E 2902267.5	21.5	104.1	95.4					
12/18/09	9405	D	430	N	229162.2	E 2902330.6	22.0	103.5	99.2					
12/19/09	9410	D	431	N	227993.8	E 2901014.7	26.0	96.7	98.2					
12/19/09	9410	D	432	N	228047.2	E 2901102.9	26.4	96.3	97.8					
12/19/09	9410	D	433	N	228151.2	E 2901047.5	27.3	95.4	96.9					
12/19/09	9410	D	434	N	228197.9	E 2901157.5	26.4	96.1	97.6					
01/05/10	9405	D	520	N	228202.8	E 2901070.8	23.5	103.6	99.3					
01/05/10	9405	D	521	N	228263.6	E 2901165.0	24.3	102.2	98.0					
01/05/10	9405	D	522	N	228339.0	E 2901125.8	21.9	104.5	100.2					
01/05/10	9405	D	523	N	228377.8	E 2901211.3	23.6	101.2	97.0					
01/05/10	9405	D	524	N	228452.8	E 2901162.8	22.9	101.8	97.6	36	17	74	6.20E-08	

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
01/05/10	9405	D	525	N 228506.1	E 2901244.8	22.7	102.4	98.2					
01/05/10	9405	D	526	N 228578.0	E 2901215.0	21.2	100.6	96.5					
01/05/10	8895	D	527	N 228649.9	E 2901311.9	26.7	94.0	95.2					
01/05/10	8895	D	528	N 228729.0	E 2901278.8	23.8	99.2	100.5					
01/05/10	8895	D	529	N 228788.3	E 2901184.4	24.5	97.3	98.6					
01/05/10	8895	D	530	N 228879.8	E 2901333.4	26.1	95.3	96.6					
01/05/10	8895	D	531	N 228918.4	E 2901415.8	25.3	95.1	96.4					
01/05/10	8895	D	532	N 229001.0	E 2901373.3	26.2	96.7	98.0					
01/05/10	8895	D	533	N 229091.0	E 2901469.8	24.2	99.3	100.6					
01/06/10	8895	D	534	N 229495.0	E 2901603.9	26.2	97.4	98.7					
01/06/10	9405	D	535	N 229413.0	E 2901661.8	22.3	102.7	98.5					
01/06/10	9405	D	536	N 229448.1	E 2901747.4	24.1	100.5	96.4					
01/06/10	9405	D	537	N 229362.2	E 2901799.3	22.5	101.4	97.2					
01/06/10	9405	D	538	N 229390.1	E 2901888.2	22.0	102.1	97.9					
01/06/10	9405	D	539	N 229329.8	E 2901945.5	22.9	100.8	96.6	39	19	90	1.67E-08	
01/06/10	9405	D	540	N 229335.8	E 2902028.9	23.7	100.0	95.9					
01/06/10	9405	D	541	N 229264.2	E 2902071.1	23.3	100.5	96.4					
01/06/10	9405	D	542	N 229281.3	E 2902163.4	23.3	101.4	97.2					
01/06/10	9405	D	543	N 229187.1	E 2902178.3	22.8	101.7	97.5					
01/06/10	9405	D	544	N 229240.2	E 2902254.2	22.6	101.6	97.4					
01/14/10	9405	D	592	N 229071.9	E 2901439.4	21.6	102.7	98.5					
01/14/10	9405	D	593	N 229091.8	E 2901497.6	23.1	102.0	97.8					
01/14/10	9405	D	594	N 229160.0	E 2901464.8	24.6	100.3	96.2					
01/14/10	9405	D	595	N 229205.5	E 2901531.5	22.8	101.0	96.8					
01/14/10	9405	D	596	N 229310.5	E 2901510.1	21.7	103.0	98.8					
01/14/10	9405	D	597	N 229360.1	E 2901595.3	23.6	100.2	96.1					
01/14/10	9405	D	598	N 229438.9	E 2901546.7	22.7	101.5	97.3					
08/19/10	9405	D-P	35	N 228833.5	E 2901238.8	19.1	103.7	99.4					
08/19/10	8801	D-P	36	N 229044.0	E 2901350.5	18.5	106.6	97.7					
08/19/10	9405	D-P	37	N 229300.3	E 2901405.2	23.4	102.1	97.9					
08/19/10	8801	D-P	38	N 229562.1	E 2901660.8	20.3	106.8	97.9					
08/19/10	9405	D-P	39	N 229408.2	E 2902014.5	19.1	103.8	99.5	40	22	79	7.23E-08	
08/19/10	9405	D-P	40	N 229278.4	E 2902321.1	20.5	103.1	98.8					
09/03/10	9405	D-P	47	N 228837.9	E 2901266.5	20.5	101.6	97.4					
09/03/10	9405	D-P	48	N 229083.6	E 2901333.9	20.9	104.9	100.6					
09/03/10	9405	D-P	49	N 229385.8	E 2901470.9	21.0	101.1	96.9					
09/03/10	8910	D-P	50	N 229566.2	E 2901676.1	19.4	109.2	99.5					
09/03/10	9405	D-P	51	N 229427.2	E 2901911.9	21.9	106.0	101.6					
09/03/10	9405	D-P	52	N 229357.6	E 2902158.1	22.6	103.4	99.1					
09/03/10	8910	D-P	53	N 229258.0	E 2902371.2	20.5	108.0	98.4	34	17	66	5.05E-08	
09/03/10	8910	D-P	54	N 229027.1	E 2902315.8	17.3	107.5	97.9					
09/03/10	8910	D-P	55	N 228873.1	E 2902273.7	19.6	108.2	98.5					
09/03/10	9405	D-P	56	N 228777.8	E 2902378.4	21.6	104.6	100.3					
10/06/10	9405	D-P	157	N 228807.9	E 2902298.4	23.0	104.0	99.7					
10/06/10	9405	D-P	158	N 228707.4	E 2902357.2	23.0	104.1	99.8					
10/06/10	9405	D-P	159	N 228628.2	E 2902320.7	22.0	103.9	99.6					
10/06/10	9405	D-P	160	N 228553.9	E 2902383.6	19.8	105.6	101.2					
10/06/10	9405	D-P	161	N 228480.5	E 2902361.0	24.5	99.5	95.4					
10/06/10	9405	D-P	162	N 228430.5	E 2902428.3	23.7	101.2	97.0					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/06/10	9405	D-P	163	N 228357.3	E 2902408.5	19.4	101.8	97.6					
10/06/10	9405	D-P	164	N 228314.3	E 2902518.2	25.2	99.4	95.3					
10/06/10	9405	D-P	165	N 228243.3	E 2902463.4	22.4	100.3	96.2					
10/06/10	8910	D-P	166	N 228224.4	E 2902567.6	17.6	108.9	99.2					
10/06/10	8910	D-P	167	N 228197.8	E 2902725.2	16.7	107.2	97.6					
10/06/10	9405	D-P	168	N 228155.2	E 2902516.2	22.7	103.8	99.5					
10/06/10	9405	D-P	169	N 228137.7	E 2902635.9	21.6	103.0	98.8					
10/06/10	9405	D-P	170	N 228124.0	E 2902743.7	21.6	102.9	98.7					
10/06/10	9405	D-P	171	N 228080.2	E 2902550.7	19.6	103.3	99.0					
10/06/10	9405	D-P	172	N 227994.8	E 2902459.7	21.1	103.1	98.8					
10/06/10	9405	D-P	173	N 227994.2	E 2902324.3	22.1	101.9	97.7					
10/06/10	9405	D-P	174	N 227897.3	E 2902250.4	22.5	100.8	96.6					
10/06/10	9405	D-P	175	N 227903.0	E 2902115.9	23.4	101.2	97.0					
10/06/10	9405	D-P	176	N 227811.2	E 2902044.7	22.0	101.4	97.2					
10/07/10	8910	D-P	205	N 228964.5	E 2902289.7	19.7	108.5	98.8	40	21	87	3.13E-08	
10/07/10	8895	D-P	206	N 228198.8	E 2902629.5	24.8	97.1	98.4	41	23	85	6.78E-08	
10/07/10	8910	D-P	207	N 227719.6	E 2901625.4	19.8	109.2	99.5	39	20	80	3.30E-08	
10/07/10	8910	D-P	208	N 227959.1	E 2900944.6	21.7	105.2	95.8	43	24	85	2.54E-08	
10/07/10	8910	D-P	209	N 228874.9	E 2902208.7	20.2	109.0	99.3	39	20	84	8.23E-08	
10/14/10	9405	D-P	293	N 227801.9	E 2901897.5	23.7	104.0	99.7					
10/14/10	8910	D-P	294	N 227703.1	E 2901789.2	22.6	107.8	98.2					
10/14/10	9405	D-P	295	N 227706.6	E 2901664.9	21.0	100.2	96.1					
10/14/10	9405	D-P	296	N 227590.1	E 2901533.6	21.8	105.0	100.7					
10/14/10	9405	D-P	297	N 227588.8	E 2901376.1	21.2	103.9	99.6					
10/14/10	8910	D-P	298	N 227486.6	E 2901276.4	21.7	106.2	96.7					
10/14/10	9405	D-P	299	N 227560.4	E 2901143.7	19.1	103.9	99.6					
10/14/10	9405	D-P	300	N 227633.2	E 2901061.1	21.3	104.6	100.3					
10/14/10	9405	D-P	301	N 227758.7	E 2901059.8	20.5	100.5	96.4					
10/14/10	9405	D-P	302	N 227819.2	E 2900978.6	20.5	103.9	99.6					
10/14/10	9405	D-P	303	N 227935.5	E 2900986.5	22.2	102.7	98.5					
10/14/10	8910	D-P	304	N 228026.6	E 2900924.1	18.0	105.3	95.9					
10/14/10	9405	D-P	305	N 228108.5	E 2901005.3	19.8	103.5	99.2					
10/14/10	9405	D-P	306	N 228204.0	E 2900980.0	19.1	103.7	99.4					
10/14/10	8910	D-P	307	N 228270.1	E 2901064.0	21.5	106.4	96.9					
10/14/10	9405	D-P	308	N 228370.6	E 2901047.3	21.1	103.1	98.8					
10/14/10	8910	D-P	309	N 228439.9	E 2901128.6	19.0	105.9	96.4					
10/14/10	9405	D-P	310	N 228543.0	E 2901113.9	22.5	101.3	97.1					
10/14/10	9405	D-P	311	N 228641.2	E 2901209.0	24.5	103.4	99.1					
10/14/10	9405	D-P	312	N 228782.0	E 2901205.8	23.5	101.5	97.3					
10/14/10	8910	D-P	313	N 228889.7	E 2901306.7	17.5	110.1	100.3					
10/14/10	9405	D-P	314	N 229209.0	E 2901428.7	21.0	103.9	99.6					
10/14/10	8910	D-P	315	N 229471.7	E 2901525.8	18.1	108.7	99.0					
10/14/10	9405	D-P	316	N 229608.8	E 2901549.3	20.1	106.2	101.8					
10/14/10	8910	D-P	317	N 229517.3	E 2901771.8	21.0	105.4	96.0					
10/14/10	9405	D-P	318	N 229355.3	E 2902053.5	24.6	100.6	96.5					
10/14/10	9405	D-P	319	N 229287.0	E 2902225.7	21.8	100.6	96.5					
10/14/10	8910	D-P	320	N 229116.8	E 2902403.7	20.9	105.0	95.6					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples														
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
12/18/09	9410	D	414	N	228179.9	E 2902342.4	24.0	97.0	98.5					
12/18/09	9410	D	415	N	228272.4	E 2902398.6	24.2	97.0	98.5					
12/18/09	9410	D	416	N	228312.9	E 2902283.0	24.4	96.7	98.2					
12/18/09	9405	D	417	N	228415.9	E 2902323.5	23.3	100.6	96.5	37	19	69	4.90E-08	
12/18/09	9410	D	418	N	228442.7	E 2902239.2	23.1	97.8	99.3					
12/18/09	9410	D	419	N	228510.0	E 2902302.3	21.8	98.2	99.7					
12/18/09	9410	D	420	N	228561.8	E 2902201.9	24.6	97.9	99.4					
12/19/09	9410	D	435	N	227979.3	E 2902066.6	26.8	95.2	96.6	47	22	83	1.99E-08	
12/19/09	9410	D	436	N	227783.9	E 2901580.3	25.0	95.9	97.4	42	19	79	9.44E-08	
12/20/09	9410	D	438	N	228133.7	E 2902383.9	22.8	96.8	98.3					
12/20/09	9410	D	439	N	228112.4	E 2902270.1	22.0	97.0	98.5					
12/20/09	9410	D	440	N	227998.1	E 2902217.6	23.0	97.4	98.9					
12/20/09	9410	D	441	N	228045.6	E 2902092.6	24.6	94.9	96.3					
12/20/09	9410	D	442	N	227916.4	E 2902028.1	24.5	95.6	97.1					
12/20/09	9410	D	443	N	227952.9	E 2901900.3	25.7	97.2	98.7					
12/20/09	9410	D	444	N	227831.1	E 2901841.8	24.2	99.1	100.6					
12/20/09	9410	D	445	N	227878.8	E 2901723.0	26.8	94.6	96.0					
12/20/09	9410	D	446	N	227757.2	E 2901670.7	25.6	97.0	98.5					
12/20/09	9410	D	447	N	227811.7	E 2901536.2	23.0	98.2	99.7					
12/20/09	9410	D	448	N	227697.6	E 2901489.9	22.9	97.9	99.4					
12/20/09	9410	D	449	N	227738.0	E 2901371.3	25.8	97.2	98.7					
12/20/09	9410	D	450	N	227631.9	E 2901349.5	25.0	96.6	98.1					
12/20/09	9410	D	451	N	227687.6	E 2901258.3	24.0	99.2	100.7					
01/06/10	9405	D	562	N	229187.5	E 2902323.7	23.3	101.7	97.5					
01/06/10	9405	D	563	N	229134.3	E 2902244.7	24.7	99.8	95.7					
01/06/10	9405	D	564	N	229051.7	E 2902284.2	24.5	99.5	95.4					
01/06/10	9405	D	565	N	229006.2	E 2902217.4	24.2	99.6	95.5					
01/06/10	9405	D	566	N	228926.8	E 2902241.2	23.8	100.4	96.3	35	16	71	3.44E-08	
01/06/10	9405	D	567	N	228878.0	E 2902186.9	24.5	99.6	95.5					
01/06/10	9405	D	568	N	228814.1	E 2902244.4	24.4	100.9	96.7					
01/06/10	9405	D	569	N	228721.5	E 2902188.2	25.2	99.4	95.3					
01/06/10	8895	D	570	N	228661.6	E 2902257.9	27.0	95.4	96.7					
01/06/10	9405	D	571	N	228591.1	E 2902210.4	21.9	103.6	99.3					
01/14/10	9405	D	572	N	227558.6	E 2901200.0	22.6	103.0	98.8					
01/14/10	9405	D	573	N	227650.9	E 2901246.9	22.2	102.7	98.5					
01/14/10	9405	D	574	N	227723.8	E 2901121.2	21.4	103.7	99.4					
01/14/10	9405	D	575	N	227852.1	E 2901154.7	22.5	103.3	99.0					
01/14/10	9405	D	576	N	227903.9	E 2901054.3	22.3	103.2	98.9					
01/14/10	8928	D	577	N	228010.7	E 2901100.8	19.9	109.4	96.1	34	16	67	5.30E-08	
01/14/10	8928	D	578	N	228085.2	E 2901030.7	18.8	110.8	97.4					
01/14/10	8928	D	579	N	228139.6	E 2901152.9	19.3	110.4	97.0					
01/14/10	8928	D	580	N	228232.3	E 2901085.4	20.9	108.4	95.3					
01/27/10	9405	D	603	N	228205.5	E 2901166.6	21.0	105.0	100.7					
01/27/10	8910	D	604	N	228295.0	E 2901114.6	19.8	107.4	97.8					
01/27/10	8910	D	605	N	228333.1	E 2901175.4	20.2	109.4	99.6					
01/27/10	8910	D	606	N	228423.9	E 2901169.8	20.5	109.0	99.3					
01/27/10	8910	D	607	N	228477.3	E 2901258.0	19.6	109.9	100.1					
01/27/10	8910	D	608	N	228581.8	E 2901221.1	19.9	109.2	99.5					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
01/27/10	8910	D	609	N 228631.7	E	2901312.4	19.4	108.3	98.6	40	24	69	1.44E-08	
01/27/10	8910	D	610	N 228728.9	E	2901275.7	17.9	109.6	99.8					
01/27/10	8910	D	611	N 228771.3	E	2901361.1	18.5	109.1	99.4					
01/27/10	8910	D	612	N 228846.9	E	2901328.1	19.5	106.9	97.4					
01/27/10	8910	D	613	N 228893.1	E	2901422.7	21.0	104.8	95.4					
01/27/10	8910	D	614	N 228993.9	E	2901379.7	16.6	107.9	98.3					
01/27/10	8910	D	615	N 229505.3	E	2901578.9	20.3	104.7	95.4					
01/27/10	8801	D	616	N 229419.3	E	2901627.6	21.0	105.0	96.2					
01/27/10	9028	D	617	N 229451.4	E	2901735.0	26.9	94.9	95.4					
01/27/10	8894	D	618	N 229361.4	E	2901771.5	21.1	102.0	98.8					
01/27/10	8895	D	619	N 229390.0	E	2901885.1	25.8	96.9	98.2					
01/27/10	8895	D	620	N 229293.6	E	2901952.7	26.0	96.2	97.5	47	28	72	1.05E-08	
01/27/10	8894	D	621	N 229321.4	E	2902035.5	24.4	100.2	97.1					
01/27/10	8894	D	622	N 229235.3	E	2902078.0	23.6	99.7	96.6					
01/27/10	9028	D	623	N 229281.2	E	2902160.3	23.9	100.3	100.8					
01/27/10	9028	D	624	N 229187.0	E	2902175.3	23.8	100.0	100.5					
01/27/10	9028	D	625	N 229232.8	E	2902251.3	22.3	101.0	101.5					
02/03/10	8896	D	641	N 229107.5	E	2901410.6	26.7	97.9	97.5					
02/03/10	8896	D	642	N 229107.8	E	2901419.8	25.2	98.8	98.4					
02/03/10	8896	D	643	N 229214.3	E	2901454.0	27.0	97.7	97.3					
02/03/10	8896	D	644	N 229227.3	E	2901527.8	26.3	98.5	98.1	54	36	74	1.89E-08	
02/03/10	8896	D	645	N 229350.3	E	2901502.8	28.0	95.7	95.3					
02/03/10	8896	D	646	N 229370.8	E	2901585.7	24.8	99.1	98.7					
08/19/10	8801	D-P	41	N 228906.8	E	2901258.4	20.2	106.2	97.3					
08/19/10	9405	D-P	42	N 229106.5	E	2901373.5	21.5	103.8	99.5					
08/19/10	8910	D-P	43	N 229366.8	E	2901440.5	18.3	107.9	98.3	40	21	99	3.17E-08	
08/19/10	9405	D-P	44	N 229492.1	E	2901758.6	18.4	104.3	100.0					
08/19/10	9405	D-P	45	N 229384.4	E	2902077.0	21.2	102.2	98.0					
08/19/10	8801	D-P	46	N 229221.9	E	2902384.6	18.6	108.5	99.5					
09/03/10	8910	D-P	57	N 228930.0	E	2901307.3	19.3	106.3	96.8					
09/03/10	8910	D-P	58	N 229182.6	E	2901362.1	17.7	104.7	95.4					
09/03/10	8910	D-P	59	N 229452.0	E	2901493.8	18.2	107.7	98.1	27	9	51	1.78E-07	
09/03/10	9405	D-P	60	N 229532.0	E	2901754.4	21.6	105.2	100.9					
09/03/10	8910	D-P	61	N 229392.8	E	2901984.0	17.4	109.9	100.1					
09/03/10	9405	D-P	62	N 229333.5	E	2902208.3	20.2	103.3	99.0					
09/03/10	9405	D-P	63	N 229193.1	E	2902394.6	21.6	101.2	97.0					
09/03/10	8910	D-P	64	N 228997.5	E	2902298.0	18.0	107.2	97.6					
09/03/10	8910	D-P	65	N 228815.2	E	2902284.5	18.8	106.1	96.6					
09/03/10	9405	D-P	66	N 228736.3	E	2902326.9	20.8	103.0	98.8					
09/16/10	8910	D-P	76	N 228197.8	E	2901154.4	18.1	110.0	100.2	31	16	57	4.86E-08	X
10/06/10	9405	D-P	177	N 229597.3	E	2901592.5	21.7	104.7	100.4					
10/06/10	8910	D-P	178	N 229510.6	E	2901499.7	21.7	107.8	98.2					
10/06/10	8910	D-P	179	N 229288.3	E	2901459.4	22.7	107.5	97.9					
10/06/10	8910	D-P	180	N 229200.3	E	2901370.8	21.7	104.4	95.1					
10/06/10	9405	D-P	181	N 229021.9	E	2901350.1	23.0	102.2	98.0					
10/06/10	8895	D-P	182	N 228808.3	E	2901272.7	26.1	98.8	100.1					
10/06/10	8895	D-P	183	N 228727.7	E	2901183.9	27.8	97.9	99.2					
10/06/10	8895	D-P	184	N 228632.0	E	2901203.4	26.2	99.9	101.2					
10/06/10	8895	D-P	185	N 228546.3	E	2901120.6	28.9	97.1	98.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
10/06/10	9405	D-P	186	N 228434.3	E	2901125.0	23.1	104.8	100.5					
10/06/10	8895	D-P	187	N 228348.5	E	2901043.3	26.2	99.6	100.9					
10/06/10	8910	D-P	188	N 228244.6	E	2901049.6	24.0	104.9	95.5					
10/06/10	9405	D-P	189	N 228145.5	E	2900966.4	24.5	99.6	95.5					
10/06/10	9405	D-P	190	N 228024.3	E	2900974.2	22.8	101.0	96.8					
10/06/10	8910	D-P	191	N 227918.9	E	2900983.4	20.3	107.4	97.8					
10/06/10	8910	D-P	192	N 227819.9	E	2900975.9	16.6	107.9	98.3					
10/06/10	8910	D-P	193	N 227758.3	E	2901058.4	17.9	109.6	99.8					
10/06/10	8895	D-P	194	N 227669.7	E	2901049.9	26.7	98.7	100.0					
10/06/10	9405	D-P	195	N 227603.5	E	2901126.2	22.7	103.8	99.5					
10/06/10	9405	D-P	196	N 227504.4	E	2901122.4	22.5	103.3	99.0					
10/07/10	9405	D-P	210	N 228187.9	E	2902629.8	20.7	100.8	96.6	41	21	86	3.90E-07	
10/21/10	9405	D-P	210A	N 228187.9	E	2902629.8	19.3	102.0	97.8	41	21	91	2.76E-08	X
10/07/10	9405	D-P	211	N 227901.4	E	2900964.7	24.0	104.0	99.7	44	24	85	2.58E-08	
10/18/10	8910	D-P	321	N 229447.8	E	2901833.1	18.6	107.2	97.6					
10/18/10	9405	D-P	322	N 229449.5	E	2901943.1	23.1	103.3	99.0					
10/18/10	9405	D-P	323	N 229322.8	E	2902129.1	22.1	101.6	97.4					
10/18/10	9405	D-P	324	N 229295.0	E	2902305.1	23.5	102.0	97.8					
10/18/10	9405	D-P	325	N 229093.3	E	2902378.4	21.0	102.8	98.6					
10/18/10	9405	D-P	326	N 228930.4	E	2902298.8	20.8	104.1	99.8					
10/18/10	9405	D-P	327	N 228665.9	E	2902361.4	21.6	103.0	98.8					
10/18/10	8910	D-P	328	N 228577.7	E	2902333.6	18.1	108.0	98.4					
10/18/10	8910	D-P	329	N 228492.0	E	2902401.2	17.3	106.4	96.9					
10/18/10	9405	D-P	330	N 228389.0	E	2902392.8	19.2	103.0	98.8					
10/18/10	8910	D-P	331	N 228339.3	E	2902484.5	17.0	107.0	97.4					
10/18/10	9405	D-P	332	N 228269.7	E	2902449.7	21.1	104.0	99.7					
10/18/10	9405	D-P	333	N 228271.6	E	2902593.4	20.0	105.3	101.0					
10/18/10	9405	D-P	334	N 228209.4	E	2902517.4	18.8	101.8	97.6					
10/18/10	9405	D-P	335	N 228178.8	E	2902677.8	22.8	101.0	96.8					
10/18/10	9405	D-P	336	N 228141.9	E	2902760.1	21.5	103.2	98.9					
10/18/10	9405	D-P	337	N 228083.1	E	2902649.2	20.7	105.0	100.7					
10/18/10	8910	D-P	338	N 228120.8	E	2902587.1	16.8	106.2	96.7					
10/18/10	9405	D-P	339	N 228067.0	E	2902496.3	21.7	101.8	97.6					
10/18/10	9405	D-P	340	N 227987.3	E	2902439.4	23.4	100.7	96.5					
10/18/10	9405	D-P	341	N 227993.6	E	2902337.0	21.1	104.2	99.9					
10/18/10	9405	D-P	342	N 227910.8	E	2902275.1	20.2	103.7	99.4					
10/18/10	9405	D-P	343	N 227931.3	E	2902181.4	23.0	101.0	96.8					
10/18/10	9405	D-P	344	N 227849.3	E	2902128.4	21.3	99.5	95.4					
10/18/10	9405	D-P	345	N 227847.2	E	2902000.1	22.8	99.8	95.7					
10/18/10	9405	D-P	346	N 227770.3	E	2901940.7	22.4	103.1	98.8					
10/18/10	9405	D-P	347	N 227773.6	E	2901834.3	20.4	103.7	99.4					
10/18/10	9405	D-P	348	N 227696.3	E	2901773.2	22.4	99.2	95.1					
10/18/10	9405	D-P	349	N 227705.1	E	2901657.7	22.7	99.3	95.2					
10/18/10	9405	D-P	350	N 227636.0	E	2901618.4	21.0	102.9	98.7					
10/18/10	9405	D-P	351	N 227646.6	E	2901503.0	20.1	104.3	100.0					
10/18/10	8910	D-P	352	N 227575.1	E	2901476.1	17.8	106.6	97.1					
10/18/10	9405	D-P	353	N 227593.0	E	2901379.4	22.8	100.3	96.2					
10/18/10	9405	D-P	354	N 227508.5	E	2901323.4	22.4	101.7	97.5					
10/18/10	9405	D-P	355	N 227471.4	E	2901227.5	21.8	103.0	98.8					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
Construction Samples											
Date	Proctor No.	Test Number	Location	Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity											

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/07/10	8895	D-S	1	N	228801.9	E 2902198.3	25.7	95.0	96.3	43	23	77	6.68E-08	
08/09/10	8895	D-S	2	N	228889.1	E 2902195.9	23.4	97.7	99.0					
08/10/10	8895	D-S	9	N	227938.9	E 2901922.3	25.2	98.0	99.3	38	20	79	5.27E-08	
08/10/10	8895	D-S	10	N	227895.6	E 2901802.9	26.4	95.4	96.7					
08/13/10	8895	D-S	17	N	228712.6	E 2901341.1	24.0	95.2	96.5					
08/13/10	8895	D-S	18	N	229109.4	E 2901478.5	23.0	95.3	96.6					
08/13/10	8895	D-S	19	N	229197.8	E 2901516.3	22.6	98.3	99.6					
08/13/10	8801	D-S	20	N	229393.1	E 2901733.5	19.0	105.7	96.9					
08/13/10	9405	D-S	21	N	229273.0	E 2901996.6	22.4	100.5	96.4					
08/24/10	8801	D-S	55	N	227790.3	E 2901549.2	17.9	104.0	95.3					
08/24/10	9405	D-S	56	N	227658.8	E 2901271.4	25.8	99.4	95.3					
08/24/10	9405	D-S	57	N	228021.2	E 2901085.1	20.4	102.7	98.5					
08/24/10	9405	D-S	58	N	228223.4	E 2901156.8	25.6	99.0	94.9					
08/24/10	9405	D-S	59	N	228513.9	E 2901266.2	23.7	99.7	95.6					
09/17/10	8910	D-S	83	N	227985.3	E 2902020.0	21.5	106.2	96.7					
09/17/10	8910	D-S	84	N	228083.6	E 2902283.2	22.1	105.6	96.2					
09/17/10	8910	D-S	85	N	228190.5	E 2902329.7	22.1	106.1	96.6					
09/17/10	8910	D-S	86	N	228396.3	E 2902271.4	19.1	109.0	99.3					
09/17/10	8910	D-S	87	N	228561.2	E 2902180.3	19.6	109.6	99.8					
09/17/10	8910	D-S	88	N	228743.9	E 2902206.1	17.1	111.9	101.9					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples											
Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples													
Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/09/10	8895	D-S	3	N	228766.0	E 2902217.9	22.7	96.6	97.9					
08/09/10	8895	D-S	4	N	228987.9	E 2902214.8	23.5	97.1	98.4	42	20	88	8.75E-08	
08/10/10	8801	D-S	11	N	227926.3	E 2901860.8	17.4	106.8	97.9					
08/10/10	8895	D-S	12	N	227865.3	E 2901760.5	27.4	95.0	96.3	40	19	82	9.22E-08	
08/13/10	8895	D-S	22	N	228742.0	E 2901352.7	24.6	94.6	95.8					
08/13/10	9405	D-S	23	N	229058.2	E 2901467.6	20.5	101.2	97.0	39	22	78	2.55E-08	
08/13/10	8895	D-S	24	N	229176.0	E 2901516.9	23.8	95.6	96.9					
08/13/10	9405	D-S	25	N	229368.6	E 2901768.2	22.4	101.5	97.3					
08/13/10	8895	D-S	26	N	229241.6	E 2902043.9	24.0	98.2	99.5					
08/24/10	9405	D-S	60	N	228248.9	E 2901159.2	24.4	101.5	97.3					
08/24/10	9405	D-S	61	N	227767.2	E 2901506.5	19.1	102.6	98.4					
08/24/10	9405	D-S	62	N	227670.2	E 2901286.6	24.3	100.5	96.4					
08/24/10	9405	D-S	63	N	228017.6	E 2901085.2	23.2	99.6	95.5					
08/24/10	9405	D-S	64	N	228535.8	E 2901268.7	23.0	101.7	97.5					
09/17/10	8910	D-S	89	N	228011.3	E 2902037.8	20.2	109.3	99.5					
09/17/10	8910	D-S	90	N	228091.0	E 2902286.1	20.1	108.7	99.0					
09/17/10	8910	D-S	91	N	228219.3	E 2902319.7	20.8	107.2	97.6					
09/17/10	8910	D-S	92	N	228413.7	E 2902243.1	21.0	108.0	98.4					
09/17/10	8910	D-S	93	N	228579.3	E 2902179.8	21.4	106.2	96.7					
09/17/10	8910	D-S	94	N	228754.2	E 2902184.2	20.3	107.4	97.8					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Pre-Construction Samples

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/09/10	9405	D-S	5	N	228827.4	E 2902200.7	23.8	99.7	95.6	41	22	81	2.98E-08	
08/09/10	8895	D-S	6	N	228940.2	E 2902200.7	22.7	99.6	100.9					
08/10/10	8895	D-S	13	N	227960.8	E 2901924.8	27.3	95.6	96.9					
08/10/10	8895	D-S	14	N	227886.8	E 2901747.5	27.6	93.9	95.1	41	20	86	9.25E-08	
08/16/10	9405	D-S	27	N	228829.7	E 2901365.7	21.0	104.3	100.0					
08/16/10	9405	D-S	28	N	229058.0	E 2901461.4	22.8	102.0	97.8					
08/16/10	9405	D-S	29	N	229370.8	E 2901585.7	20.0	106.1	101.7					
08/16/10	9405	D-S	30	N	229341.6	E 2901843.2	20.7	104.7	100.4					
08/16/10	9405	D-S	31	N	229226.2	E 2902143.2	21.6	102.2	98.0					
08/26/10	9405	D-S	65	N	228491.7	E 2901251.4	22.4	101.5	97.3					
08/26/10	9405	D-S	66	N	228293.0	E 2901173.4	21.2	103.7	99.4					
08/26/10	9405	D-S	67	N	227797.8	E 2901165.5	23.5	101.4	97.2					
08/26/10	9405	D-S	68	N	227685.5	E 2901314.0	19.4	102.8	98.6					
08/26/10	9405	D-S	69	N	227852.2	E 2901683.5	19.3	104.5	100.2					
09/18/10	8910	D-S	95	N	228000.6	E 2902047.4	20.2	107.3	97.7					
09/18/10	9405	D-S	96	N	228098.4	E 2902292.1	22.3	104.0	99.7					
09/18/10	9405	D-S	97	N	228197.5	E 2902320.3	24.3	101.4	97.2					
09/18/10	8910	D-S	98	N	228394.4	E 2902073.6	22.7	105.4	96.0					
09/18/10	9405	D-S	99	N	228604.7	E 2902176.0	21.2	103.9	99.6					
09/18/10	8910	D-S	100	N	228779.4	E 2902174.2	22.6	107.8	98.2					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/09/10	9405	D-S	7	N	228809.4	E 2902207.4	21.2	100.9	96.7	42	22	83	3.73E-08	
08/09/10	8895	D-S	8	N	228958.5	E 2902203.2	23.1	99.7	101.0					
08/10/10	8910	D-S	15	N	227930.5	E 2901879.3	18.0	105.6	96.2	38	19	81	6.18E-08	
08/10/10	8895	D-S	16	N	227907.2	E 2901827.4	25.8	95.8	97.1					
08/17/10	9405	D-S	36	N	229131.0	E 2902254.1	22.1	102.9	98.7					
08/17/10	9405	D-S	37	N	229262.6	E 2902015.4	23.4	101.0	96.8					
08/17/10	9405	D-S	38	N	229381.9	E 2901591.6	23.9	99.3	95.2					
08/17/10	9405	D-S	39	N	229120.3	E 2901478.2	21.8	101.3	97.1					
08/17/10	9405	D-S	40	N	228741.6	E 2901340.3	22.9	101.0	96.8					
08/26/10	9405	D-S	70	N	228502.9	E 2901260.4	21.9	102.3	98.1					
08/26/10	9405	D-S	71	N	228263.9	E 2901174.2	21.3	102.2	98.0					
08/26/10	9405	D-S	72	N	227769.2	E 2901184.9	22.9	99.6	95.5					
08/26/10	9405	D-S	73	N	227688.2	E 2901279.9	21.5	100.5	96.4					
08/26/10	9405	D-S	74	N	227851.1	E 2901643.4	19.0	100.7	96.5					
09/18/10	8895	D-S	101	N	228011.8	E 2902056.4	27.8	97.9	99.2					
09/18/10	9405	D-S	102	N	228112.7	E 2902282.4	23.0	102.2	98.0					
09/18/10	8895	D-S	103	N	228219.0	E 2902310.4	27.8	97.9	99.2					
09/18/10	8895	D-S	104	N	228406.4	E 2902243.3	26.2	99.9	101.2					
09/18/10	8895	D-S	105	N	228623.0	E 2902178.6	27.4	97.4	98.7					
09/18/10	8895	D-S	106	N	228801.9	E 2902198.3	24.6	97.7	99.0					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/16/10	9405		32	N 228980.2	E 2902199.6	20.6	103.9	99.6					
08/16/10	9405		33	N 228852.7	E 2902193.8	20.5	103.4	99.1	45	23	82	1.86E-08	
08/17/10	9405		41	N 227705.4	E 2901768.0	21.2	101.9	97.7	41	20	86	1.78E-07	
09/16/10	8910	D-S	41A	N 227705.4	E 2901768.0	19.3	108.3	98.6	33	16	63	9.17E-08	X
08/17/10	9405	D-S	42	N 227945.9	E 2901909.8	23.2	100.4	96.3					
08/19/10	9405	D-S	45	N 229191.7	E 2902212.2	21.8	99.8	95.7					
08/19/10	9405	D-S	46	N 229382.3	E 2901869.9	22.1	100.2	96.1					
08/19/10	9405	D-S	47	N 229388.9	E 2901582.1	24.1	99.5	95.4					
08/19/10	9405	D-S	48	N 229080.3	E 2901479.3	20.9	103.1	98.8					
08/19/10	9405	D-S	49	N 228789.4	E 2901357.5	21.2	102.7	98.5					
09/16/10	9405	D-S	75	N 228487.5	E 2901229.9	22.2	99.1	95.0					
09/16/10	9405	D-S	76	N 228197.8	E 2901154.4	19.5	101.9	97.7					
09/16/10	9405	D-S	77	N 227772.8	E 2901181.7	24.5	101.2	97.0					
09/16/10	9405	D-S	78	N 227774.4	E 2901503.2	22.1	104.2	99.9					
09/22/10	9405	D-S	107	N 228022.5	E 2902049.9	24.1	101.3	97.1					
09/22/10	9405	D-S	108	N 228115.9	E 2902266.9	24.2	100.3	96.2					
09/22/10	8910	D-S	109	N 228212.0	E 2902319.9	18.8	105.2	95.8					
09/22/10	9405	D-S	110	N 228410.1	E 2902246.3	24.8	101.2	97.0					
09/22/10	9405	D-S	111	N 228619.8	E 2902194.1	25.8	101.3	97.1					
09/22/10	8910	D-S	112	N 228798.1	E 2902192.2	19.6	105.6	96.2					
09/23/10	9405	D-S	119	N 228627.8	E 2901303.3	19.5	103.8	99.5					
09/23/10	9405	D-S	120	N 228297.2	E 2901194.9	21.0	101.5	97.3					
09/23/10	9405	D-S	121	N 227805.2	E 2901168.4	21.0	102.2	98.0					
09/23/10	9405	D-S	122	N 227706.3	E 2901409.3	22.5	99.9	95.8					
09/23/10	8910	D-S	123	N 227818.9	E 2901662.8	18.1	105.7	96.3					

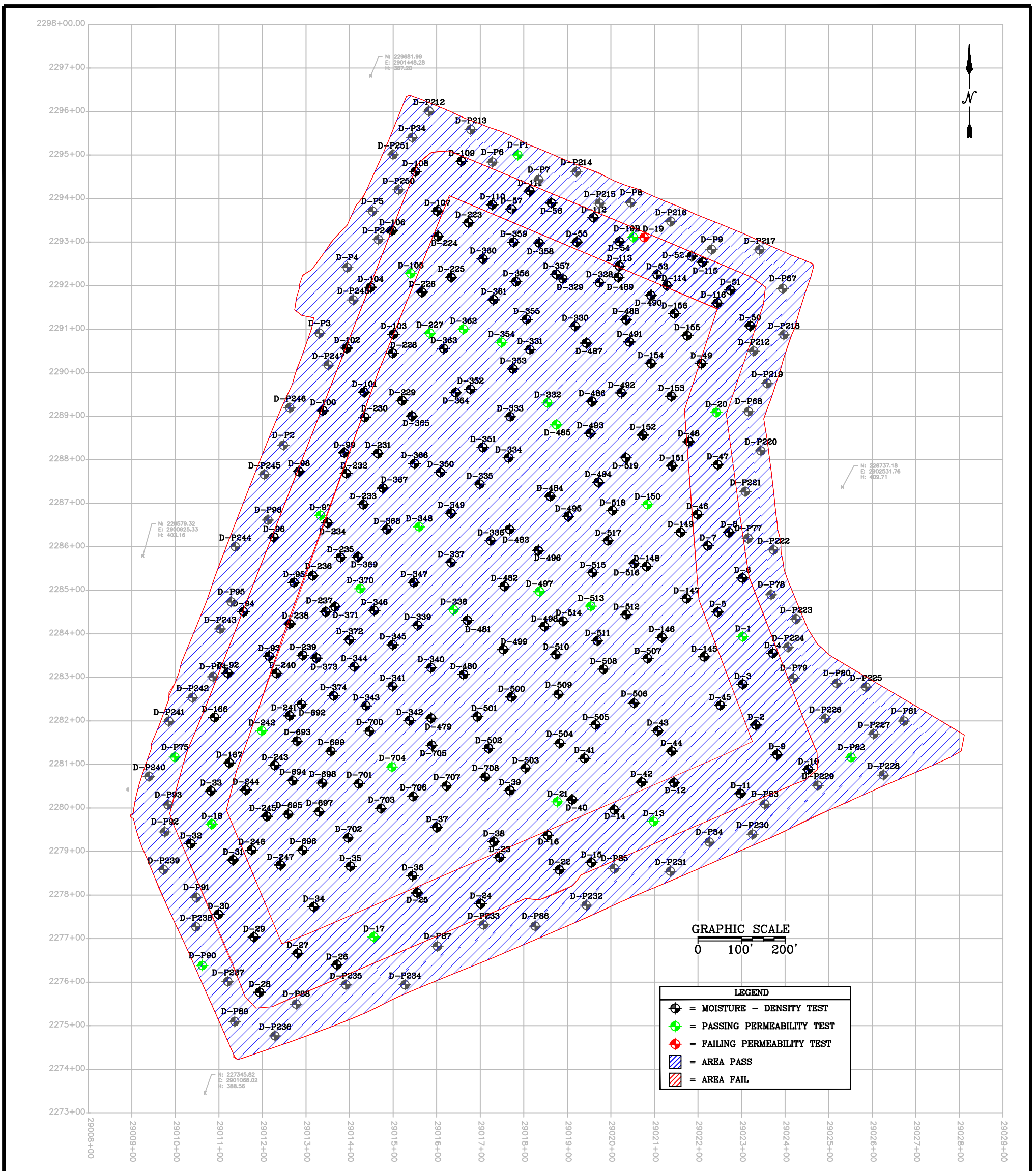
LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10' deep	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	

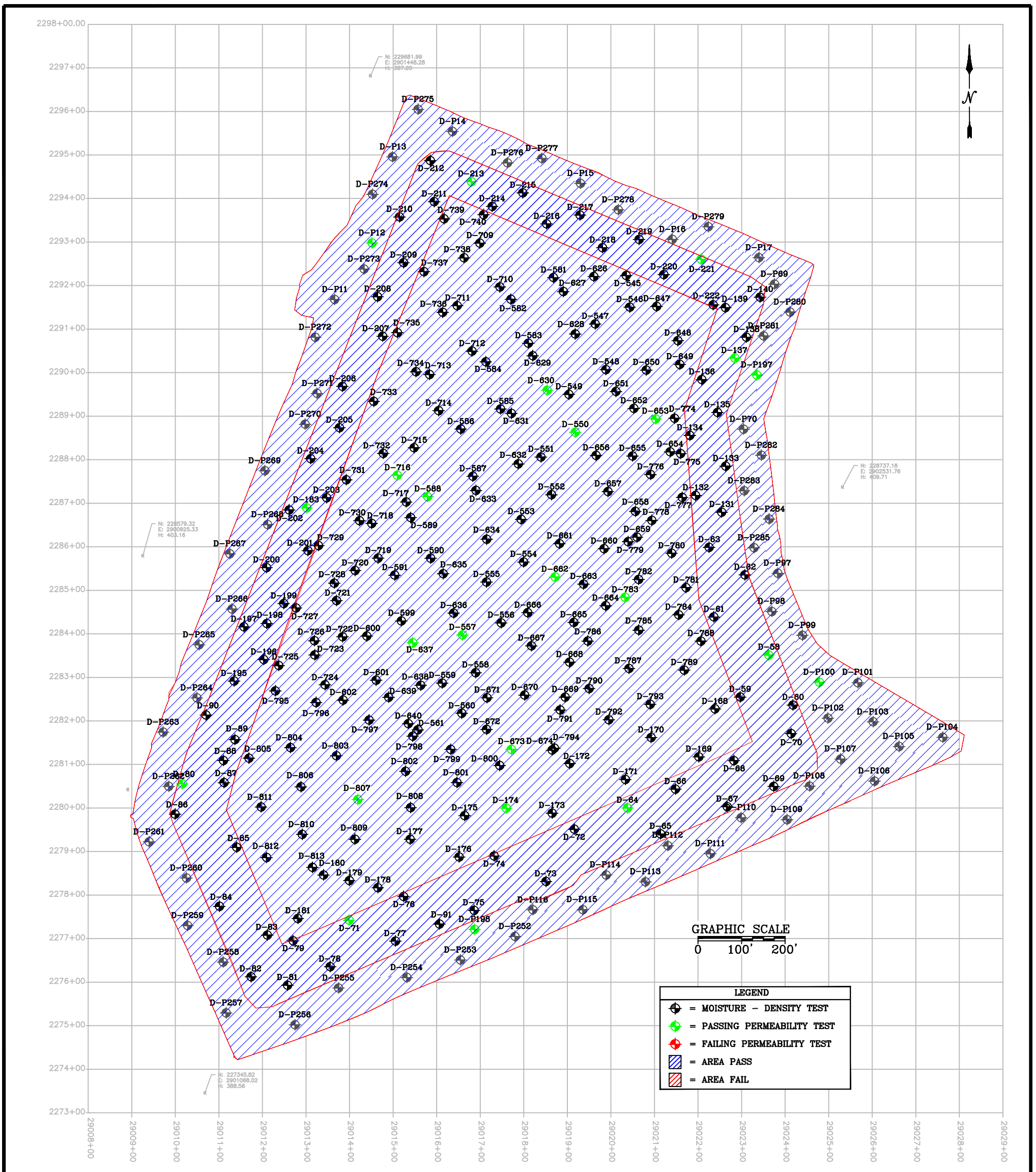
Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/16/10	9405	D-S	34	N 228808.7	E 2902182.7	22.9	101.6	97.4					
08/16/10	9405	D-S	35	N 228946.8	E 2902175.7	21.9	103.2	98.9	43	22	73	2.58E-08	
08/17/10	9405	D-S	43	N 227891.9	E 2901799.9	24.0	101.1	96.9					
08/17/10	8896	D-S	44	N 227939.7	E 2901950.2	23.8	100.5	100.1	48	34	79	1.51E-08	
08/19/10	9405	D-S	50	N 229223.3	E 2902171.2	19.6	101.8	97.6					
08/19/10	8896	D-S	51	N 229363.4	E 2901842.6	21.8	99.5	99.1					
08/19/10	8896	D-S	52	N 229418.4	E 2901596.7	21.7	100.7	100.3					
08/19/10	9405	D-S	53	N 229117.1	E 2901493.8	21.2	102.4	98.2					
08/19/10	9405	D-S	54	N 228826.4	E 2901378.2	19.1	106.3	101.9					
09/16/10	9405	D-S	79	N 228466.2	E 2901249.0	20.3	100.3	96.2					
09/16/10	9405	D-S	80	N 228179.7	E 2901158.0	23.6	99.6	95.5					
09/16/10	9405	D-S	81	N 227689.5	E 2901196.4	24.6	101.7	97.5					
09/16/10	9405	D-S	82	N 227792.9	E 2901512.0	23.4	100.8	96.6					
09/22/10	9405	D-S	113	N 228010.9	E 2902022.4	21.2	104.3	100.0					
09/22/10	9405	D-S	114	N 228101.0	E 2902254.9	25.9	100.1	96.0					
09/22/10	9405	D-S	115	N 228229.8	E 2902303.9	20.4	100.2	96.1					
09/22/10	9405	D-S	116	N 228388.1	E 2902240.7	24.0	101.9	97.7					
09/22/10	9405	D-S	117	N 228620.6	E 2902225.0	23.7	101.4	97.2					
09/22/10	9405	D-S	118	N 228819.1	E 2902163.8	25.1	100.8	96.6					
09/23/10	9405	D-S	124	N 228602.3	E 2901304.0	21.7	101.8	97.6					
09/23/10	8910	D-S	125	N 228249.1	E 2901165.4	17.4	109.4	99.6					
09/23/10	9405	D-S	126	N 227761.6	E 2901172.7	20.3	103.1	98.8					
09/23/10	9405	D-S	127	N 227739.3	E 2901417.6	20.5	103.9	99.6					
09/23/10	9405	D-S	128	N 227826.5	E 2901675.0	23.5	101.0	96.8					

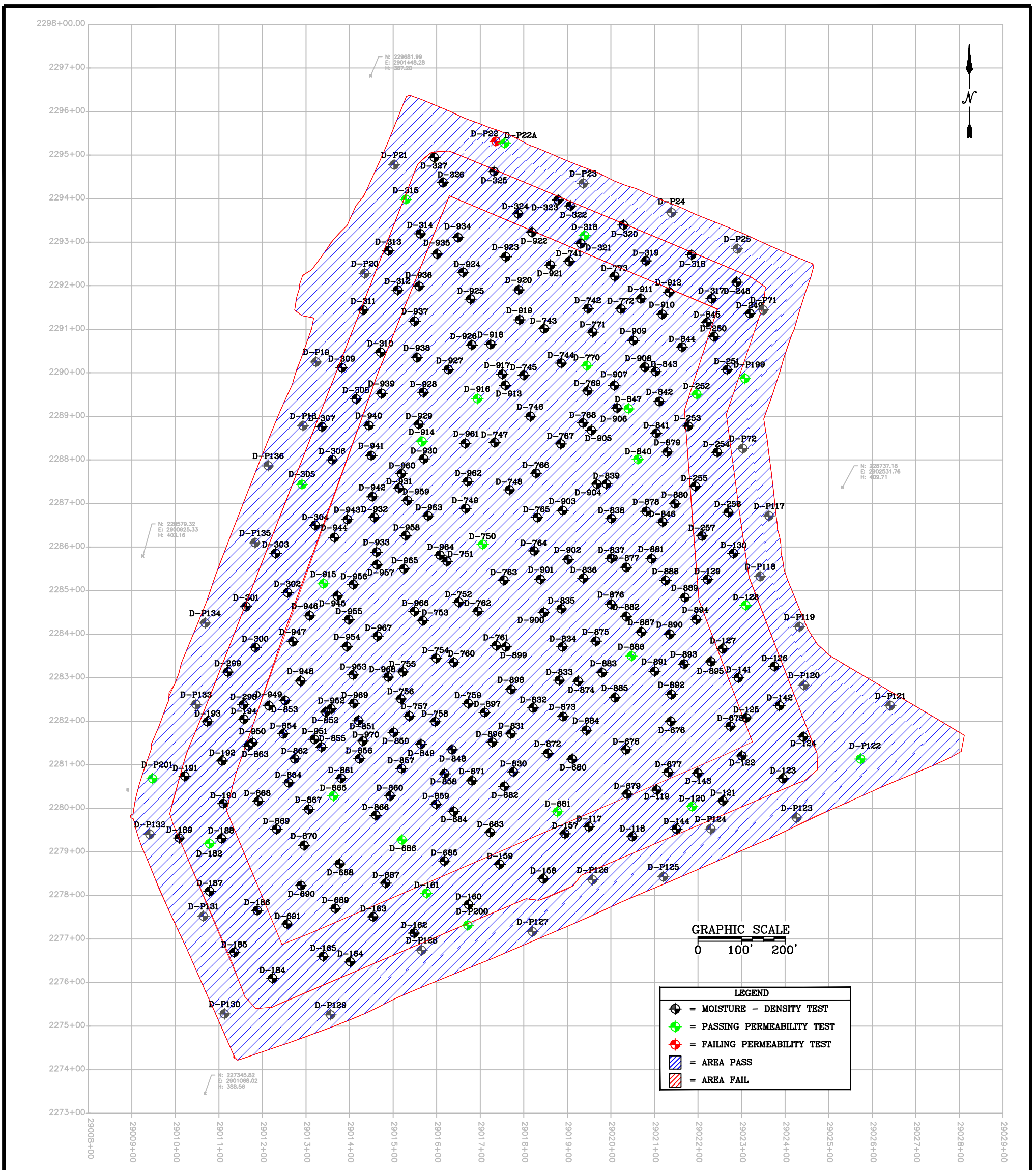
LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595–4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1–3 LIFT 1 JOB NO.: L 213–09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 LIFT 2 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 LIFT 3

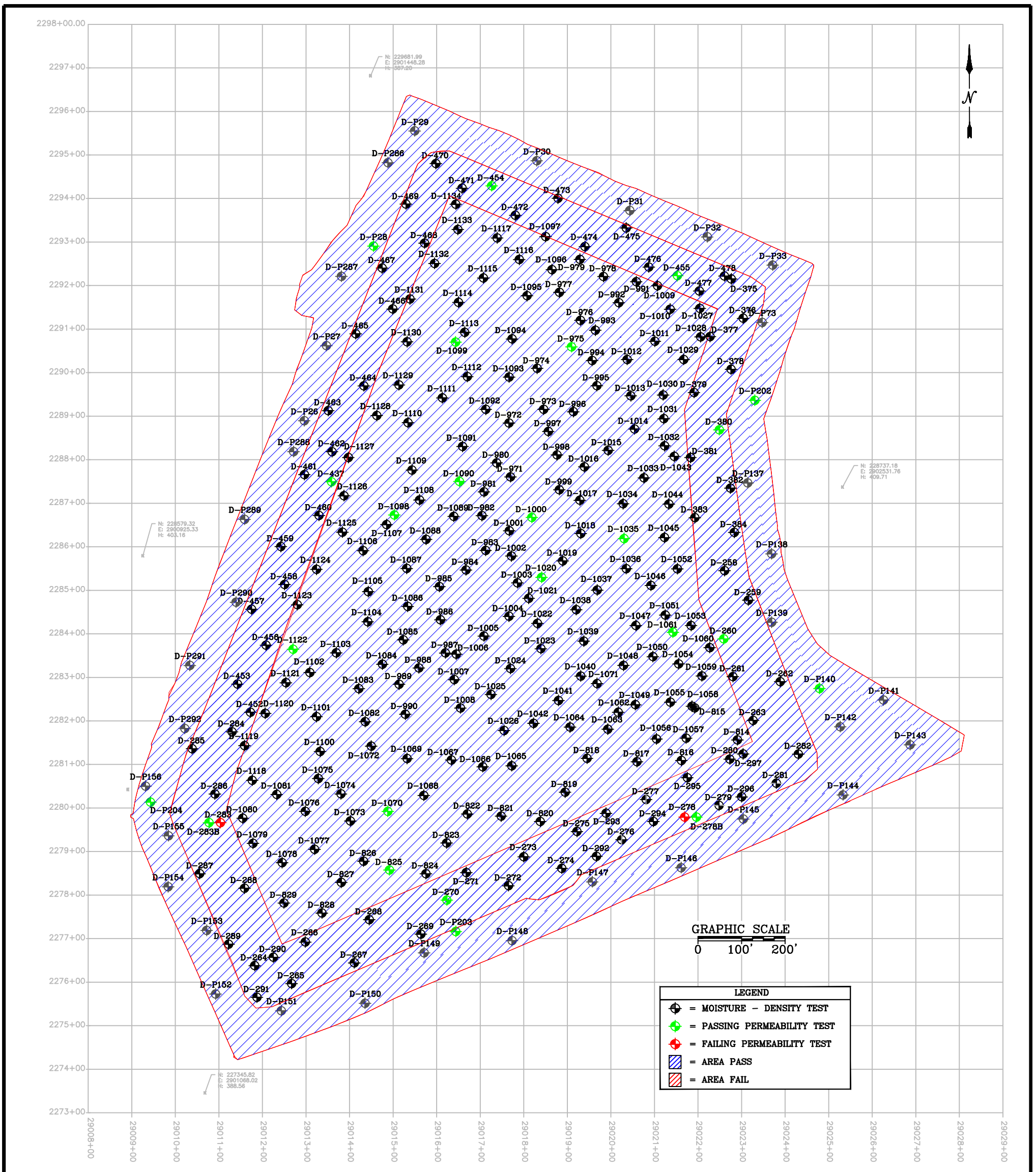
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 LIFT 4

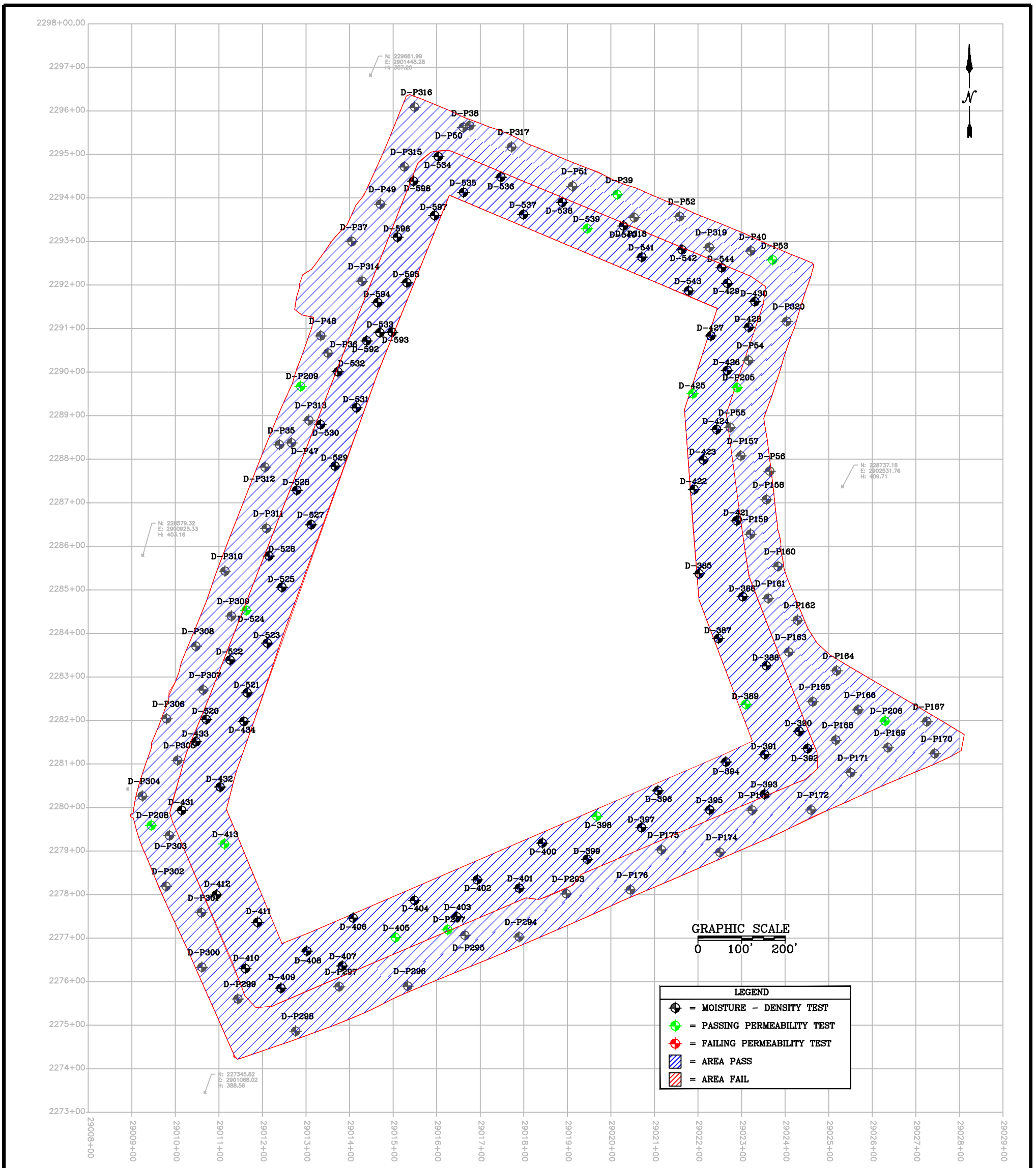
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 LIFT 5

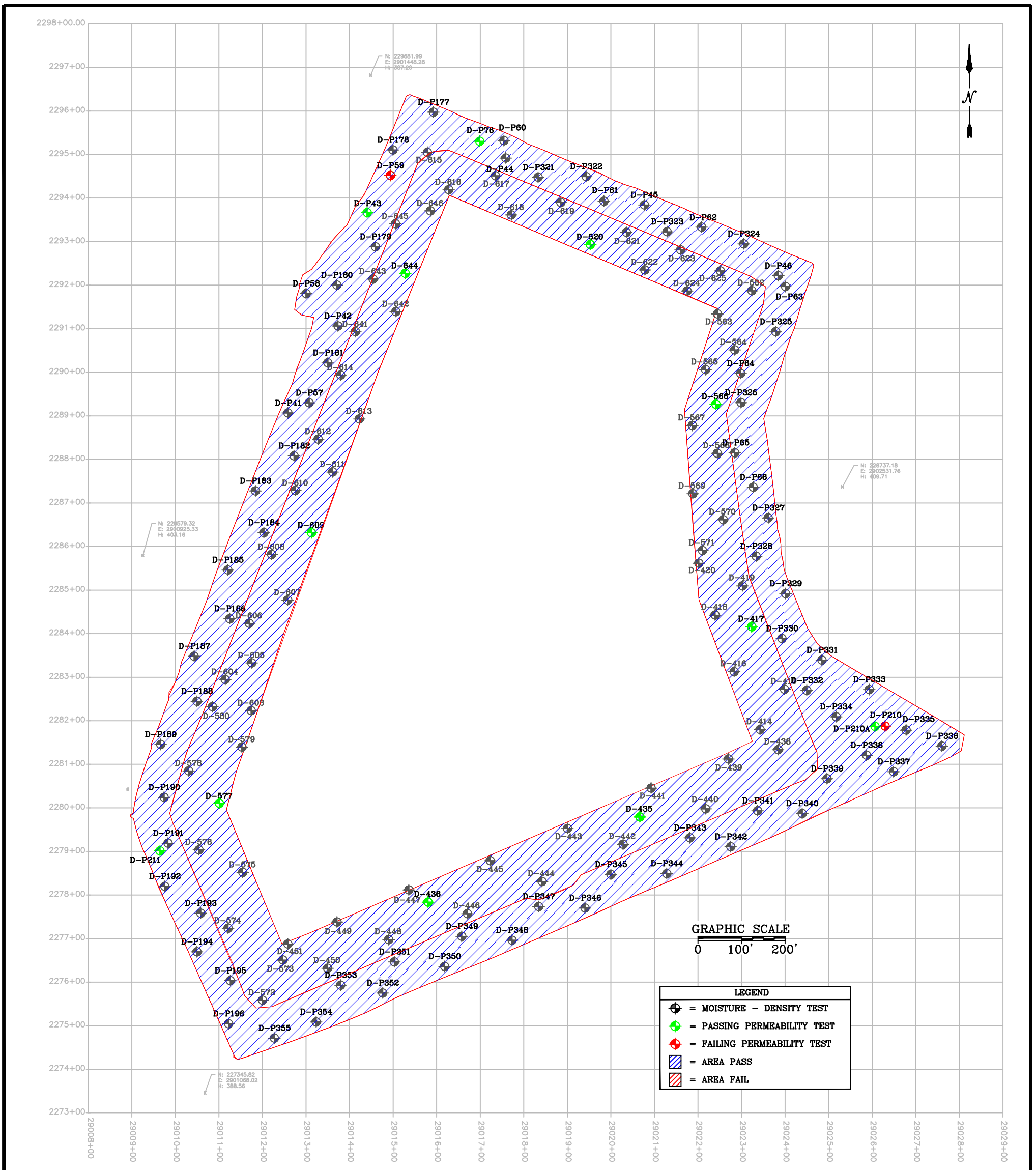
JOB NO.: L 213–09

DATE: JAN 2011

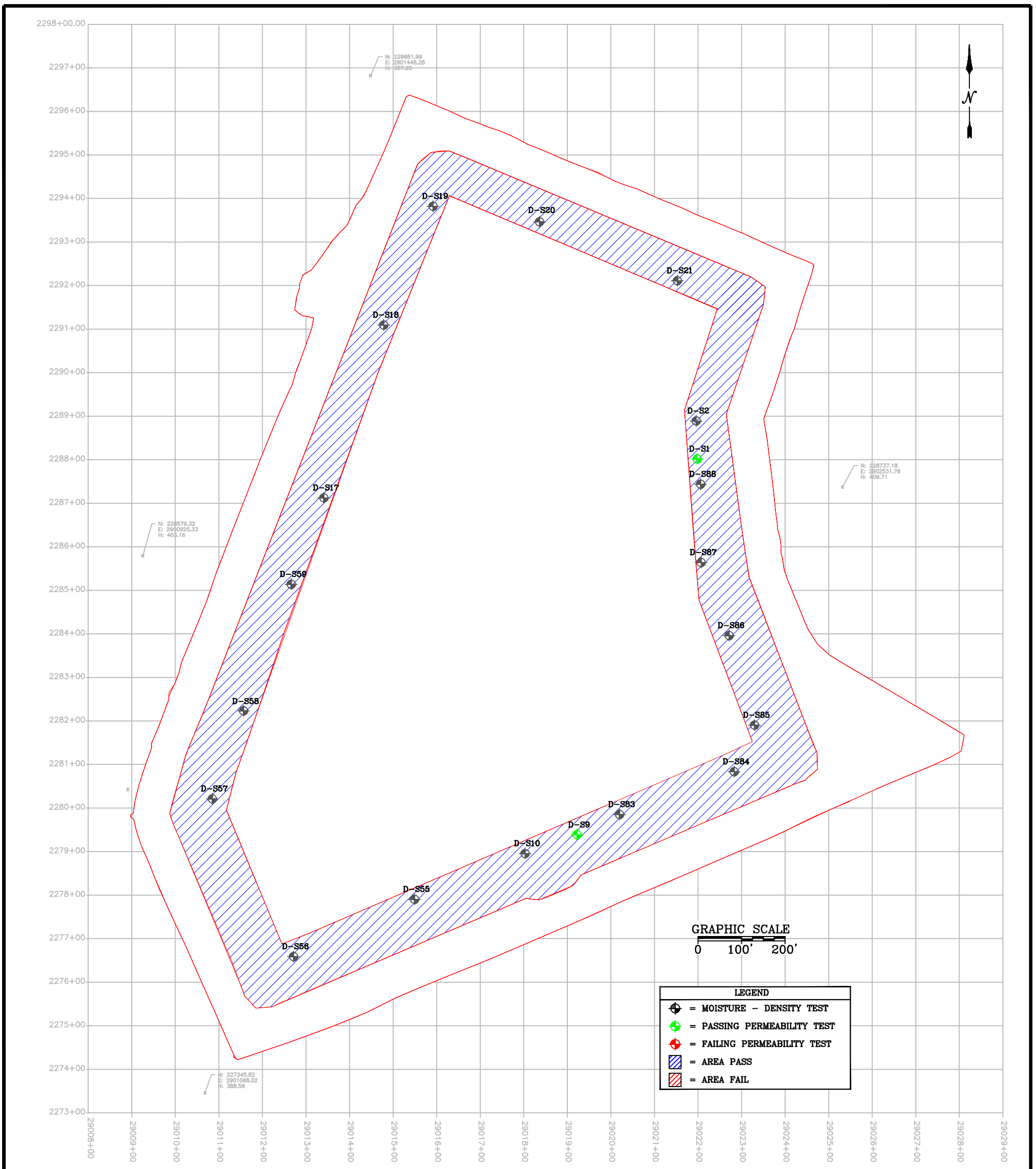
SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 LIFT 6 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 1

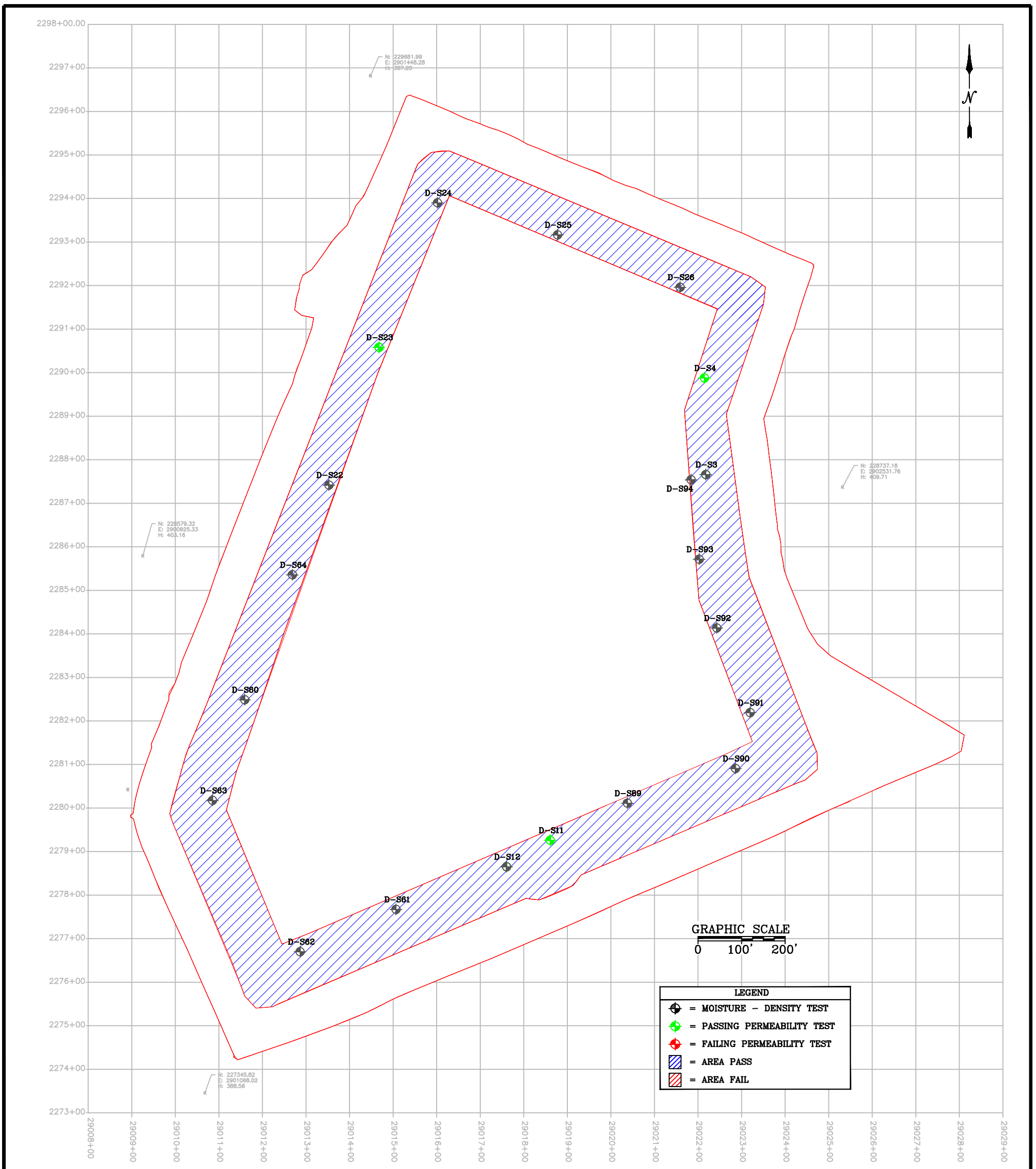
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 2

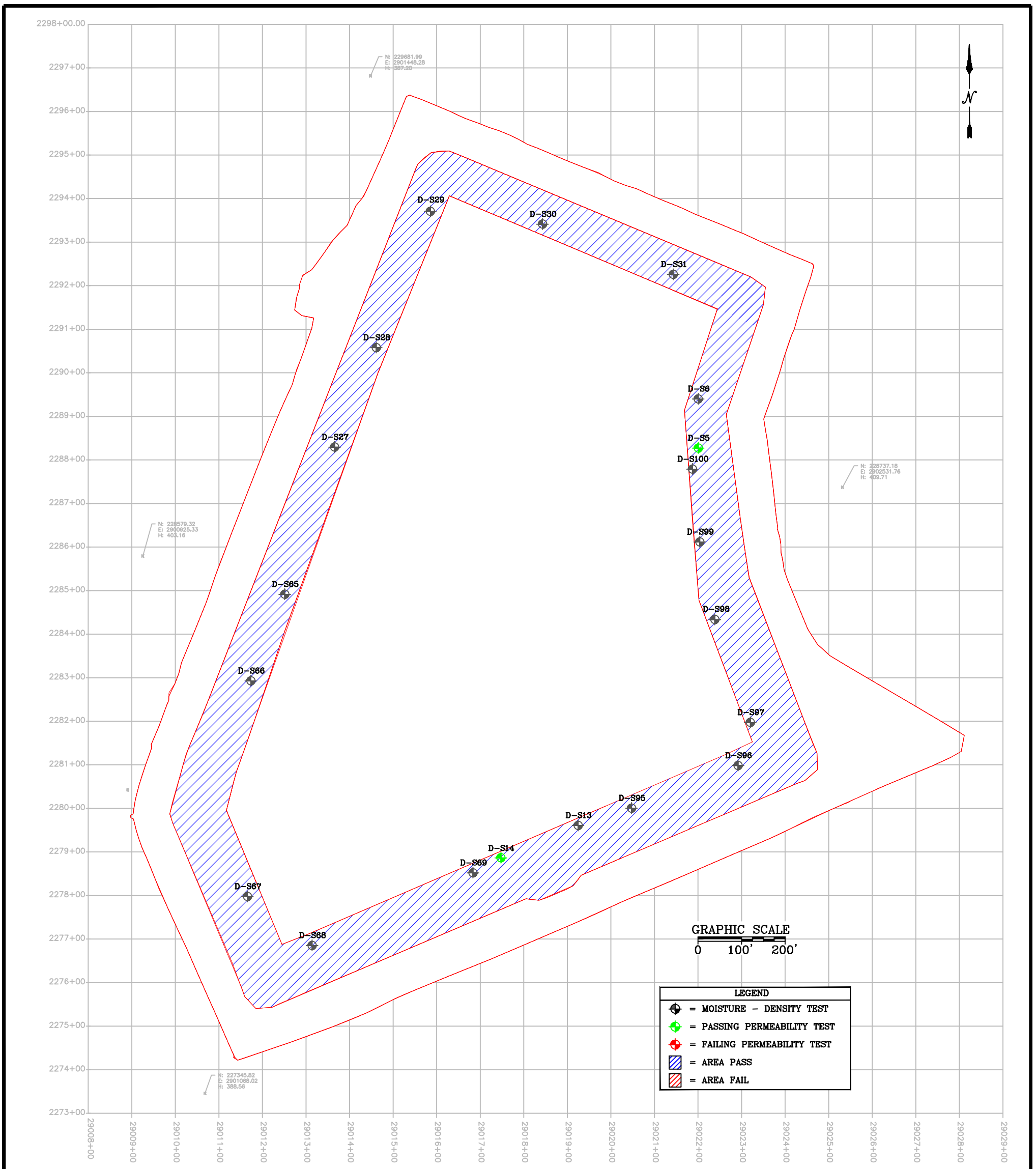
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 3

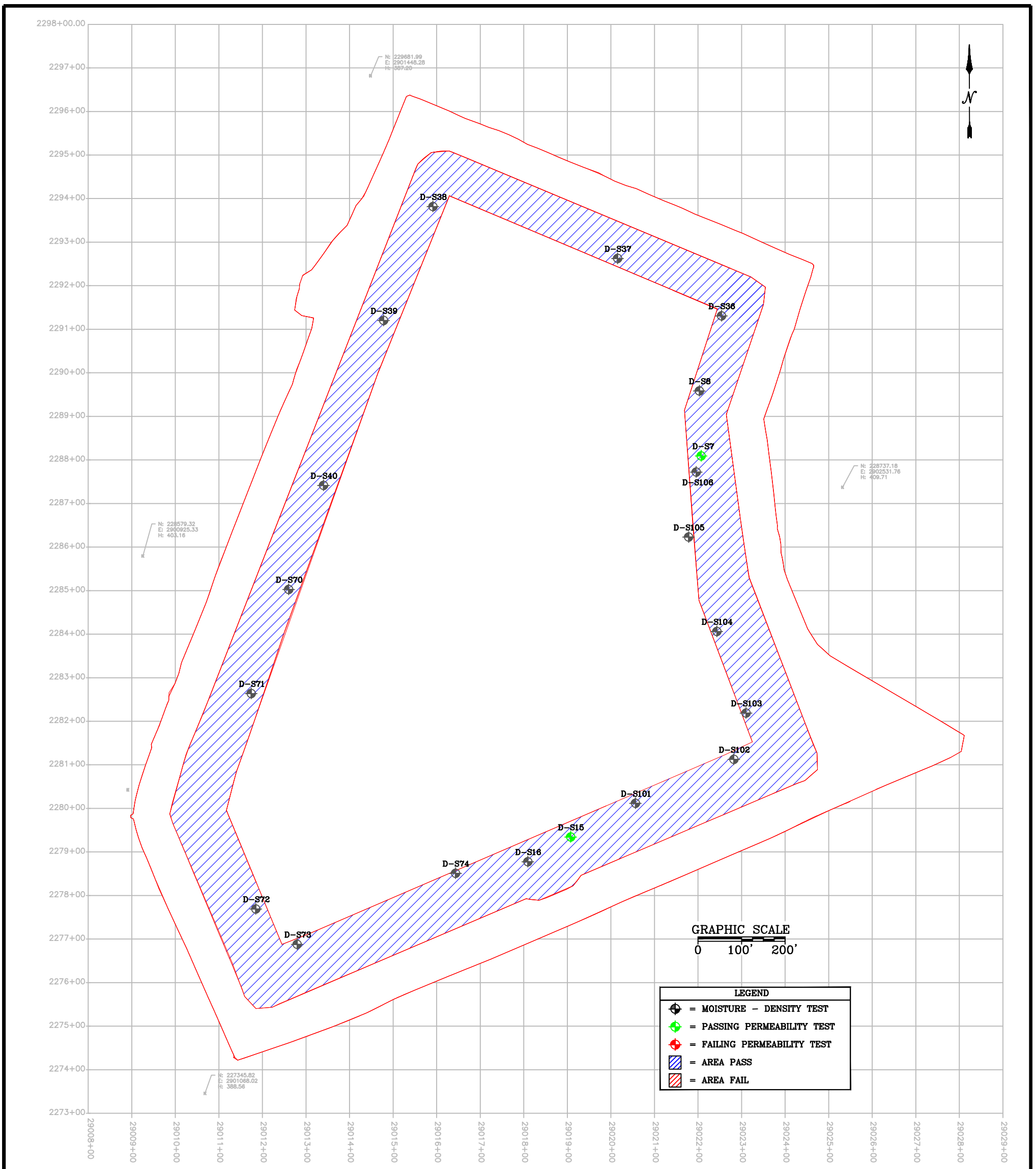
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 4

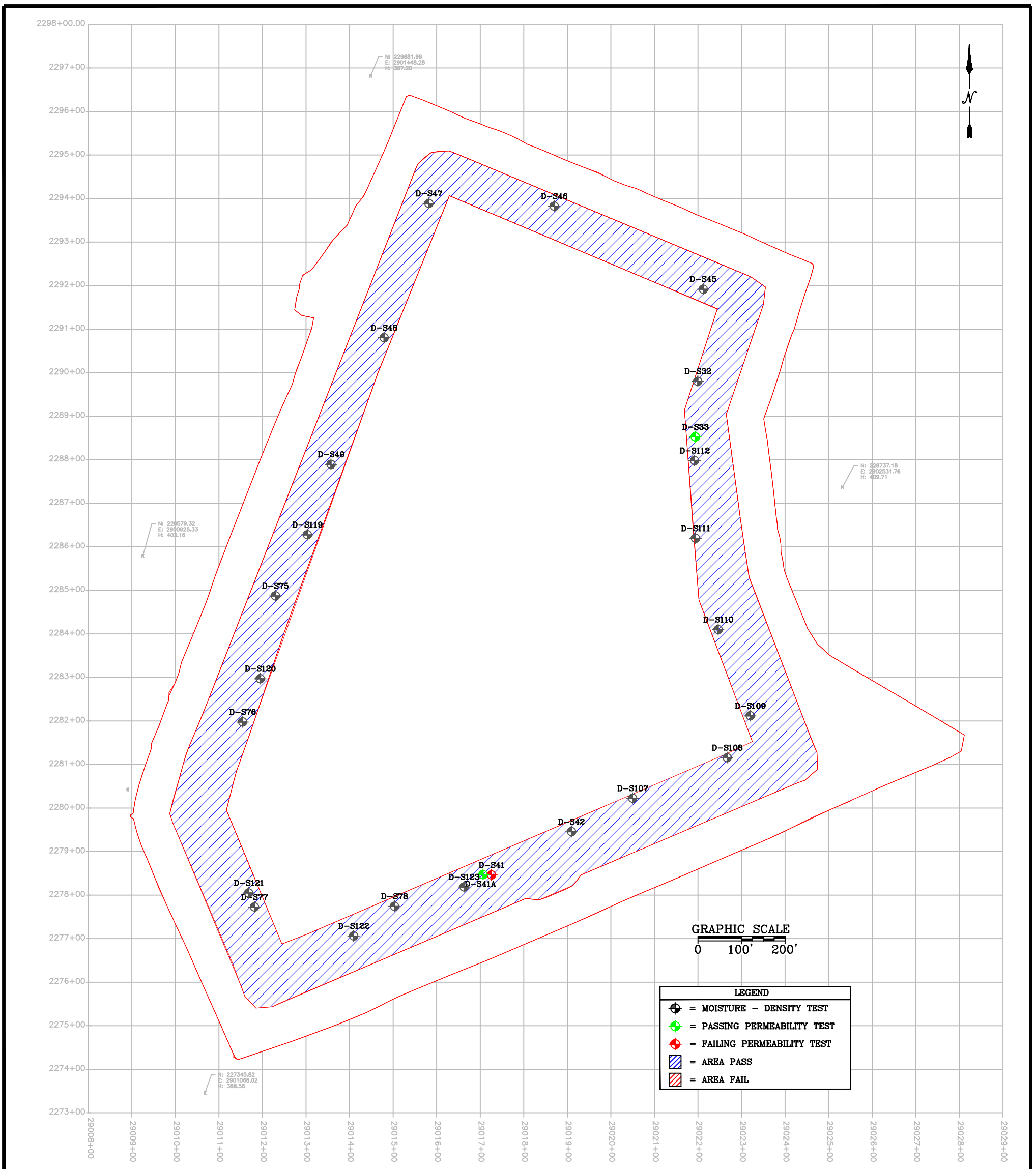
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 5

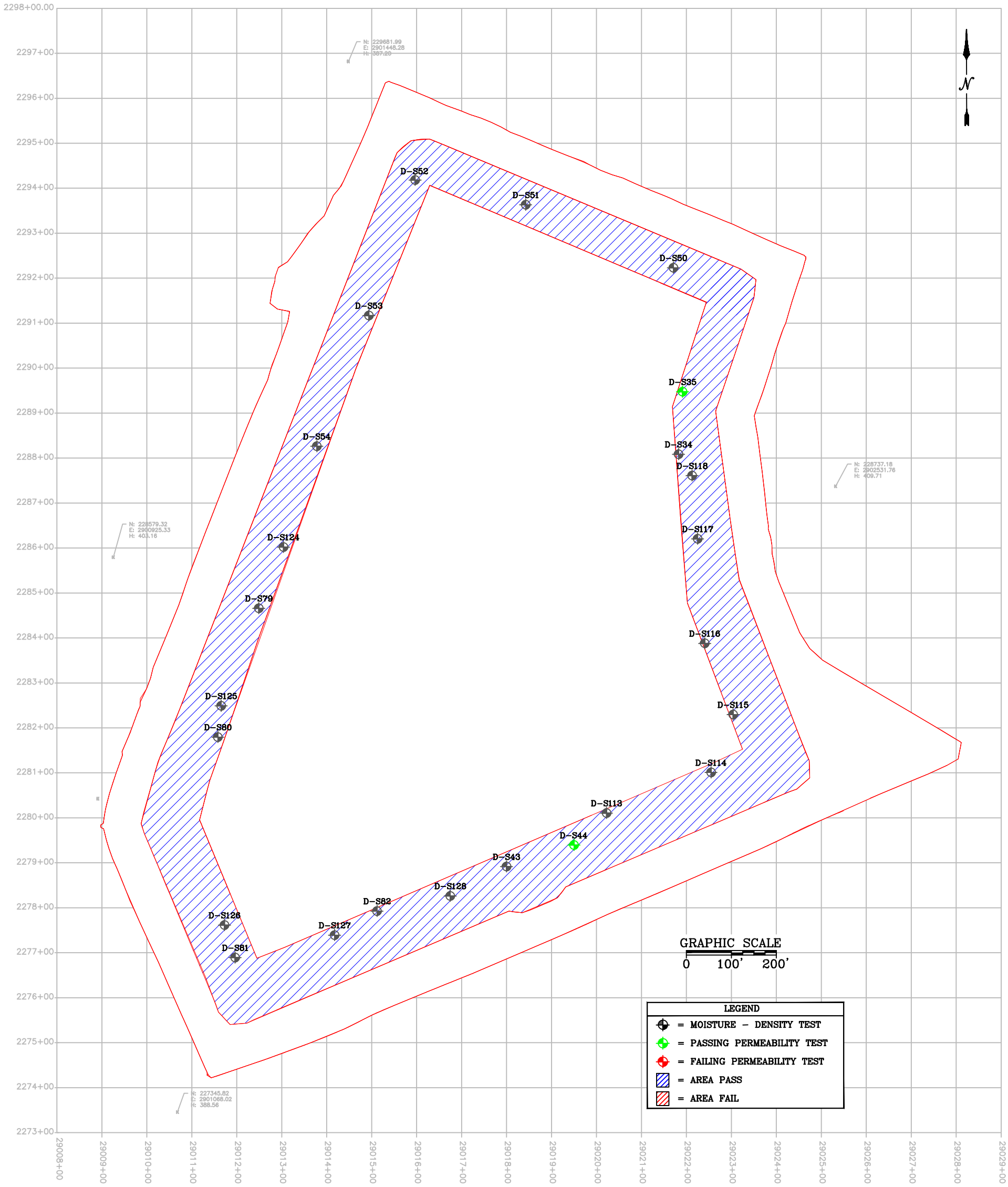
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 SLOPE LIFT 6

JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
01/27/10	8911	D-F	1	N 228158.0	E 2902339.9	13.4	115.1	101.3					
01/27/10	8911	D-F	2	N 228261.3	E 2902392.7	12.8	113.0	99.5					
01/27/10	8911	D-F	3	N 228312.9	E 2902283.0	13.5	112.1	98.7					
01/27/10	8911	D-F	4	N 228416.3	E 2902335.8	12.5	114.0	100.4					
01/27/10	8911	D-F	5	N 228467.7	E 2902223.1	13.1	113.2	99.6					
01/27/10	8906	D-F	6	N 228586.3	E 2902300.2	16.4	106.8	95.7					
01/27/10	8905	D-F	7	N 228664.1	E 2902217.6	12.8	114.2	97.3					
01/27/10	8905	D-F	8	N 228785.7	E 2902269.9	13.4	112.4	95.7					
01/27/10	8905	D-F	9	N 228848.5	E 2902175.4	13.5	114.4	97.4					
01/27/10	8905	D-F	10	N 228920.0	E 2902256.9	13.5	114.3	97.4					
01/27/10	8905	D-F	11	N 228983.9	E 2902199.5	12.7	115.4	98.3					
01/27/10	8910	D-F	12	N 229026.7	E 2902300.3	18.9	104.6	95.3					
01/27/10	8911	D-F	13	N 229112.4	E 2902242.3	13.7	110.8	97.5					
01/27/10	8911	D-F	14	N 229147.8	E 2902337.1	13.0	111.2	97.9					
01/27/10	8911	D-F	15	N 229200.3	E 2902261.5	14.2	110.8	97.5					
01/28/10	8906	D-F	16	N 228182.3	E 2902428.9	17.8	110.1	98.7					
01/28/10	8906	D-F	17	N 228065.1	E 2902404.3	16.9	111.9	100.3					
01/28/10	8906	D-F	18	N 228109.3	E 2902291.8	17.3	111.0	99.5					
01/28/10	9405	D-F	19	N 228002.4	E 2902242.2	19.2	104.6	100.3					
01/28/10	9405	D-F	20	N 228045.9	E 2902104.9	20.3	102.4	98.2					
01/28/10	8906	D-F	21	N 227913.4	E 2902049.8	19.4	107.5	96.3					
01/28/10	8906	D-F	22	N 227960.8	E 2901924.8	18.3	106.3	95.3					
01/28/10	8906	D-F	23	N 227843.1	E 2901878.6	17.0	109.5	98.1					
01/28/10	8906	D-F	24	N 227883.8	E 2901772.3	18.4	108.2	97.0					
01/28/10	8905	D-F	25	N 227780.7	E 2901728.8	11.2	120.3	102.5					
01/28/10	8905	D-F	26	N 227836.2	E 2901631.4	12.4	117.5	100.1					
01/28/10	8905	D-F	27	N 227718.2	E 2901575.9	13.4	112.0	95.4					
01/28/10	8905	D-F	28	N 227758.4	E 2901451.1	12.1	113.2	96.4					
01/28/10	9405	D-F	29	N 227648.4	E 2901420.2	22.9	102.1	97.9					
01/28/10	9405	D-F	30	N 227703.6	E 2901310.4	22.4	101.3	97.1					
01/28/10	8906	D-F	31	N 227590.1	E 2901285.7	21.7	109.1	97.8					
01/28/10	9405	D-F	32	N 227555.3	E 2901212.4	23.3	100.4	96.3					
03/05/10	8803	D-F	40	N 227988.2	E 2901073.6	16.9	111.6	98.8					
03/05/10	8803	D-F	41	N 228026.3	E 2901004.5	17.4	108.6	96.2					
03/05/10	8803	D-F	42	N 228076.0	E 2901089.8	17.7	109.4	96.9					
03/05/10	8906	D-F	43	N 228127.6	E 2901116.2	16.6	106.4	95.3					
03/05/10	8906	D-F	44	N 228228.5	E 2901079.3	16.5	109.4	98.0					
03/05/10	8906	D-F	45	N 228263.9	E 2901174.2	17.2	106.7	95.6					
03/05/10	8906	D-F	46	N 228349.6	E 2901116.2	18.5	106.0	95.0					
03/05/10	8906	D-F	47	N 228393.1	E 2901238.7	15.5	107.9	96.7					
03/05/10	8906	D-F	48	N 228478.6	E 2901174.4	16.5	107.6	96.4					
03/05/10	8801	D-F	49	N 228550.1	E 2901256.0	22.1	104.2	95.5					
03/05/10	8906	D-F	50	N 228651.5	E 2901240.8	17.5	107.1	96.0					
03/05/10	8894	D-F	51	N 228679.5	E 2901329.7	22.6	102.6	99.4					
03/05/10	8906	D-F	52	N 228776.7	E 2901293.0	16.9	108.1	96.9					
03/05/10	8894	D-F	53	N 228829.9	E 2901371.9	24.3	101.0	97.9					
03/05/10	8906	D-F	54	N 228927.4	E 2901344.4	15.3	109.3	97.9					
03/05/10	8906	D-F	55	N 228973.8	E 2901442.1	16.8	107.6	96.4					
03/05/10	8894	D-F	56	N 229066.9	E 2901390.0	25.8	99.7	96.6					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/05/10	8894	D-F	57	N	229113.3	E 2901487.7	25.3	100.0	96.9					
03/05/10	8894	D-F	58	N	229207.2	E 2901460.4	24.7	99.6	96.5					
03/05/10	8894	D-F	59	N	229275.1	E 2901548.2	24.1	100.2	97.1					
03/05/10	8894	D-F	60	N	229375.9	E 2901508.2	25.6	98.8	95.7					
03/05/10	8894	D-F	61	N	229407.3	E 2901590.9	26.5	98.0	95.0					
03/05/10	8894	D-F	62	N	229490.3	E 2901538.9	19.4	104.6	101.4					
03/05/10	8894	D-F	63	N	229455.9	E 2901635.9	23.5	100.8	97.7					
03/05/10	8894	D-F	64	N	229458.4	E 2901725.5	20.5	103.7	100.5					
03/05/10	8906	D-F	65	N	229353.9	E 2901762.4	16.0	110.2	98.7					
03/05/10	8894	D-F	66	N	229403.9	E 2901860.0	21.1	103.5	100.3					
03/05/10	8894	D-F	67	N	229303.0	E 2901896.8	21.7	102.4	99.2					
03/05/10	8894	D-F	68	N	229342.0	E 2901988.5	21.8	102.6	99.4					
03/05/10	9151	D-F	69	N	229241.6	E 2902043.9	14.9	112.9	100.4					
03/05/10	8906	D-F	70	N	229302.8	E 2902150.4	18.2	109.0	97.7					
03/05/10	8906	D-F	71	N	229183.5	E 2902181.5	16.2	109.8	98.4					
03/05/10	8906	D-F	72	N	229229.2	E 2902251.4	18.5	107.6	96.4					
03/13/10	8906	D-F	107	N	227924.2	E 2901128.0	17.1	110.4	98.9					
03/13/10	8906	D-F	108	N	227834.8	E 2901056.2	17.6	111.6	100.0					
03/13/10	8906	D-F	109	N	227823.4	E 2901167.9	20.6	106.4	95.3					
03/13/10	8906	D-F	110	N	227738.1	E 2901111.5	18.0	108.9	97.6					
03/13/10	8906	D-F	111	N	227667.1	E 2901175.3	18.9	108.6	97.3					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
02/03/10	8803	D-F	33	N 229196.9	E 2902270.8	17.3	110.9	98.2					
02/03/10	8803	D-F	34	N 229128.8	E 2902306.7	18.1	107.7	95.4					
02/03/10	8803	D-F	35	N 229097.4	E 2902224.1	18.2	109.5	97.0					
02/03/10	8803	D-F	36	N 229007.6	E 2902266.8	16.4	111.5	98.8					
02/03/10	8803	D-F	37	N 228928.5	E 2902170.1	16.2	111.4	98.7					
02/03/10	8803	D-F	38	N 228850.7	E 2902252.6	18.3	108.5	96.1					
02/03/10	8803	D-F	39	N 228765.0	E 2902180.8	16.8	110.4	97.8					
03/06/10	8911	D-F	73	N 228638.9	E 2902227.6	17.5	110.7	97.4					
03/06/10	8911	D-F	74	N 228576.2	E 2902198.4	16.7	110.1	96.9					
03/06/10	8911	D-F	75	N 228549.5	E 2902285.7	17.8	109.8	96.7					
03/06/10	8911	D-F	76	N 228482.3	E 2902222.7	16.3	111.3	98.0					
03/06/10	8911	D-F	77	N 228444.8	E 2902313.4	16.6	110.6	97.4					
03/06/10	8911	D-F	78	N 228367.4	E 2902281.5	16.2	112.6	99.1					
03/06/10	8911	D-F	79	N 228322.4	E 2902363.2	17.6	110.8	97.5					
03/06/10	8911	D-F	80	N 228255.4	E 2902309.4	17.8	111.0	97.7					
03/06/10	8911	D-F	81	N 228232.6	E 2902405.9	17.7	109.8	96.7					
03/06/10	8911	D-F	82	N 228161.8	E 2902346.0	17.2	111.6	98.2					
03/13/10	8906	D-F	83	N 229468.3	E 2901558.2	19.9	107.4	96.2					
03/13/10	8906	D-F	84	N 229378.0	E 2901582.4	19.9	108.3	97.0					
03/13/10	8906	D-F	85	N 229350.0	E 2901493.5	18.0	110.8	99.3					
03/13/10	8906	D-F	86	N 229282.4	E 2901547.9	19.7	107.5	96.3					
03/13/10	8906	D-F	87	N 229232.2	E 2901444.2	15.2	113.4	101.6					
03/13/10	8906	D-F	88	N 229171.2	E 2901476.8	19.8	107.8	96.6					
03/13/10	8906	D-F	89	N 229122.1	E 2901410.2	18.2	109.1	97.8					
03/13/10	8906	D-F	90	N 229057.7	E 2901449.1	19.2	107.5	96.3					
03/13/10	8906	D-F	91	N 229001.0	E 2901373.3	18.5	108.0	96.8					
03/13/10	8906	D-F	92	N 228925.4	E 2901403.2	16.0	108.9	97.6					
03/13/10	8906	D-F	93	N 228883.2	E 2901327.1	19.1	109.5	98.1					
03/13/10	8906	D-F	94	N 228785.7	E 2901354.6	21.3	107.2	96.1					
03/13/10	8906	D-F	95	N 228736.3	E 2901278.6	19.2	110.7	99.2					
03/13/10	8906	D-F	96	N 228667.8	E 2901302.2	18.3	111.4	99.8					
03/13/10	8906	D-F	97	N 228607.4	E 2901223.4	19.3	107.7	96.5					
03/13/10	8906	D-F	98	N 228542.4	E 2901240.7	17.1	112.5	100.8					
03/13/10	8906	D-F	99	N 228463.9	E 2901168.7	19.5	110.7	99.2					
03/13/10	8906	D-F	100	N 228388.2	E 2901195.5	23.2	108.6	97.3					
03/13/10	8906	D-F	101	N 228331.2	E 2901107.4	17.8	112.6	100.9					
03/13/10	8906	D-F	102	N 228251.6	E 2901125.1	19.6	113.4	101.6					
03/13/10	8906	D-F	103	N 228158.2	E 2901038.0	22.2	106.2	95.2					
03/13/10	8906	D-F	104	N 228061.8	E 2901105.6	21.1	107.5	96.3					
03/13/10	8906	D-F	105	N 228033.6	E 2901007.4	18.0	111.5	99.9					
03/13/10	8906	D-F	106	N 227965.3	E 2901037.2	21.3	107.0	95.9					
03/16/10	8905	D-F	112	N 228164.4	E 2902441.8	14.4	114.6	97.6					
03/16/10	8905	D-F	113	N 228069.0	E 2902410.4	12.7	115.9	98.7					
03/16/10	8906	D-F	114	N 228088.4	E 2902323.3	16.2	108.8	97.5					
03/16/10	8911	D-F	115	N 228089.3	E 2902224.3	14.8	114.3	100.6					
03/16/10	8906	D-F	116	N 228010.7	E 2902149.2	17.3	109.3	97.9					
03/16/10	8906	D-F	117	N 227947.2	E 2902089.1	16.7	109.2	97.8					
03/16/10	8905	D-F	118	N 227937.4	E 2901999.7	14.2	112.7	96.0					
03/16/10	8905	D-F	119	N 227938.0	E 2901888.3	13.6	115.1	98.0					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/16/10	8906	D-F	120	N 227878.2	E 2901831.3	15.9	111.0	99.5					
03/16/10	8905	D-F	121	N 227800.0	E 2901768.5	13.9	114.9	97.9					
03/16/10	8906	D-F	122	N 227797.3	E 2901672.7	13.2	112.5	100.8					
03/16/10	8905	D-F	123	N 227801.9	E 2901573.6	13.3	114.9	97.9					
03/16/10	8906	D-F	124	N 227731.0	E 2901510.6	14.2	111.3	99.7					
03/16/10	8906	D-F	125	N 227653.2	E 2901463.3	16.6	106.3	95.3					
03/16/10	8905	D-F	126	N 227665.5	E 2901379.5	13.1	118.1	100.6					
03/16/10	8906	D-F	127	N 227677.2	E 2901277.1	16.2	107.5	96.3					
03/16/10	8905	D-F	128	N 227628.8	E 2901238.2	12.9	117.9	100.4					
03/16/10	8906	D-F	129	N 227572.7	E 2901184.1	12.3	107.8	96.6					
03/16/10	8906	D-F	130	N 227670.6	E 2901172.1	12.3	106.5	95.4					
03/16/10	8905	D-F	131	N 227780.0	E 2901178.4	13.6	117.2	99.8					
03/16/10	8906	D-F	132	N 227832.5	E 2901102.7	12.9	106.1	95.1					
03/16/10	8906	D-F	133	N 227896.0	E 2901032.9	11.1	108.8	97.5					
03/16/10	8906	D-F	134	N 227984.5	E 2901073.7	18.6	106.1	95.1					
03/30/10	8911	D-F	135	N 229345.9	E 2901867.8	15.9	114.0	100.4					
03/30/10	8911	D-F	136	N 229351.5	E 2901938.8	17.6	111.7	98.3					
03/30/10	8911	D-F	137	N 229338.8	E 2902007.1	16.0	113.5	99.9					
03/30/10	8911	D-F	138	N 229285.7	E 2902061.2	15.4	114.7	101.0					
03/30/10	8911	D-F	139	N 229222.3	E 2902134.1	18.0	111.1	97.8					
03/30/10	8911	D-F	140	N 229232.6	E 2901982.3	16.3	111.7	98.3					
03/31/10	8911	D-F	158	N 229394.3	E 2901776.8	13.0	111.2	97.9					
03/31/10	8911	D-F	159	N 229452.0	E 2901756.6	13.1	113.2	99.6					
03/31/10	8911	D-F	160	N 229428.3	E 2901689.2	17.5	110.7	97.4					
03/31/10	8911	D-F	161	N 229470.4	E 2901632.4	13.7	110.8	97.5					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
03/30/10	8911	D-F	141	N 229176.0	E 2902302.3	15.0	112.1	98.7					
03/30/10	8911	D-F	142	N 229072.3	E 2902237.2	15.1	112.0	98.6					
03/30/10	8911	D-F	143	N 229007.5	E 2902263.7	16.5	110.1	96.9					
03/30/10	8911	D-F	144	N 228928.9	E 2902185.5	15.0	111.2	97.9					
03/30/10	8911	D-F	145	N 228850.6	E 2902249.5	13.4	110.9	97.6					
03/30/10	8911	D-F	146	N 228780.0	E 2902198.9	14.2	108.1	95.2					
03/30/10	8911	D-F	147	N 228702.3	E 2902281.5	14.0	111.0	97.7					
03/30/10	8911	D-F	148	N 228649.8	E 2902227.3	14.4	109.7	96.6					
03/30/10	8911	D-F	149	N 228580.0	E 2902204.5	14.3	108.8	95.8					
03/30/10	8911	D-F	150	N 228515.9	E 2902252.7	14.1	109.5	96.4					
03/30/10	8911	D-F	151	N 228466.6	E 2902312.8	15.4	114.7	101.0					
03/30/10	8911	D-F	152	N 228394.5	E 2902339.5	12.6	112.8	99.3					
03/30/10	8911	D-F	153	N 228327.5	E 2902285.7	14.4	110.0	96.8					
03/30/10	8911	D-F	154	N 228263.4	E 2902333.9	15.5	110.0	96.8					
03/30/10	8911	D-F	155	N 228210.9	E 2902409.6	14.2	110.9	97.6					
03/30/10	8911	D-F	156	N 228134.0	E 2902393.2	14.7	109.2	96.1					
03/30/10	8911	D-F	157	N 228071.6	E 2902373.2	14.7	107.9	95.0					
05/18/10	8905	D-F	162	N 227910.7	E 2901035.6	5.3	119.4	101.7					
05/18/10	8905	D-F	163	N 227991.4	E 2901058.1	6.5	115.1	98.0					
05/18/10	8905	D-F	164	N 228100.0	E 2901036.5	6.3	113.5	96.7					
05/18/10	8905	D-F	165	N 228204.9	E 2901148.0	7.4	114.6	97.6					
05/20/10	8910	D-F	166	N 227594.4	E 2901180.4	8.8	107.0	97.4					
05/20/10	8910	D-F	167	N 227708.3	E 2901217.5	9.2	104.4	95.1					
05/20/10	8910	D-F	168	N 227768.4	E 2901154.0	8.0	109.2	99.5					
05/20/10	8910	D-F	169	N 227824.3	E 2901072.0	7.1	110.5	100.6					
05/20/10	8910	D-F	170	N 227901.4	E 2901094.6	7.2	109.2	99.5					
05/20/10	8910	D-F	171	N 227988.2	E 2901073.6	7.1	110.1	100.3					
05/20/10	8910	D-F	172	N 228267.0	E 2901155.6	8.6	109.3	99.5					
05/20/10	8910	D-F	173	N 228345.0	E 2901212.2	19.6	107.5	97.9					
05/20/10	8910	D-F	174	N 228421.1	E 2901200.8	20.3	109.2	99.5					
05/20/10	8910	D-F	175	N 228515.7	E 2901198.2	19.9	106.7	97.2					
05/20/10	8905	D-F	176	N 228582.7	E 2901252.0	4.2	114.3	97.4					
05/20/10	8905	D-F	177	N 228686.8	E 2901332.6	7.9	116.8	99.5					
05/20/10	8905	D-F	178	N 228748.2	E 2901315.4	6.8	116.5	99.2					
05/20/10	8905	D-F	179	N 228824.4	E 2901307.1	6.2	117.1	99.7					
05/20/10	8905	D-F	180	N 228877.0	E 2901364.4	5.4	120.4	102.6					
05/20/10	8905	D-F	181	N 228925.7	E 2901415.6	4.8	115.1	98.0					
05/20/10	8905	D-F	182	N 229009.4	E 2901416.4	5.1	118.1	100.6					
05/20/10	8905	D-F	183	N 229115.6	E 2901438.2	5.5	118.0	100.5					
05/20/10	8905	D-F	184	N 229186.5	E 2901501.1	9.1	116.4	99.1					
05/20/10	8905	D-F	185	N 229260.7	E 2901551.6	9.2	121.3	103.3					
05/20/10	8905	D-F	186	N 229329.5	E 2901540.5	9.1	118.2	100.7					
05/20/10	8905	D-F	187	N 229413.2	E 2901540.9	7.8	119.7	102.0					
05/20/10	8905	D-F	188	N 229448.1	E 2901617.6	7.5	121.2	103.2					
05/20/10	8905	D-F	189	N 229443.1	E 2901698.1	6.5	120.4	102.6					
05/20/10	8905	D-F	190	N 229441.9	E 2901787.8	8.5	118.6	101.0					
05/20/10	8905	D-F	191	N 229381.8	E 2901851.3	8.0	120.7	102.8					
05/20/10	8905	D-F	192	N 229314.4	E 2901915.0	6.9	125.5	106.9					
05/20/10	8905	D-F	193	N 229305.3	E 2901980.2	7.8	123.5	105.2					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
05/20/10	8905	D-F	194	N 229318.6	E 2902066.5	7.4	124.1	105.7					
05/20/10	8905	D-F	195	N 229265.9	E 2902132.9	9.1	121.7	103.7					
05/20/10	8905	D-F	196	N 229194.4	E 2902178.1	9.8	122.4	104.3					
05/20/10	8905	D-F	197	N 229207.1	E 2902242.7	9.4	121.5	103.5					
05/22/10	8906	D-F	198	N 228112.9	E 2902421.6	14.7	109.3	97.9					
05/22/10	8906	D-F	199	N 228107.1	E 2902341.3	14.0	112.0	100.4					
05/22/10	8906	D-F	200	N 228101.0	E 2902254.9	13.2	111.3	99.7					
05/22/10	8906	D-F	201	N 228040.9	E 2902185.5	17.0	109.3	97.9					
05/22/10	8906	D-F	202	N 227970.1	E 2902125.6	16.3	108.9	97.6					
05/22/10	8906	D-F	203	N 227960.1	E 2902030.0	14.8	107.6	96.4					
05/22/10	8906	D-F	204	N 227964.8	E 2901937.1	14.4	108.9	97.6					
05/22/10	8906	D-F	205	N 227901.1	E 2901870.8	14.5	110.5	99.0					
05/22/10	8906	D-F	206	N 227830.1	E 2901804.8	18.0	107.4	96.2					
05/22/10	8905	D-F	207	N 227827.6	E 2901715.1	13.5	114.0	97.1					
05/22/10	8906	D-F	208	N 227832.4	E 2901625.3	13.4	112.2	100.5					
05/22/10	8906	D-F	209	N 227768.1	E 2901537.4	14.7	108.2	97.0					
05/22/10	8906	D-F	210	N 227711.7	E 2901471.0	13.4	109.6	98.2					
05/22/10	8906	D-F	211	N 227702.3	E 2901397.0	11.2	108.7	97.4					
05/22/10	8906	D-F	212	N 227659.9	E 2901311.6	13.3	112.0	100.4					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
05/22/10	8906	D-F	213	N 227628.6	E 2901232.1	11.6	111.5	99.9					
05/22/10	8910	D-F	214	N 227670.6	E 2901172.1	12.3	104.5	95.2					
05/22/10	8906	D-F	215	N 227735.6	E 2901151.8	13.7	111.7	100.1					
05/22/10	8906	D-F	216	N 227826.8	E 2901161.6	10.7	106.5	95.4					
05/22/10	8906	D-F	217	N 227912.4	E 2901097.4	13.9	110.7	99.2					
05/22/10	8906	D-F	218	N 227983.6	E 2901039.8	13.0	108.9	97.6					
05/22/10	8906	D-F	219	N 228074.6	E 2901040.3	15.2	107.6	96.4					
05/22/10	8910	D-F	220	N 228134.1	E 2901088.1	13.6	109.4	99.6					
05/22/10	8906	D-F	221	N 228194.0	E 2901145.2	12.9	108.4	97.1					
05/22/10	8906	D-F	222	N 228274.7	E 2901170.8	11.5	110.4	98.9					
05/22/10	8906	D-F	223	N 228351.0	E 2901165.6	12.2	109.0	97.7					
05/22/10	8906	D-F	224	N 228446.2	E 2901184.6	13.1	110.9	99.4					
05/22/10	8906	D-F	225	N 228502.2	E 2901235.6	14.3	114.4	102.5					
05/22/10	8906	D-F	226	N 228572.6	E 2901283.2	17.2	111.4	99.8					
05/22/10	8905	D-F	227	N 228656.5	E 2901287.0	14.0	113.8	96.9					
05/22/10	8906	D-F	228	N 228733.0	E 2901291.1	15.5	113.6	101.8					
05/22/10	8905	D-F	229	N 228796.3	E 2901341.9	13.2	114.3	97.4					
05/22/10	8906	D-F	230	N 228888.5	E 2901385.7	12.7	109.1	97.8					
05/22/10	8906	D-F	231	N 228983.8	E 2901410.9	13.1	108.6	97.3					
05/24/10	8905	D-F	232	N 229087.2	E 2901463.7	6.5	117.7	100.3					
05/24/10	8905	D-F	233	N 229163.8	E 2901470.8	6.1	118.4	100.9					
05/24/10	8905	D-F	234	N 229251.3	E 2901474.6	11.9	114.0	97.1					
05/24/10	8905	D-F	235	N 229322.0	E 2901531.4	9.6	118.5	100.9					
05/24/10	8905	D-F	236	N 229385.5	E 2901591.5	14.5	113.2	96.4					
05/24/10	8905	D-F	237	N 229451.1	E 2901592.7	9.5	119.2	101.5					
05/24/10	8905	D-F	238	N 229457.3	E 2901685.3	8.4	113.0	96.3					
05/24/10	8905	D-F	239	N 229404.7	E 2901757.9	12.0	121.1	103.2					
05/24/10	8905	D-F	240	N 229338.3	E 2901855.6	7.9	116.5	99.2					
05/24/10	8905	D-F	241	N 229326.2	E 2901945.6	13.0	119.1	101.4					
05/24/10	8905	D-F	242	N 229314.7	E 2902054.2	10.2	116.6	99.3					
05/24/10	8905	D-F	243	N 229248.0	E 2902142.6	9.8	118.0	100.5					
05/24/10	8905	D-F	244	N 229195.7	E 2902224.5	12.8	113.5	96.7					
05/24/10	8905	D-F	245	N 229183.9	E 2902323.8	10.4	114.8	97.8					
05/24/10	8905	D-F	246	N 229081.4	E 2902305.0	12.4	113.5	96.7					
05/24/10	8905	D-F	247	N 228996.2	E 2902248.6	13.0	112.5	95.8					
05/24/10	8905	D-F	248	N 228900.1	E 2902198.7	12.8	116.8	99.5					
05/24/10	8905	D-F	249	N 228802.5	E 2902220.0	13.2	115.8	98.6					
05/24/10	8905	D-F	250	N 228691.0	E 2902269.4	12.3	116.1	98.9					
05/24/10	8905	D-F	251	N 228599.3	E 2902244.2	12.0	117.2	99.8					
05/24/10	8905	D-F	252	N 228497.2	E 2902234.6	12.3	114.5	97.5					
05/24/10	8905	D-F	253	N 228406.9	E 2902261.9	12.7	111.9	95.3					
05/24/10	8905	D-F	254	N 228332.0	E 2902316.5	15.1	114.6	97.6					
05/24/10	8905	D-F	255	N 228261.7	E 2902405.1	14.4	114.3	97.4					
05/24/10	8905	D-F	256	N 228173.4	E 2902370.4	15.0	114.5	97.5					
05/28/10	9151	D-F	257	N 228023.7	E 2902352.9	11.6	108.7	96.6					
05/28/10	9151	D-F	258	N 228053.6	E 2902250.0	10.9	109.2	97.1					
05/28/10	9151	D-F	259	N 228043.1	E 2902135.9	11.3	108.3	96.3					
05/28/10	9151	D-F	260	N 227986.8	E 2902072.5	11.0	111.0	98.7					
05/28/10	9151	D-F	261	N 227893.7	E 2901997.8	10.4	112.9	100.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
05/28/10	9151	D-F	262	N	227898.4	E 2901904.9	10.6	113.1	100.5					
05/28/10	9151	D-F	263	N	227895.5	E 2901799.8	11.1	112.7	100.2					
05/28/10	9151	D-F	264	N	227835.3	E 2901730.4	11.6	113.4	100.8					
05/28/10	9151	D-F	265	N	227764.7	E 2901676.7	12.0	112.1	99.6					
05/28/10	9151	D-F	266	N	227766.1	E 2901596.2	12.3	110.7	98.4					
05/28/10	9151	D-F	267	N	227763.6	E 2901506.6	11.1	111.6	99.2					
05/28/10	9151	D-F	268	N	227711.2	E 2901452.4	11.8	110.3	98.0					
05/28/10	9151	D-F	269	N	227637.0	E 2901401.9	11.5	110.8	98.5					
05/28/10	9151	D-F	270	N	227648.6	E 2901426.3	12.3	111.9	99.5					
05/28/10	9151	D-F	271	N	227657.2	E 2901342.6	12.6	110.4	98.1					
05/28/10	9151	D-F	272	N	227666.1	E 2901271.2	13.2	108.8	96.7					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location		Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/01/10	9151	D-F	273	N 227599.4	E 2901229.8	13.7	108.5	96.4					
06/01/10	9151	D-F	274	N 227686.3	E 2901211.9	12.1	110.6	98.3					
06/01/10	9151	D-F	275	N 227731.8	E 2901145.7	13.1	111.5	99.1					
06/01/10	9151	D-F	276	N 227788.4	E 2901088.5	11.5	110.8	98.5					
06/01/10	9151	D-F	277	N 227861.1	E 2901086.4	10.0	111.6	99.2					
06/01/10	9151	D-F	278	N 227945.0	E 2901093.4	11.3	111.6	99.2					
06/01/10	9151	D-F	279	N 228013.4	E 2901063.7	9.9	109.7	97.5					
06/01/10	9151	D-F	280	N 228103.8	E 2901042.6	9.9	110.8	98.5					
06/01/10	9151	D-F	281	N 228152.1	E 2901078.4	11.6	111.7	99.3					
06/01/10	8905	D-F	282	N 228201.1	E 2901141.9	9.5	119.6	101.9					
06/01/10	8905	D-F	283	N 228271.2	E 2901174.0	10.7	115.0	98.0					
06/01/10	8905	D-F	284	N 228350.9	E 2901162.5	8.9	120.0	102.2					
06/01/10	9151	D-F	285	N 228423.7	E 2901160.5	10.8	111.8	99.4					
06/01/10	8905	D-F	286	N 228476.0	E 2901211.6	9.1	118.1	100.6					
06/01/10	8905	D-F	287	N 228543.3	E 2901274.7	9.4	120.7	102.8					
06/01/10	8905	D-F	288	N 228623.3	E 2901272.5	9.3	114.6	97.6					
06/01/10	8905	D-F	289	N 228706.9	E 2901267.1	7.5	116.9	99.6					
06/01/10	8905	D-F	290	N 228777.7	E 2901326.9	9.2	115.3	98.2					
06/01/10	8905	D-F	291	N 228837.5	E 2901384.0	8.9	119.0	101.4					
06/01/10	8905	D-F	292	N 228924.8	E 2901384.7	8.2	116.2	99.0					
06/01/10	8905	D-F	293	N 229012.4	E 2901391.6	9.4	115.4	98.3					
06/01/10	8905	D-F	294	N 229072.0	E 2901442.5	9.5	116.1	98.9					
06/01/10	8905	D-F	295	N 229142.4	E 2901486.9	9.8	117.0	99.7					
06/01/10	8905	D-F	296	N 229208.1	E 2901494.4	8.8	117.6	100.2					
06/01/10	8905	D-F	297	N 229258.9	E 2901486.8	9.5	113.7	96.8					
06/01/10	8905	D-F	298	N 229321.7	E 2901522.1	8.4	118.8	101.2					
06/01/10	8905	D-F	299	N 229389.0	E 2901585.2	7.8	118.4	100.9					
06/01/10	8905	D-F	300	N 229454.9	E 2901598.8	8.5	116.1	98.9					
06/03/10	8906	D-F	301	N 229484.2	E 2901607.3	8.7	110.4	98.9					
06/03/10	8906	D-F	302	N 229420.8	E 2901683.3	9.9	108.9	97.6					
06/03/10	8906	D-F	303	N 229386.1	E 2901743.0	10.1	109.6	98.2					
06/03/10	8906	D-F	304	N 229377.4	E 2901823.6	9.3	107.5	96.3					
06/03/10	8906	D-F	305	N 229358.3	E 2901923.1	10.1	108.8	97.5					
06/03/10	8906	D-F	306	N 229301.6	E 2901977.2	9.4	108.5	97.2					
06/03/10	8906	D-F	307	N 229256.1	E 2902043.5	10.9	112.9	101.2					
06/03/10	8906	D-F	308	N 229251.2	E 2902127.1	11.5	111.7	100.1					
06/03/10	9405	D-F	309	N 229242.6	E 2902210.8	18.9	102.1	97.9					
06/03/10	8905	D-F	310	N 229196.8	E 2902264.7	13.5	114.1	97.2					
06/03/10	8905	D-F	311	N 229161.2	E 2902293.5	11.0	118.8	101.2					
06/03/10	8905	D-F	312	N 229088.7	E 2902304.8	13.3	114.5	97.5					
06/03/10	8905	D-F	313	N 229036.6	E 2902262.9	13.1	111.8	95.2					
06/03/10	8905	D-F	314	N 228980.7	E 2902218.1	13.2	117.7	100.3					
06/03/10	8905	D-F	315	N 228929.7	E 2902216.4	14.0	116.5	99.2					
06/03/10	8905	D-F	316	N 228868.6	E 2902242.9	13.6	116.3	99.1					
06/03/10	8906	D-F	317	N 228788.4	E 2902238.9	15.0	109.7	98.3					
06/03/10	8905	D-F	318	N 228711.2	E 2902210.1	15.4	113.3	96.5					
06/03/10	8905	D-F	319	N 228628.3	E 2902240.3	12.9	114.2	97.3					
06/03/10	8906	D-F	320	N 228567.9	E 2902291.4	15.9	110.8	99.3					
06/03/10	8906	D-F	321	N 228483.9	E 2902281.4	15.5	112.1	100.4					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location			Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/03/10	8905	D-F	322	N 228399.7	E	2902265.2	14.3	114.6	97.6					
06/03/10	8906	D-F	323	N 228332.0	E	2902316.5	12.8	111.8	100.2					
06/03/10	8905	D-F	324	N 228261.3	E	2902392.7	12.5	117.1	99.7					
06/03/10	8910	D-F	325	N 228170.3	E	2902392.1	15.7	107.0	97.4					
06/03/10	8910	D-F	326	N 228108.8	E	2902403.1	14.8	109.6	99.8					
06/03/10	8905	D-F	327	N 228045.2	E	2902340.0	13.8	115.4	98.3					
06/03/10	8910	D-F	328	N 228042.8	E	2902256.5	15.1	108.1	98.5					
06/03/10	8905	D-F	329	N 228043.6	E	2902154.5	14.8	113.0	96.3					
06/03/10	8905	D-F	330	N 227983.2	E	2902075.7	16.0	112.2	95.6					
06/03/10	8905	D-F	331	N 227905.0	E	2902009.9	11.0	115.3	98.2					
06/03/10	8905	D-F	332	N 227898.9	E	2901923.5	14.3	113.6	96.8					
06/03/10	8905	D-F	333	N 227899.6	E	2901815.2	13.0	115.1	98.0					
06/03/10	8905	D-F	334	N 227835.5	E	2901736.6	13.3	113.1	96.3					
06/03/10	8906	D-F	335	N 227768.5	E	2901682.8	12.1	111.8	100.2					
06/03/10	8906	D-F	336	N 227766.4	E	2901605.5	12.6	109.1	97.8					
06/03/10	8906	D-F	337	N 227771.1	E	2901515.7	12.5	113.3	101.5					
06/03/10	8906	D-F	338	N 227710.7	E	2901437.0	13.4	110.2	98.7					
06/03/10	8906	D-F	339	N 227639.9	E	2901377.1	11.1	112.7	101.0					
06/03/10	8906	D-F	340	N 227666.9	E	2901299.0	14.2	109.6	98.2					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/08/10	9405	D-F	341	N	227675.0	E	2901199.8	16.5	104.0	99.7					
06/08/10	8905	D-F	342	N	227752.6	E	2901111.1	12.7	113.7	96.8					
06/08/10	8905	D-F	343	N	227807.5	E	2901121.9	14.0	113.4	96.6					
06/08/10	8910	D-F	344	N	227898.4	E	2901116.3	15.2	107.4	97.8					
06/08/10	8905	D-F	345	N	227969.4	E	2901052.5	13.4	115.5	98.4					
06/08/10	8905	D-F	346	N	228070.4	E	2901021.9	14.7	113.9	97.0					
06/08/10	8906	D-F	347	N	228137.5	E	2901078.8	12.9	110.2	98.7					
06/08/10	8906	D-F	348	N	228212.0	E	2901138.6	15.2	110.8	99.3					
06/08/10	8906	D-F	349	N	228302.8	E	2901132.9	13.6	111.5	99.9					
06/08/10	8906	D-F	350	N	228379.6	E	2901146.3	13.6	110.1	98.7					
06/08/10	8906	D-F	351	N	228443.0	E	2901203.3	15.1	111.9	100.3					
06/08/10	8906	D-F	352	N	228495.2	E	2901248.2	16.0	111.4	99.8					
06/08/10	8905	D-F	353	N	228582.8	E	2901255.0	11.6	114.7	97.7					
06/08/10	8905	D-F	354	N	228674.0	E	2901261.8	11.5	115.0	98.0					
06/08/10	8905	D-F	355	N	228719.0	E	2901310.0	11.3	115.5	98.4					
06/08/10	8905	D-F	356	N	228785.5	E	2901348.4	11.2	115.0	98.0					
06/08/10	8905	D-F	357	N	228858.4	E	2901352.5	13.1	111.8	95.2					
06/08/10	8905	D-F	358	N	228931.6	E	2901366.0	13.5	117.0	99.7					
06/08/10	8905	D-F	359	N	228994.7	E	2901410.6	15.3	116.3	99.1					
06/08/10	8905	D-F	360	N	229061.5	E	2901455.1	13.0	116.9	99.6					
06/08/10	8905	D-F	361	N	229141.9	E	2901468.4	13.7	115.9	98.7					
06/08/10	8905	D-F	362	N	229233.2	E	2901478.2	12.6	115.1	98.0					
06/08/10	8905	D-F	363	N	229303.7	E	2901528.8	13.6	116.3	99.1					
06/08/10	8905	D-F	364	N	229377.6	E	2901570.0	13.8	118.0	100.5					
06/08/10	8905	D-F	365	N	229439.8	E	2901580.7	12.9	113.5	96.7					
06/08/10	8905	D-F	366	N	229484.5	E	2901616.6	11.4	118.8	101.2					
06/08/10	8906	D-F	367	N	229428.4	E	2901692.3	17.9	107.5	96.3					
06/08/10	8906	D-F	368	N	229375.4	E	2901752.6	17.5	106.5	95.4					
06/08/10	8906	D-F	369	N	229370.3	E	2901830.0	18.7	107.3	96.1					
06/08/10	8906	D-F	370	N	229361.9	E	2901919.9	18.3	109.5	98.1					
06/08/10	8906	D-F	371	N	229312.3	E	2901970.8	18.2	107.2	96.1					
06/08/10	8906	D-F	372	N	229235.6	E	2902090.4	18.0	109.8	98.4					
06/08/10	8906	D-F	373	N	229233.9	E	2902161.6	18.2	111.0	99.5					
06/08/10	8906	D-F	374	N	229228.9	E	2902242.1	18.4	106.6	95.5					
06/09/10	8801	D-F	375	N	229168.5	E	2902296.4	16.8	105.3	96.5					
06/09/10	8801	D-F	376	N	229068.9	E	2902246.6	16.4	104.0	95.3					
06/09/10	8803	D-F	377	N	228967.1	E	2902249.4	15.8	111.4	98.7					
06/09/10	8803	D-F	378	N	228875.4	E	2902224.1	14.7	110.4	97.8					
06/09/10	8803	D-F	379	N	228736.8	E	2902215.6	15.6	108.3	95.9					
06/09/10	8803	D-F	380	N	228628.6	E	2902249.5	15.3	108.8	96.4					
06/09/10	8801	D-F	381	N	228501.1	E	2902243.8	14.0	106.4	97.5					
06/09/10	8906	D-F	382	N	228429.8	E	2902298.3	16.7	107.0	95.9					
06/09/10	8906	D-F	383	N	228336.9	E	2902362.8	17.9	106.6	95.5					
06/09/10	8801	D-F	384	N	228239.9	E	2902405.7	14.9	105.4	96.6					
06/09/10	8906	D-F	385	N	228133.4	E	2902371.5	19.1	106.4	95.3					
06/15/10	8801	D-F	386	N	228140.5	E	2902365.1	14.3	105.4	96.6					
06/15/10	8910	D-F	387	N	228087.9	E	2902307.8	15.0	104.4	95.1					
06/15/10	8801	D-F	388	N	228024.5	E	2902250.9	13.9	105.7	96.9					
06/15/10	8906	D-F	389	N	228018.2	E	2902155.2	16.4	107.4	96.2					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/15/10	8906	D-F	390	N	228019.4	E	2902068.5	14.0	111.1	99.6					
06/15/10	8801	D-F	391	N	227966.3	E	2901989.6	14.9	107.0	98.1					
06/15/10	8906	D-F	392	N	227925.1	E	2901947.5	16.2	109.4	98.0					
06/15/10	8906	D-F	393	N	227868.4	E	2901871.7	15.4	110.8	99.3					
06/15/10	8801	D-F	394	N	227847.4	E	2901770.3	16.0	107.5	98.5					
06/15/10	8801	D-F	395	N	227852.4	E	2901689.7	16.3	105.7	96.9					
06/15/10	8801	D-F	396	N	227796.0	E	2901623.2	14.4	105.1	96.3					
06/15/10	8906	D-F	397	N	227743.6	E	2901572.1	15.2	108.9	97.6					
06/15/10	8906	D-F	398	N	227730.4	E	2901489.0	14.6	109.3	97.9					
06/15/10	8801	D-F	399	N	227716.4	E	2901378.1	15.8	108.4	99.4					
06/15/10	8906	D-F	400	N	227663.9	E	2901323.9	16.2	107.7	96.5					
06/15/10	8801	D-F	401	N	227603.4	E	2901242.0	15.3	103.6	95.0					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/15/10	8801	D-F	402	N	227648.5	E	2901163.5	15.4	105.8	97.0					
06/15/10	8906	D-F	403	N	227728.5	E	2901158.2	17.7	106.8	95.7					
06/15/10	8906	D-F	404	N	227830.1	E	2901149.2	16.5	108.4	97.1					
06/15/10	8906	D-F	405	N	227908.2	E	2901075.9	17.7	106.9	95.8					
06/15/10	8906	D-F	406	N	228001.2	E	2901020.7	18.8	107.1	96.0					
06/15/10	8906	D-F	407	N	228079.3	E	2901080.4	14.2	107.7	96.5					
06/15/10	8906	D-F	408	N	228168.0	E	2901127.4	13.7	111.1	99.6					
06/15/10	8906	D-F	409	N	228273.5	E	2901127.6	16.2	107.6	96.4					
06/15/10	8906	D-F	410	N	228398.1	E	2901158.1	16.1	109.2	97.8					
06/15/10	8906	D-F	411	N	228483.4	E	2901214.5	14.7	108.7	97.4					
06/15/10	8906	D-F	412	N	228586.8	E	2901267.3	14.6	110.2	98.7					
06/15/10	8906	D-F	413	N	228693.0	E	2901292.2	16.4	108.1	96.9					
06/15/10	8906	D-F	414	N	228784.3	E	2901302.0	15.4	108.1	96.9					
06/15/10	8906	D-F	415	N	228869.4	E	2901355.3	15.6	109.8	98.4					
06/15/10	8906	D-F	416	N	228969.3	E	2901414.4	16.9	108.4	97.1					
06/15/10	8906	D-F	417	N	229049.6	E	2901421.4	17.5	108.8	97.5					
06/15/10	8906	D-F	418	N	229122.6	E	2901428.7	18.2	108.1	96.9					
06/15/10	8906	D-F	419	N	229197.0	E	2901485.4	17.2	112.2	100.5					
06/15/10	8906	D-F	420	N	229289.6	E	2901544.7	16.3	112.3	100.6					
06/15/10	8906	D-F	421	N	229377.1	E	2901551.5	17.5	110.0	98.6					
06/15/10	8906	D-F	422	N	229465.0	E	2901570.7	17.4	110.8	99.3					
06/15/10	8906	D-F	423	N	229471.3	E	2901666.4	18.0	110.9	99.4					
06/15/10	8906	D-F	424	N	229425.8	E	2901732.6	17.6	110.5	99.0					
06/15/10	8906	D-F	425	N	229359.3	E	2901827.2	18.7	109.8	98.4					
06/15/10	8906	D-F	426	N	229336.3	E	2901917.5	17.2	109.2	97.8					
06/15/10	8906	D-F	427	N	229328.0	E	2902010.5	18.5	107.9	96.7					
06/15/10	8906	D-F	428	N	229275.5	E	2902086.2	18.3	108.0	96.8					
06/15/10	8906	D-F	429	N	229216.4	E	2902186.8	17.6	110.7	99.2					
06/15/10	8906	D-F	430	N	229204.0	E	2902261.4	19.2	107.5	96.3					
06/15/10	8906	D-F	431	N	229121.3	E	2902300.8	12.4	110.5	99.0					
06/15/10	8906	D-F	432	N	229039.9	E	2902250.5	15.0	108.9	97.6					
06/15/10	8906	D-F	433	N	228918.5	E	2902204.4	17.9	109.1	97.8					
06/15/10	8906	D-F	434	N	228828.1	E	2902225.4	16.6	111.9	100.3					
06/15/10	8906	D-F	435	N	228716.0	E	2902253.3	18.2	106.1	95.1					
06/15/10	8906	D-F	436	N	228592.1	E	2902247.4	16.4	109.3	97.9					
06/15/10	8906	D-F	437	N	228443.2	E	2902257.8	16.9	108.0	96.8					
06/15/10	8906	D-F	438	N	228354.1	E	2902325.2	15.9	107.2	96.1					
06/15/10	8906	D-F	439	N	228229.0	E	2902406.0	17.0	109.8	98.4					
06/15/10	8906	D-F	440	N	228141.2	E	2902389.9	19.3	108.4	97.1					
06/15/10	8906	D-F	441	N	228069.5	E	2902299.1	17.7	108.2	97.0					
06/15/10	8906	D-F	442	N	228023.8	E	2902226.1	17.8	109.5	98.1					
06/15/10	8906	D-F	443	N	227992.0	E	2902131.2	18.4	108.2	97.0					
06/15/10	8906	D-F	444	N	227992.2	E	2902004.4	18.8	108.3	97.0					
06/15/10	8906	D-F	445	N	227916.4	E	2901898.2	18.8	108.7	97.4					
06/15/10	8906	D-F	446	N	227860.2	E	2901841.0	17.7	109.1	97.8					
06/15/10	8906	D-F	447	N	227828.1	E	2901733.7	19.2	108.2	97.0					
06/15/10	8906	D-F	448	N	227836.1	E	2901625.2	13.3	109.4	98.0					
06/15/10	8906	D-F	449	N	227764.6	E	2901540.6	18.1	109.6	98.2					
06/15/10	8906	D-F	450	N	227693.7	E	2901480.7	18.2	108.8	97.5					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/15/10	8906	D-F	451	N	227680.1	E	2901382.2	12.9	108.9	97.6					
06/15/10	8906	D-F	452	N	227677.2	E	2901277.1	18.4	108.4	97.1					
06/15/10	8906	D-F	453	N	227613.2	E	2901201.6	13.8	108.4	97.1					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/15/10	8906		454	N	227687.9	E	2901140.7	13.7	108.2	97.0					
06/15/10	8906		455	N	227782.2	E	2901128.8	13.6	108.5	97.2					
06/16/10	8906		456	N	227869.8	E	2901135.7	13.9	107.7	96.5					
06/16/10	8906	D-F	457	N	227941.0	E	2901078.0	17.6	107.7	96.5					
06/16/10	8906	D-F	458	N	228030.4	E	2901023.0	13.2	107.3	96.1					
06/16/10	8906	D-F	459	N	228133.7	E	2901072.7	14.6	111.0	99.5					
06/16/10	8906	D-F	460	N	228234.0	E	2901144.1	17.7	108.9	97.6					
06/16/10	8906	D-F	461	N	228343.7	E	2901162.7	17.4	109.6	98.2					
06/16/10	8906	D-F	462	N	228431.2	E	2901169.6	13.5	111.2	99.6					
06/16/10	8906	D-F	463	N	228520.1	E	2901225.9	16.2	113.3	101.5					
06/16/10	8906	D-F	464	N	228619.9	E	2901281.8	17.0	109.1	97.8					
06/16/10	8906	D-F	465	N	228711.4	E	2901301.0	15.9	113.4	101.6					
06/16/10	8906	D-F	466	N	228821.2	E	2901322.6	17.4	108.8	97.5					
06/16/10	8906	D-F	467	N	228906.3	E	2901372.9	17.3	108.9	97.6					
06/16/10	8906	D-F	468	N	229002.4	E	2901425.8	15.8	112.4	100.7					
06/16/10	8906	D-F	469	N	229090.5	E	2901451.2	16.8	109.2	97.8					
06/16/10	8906	D-F	470	N	229203.6	E	2901463.6	18.4	106.8	95.7					
06/16/10	8906	D-F	471	N	229281.4	E	2901510.9	16.4	114.1	102.2					
06/16/10	8906	D-F	472	N	229359.2	E	2901561.3	18.8	106.9	95.8					
06/16/10	8906	D-F	473	N	229432.6	E	2901584.0	17.8	108.9	97.6					
06/16/10	8906	D-F	474	N	229464.1	E	2901669.7	20.1	107.4	96.2					
06/16/10	8906	D-F	475	N	229404.7	E	2901757.9	17.6	108.6	97.3					
06/16/10	8906	D-F	476	N	229335.6	E	2901889.7	19.0	108.0	96.8					
06/16/10	8906	D-F	477	N	229316.4	E	2901986.1	18.5	109.3	97.9					
06/16/10	8906	D-F	478	N	229272.7	E	2902114.1	18.8	109.0	97.7					
06/16/10	8906	D-F	479	N	229244.4	E	2902145.8	14.0	108.8	97.5					
06/16/10	8906	D-F	480	N	229192.5	E	2902243.1	19.3	108.1	96.9					
06/17/10	8906	D-F	481	N	229139.1	E	2902284.8	18.0	108.6	97.3					
06/17/10	8906	D-F	482	N	229029.8	E	2902281.7	19.1	106.8	95.7					
06/17/10	8906	D-F	483	N	228958.9	E	2902218.7	15.6	107.5	96.3					
06/17/10	8906	D-F	484	N	228864.5	E	2902227.5	15.9	107.9	96.7					
06/17/10	8906	D-F	485	N	228769.7	E	2902217.8	16.7	107.5	96.3					
06/17/10	8906	D-F	486	N	228683.3	E	2902254.2	14.6	106.4	95.3					
06/17/10	8906	D-F	487	N	228580.7	E	2902229.2	16.0	107.6	96.4					
06/17/10	8906	D-F	488	N	228487.5	E	2902281.3	15.8	106.9	95.8					
06/17/10	8906	D-F	489	N	228400.1	E	2902277.5	18.0	108.6	97.3					
06/17/10	8906	D-F	490	N	228321.7	E	2902338.5	15.2	108.5	97.2					
06/17/10	8906	D-F	491	N	228213.0	E	2902353.9	19.1	107.0	95.9					
06/21/10	8906	D-F	507	N	228217.9	E	2902400.1	10.5	107.7	96.5					
06/21/10	8906	D-F	508	N	228126.5	E	2902384.1	10.2	111.8	100.2					
06/21/10	8906	D-F	509	N	228066.5	E	2902323.9	11.2	107.0	95.9					
06/21/10	8906	D-F	510	N	228062.8	E	2902187.9	10.9	111.5	99.9					
06/21/10	8906	D-F	511	N	228002.3	E	2902106.1	9.9	107.3	96.1					
06/21/10	8906	D-F	512	N	227942.1	E	2902036.7	9.8	109.9	98.5					
06/21/10	8906	D-F	513	N	227931.8	E	2901928.7	10.5	110.8	99.3					
06/21/10	8906	D-F	514	N	227888.2	E	2901800.1	9.6	109.9	98.5					
06/21/10	8906	D-F	515	N	227846.8	E	2901751.7	10.4	108.6	97.3					
06/21/10	8906	D-F	516	N	227782.6	E	2901666.9	10.0	108.1	96.9					
06/21/10	8906	D-F	517	N	227772.3	E	2901555.9	7.4	111.5	99.9					

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/21/10	8906	D-F	518	N	227747.3	E	2901445.2	8.3	110.2	98.7					
06/21/10	8906	D-F	519	N	227679.0	E	2901342.0	16.2	108.5	97.2					
06/21/10	8906	D-F	520	N	227614.8	E	2901260.3	17.4	107.5	96.3					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/18/10	8906	D-F	492	N	229462.6	E	2901614.1	13.3	109.2	97.8					
06/18/10	8906	D-F	493	N	229439.7	E	2901707.5	11.5	111.3	99.7					
06/18/10	8906	D-F	494	N	229377.1	E	2901811.3	11.2	108.9	97.6					
06/18/10	8906	D-F	495	N	229351.2	E	2901929.5	14.5	110.5	99.0					
06/18/10	8906	D-F	496	N	229285.1	E	2902036.5	8.2	112.7	101.0					
06/18/10	8906	D-F	497	N	229259.2	E	2902154.7	13.8	110.3	98.8					
06/18/10	8906	D-F	498	N	229196.3	E	2902246.1	8.9	111.9	100.3					
06/18/10	8906	D-F	499	N	229110.1	E	2902288.7	12.0	108.5	97.2					
06/18/10	8906	D-F	500	N	229021.2	E	2902232.4	11.9	113.9	102.1					
06/18/10	8906	D-F	501	N	228904.7	E	2902232.6	12.1	109.9	98.5					
06/18/10	8906	D-F	502	N	228791.4	E	2902214.1	11.4	113.4	101.6					
06/18/10	8906	D-F	503	N	228650.7	E	2902258.2	12.3	113.6	101.8					
06/18/10	8906	D-F	504	N	228479.6	E	2902256.8	12.7	110.2	98.7					
06/18/10	8906	D-F	505	N	228387.2	E	2902336.6	11.2	114.7	102.8					
06/18/10	8906	D-F	506	N	228266.9	E	2902330.7	14.3	108.4	97.1					
06/21/10	8906	D-F	521	N	227627.2	E	2901182.6	16.4	108.7	97.4					
06/21/10	8906	D-F	522	N	227757.8	E	2901166.6	20.1	107.7	96.5					
06/21/10	8906	D-F	523	N	227854.1	E	2901095.9	14.9	106.9	95.8					
06/21/10	8906	D-F	524	N	227943.4	E	2901034.7	15.9	107.8	96.6					
06/21/10	8906	D-F	525	N	228042.3	E	2901056.7	14.9	108.6	97.3					
06/21/10	8906	D-F	526	N	228145.6	E	2901109.5	15.8	106.9	95.8					
06/21/10	8906	D-F	527	N	228259.2	E	2901134.2	15.7	108.9	97.6					
06/21/10	8906	D-F	528	N	228379.8	E	2901152.5	12.3	106.6	95.5					
06/21/10	8906	D-F	529	N	228479.7	E	2901211.5	14.1	110.2	98.7					
06/21/10	8906	D-F	530	N	228597.8	E	2901270.1	11.9	107.6	96.4					
06/21/10	8906	D-F	531	N	228696.6	E	2901292.1	11.4	106.4	95.3					
06/21/10	8906	D-F	532	N	228799.2	E	2901317.1	13.6	111.4	99.8					
06/21/10	8906	D-F	533	N	228891.6	E	2901367.1	12.6	114.7	102.8					
06/21/10	8906	D-F	534	N	229006.0	E	2901422.7	9.8	108.4	97.1					
06/21/10	8906	D-F	535	N	229159.6	E	2901449.3	12.6	106.9	95.8					
06/21/10	8906	D-F	536	N	229292.6	E	2901522.9	13.2	107.4	96.2					
06/21/10	8906	D-F	537	N	229420.8	E	2901550.3	13.4	110.0	98.6					
06/22/10	8906	D-F	578	N	228071.6	E	2902373.2	14.7	112.0	100.4					
06/22/10	8906	D-F	579	N	228063.4	E	2902209.6	13.5	109.8	98.4					
06/22/10	8906	D-F	580	N	227991.5	E	2902112.6	14.6	110.5	99.0					
06/22/10	8906	D-F	581	N	227977.2	E	2901989.3	13.7	112.1	100.4					
06/22/10	8906	D-F	582	N	227902.3	E	2901914.1	9.1	110.6	99.1					
06/23/10	8906	D-F	583	N	227888.6	E	2901815.5	13.9	112.9	101.2					
06/23/10	8906	D-F	584	N	227828.8	E	2901758.4	17.7	100.5	90.1					
06/23/10	8906	D-F	585	N	227811.4	E	2901653.7	9.2	111.6	100.0					
06/23/10	8906	D-F	586	N	227793.9	E	2901549.1	13.9	106.4	95.3					
06/23/10	8906	D-F	587	N	227700.6	E	2901465.1	9.9	107.3	96.1					
06/23/10	8906	D-F	588	N	227693.5	E	2901341.6	13.8	108.0	96.8					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/21/10	8906	D-F	538	N	229459.8	E	2901645.1	9.1	108.2	97.0					
06/21/10	8906	D-F	539	N	229404.4	E	2901748.7	11.9	107.5	96.3					
06/21/10	8906	D-F	540	N	229371.6	E	2901876.4	12.9	110.4	98.9					
06/21/10	8906	D-F	541	N	229298.0	E	2901977.4	17.0	110.2	98.7					
06/21/10	8906	D-F	542	N	229282.4	E	2902070.6	18.2	108.9	97.6					
06/21/10	8906	D-F	543	N	229219.7	E	2902171.3	15.3	111.9	100.3					
06/21/10	8906	D-F	544	N	229200.3	E	2902261.5	17.2	107.4	96.2					
06/21/10	8906	D-F	545	N	229117.3	E	2902285.4	20.7	106.3	95.3					
06/21/10	8906	D-F	546	N	229010.3	E	2902232.7	18.7	109.3	97.9					
06/21/10	8906	D-F	547	N	228890.3	E	2902236.1	18.7	106.1	95.1					
06/21/10	8906	D-F	548	N	228762.3	E	2902214.9	19.8	107.0	95.9					
06/21/10	8906	D-F	549	N	228617.7	E	2902249.8	18.6	107.4	96.2					
06/21/10	8906	D-F	550	N	228511.9	E	2902240.4	17.9	108.4	97.1					
06/21/10	8906	D-F	551	N	228408.5	E	2902317.5	11.0	108.5	97.2					
06/21/10	8906	D-F	552	N	227986.5	E	2902323.0	9.9	109.8	98.4					
06/21/10	8906	D-F	553	N	228163.3	E	2902401.6	10.6	111.1	99.6					
06/21/10	8906	D-F	554	N	228689.8	E	2901307.7	9.3	111.3	99.7					
06/21/10	8906	D-F	555	N	228799.2	E	2901317.1	18.1	107.0	95.9					
06/21/10	8906	D-F	556	N	228917.6	E	2901384.9	14.8	110.2	98.7					
06/21/10	8906	D-F	557	N	229030.9	E	2901403.4	16.0	106.7	95.6					
06/21/10	8906	D-F	558	N	229159.4	E	2901443.1	16.7	110.7	99.2					
06/21/10	8906	D-F	559	N	229248.6	E	2901511.8	17.9	107.3	96.1					
06/21/10	8906	D-F	560	N	229409.8	E	2901547.5	17.8	106.5	95.4					
06/23/10	8906	D-F	589	N	227618.4	E	2901257.1	13.4	110.5	99.0					
06/23/10	8906	D-F	590	N	227714.8	E	2901189.5	18.8	108.7	97.4					
06/23/10	8906	D-F	591	N	227817.7	E	2901093.8	16.9	108.0	96.8					
06/23/10	8906	D-F	592	N	227959.1	E	2901074.4	18.1	107.3	96.1					
06/23/10	8906	D-F	593	N	228103.9	E	2901048.8	16.0	109.2	97.8					
06/23/10	8906	D-F	594	N	228200.8	E	2901129.6	20.1	106.9	95.8					
06/23/10	8906	D-F	595	N	228339.9	E	2901159.7	18.6	107.2	96.1					
06/23/10	8906	D-F	596	N	228450.7	E	2901218.5	18.4	108.4	97.1					
06/23/10	8906	D-F	597	N	228564.3	E	2901243.2	17.7	108.8	97.5					
06/28/10	8906	D-F	620	N	228063.5	E	2902345.6	18.8	106.9	95.8					
06/28/10	8906	D-F	621	N	228023.8	E	2902226.1	13.4	108.6	97.3					
06/28/10	8906	D-F	622	N	228012.9	E	2902096.6	11.4	113.4	101.6					
06/28/10	8906	D-F	623	N	227944.3	E	2901984.0	19.0	108.0	96.8					
06/28/10	8906	D-F	624	N	227861.9	E	2901899.7	14.3	108.5	97.2					
06/28/10	8906	D-F	625	N	227848.0	E	2901795.0	18.8	108.7	97.4					
06/28/10	8906	D-F	626	N	227822.9	E	2901675.1	12.3	110.2	98.7					
06/28/10	8906	D-F	627	N	227742.9	E	2901547.4	15.2	108.9	97.6					
06/28/10	8906	D-F	628	N	227685.7	E	2901453.1	14.3	109.0	97.7					
06/28/10	8906	D-F	629	N	227663.3	E	2901302.2	11.4	106.4	95.3					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/21/10	8906	D-F	561	N	229477.5	E	2901626.0	14.0	108.8	97.5					
06/21/10	8906	D-F	562	N	229411.3	E	2901733.0	14.2	112.6	100.9					
06/21/10	8906	D-F	563	N	229378.8	E	2901873.1	16.0	111.8	100.2					
06/21/10	8906	D-F	564	N	229295.0	E	2902002.2	16.7	109.1	97.8					
06/21/10	8906	D-F	565	N	229265.9	E	2902132.9	16.7	109.4	98.0					
06/21/10	8906	D-F	566	N	229203.0	E	2902227.4	14.7	109.1	97.8					
06/21/10	8906	D-F	567	N	229146.8	E	229028.5	16.3	106.5	95.4					
06/21/10	8906	D-F	568	N	229028.5	E	2902235.3	16.7	107.8	96.6					
06/21/10	8906	D-F	569	N	228897.5	E	2902235.9	13.4	109.2	97.8					
06/21/10	8906	D-F	570	N	228787.7	E	2902214.2	16.9	109.0	97.7					
06/21/10	8906	D-F	571	N	228694.0	E	2902244.6	15.6	110.6	99.1					
06/22/10	9405	D-F	572	N	228636.0	E	2902252.4	18.6	100.6	96.5					
06/22/10	9405	D-F	573	N	228544.8	E	2902245.7	17.7	102.6	98.4					
06/22/10	9405	D-F	574	N	228419.0	E	2902304.8	19.6	102.0	97.8					
06/22/10	9405	D-F	575	N	228317.4	E	2902313.8	18.8	106.3	101.9					
06/22/10	8906	D-F	576	N	228220.9	E	2902377.8	13.7	111.1	99.6					
06/22/10	8906	D-F	577	N	228131.1	E	2902421.1	14.0	111.7	100.1					
06/23/10	8906	D-F	598	N	228675.1	E	2901302.0	18.9	106.1	95.1					
06/23/10	8906	D-F	599	N	228773.9	E	2901324.0	10.3	110.3	98.8					
06/23/10	8906	D-F	600	N	228914.1	E	2901391.2	9.9	111.4	99.8					
06/23/10	8906	D-F	601	N	229075.2	E	2901426.9	9.4	112.3	100.6					
06/23/10	8906	D-F	602	N	229167.9	E	2901486.2	9.7	112.8	101.1					
06/23/10	8906	D-F	603	N	229281.2	E	2901504.7	11.2	110.4	98.9					
06/28/10	8906	D-F	604	N	229351.7	E	2901552.2	16.8	106.3	95.3					
06/28/10	8906	D-F	630	N	227685.2	E	2901171.7	12.2	111.0	99.5					
06/28/10	8906	D-F	631	N	227774.5	E	2901110.5	13.4	109.2	97.8					
06/28/10	8906	D-F	632	N	227876.0	E	2901098.4	17.5	108.8	97.5					
06/28/10	8906	D-F	633	N	228024.8	E	2901081.9	8.7	112.1	100.4					
06/28/10	8906	D-F	634	N	228137.7	E	2901085.0	12.6	106.9	95.8					
06/28/10	8906	D-F	635	N	228251.9	E	2901134.4	14.5	107.5	96.3					
06/28/10	8906	D-F	636	N	228355.3	E	2901190.2	19.1	106.4	95.3					
06/28/10	8906	D-F	637	N	228461.7	E	2901218.2	10.3	108.3	97.0					
06/28/10	8906	D-F	638	N	228564.1	E	2901237.0	14.7	112.0	100.4					
06/29/10	8906	D-F	654	N	228009.5	E	2902235.8	13.6	111.8	100.2					
06/29/10	8906	D-F	655	N	227979.1	E	2902057.3	15.0	111.8	100.2					
06/29/10	8906	D-F	656	N	227911.8	E	2901861.2	15.5	109.4	98.0					
06/29/10	8906	D-F	657	N	227796.6	E	2901644.9	11.5	107.0	95.9					
06/29/10	8906	D-F	658	N	227685.9	E	2901459.3	14.4	106.8	95.7					
06/29/10	8906	D-F	659	N	227645.0	E	2901299.6	16.5	109.0	97.7					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/28/10	8906	D-F	605	N	229466.6	E	2901629.4	18.0	106.0	95.0					
06/28/10	8906	D-F	606	N	229421.6	E	2901711.1	16.7	108.9	97.6					
06/28/10	8906	D-F	607	N	229384.9	E	2901829.6	19.1	106.4	95.3					
06/28/10	8906	D-F	608	N	229325.8	E	2901930.2	13.9	110.7	99.2					
06/28/10	8906	D-F	609	N	229289.1	E	2902051.8	8.8	108.5	97.2					
06/28/10	8906	D-F	610	N	229230.1	E	2902155.5	17.9	106.6	95.5					
06/28/10	8906	D-F	611	N	229214.2	E	2902236.3	11.8	113.7	96.8					
06/28/10	8906	D-F	612	N	229135.5	E	2902284.9	14.0	109.7	98.3					
06/28/10	8906	D-F	613	N	229007.3	E	2902257.6	15.2	108.9	97.6					
06/28/10	8906	D-F	614	N	228896.9	E	2902214.2	17.7	106.8	95.7					
06/28/10	8906	D-F	615	N	228752.1	E	2902239.9	17.8	109.5	98.1					
06/28/10	8906	D-F	616	N	228599.0	E	2902231.8	11.7	110.1	98.7					
06/28/10	8906	D-F	617	N	228462.3	E	2902291.3	13.7	108.2	97.0					
06/28/10	8906	D-F	618	N	228292.1	E	2902320.7	12.2	111.0	99.5					
06/28/10	8906	D-F	619	N	228163.2	E	2902398.5	17.9	106.6	95.5					
06/29/10	8906	D-F	639	N	228671.3	E	2901299.0	16.4	106.8	95.7					
06/29/10	8906	D-F	640	N	228799.7	E	2901332.5	15.8	108.4	97.1					
06/29/10	8906	D-F	641	N	228895.8	E	2901385.5	18.0	107.2	96.1					
06/29/10	8906	D-F	642	N	229031.4	E	2901421.9	17.3	107.0	95.9					
06/29/10	8906	D-F	643	N	229186.3	E	2901495.0	16.5	107.0	95.9					
06/29/10	8906	D-F	644	N	229366.0	E	2901542.5	16.5	108.4	97.1					
06/29/10	8906	D-F	660	N	227692.1	E	2901159.2	15.3	108.2	97.0					
06/29/10	8906	D-F	661	N	227890.7	E	2901104.2	12.4	106.6	95.5					
06/29/10	8906	D-F	662	N	228075.1	E	2901058.9	16.5	106.3	95.3					
06/29/10	8906	D-F	663	N	228300.3	E	2901173.2	17.1	109.6	98.2					
06/29/10	8906	D-F	664	N	228524.0	E	2901235.0	14.8	112.0	100.4					
07/16/10	8906	D-F	693	N	228053.1	E	2902231.5	13.5	113.0	101.3					
07/16/10	8906	D-F	694	N	227897.9	E	2901886.4	10.0	114.7	102.8					
07/16/10	8906	D-F	695	N	227776.8	E	2901586.7	13.0	111.3	99.7					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
06/29/10	8906	D-F	645	N	229445.9	E	2901667.1	16.6	106.6	95.5					
06/29/10	8906	D-F	646	N	229352.9	E	2901858.3	16.5	108.3	97.0					
06/29/10	8906	D-F	647	N	229285.9	E	2902067.4	18.5	106.2	95.2					
06/29/10	8906	D-F	648	N	229175.2	E	2902274.5	15.8	108.3	97.0					
06/29/10	8906	D-F	649	N	228999.8	E	2902248.5	14.9	110.0	98.6					
06/29/10	8906	D-F	650	N	228788.0	E	2902223.4	17.0	106.3	95.3					
06/29/10	8906	D-F	651	N	228567.2	E	2902266.7	13.0	112.3	100.6					
06/29/10	8906	D-F	652	N	228360.6	E	2902297.2	16.0	107.6	96.4					
06/29/10	8906	D-F	653	N	228163.3	E	2902401.6	15.0	109.2	97.8					
06/29/10	8906	D-F	665	N	228697.4	E	2901319.9	14.5	111.7	100.1					
06/29/10	8906	D-F	666	N	228866.4	E	2901377.1	15.2	109.6	98.2					
06/29/10	8906	D-F	667	N	229134.8	E	2901474.7	15.9	110.8	99.3					
06/29/10	8906	D-F	668	N	229310.6	E	2901513.2	14.7	107.8	96.6					
07/20/10	8906	D-F	696	N	228104.3	E	2902372.3	13.0	107.0	95.9					
07/20/10	8906	D-F	697	N	228017.9	E	2902145.9	13.9	106.1	95.1					
07/20/10	8906	D-F	698	N	227858.7	E	2901785.4	13.7	111.9	100.3					
07/20/10	8906	D-F	699	N	227726.4	E	2901476.7	12.5	108.2	97.0					
07/20/10	8906	D-F	700	N	227659.9	E	2901178.6	11.4	109.6	98.2					
07/20/10	8906	D-F	701	N	227879.4	E	2901089.0	13.7	108.8	97.5					
07/20/10	8905	D-F	702	N	228108.3	E	2901076.5	12.6	111.6	95.1					

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Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
07/15/10	8906	D-F	669	N	229064.7	E	2901439.6	16.9	108.7	97.4					
07/15/10	8906	D-F	670	N	229234.0	E	2901509.1	16.8	109.4	98.0					
07/15/10	8906	D-F	671	N	229369.9	E	2901554.8	18.0	106.7	95.6					
07/15/10	8906	D-F	672	N	229439.0	E	2901682.8	16.7	106.1	95.1					
07/15/10	8906	D-F	673	N	229352.6	E	2901849.0	16.5	107.9	96.7					
07/15/10	8906	D-F	674	N	229319.6	E	2901970.6	14.1	112.0	100.4					
07/15/10	8906	D-F	675	N	229241.2	E	2902161.4	11.7	108.0	96.8					
07/15/10	8906	D-F	676	N	229186.4	E	2902283.5	12.0	106.5	95.4					
07/15/10	8906	D-F	677	N	229017.9	E	2902244.9	14.5	106.8	95.7					
07/15/10	8906	D-F	678	N	228820.7	E	2902219.4	14.7	107.5	96.3					
07/15/10	8906	D-F	679	N	228555.3	E	2902229.9	13.7	108.0	96.8					
07/15/10	8906	D-F	680	N	228353.8	E	2902315.9	15.9	107.3	96.1					
07/16/10	8906	D-F	681	N	228660.3	E	2901293.1	14.6	108.6	97.3					
07/16/10	8906	D-F	682	N	228814.3	E	2901335.2	12.4	109.5	98.1					
07/20/10	8906	D-F	703	N	228137.8	E	2902399.2	12.0	114.2	102.3					
07/20/10	8906	D-F	704	N	227983.6	E	2902088.1	11.2	110.7	99.2					
07/20/10	8906	D-F	705	N	227827.6	E	2901715.1	12.8	111.3	99.7					
07/20/10	8906	D-F	706	N	227629.3	E	2901256.8	12.6	109.1	97.8					
07/20/10	8906	D-F	707	N	227868.7	E	2901095.5	12.7	106.4	95.3					
07/20/10	8906	D-F	708	N	228211.1	E	2901107.7	13.4	107.5	96.3					
07/20/10	8906	D-F	709	N	228534.6	E	2901225.5	12.4	110.5	99.0					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
07/16/10	8906	D-F	683	N	229060.8	E	2901430.4	13.9	113.2	101.4					
07/16/10	8906	D-F	684	N	229238.4	E	2901799.6	14.2	111.1	99.6					
07/16/10	8906	D-F	685	N	229426.4	E	2901491.4	12.1	107.6	96.4					
07/16/10	8906	D-F	686	N	229383.7	E	2901789.4	9.8	112.1	100.4					
07/16/10	8906	D-F	687	N	229264.3	E	2902074.1	13.7	111.1	99.6					
07/16/10	8906	D-F	688	N	229110.1	E	2902288.7	13.9	113.8	102.0					
07/16/10	8906	D-F	689	N	228922.6	E	2902219.7	9.5	114.6	102.7					
07/16/10	8906	D-F	690	N	228729.0	E	2902197.3	10.5	109.6	98.2					
07/16/10	8906	D-F	691	N	228519.1	E	2902237.1	10.4	111.0	99.5					
07/16/10	8906	D-F	692	N	228173.4	E	2902370.4	8.9	115.9	103.9					
07/22/10	8906	D-F	710	N	228119.1	E	2902381.2	12.7	112.4	100.7					
07/22/10	8906	D-F	711	N	228013.5	E	2902118.2	12.9	108.4	97.1					
07/22/10	8906	D-F	712	N	227764.8	E	2901549.9	12.2	112.7	101.0					
07/22/10	8906	D-F	713	N	227721.0	E	2901152.2	9.3	106.6	95.5					
07/22/10	8906	D-F	714	N	228111.9	E	2901073.3	12.3	110.3	98.8					
07/22/10	8906	D-F	715	N	228527.4	E	2901225.7	13.9	108.5	97.2					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
07/24/10	8928	D-F	716	N	228099.8	E	2902341.5	9.6	109.1	95.9					
07/24/10	8906	D-F	717	N	227966.5	E	2901998.9	9.9	108.5	97.2					
07/24/10	8906	D-F	718	N	227721.5	E	2901433.6	9.8	106.6	95.5					
07/24/10	8906	D-F	719	N	227846.9	E	2901099.2	12.0	114.6	102.7					
07/24/10	8906	D-F	720	N	228310.4	E	2901145.1	10.0	108.1	96.9					
07/24/10	8928	D-F	721	N	228792.0	E	2901320.4	9.6	110.8	97.4					
07/24/10	8905	D-F	722	N	229281.2	E	2901504.7	11.3	117.1	99.7					
07/24/10	8906	D-F	723	N	229422.6	E	2901748.1	9.9	108.0	96.8					
07/24/10	8905	D-F	724	N	229272.5	E	2902107.9	12.2	119.5	101.8					
07/24/10	8906	D-F	725	N	229032.7	E	2902253.8	10.6	106.1	95.1					
07/24/10	8905	D-F	726	N	228694.0	E	2902244.6	13.2	112.9	96.2					
07/24/10	8905	D-F	727	N	228354.1	E	2902325.2	10.8	117.1	99.7					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/02/10	8906	D-F	728	N	229073.1	E	2902268.1	12.7	109.4	98.0					
08/02/10	8906	D-F	729	N	228646.9	E	2902252.1	10.7	110.8	99.3					
08/02/10	8906	D-F	730	N	228184.6	E	2902382.5	12.9	108.2	97.0					
08/02/10	8906	D-F	731	N	227952.4	E	2902014.7	14.4	111.7	100.1					
08/02/10	8906	D-F	732	N	227730.6	E	2901498.3	14.2	112.5	100.8					
08/02/10	8906	D-F	733	N	227836.2	E	2901105.7	10.7	113.6	101.8					
08/02/10	8906	D-F	734	N	228369.5	E	2901174.4	12.0	114.9	103.0					
08/02/10	8906	D-F	735	N	228921.3	E	2901387.9	11.4	112.8	101.1					
08/02/10	8906	D-F	736	N	229251.9	E	2901499.3	10.9	111.2	99.6					

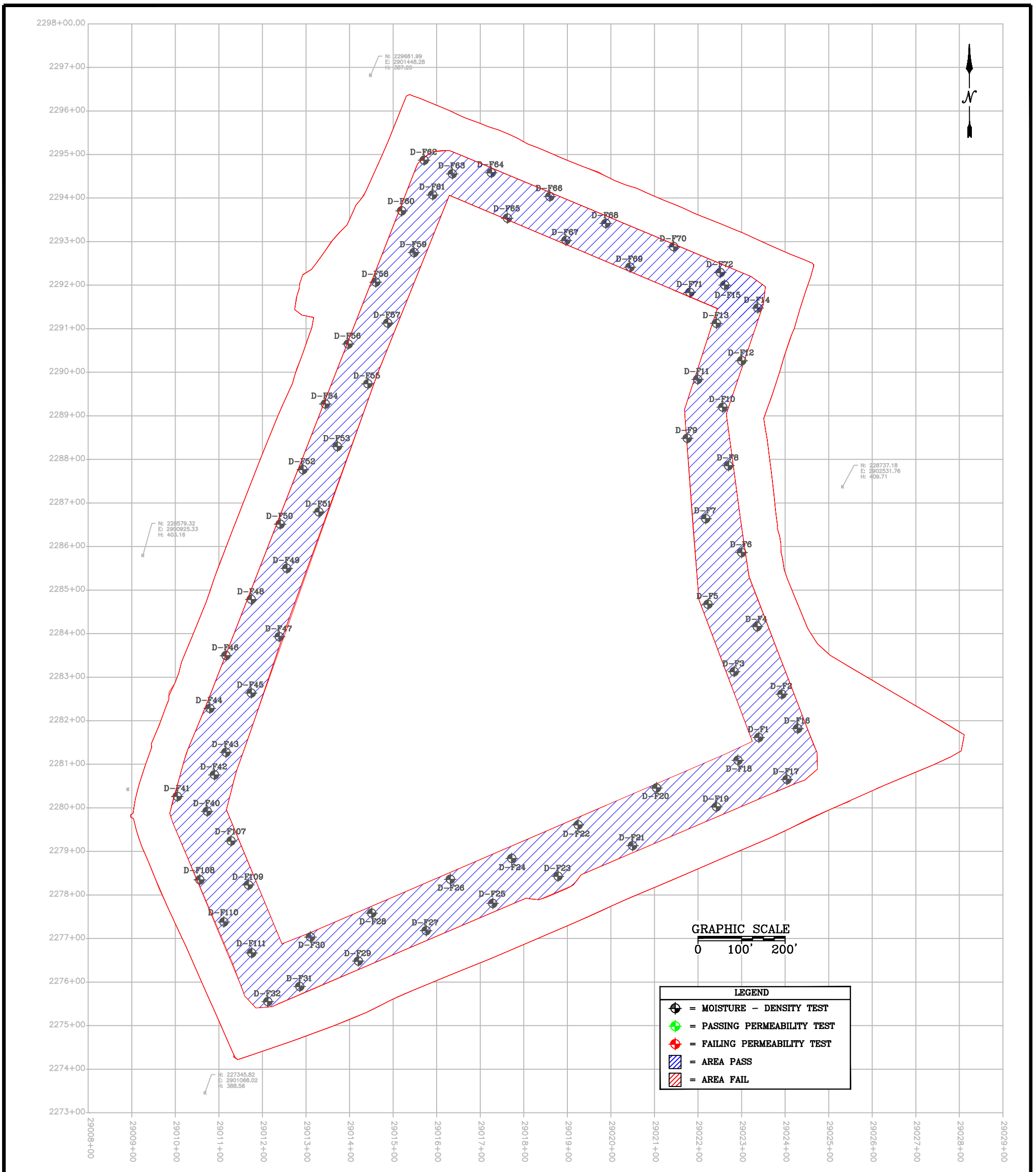
LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity

Date	Proctor No.	Borrow Source	Soil Description	Optimum Percent Moisture	Maximum Dry Density [pcf]		LL	PI	-200	k [cm/sec]	
04/21/09	8801	Berm PDP 2,3	Brown, Gray & Tan Sandy Lean Clay	17.0	109.1		48	31	65	1.06E-08	
06/03/09	8894	S. Borrow Area	Red & Gray Fat Clay	19.7	103.2		52	30	87	9.09E-08	
06/03/09	8895	S. Borrow Area	Gray & Tan Lean Clay	22.4	98.7		48	24	89	7.51E-08	
06/03/09	8896	S. Borrow Area	Tan & Red Fat Clay	21.8	100.4		52	30	87	5.33E-08	
06/05/09	8910	Borrow Area, Sta. 18+00, Center, 2'-6'	Tannish Gray Sandy Lean Clay	16.6	109.8		36	17	59	1.23E-08	
06/10/09	8928	Borrow Area, Sta. 4+00, Center, ~10'	Red & Gray Sandy Lean Clay	16.9	113.8		42	23	59	9.25E-08	
07/07/09	9028	Test Strip, Lift 1	Red & Tan Fat Clay	21.4	99.5		64	43	86	1.12E-08	
12/16/09	9405	S. Berm Lift 5	Tan & Gray Lean Clay with Sand	18.4	104.3		42	19	80	6.67E-08	
12/16/09	9410	S.W. Berm Lift 5	Tan, Gray, & Red Lean Clay	21.3	98.5		48	25	88	3.67E-08	
4/21/09	8803	S.End Borrow	Brown, Gray & Red Clayey Sand	14.0	112.9		30	15	33	1.22E-07	
6/11/09	8905	Center Borrow	Tan Silty Sand	11.0	117.4		n/a	n/a	n/a	n/a	
6/11/09	8906	Center Borrow	Red & Tan Clayey Sand	15.2	111.6		33	14	30	n/a	
6/11/09	8911	Center Borrow	Red, Tan & Gray Silty Clayey Sand	12.6	113.6		22	6	31	n/a	
8/5/09	9151	NW Borrow	Red & Tan Clayey Sand	14.7	112.5		36	19	49	3.88E-08	

Construction Samples

Date	Proctor No.	Test Number		Location				Field Percent Moisture	Field Dry Density [pcf]	Percent of Maximum Density	LL	PI	-200	k [cm/sec]	Perm Retest
08/02/10	8906	D-F	737	N	228878.9	E	2902220.9	12.7	109.4	98.0					
08/02/10	8960	D-F	738	N	228407.7	E	2902289.7	13.4	107.5	96.3					
08/02/10	8960	D-F	739	N	228034.3	E	2902210.4	15.2	112.2	100.5					
08/02/10	8960	D-F	740	N	227944.2	E	2901851.1	15.2	111.6	100.0					
08/02/10	8960	D-F	741	N	227632.1	E	2901225.8	13.5	109.9	98.5					
08/02/10	8960	D-F	742	N	228064.4	E	2901065.3	13.9	112.2	100.5					
08/02/10	8960	D-F	743	N	228627.0	E	2901275.5	9.9	112.5	100.8					

LL = Liquid Limit PI = Plasticity Index -200 = Minus Number 200 Sieve k = Hydraulic Conductivity



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 FILL LIFT 1

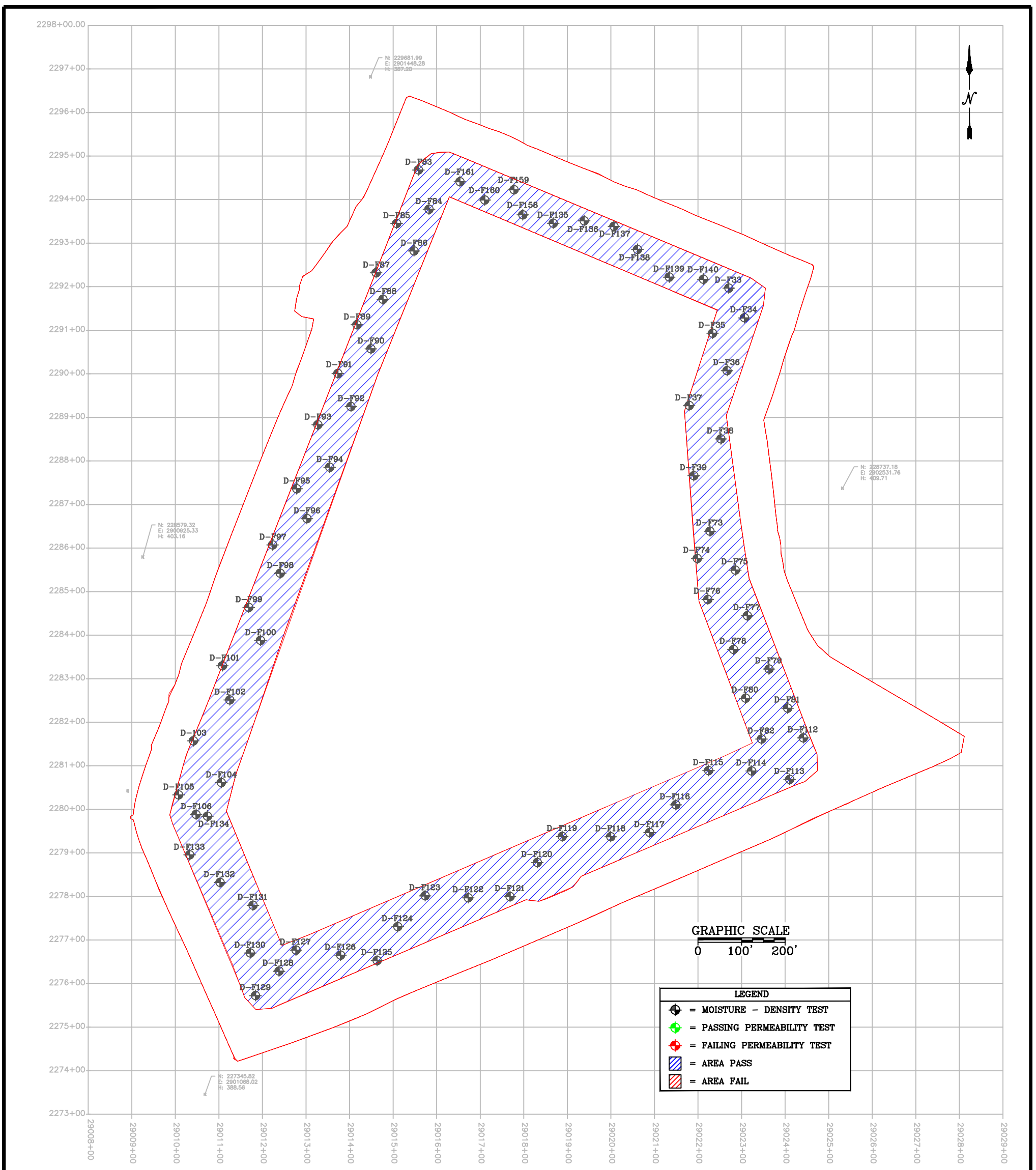
JOB NO.: L 213–09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 FILL LIFT 2

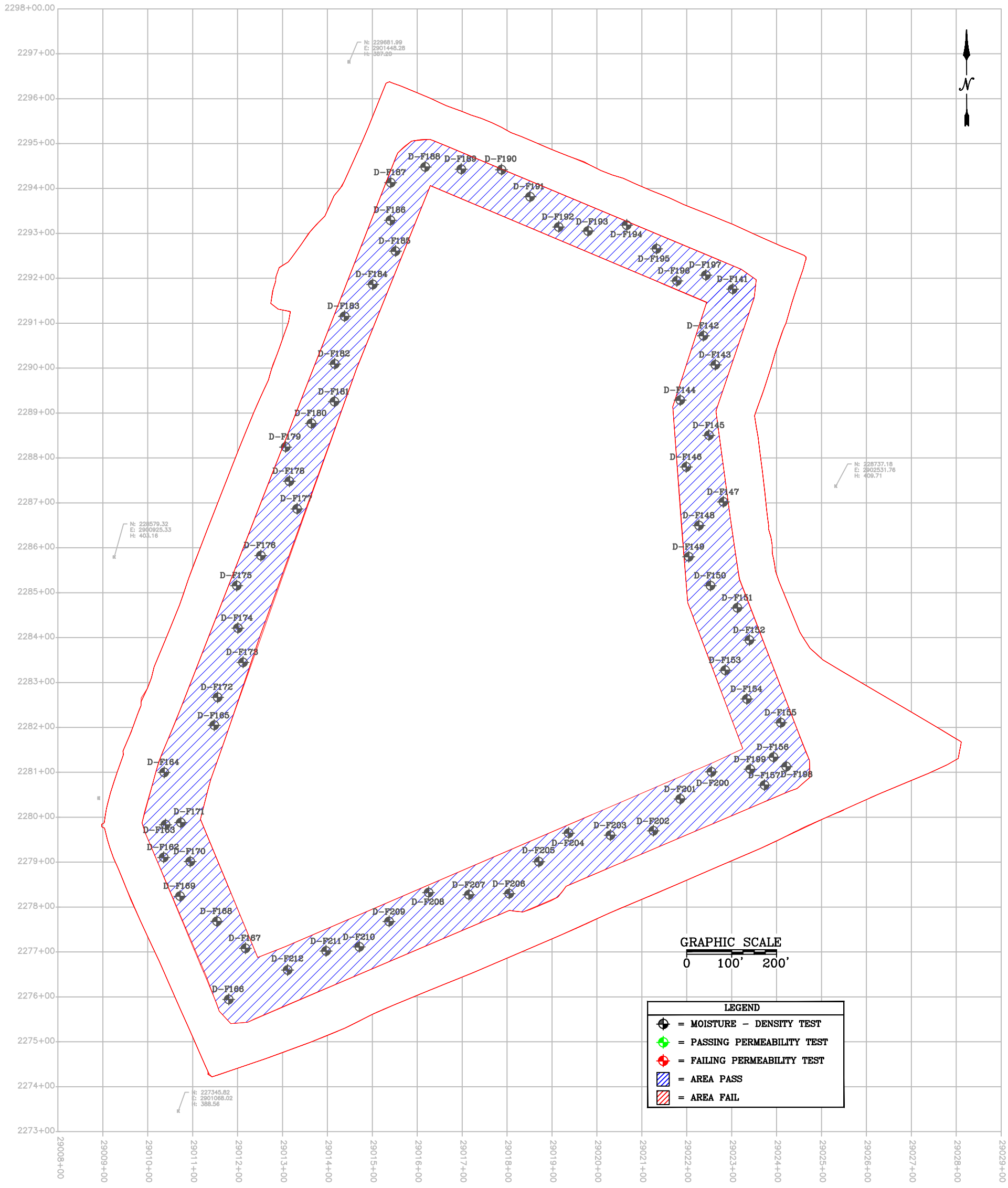
JOB NO.: L 213–09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 3

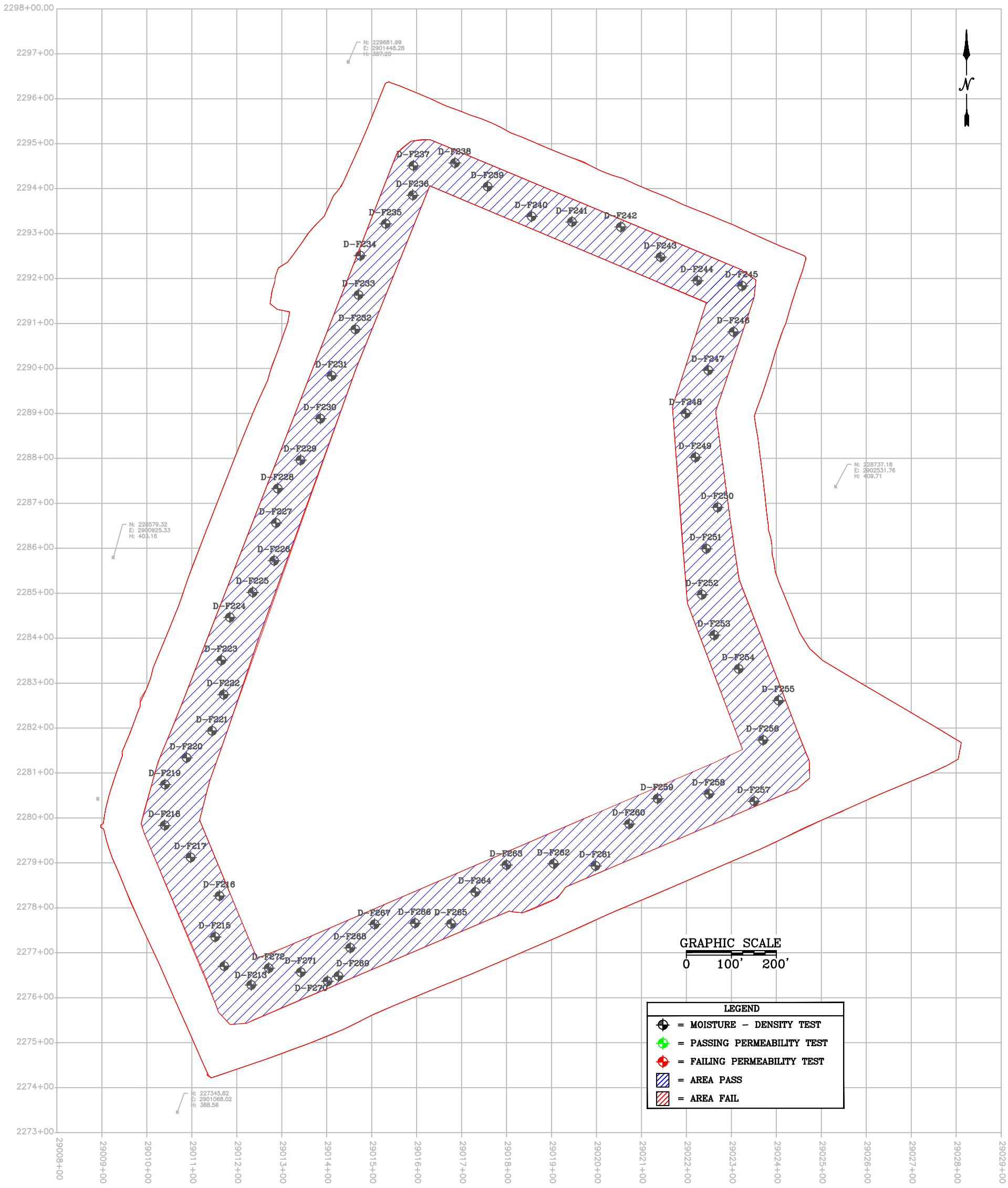
JOB NO.: L 213-09

DATE: JAN 2011

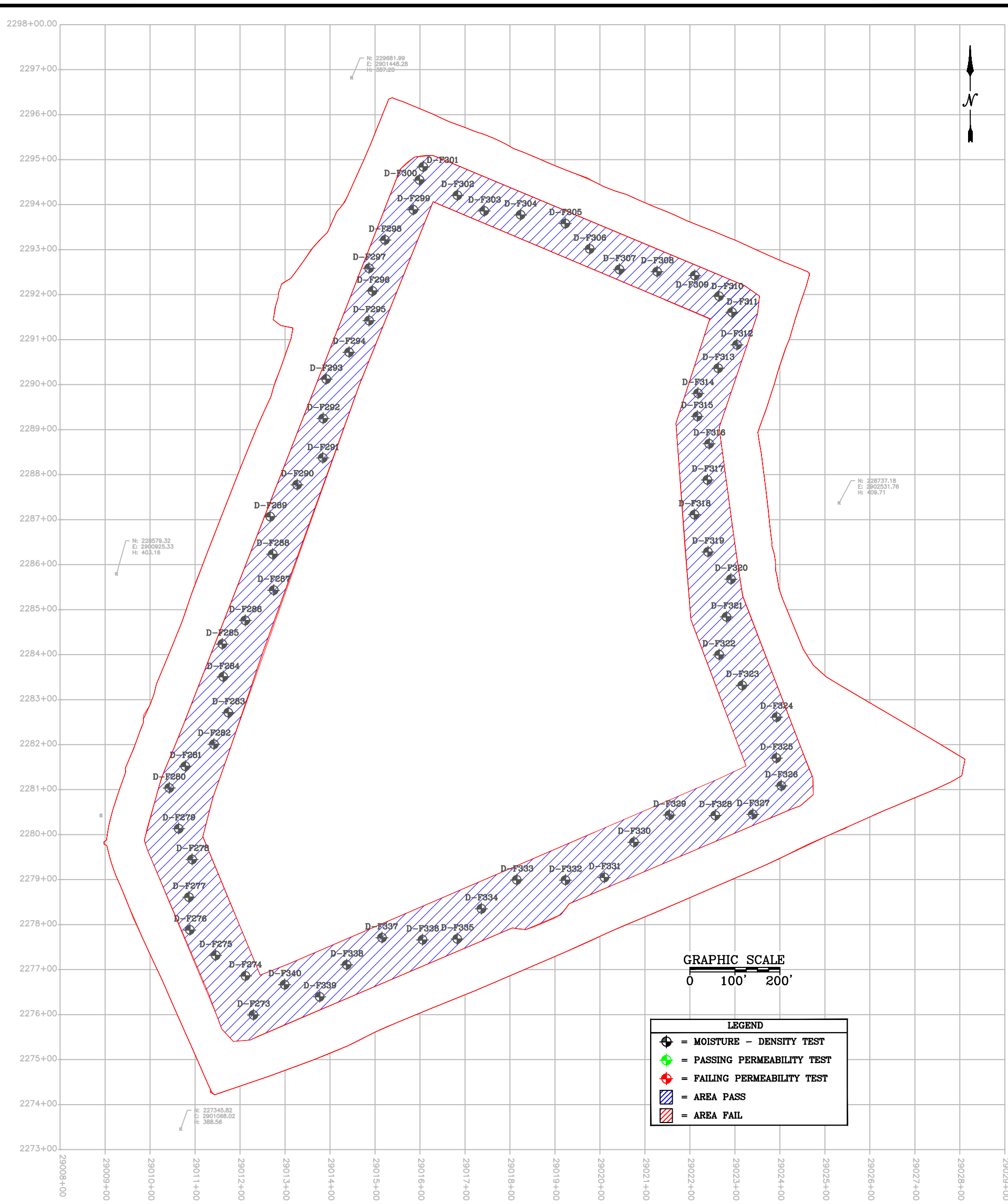
SCALE: AS SHOWN

APPROVED BY:
B. Quinn

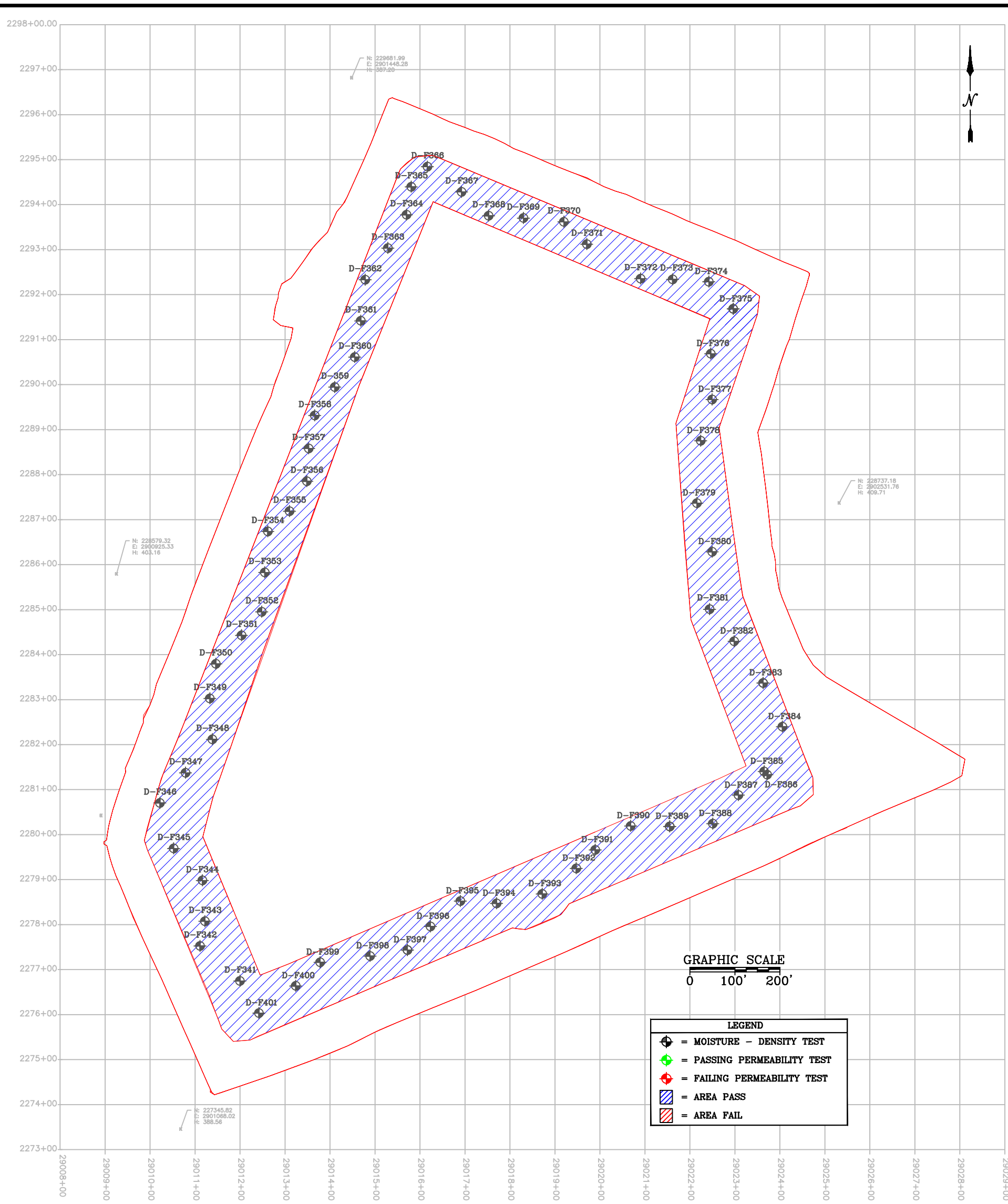
DRAWN BY:
J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 FILL LIFT 4 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 FILL LIFT 5 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 6

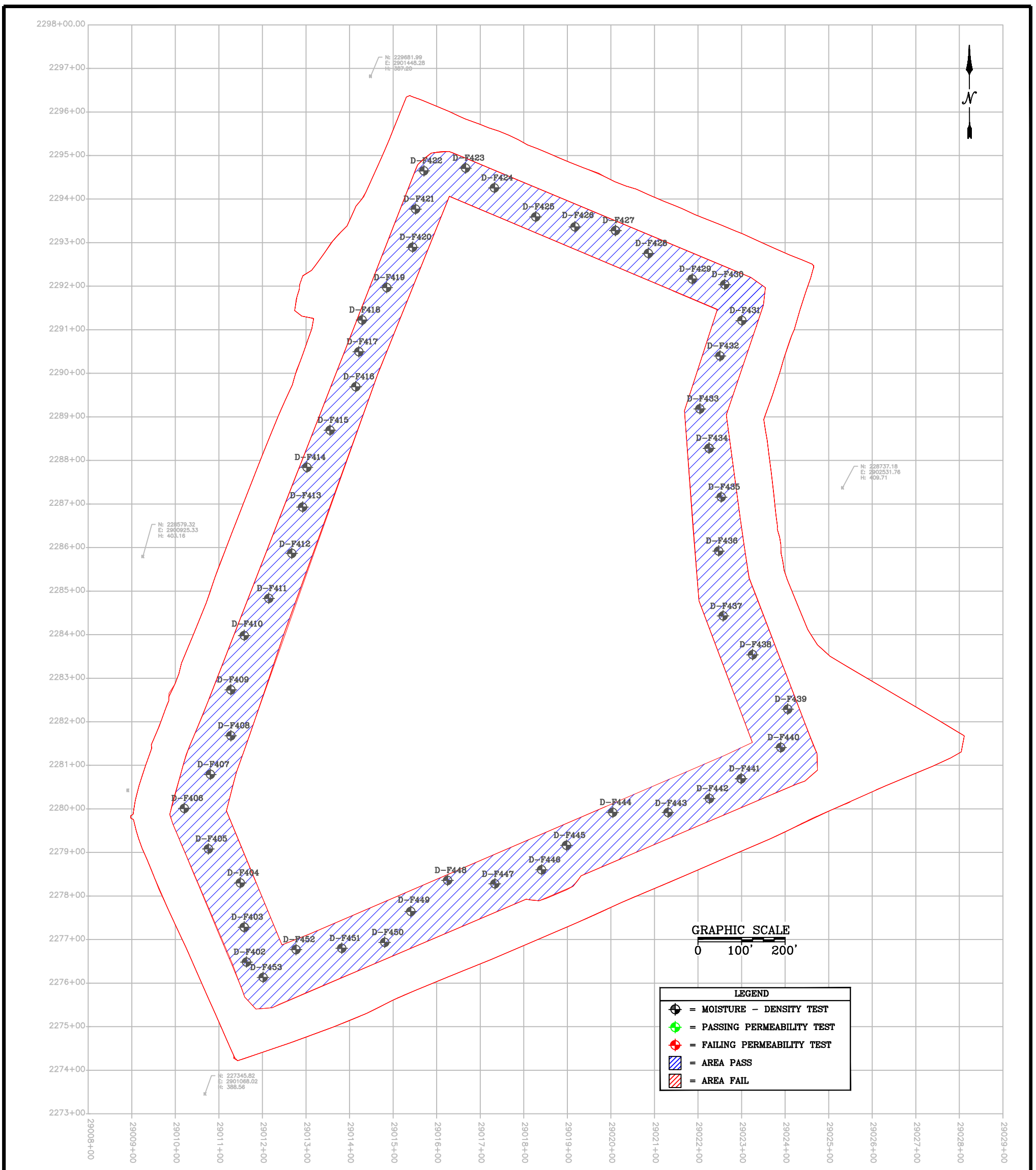
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 FILL LIFT 7

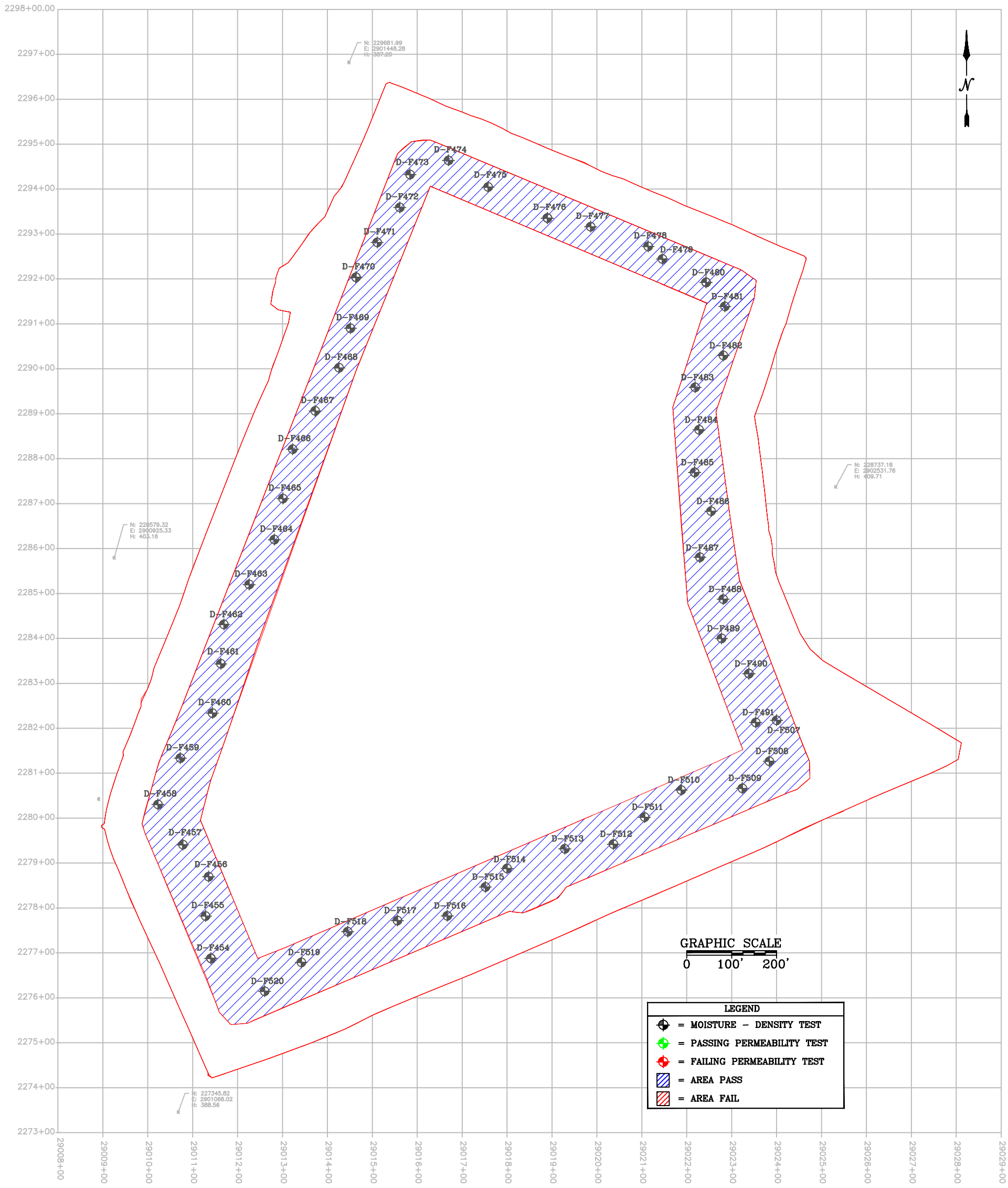
JOB NO.: L 213–09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 FILL LIFT 8

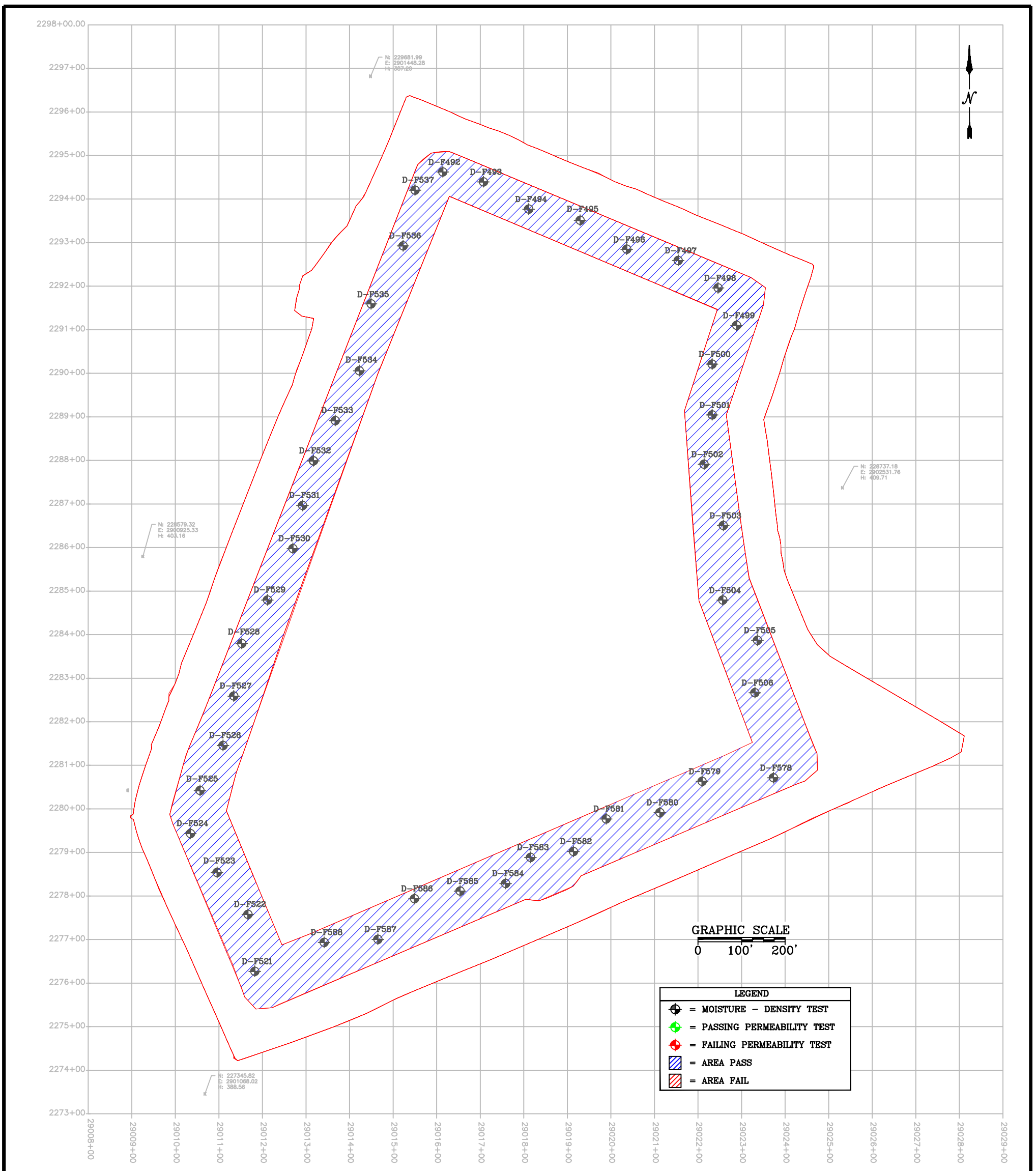
JOB NO.: L 213–09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1–3 FILL LIFT 9

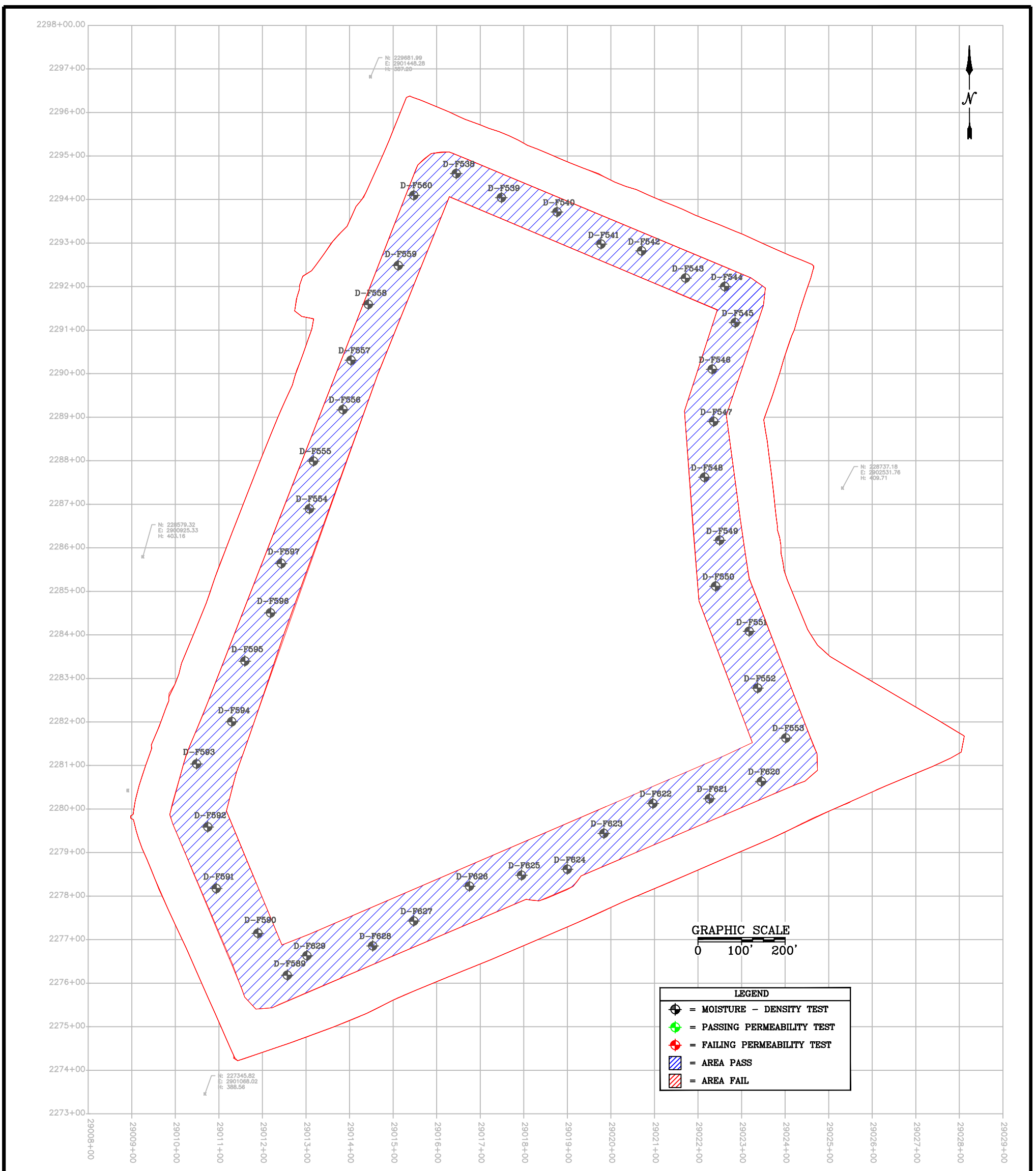
JOB NO.: L 213–09

DATE: JAN 2011

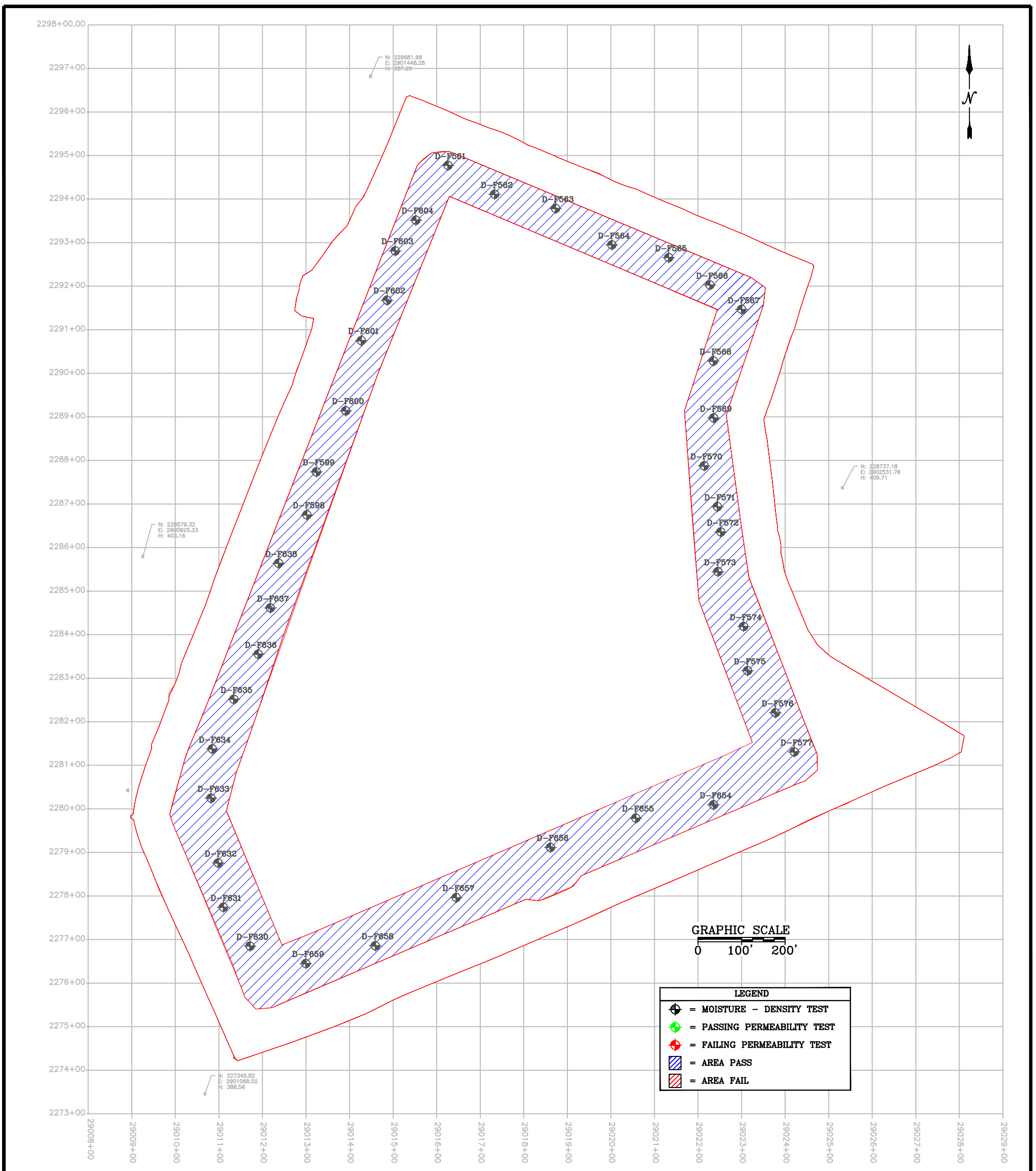
SCALE: AS SHOWN

APPROVED BY: B. Quinn

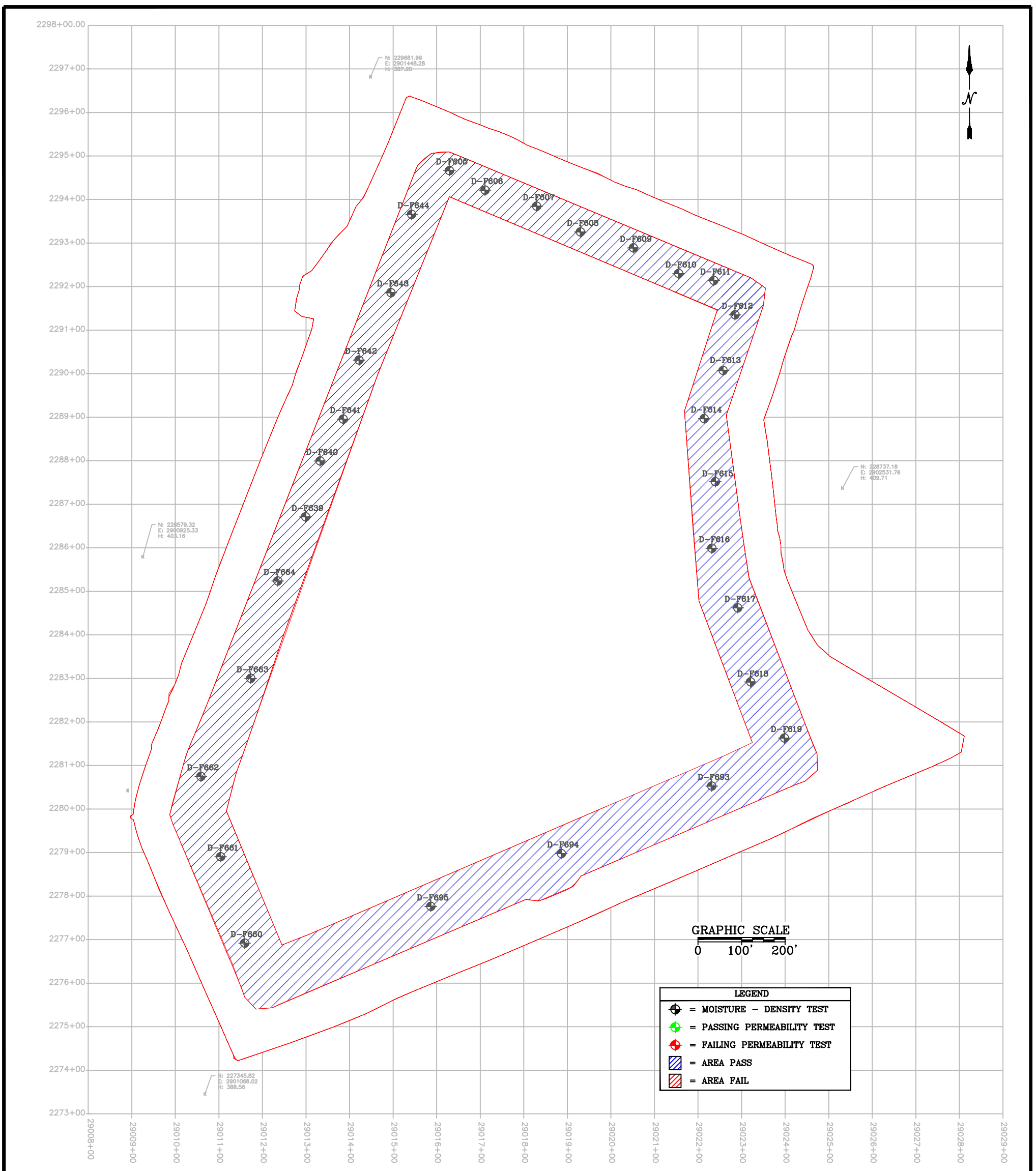
DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595–4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1–3 FILL LIFT 10 JOB NO.: L 213–09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 FILL LIFT 11 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 12

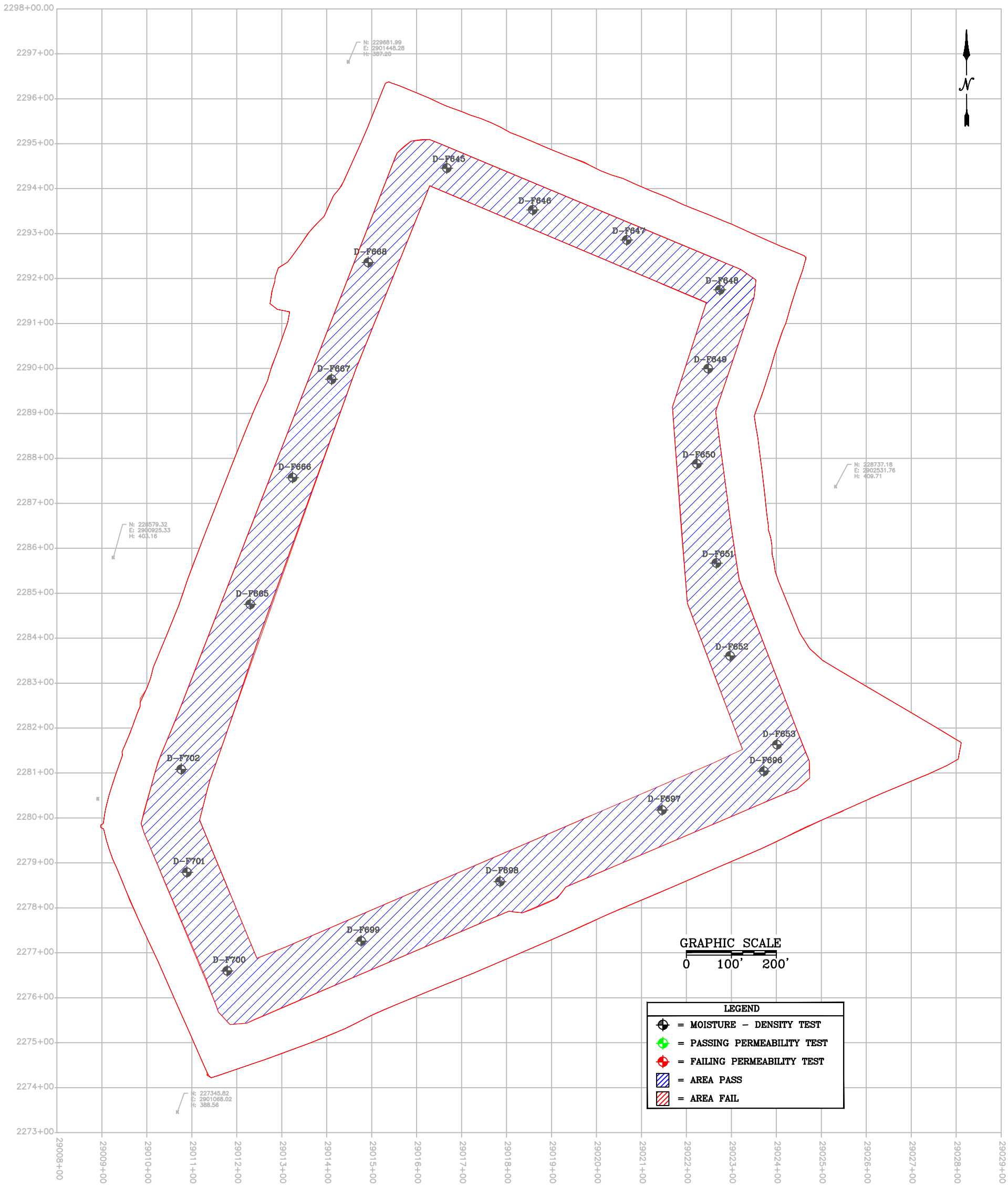
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 13

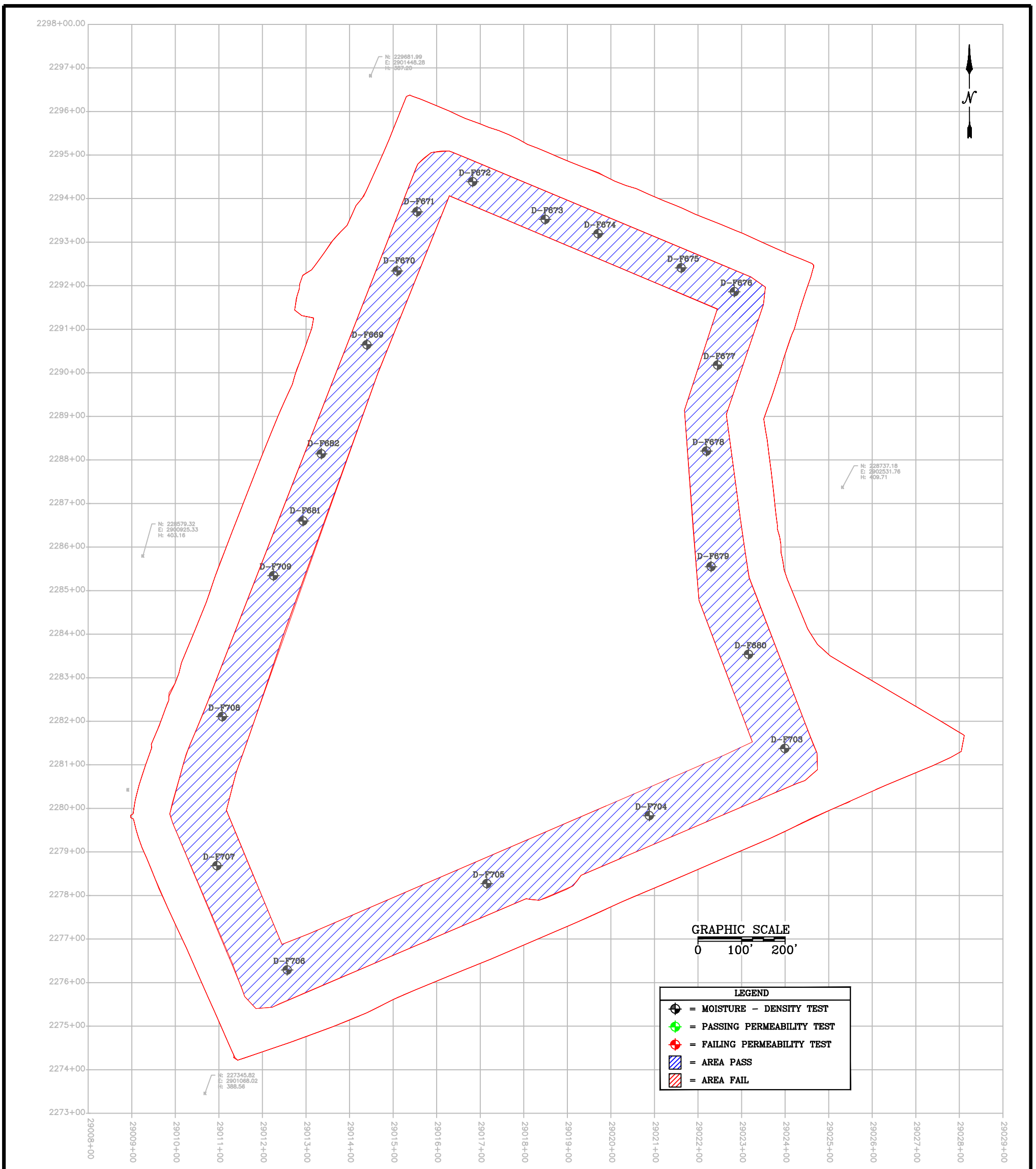
JOB NO.: L 213-09

DATE: JAN 2011

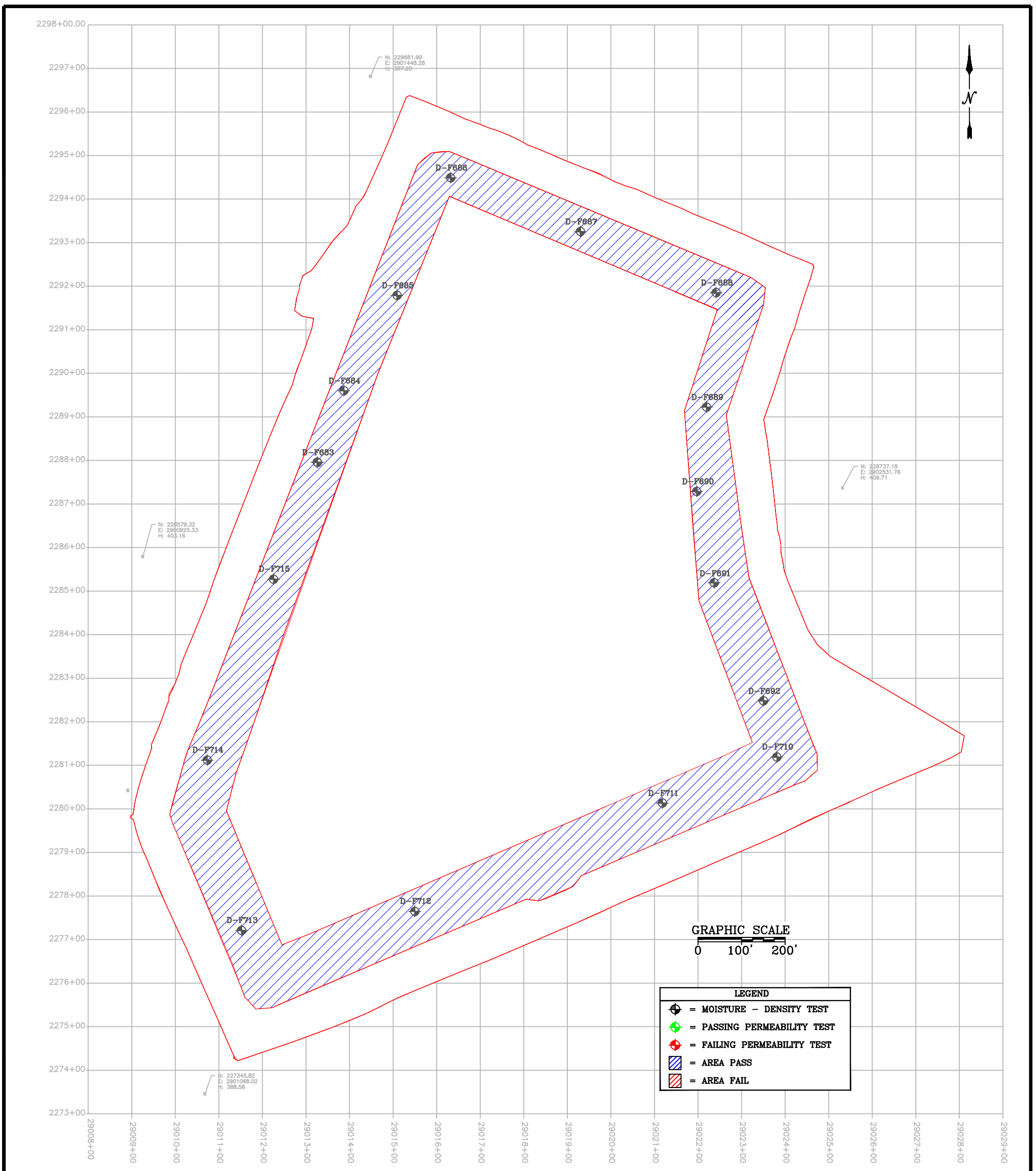
SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 FILL LIFT 14 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 15

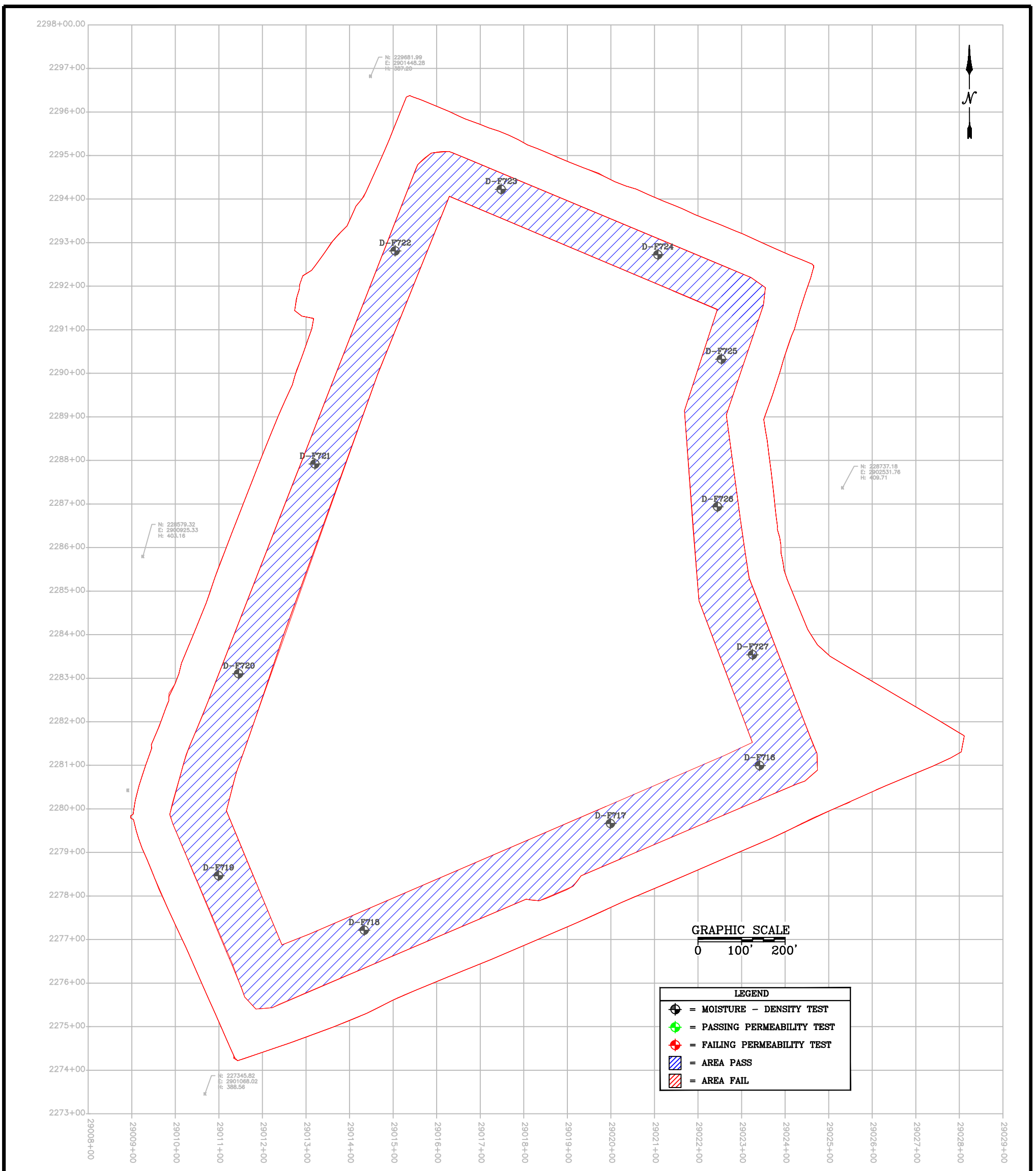
JOB NO.: L 213-09

DATE: JAN 2011

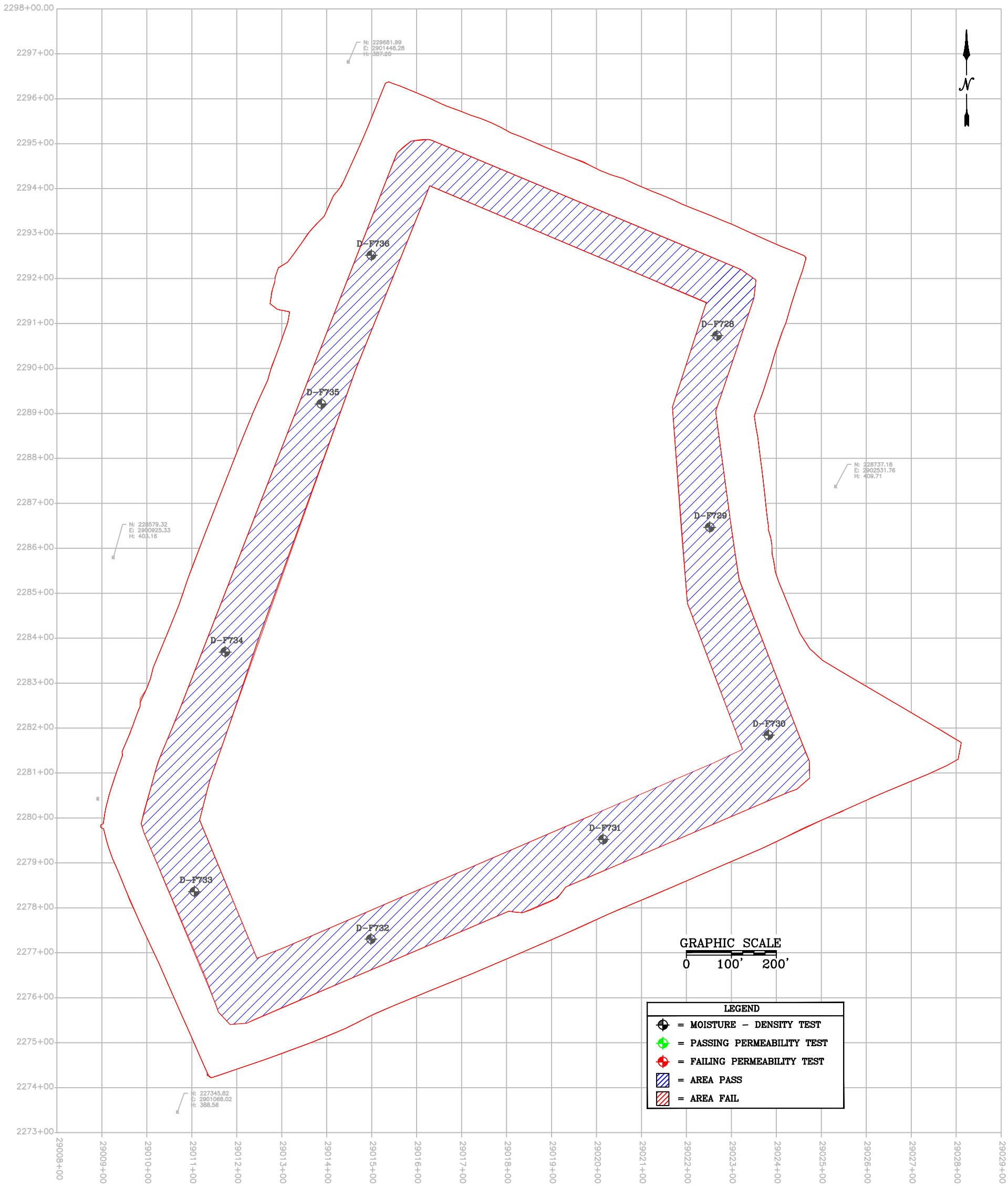
SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 East Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP 1-3 FILL LIFT 16 JOB NO.: L 213-09 DATE: JAN 2011 / SCALE: AS SHOWN	APPROVED BY: B. Quinn DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 17

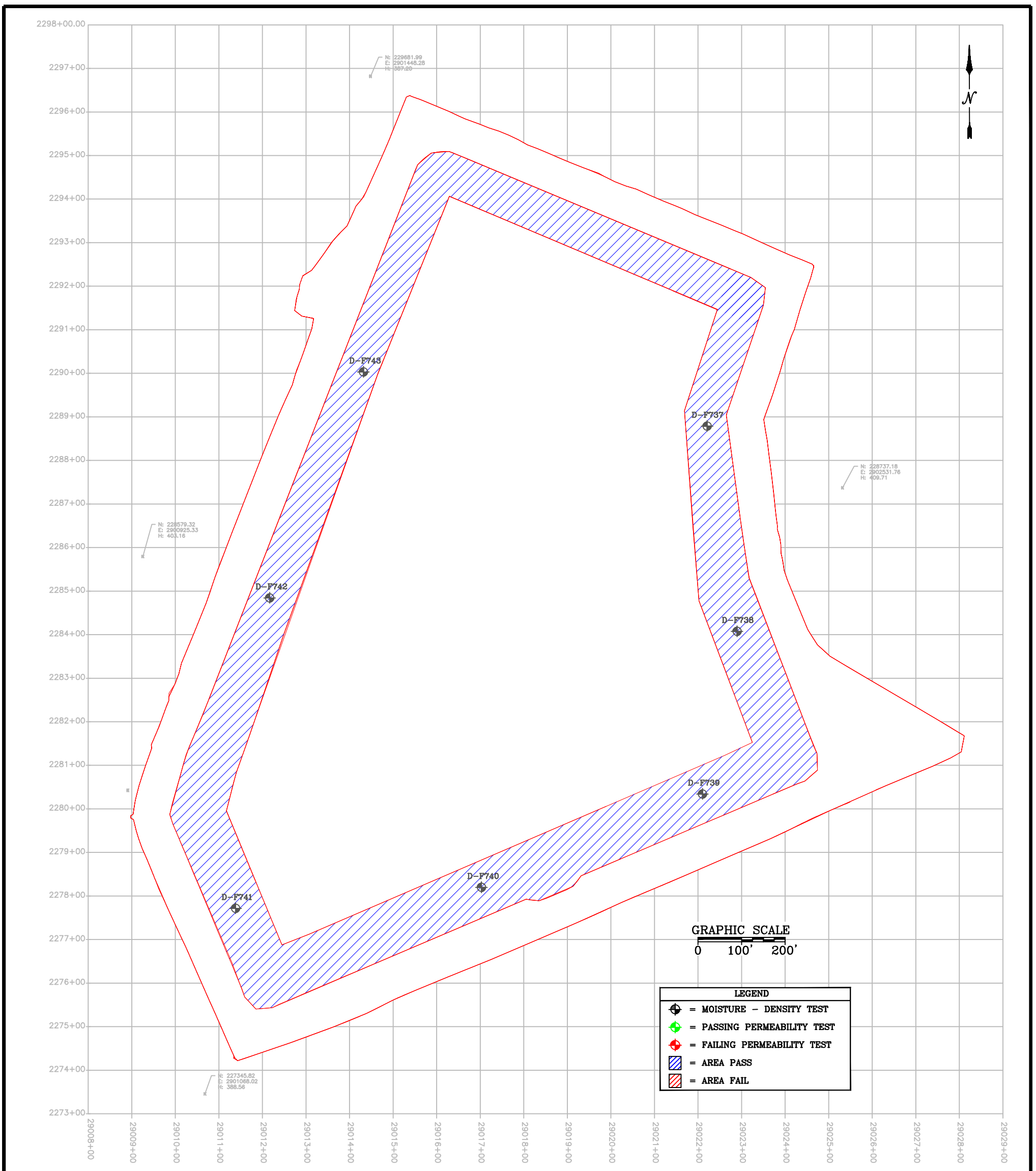
JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR



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LUMINANT MARTIN LAKE

TATUM, TEXAS

PDP 1-3 FILL LIFT 18

JOB NO.: L 213-09

DATE: JAN 2011

SCALE: AS SHOWN

APPROVED BY: B. Quinn

DRAWN BY: J. LeNOIR

Section 7

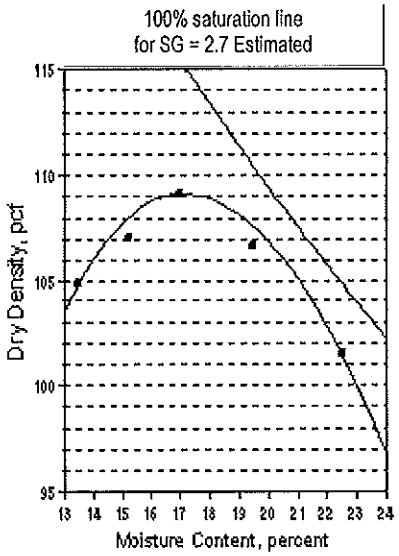
Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L211-09 Date Sampled: 04/21/2009
Report Date: 04/29/2009 Sampled By: Clint Richardson
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Onsite, Location: (Bucket 1B), Berm Between Pond #2 and #3, West End 2'-6' Deep - (Berm) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8801
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000001
Page 1 of 1

Field Number: Berm



% Moisture	Dry Density Lbs./Cu.Ft.
17.1	109.1
19.5	106.6
22.6	101.2
13.6	105.1
15.2	107.0
17.0 Optimum	**109.1 Maximum**

Sieve	% Passing
3/4 inches Sieve:	100
Sieve No. 4:	98
Sieve No. 40:	95
Sieve No. 200:	65.0

Color: Brown, Gray & Tan
Description: Sandy Lean Clay

Liquid Limit: 48
Plastic Limit: 17
Plasticity Index: 31
Group Symbol: CL

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks: **These tests were performed solely at the request of the Client for his own use. No warranties are expressed or implied regarding the suitability of the site for construction or whether or not the reported data represents all conditions of the site.**
Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

Brandon Quinn, P.E.

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas				Report No: 1-1103-000004			
Date:	4/29/2009	Panel Number :		P-2 ; ASTM D 5084				
Project No. :	L 211-09	Permometer Data						
Boring No.:	Pond # 2 & # 3	ap =	0.031416 cm2	Set Mercury to Pipet Rp at		Equilibrium	1.8	cm3
Sample:	8801	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	2' to 6' deep	M1 =	0.030180	C =	0.00042069	Annulus Ra	1.6	cm3
Other Location:	West End	M2 =	1.040953	T =	0.20608904			
Material Description :	Brown, Gray & Tan Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			597.27	g	Tare No.:	T 22	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	751.74	Wet Wt.+tare:	755.21
Wet Wt: of Sample :			597.27	g	Dry Wt.+tare:	649.34	Dry Wt.+tare:	649.50
Diameter :	2.84	in	7.22	cm2	Tare Wt:	140.38	Tare Wt:	151.89
Length :	2.83	in	7.18	cm	Dry Wt.:	508.96	Dry Wt.:	497.61
Area:	6.34	in^2	40.90	cm2	Water Wt.:	102.4	Water Wt.:	105.71
Volume :	17.93	in^3	293.77	cm3	% moist.:	20.1	% moist.:	21.2
Unit Wt.(wet):	126.87	pcf	2.03	g/cm^3				
Unit Wt.(dry):	105.62	pcf	1.69	g/cm^3				

Specific Gravity:	2.70	Max Dry Density(pcf) =	105.661	OMC =	20.1194593
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	96.24	Void ratio (e) =	0.60	Porosity (n)=	0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 8.86

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/28/2009	3960	6.1	0.552272	25	0.889	1.14E-08	3.24E-05	
4/28/2009	4560	6.05	0.602272	25	0.889	1.09E-08	3.08E-05	
4/28/2009	5220	6	0.652272	25	0.889	1.03E-08	2.93E-05	
4/28/2009	5880	5.95	0.702272	25	0.889	9.95E-09	2.82E-05	

SUMMARY

ka =	1.06E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.14E-08	cm/sec	7.2	%	Vm = |ka-ki| / ka x 100
k2 =	1.09E-08	cm/sec	2.1	%	
k3 =	1.03E-08	cm/sec	2.8	%	
k4 =	9.95E-09	cm/sec	6.6	%	

Hydraulic conductivity	k =	1.06E-08	cm/sec	3.02E-05 ft/day
Void Ratio	e =	0.60		
Porosity	n =	0.37		
Bulk Density	γ =	2.03	g/cm3	126.9 pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	1.09E-13	cm2	(at 20 deg C)

Liquid Limit	LL	48
Plastic Limit	PL	17
Plasticity Index	**PI**	**31**
- 200 Sieve		65 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

Respectfully Submitted

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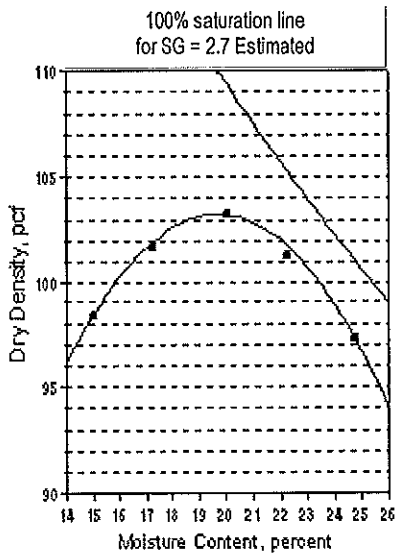
Acct ID: HDR File ID: L211-09 Date Sampled: 06/03/2009
Report Date: 08/10/2009 Previously Reported: 06/08/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Northern 1/3 of Borrow Area Center of Ridge - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8894
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000015
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.
17.3	101.6
19.9	103.2
22.3	101.2
24.7	97.4
14.9	98.2
19.7 Optimum	**103.2 Maximum**

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99.2
Sieve No. 40:	94.6
Sieve No. 200:	87.0

Color: Red & Gray
Description: Fat Clay

Liquid Limit: 52
Plastic Limit: 22
Plasticity Index: 30

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
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HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3							
Date:	6/6/2009	Panel Number : P-3 ; ASTM D 5084						
Project No. :	L 211-09	Permometer Data						
Boring No.:	Borrow Area	a_p =	0.031416 cm^2		Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
Sample:	8894	a_a =	0.767120 cm^2			Pipet Rp	6.7	cm^3
Depth (ft):	Center of Ridge	M_1 =	0.030180	C = 0.000418618		Annulus Ra	1.4	cm^3
Other Location:	Northern 1/3	M_2 =	1.040953	T = 0.199588911				
Material Description :	Red & Gray Fat Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			571.16 g		Tare No.:	T-20	Tare No.:	T-21
Tare or ring Wt. :			0.0 g		Wet Wt.+tare:	666.27	Wet Wt.+tare:	719.43
Wet Wt: of Sample :			571.16 g		Dry Wt.+tare:	567.56	Dry Wt.+tare:	601.78
Diameter :	2.85	in	7.23 cm^2		Tare Wt:	160.15	Tare Wt:	140.28
Length :	2.82	in	7.17 cm		Dry Wt.:	407.41	Dry Wt.:	461.5
Area:	6.36	in^2	41.01 cm^2		Water Wt.:	98.71	Water Wt.:	117.65
Volume :	17.94	in^3	293.98 cm^3		% moist.:	24.2	% moist.:	25.5
Unit Wt.(wet):	121.24	pcf	1.94 $g/cm^{\wedge 3}$					
Unit Wt.(dry):	97.59	pcf	1.56 $g/cm^{\wedge 3}$					

Assumed Specific Gravity:	2.60	Max Dry Density(pcf) =	97.63236	OMC =	24.228664
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.93	Void ratio (e) =	0.66	Porosity (n)=	0.40

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.2 cm Hydraulic Gradient = 9.17

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
6/6/2009	1390	5.2	1.460298	24.5	0.899	9.33E-08	2.65E-04	
6/6/2009	1650	5	1.660298	24.5	0.899	9.19E-08	2.60E-04	
6/6/2009	1820	4.9	1.760298	24.5	0.899	8.95E-08	2.54E-04	
6/6/2009	2100	4.7	1.960298	24.5	0.899	8.90E-08	2.52E-04	

SUMMARY

ka =	9.09E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	9.33E-08	cm/sec	2.6	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	9.19E-08	cm/sec	1.0	%	
k3 =	8.95E-08	cm/sec	1.5	%	
k4 =	8.90E-08	cm/sec	2.1	%	

Hydraulic conductivity	k =	9.09E-08 cm/sec	2.58E-04	ft/day
Void Ratio	e =	0.66		
Porosity	n =	0.40		
Bulk Density	γ =	1.94 g/cm^3	121.2	pcf
Water Content	W =	0.38 cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	9.32E-13 cm^2	(at 20 deg C)	

Liquid Limit LL	52	
Plastic Limit PL	22	
Plasticity Index PI	30	
- 200 Sieve	87	%
+ No 40 Sieve	5	%
+ No 4 Sieve	1	%

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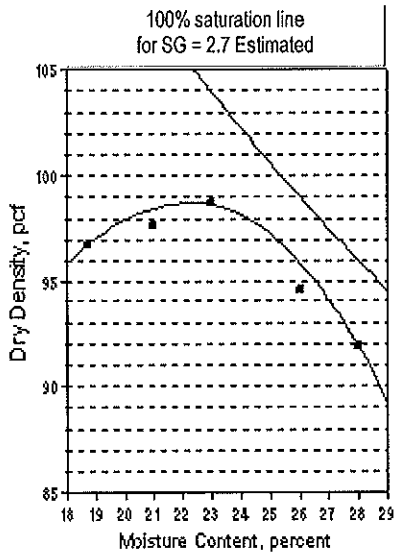
Acct ID: HDR File ID: L211-09 Date Sampled: 06/03/2009
Report Date: 08/10/2009 Previously Reported: 06/08/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Northern 1/3 of Borrow Area Center of Ridge - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8895
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000017
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.	
21.0	97.6	
22.9	98.7	
25.9	94.6	
28.0	91.9	
18.7	96.7	
22.4	**98.7**	**Maximum**
Optimum		

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99.3
Sieve No. 40:	93.9
Sieve No. 200:	89.0

Color: Gray & Tan
Description: Lean Clay (Laminated)

Liquid Limit: 48
Plastic Limit: 24
Plasticity Index: 24

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

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HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3							
Date:	6/6/2009	Panel Number : P-2 ; ASTM D 5084						
Project No. :	L 211-09	Permometer Data						
Boring No.:	Borrow Area	a_p =	0.031416 cm^2		Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
Sample:	8895	a_a =	0.767120 cm^2			Pipet Rp	6.7	cm^3
Depth (ft):	Center of Ridge	M_1 =	0.030180	C = 0.000419217		Annulus Ra	1.4	cm^3
Other Location:	Northern 1/3	M_2 =	1.040953	T = 0.198884148				
Material Description :	Gray and Tan Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			562.91	g	Tare No.:	T-23	Tare No.:	T-16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	582.56	Wet Wt.+tare:	721.47
Wet Wt: of Sample :			562.91	g	Dry Wt.+tare:	489.81	Dry Wt.+tare:	598.16
Diameter :	2.85	in	7.23	cm^2	Tare Wt:	140.28	Tare Wt:	151.90
Length :	2.83	in	7.19	cm	Dry Wt.:	349.53	Dry Wt.:	446.26
Area:	6.37	in^2	41.10	cm^2	Water Wt.:	92.75	Water Wt.:	123.31
Volume :	18.04	in^3	295.64	cm^3	% moist.:	26.5	% moist.:	27.6
Unit Wt.(wet):	118.81	pcf	1.90	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	93.90	pcf	1.50	$g/cm^{\wedge 3}$				

Assumed Specific Gravity:	2.60	Max Dry Density(pcf) =	93.93604	OMC =	26.5356336
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.59	Void ratio (e) =	0.73	Porosity (n)=	0.42

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.2 cm Hydraulic Gradient = 9.17

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
6/7/2009	2247	4.8	1.878053	25	0.889	7.76E-08	2.20E-04	
6/7/2009	3410	4.2	2.478053	25	0.889	7.42E-08	2.10E-04	
6/7/2009	4042	3.9	2.778053	25	0.889	7.42E-08	2.10E-04	
6/7/2009	4500	3.7	2.978053	25	0.889	7.43E-08	2.11E-04	

SUMMARY

k_a =	7.51E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	7.76E-08	cm/sec	3.3	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	7.42E-08	cm/sec	1.1	%	
k3 =	7.42E-08	cm/sec	1.2	%	
k4 =	7.43E-08	cm/sec	1.0	%	

Hydraulic conductivity	k =	**7.51E-08**	cm/sec	**2.13E-04**	ft/day
Void Ratio	e =	**0.73**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.90**	g/cm^3	**118.8**	pcf
Water Content	W =	**0.40**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**7.69E-13**	cm^2	(at 20 deg C)	

Liquid Limit	LL	48
Plastic Limit	PL	24
Plasticity Index	**PI**	**24**
- 200 Sieve		89 %
+ No 40 Sieve		6 %
+ No 4 Sieve		1 %

Respectfully Submitted

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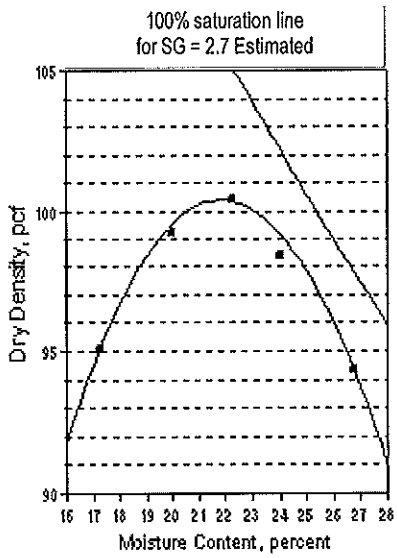
Acct ID: HDR File ID: L211-09 Date Sampled: 06/03/2009
Report Date: 08/10/2009 Previously Reported: 06/08/2009 Sampled By: Jacob Le Noir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Northern 1/3 of Borrow Area Center of Ridge - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8896
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000019

Field Number: Borrow **Page 1 of 1**



% Moisture	Dry Density Lbs./Cu.Ft.
17.2	95.0
19.9	99.2
22.3	100.4
23.9	98.4
26.7	94.5
21.8 Optimum	**100.4 Maximum**

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99.7
Sieve No. 40:	98.2
Sieve No. 200:	87.0

Color: Tan & Red
Description: Fat Clay

Liquid Limit: 52
Plastic Limit: 22
Plasticity Index: 30

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3
Date: 6/6/2009 Panel Number : P-1 ; ASTM D 5084
Project No. : L 211-09 Permometer Data

Boring No.:	Borrow Area	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3
Sample:	8896	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	Center of Ridge	M_1 =	0.030180	C = 0.00042024	Annulus Ra	1.5	cm^3
Other Location:	Northern 1/3	M_2 =	1.040953	T = 0.203794231			

Material Description : Tan & Red Fat Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			564.82	g	Tare No.:	T-17	Tare No.:	T-18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	567.16	Wet Wt.+tare:	714.36
Wet Wt: of Sample :			564.82	g	Dry Wt.+tare:	480.77	Dry Wt.+tare:	597.22
Diameter :	2.84	in	7.21	cm^2	Tare Wt:	146.65	Tare Wt:	146.64
Length :	2.82	in	7.17	cm	Dry Wt.:	334.12	Dry Wt.:	450.58
Area:	6.33	in^2	40.84	cm^2	Water Wt.:	86.39	Water Wt.:	117.14
Volume :	17.86	in^3	292.63	cm^3	% moist.:	25.9	% moist.:	26.0
Unit Wt.(wet):	120.44	pcf	1.93	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	95.70	pcf	1.53	$g/cm^{\wedge 3}$				

Assumed Specific Gravity: 2.60 Max Dry Density(pcf) = 95.73742 OMC = 25.8559799
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.09 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 8.98

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
6/6/2009	2220	5.3	1.35691	24.5	0.899	5.51E-08	1.56E-04	
6/6/2009	2700	5.1	1.55691	24.5	0.899	5.34E-08	1.51E-04	
6/6/2009	3000	5	1.65691	24.5	0.899	5.19E-08	1.47E-04	
6/6/2009	3420	4.8	1.85691	24.5	0.899	5.26E-08	1.49E-04	

SUMMARY

ka = 5.33E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.51E-08 cm/sec	3.5	%
k2 =	5.34E-08 cm/sec	0.3	%
k3 =	5.19E-08 cm/sec	2.5	%
k4 =	5.26E-08 cm/sec	1.3	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**5.33E-08**	cm/sec	**1.51E-04** ft/day
Void Ratio	e =	**0.70**		
Porosity	n =	**0.41**		
Bulk Density	γ =	**1.93**	g/cm^3	**120.4** pcf
Water Content	W =	**0.40**	cm^3/cm^3	(at 20 deg C)
Intrinsic Permeability	k_{int} =	**5.46E-13**	cm^2	(at 20 deg C)

Liquid Limit	LL	52
Plastic Limit	PL	22
Plasticity Index	**PI**	**30**
- 200 Sieve		87 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted

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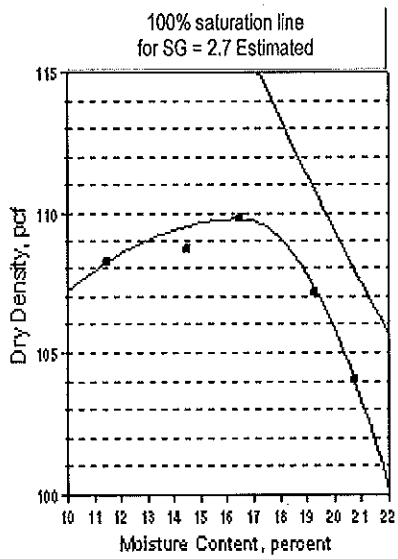
Acct ID: HDR File ID: L211-09 Date Sampled: 06/05/2009
Report Date: 08/10/2009 Previously Reported: 06/09/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Borrow Area Order Number:
Sta 18+00, Center, 2'-6' (Borrow)
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8910
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000020

Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.
14.5	108.7
16.4	109.8
19.2	107.2
20.7	104.2
11.4	108.2
16.6 Optimum	**109.8 Maximum**

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99.6
Sieve No. 40:	98.8
Sieve No. 200:	59.0

Color: Tannish Gray
Description: Sandy Lean Clay

Liquid Limit: 36
Plastic Limit: 19
Plasticity Index: 17

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3					Report No: 1-1103-000145		
Date:	6/10/2009			Panel Number : P-3 ; ASTM D 5084				
Project No. :	L 211-09			Permometer Data				
Boring No.:	Borrow Area	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3	
Sample:	8910	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3	
Depth (ft):	2'-6'	M_1 =	0.030180	C = 0.000418928	Annulus Ra	1.4	cm^3	
Other Location:		M_2 =	1.040953	T = 0.199595762				
Material Description :	Tannish Gray Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			601.57	g	Tare No.:	T-22	Tare No.:	T-5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	688.96	Wet Wt.+tare:	820.37
Wet Wt: of Sample :			601.57	g	Dry Wt.+tare:	595.89	Dry Wt.+tare:	718.30
Diameter :	2.85	in	7.24	cm^2	Tare Wt:	140.52	Tare Wt:	218.66
Length :	2.84	in	7.21	cm	Dry Wt.:	455.37	Dry Wt.:	499.64
Area:	6.39	in^2	41.22	cm^2	Water Wt.:	93.07	Water Wt.:	102.07
Volume :	18.13	in^3	297.10	cm^3	% moist.:	20.4	% moist.:	20.4
Unit Wt.(wet):	126.35	pcf	2.02	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	104.91	pcf	1.68	$g/cm^{\wedge 3}$				

Assumed Specific Gravity:	2.60	Max Dry Density(pcf) =	104.9511	OMC =	20.4383249
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	97.05	Void ratio (e) =	0.55	Porosity (n)=	0.35

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.2 cm Hydraulic Gradient = 9.12

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
6/10/2009	3780	6.05	0.610126	25	0.889	1.28E-08	3.63E-05	
6/10/2009	5100	5.89	0.770126	25	0.889	1.22E-08	3.46E-05	
6/10/2009	6000	5.79	0.870126	25	0.889	1.18E-08	3.36E-05	
6/10/2009	6420	5.71	0.950126	25	0.889	1.22E-08	3.46E-05	

SUMMARY

	k_a =	1.23E-08 cm/sec		Acceptance criteria =	25 %
	ki		Vm		
	k1 =	1.28E-08 cm/sec	4.4 %	Vm =	$\frac{\lvert ka-ki \rvert}{ka} \times 100$
	k2 =	1.22E-08 cm/sec	0.6 %		
	k3 =	1.18E-08 cm/sec	3.4 %		
	k4 =	1.22E-08 cm/sec	0.5 %		

Hydraulic conductivity	k =	1.23E-08	cm/sec	3.47E-05	ft/day
Void Ratio	e =	0.55			
Porosity	n =	0.35			
Bulk Density	γ =	2.02	g/cm^3	126.3	pcf
Water Content	W =	0.34	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	1.26E-13	cm^2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	19
Plasticity Index	**PI**	**17**
- 200 Sieve		59 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

Respectfully Submitted

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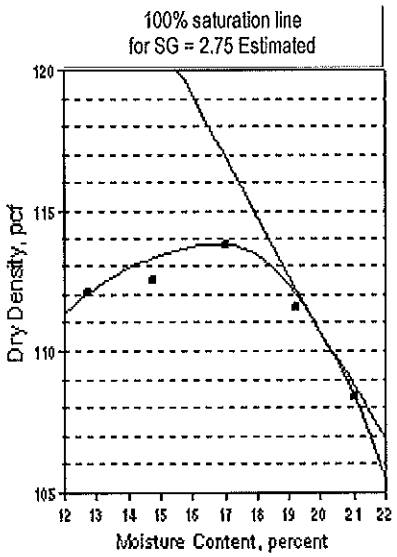
Acct ID: HDR File ID: L211-09 Date Sampled: 06/11/2009
Report Date: 08/10/2009 Previously Reported: 06/23/2009 Sampled By: Mike Woodford
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Onsite, Location: Borrow area south, sta 4+00 center ~ 10' deep - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8928
Material: Soil Test Method: See Below

TEST RESULTS

Report No: 1-1103-000031
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.
14.8	112.5
16.9	113.8
19.3	111.6
21.0	108.4
12.8	112.1
16.9 Optimum	**113.8 Maximum**

Sieve	% Passing
Sieve No. 4:	100
Sieve No. 10:	99.9
Sieve No. 40:	98
Sieve No. 200:	59.0

Color: Red & Gray
Description: Sandy Lean Clay

Liquid Limit: 42
Plastic Limit: 19
Plasticity Index: 23
Group Symbol: CL

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas — Report No: 1-1103-000143
Date: 6/22/2009 — Panel Number : P-2 ; ASTM D 5084
Project No. : L 211-09 — Permometer Data

Boring No.:	Borrow Area South	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	8928	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	~ 10 ft deep	M1 =	0.030180	C = 0.000415905		Annulus Ra	1.5	cm3
Other Location:	Station 4+00 Center	M2 =	1.040953	T = 0.203790628				

Material Description : Red & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			585.18	g	Tare No.:	T 1	Tare No.:	T 23
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	677.27	Wet Wt.+tare:	737.40
Wet Wt: of Sample :			585.18	g	Dry Wt.+tare:	602.95	Dry Wt.+tare:	629.96
Diameter :	2.84	in	7.20	cm2	Tare Wt:	217.12	Tare Wt:	140.22
Length :	2.79	in	7.08	cm	Dry Wt.:	385.83	Dry Wt.:	489.74
Area:	6.32	in^2	40.75	cm2	Water Wt.:	74.32	Water Wt.:	107.44
Volume :	17.60	in^3	288.39	cm3	% moist.:	19.3	% moist.:	21.9
Unit Wt.(wet):	126.62	pcf	2.03	g/cm^3				
Unit Wt.(dry):	106.17	pcf	1.70	g/cm^3				

Specific Gravity: 2.70 — Max Dry Density(pcf) = 106.2116 — OMC = 19.2623694
% of max = 100.0 — +/- OMC = 0.00
Calculated % saturation: 100.79 — Void ratio (e) = 0.59 — Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm — Hydraulic Gradient = 9.10

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
6/22/2009	2460	4.4	2.256997	24.5	0.899	9.37E-08	2.66E-04	
6/22/2009	2820	4.2	2.456997	24.5	0.899	9.21E-08	2.61E-04	
6/22/2009	3120	4	2.656997	24.5	0.899	9.35E-08	2.65E-04	
6/22/2009	3600	3.8	2.856997	24.5	0.899	9.07E-08	2.57E-04	

SUMMARY

ka = 9.25E-08 cm/sec — Acceptance criteria = 25 %

ki		Vm
k1 =	9.37E-08 cm/sec	1.3 %
k2 =	9.21E-08 cm/sec	0.4 %
k3 =	9.35E-08 cm/sec	1.1 %
k4 =	9.07E-08 cm/sec	2.0 %

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.25E-08	cm/sec	2.62E-04	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.03	g/cm3	126.6	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.48E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	19
Plasticity Index	**PI**	23
- 200 Sieve		59 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted

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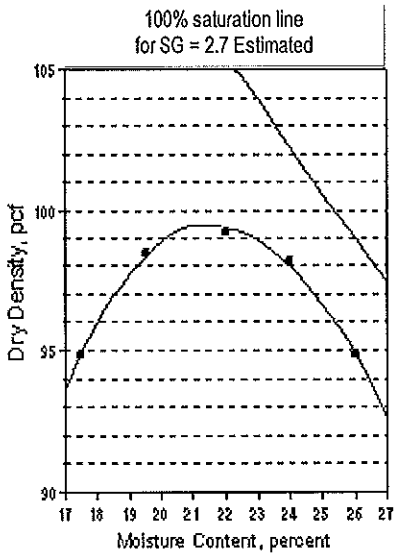
Acct ID: HDR File ID: L211-09 Date Sampled: 07/07/2009
Report Date: 07/29/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: PDP-1 test strip, Location: Test strip lift 1 Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-9028
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000050
Page 1 of 1



% Moisture	Dry Density Lbs./Cu.Ft.
17.6	95.1
19.6	98.5
21.9	99.2
24.1	98.2
26.1	94.7
21.4 Optimum	**99.5 Maximum**

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99
Sieve No. 40:	97
Sieve No. 200:	86.0

Color: Red & Tan
Description: Fat Clay

Liquid Limit: 64
Plastic Limit: 21
Plasticity Index: 43
Group Symbol: CH

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D698

Charge: HDR Engineering Inc. Attn: Dave Vogt
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Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Respectfully Submitted,
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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas		Report No: 1-1103-000222
Date:	7/16/2009	Panel Number :	P-6 ; ASTM D 5084
Project No. :	L 211-09	Permometer Data	

Boring No.:	Test Strip	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9028	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift #1	M1 =	0.030180	C = 0.000419069		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.20380044				

Material Description : Red & Tan Fat Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			565.34	g	Tare No.:	H 2	Tare No.:	T 4
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	985.44	Wet Wt.+tare:	788.99
Wet Wt: of Sample :			565.34	g	Dry Wt.+tare:	856.86	Dry Wt.+tare:	670.18
Diameter :	2.85	in	7.23	cm2	Tare Wt:	361.86	Tare Wt:	219.14
Length :	2.83	in	7.19	cm	Dry Wt.:	495	Dry Wt.:	451.04
Area:	6.37	in^2	41.10	cm2	Water Wt.:	128.58	Water Wt.:	118.81
Volume :	18.03	in^3	295.54	cm3	% moist.:	26.0	% moist.:	26.3
Unit Wt.(wet):	119.37	pcf	1.91	g/cm^3				
Unit Wt.(dry):	94.75	pcf	1.52	g/cm^3				

Specific Gravity:	2.70	Max Dry Density(pcf) =	94.79431	OMC =	25.9757576
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	91.31	Void ratio (e) =	0.78	Porosity (n)=	0.44

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 8.95

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
7/16/2009	3420	6.1	0.556761	25	0.889	1.31E-08	3.72E-05	
7/16/2009	4320	6.05	0.606761	25	0.889	1.14E-08	3.23E-05	
7/16/2009	5160	6	0.656761	25	0.889	1.04E-08	2.94E-05	
7/16/2009	6360	5.9	0.756761	25	0.889	9.81E-09	2.78E-05	

SUMMARY

ka = 1.12E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.31E-08 cm/sec	17.4	%
k2 =	1.14E-08 cm/sec	1.9	%
k3 =	1.04E-08 cm/sec	7.1	%
k4 =	9.81E-09 cm/sec	12.2	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	1.12E-08	cm/sec	3.17E-05 ft/day
Void Ratio	e =	0.78		
Porosity	n =	0.44		
Bulk Density	γ =	1.91	g/cm3	119.4 pcf
Water Content	W =	0.40	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	1.14E-13	cm2	(at 20 deg C)

Liquid Limit	LL	64
Plastic Limit	PL	21
Plasticity Index	**PI**	**43**
- 200 Sieve		86 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

Respectfully Submitted

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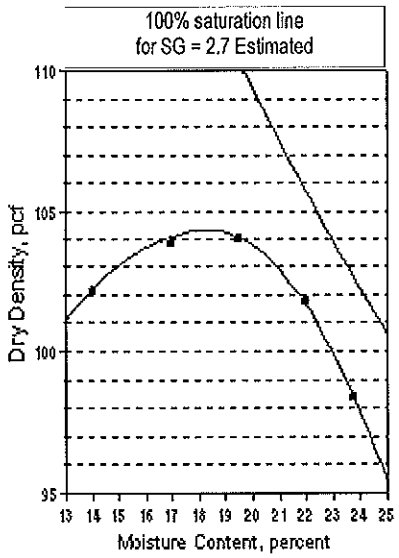
Acct ID: HDR File ID: L213-09 Date Sampled: 12/11/2009
Report Date: 12/16/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Material origin: S. berm lift # 5, Sample location: S # 5 Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-9405
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1165-000086



% Moisture	Dry Density Lbs./Cu.Ft.
16.9	103.9
19.4	104.0
22.0	101.8
23.8	98.3
14.1	102.3
18.4 Optimum	**104.3 Maximum**

Sieve	% Passing
3/4 inches Sieve:	100
Sieve No. 4:	99
Sieve No. 40:	95
Sieve No. 200:	80.0

Color: Tan & Gray
Description: Lean Clay with Sand

Liquid Limit: 42
Plastic Limit: 23
Plasticity Index: 19
Group Symbol: CL

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks: These tests were performed solely at the request of the Client for his own use. No warranties are expressed or implied regarding the suitability of the site for construction or whether or not the reported data represents all conditions of the site.

Test Method (As Applicable): ASTM D2487, D698

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/19/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S # 5	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9405	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000437723		Annulus Ra	1.5	cm3
Other Location:	South Berm	M2 =	1.040953	T = 0.203881792				

Material Description : Tan & Gray Lean Clay w/ Sand (Lab Molded)

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			527.41	g	Tare No.:	T 22	Tare No.:	T 20
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	547.35	Wet Wt.+tare:	690.83
Wet Wt: of Sample :			527.41	g	Dry Wt.+tare:	465.76	Dry Wt.+tare:	583.85
Diameter :	2.75	in	6.97	cm2	Tare Wt:	140.46	Tare Wt:	160.26
Length :	2.75	in	6.98	cm	Dry Wt.:	325.3	Dry Wt.:	423.59
Area:	5.92	in^2	38.18	cm2	Water Wt.:	81.59	Water Wt.:	106.98
Volume :	16.26	in^3	266.40	cm3	% moist.:	25.1	% moist.:	25.3
Unit Wt.(wet):	123.54	pcf	1.98	g/cm^3				
Unit Wt.(dry):	98.77	pcf	1.58	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 98.80784 OMC = 25.0814633
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.49 Void ratio (e) = 0.71 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/18/2009	1140	5.7	0.954803	25	0.889	7.39E-08	2.10E-04	
12/18/2009	1380	5.6	1.054803	25	0.889	6.83E-08	1.94E-04	
12/18/2009	1620	5.5	1.154803	25	0.889	6.45E-08	1.83E-04	
12/18/2009	1920	5.4	1.254803	25	0.889	5.99E-08	1.70E-04	

SUMMARY

ka = 6.67E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	7.39E-08 cm/sec	10.9	%
k2 =	6.83E-08 cm/sec	2.5	%
k3 =	6.45E-08 cm/sec	3.2	%
k4 =	5.99E-08 cm/sec	10.1	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	6.67E-08	cm/sec	1.89E-04	ft/day
Void Ratio	e =	0.71			
Porosity	n =	0.41			
Bulk Density	γ =	1.98	g/cm3	123.5	pcf
Water Content	W =	0.40	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.83E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	23
Plasticity Index	**PI**	**19**
- 200 Sieve		80 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

Respectfully Submitted

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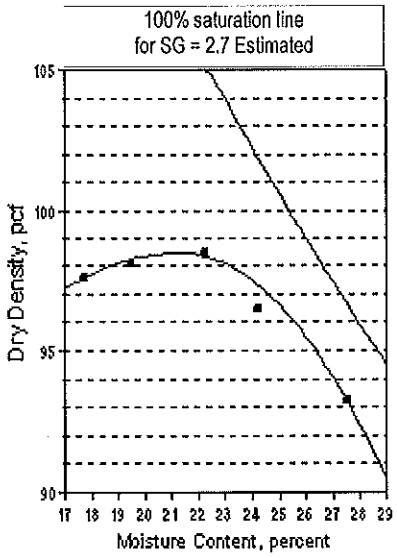
Acct ID: HDR File ID: L213-09 Date Sampled: 12/14/2009
Report Date: 12/16/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Material origin: SW berm lift #5, Sample location: S-6 Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-9410
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1165-000085
Page 1 of 1



% Moisture		Dry Density Lbs./Cu.Ft.	
22.2		98.5	
24.3		96.5	
27.6		93.1	
17.7		97.6	
19.5		98.1	
21.3	**Optimum**	**98.5**	**Maximum**

Sieve	% Passing
3/4 inches Sieve:	100
Sieve No. 4:	99
Sieve No. 40:	96
Sieve No. 200:	88.0

Color: Tan, Gray & Red
Description: Lean Clay

Liquid Limit: 48
Plastic Limit: 23
Plasticity Index: 25
Group Symbol: CL

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks: These tests were performed solely at the request of the Client for his own use. No warranties are expressed or implied regarding the suitability of the site for construction or whether or not the reported data represents all conditions of the site.

Test Method (As Applicable): ASTM D2487, D698

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/19/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S # 6	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9410	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.000435804	Annulus Ra	1.5	cm3
Other Location:	South-West Berm	M2 =	1.040953	T =	0.203774182			

Material Description : Tan & Gray Lean Clay (Lab Molded)

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			534.64	g	Tare No.:	T 18	Tare No.:	T 21
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	553.07	Wet Wt.+tare:	679.17
Wet Wt: of Sample :			534.64	g	Dry Wt.+tare:	467.12	Dry Wt.+tare:	563.47
Diameter :	2.77	in	7.04	cm2	Tare Wt:	146.71	Tare Wt:	140.35
Length :	2.79	in	7.07	cm	Dry Wt.:	320.41	Dry Wt.:	423.12
Area:	6.03	in^2	38.88	cm2	Water Wt.:	85.95	Water Wt.:	115.7
Volume :	16.78	in^3	275.03	cm3	% moist.:	26.8	% moist.:	27.3
Unit Wt.(wet):	121.30	pcf	1.94	g/cm^3				
Unit Wt.(dry):	95.65	pcf	1.53	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 95.68661 OMC = 26.8250055
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.85 Void ratio (e) = 0.76 Porosity (n)= 0.43

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.10

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/18/2009	2220	5.7	0.957393	25	0.889	3.79E-08	1.07E-04	
12/18/2009	2520	5.6	1.057393	25	0.889	3.73E-08	1.06E-04	
12/18/2009	2880	5.5	1.157393	25	0.889	3.62E-08	1.03E-04	
12/18/2009	3240	5.4	1.257393	25	0.889	3.54E-08	1.00E-04	

SUMMARY

ka = 3.67E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.79E-08 cm/sec	3.2	%
k2 =	3.73E-08 cm/sec	1.7	%
k3 =	3.62E-08 cm/sec	1.4	%
k4 =	3.54E-08 cm/sec	3.5	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	3.67E-08	cm/sec	1.04E-04	ft/day
Void Ratio	e =	0.76			
Porosity	n =	0.43			
Bulk Density	γ =	1.94	g/cm3	121.3	pcf
Water Content	W =	0.41	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.76E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	48
Plastic Limit	PL	23
Plasticity Index	**PI**	**25**
- 200 Sieve		88 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

Respectfully Submitted

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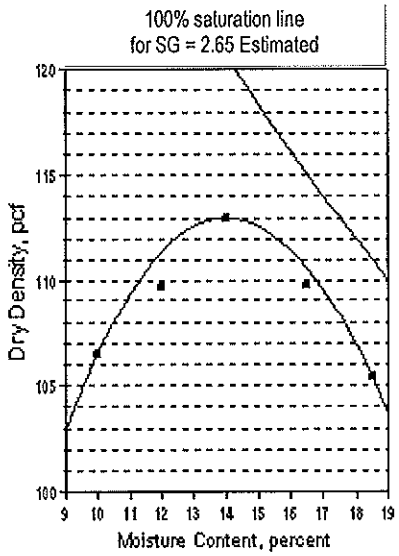
Acct ID: HDR File ID: L211-09 Date Sampled: 04/21/2009
Report Date: 04/29/2009 Sampled By: Clint Richardson
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Onsite Borrow Area, Location: (Bucket 3A), South End of Borrow Area 1'-11' Deep - (Borrow Area) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8803
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000002
Page 1 of 1

Field Number: Borrow pit



% Moisture	Dry Density Lbs./Cu.Ft.
9.9	106.2
11.9	109.7
13.9	112.9
16.4	109.8
18.4	105.7
14.0 Optimum	**112.9 Maximum**

Sieve	% Passing
Sieve No. 4:	100
Sieve No. 40:	98
Sieve No. 200:	33.0

Color: Brown, Gray & Red
Description: Clayey Sand

Liquid Limit: 30
Plastic Limit: 15
Plasticity Index: 15
Group Symbol: SC

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks: **These tests were performed solely at the request of the Client for his own use. No warranties are expressed or implied regarding the suitability of the site for construction or whether or not the reported data represents all conditions of the site.**
Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
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ETTL Engineers & Consultants Inc.

GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas				Report No: 1-1103-000005			
Date:	4/29/2009	Panel Number :		P-3 ; ASTM D 5084				
Project No. :	L 211-09	Permometer Data						
Boring No.:	Borrow Area	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	8803	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	1' to 11' deep	M1 =	0.030180	C =	0.000421289	Annulus Ra	1.6	cm3
Other Location:	South End	M2 =	1.040953	T =	0.206003863			
Material Description :	Brown, Gray & Red Clayey Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			605.73	g	Tare No.:	T 14	Tare No.:	T 22
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	786.04	Wet Wt.+tare:	750.43
Wet Wt: of Sample :			605.73	g	Dry Wt.+tare:	698.86	Dry Wt.+tare:	658.10
Diameter :	2.85	in	7.23	cm2	Tare Wt:	186.21	Tare Wt:	140.39
Length :	2.84	in	7.22	cm	Dry Wt.:	512.65	Dry Wt.:	517.71
Area:	6.36	in^2	41.04	cm2	Water Wt.:	87.18	Water Wt.:	92.33
Volume :	18.08	in^3	296.27	cm3	% moist.:	17.0	% moist.:	17.8
Unit Wt.(wet):	127.58	pcf	2.04	g/cm^3				
Unit Wt.(dry):	109.04	pcf	1.75	g/cm^3				

Specific Gravity:	2.60	Max Dry Density(pcf) =	109.0831	OMC =	17.0057544
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	94.89	Void ratio (e) =	0.49	Porosity (n)=	0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 8.82

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/28/2009	1440	4.8	1.854278	25	0.889	1.25E-07	3.55E-04	
4/28/2009	1620	4.65	2.004278	25	0.889	1.23E-07	3.49E-04	
4/28/2009	1800	4.5	2.154278	25	0.889	1.22E-07	3.46E-04	
4/28/2009	2040	4.35	2.304278	25	0.889	1.18E-07	3.35E-04	

SUMMARY

ka =	1.22E-07	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.25E-07	cm/sec	2.5	%	Vm = |ka-ki| / ka x 100
k2 =	1.23E-07	cm/sec	0.8	%	
k3 =	1.22E-07	cm/sec	0.1	%	
k4 =	1.18E-07	cm/sec	3.2	%	

Hydraulic conductivity	k =	1.22E-07 cm/sec	3.46E-04	ft/day
Void Ratio	e =	0.49		
Porosity	n =	0.33		
Bulk Density	γ =	2.04 g/cm3	127.6	pcf
Water Content	W =	0.30 cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.25E-12 cm2	(at 20 deg C)	

Liquid Limit LL	30	
Plastic Limit PL	15	
Plasticity Index PI	**15**	
- 200 Sieve	33	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

Respectfully Submitted

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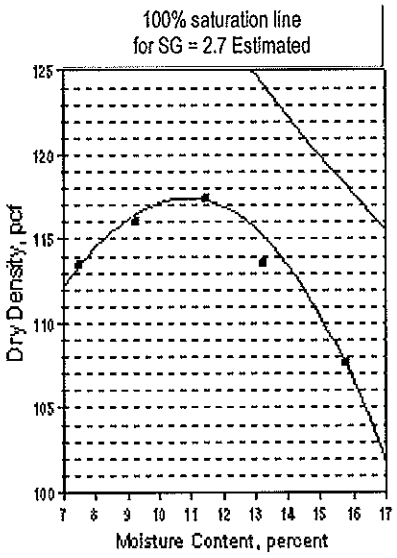
Acct ID: HDR File ID: L211-09 Date Sampled: 06/05/2009
Report Date: 08/10/2009 Previously Reported: 06/11/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow area, Location: sta12+00 center 0-2' - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8905
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000021
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.
7.5	113.4
9.3	116.0
11.5	117.4
13.3	113.5
15.7	107.8
11.0 Optimum	**117.4 Maximum**

Sieve	% Passing
Sieve No. 4:	100
Sieve No. 10:	99.9
Sieve No. 40:	98.8
Sieve No. 200:	26.0

Color: Tan
Description: Silty Sand

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

Charge: HDR Engineering Inc. Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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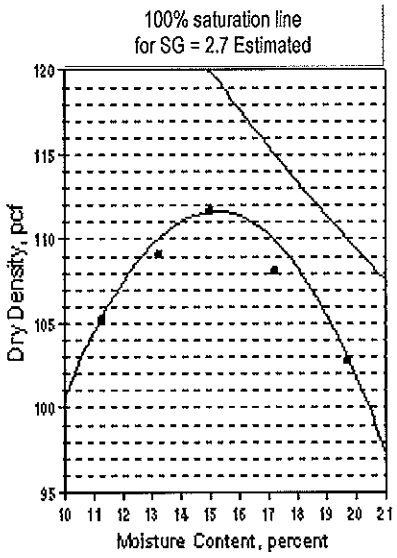
Acct ID: HDR File ID: L211-09 Date Sampled: 06/05/2009
Report Date: 08/10/2009 Previously Reported: 06/11/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Sta 12+00 Center 2 - 4' - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8906
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1103-000022
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.	
11.2	105.1	
13.3	109.1	
15.1	111.6	
17.3	108.0	
19.7	103.0	
15.2	**111.6**	**Maximum**
Optimum		

Sieve	% Passing
Sieve No. 4:	100
Sieve No. 10:	99.9
Sieve No. 40:	98
Sieve No. 200:	30.0

Color: Red & Tan
Description: Clayey Sand

Liquid Limit: 33
Plastic Limit: 19
Plasticity Index: 14

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

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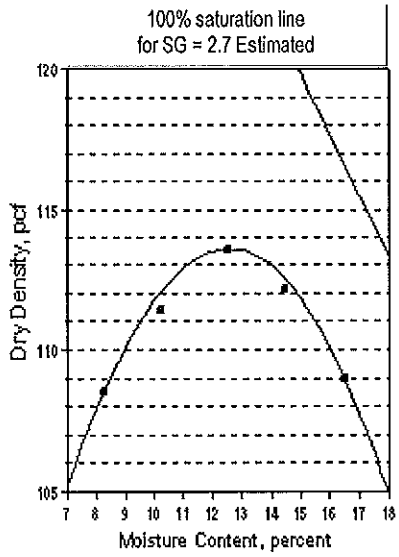
Acct ID: HDR File ID: L211-09 Date Sampled: 06/05/2009
Report Date: 06/11/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, PDP 1-3 Vertical Expansion Project, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Sta 12+00 Center 6 - 8' - (Borrow) Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-8911
Material: Soil Test Method: See Below

TEST RESULTS

Report No: 1-1103-000026
Page 1 of 1

Field Number: Borrow



% Moisture	Dry Density Lbs./Cu.Ft.
8.2	108.4
10.2	111.4
12.4	113.6
14.4	112.2
16.5	109.0
12.6 Optimum	**113.6 Maximum**

Sieve	% Passing
3/8 inches Sieve:	100
Sieve No. 4:	99
Sieve No. 40:	99
Sieve No. 200:	31.0

Color: Red, Tan & Gray
Description: Silty, Clayey Sand

Liquid Limit: 22
Plastic Limit: 16
Plasticity Index: 6

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D-698 Method-A

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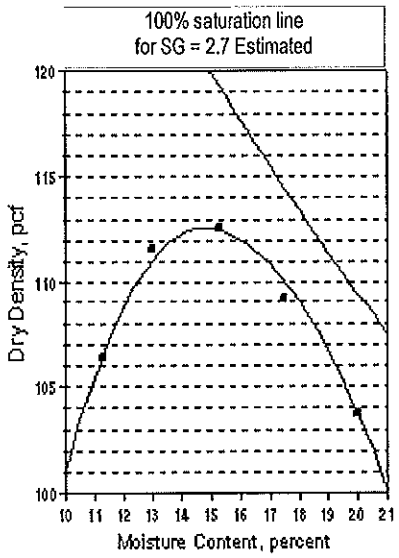
Acct ID: HDR File ID: L210-09 Date Sampled: 08/05/2009
Report Date: 09/01/2009 Sampled By: Jacob LeNoir
Project: Luminant Martin Lake, East Ash Disposal Pond, Tatum, Texas By Order Of:
Location: Origin: Borrow Area, Location: Northwest Borrow Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Pickett Industries, Bossier City, LA

REPORT: **Standard Proctor W/Soil Class** LAB NO: S-9151
Material: Soil Test Method: See Below

TEST RESULTS Report No: 1-1102-000086
Page 1 of 1



% Moisture	Dry Density Lbs./Cu.Ft.
11.2	106.2
13.1	111.5
15.2	112.5
17.6	109.2
20.0	103.7
14.7 Optimum	**112.5 Maximum**

Sieve	% Passing
Sieve No. 10:	100
Sieve No. 40:	97
Sieve No. 200:	49.0

Color: Red & Tan
Description: Clayey Sand

Liquid Limit: 36
Plastic Limit: 17
Plasticity Index: 19
Group Symbol: SC
AASHTO: A-6(6)

Standard Method: A
Desc of Rammer: Mechanical
Preparation Method: Moist
Remarks:

Test Method (As Applicable): ASTM D2487, D698

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

HYDRAULIC CONDUCTIVITY DETERMINATION
FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
ASTM D 5084 (Mercury Permometer Test)

Project :	Luminant Martin Lake EAP				Report No: 1-1102-000087			
Date:	8/8/2009			Panel Number : P-3 ; ASTM D 5084				
Project No. :	L 210-09			Permometer Data				
Boring No.:	Borrow Area	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3	
Sample:	9151	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3	
Depth (ft):		M_1 =	0.030180	C = 0.000425752	Annulus Ra	1.5	cm^3	
Other Location:	N.W. Borrow Area	M_2 =	1.040953	T = 0.203783414				
Material Description :	Red & Tan Clayey Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			608.49 g		Tare No.:	T-16	Tare No.:	T-22
Tare or ring Wt. :			0.0 g		Wet Wt.+tare:	821.96	Wet Wt.+tare:	750.79
Wet Wt: of Sample :			608.49 g		Dry Wt.+tare:	716.75	Dry Wt.+tare:	652.62
Diameter :	2.84 in		7.21 cm^2		Tare Wt:	151.84	Tare Wt:	140.34
Length :	2.86 in		7.26 cm		Dry Wt.:	564.91	Dry Wt.:	512.28
Area:	6.33 in^2		40.84 cm^2		Water Wt.:	105.21	Water Wt.:	98.17
Volume :	18.09 in^3		296.47 cm^3		% moist.:	18.6	% moist.:	19.2
Unit Wt.(wet):	128.07 pcf		2.05 $g/cm^{\wedge 3}$					
Unit Wt.(dry):	107.96 pcf		1.73 $g/cm^{\wedge 3}$					

Assumed Specific Gravity:	2.59	Max Dry Density(pcf) =	108.0106	OMC =	18.6242056
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.73	Void ratio (e) =	0.50	Porosity (n)=	0.33

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 8.87

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/8/2009	2640	5.5	1.157171	25	0.889	3.86E-08	1.09E-04	
8/8/2009	2880	5.4	1.257171	25	0.889	3.89E-08	1.10E-04	
8/8/2009	3120	5.3	1.357171	25	0.889	3.93E-08	1.11E-04	
8/8/2009	3480	5.2	1.457171	25	0.889	3.83E-08	1.09E-04	

SUMMARY

ka =	3.88E-08 cm/sec			Acceptance criteria =	25 %
ki		Vm			
k1 =	3.86E-08 cm/sec	0.5	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$	
k2 =	3.89E-08 cm/sec	0.3	%		
k3 =	3.93E-08 cm/sec	1.3	%		
k4 =	3.83E-08 cm/sec	1.1	%		

Hydraulic conductivity	k =	3.88E-08	cm/sec	1.10E-04	ft/day
Void Ratio	e =	0.50			
Porosity	n =	0.33			
Bulk Density	γ =	2.05	g/cm^3	128.1	pcf
Water Content	W =	0.32	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	3.97E-13	cm^2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	17
Plasticity Index	**PI**	**19**
- 200 Sieve		49 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/5/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9315	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000441245	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203775991			

Material Description : Brown, Gray & Tan Lean Clay with Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			550.01	g	Tare No.:	T 9	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	656.09	Wet Wt.+tare:	705.35
Wet Wt: of Sample :			550.01	g	Dry Wt.+tare:	584.66	Dry Wt.+tare:	612.39
Diameter :	2.74	in	6.95	cm2	Tare Wt:	220.53	Tare Wt:	151.97
Length :	2.76	in	7.00	cm	Dry Wt.:	364.13	Dry Wt.:	460.42
Area:	5.89	in^2	37.99	cm2	Water Wt.:	71.43	Water Wt.:	92.96
Volume :	16.22	in^3	265.82	cm3	% moist.:	19.6	% moist.:	20.2
Unit Wt.(wet):	129.11	pcf	2.07	g/cm^3				
Unit Wt.(dry):	107.94	pcf	1.73	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 107.9866 OMC = 19.6166204
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.07 Void ratio (e) = 0.56 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.20

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/5/2009	2940	6.1	0.557349	25	0.889	1.61E-08	4.56E-05	
11/5/2009	3780	6	0.657349	25	0.889	1.49E-08	4.23E-05	
11/5/2009	4620	5.9	0.757349	25	0.889	1.42E-08	4.04E-05	
11/5/2009	6120	5.8	0.857349	25	0.889	1.23E-08	3.49E-05	

SUMMARY

ka = 1.44E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.61E-08 cm/sec	11.8	%	Vm = |ka-ki| / ka x 100
k2 =	1.49E-08 cm/sec	3.7	%	
k3 =	1.42E-08 cm/sec	1.1	%	
k4 =	1.23E-08 cm/sec	14.5	%	

Hydraulic conductivity	k =	1.44E-08	cm/sec	4.08E-05	ft/day
Void Ratio	e =	0.56			
Porosity	n =	0.36			
Bulk Density	γ =	2.07	g/cm3	129.1	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.47E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	45
Plastic Limit	PL	19
Plasticity Index	**PI**	**26**
- 200 Sieve		76 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/6/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 13	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9322	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000442398	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203772726			

Material Description : Brown, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			542.09	g	Tare No.:	T 17	Tare No.:	T 20
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	547.62	Wet Wt.+tare:	706.32
Wet Wt: of Sample :			542.09	g	Dry Wt.+tare:	487.13	Dry Wt.+tare:	617.15
Diameter :	2.72	in	6.91	cm2	Tare Wt:	146.71	Tare Wt:	160.22
Length :	2.73	in	6.92	cm	Dry Wt.:	340.42	Dry Wt.:	456.93
Area:	5.81	in^2	37.49	cm2	Water Wt.:	60.49	Water Wt.:	89.17
Volume :	15.84	in^3	259.57	cm3	% moist.:	17.8	% moist.:	19.5
Unit Wt.(wet):	130.32	pcf	2.09	g/cm^3				
Unit Wt.(dry):	110.65	pcf	1.77	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 110.702 OMC = 17.7692263
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.69 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/6/2009	3000	6.1	0.557428	25	0.889	1.58E-08	4.48E-05	
11/6/2009	3900	6	0.657428	25	0.889	1.45E-08	4.11E-05	
11/6/2009	4860	5.9	0.757428	25	0.889	1.36E-08	3.85E-05	
11/6/2009	5940	5.8	0.857428	25	0.889	1.27E-08	3.61E-05	

SUMMARY

ka = 1.42E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.58E-08 cm/sec	11.7	%	Vm = |ka-ki| / ka x 100
k2 =	1.45E-08 cm/sec	2.5	%	
k3 =	1.36E-08 cm/sec	4.1	%	
k4 =	1.27E-08 cm/sec	10.1	%	

Hydraulic conductivity	k =	**1.42E-08**	cm/sec	**4.01E-05**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.09**	g/cm3	**130.3**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.45E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	48
Plastic Limit	PL	27
Plasticity Index	**PI**	**21**
- 200 Sieve		69 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/7/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 17	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9323	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000438347		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203799877				

Material Description : Brown, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			546.85	g	Tare No.:	T 8	Tare No.:	T25
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	673.64	Wet Wt.+tare:	669.91
Wet Wt: of Sample :			546.85	g	Dry Wt.+tare:	606.10	Dry Wt.+tare:	583.07
Diameter :	2.72	in	6.92	cm2	Tare Wt:	221.93	Tare Wt:	116.17
Length :	2.71	in	6.88	cm	Dry Wt.:	384.17	Dry Wt.:	466.9
Area:	5.82	in^2	37.57	cm2	Water Wt.:	67.54	Water Wt.:	86.84
Volume :	15.76	in^3	258.33	cm3	% moist.:	17.6	% moist.:	18.6
Unit Wt.(wet):	132.09	pcf	2.12	g/cm^3				
Unit Wt.(dry):	112.34	pcf	1.80	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 112.39 OMC = 17.5807585
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.35 Void ratio (e) = 0.50 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.36

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/7/2009	1740	6.1	0.556774	25	0.889	2.70E-08	7.65E-05	
11/7/2009	2160	6	0.656774	25	0.889	2.59E-08	7.35E-05	
11/7/2009	2580	5.9	0.756774	25	0.889	2.53E-08	7.17E-05	
11/7/2009	3000	5.8	0.856774	25	0.889	2.49E-08	7.07E-05	

SUMMARY

ka = 2.58E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.70E-08 cm/sec	4.6	%
k2 =	2.59E-08 cm/sec	0.6	%
k3 =	2.53E-08 cm/sec	1.9	%
k4 =	2.49E-08 cm/sec	3.3	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	2.58E-08	cm/sec	7.31E-05	ft/day
Void Ratio	e =	0.50			
Porosity	n =	0.33			
Bulk Density	γ =	2.12	g/cm3	132.1	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.64E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	16
Plasticity Index	**PI**	**28**
- 200 Sieve		67 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/7/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 18	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9324	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000439004	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.2037868			

Material Description : Red & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.83	g	Tare No.:	T 7	Tare No.:	T21
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	789.90	Wet Wt.+tare:	663.73
Wet Wt: of Sample :			519.83	g	Dry Wt.+tare:	686.28	Dry Wt.+tare:	554.68
Diameter :	2.74	in	6.95	cm2	Tare Wt:	221.27	Tare Wt:	140.35
Length :	2.74	in	6.95	cm	Dry Wt.:	465.01	Dry Wt.:	414.33
Area:	5.88	in^2	37.93	cm2	Water Wt.:	103.62	Water Wt.:	109.05
Volume :	16.09	in^3	263.69	cm3	% moist.:	22.3	% moist.:	26.3
Unit Wt.(wet):	123.01	pcf	1.97	g/cm^3				
Unit Wt.(dry):	100.60	pcf	1.61	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 100.639 OMC = 22.2833918
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 102.42 Void ratio (e) = 0.71 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/7/2009	3120	6.1	0.557089	25	0.889	1.51E-08	4.27E-05	
11/7/2009	3720	6.05	0.607089	25	0.889	1.39E-08	3.93E-05	
11/7/2009	4320	6	0.657089	25	0.889	1.30E-08	3.68E-05	
11/7/2009	4980	5.95	0.707089	25	0.889	1.22E-08	3.46E-05	

SUMMARY

ka = 1.35E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	1.51E-08	cm/sec	11.4	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.39E-08	cm/sec	2.4	%	
k3 =	1.30E-08	cm/sec	4.0	%	
k4 =	1.22E-08	cm/sec	9.9	%	

Hydraulic conductivity	k =	1.35E-08	cm/sec	3.84E-05	ft/day
Void Ratio	e =	0.71			
Porosity	n =	0.41			
Bulk Density	γ =	1.97	g/cm3	123.0	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.39E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	16
Plasticity Index	**PI**	**28**
- 200 Sieve		65 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/10/2009	Panel Number :		P 1 ; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 19	ap =	0.031416 cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3	
Sample:	9325	aa =	0.767120 cm2		Pipet Rp	6.7	cm3	
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000444528	Annulus Ra	1.5	cm3	
Other Location:		M2 =	1.040953	T = 0.203792421				
Material Description :	Red & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			510.12	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			510.12	g	Tare No.:	T 24	Tare No.:	T 20
Diameter :	2.70	in	6.85	cm2	Wet Wt.+tare:	643.23	Wet Wt.+tare:	674.04
Length :	2.69	in	6.83	cm	Dry Wt.+tare:	551.84	Dry Wt.+tare:	580.68
Area:	5.70	in^2	36.80	cm2	Tare Wt:	112.37	Tare Wt:	160.23
Volume :	15.34	in^3	251.36	cm3	Dry Wt.:	439.47	Dry Wt.:	420.45
Unit Wt.(wet):	126.64	pcf	2.03	g/cm^3	Water Wt.:	91.39	Water Wt.:	93.36
Unit Wt.(dry):	104.84	pcf	1.68	g/cm^3	% moist.:	20.8	% moist.:	22.2

Specific Gravity:	2.70	Max Dry Density(pcf) =	104.88	OMC =	20.7955037
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.63	Void ratio (e) =	0.61	Porosity (n)=	0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.42

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/10/2009	600	5.7	0.956954	25	0.889	1.43E-07	4.05E-04	
11/10/2009	720	5.55	1.106954	25	0.889	1.40E-07	3.98E-04	
11/10/2009	840	5.4	1.256954	25	0.889	1.39E-07	3.95E-04	
11/10/2009	960	5.25	1.406954	25	0.889	1.39E-07	3.94E-04	

SUMMARY

ka =	1.40E-07	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.43E-07	cm/sec	1.8	%	Vm = |ka-ki| / ka x 100
k2 =	1.40E-07	cm/sec	0.0	%	
k3 =	1.39E-07	cm/sec	0.8	%	
k4 =	1.39E-07	cm/sec	0.9	%	

Hydraulic conductivity	k =	1.40E-07	cm/sec	3.98E-04	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.03	g/cm3	126.6	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.44E-12	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	19
Plasticity Index	**PI**	**22**
- 200 Sieve		75 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/13/2009	Panel Number :		P 3 ; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 19B	ap =	0.031416 cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3	
Sample:	9336	aa =	0.767120 cm2		Pipet Rp	6.7	cm3	
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000436749	Annulus Ra	1.5	cm3	
Other Location:		M2 =	1.040953	T = 0.203784596				
Material Description :	Red & Tan Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			527.56	g	Tare No.:	T 19	Tare No.:	T 4
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	397.04	Wet Wt.+tare:	750.83
Wet Wt: of Sample :			527.56	g	Dry Wt.+tare:	363.13	Dry Wt.+tare:	653.79
Diameter :	2.73	in	6.94	cm2	Tare Wt:	186.32	Tare Wt:	219.55
Length :	2.71	in	6.89	cm	Dry Wt.:	176.81	Dry Wt.:	434.24
Area:	5.86	in^2	37.79	cm2	Water Wt.:	33.91	Water Wt.:	97.04
Volume :	15.89	in^3	260.43	cm3	% moist.:	19.2	% moist.:	22.3
Unit Wt.(wet):	126.41	pcf	2.03	g/cm^3				
Unit Wt.(dry):	106.07	pcf	1.70	g/cm^3				

Specific Gravity:	2.75	Max Dry Density(pcf) =	106.1107	OMC =	19.1787795
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.34	Void ratio (e) =	0.62	Porosity (n)=	0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/13/2009	2760	6	0.657142	25	0.889	2.02E-08	5.73E-05	
11/13/2009	3300	5.9	0.757142	25	0.889	1.97E-08	5.59E-05	
11/13/2009	3900	5.8	0.857142	25	0.889	1.91E-08	5.42E-05	
11/13/2009	5160	5.6	1.057142	25	0.889	1.83E-08	5.18E-05	

SUMMARY

ka = 1.93E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.02E-08 cm/sec	4.6	%	Vm = |ka-ki| / ka x 100
k2 =	1.97E-08 cm/sec	2.0	%	
k3 =	1.91E-08 cm/sec	1.1	%	
k4 =	1.83E-08 cm/sec	5.5	%	

Hydraulic conductivity	k =	1.93E-08	cm/sec	5.48E-05	ft/day
Void Ratio	e =	0.62			
Porosity	n =	0.38			
Bulk Density	γ =	2.03	g/cm3	126.4	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.98E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	16
Plasticity Index	**PI**	**23**
- 200 Sieve		71 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/10/2009	Panel Number :			P 2 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 20	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9326	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000440289		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203775549				
Material Description :	Red, Gray & Tan Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			521.29	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			521.29	g	Tare No.:	T 22	Tare No.:	T 25
Diameter :	2.73	in	6.94	cm2	Wet Wt.+tare:	730.17	Wet Wt.+tare:	638.44
Length :	2.74	in	6.96	cm	Dry Wt.+tare:	622.93	Dry Wt.+tare:	540.53
Area:	5.87	in^2	37.88	cm2	Tare Wt:	140.47	Tare Wt:	116.18
Volume :	16.09	in^3	263.69	cm3	Dry Wt.:	482.46	Dry Wt.:	424.35
Unit Wt.(wet):	123.36	pcf	1.98	g/cm^3	Water Wt.:	107.24	Water Wt.:	97.91
Unit Wt.(dry):	100.92	pcf	1.62	g/cm^3	% moist.:	22.2	% moist.:	23.1

Specific Gravity:	2.65	Max Dry Density(pcf) =	100.9678	OMC =	22.2277495
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	95.65	Void ratio (e) =	0.64	Porosity (n)=	0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/10/2009	960	6.1	0.55736	25	0.889	4.92E-08	1.39E-04	
11/10/2009	1320	6	0.65736	25	0.889	4.27E-08	1.21E-04	
11/10/2009	1680	5.9	0.75736	25	0.889	3.91E-08	1.11E-04	
11/10/2009	2100	5.8	0.85736	25	0.889	3.58E-08	1.01E-04	

SUMMARY

ka =	4.17E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	4.92E-08	cm/sec	18.0	%	Vm = |ka-ki| / ka x 100
k2 =	4.27E-08	cm/sec	2.4	%	
k3 =	3.91E-08	cm/sec	6.3	%	
k4 =	3.58E-08	cm/sec	14.1	%	

Hydraulic conductivity	k =	4.17E-08	cm/sec	1.18E-04	ft/day
Void Ratio	e =	0.64			
Porosity	n =	0.39			
Bulk Density	γ =	1.98	g/cm3	123.4	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.27E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	18
Plasticity Index	**PI**	**18**
- 200 Sieve		71 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/10/2009	Panel Number :		P 3 ; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 21	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9327	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000437723	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.2037868			
Material Description :	Red & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			536.15	g	Tare No.:	T 18	Tare No.:	T 17
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	724.98	Wet Wt.+tare:	685.70
Wet Wt: of Sample :			536.15	g	Dry Wt.+tare:	622.57	Dry Wt.+tare:	584.21
Diameter :	2.74	in	6.96	cm2	Tare Wt:	146.71	Tare Wt:	146.73
Length :	2.74	in	6.95	cm	Dry Wt.:	475.86	Dry Wt.:	437.48
Area:	5.90	in^2	38.04	cm2	Water Wt.:	102.41	Water Wt.:	101.49
Volume :	16.14	in^3	264.46	cm3	% moist.:	21.5	% moist.:	23.2
Unit Wt.(wet):	126.50	pcf	2.03	g/cm^3				
Unit Wt.(dry):	104.10	pcf	1.67	g/cm^3				

Specific Gravity:	2.72	Max Dry Density(pcf) =	104.145	OMC =	21.5210356
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.97	Void ratio (e) =	0.63	Porosity (n)=	0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/10/2009	1020	6.1	0.557089	25	0.889	4.60E-08	1.30E-04	
11/10/2009	1440	6	0.657089	25	0.889	3.89E-08	1.10E-04	
11/10/2009	1920	5.9	0.757089	25	0.889	3.40E-08	9.63E-05	
11/10/2009	2460	5.8	0.857089	25	0.889	3.04E-08	8.61E-05	

SUMMARY

ka = 3.73E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.60E-08 cm/sec	23.3	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	3.89E-08 cm/sec	4.2	%	
k3 =	3.40E-08 cm/sec	8.9	%	
k4 =	3.04E-08 cm/sec	18.6	%	

Hydraulic conductivity	k =	3.73E-08	cm/sec	1.06E-04	ft/day
Void Ratio	e =	0.63			
Porosity	n =	0.39			
Bulk Density	γ =	2.03	g/cm3	126.5	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.82E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	21
Plasticity Index	**PI**	**23**
- 200 Sieve		73 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/13/2009	Panel Number :			P 2 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 97	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9337	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000433359		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203781733				
Material Description :	Red & Gray Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			532.67	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			532.67	g	Tare No.:	T 23	Tare No.:	T 25
Diameter :	2.73	in	6.93	cm2	Wet Wt.+tare:	613.56	Wet Wt.+tare:	654.32
Length :	2.69	in	6.83	cm	Dry Wt.+tare:	533.12	Dry Wt.+tare:	562.94
Area:	5.85	in^2	37.74	cm2	Tare Wt:	140.31	Tare Wt:	116.18
Volume :	15.72	in^3	257.65	cm3	Dry Wt.:	392.81	Dry Wt.:	446.76
Unit Wt.(wet):	**129.01**	pcf	**2.07**	g/cm^3	Water Wt.:	80.44	Water Wt.:	91.38
Unit Wt.(dry):	**107.08**	pcf	**1.72**	g/cm^3	% moist.:	**20.5**	% moist.:	**20.5**

Specific Gravity:	**2.70**	Max Dry Density(pcf) =	107.1256	OMC =	20.4780937
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	96.18	Void ratio (e) =	**0.57**	Porosity (n)=	**0.36**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.43

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/13/2009	2580	6.1	0.557211	25	0.889	1.80E-08	5.10E-05	
11/13/2009	3180	6	0.657211	25	0.889	1.74E-08	4.94E-05	
11/13/2009	3780	5.9	0.757211	25	0.889	1.71E-08	4.84E-05	
11/13/2009	4440	5.8	0.857211	25	0.889	1.67E-08	4.72E-05	

SUMMARY

ka = 1.73E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.80E-08 cm/sec	4.1	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.74E-08 cm/sec	0.8	%	
k3 =	1.71E-08 cm/sec	1.2	%	
k4 =	1.67E-08 cm/sec	3.6	%	

Hydraulic conductivity	k =	**1.73E-08**	cm/sec	**4.90E-05**	ft/day
Void Ratio	e =	**0.57**			
Porosity	n =	**0.36**			
Bulk Density	γ =	**2.07**	g/cm3	**129.0**	pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.77E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	43	
Plastic Limit PL	17	
Plasticity Index PI	26	
- 200 Sieve	67	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/13/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 105	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9338	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000435613	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203762241			

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			524.66	g	Tare No.:	T 16	Tare No.:	T 19
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	320.08	Wet Wt.+tare:	714.22
Wet Wt. of Sample :			524.66	g	Dry Wt.+tare:	291.28	Dry Wt.+tare:	616.34
Diameter :	2.73	in	6.93	cm2	Tare Wt:	151.97	Tare Wt:	186.31
Length :	2.70	in	6.86	cm	Dry Wt.:	139.31	Dry Wt.:	430.03
Area:	5.84	in^2	37.71	cm2	Water Wt.:	28.8	Water Wt.:	97.88
Volume :	15.78	in^3	258.61	cm3	% moist.:	20.7	% moist.:	22.8
Unit Wt.(wet):	126.60	pcf	2.03	g/cm^3				
Unit Wt.(dry):	104.91	pcf	1.68	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 104.9527 OMC = 20.6733185
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.34 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/13/2009	4200	6.1	0.557681	25	0.889	1.11E-08	3.15E-05	
11/13/2009	4920	6	0.657681	25	0.889	1.13E-08	3.21E-05	
11/13/2009	5640	5.9	0.757681	25	0.889	1.15E-08	3.26E-05	
11/13/2009	6420	5.8	0.857681	25	0.889	1.16E-08	3.29E-05	

SUMMARY

ka = 1.14E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.11E-08 cm/sec	2.3	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.13E-08 cm/sec	0.5	%	
k3 =	1.15E-08 cm/sec	1.1	%	
k4 =	1.16E-08 cm/sec	1.8	%	

Hydraulic conductivity	k =	**1.14E-08**	cm/sec	**3.23E-05**	ft/day
Void Ratio	e =	**0.64**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.03**	g/cm3	**126.6**	pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.17E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	18
Plasticity Index	**PI**	**25**
- 200 Sieve		75 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/15/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 150	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9343	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000442726		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203808243				

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			537.27	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 23
Wet Wt: of Sample :			537.27	g	Wet Wt.+tare:	393.56	Wet Wt.+tare:	680.78
Diameter :	2.71	in	6.88	cm2	Dry Wt.+tare:	361.95	Dry Wt.+tare:	591.65
Length :	2.70	in	6.87	cm	Tare Wt:	186.33	Tare Wt:	140.30
Area:	5.76	in^2	37.16	cm2	Dry Wt.:	175.62	Dry Wt.:	451.35
Volume :	15.57	in^3	255.21	cm3	Water Wt.:	31.61	Water Wt.:	89.13
Unit Wt.(wet):	131.37	pcf	2.11	g/cm^3	% moist.:	18.0	% moist.:	19.7
Unit Wt.(dry):	111.33	pcf	1.78	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 111.3754 OMC = 17.9990889
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.17 Void ratio (e) = 0.54 Porosity (n)= 0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.37

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/15/2009	960	5.75	0.906573	25	0.889	8.38E-08	2.37E-04	
11/15/2009	1200	5.5	1.156573	25	0.889	8.82E-08	2.50E-04	
11/15/2009	1440	5.3	1.356573	25	0.889	8.85E-08	2.51E-04	
11/15/2009	1680	5.1	1.556573	25	0.889	8.94E-08	2.53E-04	

SUMMARY

ka = 8.75E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	8.38E-08 cm/sec	4.2	%
k2 =	8.82E-08 cm/sec	0.8	%
k3 =	8.85E-08 cm/sec	1.2	%
k4 =	8.94E-08 cm/sec	2.2	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	8.75E-08	cm/sec	2.48E-04	ft/day
Void Ratio	e =	0.54			
Porosity	n =	0.35			
Bulk Density	γ =	2.11	g/cm3	131.4	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	8.96E-13	cm2	(at 20 deg C)	

Liquid Limit LL	48	
Plastic Limit PL	19	
Plasticity Index PI	29	
- 200 Sieve	69	%
+ No 40 Sieve	3	%
+ No 4 Sieve	0	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/20/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 227	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9365	aa =	0.767120	cm2		Pipet Rp	6.6	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000423479		Annulus Ra	1.6	cm3
Other Location:	North- West Liner	M2 =	1.040953	T = 0.20609998				

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			497.27	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 2	Tare No.:	T 12
Wet Wt: of Sample :			497.27	g				
Diameter :	2.70	in	6.86	cm2	Wet Wt.+tare:	665.49	Wet Wt.+tare:	723.42
Length :	2.58	in	6.54	cm	Dry Wt.+tare:	592.56	Dry Wt.+tare:	638.44
Area:	5.73	in^2	36.99	cm2	Tare Wt:	216.66	Tare Wt:	220.22
Volume :	14.77	in^3	241.96	cm3	Dry Wt.:	375.9	Dry Wt.:	418.22
Unit Wt.(wet):	128.24	pcf	2.06	g/cm^3	Water Wt.:	72.93	Water Wt.:	84.98
Unit Wt.(dry):	107.41	pcf	1.72	g/cm^3	% moist.:	19.4	% moist.:	20.3

Specific Gravity: 2.70 Max Dry Density(pcf) = 107.4519 OMC = 19.4014366
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.35 Void ratio (e) = 0.57 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.73

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/20/2009	2160	5.7	0.902014	25	0.889	3.59E-08	1.02E-04	
11/20/2009	2520	5.6	1.002014	25	0.889	3.46E-08	9.80E-05	
11/20/2009	3060	5.4	1.202014	25	0.889	3.50E-08	9.93E-05	
11/20/2009	3600	5.2	1.402014	25	0.889	3.57E-08	1.01E-04	

SUMMARY

ka = 3.53E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.59E-08 cm/sec	1.6	%
k2 =	3.46E-08 cm/sec	2.0	%
k3 =	3.50E-08 cm/sec	0.7	%
k4 =	3.57E-08 cm/sec	1.1	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	3.53E-08	cm/sec	1.00E-04	ft/day
Void Ratio	e =	0.57			
Porosity	n =	0.36			
Bulk Density	γ =	2.06	g/cm3	128.2	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.61E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	19
Plasticity Index	**PI**	**23**
- 200 Sieve		76 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/20/2009 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 242	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9366	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000452819		Annulus Ra	1.5	cm3
Other Location:	South- West Liner	M2 =	1.040953	T = 0.203789864				

Material Description : Red, Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			529.43	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			529.43	g	Tare No.:	T 3	Tare No.:	T22
Diameter :	2.69	in	6.83	cm2	Wet Wt.+tare:	833.67	Wet Wt.+tare:	657.45
Length :	2.73	in	6.93	cm	Dry Wt.+tare:	743.32	Dry Wt.+tare:	578.19
Area:	5.68	in^2	36.67	cm2	Tare Wt:	220.73	Tare Wt:	140.47
Volume :	15.51	in^3	254.16	cm3	Dry Wt.:	522.59	Dry Wt.:	437.72
Unit Wt.(wet):	129.99	pcf	2.08	g/cm^3	Water Wt.:	90.35	Water Wt.:	79.26
Unit Wt.(dry):	110.82	pcf	1.78	g/cm^3	% moist.:	17.3	% moist.:	18.1

Specific Gravity: 2.70 Max Dry Density(pcf) = 110.8723 OMC = 17.288888
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 93.84 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/20/2009	3240	6	0.657015	25	0.889	1.79E-08	5.06E-05	
11/20/2009	3900	5.9	0.757015	25	0.889	1.73E-08	4.90E-05	
11/20/2009	4320	5.8	0.857015	25	0.889	1.79E-08	5.07E-05	
11/20/2009	5160	5.7	0.957015	25	0.889	1.69E-08	4.80E-05	

SUMMARY

ka = 1.75E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	1.79E-08	cm/sec	2.1	%	Vm = |ka-ki| / ka x 100
k2 =	1.73E-08	cm/sec	1.1	%	
k3 =	1.79E-08	cm/sec	2.3	%	
k4 =	1.69E-08	cm/sec	3.2	%	

Hydraulic conductivity	k =	1.75E-08	cm/sec	4.96E-05	ft/day
Void Ratio	e =	0.52			
Porosity	n =	0.34			
Bulk Density	γ =	2.08	g/cm3	130.0	pcf
Water Content	W =	0.31	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.79E-13	cm2	(at 20 deg C)	

Liquid Limit LL	42	
Plastic Limit PL	17	
Plasticity Index PI	25	
- 200 Sieve	74	%
+ No 40 Sieve	4	%
+ No 4 Sieve	1	%

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/7/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 332	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9396	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.0004351	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203880343			

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			545.94	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 16	Tare No.:	T 21
Wet Wt: of Sample :			545.94	g	Wet Wt.+tare:	584.83	Wet Wt.+tare:	691.99
Diameter :	2.72	in	6.91	cm2	Dry Wt.+tare:	514.93	Dry Wt.+tare:	610.15
Length :	2.68	in	6.81	cm	Tare Wt:	151.96	Tare Wt:	140.35
Area:	5.81	in^2	37.52	cm2	Dry Wt.:	362.97	Dry Wt.:	469.8
Volume :	15.60	in^3	255.66	cm3	Water Wt.:	69.9	Water Wt.:	81.84
Unit Wt.(wet):	133.25	pcf	2.14	g/cm^3	% moist.:	19.3	% moist.:	17.4
Unit Wt.(dry):	111.73	pcf	1.79	g/cm^3				

Specific Gravity: 2.65 Max Dry Density(pcf) = 111.7789 OMC = 19.2577899
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.04 Void ratio (e) = 0.48 Porosity (n)= 0.32

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.44

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	1440	5.7	0.954838	24.5	0.899	5.88E-08	1.67E-04	
12/7/2009	1680	5.6	1.054838	24.5	0.899	5.64E-08	1.60E-04	
12/7/2009	1920	5.5	1.154838	24.5	0.899	5.47E-08	1.55E-04	
12/7/2009	2160	5.4	1.254838	24.5	0.899	5.35E-08	1.52E-04	

SUMMARY

ka = 5.59E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.88E-08 cm/sec	5.3	%
k2 =	5.64E-08 cm/sec	1.0	%
k3 =	5.47E-08 cm/sec	2.1	%
k4 =	5.35E-08 cm/sec	4.2	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	5.59E-08	cm/sec	1.58E-04	ft/day
Void Ratio	e =	0.48			
Porosity	n =	0.32			
Bulk Density	γ =	2.14	g/cm3	133.2	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.72E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	19
Plasticity Index	**PI**	**17**
- 200 Sieve		68 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/7/2009	Panel Number :			P 2 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 338	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9397	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000447995		Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T = 0.203796789				
Material Description :	Red & Gray Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.47	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 23
Wet Wt: of Sample :			533.47	g	Wet Wt.+tare:	567.41	Wet Wt.+tare:	676.33
Diameter :	2.70	in	6.85	cm2	Dry Wt.+tare:	500.70	Dry Wt.+tare:	582.65
Length :	2.71	in	6.89	cm	Tare Wt:	186.36	Tare Wt:	140.31
Area:	5.71	in^2	36.86	cm2	Dry Wt.:	314.34	Dry Wt.:	442.34
Volume :	15.50	in^3	254.08	cm3	Water Wt.:	66.71	Water Wt.:	93.68
Unit Wt.(wet):	131.02	pcf	2.10	g/cm^3	% moist.:	21.2	% moist.:	21.2
Unit Wt.(dry):	108.08	pcf	1.73	g/cm^3				

Specific Gravity:	2.75	Max Dry Density(pcf) =	108.1273	OMC =	21.2222434
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.97	Void ratio (e) =	0.59	Porosity (n)=	0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	1440	6.1	0.556849	24.5	0.899	3.37E-08	9.55E-05	
12/7/2009	1800	6	0.656849	24.5	0.899	3.22E-08	9.12E-05	
12/7/2009	2220	5.9	0.756849	24.5	0.899	3.04E-08	8.62E-05	
12/7/2009	2700	5.8	0.856849	24.5	0.899	2.86E-08	8.12E-05	

SUMMARY

ka =	3.12E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	3.37E-08	cm/sec	7.9	%	Vm = |ka-ki| / ka x 100
k2 =	3.22E-08	cm/sec	3.0	%	
k3 =	3.04E-08	cm/sec	2.6	%	
k4 =	2.86E-08	cm/sec	8.3	%	

Hydraulic conductivity	k =	3.12E-08	cm/sec	8.85E-05	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.10	g/cm3	131.0	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.20E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	16
Plasticity Index	**PI**	**22**
- 200 Sieve		66 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/7/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 348	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9398	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.0004411	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203772726			

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.74	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			533.74	g	Tare No.:	T 17	Tare No.:	T 22
Diameter :	2.72	in	6.92	cm2	Wet Wt.+tare:	738.63	Wet Wt.+tare:	678.87
Length :	2.73	in	6.92	cm	Dry Wt.+tare:	629.39	Dry Wt.+tare:	577.89
Area:	5.83	in^2	37.60	cm2	Tare Wt:	146.74	Tare Wt:	140.47
Volume :	15.89	in^3	260.33	cm3	Dry Wt.:	482.65	Dry Wt.:	437.42
Unit Wt.(wet):	**127.93**	pcf	**2.05**	g/cm^3	Water Wt.:	109.24	Water Wt.:	100.98
Unit Wt.(dry):	**104.32**	pcf	**1.67**	g/cm^3	% moist.:	**22.6**	% moist.:	**23.1**

Specific Gravity: **2.75** Max Dry Density(pcf) = 104.3663 OMC = 22.6333782
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.32 Void ratio (e) = **0.65** Porosity (n)= **0.39**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	660	6	0.657428	24.5	0.899	8.65E-08	2.45E-04	
12/7/2009	900	5.9	0.757428	24.5	0.899	7.39E-08	2.09E-04	
12/7/2009	1140	5.8	0.857428	24.5	0.899	6.68E-08	1.89E-04	
12/7/2009	1440	5.7	0.957428	24.5	0.899	5.98E-08	1.69E-04	

SUMMARY

ka = 7.17E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	8.65E-08	cm/sec	20.5	%	Vm = |ka-ki| / ka x 100
k2 =	7.39E-08	cm/sec	3.0	%	
k3 =	6.68E-08	cm/sec	6.9	%	
k4 =	5.98E-08	cm/sec	16.7	%	

Hydraulic conductivity	k =	**7.17E-08**	cm/sec	**2.03E-04**	ft/day
Void Ratio	e =	**0.65**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.05**	g/cm3	**127.9**	pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**7.35E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	17
Plasticity Index	**PI**	**24**
- 200 Sieve		74 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/7/2009	Panel Number :			P 4 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 354	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9399	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000442722		Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T = 0.20378183				
Material Description :	Red & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.32	g	Tare No.:	T 22	Tare No.:	T 19
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	653.92	Wet Wt.+tare:	709.32
Wet Wt: of Sample :			511.32	g	Dry Wt.+tare:	569.01	Dry Wt.+tare:	611.21
Diameter :	2.70	in	6.87	cm2	Tare Wt:	140.46	Tare Wt:	186.38
Length :	2.69	in	6.84	cm	Dry Wt.:	428.55	Dry Wt.:	424.83
Area:	5.74	in^2	37.02	cm2	Water Wt.:	84.91	Water Wt.:	98.11
Volume :	15.46	in^3	253.33	cm3	% moist.:	19.8	% moist.:	23.1
Unit Wt.(wet):	125.95	pcf	2.02	g/cm^3				
Unit Wt.(dry):	105.12	pcf	1.68	g/cm^3				

Specific Gravity:	2.75	Max Dry Density(pcf) =	105.1665	OMC =	19.813324
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	100.30	Void ratio (e) =	0.63	Porosity (n)=	0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.41

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	1860	6.1	0.557209	24.5	0.899	2.58E-08	7.31E-05	
12/7/2009	2220	6	0.657209	24.5	0.899	2.58E-08	7.31E-05	
12/7/2009	2640	5.9	0.757209	24.5	0.899	2.53E-08	7.17E-05	
12/7/2009	3120	5.8	0.857209	24.5	0.899	2.45E-08	6.95E-05	

SUMMARY

ka = 2.53E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.58E-08 cm/sec	1.8	%
k2 =	2.58E-08 cm/sec	1.8	%
k3 =	2.53E-08 cm/sec	0.3	%
k4 =	2.45E-08 cm/sec	3.3	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.53E-08**	cm/sec	**7.18E-05**	ft/day
Void Ratio	e =	**0.63**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.02**	g/cm3	**125.9**	pcf
Water Content	W =	**0.33**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.60E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	39	
Plastic Limit	PL	11	
Plasticity Index	**PI**	**28**	
- 200 Sieve		78	%
+ No 40 Sieve		3	%
+ No 4 Sieve		1	%

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/7/2009	Panel Number :			P 5 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 362	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9400	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000438824	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203783953			
Material Description :	Red, Gray & Tan Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			523.81	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 18	Tare No.:	T 17
Wet Wt: of Sample :			523.81	g	Wet Wt.+tare:	393.63	Wet Wt.+tare:	676.65
Diameter :	2.72	in	6.90	cm2	Dry Wt.+tare:	352.53	Dry Wt.+tare:	583.64
Length :	2.70	in	6.86	cm	Tare Wt:	146.71	Tare Wt:	146.74
Area:	5.80	in^2	37.43	cm2	Dry Wt.:	205.82	Dry Wt.:	436.9
Volume :	15.67	in^3	256.72	cm3	Water Wt.:	41.1	Water Wt.:	93.01
Unit Wt.(wet):	127.32	pcf	2.04	g/cm^3	% moist.:	20.0	% moist.:	21.3
Unit Wt.(dry):	106.13	pcf	1.70	g/cm^3				

Specific Gravity:	2.70	Max Dry Density(pcf) =	106.1749	OMC =	19.9689049
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	97.71	Void ratio (e) =	0.59	Porosity (n)=	0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	1020	5.7	0.957158	24.5	0.899	8.40E-08	2.38E-04	
12/7/2009	1200	5.6	1.057158	24.5	0.899	7.98E-08	2.26E-04	
12/7/2009	1380	5.5	1.157158	24.5	0.899	7.69E-08	2.18E-04	
12/7/2009	1560	5.4	1.257158	24.5	0.899	7.49E-08	2.12E-04	

SUMMARY

ka =	7.89E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	8.40E-08	cm/sec	6.4	%	Vm = |ka-ki| / ka x 100
k2 =	7.98E-08	cm/sec	1.2	%	
k3 =	7.69E-08	cm/sec	2.5	%	
k4 =	7.49E-08	cm/sec	5.1	%	

Hydraulic conductivity	k =	**7.89E-08**	cm/sec	**2.24E-04**	ft/day
Void Ratio	e =	**0.59**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.04**	g/cm3	**127.3**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**8.08E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	49	
Plastic Limit PL	19	
Plasticity Index PI	30	
- 200 Sieve	70	%
+ No 40 Sieve	4	%
+ No 4 Sieve	0	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/7/2009 Panel Number : P 6 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 370	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9401	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000451179	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203799877			

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			509.58	g	Tare No.:	T 24	Tare No.:	T 18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	589.92	Wet Wt.+tare:	663.31
Wet Wt: of Sample :			509.58	g	Dry Wt.+tare:	506.64	Dry Wt.+tare:	565.71
Diameter :	2.68	in	6.82	cm2	Tare Wt:	112.34	Tare Wt:	146.75
Length :	2.71	in	6.88	cm	Dry Wt.:	394.3	Dry Wt.:	418.96
Area:	5.66	in^2	36.50	cm2	Water Wt.:	83.28	Water Wt.:	97.6
Volume :	15.32	in^3	250.98	cm3	% moist.:	21.1	% moist.:	23.3
Unit Wt.(wet):	126.69	pcf	2.03	g/cm^3				
Unit Wt.(dry):	104.60	pcf	1.68	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 104.6451 OMC = 21.1209739
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.89 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.36

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/7/2009	3420	6.1	0.556774	24.5	0.899	1.43E-08	4.05E-05	
12/7/2009	3900	6	0.656774	24.5	0.899	1.50E-08	4.24E-05	
12/7/2009	4380	5.9	0.756774	24.5	0.899	1.55E-08	4.40E-05	
12/7/2009	4920	5.8	0.856774	24.5	0.899	1.58E-08	4.49E-05	

SUMMARY

ka = 1.51E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	1.43E-08	cm/sec	5.7	%	Vm = |ka-ki| / ka x 100
k2 =	1.50E-08	cm/sec	1.3	%	
k3 =	1.55E-08	cm/sec	2.5	%	
k4 =	1.58E-08	cm/sec	4.5	%	

Hydraulic conductivity	k =	**1.51E-08**	cm/sec	**4.29E-05**	ft/day
Void Ratio	e =	**0.64**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.03**	g/cm3	**126.7**	pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.55E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	37	
Plastic Limit PL	20	
Plasticity Index PI	17	
- 200 Sieve	83	%
+ No 40 Sieve	4	%
+ No 4 Sieve	1	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/23/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 485	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9468	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000438511	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203791995			

Material Description : Red, Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			543.37	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			543.37	g	Tare No.:	T 18	Tare No.:	T 22
Diameter :	2.72	in	6.92	cm2	Wet Wt.+tare:	378.19	Wet Wt.+tare:	687.04
Length :	2.71	in	6.88	cm	Dry Wt.+tare:	349.75	Dry Wt.+tare:	602.19
Area:	5.83	in^2	37.60	cm2	Tare Wt:	146.71	Tare Wt:	140.45
Volume :	15.79	in^3	258.81	cm3	Dry Wt.:	203.04	Dry Wt.:	461.74
Unit Wt.(wet):	131.01	pcf	2.10	g/cm^3	Water Wt.:	28.44	Water Wt.:	84.85
Unit Wt.(dry):	114.91	pcf	1.84	g/cm^3	% moist.:	14.0	% moist.:	18.4

Specific Gravity: 2.75 Max Dry Density(pcf) = 114.9634 OMC = 14.0070922
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 102.30 Void ratio (e) = 0.49 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/23/2009	2220	6.1	0.556964	25	0.889	2.12E-08	6.00E-05	
12/23/2009	3060	6	0.656964	25	0.889	1.83E-08	5.19E-05	
12/23/2009	3960	5.9	0.756964	25	0.889	1.65E-08	4.68E-05	
12/23/2009	4920	5.8	0.856964	25	0.889	1.52E-08	4.31E-05	

SUMMARY

ka = 1.78E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	2.12E-08	cm/sec	18.9	%	Vm = |ka-ki| / ka x 100
k2 =	1.83E-08	cm/sec	2.9	%	
k3 =	1.65E-08	cm/sec	7.3	%	
k4 =	1.52E-08	cm/sec	14.5	%	

Hydraulic conductivity	k =	1.78E-08	cm/sec	5.04E-05	ft/day
Void Ratio	e =	0.49			
Porosity	n =	0.33			
Bulk Density	γ =	2.10	g/cm3	131.0	pcf
Water Content	W =	0.26	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.82E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	16
Plasticity Index	**PI**	**22**
- 200 Sieve		61 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/23/2009	Panel Number :		P 2 ; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 497	ap =	0.031416 cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3	
Sample:	9469	aa =	0.767120 cm2		Pipet Rp	6.7	cm3	
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000439156	Annulus Ra	1.5	cm3	
Other Location:	Liner	M2 =	1.040953	T = 0.203791995				
Material Description :	Tan & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.55	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			516.55	g	Tare No.:	T 21	Tare No.:	T 18
Diameter :	2.72	in	6.91	cm2	Wet Wt.+tare:	302.72	Wet Wt.+tare:	678.22
Length :	2.71	in	6.88	cm	Dry Wt.+tare:	276.34	Dry Wt.+tare:	579.86
Area:	5.82	in^2	37.54	cm2	Tare Wt:	140.36	Tare Wt:	146.71
Volume :	15.77	in^3	258.43	cm3	Dry Wt.:	135.98	Dry Wt.:	433.15
Unit Wt.(wet):	124.73	pcf	2.00	g/cm^3	Water Wt.:	26.38	Water Wt.:	98.36
Unit Wt.(dry):	104.46	pcf	1.67	g/cm^3	% moist.:	19.4	% moist.:	22.7

Specific Gravity:	2.70	Max Dry Density(pcf) =	104.5062	OMC =	19.3999118
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.92	Void ratio (e) =	0.61	Porosity (n)=	0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/23/2009	1500	5.7	0.956964	25	0.889	5.65E-08	1.60E-04	
12/23/2009	1800	5.6	1.056964	25	0.889	5.26E-08	1.49E-04	
12/23/2009	2160	5.5	1.156964	25	0.889	4.86E-08	1.38E-04	
12/23/2009	2580	5.4	1.256964	25	0.889	4.48E-08	1.27E-04	

SUMMARY

ka =	5.06E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	5.65E-08	cm/sec	11.6	%	Vm = |ka-ki| / ka x 100
k2 =	5.26E-08	cm/sec	4.0	%	
k3 =	4.86E-08	cm/sec	4.0	%	
k4 =	4.48E-08	cm/sec	11.5	%	

Hydraulic conductivity	k =	5.06E-08	cm/sec	1.44E-04	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.00	g/cm3	124.7	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.19E-13	cm2	(at 20 deg C)	

Liquid Limit LL	43	
Plastic Limit PL	19	
Plasticity Index PI	24	
- 200 Sieve	79	%
+ No 40 Sieve	4	%
+ No 4 Sieve	0	%

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/24/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 513	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3
Sample:	9474	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	Lift 1	M_1 =	0.030180	C = 0.00044856	Annulus Ra	1.5	cm^3
Other Location:	Liner	M_2 =	1.040953	T = 0.203807599			

Material Description : Tan, Gray & Red Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			534.98	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 17	Tare No.:	T-18
Wet Wt: of Sample :			534.98	g	Wet Wt.+tare:	488.79	Wet Wt.+tare	687.99
Diameter :	2.72	in	6.91	cm^2	Dry Wt.+tare:	427.49	Dry Wt.+tare:	582.87
Length :	2.77	in	7.03	cm	Tare Wt:	146.72	Tare Wt:	146.73
Area:	5.81	in^2	37.52	cm^2	Dry Wt.:	280.77	Dry Wt.:	436.14
Volume :	16.08	in^3	263.57	cm^3	Water Wt.:	61.3	Water Wt.:	105.12
Unit Wt.(wet):	**126.65**	pcf	**2.03**	$g/cm^{\wedge 3}$	% moist.:	**21.8**	% moist.:	**24.1**
Unit Wt.(dry):	**103.96**	pcf	**1.67**	$g/cm^{\wedge 3}$				

Assumed Specific Gravity: **2.78** Max Dry Density(pcf) = 104.0024 OMC = 21.8328169
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.35 Void ratio (e) = **0.67** Porosity (n)= **0.40**

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 9.16

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/24/2009	1020	6.1	0.5565884	25.5	0.879	4.66E-08	1.32E-04	
12/24/2009	1380	6	0.6565884	25.5	0.879	4.11E-08	1.16E-04	
12/24/2009	1740	5.9	0.7565884	25.5	0.879	3.80E-08	1.08E-04	
12/24/2009	2160	5.8	0.8565884	25.5	0.879	3.50E-08	9.93E-05	

SUMMARY

k_a = 4.01E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	4.66E-08 cm/sec	16.0	%
k2 =	4.11E-08 cm/sec	2.3	%
k3 =	3.80E-08 cm/sec	5.5	%
k4 =	3.50E-08 cm/sec	12.7	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**4.01E-08**	cm/sec	**1.14E-04**	ft/day
Void Ratio	e =	**0.67**			
Porosity	n =	**0.40**			
Bulk Density	γ =	**2.03**	g/cm^3	**126.7**	pcf
Water Content	W =	**0.36**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**4.11E-13**	cm^2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	21
Plasticity Index	**PI**	**19**
- 200 Sieve		81 %
+ No 40 Sieve		8 %
+ No 4 Sieve		4 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/9/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 704	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9599	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000438362	Annulus Ra	1.5	cm3
Other Location:	South - West Liner	M2 =	1.040953	T =	0.203809289			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			520.14	g	Tare No.:	T 8	Tare No.:	T 7
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	794.72	Wet Wt.+tare:	743.43
Wet Wt: of Sample :			520.14	g	Dry Wt.+tare:	675.19	Dry Wt.+tare:	636.26
Diameter :	2.74	in	6.96	cm2	Tare Wt:	221.91	Tare Wt:	221.19
Length :	2.75	in	6.97	cm	Dry Wt.:	453.28	Dry Wt.:	415.07
Area:	5.91	in^2	38.10	cm2	Water Wt.:	119.53	Water Wt.:	107.17
Volume :	16.21	in^3	265.62	cm3	% moist.:	26.4	% moist.:	25.8
Unit Wt.(wet):	122.19	pcf	1.96	g/cm^3				
Unit Wt.(dry):	96.69	pcf	1.55	g/cm^3				

Specific Gravity: 2.65 Max Dry Density(pcf) = 96.73382 OMC = 26.3700141
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.24 Void ratio (e) = 0.71 Porosity (n)= 0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.23

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/9/2010	3120	6.1	0.556548	25.5	0.879	1.49E-08	4.22E-05	
3/9/2010	3540	6.05	0.606548	25.5	0.879	1.44E-08	4.07E-05	
3/9/2010	3960	6	0.656548	25.5	0.879	1.40E-08	3.96E-05	
3/9/2010	4380	5.95	0.706548	25.5	0.879	1.37E-08	3.88E-05	

SUMMARY

ka = 1.42E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.49E-08 cm/sec	4.5	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.44E-08 cm/sec	1.0	%	
k3 =	1.40E-08 cm/sec	1.7	%	
k4 =	1.37E-08 cm/sec	3.8	%	

Hydraulic conductivity	k =	**1.42E-08**	cm/sec	**4.03E-05**	ft/day
Void Ratio	e =	**0.71**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.96**	g/cm3	**122.2**	pcf
Water Content	W =	**0.41**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.46E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	45	
Plastic Limit PL	17	
Plasticity Index PI	28	
- 200 Sieve	76	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/11/2010 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 1	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9856	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000433074	Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T =	0.203782736			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.53	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 4	Tare No.:	T 20
Wet Wt: of Sample :			511.53	g				
Diameter :	2.74	in	6.96	cm2	Wet Wt.+tare:	885.21	Wet Wt.+tare:	673.57
Length :	2.71	in	6.88	cm	Dry Wt.+tare:	758.75	Dry Wt.+tare:	569.66
Area:	5.90	in^2	38.08	cm2	Tare Wt:	219.47	Tare Wt:	160.24
Volume :	16.00	in^3	262.15	cm3	Dry Wt.:	539.28	Dry Wt.:	409.42
Unit Wt.(wet):	121.76	pcf	1.95	g/cm^3	Water Wt.:	126.46	Water Wt.:	103.91
Unit Wt.(dry):	98.63	pcf	1.58	g/cm^3	% moist.:	23.4	% moist.:	25.4

Assumed Specific Gravity: 2.65 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.29 Void ratio (e) = 0.68 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/11/2010	1440	6.1	0.557187	25.3	0.883	3.20E-08	9.07E-05	
8/11/2010	1800	6	0.657187	25.3	0.883	3.06E-08	8.66E-05	
8/11/2010	2160	5.9	0.757187	25.2	0.885	2.97E-08	8.43E-05	
8/11/2010	2580	5.8	0.857187	25.2	0.885	2.85E-08	8.09E-05	

SUMMARY

ka = 3.02E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.20E-08 cm/sec	6.0	%
k2 =	3.06E-08 cm/sec	1.1	%
k3 =	2.97E-08 cm/sec	1.5	%
k4 =	2.85E-08 cm/sec	5.6	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	3.02E-08	cm/sec	8.56E-05	ft/day
Void Ratio	e =	0.68			
Porosity	n =	0.40			
Bulk Density	γ =	1.95	g/cm3	121.8	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.09E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	19
Plasticity Index	PI	20
- 200 Sieve		77 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 9/20/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 75	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9919	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C = 0.000440936		Annulus Ra	1.5	cm3
Other Location:	South-West Perimeter	M2 =	1.040953	T = 0.203791624				

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			506.95	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 12	Tare No.:	T 21
Wet Wt: of Sample :			506.95	g	Wet Wt.+tare:	760.80	Wet Wt.+tare:	650.37
Diameter :	2.72	in	6.90	cm2	Dry Wt.+tare:	669.57	Dry Wt.+tare:	546.21
Length :	2.71	in	6.89	cm	Tare Wt:	220.19	Tare Wt:	140.31
Area:	5.80	in^2	37.41	cm2	Dry Wt.:	449.38	Dry Wt.:	405.9
Volume :	15.73	in^3	257.69	cm3	Water Wt.:	91.23	Water Wt.:	104.16
Unit Wt.(wet):	122.76	pcf	1.97	g/cm^3	% moist.:	20.3	% moist.:	25.7
Unit Wt.(dry):	102.04	pcf	1.64	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 103.41 Void ratio (e) = 0.68 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/20/2010	2460	6.1	0.556973	25	0.889	1.92E-08	5.44E-05	
9/20/2010	3120	6	0.656973	25	0.889	1.81E-08	5.12E-05	
9/20/2010	3840	5.9	0.756973	25	0.889	1.71E-08	4.85E-05	
9/20/2010	4620	5.8	0.856973	25	0.889	1.63E-08	4.62E-05	

SUMMARY

ka = 1.77E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	1.92E-08	cm/sec	8.7	%	Vm = |ka-ki| / ka x 100
k2 =	1.81E-08	cm/sec	2.3	%	
k3 =	1.71E-08	cm/sec	3.2	%	
k4 =	1.63E-08	cm/sec	7.8	%	

Hydraulic conductivity	k =	1.77E-08	cm/sec	5.01E-05	ft/day
Void Ratio	e =	0.68			
Porosity	n =	0.41			
Bulk Density	γ =	1.97	g/cm3	122.8	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.81E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	20
Plasticity Index	**PI**	**23**
- 200 Sieve		89 %
+ No 40 Sieve		7 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/7/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9950	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 1, Density P-82	M1 =	0.030180	C = 0.000448637		Annulus Ra	1.5	cm3
Other Location:	South Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			510.78	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 5	Tare No.:	T 9
Wet Wt: of Sample :			510.78	g	Wet Wt.+tare:	676.95	Wet Wt.+tare:	732.13
Diameter :	2.70	in	6.85	cm2	Dry Wt.+tare:	589.59	Dry Wt.+tare:	632.16
Length :	2.72	in	6.91	cm	Tare Wt:	218.77	Tare Wt:	220.51
Area:	5.72	in^2	36.88	cm2	Dry Wt.:	370.82	Dry Wt.:	411.65
Volume :	15.55	in^3	254.74	cm3	Water Wt.:	87.36	Water Wt.:	99.97
Unit Wt.(wet):	125.12	pcf	2.01	g/cm^3	% moist.:	23.6	% moist.:	24.3
Unit Wt.(dry):	101.26	pcf	1.62	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.66 Void ratio (e) = 0.66 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.32

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/7/2010	2580	5.3	1.357171	25	0.889	5.01E-08	1.42E-04	
10/7/2010	2820	5.2	1.457171	25	0.889	4.98E-08	1.41E-04	
10/7/2010	3060	5.1	1.557171	25	0.889	4.98E-08	1.41E-04	
10/7/2010	3360	5	1.657171	25	0.889	4.89E-08	1.39E-04	

SUMMARY

ka = 4.96E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	5.01E-08 cm/sec	0.8	%	Vm = |ka-ki| / ka x 100
k2 =	4.98E-08 cm/sec	0.4	%	
k3 =	4.98E-08 cm/sec	0.2	%	
k4 =	4.89E-08 cm/sec	1.5	%	

Hydraulic conductivity	k =	4.96E-08	cm/sec	1.41E-04	ft/day
Void Ratio	e =	0.66			
Porosity	n =	0.40			
Bulk Density	γ =	2.01	g/cm3	125.1	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.09E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	21
Plasticity Index	**PI**	**18**
- 200 Sieve		91 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/6/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9947	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1 Density P-90	M1 =	0.030180	C =	0.000442492	Annulus Ra	1.5	cm3
Other Location:	South Perimeter	M2 =	1.040953	T =	0.203791163			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			539.05	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 21	Tare No.:	T 13
Wet Wt: of Sample :			539.05	g				
Diameter :	2.73	in	6.94	cm2	Wet Wt.+tare:	694.54	Wet Wt.+tare:	765.16
Length :	2.75	in	6.99	cm	Dry Wt.+tare:	589.42	Dry Wt.+tare:	670.14
Area:	5.87	in^2	37.85	cm2	Tare Wt:	140.32	Tare Wt:	219.66
Volume :	16.15	in^3	264.62	cm3	Dry Wt.:	449.1	Dry Wt.:	450.48
Unit Wt.(wet):	127.11	pcf	2.04	g/cm^3	Water Wt.:	105.12	Water Wt.:	95.02
Unit Wt.(dry):	103.00	pcf	1.65	g/cm^3	% moist.:	23.4	% moist.:	21.1

Assumed Specific Gravity: 2.60 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 95.23 Void ratio (e) = 0.58 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.21

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/6/2010	1620	6.1	0.556984	25.5	0.879	2.89E-08	8.20E-05	
10/6/2010	2280	6	0.656984	25.5	0.879	2.45E-08	6.95E-05	
10/6/2010	2883	5.9	0.756984	25.5	0.879	2.26E-08	6.41E-05	
10/6/2010	3600	5.8	0.856984	25.5	0.879	2.07E-08	5.88E-05	

SUMMARY

ka = 2.42E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.89E-08 cm/sec	19.5	%
k2 =	2.45E-08 cm/sec	1.3	%
k3 =	2.26E-08 cm/sec	6.6	%
k4 =	2.07E-08 cm/sec	14.3	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	2.42E-08	cm/sec	6.86E-05	ft/day
Void Ratio	e =	0.58			
Porosity	n =	0.37			
Bulk Density	γ =	2.04	g/cm3	127.1	pcf
Water Content	W =	0.39	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.48E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	21
Plasticity Index	**PI**	**26**
- 200 Sieve		85 %
+ No 40 Sieve		6 %
+ No 4 Sieve		2 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/10/2009 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 58	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9328	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000445469		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203879699				

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			531.58	g	Tare No.:	T 20	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	679.68	Wet Wt.+tare:	688.53
Wet Wt: of Sample :			531.58	g	Dry Wt.+tare:	594.66	Dry Wt.+tare:	590.87
Diameter :	2.72	in	6.92	cm2	Tare Wt:	160.22	Tare Wt:	151.99
Length :	2.75	in	6.99	cm	Dry Wt.:	434.44	Dry Wt.:	438.88
Area:	5.83	in^2	37.60	cm2	Water Wt.:	85.02	Water Wt.:	97.66
Volume :	16.04	in^3	262.91	cm3	% moist.:	19.6	% moist.:	22.3
Unit Wt.(wet):	126.17	pcf	2.02	g/cm^3				
Unit Wt.(dry):	105.52	pcf	1.69	g/cm^3				

Specific Gravity: 2.72 Max Dry Density(pcf) = 105.5614 OMC = 19.5700212
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.33 Void ratio (e) = 0.61 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.20

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/10/2009	1020	6	0.654853	25	0.889	5.57E-08	1.58E-04	
11/10/2009	1200	5.9	0.754853	25	0.889	5.52E-08	1.56E-04	
11/10/2009	1380	5.8	0.854853	25	0.889	5.50E-08	1.56E-04	
11/10/2009	1740	5.7	0.954853	25	0.889	4.93E-08	1.40E-04	

SUMMARY

ka = 5.38E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.57E-08 cm/sec	3.5	%
k2 =	5.52E-08 cm/sec	2.6	%
k3 =	5.50E-08 cm/sec	2.2	%
k4 =	4.93E-08 cm/sec	8.3	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**5.38E-08**	cm/sec	**1.52E-04**	ft/day
Void Ratio	e =	**0.61**			
Porosity	n =	**0.38**			
Bulk Density	γ =	**2.02**	g/cm3	**126.2**	pcf
Water Content	W =	**0.33**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**5.51E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	18
Plasticity Index	**PI**	**25**
- 200 Sieve		67 %
+ No 40 Sieve		5 %
+ No 4 Sieve		3 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/11/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 64	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9331	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000436132		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203809289				

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			553.90	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 23	Tare No.:	T 21
Wet Wt: of Sample :			553.90	g	Wet Wt.+tare:	640.25	Wet Wt.+tare:	698.37
Diameter :	2.75	in	6.98	cm2	Dry Wt.+tare:	563.68	Dry Wt.+tare:	604.52
Length :	2.75	in	6.97	cm	Tare Wt:	140.31	Tare Wt:	140.37
Area:	5.94	in^2	38.29	cm2	Dry Wt.:	423.37	Dry Wt.:	464.15
Volume :	16.29	in^3	266.98	cm3	Water Wt.:	76.57	Water Wt.:	93.85
Unit Wt.(wet):	129.46	pcf	2.07	g/cm^3	% moist.:	18.1	% moist.:	20.2
Unit Wt.(dry):	109.63	pcf	1.76	g/cm^3				

Specific Gravity: 2.73 Max Dry Density(pcf) = 109.6784 OMC = 18.0858351
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.53 Void ratio (e) = 0.55 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.23

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	(deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/11/2009	1680	5.7	0.956548	25	0.889	5.01E-08	1.42E-04	
11/11/2009	1920	5.6	1.056548	25	0.889	4.90E-08	1.39E-04	
11/11/2009	2160	5.5	1.156548	25	0.889	4.83E-08	1.37E-04	
11/11/2009	2400	5.4	1.256548	25	0.889	4.78E-08	1.36E-04	

SUMMARY

ka = 4.88E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.01E-08 cm/sec	2.6	%
k2 =	4.90E-08 cm/sec	0.4	%
k3 =	4.83E-08 cm/sec	1.1	%
k4 =	4.78E-08 cm/sec	2.0	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	4.88E-08	cm/sec	1.38E-04 ft/day
Void Ratio	e =	0.55		
Porosity	n =	0.36		
Bulk Density	γ =	2.07	g/cm3	129.5 pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	5.00E-13	cm2	(at 20 deg C)

Liquid Limit	LL	38
Plastic Limit	PL	16
Plasticity Index	**PI**	**22**
- 200 Sieve		63 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/12/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 71	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9332	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000441739		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203781572				

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			518.13	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			518.13	g	Tare No.:	T 19	Tare No.:	T 21
Diameter :	2.71	in	6.87	cm2	Wet Wt.+tare:	429.42	Wet Wt.+tare:	672.56
Length :	2.69	in	6.84	cm	Dry Wt.+tare:	391.90	Dry Wt.+tare:	573.69
Area:	5.75	in^2	37.08	cm2	Tare Wt:	186.31	Tare Wt:	140.35
Volume :	15.47	in^3	253.51	cm3	Dry Wt.:	205.59	Dry Wt.:	433.34
Unit Wt.(wet):	127.53	pcf	2.04	g/cm^3	Water Wt.:	37.52	Water Wt.:	98.87
Unit Wt.(dry):	107.85	pcf	1.73	g/cm^3	% moist.:	18.2	% moist.:	22.8

Specific Gravity: 2.80 Max Dry Density(pcf) = 107.8966 OMC = 18.2499149
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 102.91 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.41

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/12/2009	1380	5.6	1.057215	25	0.889	6.91E-08	1.96E-04	
11/12/2009	1620	5.45	1.207215	25	0.889	6.85E-08	1.94E-04	
11/12/2009	1860	5.3	1.357215	25	0.889	6.84E-08	1.94E-04	
11/12/2009	2100	5.2	1.457215	25	0.889	6.59E-08	1.87E-04	

SUMMARY

ka = 6.80E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	6.91E-08	cm/sec	1.6	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	6.85E-08	cm/sec	0.8	%	
k3 =	6.84E-08	cm/sec	0.6	%	
k4 =	6.59E-08	cm/sec	3.0	%	

Hydraulic conductivity	k =	6.80E-08	cm/sec	1.93E-04	ft/day
Void Ratio	e =	0.62			
Porosity	n =	0.38			
Bulk Density	γ =	2.04	g/cm3	127.5	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.96E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	19
Plasticity Index	**PI**	**28**
- 200 Sieve		78 %
+ No 40 Sieve		2 %
+ No 4 Sieve		2 %

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/12/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 80	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9333	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000431291	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203790226			

Material Description : Red & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			514.21	g	Tare No.:	T 23	Tare No.:	T 18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	588.35	Wet Wt.+tare:	666.68
Wet Wt: of Sample :			514.21	g	Dry Wt.+tare:	517.85	Dry Wt.+tare:	574.99
Diameter :	2.71	in	6.89	cm2	Tare Wt:	140.31	Tare Wt:	146.73
Length :	2.64	in	6.71	cm	Dry Wt.:	377.54	Dry Wt.:	428.26
Area:	5.77	in^2	37.24	cm2	Water Wt.:	70.5	Water Wt.:	91.69
Volume :	15.24	in^3	249.72	cm3	% moist.:	18.7	% moist.:	21.4
Unit Wt.(wet):	128.49	pcf	2.06	g/cm^3				
Unit Wt.(dry):	108.27	pcf	1.74	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 108.3186 OMC = 18.673518
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.53 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.60

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/12/2009	1800	5.7	0.957007	25	0.889	4.62E-08	1.31E-04	
11/12/2009	2160	5.6	1.057007	25	0.889	4.31E-08	1.22E-04	
11/12/2009	2760	5.4	1.257007	25	0.889	4.11E-08	1.17E-04	
11/12/2009	3420	5.2	1.457007	25	0.889	3.95E-08	1.12E-04	

SUMMARY

ka = 4.25E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.62E-08 cm/sec	8.8	%	Vm = |ka-ki| / ka x 100
k2 =	4.31E-08 cm/sec	1.4	%	
k3 =	4.11E-08 cm/sec	3.2	%	
k4 =	3.95E-08 cm/sec	7.0	%	

Hydraulic conductivity	k =	**4.25E-08**	cm/sec	**1.20E-04**	ft/day
Void Ratio	e =	**0.59**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.06**	g/cm3	**128.5**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.35E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	18
Plasticity Index	**PI**	**21**
- 200 Sieve		74 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/14/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 137	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9341	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000439965	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203784596			

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test
Wet Wt. sample + ring or tare :			528.07	g	Tare No.:	T 18	Tare No.:
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	645.96	Wet Wt.+tare:
Wet Wt: of Sample :			528.07	g	Dry Wt.+tare:	557.46	Dry Wt.+tare:
Diameter :	2.72	in	6.91	cm2	Tare Wt:	146.71	Tare Wt:
Length :	2.71	in	6.89	cm	Dry Wt.:	410.75	Dry Wt.:
Area:	5.81	in^2	37.52	cm2	Water Wt.:	88.5	Water Wt.:
Volume :	15.78	in^3	258.52	cm3	% moist.:	21.5	% moist.:
Unit Wt.(wet):	127.46	pcf	2.04	g/cm^3			
Unit Wt.(dry):	104.87	pcf	1.68	g/cm^3			

Specific Gravity: 2.70 Max Dry Density(pcf) = 104.9116 OMC = 21.5459525
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: #VALUE! Void ratio (e) = #VALUE! Porosity (n)= #VALUE!

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/14/2009	2760	6.1	0.557142	25	0.889	1.71E-08	4.84E-05	
11/14/2009	3120	6.05	0.607142	25	0.889	1.66E-08	4.69E-05	
11/14/2009	3480	6	0.657142	25	0.889	1.62E-08	4.58E-05	
11/14/2009	3900	5.95	0.707142	25	0.889	1.56E-08	4.42E-05	

SUMMARY

ka = 1.64E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.71E-08 cm/sec	4.5	%	Vm = |ka-ki| / ka x 100
k2 =	1.66E-08 cm/sec	1.3	%	
k3 =	1.62E-08 cm/sec	1.2	%	
k4 =	1.56E-08 cm/sec	4.6	%	

Hydraulic conductivity	k =	1.64E-08	cm/sec	4.64E-05 ft/day
Void Ratio	e =	#VALUE!		
Porosity	n =	#VALUE!		
Bulk Density	γ =	2.04	g/cm3	127.5 pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	1.68E-13	cm2	(at 20 deg C)

Liquid Limit	LL	47
Plastic Limit	PL	17
Plasticity Index	**PI**	30
- 200 Sieve		71 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/17/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 174	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9344	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000438031		Annulus Ra	1.5	cm3
Other Location:	South Liner	M2 =	1.040953	T = 0.203784596				

Material Description : Tan, Gray & Red Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.13	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 24	Tare No.:	T 22
Wet Wt: of Sample :			519.13	g	Wet Wt.+tare:	441.84	Wet Wt.+tare:	661.04
Diameter :	2.73	in	6.93	cm2	Dry Wt.+tare:	389.26	Dry Wt.+tare:	559.51
Length :	2.71	in	6.89	cm	Tare Wt:	112.37	Tare Wt:	140.46
Area:	5.84	in^2	37.68	cm2	Dry Wt.:	276.89	Dry Wt.:	419.05
Volume :	15.85	in^3	259.66	cm3	Water Wt.:	52.58	Water Wt.:	101.53
Unit Wt.(wet):	**124.75**	pcf	**2.00**	g/cm^3	% moist.:	**19.0**	% moist.:	**24.2**
Unit Wt.(dry):	**104.84**	pcf	**1.68**	g/cm^3				

Specific Gravity: **2.80** Max Dry Density(pcf) = 104.8882 OMC = 18.9894904
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 101.67 Void ratio (e) = **0.67** Porosity (n)= **0.40**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/17/2009	1740	6.1	0.557142	25	0.889	2.70E-08	7.65E-05	
11/17/2009	2280	6	0.657142	25	0.889	2.46E-08	6.96E-05	
11/17/2009	2820	5.9	0.757142	25	0.889	2.31E-08	6.56E-05	
11/17/2009	3480	5.8	0.857142	25	0.889	2.15E-08	6.09E-05	

SUMMARY

ka = 2.40E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.70E-08 cm/sec	12.2	%
k2 =	2.46E-08 cm/sec	2.2	%
k3 =	2.31E-08 cm/sec	3.7	%
k4 =	2.15E-08 cm/sec	10.6	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.40E-08**	cm/sec	**6.82E-05**	ft/day
Void Ratio	e =	**0.67**			
Porosity	n =	**0.40**			
Bulk Density	γ =	**2.00**	g/cm3	**124.8**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.46E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	54	
Plastic Limit PL	17	
Plasticity Index PI	**37**	
- 200 Sieve	77	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/17/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 183	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9346	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.00044076	Annulus Ra	1.5	cm3
Other Location:	W. Berm	M2 =	1.040953	T =	0.203775879			

Material Description : Tan, Gray & Red Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			552.75	g	Tare No.:	T 20	Tare No.:	T 23
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	584.37	Wet Wt.+tare:	701.36
Wet Wt: of Sample :			552.75	g	Dry Wt.+tare:	518.23	Dry Wt.+tare:	607.99
Diameter :	2.74	in	6.96	cm2	Tare Wt:	160.24	Tare Wt:	140.30
Length :	2.76	in	7.01	cm	Dry Wt.:	357.99	Dry Wt.:	467.69
Area:	5.90	in^2	38.07	cm2	Water Wt.:	66.14	Water Wt.:	93.37
Volume :	16.27	in^3	266.69	cm3	% moist.:	18.5	% moist.:	20.0
Unit Wt.(wet):	129.33	pcf	2.07	g/cm^3				
Unit Wt.(dry):	109.16	pcf	1.75	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 109.2113 OMC = 18.4753764
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.07 Void ratio (e) = 0.54 Porosity (n)= 0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.19

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/17/2009	1260	5.4	1.257352	25	0.889	9.21E-08	2.61E-04	
11/17/2009	1440	5.3	1.357352	25	0.889	8.81E-08	2.50E-04	
11/17/2009	1620	5.2	1.457352	25	0.889	8.52E-08	2.42E-04	
11/17/2009	1800	5.1	1.557352	25	0.889	8.31E-08	2.36E-04	

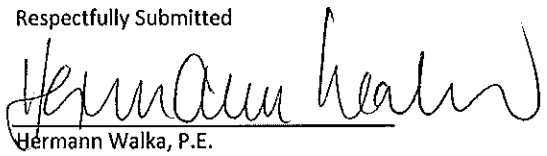
SUMMARY

ka =	8.71E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	9.21E-08	cm/sec	5.7	%	Vm = |ka-ki| / ka x 100
k2 =	8.81E-08	cm/sec	1.1	%	
k3 =	8.52E-08	cm/sec	2.2	%	
k4 =	8.31E-08	cm/sec	4.6	%	

Hydraulic conductivity	k =	**8.71E-08**	cm/sec	**2.47E-04**	ft/day
Void Ratio	e =	**0.54**			
Porosity	n =	**0.35**			
Bulk Density	γ =	**2.07**	g/cm3	**129.3**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**8.93E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	17
Plasticity Index	**PI**	**24**
- 200 Sieve		72 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted



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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/20/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 213	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9363	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000440615		Annulus Ra	1.5	cm3
Other Location:	North- West Berm	M2 =	1.040953	T = 0.203789864				

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			547.51	g	Tare No.:	T 1	Tare No.:	T 21
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	711.26	Wet Wt.+tare:	692.03
Wet Wt: of Sample :			547.51	g	Dry Wt.+tare:	635.07	Dry Wt.+tare:	603.12
Diameter :	2.73	in	6.93	cm2	Tare Wt:	217.29	Tare Wt:	140.36
Length :	2.73	in	6.93	cm	Dry Wt.:	417.78	Dry Wt.:	462.76
Area:	5.84	in^2	37.68	cm2	Water Wt.:	76.19	Water Wt.:	88.91
Volume :	15.94	in^3	261.19	cm3	% moist.:	18.2	% moist.:	19.2
Unit Wt.(wet):	130.80	pcf	2.10	g/cm^3				
Unit Wt.(dry):	110.63	pcf	1.77	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 110.6738 OMC = 18.2368711
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.06 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/20/2009	2100	6.1	0.557015	25	0.889	2.25E-08	6.37E-05	
11/20/2009	3120	5.95	0.707015	25	0.889	1.95E-08	5.54E-05	
11/20/2009	4560	5.8	0.857015	25	0.889	1.65E-08	4.68E-05	
11/20/2009	5700	5.7	0.957015	25	0.889	1.49E-08	4.23E-05	

SUMMARY

ka =	1.84E-08	cm/sec		
ki			Vm	
k1 =	2.25E-08	cm/sec	22.5	%
k2 =	1.95E-08	cm/sec	6.4	%
k3 =	1.65E-08	cm/sec	10.2	%
k4 =	1.49E-08	cm/sec	18.8	%

Acceptance criteria = 25 %

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	1.84E-08	cm/sec	5.20E-05	ft/day
Void Ratio	e =	0.52			
Porosity	n =	0.34			
Bulk Density	γ =	2.10	g/cm3	130.8	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.88E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	17
Plasticity Index	**PI**	**22**
- 200 Sieve		69 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/20/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 221	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9364	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000443355		Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T = 0.203880504				

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			553.05	g	Tare No.:	T 4	Tare No.:	T 8
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	751.29	Wet Wt.+tare:	783.58
Wet Wt: of Sample :			553.05	g	Dry Wt.+tare:	673.26	Dry Wt.+tare:	694.32
Diameter :	2.73	in	6.93	cm2	Tare Wt:	219.57	Tare Wt:	221.93
Length :	2.75	in	6.99	cm	Dry Wt.:	453.69	Dry Wt.:	472.39
Area:	5.85	in^2	37.74	cm2	Water Wt.:	78.03	Water Wt.:	89.26
Volume :	16.09	in^3	263.59	cm3	% moist.:	17.2	% moist.:	18.9
Unit Wt.(wet):	130.92	pcf	2.10	g/cm^3				
Unit Wt.(dry):	111.71	pcf	1.79	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 111.7584 OMC = 17.1989685
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.25 Void ratio (e) = 0.51 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.21

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/20/2009	960	5.7	0.954834	25	0.889	8.89E-08	2.52E-04	
11/20/2009	1140	5.6	1.054834	25	0.889	8.37E-08	2.37E-04	
11/20/2009	1380	5.4	1.254834	25	0.889	8.44E-08	2.39E-04	
11/20/2009	1620	5.3	1.354834	25	0.889	7.87E-08	2.23E-04	

SUMMARY

ka = 8.39E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	8.89E-08 cm/sec	5.9	%
k2 =	8.37E-08 cm/sec	0.2	%
k3 =	8.44E-08 cm/sec	0.6	%
k4 =	7.87E-08 cm/sec	6.3	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	8.39E-08	cm/sec	2.38E-04	ft/day
Void Ratio	e =	0.51			
Porosity	n =	0.34			
Bulk Density	γ =	2.10	g/cm3	130.9	pcf
Water Content	W =	0.31	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	8.60E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	17
Plasticity Index	**PI**	**22**
- 200 Sieve		73 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	1/8/2010	Panel Number :			P 2 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 550	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9481	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000452365		Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T = 0.203809289				
Material Description :	Tan & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			525.07	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			525.07	g	Tare No.:	T 17	Tare No.:	T- 25
Diameter :	2.71	in	6.89	cm2	Wet Wt.+tare:	516.88	Wet Wt.+tare:	644.72
Length :	2.77	in	7.03	cm	Dry Wt.+tare:	449.64	Dry Wt.+tare:	542.90
Area:	5.77	in^2	37.24	cm2	Tare Wt:	146.72	Tare Wt:	116.17
Volume :	15.98	in^3	261.92	cm3	Dry Wt.:	302.92	Dry Wt.:	426.73
Unit Wt.(wet):	125.09	pcf	2.00	g/cm^3	Water Wt.:	67.24	Water Wt.:	101.82
Unit Wt.(dry):	102.37	pcf	1.64	g/cm^3	% moist.:	22.2	% moist.:	23.9

Specific Gravity:	2.70	Max Dry Density(pcf) =	102.4125	OMC =	22.1972798
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.63	Void ratio (e) =	0.65	Porosity (n)=	0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.15

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/8/2010	2100	4.9	1.756548	23.5	0.920	8.79E-08	2.49E-04	
1/8/2010	2400	4.7	1.956548	23.5	0.920	8.83E-08	2.50E-04	
1/8/2010	2700	4.5	2.156548	23.5	0.920	8.93E-08	2.53E-04	
1/8/2010	3000	4.3	2.356548	23.5	0.920	9.08E-08	2.57E-04	

SUMMARY

ka =	8.91E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	8.79E-08	cm/sec	1.3	%	Vm = |ka-ki| / ka x 100
k2 =	8.83E-08	cm/sec	0.9	%	
k3 =	8.93E-08	cm/sec	0.2	%	
k4 =	9.08E-08	cm/sec	2.0	%	

Hydraulic conductivity	k =	**8.91E-08**	cm/sec	**2.52E-04**	ft/day
Void Ratio	e =	**0.65**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.00**	g/cm3	**125.1**	pcf
Water Content	W =	**0.36**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**9.12E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	42	
Plastic Limit PL	20	
Plasticity Index PI	**22**	
- 200 Sieve	85	%
+ No 40 Sieve	3	%
+ No 4 Sieve	0	%

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/8/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 557	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9482	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.00044518	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203840183			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			512.42	g	Tare No.:	T 21	Tare No.:	T- 24
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	442.54	Wet Wt.+tare:	627.37
Wet Wt: of Sample :			512.42	g	Dry Wt.+tare:	388.72	Dry Wt.+tare:	530.80
Diameter :	2.71	in	6.88	cm2	Tare Wt:	140.33	Tare Wt:	112.38
Length :	2.72	in	6.91	cm	Dry Wt.:	248.39	Dry Wt.:	418.42
Area:	5.76	in^2	37.19	cm2	Water Wt.:	53.82	Water Wt.:	96.57
Volume :	15.68	in^3	257.00	cm3	% moist.:	21.7	% moist.:	23.1
Unit Wt.(wet):	124.42	pcf	1.99	g/cm^3				
Unit Wt.(dry):	102.26	pcf	1.64	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 102.302 OMC = 21.667539
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.11 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.31

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/8/2010	1140	5.65	1.005804	24	0.910	8.15E-08	2.31E-04	
1/8/2010	1320	5.6	1.055804	24	0.910	7.44E-08	2.11E-04	
1/8/2010	1500	5.5	1.155804	24	0.910	7.25E-08	2.06E-04	
1/8/2010	1680	5.4	1.255804	24	0.910	7.13E-08	2.02E-04	

SUMMARY

ka =	7.49E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	8.15E-08	cm/sec	8.8	%	Vm = |ka-ki| / ka x 100
k2 =	7.44E-08	cm/sec	0.8	%	
k3 =	7.25E-08	cm/sec	3.2	%	
k4 =	7.13E-08	cm/sec	4.9	%	

Hydraulic conductivity	k =	7.49E-08	cm/sec	2.12E-04	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.39			
Bulk Density	γ =	1.99	g/cm3	124.4	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	7.68E-13	cm2	(at 20 deg C)	

Liquid Limit LL	38	
Plastic Limit PL	19	
Plasticity Index PI	19	
- 200 Sieve	73	%
+ No 40 Sieve	5	%
+ No 4 Sieve	3	%

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/16/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 588	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9504	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.00044012	Annulus Ra	1.5	cm3
Other Location:	Liner	M2 =	1.040953	T =	0.203785111			

Material Description : Tan, Gray & Red Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			495.37	g	Tare No.:	T 16	Tare No.:	T 22
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	473.40	Wet Wt.+tare:	637.87
Wet Wt. of Sample :			495.37	g	Dry Wt.+tare:	409.66	Dry Wt.+tare:	529.52
Diameter :	2.72	in	6.90	cm2	Tare Wt:	152.00	Tare Wt:	140.45
Length :	2.70	in	6.86	cm	Dry Wt.:	257.66	Dry Wt.:	389.07
Area:	5.79	in^2	37.35	cm2	Water Wt.:	63.74	Water Wt.:	108.35
Volume :	15.64	in^3	256.34	cm3	% moist.:	**24.7**	% moist.:	**27.8**
Unit Wt.(wet):	**120.59**	pcf	**1.93**	g/cm^3				
Unit Wt.(dry):	**96.67**	pcf	**1.55**	g/cm^3				

Specific Gravity: **2.75** Max Dry Density(pcf) = 96.71307 OMC = 24.7380269
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.70 Void ratio (e) = **0.78** Porosity (n)= **0.44**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.38

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/16/2010	960	6.1	0.55713	24	0.910	5.03E-08	1.42E-04	
1/16/2010	1200	6	0.65713	24	0.910	4.80E-08	1.36E-04	
1/16/2010	1500	5.9	0.75713	24	0.910	4.47E-08	1.27E-04	
1/16/2010	1860	5.8	0.85713	24	0.910	4.13E-08	1.17E-04	

SUMMARY

ka = 4.61E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.03E-08 cm/sec	9.1	%
k2 =	4.80E-08 cm/sec	4.1	%
k3 =	4.47E-08 cm/sec	2.9	%
k4 =	4.13E-08 cm/sec	10.3	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**4.61E-08**	cm/sec	**1.31E-04**	ft/day
Void Ratio	e =	**0.78**			
Porosity	n =	**0.44**			
Bulk Density	γ =	**1.93**	g/cm3	**120.6**	pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.72E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	51
Plastic Limit	PL	21
Plasticity Index	**PI**	**30**
- 200 Sieve		79 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 2/1/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 630	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9533	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000435338		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203783792				

Material Description : Red & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			555.41	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 14	Tare No.:	T 17
Wet Wt: of Sample :			555.41	g	Wet Wt.+tare:	749.55	Wet Wt.+tare:	466.13
Diameter :	2.75	in	6.98	cm2	Dry Wt.+tare:	663.39	Dry Wt.+tare:	410.84
Length :	2.74	in	6.96	cm	Tare Wt:	221.17	Tare Wt:	146.69
Area:	5.94	in^2	38.29	cm2	Dry Wt.:	442.22	Dry Wt.:	264.15
Volume :	16.26	in^3	266.50	cm3	Water Wt.:	86.16	Water Wt.:	55.29
Unit Wt.(wet):	130.05	pcf	2.08	g/cm^3	% moist.:	19.5	% moist.:	20.9
Unit Wt.(dry):	108.84	pcf	1.74	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 108.8893 OMC = 19.483515
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.70 Void ratio (e) = 0.58 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/1/2010	2520	6.1	0.557162	23	0.931	1.94E-08	5.50E-05	
2/1/2010	3180	6	0.657162	23	0.931	1.83E-08	5.20E-05	
2/1/2010	4140	5.9	0.757162	23	0.931	1.64E-08	4.65E-05	
2/1/2010	5040	5.8	0.857162	23	0.931	1.54E-08	4.38E-05	

SUMMARY

ka = 1.74E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.94E-08 cm/sec	11.5	%	Vm = |ka-ki| / ka x 100
k2 =	1.83E-08 cm/sec	5.4	%	
k3 =	1.64E-08 cm/sec	5.6	%	
k4 =	1.54E-08 cm/sec	11.2	%	

Hydraulic conductivity	k =	**1.74E-08**	cm/sec	**4.93E-05**	ft/day
Void Ratio	e =	**0.58**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.08**	g/cm3	**130.0**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.78E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	16
Plasticity Index	**PI**	**26**
- 200 Sieve		71 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 2/1/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 637	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9534	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000439001		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203784296				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			517.09	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 11	Tare No.:	T 16
Wet Wt: of Sample :			517.09	g	Wet Wt.+tare:	712.06	Wet Wt.+tare:	669.10
Diameter :	2.74	in	6.96	cm2	Dry Wt.+tare:	603.86	Dry Wt.+tare:	550.46
Length :	2.75	in	6.98	cm	Tare Wt:	219.28	Tare Wt:	151.95
Area:	5.91	in^2	38.10	cm2	Dry Wt.:	384.58	Dry Wt.:	398.51
Volume :	16.23	in^3	266.01	cm3	Water Wt.:	108.2	Water Wt.:	118.64
Unit Wt.(wet):	121.30	pcf	1.94	g/cm^3	% moist.:	28.1	% moist.:	29.8
Unit Wt.(dry):	94.66	pcf	1.52	g/cm^3				

Specific Gravity: 2.77 Max Dry Density(pcf) = 94.70425 OMC = 28.1345884
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.74 Void ratio (e) = 0.83 Porosity (n)= 0.45

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/1/2010	1260	5.6	1.057149	23	0.931	7.87E-08	2.23E-04	
2/1/2010	1440	5.45	1.207149	23	0.931	8.02E-08	2.27E-04	
2/1/2010	1620	5.3	1.357149	23	0.931	8.17E-08	2.32E-04	
2/1/2010	1860	5.15	1.507149	23	0.931	8.06E-08	2.29E-04	

SUMMARY

ka = 8.03E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.87E-08 cm/sec	2.0	%	Vm = |ka-ki| / ka x 100
k2 =	8.02E-08 cm/sec	0.2	%	
k3 =	8.17E-08 cm/sec	1.7	%	
k4 =	8.06E-08 cm/sec	0.4	%	

Hydraulic conductivity	k =	**8.03E-08**	cm/sec	**2.28E-04**	ft/day
Void Ratio	e =	**0.83**			
Porosity	n =	**0.45**			
Bulk Density	γ =	**1.94**	g/cm3	**121.3**	pcf
Water Content	W =	**0.43**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**8.23E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	18
Plasticity Index	**PI**	**29**
- 200 Sieve		70 %
+ No 40 Sieve		5 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 2/24/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 653	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9578	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000443778	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203774182			

Material Description : Tan & Gray Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			544.42	g	Tare No.:	T 17	Tare No.:	T 2
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	633.69	Wet Wt.+tare:	770.00
Wet Wt: of Sample :			544.42	g	Dry Wt.+tare:	552.51	Dry Wt.+tare:	663.74
Diameter :	2.75	in	6.97	cm2	Tare Wt:	146.75	Tare Wt:	216.63
Length :	2.79	in	7.07	cm	Dry Wt.:	405.76	Dry Wt.:	447.11
Area:	5.92	in^2	38.18	cm2	Water Wt.:	81.18	Water Wt.:	106.26
Volume :	16.48	in^3	270.09	cm3	% moist.:	20.0	% moist.:	23.8
Unit Wt.(wet):	125.78	pcf	2.02	g/cm^3				
Unit Wt.(dry):	104.81	pcf	1.68	g/cm^3				

Specific Gravity: 2.80 Max Dry Density(pcf) = 104.857 OMC = 20.0069006
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.65 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.10

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/24/2010	1320	5.7	0.957393	23	0.931	6.79E-08	1.93E-04	
2/24/2010	1560	5.6	1.057393	23	0.931	6.43E-08	1.82E-04	
2/24/2010	1800	5.5	1.157393	23	0.931	6.18E-08	1.75E-04	
2/24/2010	2100	5.4	1.257393	23	0.931	5.83E-08	1.65E-04	

SUMMARY

ka = 6.31E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	6.79E-08 cm/sec	7.7	%
k2 =	6.43E-08 cm/sec	1.9	%
k3 =	6.18E-08 cm/sec	2.1	%
k4 =	5.83E-08 cm/sec	7.6	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	6.31E-08	cm/sec	1.79E-04	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	2.02	g/cm3	125.8	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.46E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	52
Plastic Limit	PL	21
Plasticity Index	**PI**	31
- 200 Sieve		80 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 2/24/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 662	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9579	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000450793		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203891774				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			525.98	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			525.98	g	Tare No.:	T 21	Tare No.:	T 3
Diameter :	2.70	in	6.86	cm2	Wet Wt.+tare:	633.07	Wet Wt.+tare:	754.05
Length :	2.74	in	6.95	cm	Dry Wt.+tare:	551.75	Dry Wt.+tare:	664.97
Area:	5.72	in^2	36.91	cm2	Tare Wt:	140.34	Tare Wt:	220.69
Volume :	15.65	in^3	256.42	cm3	Dry Wt.:	411.41	Dry Wt.:	444.28
Unit Wt.(wet):	128.00	pcf	2.05	g/cm^3	Water Wt.:	81.32	Water Wt.:	89.08
Unit Wt.(dry):	106.87	pcf	1.71	g/cm^3	% moist.:	19.8	% moist.:	20.1

Specific Gravity: 2.65 Max Dry Density(pcf) = 106.9181 OMC = 19.76617
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.96 Void ratio (e) = 0.55 Porosity (n)= 0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/24/2010	1140	5.7	0.954563	24	0.910	7.79E-08	2.21E-04	
2/24/2010	1380	5.6	1.054563	24	0.910	7.20E-08	2.04E-04	
2/24/2010	1620	5.5	1.154563	24	0.910	6.80E-08	1.93E-04	
2/24/2010	1920	5.4	1.254563	24	0.910	6.31E-08	1.79E-04	

SUMMARY

ka = 7.02E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.79E-08 cm/sec	10.9	%	Vm = |ka-ki| / ka x 100
k2 =	7.20E-08 cm/sec	2.5	%	
k3 =	6.80E-08 cm/sec	3.2	%	
k4 =	6.31E-08 cm/sec	10.1	%	

Hydraulic conductivity	k =	**7.02E-08**	cm/sec	**1.99E-04**	ft/day
Void Ratio	e =	**0.55**			
Porosity	n =	**0.35**			
Bulk Density	γ =	**2.05**	g/cm3	**128.0**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**7.19E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	18
Plasticity Index	**PI**	**20**
- 200 Sieve		81 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	2/24/2010	Panel Number :		P 3 ; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 673	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9580	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000449643	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203772726			
Material Description :	Tan & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			526.80	g	Tare No.:	T 19	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	779.31	Wet Wt.+tare:	746.68
Wet Wt: of Sample :			526.80	g	Dry Wt.+tare:	680.79	Dry Wt.+tare:	651.25
Diameter :	2.70	in	6.85	cm2	Tare Wt:	186.30	Tare Wt:	217.30
Length :	2.73	in	6.92	cm	Dry Wt.:	494.49	Dry Wt.:	433.95
Area:	5.72	in^2	36.88	cm2	Water Wt.:	98.52	Water Wt.:	95.43
Volume :	15.58	in^3	255.39	cm3	% moist.:	19.9	% moist.:	22.0
Unit Wt.(wet):	128.72	pcf	2.06	g/cm^3				
Unit Wt.(dry):	107.33	pcf	1.72	g/cm^3				

Specific Gravity:	2.77	Max Dry Density(pcf) =	107.3769	OMC =	19.9235576
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	99.67	Void ratio (e) =	0.61	Porosity (n)=	0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/24/2010	1560	6.1	0.557428	23	0.931	3.24E-08	9.17E-05	
2/24/2010	2040	6	0.657428	23	0.931	2.95E-08	8.37E-05	
2/24/2010	2580	5.9	0.757428	23	0.931	2.72E-08	7.71E-05	
2/24/2010	3240	5.8	0.857428	23	0.931	2.48E-08	7.03E-05	

SUMMARY

ka =	2.85E-08	cm/sec		Acceptance criteria =	25 %	
ki			Vm			
k1 =	3.24E-08	cm/sec	13.6	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$	
k2 =	2.95E-08	cm/sec	3.7	%		
k3 =	2.72E-08	cm/sec	4.5	%		
k4 =	2.48E-08	cm/sec	12.9	%		

Hydraulic conductivity	k =	2.85E-08	cm/sec	8.07E-05	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.06	g/cm3	128.7	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.92E-13	cm2	(at 20 deg C)	

Liquid Limit LL	39	
Plastic Limit PL	18	
Plasticity Index PI	21	
- 200 Sieve	72	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

Respectfully Submitted

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/10/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 716	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9601	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000438181		Annulus Ra	1.5	cm3
Other Location:	West-Central Liner	M2 =	1.040953	T = 0.203785111				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			507.52	g	Tare No.:	T 1	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	822.25	Wet Wt.+tare:	728.37
Wet Wt: of Sample :			507.52	g	Dry Wt.+tare:	704.47	Dry Wt.+tare:	625.81
Diameter :	2.72	in	6.91	cm2	Tare Wt:	217.28	Tare Wt:	218.80
Length :	2.70	in	6.86	cm	Dry Wt.:	487.19	Dry Wt.:	407.01
Area:	5.81	in^2	37.52	cm2	Water Wt.:	117.78	Water Wt.:	102.56
Volume :	15.71	in^3	257.47	cm3	% moist.:	24.2	% moist.:	25.2
Unit Wt.(wet):	123.00	pcf	1.97	g/cm^3				
Unit Wt.(dry):	99.05	pcf	1.59	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 99.09566 OMC = 24.1753731
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.96 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.38

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/10/2010	3480	6.1	0.55713	26	0.869	1.32E-08	3.74E-05	
3/10/2010	3960	6.05	0.60713	26	0.869	1.27E-08	3.60E-05	
3/10/2010	4440	6	0.65713	26	0.869	1.23E-08	3.50E-05	
3/10/2010	4980	5.95	0.70713	26	0.869	1.19E-08	3.37E-05	

SUMMARY

ka =	1.25E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.32E-08	cm/sec	5.3	%	Vm = |ka-ki| / ka x 100
k2 =	1.27E-08	cm/sec	1.4	%	
k3 =	1.23E-08	cm/sec	1.6	%	
k4 =	1.19E-08	cm/sec	5.0	%	

Hydraulic conductivity	k =	1.25E-08	cm/sec	3.55E-05 ft/day
Void Ratio	e =	0.70		
Porosity	n =	0.41		
Bulk Density	γ =	1.97	g/cm3	123.0 pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	1.28E-13	cm2	(at 20 deg C)

Liquid Limit LL	48	
Plastic Limit PL	20	
Plasticity Index PI	28	
- 200 Sieve	83	%
+ No 40 Sieve	4	%
+ No 4 Sieve	1	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/17/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 783	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9621	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.00044126	Annulus Ra	1.5	cm3
Other Location:	South- East Liner	M2 =	1.040953	T =	0.203781741			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			537.08	g	Tare No.:	T 5	Tare No.:	T 7
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	849.99	Wet Wt.+tare:	759.37
Wet Wt: of Sample :			537.08	g	Dry Wt.+tare:	742.54	Dry Wt.+tare:	663.61
Diameter :	2.73	in	6.93	cm2	Tare Wt:	218.82	Tare Wt:	221.18
Length :	2.74	in	6.95	cm	Dry Wt.:	523.72	Dry Wt.:	442.43
Area:	5.84	in^2	37.71	cm2	Water Wt.:	107.45	Water Wt.:	95.76
Volume :	15.99	in^3	261.96	cm3	% moist.:	20.5	% moist.:	21.6
Unit Wt.(wet):	127.93	pcf	2.05	g/cm^3				
Unit Wt.(dry):	106.15	pcf	1.70	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 106.2001 OMC = 20.5166883
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.41 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.27

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/17/2010	480	6.1	0.557211	25	0.889	9.85E-08	2.79E-04	
3/17/2010	660	6	0.657211	25	0.889	8.55E-08	2.42E-04	
3/17/2010	900	5.9	0.757211	25	0.889	7.31E-08	2.07E-04	
3/17/2010	1200	5.8	0.857211	25	0.889	6.28E-08	1.78E-04	

SUMMARY

ka = 8.00E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.85E-08 cm/sec	23.2	%
k2 =	8.55E-08 cm/sec	6.9	%
k3 =	7.31E-08 cm/sec	8.6	%
k4 =	6.28E-08 cm/sec	21.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	8.00E-08	cm/sec	2.27E-04	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.05	g/cm3	127.9	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	8.19E-13	cm2	(at 20 deg C)	

Liquid Limit LL	39	
Plastic Limit PL	19	
Plasticity Index PI	20	
- 200 Sieve	86	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/17/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 807	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9622	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000436273	Annulus Ra	1.5	cm3
Other Location:	South- West Liner	M2 =	1.040953	T =	0.20377768			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			514.65	g	Tare No.:	T 7	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	746.97	Wet Wt.+tare:	734.49
Wet Wt: of Sample :			514.65	g	Dry Wt.+tare:	654.68	Dry Wt.+tare:	629.70
Diameter :	2.73	in	6.94	cm2	Tare Wt:	221.20	Tare Wt:	218.81
Length :	2.72	in	6.90	cm	Dry Wt.:	433.48	Dry Wt.:	410.89
Area:	5.87	in^2	37.88	cm2	Water Wt.:	92.29	Water Wt.:	104.79
Volume :	15.94	in^3	261.29	cm3	% moist.:	21.3	% moist.:	25.5
Unit Wt.(wet):	122.91	pcf	1.97	g/cm^3				
Unit Wt.(dry):	101.33	pcf	1.62	g/cm^3				

Specific Gravity: 2.77 Max Dry Density(pcf) = 101.3766 OMC = 21.2904863
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.98 Void ratio (e) = 0.71 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.33

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/17/2010	720	6.1	0.557309	25	0.889	6.50E-08	1.84E-04	
3/17/2010	1020	6	0.657309	25	0.889	5.47E-08	1.55E-04	
3/17/2010	1320	5.9	0.757309	25	0.889	4.93E-08	1.40E-04	
3/17/2010	1680	5.8	0.857309	25	0.889	4.43E-08	1.26E-04	

SUMMARY

ka = 5.33E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	6.50E-08 cm/sec	21.8	%	Vm = |ka-ki| / ka x 100
k2 =	5.47E-08 cm/sec	2.6	%	
k3 =	4.93E-08 cm/sec	7.6	%	
k4 =	4.43E-08 cm/sec	16.8	%	

Hydraulic conductivity	k =	**5.33E-08**	cm/sec	**1.51E-04**	ft/day
Void Ratio	e =	**0.71**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**1.97**	g/cm3	**122.9**	pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**5.46E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	20
Plasticity Index	**PI**	**24**
- 200 Sieve		72 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/12/2010 Panel Number : P 6; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 12	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9863	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000429636		Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T = 0.203783901				

Material Description : Gray & Tan Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			495.59	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 18	Tare No.:	T 16
Wet Wt: of Sample :			495.59	g	Wet Wt.+tare:	566.33	Wet Wt.+tare:	303.67
Diameter :	2.72	in	6.91	cm2	Dry Wt.+tare:	502.56	Dry Wt.+tare:	274.04
Length :	2.65	in	6.73	cm	Tare Wt:	146.71	Tare Wt:	151.95
Area:	5.81	in^2	37.50	cm2	Dry Wt.:	355.85	Dry Wt.:	122.09
Volume :	15.39	in^3	252.20	cm3	Water Wt.:	63.77	Water Wt.:	29.63
Unit Wt.(wet):	122.62	pcf	1.97	g/cm^3	% moist.:	17.9	% moist.:	24.3
Unit Wt.(dry):	103.98	pcf	1.67	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 102.51 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.57

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/12/2010	660	6.1	0.557159	25.1	0.887	6.96E-08	1.97E-04	
8/12/2010	900	6	0.657159	25.1	0.887	6.09E-08	1.73E-04	
8/12/2010	1140	5.9	0.757159	25.2	0.885	5.59E-08	1.58E-04	
8/12/2010	1440	5.8	0.857159	25.2	0.885	5.07E-08	1.44E-04	

SUMMARY

ka = 5.93E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	6.96E-08 cm/sec	17.4	%
k2 =	6.09E-08 cm/sec	2.7	%
k3 =	5.59E-08 cm/sec	5.7	%
k4 =	5.07E-08 cm/sec	14.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	5.93E-08	cm/sec	1.68E-04	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.39			
Bulk Density	γ =	1.97	g/cm3	122.6	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.07E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	50
Plastic Limit	PL	22
Plasticity Index	**PI**	**28**
- 200 Sieve		80 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/7/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9951	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2, Density P-100	M1 =	0.030180	C =	0.000444698	Annulus Ra	1.5	cm3
Other Location:	South Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			506.82	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			506.82	g	Tare No.:	T 1	Tare No.:	T 13
Diameter :	2.71	in	6.90	cm2	Wet Wt.+tare:	831.19	Wet Wt.+tare:	730.35
Length :	2.73	in	6.93	cm	Dry Wt.+tare:	701.90	Dry Wt.+tare:	618.01
Area:	5.79	in^2	37.35	cm2	Tare Wt:	217.25	Tare Wt:	219.66
Volume :	15.80	in^3	258.93	cm3	Dry Wt.:	484.65	Dry Wt.:	398.35
Unit Wt.(wet):	122.14	pcf	1.96	g/cm^3	Water Wt.:	129.29	Water Wt.:	112.34
Unit Wt.(dry):	96.42	pcf	1.55	g/cm^3	% moist.:	26.7	% moist.:	28.2

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.35 Void ratio (e) = 0.78 Porosity (n)= 0.44

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.28

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/7/2010	2280	6	0.657171	25	0.889	2.49E-08	7.07E-05	
10/7/2010	2820	5.9	0.757171	25	0.889	2.35E-08	6.66E-05	
10/7/2010	3420	5.8	0.857171	25	0.889	2.22E-08	6.29E-05	
10/7/2010	4080	5.7	0.957171	25	0.889	2.10E-08	5.96E-05	

SUMMARY

ka = 2.29E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.49E-08 cm/sec	8.8	%	Vm = |ka-ki| / ka x 100
k2 =	2.35E-08 cm/sec	2.5	%	
k3 =	2.22E-08 cm/sec	3.1	%	
k4 =	2.10E-08 cm/sec	8.2	%	

Hydraulic conductivity	k =	2.29E-08	cm/sec	6.50E-05	ft/day
Void Ratio	e =	0.78			
Porosity	n =	0.44			
Bulk Density	γ =	1.96	g/cm3	122.1	pcf
Water Content	W =	0.41	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.35E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	21
Plasticity Index	**PI**	**22**
- 200 Sieve		83 %
+ No 40 Sieve		4 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/11/2010 Panel Number : P 4; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9953 A	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2, Density P-197	M1 =	0.030180	C = 0.000449471		Annulus Ra	1.5	cm3
Other Location:	East Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.66	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 24	Tare No.:	T 8
Wet Wt: of Sample :			511.66	g	Wet Wt.+tare:	392.76	Wet Wt.+tare:	737.31
Diameter :	2.67	in	6.77	cm2	Dry Wt.+tare:	348.37	Dry Wt.+tare:	648.15
Length :	2.66	in	6.76	cm	Tare Wt:	112.37	Tare Wt:	221.91
Area:	5.59	in^2	36.04	cm2	Dry Wt.:	236	Dry Wt.:	426.24
Volume :	14.88	in^3	243.76	cm3	Water Wt.:	44.39	Water Wt.:	89.16
Unit Wt.(wet):	130.98	pcf	2.10	g/cm^3	% moist.:	18.8	% moist.:	20.9
Unit Wt.(dry):	110.24	pcf	1.77	g/cm^3				

Assumed Specific Gravity: 2.80 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 100.02 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.52

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	600	6.15	0.507171	25	0.889	7.27E-08	2.06E-04	
10/11/2010	900	6	0.657171	25	0.889	6.39E-08	1.81E-04	
10/11/2010	1260	5.9	0.757171	25	0.889	5.32E-08	1.51E-04	
10/11/2010	1560	5.8	0.857171	25	0.889	4.92E-08	1.39E-04	

SUMMARY

ka = 5.97E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	7.27E-08 cm/sec	21.7	%
k2 =	6.39E-08 cm/sec	6.9	%
k3 =	5.32E-08 cm/sec	11.0	%
k4 =	4.92E-08 cm/sec	17.6	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	5.97E-08	cm/sec	1.69E-04	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.10	g/cm3	131.0	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.12E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	18
Plasticity Index	**PI**	**20**
- 200 Sieve		83 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9959 A	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2, Density P-198	M1 =	0.030180	C = 0.000436925		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			513.44	g	Tare No.:	T 15	Tare No.:	T 2
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	746.23	Wet Wt.+tare:	728.69
Wet Wt: of Sample :			513.44	g	Dry Wt.+tare:	632.91	Dry Wt.+tare:	621.83
Diameter :	2.74	in	6.97	cm2	Tare Wt:	221.68	Tare Wt:	216.56
Length :	2.74	in	6.95	cm	Dry Wt.:	411.23	Dry Wt.:	405.27
Area:	5.91	in^2	38.12	cm2	Water Wt.:	113.32	Water Wt.:	106.86
Volume :	16.18	in^3	265.14	cm3	% moist.:	27.6	% moist.:	26.4
Unit Wt.(wet):	120.84	pcf	1.94	g/cm^3				
Unit Wt.(dry):	94.73	pcf	1.52	g/cm^3				

Assumed Specific Gravity: 2.60 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.09 Void ratio (e) = 0.71 Porosity (n)= 0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	960	6.1	0.557171	25	0.889	4.88E-08	1.38E-04	
10/12/2010	1080	6.05	0.607171	25	0.889	4.75E-08	1.35E-04	
10/12/2010	1200	6	0.657171	25	0.889	4.66E-08	1.32E-04	
10/12/2010	1320	5.95	0.707171	25	0.889	4.58E-08	1.30E-04	

SUMMARY

ka = 4.72E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.88E-08 cm/sec	3.4	%	Vm = |ka-ki| / ka x 100
k2 =	4.75E-08 cm/sec	0.8	%	
k3 =	4.66E-08 cm/sec	1.3	%	
k4 =	4.58E-08 cm/sec	2.9	%	

Hydraulic conductivity	k =	**4.72E-08**	cm/sec	**1.34E-04**	ft/day
Void Ratio	e =	**0.71**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.94**	g/cm3	**120.8**	pcf
Water Content	W =	**0.42**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.83E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	22
Plasticity Index	**PI**	**20**
- 200 Sieve		85 %
+ No 40 Sieve		6 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/14/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data
Boring No.: Density # 120
Sample: 9339
Depth (ft): Lift 3
Other Location:
Material Description : Red, Gray & Tan Lean Clay w/ Sand

ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
aa =	0.767120	cm2		Pipet Rp	6.7	cm3
M1 =	0.030180	C = 0.000445152		Annulus Ra	1.5	cm3
M2 =	1.040953	T = 0.203881792				

SAMPLE DATA

Wet Wt. sample + ring or tare :		535.72	g
Tare or ring Wt. :		0.0	g
Wet Wt: of Sample :		535.72	g
Diameter :	2.72 in	6.91	cm2
Length :	2.75 in	6.98	cm
Area:	5.82 in^2	37.54	cm2
Volume :	15.99 in^3	261.95	cm3
Unit Wt.(wet):	127.61 pcf	2.05	g/cm^3
Unit Wt.(dry):	105.32 pcf	1.69	g/cm^3

Before Test		After Test	
Tare No.:	T 16	Tare No.:	T 21
Wet Wt.+tare:	386.01	Wet Wt.+tare:	680.98
Dry Wt.+tare:	345.13	Dry Wt.+tare:	584.51
Tare Wt:	151.97	Tare Wt:	140.35
Dry Wt.:	193.16	Dry Wt.:	444.16
Water Wt.:	40.88	Water Wt.:	96.47
% moist.:	21.2	% moist.:	21.7

Specific Gravity: 2.70 Max Dry Density(pcf) = 105.3682 OMC = 21.163802
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.67 Void ratio (e) = 0.60 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/14/2009	2160	6.1	0.554803	25	0.889	2.20E-08	6.24E-05	
11/14/2009	2460	6.05	0.604803	25	0.889	2.12E-08	6.00E-05	
11/14/2009	2760	6	0.654803	25	0.889	2.06E-08	5.83E-05	
11/14/2009	3060	5.95	0.704803	25	0.889	2.01E-08	5.69E-05	

SUMMARY

ka = 2.09E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.20E-08 cm/sec	5.0	%
k2 =	2.12E-08 cm/sec	1.1	%
k3 =	2.06E-08 cm/sec	1.9	%
k4 =	2.01E-08 cm/sec	4.2	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	2.09E-08	cm/sec	5.94E-05 ft/day
Void Ratio	e =	0.60		
Porosity	n =	0.38		
Bulk Density	γ =	2.05	g/cm3	127.6 pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	2.15E-13	cm2	(at 20 deg C)

Liquid Limit LL	42	
Plastic Limit PL	18	
Plasticity Index PI	24	
- 200 Sieve	77	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/14/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 128	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9340	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000442563	Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T =	0.203867223			

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			524.82	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 21	Tare No.:	T 16
Wet Wt: of Sample :			524.82	g	Wet Wt.+tare:	708.46	Wet Wt.+tare:	681.76
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	612.88	Dry Wt.+tare:	587.01
Length :	2.71	in	6.88	cm	Tare Wt:	140.35	Tare Wt:	151.97
Area:	5.77	in^2	37.24	cm2	Dry Wt.:	472.53	Dry Wt.:	435.04
Volume :	15.64	in^3	256.25	cm3	Water Wt.:	95.58	Water Wt.:	94.75
Unit Wt.(wet):	127.80	pcf	2.05	g/cm^3	% moist.:	20.2	% moist.:	21.8
Unit Wt.(dry):	106.30	pcf	1.70	g/cm^3				

Specific Gravity: 2.72 Max Dry Density(pcf) = 106.3454 OMC = 20.2272872
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.15 Void ratio (e) = 0.60 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/14/2009	1140	6.1	0.555153	25	0.889	4.15E-08	1.18E-04	
11/14/2009	1320	6.05	0.605153	25	0.889	3.93E-08	1.11E-04	
11/14/2009	1500	6	0.655153	25	0.889	3.76E-08	1.07E-04	
11/14/2009	1680	5.95	0.705153	25	0.889	3.64E-08	1.03E-04	

SUMMARY

ka = 3.87E-08 cm/sec Acceptance criteria = 25 %

ki			Vm	
k1 =	4.15E-08	cm/sec	7.2	%
k2 =	3.93E-08	cm/sec	1.5	%
k3 =	3.76E-08	cm/sec	2.7	%
k4 =	3.64E-08	cm/sec	6.0	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	3.87E-08	cm/sec	1.10E-04	ft/day
Void Ratio	e =	0.60			
Porosity	n =	0.37			
Bulk Density	γ =	2.05	g/cm3	127.8	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.96E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	48
Plastic Limit	PL	16
Plasticity Index	**PI**	**32**
- 200 Sieve		68 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/15/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 161	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9342	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C = 0.000441587		Annulus Ra	1.5	cm3
Other Location:		M2 =	1.040953	T = 0.203784596				

Material Description : Tan, Gray & Red Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			538.30	g	Tare No.:	T 25	Tare No.:	T 17
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	633.80	Wet Wt.+tare:	694.41
Wet Wt: of Sample :			538.30	g	Dry Wt.+tare:	560.99	Dry Wt.+tare:	609.15
Diameter :	2.72	in	6.90	cm2	Tare Wt:	116.18	Tare Wt:	146.72
Length :	2.71	in	6.89	cm	Dry Wt.:	444.81	Dry Wt.:	462.43
Area:	5.79	in^2	37.38	cm2	Water Wt.:	72.81	Water Wt.:	85.26
Volume :	15.72	in^3	257.57	cm3	% moist.:	16.4	% moist.:	18.4
Unit Wt.(wet):	130.41	pcf	2.09	g/cm^3				
Unit Wt.(dry):	112.07	pcf	1.80	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 112.1135 OMC = 16.3687867
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.75 Void ratio (e) = 0.50 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/15/2009	1260	6	0.657142	25	0.889	4.48E-08	1.27E-04	
11/15/2009	1560	5.9	0.757142	25	0.889	4.22E-08	1.20E-04	
11/15/2009	1860	5.8	0.857142	25	0.889	4.05E-08	1.15E-04	
11/15/2009	2160	5.7	0.957142	25	0.889	3.94E-08	1.12E-04	

SUMMARY

ka = 4.17E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	4.48E-08	cm/sec	7.3	%	Vm = |ka-ki| / ka x 100
k2 =	4.22E-08	cm/sec	1.1	%	
k3 =	4.05E-08	cm/sec	2.9	%	
k4 =	3.94E-08	cm/sec	5.5	%	

Hydraulic conductivity	k =	4.17E-08	cm/sec	1.18E-04	ft/day
Void Ratio	e =	0.50			
Porosity	n =	0.34			
Bulk Density	γ =	2.09	g/cm3	130.4	pcf
Water Content	W =	0.29	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.28E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	37
Plastic Limit	PL	17
Plasticity Index	**PI**	**20**
- 200 Sieve		97 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/17/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 182	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9345	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C = 0.000447319		Annulus Ra	1.5	cm3
Other Location:	South West Berm	M2 =	1.040953	T = 0.203772726				

Material Description : Tan, Gray & Red Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.25	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			533.25	g	Tare No.:	T 22	Tare No.:	T 20
Diameter :	2.71	in	6.87	cm2	Wet Wt.+tare:	443.09	Wet Wt.+tare:	697.25
Length :	2.73	in	6.92	cm	Dry Wt.+tare:	394.39	Dry Wt.+tare:	604.65
Area:	5.75	in^2	37.08	cm2	Tare Wt:	140.47	Tare Wt:	160.24
Volume :	15.67	in^3	256.72	cm3	Dry Wt.:	253.92	Dry Wt.:	444.41
Unit Wt.(wet):	**129.62**	pcf	**2.08**	g/cm^3	Water Wt.:	48.7	Water Wt.:	92.6
Unit Wt.(dry):	**108.76**	pcf	**1.74**	g/cm^3	% moist.:	**19.2**	% moist.:	**20.8**

Specific Gravity: **2.75** Max Dry Density(pcf) = 108.8051 OMC = 19.1792691
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.04 Void ratio (e) = **0.58** Porosity (n)= **0.37**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/17/2009	2040	5.7	0.957428	25	0.889	4.23E-08	1.20E-04	
11/17/2009	2460	5.6	1.057428	25	0.889	3.92E-08	1.11E-04	
11/17/2009	2880	5.5	1.157428	25	0.889	3.72E-08	1.05E-04	
11/17/2009	3360	5.4	1.257428	25	0.889	3.50E-08	9.93E-05	

SUMMARY

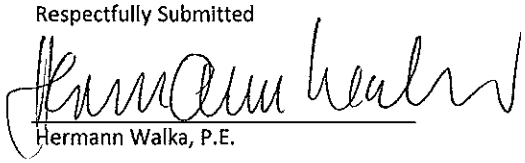
ka = 3.84E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.23E-08 cm/sec	10.1	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	3.92E-08 cm/sec	2.1	%	
k3 =	3.72E-08 cm/sec	3.3	%	
k4 =	3.50E-08 cm/sec	8.8	%	

Hydraulic conductivity	k =	**3.84E-08**	cm/sec	**1.09E-04**	ft/day
Void Ratio	e =	**0.58**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.08**	g/cm3	**129.6**	pcf
Water Content	W =	**0.33**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**3.94E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	18
Plasticity Index	**PI**	**24**
- 200 Sieve		84 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted



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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/21/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 252	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9370	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000443504	Annulus Ra	1.5	cm3
Other Location:	North- East Berm	M2 =	1.040953	T =	0.20379074			

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			542.21	g	Tare No.:	T 16	Tare No.:	T 25
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	605.99	Wet Wt.+tare:	664.46
Wet Wt: of Sample :			542.21	g	Dry Wt.+tare:	533.26	Dry Wt.+tare:	572.79
Diameter :	2.73	in	6.94	cm2	Tare Wt:	151.97	Tare Wt:	116.18
Length :	2.76	in	7.01	cm	Dry Wt.:	381.29	Dry Wt.:	456.61
Area:	5.87	in^2	37.85	cm2	Water Wt.:	72.73	Water Wt.:	91.67
Volume :	16.19	in^3	265.23	cm3	% moist.:	19.1	% moist.:	20.1
Unit Wt.(wet):	127.56	pcf	2.04	g/cm^3				
Unit Wt.(dry):	107.13	pcf	1.72	g/cm^3				

Specific Gravity: 2.65 Max Dry Density(pcf) = 107.1757 OMC = 19.07472
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.75 Void ratio (e) = 0.57 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.18

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/21/2009	1740	5.7	0.956994	25	0.889	4.92E-08	1.39E-04	
11/21/2009	2040	5.6	1.056994	25	0.889	4.69E-08	1.33E-04	
11/21/2009	2340	5.5	1.156994	25	0.889	4.53E-08	1.28E-04	
11/21/2009	2700	5.4	1.256994	25	0.889	4.32E-08	1.23E-04	

SUMMARY

ka = 4.62E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.92E-08 cm/sec	6.5	%	Vm = |ka-ki| / ka x 100
k2 =	4.69E-08 cm/sec	1.6	%	
k3 =	4.53E-08 cm/sec	1.8	%	
k4 =	4.32E-08 cm/sec	6.3	%	

Hydraulic conductivity	k =	4.62E-08	cm/sec	1.31E-04	ft/day
Void Ratio	e =	0.57			
Porosity	n =	0.36			
Bulk Density	γ =	2.04	g/cm3	127.6	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.73E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	18
Plasticity Index	**PI**	**20**
- 200 Sieve		72 %
+ No 40 Sieve		4 %
+ No 4 Sieve		0 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/28/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 305	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9385	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000435522	Annulus Ra	1.5	cm3
Other Location:	West Berm	M2 =	1.040953	T =	0.203786687			

Material Description : Red, Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.46	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 23	Tare No.:	T 2
Wet Wt: of Sample :			519.46	g	Wet Wt.+tare:	436.04	Wet Wt.+tare:	744.29
Diameter :	2.71	in	6.88	cm2	Dry Wt.+tare:	393.92	Dry Wt.+tare:	658.24
Length :	2.66	in	6.76	cm	Tare Wt:	140.34	Tare Wt:	216.66
Area:	5.76	in^2	37.16	cm2	Dry Wt.:	253.58	Dry Wt.:	441.58
Volume :	15.32	in^3	251.06	cm3	Water Wt.:	42.12	Water Wt.:	86.05
Unit Wt.(wet):	129.11	pcf	2.07	g/cm^3	% moist.:	16.6	% moist.:	19.5
Unit Wt.(dry):	110.72	pcf	1.77	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 110.7685 OMC = 16.6101428
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 100.72 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.53

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/28/2009	900	5.7	0.957092	24	0.910	9.55E-08	2.71E-04	
11/28/2009	1020	5.6	1.057092	24	0.910	9.42E-08	2.67E-04	
11/28/2009	1140	5.5	1.157092	24	0.910	9.35E-08	2.65E-04	
11/28/2009	1260	5.4	1.257092	24	0.910	9.31E-08	2.64E-04	

SUMMARY

ka = 9.41E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.55E-08 cm/sec	1.5	%
k2 =	9.42E-08 cm/sec	0.2	%
k3 =	9.35E-08 cm/sec	0.6	%
k4 =	9.31E-08 cm/sec	1.1	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.41E-08	cm/sec	2.67E-04	ft/day
Void Ratio	e =	0.52			
Porosity	n =	0.34			
Bulk Density	γ =	2.07	g/cm3	129.1	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.64E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	17
Plasticity Index	**PI**	**21**
- 200 Sieve		59 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/28/2009 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 315	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9386	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.00044061	Annulus Ra	1.5	cm3
Other Location:	North -West Berm	M2 =	1.040953	T =	0.203799877			

Material Description : Red & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			509.49	g	Tare No.:	T 20	Tare No.:	T 3
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	404.29	Wet Wt.+tare:	742.75
Wet Wt: of Sample :			509.49	g	Dry Wt.+tare:	364.01	Dry Wt.+tare:	639.25
Diameter :	2.72	in	6.90	cm2	Tare Wt:	160.24	Tare Wt:	220.72
Length :	2.71	in	6.88	cm	Dry Wt.:	203.77	Dry Wt.:	418.53
Area:	5.79	in^2	37.38	cm2	Water Wt.:	40.28	Water Wt.:	103.5
Volume :	15.68	in^3	257.00	cm3	% moist.:	19.8	% moist.:	24.7
Unit Wt.(wet):	123.70	pcf	1.98	g/cm^3				
Unit Wt.(dry):	103.29	pcf	1.66	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 103.3305 OMC = 19.7673848
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 102.70 Void ratio (e) = 0.66 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.36

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/28/2009	960	5.7	0.956774	24	0.910	9.06E-08	2.57E-04	
11/28/2009	1080	5.6	1.056774	24	0.910	9.00E-08	2.55E-04	
11/28/2009	1200	5.5	1.156774	24	0.910	8.98E-08	2.55E-04	
11/28/2009	1320	5.4	1.256774	24	0.910	8.99E-08	2.55E-04	

SUMMARY

ka =	9.01E-08	cm/sec	Acceptance criteria =	25 %
ki			Vm	
k1 =	9.06E-08	cm/sec	0.6	%
k2 =	9.00E-08	cm/sec	0.0	%
k3 =	8.98E-08	cm/sec	0.3	%
k4 =	8.99E-08	cm/sec	0.2	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	9.01E-08	cm/sec	2.55E-04	ft/day
Void Ratio	e =	0.66			
Porosity	n =	0.40			
Bulk Density	γ =	1.98	g/cm3	123.7	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.23E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	18
Plasticity Index	PI	21
- 200 Sieve		65 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/30/2009 Panel Number : P 1
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 316	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9387	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000441544	Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T =	0.203938777			

Material Description : Red, Gray & Tan Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			545.29	g	Tare No.:	T 4	Tare No.:	T 22
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	612.82	Wet Wt.+tare:	699.85
Wet Wt: of Sample :			545.29	g	Dry Wt.+tare:	538.60	Dry Wt.+tare:	594.62
Diameter :	2.75	in	6.97	cm2	Tare Wt:	219.59	Tare Wt:	140.47
Length :	2.77	in	7.04	cm	Dry Wt.:	319.01	Dry Wt.:	454.15
Area:	5.92	in^2	38.21	cm2	Water Wt.:	74.22	Water Wt.:	105.23
Volume :	16.42	in^3	269.12	cm3	% moist.:	23.3	% moist.:	23.2
Unit Wt.(wet):	126.44	pcf	2.03	g/cm^3				
Unit Wt.(dry):	102.57	pcf	1.64	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 102.6157 OMC = 23.2657284
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.24 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.13

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/30/2009	4200	6.1	0.553432	25	0.889	1.12E-08	3.17E-05	
11/30/2009	4920	6.05	0.603432	25	0.889	1.05E-08	2.97E-05	
11/30/2009	5700	6	0.653432	25	0.889	9.85E-09	2.79E-05	
11/30/2009	6840	5.95	0.703432	25	0.889	8.89E-09	2.52E-05	

SUMMARY

ka = 1.01E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.12E-08 cm/sec	10.8	%	Vm = |ka-ki| / ka x 100
k2 =	1.05E-08 cm/sec	3.7	%	
k3 =	9.85E-09 cm/sec	2.5	%	
k4 =	8.89E-09 cm/sec	12.0	%	

Hydraulic conductivity	k =	1.01E-08	cm/sec	2.86E-05	ft/day
Void Ratio	e =	0.64			
Porosity	n =	0.39			
Bulk Density	γ =	2.03	g/cm3	126.4	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.04E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	54
Plastic Limit	PL	19
Plasticity Index	**PI**	**35**
- 200 Sieve		80 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/9/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 681	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9597	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000434696	Annulus Ra	1.5	cm3
Other Location:	South -East Liner	M2 =	1.040953	T =	0.203776779			

Material Description : Tan & Gray Sandy Lean Clay

					Before Test		After Test	
Wet Wt. sample + ring or tare :			536.15	g	Tare No.:	T 1	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	845.86	Wet Wt.+tare:	756.34
Wet Wt: of Sample :			536.15	g	Dry Wt.+tare:	734.96	Dry Wt.+tare:	657.05
Diameter :	2.75	in	6.97	cm2	Tare Wt:	217.27	Tare Wt:	218.80
Length :	2.73	in	6.93	cm	Dry Wt.:	517.69	Dry Wt.:	438.25
Area:	5.92	in^2	38.18	cm2	Water Wt.:	110.9	Water Wt.:	99.29
Volume :	16.14	in^3	264.56	cm3	% moist.:	21.4	% moist.:	22.7
Unit Wt.(wet):	126.46	pcf	2.03	g/cm^3				
Unit Wt.(dry):	104.15	pcf	1.67	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 104.1931 OMC = 21.4220866
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.91 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/9/2010	3600	6.1	0.55733	26	0.869	1.27E-08	3.59E-05	
3/9/2010	4080	6.05	0.60733	26	0.869	1.22E-08	3.47E-05	
3/9/2010	4620	6	0.65733	26	0.869	1.18E-08	3.33E-05	
3/9/2010	5160	5.95	0.70733	26	0.869	1.14E-08	3.23E-05	

SUMMARY

ka = 1.20E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.27E-08 cm/sec	5.3	%
k2 =	1.22E-08 cm/sec	1.9	%
k3 =	1.18E-08 cm/sec	2.1	%
k4 =	1.14E-08 cm/sec	5.1	%

$Vm = \frac{|ka - ki|}{ka} \times 100$

Hydraulic conductivity	k =	1.20E-08	cm/sec	3.41E-05	ft/day
Void Ratio	e =	0.62			
Porosity	n =	0.38			
Bulk Density	γ =	2.03	g/cm3	126.5	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.23E-13	cm2	(at 20 deg C)	

Liquid Limit LL	37	
Plastic Limit PL	16	
Plasticity Index PI	21	
- 200 Sieve	67	%
+ No 40 Sieve	4	%
+ No 4 Sieve	2	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/9/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 688	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9598	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000445466	Annulus Ra	1.5	cm3
Other Location:	South - West Berm	M2 =	1.040953	T =	0.203775991			

Material Description : Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			561.49	g	Tare No.:	T 5	Tare No.:	T 8
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	974.24	Wet Wt.+tare:	785.97
Wet Wt: of Sample :			561.49	g	Dry Wt.+tare:	859.89	Dry Wt.+tare:	701.20
Diameter :	2.73	in	6.92	cm2	Tare Wt:	218.77	Tare Wt:	221.90
Length :	2.76	in	7.00	cm	Dry Wt.:	641.12	Dry Wt.:	479.3
Area:	5.83	in^2	37.63	cm2	Water Wt.:	114.35	Water Wt.:	84.77
Volume :	16.07	in^3	263.30	cm3	% moist.:	17.8	% moist.:	17.7
Unit Wt.(wet):	133.07	pcf	2.13	g/cm^3				
Unit Wt.(dry):	112.93	pcf	1.81	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 112.9767 OMC = 17.8359745
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.93 Void ratio (e) = 0.49 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.20

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/9/2010	3480	6.1	0.557349	25.5	0.879	1.36E-08	3.85E-05	
3/9/2010	3900	6.05	0.607349	25.5	0.879	1.33E-08	3.76E-05	
3/9/2010	4380	6	0.657349	25.5	0.879	1.29E-08	3.65E-05	
3/9/2010	4860	5.95	0.707349	25.5	0.879	1.25E-08	3.56E-05	

SUMMARY

ka = 1.31E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.36E-08 cm/sec	3.9	%
k2 =	1.33E-08 cm/sec	1.6	%
k3 =	1.29E-08 cm/sec	1.5	%
k4 =	1.25E-08 cm/sec	4.0	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.31E-08	cm/sec	3.70E-05	ft/day
Void Ratio	e =	0.49			
Porosity	n =	0.33			
Bulk Density	γ =	2.13	g/cm3	133.1	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.34E-13	cm2	(at 20 deg C)	

Liquid Limit LL	37	
Plastic Limit PL	14	
Plasticity Index PI	**23**	
- 200 Sieve	67	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/15/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 750	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9610	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000444681	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203781058			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			532.56	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 5	Tare No.:	T 1
Wet Wt: of Sample :			532.56	g	Wet Wt.+tare:	616.27	Wet Wt.+tare:	752.03
Diameter :	2.72	in	6.90	cm2	Dry Wt.+tare:	551.54	Dry Wt.+tare:	657.72
Length :	2.73	in	6.93	cm	Tare Wt:	218.81	Tare Wt:	217.28
Area:	5.79	in^2	37.35	cm2	Dry Wt.:	332.73	Dry Wt.:	440.44
Volume :	15.80	in^3	259.00	cm3	Water Wt.:	64.73	Water Wt.:	94.31
Unit Wt.(wet):	128.31	pcf	2.06	g/cm^3	% moist.:	19.5	% moist.:	21.4
Unit Wt.(dry):	107.41	pcf	1.72	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 107.4593 OMC = 19.4542121
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.41 Void ratio (e) = 0.60 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.28

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/15/2010	1380	5.7	0.957227	25	0.889	6.22E-08	1.76E-04	
3/15/2010	1560	5.6	1.057227	25	0.889	6.15E-08	1.74E-04	
3/15/2010	1740	5.5	1.157227	25	0.889	6.11E-08	1.73E-04	
3/15/2010	1980	5.4	1.257227	25	0.889	5.91E-08	1.68E-04	

SUMMARY

ka = 6.10E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	6.22E-08 cm/sec	2.0	%	Vm = |ka-ki| / ka x 100
k2 =	6.15E-08 cm/sec	0.9	%	
k3 =	6.11E-08 cm/sec	0.2	%	
k4 =	5.91E-08 cm/sec	3.1	%	

Hydraulic conductivity	k =	6.10E-08	cm/sec	1.73E-04	ft/day
Void Ratio	e =	0.60			
Porosity	n =	0.37			
Bulk Density	γ =	2.06	g/cm3	128.3	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.25E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	19
Plasticity Index	**PI**	**24**
- 200 Sieve		77 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/15/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 770	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9611	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000438106	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203572985			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			505.54	g	Tare No.:	T 1	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	824.08	Wet Wt.+tare:	730.35
Wet Wt: of Sample :			505.54	g	Dry Wt.+tare:	728.10	Dry Wt.+tare:	638.36
Diameter :	2.70	in	6.86	cm2	Tare Wt:	217.28	Tare Wt:	218.80
Length :	2.66	in	6.76	cm	Dry Wt.:	510.82	Dry Wt.:	419.56
Area:	5.73	in^2	36.94	cm2	Water Wt.:	95.98	Water Wt.:	91.99
Volume :	15.23	in^3	249.57	cm3	% moist.:	18.8	% moist.:	21.9
Unit Wt.(wet):	126.40	pcf	2.03	g/cm^3				
Unit Wt.(dry):	106.41	pcf	1.71	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 106.4506 OMC = 18.7893974
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.28 Void ratio (e) = 0.61 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.54

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/15/2010	1440	5.7	0.962243	25	0.889	5.90E-08	1.67E-04	
3/15/2010	1620	5.6	1.062243	25	0.889	5.86E-08	1.66E-04	
3/15/2010	1860	5.5	1.162243	25	0.889	5.65E-08	1.60E-04	
3/15/2010	2100	5.4	1.262243	25	0.889	5.51E-08	1.56E-04	

SUMMARY

ka = 5.73E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	5.90E-08 cm/sec	2.9	%	Vm = |ka-ki| / ka x 100
k2 =	5.86E-08 cm/sec	2.3	%	
k3 =	5.65E-08 cm/sec	1.3	%	
k4 =	5.51E-08 cm/sec	3.9	%	

Hydraulic conductivity	k =	**5.73E-08**	cm/sec	**1.62E-04**	ft/day
Void Ratio	e =	**0.61**			
Porosity	n =	**0.38**			
Bulk Density	γ =	**2.03**	g/cm3	**126.4**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**5.87E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	18
Plasticity Index	**PI**	**22**
- 200 Sieve		84 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/22/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 840	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9635	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000440289	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203784596			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			524.07	g	Tare No.:	T 16	Tare No.:	T 8
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	489.83	Wet Wt.+tare:	750.42
Wet Wt: of Sample :			524.07	g	Dry Wt.+tare:	435.20	Dry Wt.+tare:	658.55
Diameter :	2.72	in	6.91	cm2	Tare Wt:	151.97	Tare Wt:	221.91
Length :	2.71	in	6.89	cm	Dry Wt.:	283.23	Dry Wt.:	436.64
Area:	5.81	in^2	37.49	cm2	Water Wt.:	54.63	Water Wt.:	91.87
Volume :	15.76	in^3	258.33	cm3	% moist.:	19.3	% moist.:	21.0
Unit Wt.(wet):	126.59	pcf	2.03	g/cm^3				
Unit Wt.(dry):	106.12	pcf	1.70	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 106.1655 OMC = 19.288211
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.55 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/22/2010	1860	6.1	0.557142	23.5	0.920	2.63E-08	7.44E-05	
3/22/2010	2580	6	0.657142	23.5	0.920	2.26E-08	6.40E-05	
3/22/2010	3420	5.9	0.757142	23.5	0.920	1.99E-08	5.63E-05	
3/22/2010	4440	5.8	0.857142	23.5	0.920	1.75E-08	4.97E-05	

SUMMARY

ka = 2.16E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.63E-08 cm/sec	21.8	%	Vm = |ka-ki| / ka x 100
k2 =	2.26E-08 cm/sec	4.8	%	
k3 =	1.99E-08 cm/sec	7.9	%	
k4 =	1.75E-08 cm/sec	18.7	%	

Hydraulic conductivity	k =	**2.16E-08**	cm/sec	**6.11E-05**	ft/day
Void Ratio	e =	**0.59**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.03**	g/cm3	**126.6**	pcf
Water Content	W =	**0.33**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.21E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	20
Plasticity Index	**PI**	**24**
- 200 Sieve		84 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/30/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 847	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9640	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000447635	Annulus Ra	1.5	cm3
Other Location:	East Liner	M2 =	1.040953	T =	0.203817253			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.59	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			533.59	g	Tare No.:	T 21	Tare No.:	T 17
Diameter :	2.71	in	6.88	cm2	Wet Wt.+tare:	436.34	Wet Wt.+tare:	682.25
Length :	2.74	in	6.95	cm	Dry Wt.+tare:	387.99	Dry Wt.+tare:	589.92
Area:	5.76	in^2	37.19	cm2	Tare Wt:	140.33	Tare Wt:	146.76
Volume :	15.77	in^3	258.42	cm3	Dry Wt.:	247.66	Dry Wt.:	443.16
Unit Wt.(wet):	**128.84**	pcf	**2.06**	g/cm^3	Water Wt.:	48.35	Water Wt.:	92.33
Unit Wt.(dry):	**107.80**	pcf	**1.73**	g/cm^3	% moist.:	**19.5**	% moist.:	**20.8**

Specific Gravity: **2.70** Max Dry Density(pcf) = 107.8456 OMC = 19.5227328
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.80 Void ratio (e) = **0.56** Porosity (n)= **0.36**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/30/2010	1020	6.1	0.556356	24.5	0.899	4.75E-08	1.35E-04	
3/30/2010	1140	6.05	0.606356	24.5	0.899	4.66E-08	1.32E-04	
3/30/2010	1260	6	0.656356	24.5	0.899	4.59E-08	1.30E-04	
3/30/2010	1500	5.9	0.756356	24.5	0.899	4.49E-08	1.27E-04	

SUMMARY

ka = 4.62E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	4.75E-08 cm/sec	2.8	%
k2 =	4.66E-08 cm/sec	0.8	%
k3 =	4.59E-08 cm/sec	0.7	%
k4 =	4.49E-08 cm/sec	2.8	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**4.62E-08**	cm/sec	**1.31E-04**	ft/day
Void Ratio	e =	**0.56**			
Porosity	n =	**0.36**			
Bulk Density	γ =	**2.06**	g/cm3	**128.8**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.74E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	37
Plastic Limit	PL	19
Plasticity Index	**PI**	18
- 200 Sieve		74 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/31/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 865	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9644	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000447962	Annulus Ra	1.5	cm3
Other Location:	South Liner	M2 =	1.040953	T =	0.203888554			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			514.89	g	Tare No.:	T 9	Tare No.:	T 18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	530.15	Wet Wt.+tare:	667.10
Wet Wt: of Sample :			514.89	g	Dry Wt.+tare:	471.14	Dry Wt.+tare:	565.71
Diameter :	2.71	in	6.88	cm2	Tare Wt:	220.49	Tare Wt:	146.73
Length :	2.74	in	6.95	cm	Dry Wt.:	250.65	Dry Wt.:	418.98
Area:	5.76	in^2	37.19	cm2	Water Wt.:	59.01	Water Wt.:	101.39
Volume :	15.78	in^3	258.61	cm3	% moist.:	23.5	% moist.:	24.2
Unit Wt.(wet):	124.24	pcf	1.99	g/cm^3				
Unit Wt.(dry):	100.56	pcf	1.61	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 100.6063 OMC = 23.5427888
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.63 Void ratio (e) = 0.68 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/31/2010	1320	6.1	0.55464	25	0.889	3.62E-08	1.03E-04	
3/31/2010	1560	6.05	0.60464	25	0.889	3.36E-08	9.52E-05	
3/31/2010	1800	6	0.65464	25	0.889	3.17E-08	8.99E-05	
3/31/2010	2040	5.9	0.75464	25	0.889	3.26E-08	9.25E-05	

SUMMARY

ka = 3.35E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.62E-08 cm/sec	8.0	%
k2 =	3.36E-08 cm/sec	0.2	%
k3 =	3.17E-08 cm/sec	5.5	%
k4 =	3.26E-08 cm/sec	2.7	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**3.35E-08**	cm/sec	**9.51E-05**	ft/day
Void Ratio	e =	**0.68**			
Porosity	n =	**0.40**			
Bulk Density	γ =	**1.99**	g/cm3	**124.2**	pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**3.44E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	21
Plasticity Index	**PI**	**22**
- 200 Sieve		82 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/1/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 886	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9647 Rerun w/ 5 psi	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C = 0.000437871		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203774962				

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			512.20	g	Tare No.:	T 22	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	588.99	Wet Wt.+tare:	748.43
Wet Wt: of Sample :			512.20	g	Dry Wt.+tare:	508.69	Dry Wt.+tare:	645.30
Diameter :	2.73	in	6.93	cm2	Tare Wt:	140.49	Tare Wt:	218.79
Length :	2.71	in	6.89	cm	Dry Wt.:	368.2	Dry Wt.:	426.51
Area:	5.84	in^2	37.71	cm2	Water Wt.:	80.3	Water Wt.:	103.13
Volume :	15.86	in^3	259.95	cm3	% moist.:	21.8	% moist.:	24.2
Unit Wt.(wet):	122.95	pcf	1.97	g/cm^3				
Unit Wt.(dry):	100.94	pcf	1.62	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 100.9815 OMC = 21.8087996
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.45 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/3/2010	900	5.7	0.957374	24.5	0.899	9.50E-08	2.69E-04	
4/3/2010	1020	5.6	1.057374	24.5	0.899	9.37E-08	2.66E-04	
4/3/2010	1140	5.5	1.157374	24.5	0.899	9.29E-08	2.63E-04	
4/3/2010	1260	5.4	1.257374	24.5	0.899	9.25E-08	2.62E-04	

SUMMARY

ka =	9.35E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	9.50E-08	cm/sec	1.5	%	Vm = |ka-ki| / ka x 100
k2 =	9.37E-08	cm/sec	0.2	%	
k3 =	9.29E-08	cm/sec	0.6	%	
k4 =	9.25E-08	cm/sec	1.1	%	

Hydraulic conductivity	k =	9.35E-08	cm/sec	2.65E-04	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	1.97	g/cm3	123.0	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.58E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	45
Plastic Limit	PL	22
Plasticity Index	**PI**	**23**
- 200 Sieve		91 %
+ No 40 Sieve		3
+ No 4 Sieve		0 %

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/3/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 914	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9653	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.00044351	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203775991			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			526.57	g	Tare No.:	T 24	Tare No.:	T 12
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	499.59	Wet Wt.+tare:	756.49
Wet Wt: of Sample :			526.57	g	Dry Wt.+tare:	427.49	Dry Wt.+tare:	652.91
Diameter :	2.73	in	6.94	cm2	Tare Wt:	112.36	Tare Wt:	220.20
Length :	2.76	in	7.00	cm	Dry Wt.:	315.13	Dry Wt.:	432.71
Area:	5.86	in^2	37.79	cm2	Water Wt.:	72.1	Water Wt.:	103.58
Volume :	16.14	in^3	264.46	cm3	% moist.:	22.9	% moist.:	23.9
Unit Wt.(wet):	124.25	pcf	1.99	g/cm^3				
Unit Wt.(dry):	101.11	pcf	1.62	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 101.1559 OMC = 22.8794466
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.89 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.20

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/3/2010	1260	5.7	0.957349	24.5	0.899	6.87E-08	1.95E-04	
4/3/2010	1620	5.6	1.057349	24.5	0.899	5.98E-08	1.69E-04	
4/3/2010	2040	5.5	1.157349	24.5	0.899	5.26E-08	1.49E-04	
4/3/2010	2640	5.4	1.257349	24.5	0.899	4.47E-08	1.27E-04	

SUMMARY

ka = 5.64E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	6.87E-08 cm/sec	21.7	%
k2 =	5.98E-08 cm/sec	5.9	%
k3 =	5.26E-08 cm/sec	6.8	%
k4 =	4.47E-08 cm/sec	20.8	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	5.64E-08	cm/sec	1.60E-04	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	1.99	g/cm3	124.2	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.78E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	45
Plastic Limit	PL	20
Plasticity Index	**PI**	**25**
- 200 Sieve		85 %
+ No 40 Sieve		4 %
+ No 4 Sieve		2 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/3/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 915	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9654	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C = 0.000448255		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203879377				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			525.42	g	Tare No.:	T 22	Tare No.:	T 10
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	680.68	Wet Wt.+tare:	752.57
Wet Wt: of Sample :			525.42	g	Dry Wt.+tare:	584.07	Dry Wt.+tare:	651.26
Diameter :	2.72	in	6.90	cm2	Tare Wt:	140.43	Tare Wt:	221.15
Length :	2.76	in	7.00	cm	Dry Wt.:	443.64	Dry Wt.:	430.11
Area:	5.80	in^2	37.41	cm2	Water Wt.:	96.61	Water Wt.:	101.31
Volume :	15.98	in^3	261.85	cm3	% moist.:	21.8	% moist.:	23.6
Unit Wt.(wet):	125.21	pcf	2.01	g/cm^3				
Unit Wt.(dry):	102.82	pcf	1.65	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 102.864 OMC = 21.7766658
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.47 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.19

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/3/2010	2040	5.7	0.954861	24.5	0.899	4.28E-08	1.21E-04	
4/3/2010	2520	5.6	1.054861	24.5	0.899	3.87E-08	1.10E-04	
4/3/2010	3060	5.5	1.154861	24.5	0.899	3.54E-08	1.00E-04	
4/3/2010	3660	5.4	1.254861	24.5	0.899	3.26E-08	9.23E-05	

SUMMARY

ka = 3.74E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	4.28E-08 cm/sec	14.5	%
k2 =	3.87E-08 cm/sec	3.7	%
k3 =	3.54E-08 cm/sec	5.3	%
k4 =	3.26E-08 cm/sec	12.9	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	3.74E-08	cm/sec	1.06E-04	ft/day
Void Ratio	e =	0.64			
Porosity	n =	0.39			
Bulk Density	γ =	2.01	g/cm3	125.2	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.83E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	45
Plastic Limit	PL	19
Plasticity Index	**PI**	**26**
- 200 Sieve		80 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/8/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 916	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9663	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000421737	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203772606			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			543.75	g	Tare No.:	13T	Tare No.:	T 12
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	634.61	Wet Wt.+tare:	774.02
Wet Wt: of Sample :			543.75	g	Dry Wt.+tare:	550.41	Dry Wt.+tare:	677.03
Diameter :	2.77	in	7.04	cm2	Tare Wt:	133.52	Tare Wt:	220.19
Length :	2.70	in	6.86	cm	Dry Wt.:	416.89	Dry Wt.:	456.84
Area:	6.03	in^2	38.94	cm2	Water Wt.:	84.2	Water Wt.:	96.99
Volume :	16.29	in^3	266.92	cm3	% moist.:	20.2	% moist.:	21.2
Unit Wt.(wet):	127.12	pcf	2.04	g/cm^3				
Unit Wt.(dry):	105.76	pcf	1.69	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 105.8023 OMC = 20.1971743
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.53 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/8/2010	780	5.7	0.957431	24.5	0.899	1.06E-07	2.99E-04	
4/8/2010	960	5.6	1.057431	24.5	0.899	9.59E-08	2.72E-04	
4/8/2010	1140	5.5	1.157431	24.5	0.899	8.95E-08	2.54E-04	
4/8/2010	1320	5.4	1.257431	24.5	0.899	8.51E-08	2.41E-04	

SUMMARY

ka =	9.40E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.06E-07	cm/sec	12.3	%	Vm = |ka-ki| / ka x 100
k2 =	9.59E-08	cm/sec	2.0	%	
k3 =	8.95E-08	cm/sec	4.8	%	
k4 =	8.51E-08	cm/sec	9.5	%	

Hydraulic conductivity	k =	9.40E-08	cm/sec	2.66E-04	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.04	g/cm3	127.1	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.63E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	18
Plasticity Index	**PI**	**24**
- 200 Sieve		84 %
+ No 40 Sieve		5 %
+ No 4 Sieve		2 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/16/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 22	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9870	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000443305	Annulus Ra	1.5	cm3
Other Location:	Western Perimeter	M2 =	1.040953	T =	0.20379399			

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			530.18	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 21	Tare No.:	T 6
Wet Wt: of Sample :			530.18	g	Wet Wt.+tare:	642.69	Wet Wt.+tare:	752.97
Diameter :	2.70	in	6.85	cm2	Dry Wt.+tare:	561.69	Dry Wt.+tare:	671.85
Length :	2.68	in	6.81	cm	Tare Wt:	140.32	Tare Wt:	217.33
Area:	5.71	in^2	36.82	cm2	Dry Wt.:	421.37	Dry Wt.:	454.52
Volume :	15.31	in^3	250.93	cm3	Water Wt.:	81	Water Wt.:	81.12
Unit Wt.(wet):	**131.84**	pcf	**2.11**	g/cm^3	% moist.:	**19.2**	% moist.:	**17.8**
Unit Wt.(dry):	**110.58**	pcf	**1.77**	g/cm^3				

Assumed Specific Gravity: **2.65** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 95.34 Void ratio (e) = **0.50** Porosity (n)= **0.33**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.44

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/16/2010	480	5.8	0.856916	25	0.889	1.58E-07	4.47E-04	
8/16/2010	540	5.7	0.956916	25	0.889	1.58E-07	4.49E-04	
8/16/2010	600	5.6	1.056916	25	0.889	1.59E-07	4.52E-04	
8/16/2010	660	5.5	1.156916	25	0.889	1.61E-07	4.55E-04	

SUMMARY

ka = 1.59E-07 cm/sec

ki		Vm	
k1 =	1.58E-07 cm/sec	0.9	%
k2 =	1.58E-07 cm/sec	0.4	%
k3 =	1.59E-07 cm/sec	0.2	%
k4 =	1.61E-07 cm/sec	1.0	%

Acceptance criteria = 25 %

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**1.59E-07**	cm/sec	**4.51E-04**	ft/day
Void Ratio	e =	**0.50**			
Porosity	n =	**0.33**			
Bulk Density	γ =	**2.11**	g/cm3	**131.8**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.63E-12**	cm2	(at 20 deg C)	

Liquid Limit LL	43	
Plastic Limit PL	23	
Plasticity Index PI	**20**	
- 200 Sieve	87	%
+ No 40 Sieve	7	%
+ No 4 Sieve	2	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/19/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 22 A	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9877	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000438184	Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T =	0.203785336			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			538.43	g	Tare No.:	T 2	Tare No.:	T 8
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	865.96	Wet Wt.+tare:	770.13
Wet Wt: of Sample :			538.43	g	Dry Wt.+tare:	758.83	Dry Wt.+tare:	667.55
Diameter :	2.76	in	7.01	cm2	Tare Wt:	216.58	Tare Wt:	221.90
Length :	2.78	in	7.05	cm	Dry Wt.:	542.25	Dry Wt.:	445.65
Area:	5.97	in^2	38.54	cm2	Water Wt.:	107.13	Water Wt.:	102.58
Volume :	16.58	in^3	271.77	cm3	% moist.:	19.8	% moist.:	23.0
Unit Wt.(wet):	123.63	pcf	1.98	g/cm^3				
Unit Wt.(dry):	103.23	pcf	1.65	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 95.46 Void ratio (e) = 0.66 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.13

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/19/2010	720	5.7	0.957124	25	0.889	1.17E-07	3.33E-04	
8/19/2010	900	5.6	1.057124	25	0.889	1.05E-07	2.98E-04	
8/19/2010	1140	5.5	1.157124	25	0.889	9.19E-08	2.61E-04	
8/19/2010	1440	5.4	1.257124	25	0.889	8.01E-08	2.27E-04	

SUMMARY

ka = 9.86E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	1.17E-07	cm/sec	19.1	%	Vm = |ka-ki| / ka x 100
k2 =	1.05E-07	cm/sec	6.5	%	
k3 =	9.19E-08	cm/sec	6.8	%	
k4 =	8.01E-08	cm/sec	18.8	%	

Hydraulic conductivity	k =	9.86E-08	cm/sec	2.80E-04	ft/day
Void Ratio	e =	0.66			
Porosity	n =	0.40			
Bulk Density	γ =	1.98	g/cm3	123.6	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.01E-12	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	21
Plasticity Index	**PI**	19
- 200 Sieve		89 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/7/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9952	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3, Density P-122	M1 =	0.030180	C =	0.000436102	Annulus Ra	1.5	cm3
Other Location:	South Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			546.40	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 15	Tare No.:	T 5
Wet Wt: of Sample :			546.40	g	Wet Wt.+tare:	745.87	Wet Wt.+tare:	768.56
Diameter :	2.75	in	6.99	cm2	Dry Wt.+tare:	652.54	Dry Wt.+tare:	667.29
Length :	2.75	in	6.99	cm	Tare Wt:	221.71	Tare Wt:	218.77
Area:	5.95	in^2	38.40	cm2	Dry Wt.:	430.83	Dry Wt.:	448.52
Volume :	16.38	in^3	268.40	cm3	Water Wt.:	93.33	Water Wt.:	101.27
Unit Wt.(wet):	127.03	pcf	2.04	g/cm^3	% moist.:	21.7	% moist.:	22.6
Unit Wt.(dry):	104.41	pcf	1.67	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.22 Void ratio (e) = 0.61 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.21

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/7/2010	960	6.1	0.557171	25	0.889	4.87E-08	1.38E-04	
10/7/2010	1260	6	0.657171	25	0.889	4.43E-08	1.25E-04	
10/7/2010	1560	5.9	0.757171	25	0.889	4.17E-08	1.18E-04	
10/7/2010	2640	5.5	1.157171	25	0.889	3.95E-08	1.12E-04	

SUMMARY

ka = 4.35E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.87E-08 cm/sec	11.9	%	Vm = |ka-ki| / ka x 100
k2 =	4.43E-08 cm/sec	1.7	%	
k3 =	4.17E-08 cm/sec	4.3	%	
k4 =	3.95E-08 cm/sec	9.2	%	

Hydraulic conductivity	k =	4.35E-08	cm/sec	1.23E-04	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.04	g/cm3	127.0	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.46E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	46
Plastic Limit	PL	22
Plasticity Index	**PI**	**24**
- 200 Sieve		79 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	10/11/2010	Panel Number :		P 6; ASTM D 5084				
Project No. :	L 213-09	Permometer Data						
Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9953 C	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3, Density P-199	M1 =	0.030180	C =	0.000444405	Annulus Ra	1.5	cm3
Other Location:	East Perimeter	M2 =	1.040953	T =	0.203783414			
Material Description :	Tan & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			543.60	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 21	Tare No.:	T 7
Wet Wt: of Sample :			543.60	g	Wet Wt.+tare:	346.06	Wet Wt.+tare:	768.21
Diameter :	2.71	in	6.90	cm2	Dry Wt.+tare:	319.26	Dry Wt.+tare:	680.57
Length :	2.73	in	6.93	cm	Tare Wt:	140.32	Tare Wt:	221.20
Area:	5.79	in^2	37.34	cm2	Dry Wt.:	178.94	Dry Wt.:	459.37
Volume :	15.79	in^3	258.72	cm3	Water Wt.:	26.8	Water Wt.:	87.64
Unit Wt.(wet):	131.11	pcf	2.10	g/cm^3	% moist.:	15.0	% moist.:	19.1
Unit Wt.(dry):	114.03	pcf	1.83	g/cm^3				

Assumed Specific Gravity:	2.80	Max Dry Density(pcf) =		OMC =	
		% of max =		+/- OMC =	
Calculated % saturation:	100.23	Void ratio (e) =	0.53	Porosity (n)=	0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	1080	5.8	0.857171	25	0.889	7.02E-08	1.99E-04	
10/11/2010	1740	5.5	1.157171	25	0.889	6.11E-08	1.73E-04	
10/11/2010	1980	5.4	1.257171	25	0.889	5.91E-08	1.67E-04	
10/11/2010	2280	5.3	1.357171	25	0.889	5.61E-08	1.59E-04	

SUMMARY

ka = 6.16E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.02E-08 cm/sec	14.0	%	Vm = |ka-ki| / ka x 100
k2 =	6.11E-08 cm/sec	0.9	%	
k3 =	5.91E-08 cm/sec	4.1	%	
k4 =	5.61E-08 cm/sec	8.9	%	

Hydraulic conductivity	k =	6.16E-08	cm/sec	1.75E-04	ft/day
Void Ratio	e =	0.53			
Porosity	n =	0.35			
Bulk Density	γ =	2.10	g/cm3	131.1	pcf
Water Content	W =	0.27	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.31E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	34
Plastic Limit	PL	17
Plasticity Index	**PI**	17
- 200 Sieve		71 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9959 B	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3, Density P-200	M1 =	0.030180	C = 0.000445815		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			545.01	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 5	Tare No.:	T 4
Wet Wt: of Sample :			545.01	g	Wet Wt.+tare:	654.77	Wet Wt.+tare:	768.06
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	596.01	Dry Wt.+tare:	686.72
Length :	2.73	in	6.93	cm	Tare Wt:	218.77	Tare Wt:	219.53
Area:	5.77	in^2	37.23	cm2	Dry Wt.:	377.24	Dry Wt.:	467.19
Volume :	15.75	in^3	258.02	cm3	Water Wt.:	58.76	Water Wt.:	81.34
Unit Wt.(wet):	131.81	pcf	2.11	g/cm^3	% moist.:	15.6	% moist.:	17.4
Unit Wt.(dry):	114.04	pcf	1.83	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.34 Void ratio (e) = 0.48 Porosity (n)= 0.32

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	960	6.1	0.557171	25	0.889	4.98E-08	1.41E-04	
10/12/2010	1080	6.05	0.607171	25	0.889	4.85E-08	1.37E-04	
10/12/2010	1200	6	0.657171	25	0.889	4.75E-08	1.35E-04	
10/12/2010	1320	5.95	0.707171	25	0.889	4.67E-08	1.32E-04	

SUMMARY

ka = 4.81E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	4.98E-08 cm/sec	3.4	%	Vm = |ka-ki| / ka x 100
k2 =	4.85E-08 cm/sec	0.8	%	
k3 =	4.75E-08 cm/sec	1.3	%	
k4 =	4.67E-08 cm/sec	2.9	%	

Hydraulic conductivity	k =	4.81E-08	cm/sec	1.36E-04	ft/day
Void Ratio	e =	0.48			
Porosity	n =	0.32			
Bulk Density	γ =	2.11	g/cm3	131.8	pcf
Water Content	W =	0.29	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.93E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	33
Plastic Limit	PL	17
Plasticity Index	**PI**	**16**
- 200 Sieve		62 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9959 C	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3, Density P-201	M1 =	0.030180	C = 0.000437308		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			509.44	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 3	Tare No.:	T 8
Wet Wt: of Sample :			509.44	g				
Diameter :	2.72	in	6.91	cm2	Wet Wt.+tare:	576.77	Wet Wt.+tare:	735.78
Length :	2.70	in	6.85	cm	Dry Wt.+tare:	506.68	Dry Wt.+tare:	631.08
Area:	5.82	in^2	37.54	cm2	Tare Wt:	220.69	Tare Wt:	221.89
Volume :	15.70	in^3	257.23	cm3	Dry Wt.:	285.99	Dry Wt.:	409.19
Unit Wt.(wet):	123.58	pcf	1.98	g/cm^3	Water Wt.:	70.09	Water Wt.:	104.7
Unit Wt.(dry):	99.26	pcf	1.59	g/cm^3	% moist.:	24.5	% moist.:	25.6

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.95 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	1440	6.2	0.457171	25	0.889	2.64E-08	7.49E-05	
10/12/2010	1680	6.15	0.507171	25	0.889	2.53E-08	7.16E-05	
10/12/2010	1920	6.1	0.557171	25	0.889	2.44E-08	6.92E-05	
10/12/2010	2160	6.05	0.607171	25	0.889	2.38E-08	6.74E-05	

SUMMARY

ka = 2.50E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.64E-08 cm/sec	5.8	%	Vm = |ka-ki| / ka x 100
k2 =	2.53E-08 cm/sec	1.2	%	
k3 =	2.44E-08 cm/sec	2.2	%	
k4 =	2.38E-08 cm/sec	4.7	%	

Hydraulic conductivity	k =	**2.50E-08**	cm/sec	**7.08E-05**	ft/day
Void Ratio	e =	**0.70**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**1.98**	g/cm3	**123.6**	pcf
Water Content	W =	**0.39**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.56E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	45
Plastic Limit	PL	20
Plasticity Index	**PI**	**25**
- 200 Sieve		92 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/21/2009 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data
Boring No.: Density # 260
Sample: 9371
Depth (ft): Lift 4
Other Location: South- East Berm
Material Description : Gray, Red & Tan Sandy Lean Clay

ap = 0.031416 cm2
aa = 0.767120 cm2
M1 = 0.030180 C = 0.000446174
M2 = 1.040953 T = 0.203784065

Set Mercury to Pipet Rp at

Equilibrium	1.8	cm3
Pipet Rp	6.7	cm3
Annulus Ra	1.5	cm3

SAMPLE DATA

Wet Wt. sample + ring or tare :		523.74	g
Tare or ring Wt. :		0.0	g
Wet Wt: of Sample :		523.74	g
Diameter :	2.68 in	6.81	cm2
Length :	2.67 in	6.78	cm
Area:	5.64 in^2	36.39	cm2
Volume :	15.06 in^3	246.72	cm3
Unit Wt.(wet):	132.46 pcf	2.12	g/cm^3
Unit Wt.(dry):	113.27 pcf	1.82	g/cm^3

	Before Test		After Test
Tare No.:	T 20	Tare No.:	T 23
Wet Wt.+tare:	559.97	Wet Wt.+tare:	668.29
Dry Wt.+tare:	502.06	Dry Wt.+tare:	586.01
Tare Wt:	160.25	Tare Wt:	140.33
Dry Wt.:	341.81	Dry Wt.:	445.68
Water Wt.:	57.91	Water Wt.:	82.28
% moist.:	16.9	% moist.:	18.5

Specific Gravity: 2.75 Max Dry Density(pcf) = 113.3198 OMC = 16.9421609
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.45 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.49

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/21/2009	1380	5.3	1.357155	25	0.889	9.31E-08	2.64E-04	
11/21/2009	1620	5.1	1.557155	25	0.889	9.35E-08	2.65E-04	
11/21/2009	1860	5	1.657155	25	0.889	8.79E-08	2.49E-04	
11/21/2009	2100	4.9	1.757155	25	0.889	8.38E-08	2.37E-04	

SUMMARY

ka = 8.96E-08 cm/sec
Acceptance criteria = 25 %

ki		Vm	
k1 =	9.31E-08 cm/sec	3.9	%
k2 =	9.35E-08 cm/sec	4.4	%
k3 =	8.79E-08 cm/sec	1.9	%
k4 =	8.38E-08 cm/sec	6.5	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	8.96E-08	cm/sec	2.54E-04 ft/day
Void Ratio	e =	0.52		
Porosity	n =	0.34		
Bulk Density	γ =	2.12	g/cm3	132.5 pcf
Water Content	W =	0.31	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	9.17E-13	cm2	(at 20 deg C)

Liquid Limit	LL	42
Plastic Limit	PL	16
Plasticity Index	PI	26
- 200 Sieve		57 %
+ No 40 Sieve		6 %
+ No 4 Sieve		3 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/23/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 270	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9373	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000443868		Annulus Ra	1.5	cm3
Other Location:	South Berm	M2 =	1.040953	T = 0.203792719				

Material Description : Red & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			537.58	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			537.58	g	Tare No.:	T 17	Tare No.:	T 19
Diameter :	2.70	in	6.85	cm2	Wet Wt.+tare:	632.60	Wet Wt.+tare:	726.21
Length :	2.69	in	6.82	cm	Dry Wt.+tare:	560.86	Dry Wt.+tare:	643.55
Area:	5.71	in^2	36.83	cm2	Tare Wt:	146.77	Tare Wt:	186.36
Volume :	15.34	in^3	251.36	cm3	Dry Wt.:	414.09	Dry Wt.:	457.19
Unit Wt.(wet):	133.45	pcf	2.14	g/cm^3	Water Wt.:	71.74	Water Wt.:	82.66
Unit Wt.(dry):	113.75	pcf	1.82	g/cm^3	% moist.:	17.3	% moist.:	18.1

Specific Gravity: 2.75 Max Dry Density(pcf) = 113.7956 OMC = 17.3247362
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.62 Void ratio (e) = 0.51 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.43

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/23/2009	3000	6.1	0.556947	25	0.889	1.59E-08	4.49E-05	
11/23/2009	3600	6	0.656947	25	0.889	1.58E-08	4.47E-05	
11/23/2009	4260	5.9	0.756947	25	0.889	1.55E-08	4.40E-05	
11/23/2009	4920	5.8	0.856947	25	0.889	1.54E-08	4.36E-05	

SUMMARY

ka = 1.56E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.59E-08 cm/sec	1.4	%
k2 =	1.58E-08 cm/sec	0.8	%
k3 =	1.55E-08 cm/sec	0.7	%
k4 =	1.54E-08 cm/sec	1.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.56E-08	cm/sec	4.43E-05	ft/day
Void Ratio	e =	0.51			
Porosity	n =	0.34			
Bulk Density	γ =	2.14	g/cm3	133.5	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.60E-13	cm2	(at 20 deg C)	

Liquid Limit LL	41	
Plastic Limit PL	19	
Plasticity Index PI	22	
- 200 Sieve	73	%
+ No 40 Sieve	4	%
+ No 4 Sieve	0	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/23/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 278	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9374	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000444344	Annulus Ra	1.5	cm3
Other Location:	South Berm	M2 =	1.040953	T =	0.203783792			

Material Description : Red & Gray Sandy - Silty Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			548.57	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 22
Wet Wt: of Sample :			548.57	g	Wet Wt.+tare:	693.20	Wet Wt.+tare:	694.18
Diameter :	2.72	in	6.91	cm2	Dry Wt.+tare:	620.01	Dry Wt.+tare:	608.25
Length :	2.74	in	6.96	cm	Tare Wt:	186.42	Tare Wt:	140.45
Area:	5.81	in^2	37.52	cm2	Dry Wt.:	433.59	Dry Wt.:	467.8
Volume :	15.93	in^3	261.10	cm3	Water Wt.:	73.19	Water Wt.:	85.93
Unit Wt.(wet):	131.10	pcf	2.10	g/cm^3	% moist.:	16.9	% moist.:	18.4
Unit Wt.(dry):	112.17	pcf	1.80	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 112.2183 OMC = 16.8800019
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.65 Void ratio (e) = 0.50 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/23/2009	660	5.7	0.957162	25	0.889	1.30E-07	3.68E-04	
11/23/2009	780	5.6	1.057162	25	0.889	1.23E-07	3.48E-04	
11/23/2009	900	5.5	1.157162	25	0.889	1.18E-07	3.35E-04	
11/23/2009	1020	5.4	1.257162	25	0.889	1.15E-07	3.25E-04	

SUMMARY

ka = 1.21E-07 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.30E-07 cm/sec	7.0	%	Vm = |ka-ki| / ka x 100
k2 =	1.23E-07 cm/sec	1.3	%	
k3 =	1.18E-07 cm/sec	2.7	%	
k4 =	1.15E-07 cm/sec	5.5	%	

Hydraulic conductivity	k =	1.21E-07	cm/sec	3.44E-04	ft/day
Void Ratio	e =	0.50			
Porosity	n =	0.33			
Bulk Density	γ =	2.10	g/cm3	131.1	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.24E-12	cm2	(at 20 deg C)	

Liquid Limit LL	22	
Plastic Limit PL	17	
Plasticity Index PI	5	
- 200 Sieve	56	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 11/28/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 278 B	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9384	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.00044126	Annulus Ra	1.5	cm3
Other Location:	South - East Berm	M2 =	1.040953	T =	0.203891774			

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			547.41	g	Tare No.:	T 19	Tare No.:	T 12
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	655.51	Wet Wt.+tare:	772.31
Wet Wt. of Sample :			547.41	g	Dry Wt.+tare:	581.62	Dry Wt.+tare:	676.43
Diameter :	2.73	in	6.93	cm2	Tare Wt:	186.38	Tare Wt:	220.21
Length :	2.74	in	6.95	cm	Dry Wt.:	395.24	Dry Wt.:	456.22
Area:	5.84	in^2	37.71	cm2	Water Wt.:	73.89	Water Wt.:	95.88
Volume :	15.99	in^3	261.96	cm3	% moist.:	18.7	% moist.:	21.0
Unit Wt.(wet):	130.39	pcf	2.09	g/cm^3				
Unit Wt.(dry):	109.86	pcf	1.76	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 109.9041 OMC = 18.6949701
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 102.69 Void ratio (e) = 0.56 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/28/2009	1380	5.7	0.954563	24	0.910	6.30E-08	1.78E-04	
11/28/2009	1620	5.6	1.054563	24	0.910	6.00E-08	1.70E-04	
11/28/2009	1860	5.5	1.154563	24	0.910	5.79E-08	1.64E-04	
11/28/2009	2100	5.4	1.254563	24	0.910	5.65E-08	1.60E-04	

SUMMARY

ka = 5.93E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	6.30E-08 cm/sec	6.1	%	Vm = |ka-ki| / ka x 100
k2 =	6.00E-08 cm/sec	1.1	%	
k3 =	5.79E-08 cm/sec	2.4	%	
k4 =	5.65E-08 cm/sec	4.8	%	

Hydraulic conductivity	k =	5.93E-08	cm/sec	1.68E-04	ft/day
Void Ratio	e =	0.56			
Porosity	n =	0.36			
Bulk Density	γ =	2.09	g/cm3	130.4	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.08E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	18
Plasticity Index	**PI**	**24**
- 200 Sieve		76 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/23/2009	Panel Number :			P 3 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 283	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9375	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000439925		Annulus Ra	1.5	cm3
Other Location:	South - West Berm	M2 =	1.040953	T = 0.20377772				
Material Description :	Red, Gray & Tan Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.18	g	Tare No.:	T 12	Tare No.:	T 17
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	605.01	Wet Wt.+tare:	674.33
Wet Wt. of Sample :			519.18	g	Dry Wt.+tare:	546.63	Dry Wt.+tare:	587.29
Diameter :	2.70	in	6.86	cm2	Tare Wt:	220.22	Tare Wt:	146.76
Length :	2.68	in	6.79	cm	Dry Wt.:	326.41	Dry Wt.:	440.53
Area:	5.73	in^2	36.99	cm2	Water Wt.:	58.38	Water Wt.:	87.04
Volume :	15.34	in^3	251.35	cm3	% moist.:	17.9	% moist.:	19.8
Unit Wt.(wet):	128.89	pcf	2.07	g/cm^3				
Unit Wt.(dry):	109.33	pcf	1.75	g/cm^3				

Specific Gravity:	2.70	Max Dry Density(pcf) =	109.3812	OMC =	17.8854815
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.48	Void ratio (e) =	0.54	Porosity (n)=	0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.47

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/23/2009	540	4.5	2.157308	25	0.889	4.20E-07	1.19E-03	
11/23/2009	600	4.35	2.307308	25	0.889	4.14E-07	1.17E-03	
11/23/2009	660	4.2	2.457308	25	0.889	4.12E-07	1.17E-03	
11/23/2009	720	4.1	2.557308	25	0.889	4.00E-07	1.13E-03	

SUMMARY

ka =	4.11E-07	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	4.20E-07	cm/sec	2.0	%	Vm = |ka-ki| / ka x 100
k2 =	4.14E-07	cm/sec	0.7	%	
k3 =	4.12E-07	cm/sec	0.1	%	
k4 =	4.00E-07	cm/sec	2.7	%	

Hydraulic conductivity	k =	**4.11E-07**	cm/sec	**1.17E-03** ft/day
Void Ratio	e =	**0.54**		
Porosity	n =	**0.35**		
Bulk Density	γ =	**2.07**	g/cm3	**128.9** pcf
Water Content	W =	**0.31**	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	**4.21E-12**	cm2	(at 20 deg C)

Liquid Limit	LL	35
Plastic Limit	PL	16
Plasticity Index	**PI**	**19**
- 200 Sieve		57 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	11/28/2009	Panel Number :	P 2					
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 283 B	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9388	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000447488	Annulus Ra	1.5	cm3
Other Location:	South - West Berm	M2 =	1.040953	T =	0.203778018			
Material Description :	Red, Gray & Tan Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			532.97	g	Tare No.:	T 18	Tare No.:	T 8
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	575.02	Wet Wt.+tare:	771.71
Wet Wt: of Sample :			532.97	g	Dry Wt.+tare:	522.71	Dry Wt.+tare:	680.39
Diameter :	2.70	in	6.87	cm2	Tare Wt:	146.73	Tare Wt:	221.92
Length :	2.72	in	6.92	cm	Dry Wt.:	375.98	Dry Wt.:	458.47
Area:	5.74	in^2	37.02	cm2	Water Wt.:	52.31	Water Wt.:	91.32
Volume :	15.63	in^3	256.05	cm3	% moist.:	13.9	% moist.:	19.9
Unit Wt.(wet):	129.88	pcf	2.08	g/cm^3				
Unit Wt.(dry):	114.02	pcf	1.83	g/cm^3				

Specific Gravity:	2.80	Max Dry Density(pcf) =	114.0694	OMC =	13.9129741
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	104.62	Void ratio (e) =	0.53	Porosity (n)=	0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.31

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
11/28/2009	840	5.7	0.957301	24	0.910	1.05E-07	2.98E-04	
11/28/2009	960	5.6	1.057301	24	0.910	1.03E-07	2.92E-04	
11/28/2009	1080	5.53	1.127301	24	0.910	9.84E-08	2.79E-04	
11/28/2009	1200	5.47	1.187301	24	0.910	9.40E-08	2.66E-04	

SUMMARY

ka =	1.00E-07	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.05E-07	cm/sec	5.1	%	Vm = |ka-ki| / ka x 100
k2 =	1.03E-07	cm/sec	2.8	%	
k3 =	9.84E-08	cm/sec	1.7	%	
k4 =	9.40E-08	cm/sec	6.1	%	

Hydraulic conductivity	k =	1.00E-07	cm/sec	2.84E-04	ft/day
Void Ratio	e =	0.53			
Porosity	n =	0.35			
Bulk Density	γ =	2.08	g/cm3	129.9	pcf
Water Content	W =	0.25	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.03E-12	cm2	(at 20 deg C)	

Liquid Limit LL	35	
Plastic Limit PL	15	
Plasticity Index PI	20	
- 200 Sieve	59	%
+ No 40 Sieve	4	%
+ No 4 Sieve	1	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/12/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 380	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9402	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000444037	Annulus Ra	1.5	cm3
Other Location:	East-North-East Berm	M2 =	1.040953	T =	0.203785111			

Material Description : Red, Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			522.79	g	Tare No.:	T 18	Tare No.:	T 22
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	638.06	Wet Wt.+tare:	664.97
Wet Wt: of Sample :			522.79	g	Dry Wt.+tare:	559.69	Dry Wt.+tare:	577.70
Diameter :	2.70	in	6.87	cm2	Tare Wt:	146.74	Tare Wt:	140.49
Length :	2.70	in	6.86	cm	Dry Wt.:	412.95	Dry Wt.:	437.21
Area:	5.74	in^2	37.02	cm2	Water Wt.:	78.37	Water Wt.:	87.27
Volume :	15.50	in^3	254.08	cm3	% moist.:	19.0	% moist.:	20.0
Unit Wt.(wet):	128.39	pcf	2.06	g/cm^3				
Unit Wt.(dry):	107.91	pcf	1.73	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 107.9598 OMC = 18.9780845
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 95.90 Void ratio (e) = 0.56 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.38

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/12/2009	1140	5.7	0.95713	24.5	0.899	7.60E-08	2.15E-04	
12/12/2009	1380	5.6	1.05713	24.5	0.899	7.02E-08	1.99E-04	
12/12/2009	1620	5.5	1.15713	24.5	0.899	6.63E-08	1.88E-04	
12/12/2009	1920	5.4	1.25713	24.5	0.899	6.16E-08	1.75E-04	

SUMMARY

ka = 6.85E-08 cm/sec Acceptance criteria = 25 %

ki Vm

k1 =	7.60E-08	cm/sec	10.9	%
k2 =	7.02E-08	cm/sec	2.5	%
k3 =	6.63E-08	cm/sec	3.2	%
k4 =	6.16E-08	cm/sec	10.2	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	6.85E-08	cm/sec	1.94E-04	ft/day
Void Ratio	e =	0.56			
Porosity	n =	0.36			
Bulk Density	γ =	2.06	g/cm3	128.4	pcf
Water Content	W =	0.33	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	7.02E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	17
Plasticity Index	**PI**	**25**
- 200 Sieve		72 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/21/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 437	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9442	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000439561		Annulus Ra	1.5	cm3
Other Location:	West Berm	M2 =	1.040953	T = 0.20382216				

Material Description : Tan, Gray & Red Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			503.22	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			503.22	g	Tare No.:	T 21	Tare No.:	D-3
Diameter :	2.72	in	6.91	cm2	Wet Wt.+tare:	235.35	Wet Wt.+tare:	660.38
Length :	2.71	in	6.89	cm	Dry Wt.+tare:	213.96	Dry Wt.+tare:	547.57
Area:	5.82	in^2	37.54	cm2	Tare Wt:	140.34	Tare Wt:	152.55
Volume :	15.78	in^3	258.66	cm3	Dry Wt.:	73.62	Dry Wt.:	395.02
Unit Wt.(wet):	**121.40**	pcf	**1.95**	g/cm^3	Water Wt.:	21.39	Water Wt.:	112.81
Unit Wt.(dry):	**94.07**	pcf	**1.51**	g/cm^3	% moist.:	**29.1**	% moist.:	**28.6**

Specific Gravity: **2.70** Max Dry Density(pcf) = 94.1061 OMC = 29.0546047
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.36 Void ratio (e) = **0.79** Porosity (n)= **0.44**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/21/2009	3000	6.1	0.556238	24	0.910	1.60E-08	4.55E-05	
12/21/2009	3420	6.05	0.606238	24	0.910	1.54E-08	4.37E-05	
12/21/2009	3780	6	0.656238	24	0.910	1.52E-08	4.31E-05	
12/21/2009	4200	5.95	0.706238	24	0.910	1.48E-08	4.20E-05	

SUMMARY

ka =	1.54E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.60E-08	cm/sec	4.4	%	Vm = |ka-ki| / ka x 100
k2 =	1.54E-08	cm/sec	0.4	%	
k3 =	1.52E-08	cm/sec	1.1	%	
k4 =	1.48E-08	cm/sec	3.7	%	

Hydraulic conductivity	k =	**1.54E-08** cm/sec	**4.36E-05**	ft/day
Void Ratio	e =	**0.79**		
Porosity	n =	**0.44**		
Bulk Density	γ =	**1.95** g/cm3	**121.4**	pcf
Water Content	W =	**0.44** cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.57E-13** cm2	(at 20 deg C)	

Liquid Limit	LL	53
Plastic Limit	PL	22
Plasticity Index	**PI**	**31**
- 200 Sieve		85 %
+ No 40 Sieve		6 %
+ No 4 Sieve		2 %

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/22/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 454	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9443	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.00043996	Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T =	0.203776393			

Material Description : Red, Tan & Gray Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			515.74	g	Tare No.:	F 3	Tare No.:	T 19
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	497.52	Wet Wt.+tare:	712.39
Wet Wt: of Sample :			515.74	g	Dry Wt.+tare:	431.30	Dry Wt.+tare:	606.43
Diameter :	2.72	in	6.90	cm2	Tare Wt:	151.57	Tare Wt:	186.31
Length :	2.71	in	6.87	cm	Dry Wt.:	279.73	Dry Wt.:	420.12
Area:	5.80	in^2	37.41	cm2	Water Wt.:	66.22	Water Wt.:	105.96
Volume :	15.68	in^3	257.00	cm3	% moist.:	23.7	% moist.:	25.2
Unit Wt.(wet):	125.22	pcf	2.01	g/cm^3				
Unit Wt.(dry):	101.25	pcf	1.62	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 101.2953 OMC = 23.6728274
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.71 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.37

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/22/2009	2040	6.1	0.55734	25	0.889	2.31E-08	6.55E-05	
12/22/2009	2460	6.05	0.60734	25	0.889	2.10E-08	5.96E-05	
12/22/2009	2760	6	0.65734	25	0.889	2.04E-08	5.78E-05	
12/22/2009	3480	5.9	0.75734	25	0.889	1.88E-08	5.34E-05	

SUMMARY

ka = 2.08E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.31E-08 cm/sec	10.9	%
k2 =	2.10E-08 cm/sec	0.8	%
k3 =	2.04E-08 cm/sec	2.2	%
k4 =	1.88E-08 cm/sec	9.6	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.08E-08**	cm/sec	**5.91E-05**	ft/day
Void Ratio	e =	**0.70**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**2.01**	g/cm3	**125.2**	pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.14E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	53
Plastic Limit	PL	21
Plasticity Index	**PI**	**32**
- 200 Sieve		85 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/22/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 455	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9444	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000444495	Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T =	0.203777664			

Material Description : Red, Tan & Gray Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.57	g	Tare No.:	3-A	Tare No.:	T 20
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	557.36	Wet Wt.+tare:	689.26
Wet Wt: of Sample :			516.57	g	Dry Wt.+tare:	474.66	Dry Wt.+tare:	579.16
Diameter :	2.73	in	6.92	cm2	Tare Wt:	165.71	Tare Wt:	160.23
Length :	2.75	in	6.98	cm	Dry Wt.:	308.95	Dry Wt.:	418.93
Area:	5.83	in^2	37.63	cm2	Water Wt.:	82.7	Water Wt.:	110.1
Volume :	16.03	in^3	262.72	cm3	% moist.:	26.8	% moist.:	26.3
Unit Wt.(wet):	122.69	pcf	1.97	g/cm^3				
Unit Wt.(dry):	96.78	pcf	1.55	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 96.82575 OMC = 26.7680855
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 95.68 Void ratio (e) = 0.74 Porosity (n)= 0.43

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/22/2009	780	6	0.657309	25	0.889	7.29E-08	2.07E-04	
12/22/2009	1020	5.9	0.757309	25	0.889	6.50E-08	1.84E-04	
12/22/2009	1260	5.8	0.857309	25	0.889	6.02E-08	1.71E-04	
12/22/2009	1500	5.7	0.957309	25	0.889	5.72E-08	1.62E-04	

SUMMARY

ka = 6.38E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	7.29E-08 cm/sec	14.2	%
k2 =	6.50E-08 cm/sec	1.8	%
k3 =	6.02E-08 cm/sec	5.6	%
k4 =	5.72E-08 cm/sec	10.4	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	6.38E-08	cm/sec	1.81E-04	ft/day
Void Ratio	e =	0.74			
Porosity	n =	0.43			
Bulk Density	γ =	1.97	g/cm3	122.7	pcf
Water Content	W =	0.42	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.54E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	52
Plastic Limit	PL	27
Plasticity Index	**PI**	**25**
- 200 Sieve		85 %
+ No 40 Sieve		5 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 3/22/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 825	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9634	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000443872	Annulus Ra	1.5	cm3
Other Location:	South Liner	M2 =	1.040953	T =	0.203883644			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			525.07	g	Tare No.:	T 19	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	514.14	Wet Wt.+tare:	747.00
Wet Wt: of Sample :			525.07	g	Dry Wt.+tare:	460.40	Dry Wt.+tare:	650.70
Diameter :	2.70	in	6.87	cm2	Tare Wt:	186.30	Tare Wt:	217.30
Length :	2.70	in	6.87	cm	Dry Wt.:	274.1	Dry Wt.:	433.4
Area:	5.74	in^2	37.05	cm2	Water Wt.:	53.74	Water Wt.:	96.3
Volume :	15.52	in^3	254.36	cm3	% moist.:	19.6	% moist.:	22.2
Unit Wt.(wet):	128.81	pcf	2.06	g/cm^3				
Unit Wt.(dry):	107.70	pcf	1.73	g/cm^3				

Specific Gravity: 2.80 Max Dry Density(pcf) = 107.7418 OMC = 19.6059832
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.84 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.37

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
3/22/2010	1020	5.7	0.954758	23.5	0.920	8.67E-08	2.46E-04	
3/22/2010	1260	5.6	1.054758	23.5	0.920	7.85E-08	2.23E-04	
3/22/2010	1560	5.5	1.154758	23.5	0.920	7.03E-08	1.99E-04	
3/22/2010	1920	5.4	1.254758	23.5	0.920	6.29E-08	1.78E-04	

SUMMARY

ka = 7.46E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	8.67E-08 cm/sec	16.2	%	Vm = |ka-ki| / ka x 100
k2 =	7.85E-08 cm/sec	5.2	%	
k3 =	7.03E-08 cm/sec	5.8	%	
k4 =	6.29E-08 cm/sec	15.7	%	

Hydraulic conductivity	k =	**7.46E-08**	cm/sec	**2.11E-04**	ft/day
Void Ratio	e =	**0.62**			
Porosity	n =	**0.38**			
Bulk Density	γ =	**2.06**	g/cm3	**128.8**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**7.64E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	19
Plasticity Index	**PI**	**22**
- 200 Sieve		81 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/13/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 975	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9668	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000448576		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203805669				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			527.39	g	Tare No.:	20A	Tare No.:	T 19
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	481.10	Wet Wt.+tare:	722.63
Wet Wt: of Sample :			527.39	g	Dry Wt.+tare:	422.93	Dry Wt.+tare:	623.17
Diameter :	2.72	in	6.90	cm2	Tare Wt:	135.08	Tare Wt:	186.29
Length :	2.76	in	7.01	cm	Dry Wt.:	287.85	Dry Wt.:	436.88
Area:	5.80	in^2	37.43	cm2	Water Wt.:	58.17	Water Wt.:	99.46
Volume :	16.01	in^3	262.42	cm3	% moist.:	20.2	% moist.:	22.8
Unit Wt.(wet):	125.41	pcf	2.01	g/cm^3				
Unit Wt.(dry):	104.32	pcf	1.67	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 104.3682 OMC = 20.2084419
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.83 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.18

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/13/2010	1680	5	1.656635	25	0.889	9.78E-08	2.77E-04	
4/13/2010	1800	4.9	1.756635	25	0.889	9.82E-08	2.78E-04	
4/13/2010	1920	4.8	1.856635	25	0.889	9.88E-08	2.80E-04	
4/13/2010	2040	4.7	1.956635	25	0.889	9.95E-08	2.82E-04	

SUMMARY

ka = 9.86E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.78E-08 cm/sec	0.8	%
k2 =	9.82E-08 cm/sec	0.4	%
k3 =	9.88E-08 cm/sec	0.2	%
k4 =	9.95E-08 cm/sec	0.9	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.86E-08	cm/sec	2.79E-04 ft/day
Void Ratio	e =	0.62		
Porosity	n =	0.38		
Bulk Density	γ =	2.01	g/cm3	125.4 pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	1.01E-12	cm2	(at 20 deg C)

Liquid Limit	LL	42
Plastic Limit	PL	20
Plasticity Index	**PI**	**22**
- 200 Sieve		75 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/20/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1000	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9676	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000438355	Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T =	0.203790049			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.64	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 10	Tare No.:	T 11
Wet Wt: of Sample :			519.64	g	Wet Wt.+tare:	679.60	Wet Wt.+tare:	744.69
Diameter :	2.73	in	6.93	cm2	Dry Wt.+tare:	597.75	Dry Wt.+tare:	643.43
Length :	2.72	in	6.90	cm	Tare Wt:	221.13	Tare Wt:	219.32
Area:	5.84	in^2	37.71	cm2	Dry Wt.:	376.62	Dry Wt.:	424.11
Volume :	15.88	in^3	260.24	cm3	Water Wt.:	81.85	Water Wt.:	101.26
Unit Wt.(wet):	124.60	pcf	2.00	g/cm^3	% moist.:	21.7	% moist.:	23.9
Unit Wt.(dry):	102.36	pcf	1.64	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 102.3991 OMC = 21.7327811
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.66 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.33

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/13/2010	780	5.7	0.957011	25	0.889	1.08E-07	3.07E-04	
4/13/2010	960	5.6	1.057011	25	0.889	9.85E-08	2.79E-04	
4/13/2010	1140	5.5	1.157011	25	0.889	9.19E-08	2.61E-04	
4/13/2010	1320	5.4	1.257011	25	0.889	8.74E-08	2.48E-04	

SUMMARY

ka = 9.66E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.08E-07 cm/sec	12.3	%
k2 =	9.85E-08 cm/sec	2.0	%
k3 =	9.19E-08 cm/sec	4.8	%
k4 =	8.74E-08 cm/sec	9.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.66E-08	cm/sec	2.74E-04	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.39			
Bulk Density	γ =	2.00	g/cm3	124.6	pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.89E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	19
Plasticity Index	**PI**	**24**
- 200 Sieve		88 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/23/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1020	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9678	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000442398		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203785111				

Material Description : Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			512.63	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 18	Tare No.:	T 19
Wet Wt: of Sample :			512.63	g	Wet Wt.+tare:	617.39	Wet Wt.+tare:	701.78
Diameter :	2.71	in	6.88	cm2	Dry Wt.+tare:	538.40	Dry Wt.+tare:	609.16
Length :	2.70	in	6.86	cm	Tare Wt:	146.72	Tare Wt:	186.35
Area:	5.76	in^2	37.16	cm2	Dry Wt.:	391.68	Dry Wt.:	422.81
Volume :	15.56	in^3	255.02	cm3	Water Wt.:	78.99	Water Wt.:	92.62
Unit Wt.(wet):	**125.43**	pcf	**2.01**	g/cm^3	% moist.:	**20.2**	% moist.:	**21.9**
Unit Wt.(dry):	**104.38**	pcf	**1.67**	g/cm^3				

Specific Gravity: **2.70** Max Dry Density(pcf) = 104.4277 OMC = 20.166973
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.20 Void ratio (e) = **0.61** Porosity (n)= **0.38**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.38

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/23/2010	5580	5.7	0.95713	25	0.889	1.53E-08	4.34E-05	
4/23/2010	6360	5.6	1.05713	25	0.889	1.50E-08	4.25E-05	
4/23/2010	7140	5.5	1.15713	25.5	0.879	1.47E-08	4.15E-05	
4/23/2010	7980	5.4	1.25713	25.5	0.879	1.44E-08	4.09E-05	

SUMMARY

ka =	1.48E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	1.53E-08	cm/sec	3.0	%	Vm = |ka-ki| / ka x 100
k2 =	1.50E-08	cm/sec	1.1	%	
k3 =	1.47E-08	cm/sec	1.3	%	
k4 =	1.44E-08	cm/sec	2.8	%	

Hydraulic conductivity	k =	**1.48E-08**	cm/sec	**4.21E-05**	ft/day
Void Ratio	e =	**0.61**			
Porosity	n =	**0.38**			
Bulk Density	γ =	**2.01**	g/cm3	**125.4**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.52E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	35
Plastic Limit	PL	15
Plasticity Index	**PI**	**20**
- 200 Sieve		66 %
+ No 40 Sieve		3 %
+ No 4 Sieve		2 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/23/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1035	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9679	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000441897		Annulus Ra	1.5	cm3
Other Location:	Central Liner	M2 =	1.040953	T = 0.203777664				

Material Description : Red & Tan Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			529.11	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 18
Wet Wt: of Sample :			529.11	g	Wet Wt.+tare:	750.43	Wet Wt.+tare:	678.71
Diameter :	2.73	in	6.94	cm2	Dry Wt.+tare:	645.02	Dry Wt.+tare:	571.22
Length :	2.75	in	6.98	cm	Tare Wt:	186.38	Tare Wt:	146.70
Area:	5.87	in^2	37.85	cm2	Dry Wt.:	458.64	Dry Wt.:	424.52
Volume :	16.13	in^3	264.27	cm3	Water Wt.:	105.41	Water Wt.:	107.49
Unit Wt.(wet):	**124.94**	pcf	**2.00**	g/cm^3	% moist.:	**23.0**	% moist.:	**25.3**
Unit Wt.(dry):	**101.59**	pcf	**1.63**	g/cm^3				

Specific Gravity: **2.77** Max Dry Density(pcf) = 101.6309 OMC = 22.9831676
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.87 Void ratio (e) = **0.70** Porosity (n)= **0.41**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/23/2010	4140	6.3	0.357309	25	0.889	7.18E-09	2.03E-05	
4/23/2010	4800	6.25	0.407309	25	0.889	7.09E-09	2.01E-05	
4/23/2010	6660	6.2	0.457309	25	0.889	5.77E-09	1.64E-05	
4/23/2010	8940	6.1	0.557309	25	0.889	5.30E-09	1.50E-05	

SUMMARY

ka = 6.33E-09 cm/sec Acceptance criteria = 50 %

ki		Vm	
k1 =	7.18E-09 cm/sec	13.3	%
k2 =	7.09E-09 cm/sec	12.0	%
k3 =	5.77E-09 cm/sec	8.9	%
k4 =	5.30E-09 cm/sec	16.4	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**6.33E-09**	cm/sec	**1.80E-05**	ft/day
Void Ratio	e =	**0.70**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**2.00**	g/cm3	**124.9**	pcf
Water Content	W =	**0.37**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**6.49E-14**	cm2	(at 20 deg C)	

Liquid Limit LL	55	
Plastic Limit PL	19	
Plasticity Index PI	**36**	
- 200 Sieve	72	%
+ No 40 Sieve	3	%
+ No 4 Sieve	1	%

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/28/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1061	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3
Sample:	9684	a_s =	0.767120 cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	Lift 4	M_1 =	0.030180 C =	0.000443144	Annulus Ra	1.5	cm^3
Other Location:	South- East Liner	M_2 =	1.040953 T =	0.203785561			

Material Description : Tan, Gray & Red Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.00	g	Tare No.:	T 23	Tare No.:	T10
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	581.50	Wet Wt.+tare	761.48
Wet Wt: of Sample :			533.00	g	Dry Wt.+tare:	513.21	Dry Wt.+tare:	671.42
Diameter :	2.72	in	6.91	cm^2	Tare Wt:	140.29	Tare Wt:	221.16
Length :	2.73	in	6.94	cm	Dry Wt.:	372.92	Dry Wt.:	450.26
Area:	5.81	in^2	37.51	cm^2	Water Wt.:	68.29	Water Wt.:	90.06
Volume :	15.88	in^3	260.28	cm^3	% moist.:	18.3	% moist.:	20.0
Unit Wt.(wet):	127.78	pcf	2.05	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	108.01	pcf	1.73	$g/cm^{\wedge 3}$				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = 108.0525 OMC = 18.3122385
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.32 Void ratio (e) = 0.56 Porosity (n)= 0.36

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 9.28

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/29/2010	1140	5.7	0.957119	25.2	0.885	7.47E-08	2.12E-04	
4/29/2010	1680	5.6	1.057119	25.2	0.885	5.66E-08	1.61E-04	
4/29/2010	1920	5.5	1.157119	25.2	0.885	5.49E-08	1.56E-04	
4/29/2010	2160	5.4	1.257119	25.2	0.885	5.37E-08	1.52E-04	

SUMMARY

ka = 6.00E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.47E-08 cm/sec	24.4	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	5.66E-08 cm/sec	5.6	%	
k3 =	5.49E-08 cm/sec	8.4	%	
k4 =	5.37E-08 cm/sec	10.4	%	

Hydraulic conductivity	k =	6.00E-08	cm/sec	1.70E-04	ft/day
Void Ratio	e =	0.56			
Porosity	n =	0.36			
Bulk Density	γ =	2.05	g/cm^3	127.8	pcf
Water Content	W =	0.32	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	6.15E-13	cm^2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	18
Plasticity Index	**PI**	**20**
- 200 Sieve		60 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/28/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1070	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3
Sample:	9685	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	Lift 4	M_1 =	0.030180 C =	0.000442301	Annulus Ra	1.5	cm^3
Other Location:	South Liner	M_2 =	1.040953 T =	0.203772726			

Material Description : Tan & Gray lean Clay with sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			523.08 g		Tare No.:	T 16	Tare No.:	T-4
Tare or ring Wt. :			0.0 g		Wet Wt.+tare:	612.68	Wet Wt.+tare	745.75
Wet Wt: of Sample :			523.08 g		Dry Wt.+tare:	529.97	Dry Wt.+tare:	651.23
Diameter :	2.72	in	6.91 cm^2		Tare Wt:	151.98	Tare Wt:	219.49
Length :	2.73	in	6.92 cm		Dry Wt.:	377.99	Dry Wt.:	431.74
Area:	5.81	in^2	37.50 cm^2		Water Wt.:	82.71	Water Wt.:	94.52
Volume :	15.84	in^3	259.63 cm^3		% moist.:	21.9	% moist.:	21.9
Unit Wt.(wet):	125.72	pcf	2.01 $g/cm^{\wedge 3}$					
Unit Wt.(dry):	103.15	pcf	1.65 $g/cm^{\wedge 3}$					

Assumed Specific Gravity: 2.65 Max Dry Density(pcf) = 103.193 OMC = 21.8815313
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.07 Void ratio (e) = 0.60 Porosity (n)= 0.38

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/28/2010	2520	5.7	0.9574281	25	0.889	3.39E-08	9.60E-05	
4/28/2010	3120	5.6	1.0574281	25	0.889	3.06E-08	8.67E-05	
4/28/2010	3780	5.5	1.1574281	25	0.889	2.80E-08	7.93E-05	
4/28/2010	4800	5.4	1.2574281	25	0.889	2.43E-08	6.88E-05	

SUMMARY

ka = 2.92E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.39E-08 cm/sec	16.1	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	3.06E-08 cm/sec	4.8	%	
k3 =	2.80E-08 cm/sec	4.1	%	
k4 =	2.43E-08 cm/sec	16.9	%	

Hydraulic conductivity	k =	2.92E-08	cm/sec	8.27E-05	ft/day
Void Ratio	e =	0.60			
Porosity	n =	0.38			
Bulk Density	γ =	2.01	g/cm^3	125.7	pcf
Water Content	W =	0.36	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	2.99E-13	cm^2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	22
Plasticity Index	**PI**	**25**
- 200 Sieve		73 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/28/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1090	a_p =	0.031416 cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.8	cm^3
Sample:	9686	a_a =	0.767120 cm^2		Pipet Rp	6.7	cm^3
Depth (ft):	Lift 4	M_1 =	0.030180 C =	0.000441212	Annulus Ra	1.5	cm^3
Other Location:	Central Liner	M_2 =	1.040953 T =	0.203783623			

Material Description : Tan & Gray Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			530.13	g	Tare No.:	T 20	Tare No.:	T-3
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	597.68	Wet Wt.+tare	764.64
Wet Wt: of Sample :			530.13	g	Dry Wt.+tare:	529.27	Dry Wt.+tare:	672.77
Diameter :	2.72	in	6.90	cm^2	Tare Wt:	160.22	Tare Wt:	220.72
Length :	2.71	in	6.88	cm	Dry Wt.:	369.05	Dry Wt.:	452.05
Area:	5.79	in^2	37.36	cm^2	Water Wt.:	68.41	Water Wt.:	91.87
Volume :	15.69	in^3	257.09	cm^3	% moist.:	18.5	% moist.:	20.3
Unit Wt.(wet):	128.67	pcf	2.06	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	108.55	pcf	1.74	$g/cm^{\wedge 3}$				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = 108.5965 OMC = 18.5367836
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.25 Void ratio (e) = 0.55 Porosity (n)= 0.36

TEST READINGS

Z_1(Mercury Height Difference @ t_f): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/29/2010	1620	5.7	0.9571657	25.2	0.885	5.23E-08	1.48E-04	
4/29/2010	1860	5.6	1.0571657	25.2	0.885	5.09E-08	1.44E-04	
4/29/2010	2100	5.5	1.1571657	25.2	0.885	5.00E-08	1.42E-04	
4/29/2010	2400	5.4	1.2571657	25.2	0.885	4.82E-08	1.37E-04	

SUMMARY

ka = 5.04E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.23E-08 cm/sec	3.9	%
k2 =	5.09E-08 cm/sec	1.2	%
k3 =	5.00E-08 cm/sec	0.7	%
k4 =	4.82E-08 cm/sec	4.4	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**5.04E-08**	cm/sec	**1.43E-04**	ft/day
Void Ratio	e =	**0.55**			
Porosity	n =	**0.36**			
Bulk Density	γ =	**2.06**	g/cm^3	**128.7**	pcf
Water Content	W =	**0.32**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**5.16E-13**	cm^2	(at 20 deg C)	

Liquid Limit	LL	50
Plastic Limit	PL	20
Plasticity Index	**PI**	**30**
- 200 Sieve		72 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/28/2010 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data
Boring No.: Density # 1098
Sample: 9687
Depth (ft): Lift 4
Other Location: Central Liner
Material Description : Red & Gray Lean Clay w/ Sand

a_p = 0.031416 cm^2
a_a = 0.767120 cm^2
M_1 = 0.030180 C = 0.00044121
M_2 = 1.040953 T = 0.203777243

Set Mercury to Pipet Rp at beginning

Equilibrium 1.8 cm^3
Pipet Rp 6.7 cm^3
Annulus Ra 1.5 cm^3

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			505.69	g	Tare No.:	T 18	Tare No.:	T-1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	588.62	Wet Wt.+tare	735.17
Wet Wt: of Sample :			505.69	g	Dry Wt.+tare:	516.12	Dry Wt.+tare:	635.57
Diameter :	2.71	in	6.89	cm^2	Tare Wt:	146.74	Tare Wt:	217.28
Length :	2.70	in	6.87	cm	Dry Wt.:	369.38	Dry Wt.:	418.29
Area:	5.78	in^2	37.30	cm^2	Water Wt.:	72.5	Water Wt.:	99.6
Volume :	15.64	in^3	256.22	cm^3	% moist.:	19.6	% moist.:	23.8
Unit Wt.(wet):	123.16	pcf	1.97	$g/cm^{\wedge 3}$				
Unit Wt.(dry):	102.95	pcf	1.65	$g/cm^{\wedge 3}$				

Assumed Specific Gravity: 2.73 Max Dry Density(pcf) = 102.9945 OMC = 19.6274839
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.17 Void ratio (e) = 0.66 Porosity (n)= 0.40

TEST READINGS

Z_1(Mercury Height Difference @ t_1): 5.1 cm Hydraulic Gradient = 9.37

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/29/2010	960	5.7	0.9573193	25	0.889	8.87E-08	2.51E-04	
4/29/2010	1080	5.6	1.0573193	25	0.889	8.82E-08	2.50E-04	
4/29/2010	1260	5.5	1.1573193	25	0.889	8.38E-08	2.37E-04	
4/29/2010	1440	5.4	1.2573193	25	0.889	8.06E-08	2.29E-04	

SUMMARY

ka = 8.53E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	8.87E-08 cm/sec	4.0	%
k2 =	8.82E-08 cm/sec	3.3	%
k3 =	8.38E-08 cm/sec	1.8	%
k4 =	8.06E-08 cm/sec	5.5	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**8.53E-08**	cm/sec	**2.42E-04**	ft/day
Void Ratio	e =	**0.66**			
Porosity	n =	**0.40**			
Bulk Density	γ =	**1.97**	g/cm^3	**123.2**	pcf
Water Content	W =	**0.32**	cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**8.74E-13**	cm^2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	20
Plasticity Index	**PI**	**16**
- 200 Sieve		73 %
+ No 40 Sieve		7 %
+ No 4 Sieve		2 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 4/28/2010 Panel Number : P 5 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 1099	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9689	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000440234		Annulus Ra	1.5	cm3
Other Location:	West Central Liner	M2 =	1.040953	T = 0.203775789				

Material Description : Red, Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			527.04	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 12
Wet Wt: of Sample :			527.04	g				
Diameter :	2.72	in	6.90	cm2	Wet Wt.+tare:	495.68	Wet Wt.+tare:	751.44
Length :	2.70	in	6.86	cm	Dry Wt.+tare:	449.45	Dry Wt.+tare:	665.76
Area:	5.79	in^2	37.35	cm2	Tare Wt:	186.35	Tare Wt:	220.19
Volume :	15.65	in^3	256.41	cm3	Dry Wt.:	263.1	Dry Wt.:	445.57
Unit Wt.(wet):	**128.26**	pcf	**2.06**	g/cm^3	Water Wt.:	46.23	Water Wt.:	85.68
Unit Wt.(dry):	**109.09**	pcf	**1.75**	g/cm^3	% moist.:	**17.6**	% moist.:	**19.2**

Assumed Specific Gravity: **2.65** Max Dry Density(pcf) = 109.1401 OMC = 17.5712657
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.66 Void ratio (e) = **0.52** Porosity (n)= **0.34**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.38

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
4/29/2010	1620	5.7	0.957354	25.2	0.885	5.22E-08	1.48E-04	
4/29/2010	1920	5.6	1.057354	25.2	0.885	4.93E-08	1.40E-04	
4/29/2010	2220	5.5	1.157354	25.2	0.885	4.72E-08	1.34E-04	
4/29/2010	2580	5.4	1.257354	25.2	0.885	4.47E-08	1.27E-04	

SUMMARY

ka = 4.83E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.22E-08 cm/sec	8.0	%
k2 =	4.93E-08 cm/sec	1.9	%
k3 =	4.72E-08 cm/sec	2.3	%
k4 =	4.47E-08 cm/sec	7.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**4.83E-08**	cm/sec	**1.37E-04**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.06**	g/cm3	**128.3**	pcf
Water Content	W =	**0.31**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.95E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	38	
Plastic Limit PL	17	
Plasticity Index PI	21	
- 200 Sieve	61	%
+ No 40 Sieve	4	%
+ No 4 Sieve	1	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test) ASTM D 5084

Project : Luminant Martin Lake PDP 1-3
Date: 5/3/2010 Panel Number : P-4
Project No. : L 213-09 Permometer Data
Boring No.: Lift #4
Sample: 9694
Depth (ft):
Other Location: Density #1122
Material Description : Red, Tan & Gray Sandy Lean Clay

a_p =	0.031416	cm^2	Set Mercury to Pipet Rp at beginning	Equilibrium	1.7	cm^3
a_a =	0.767120	cm^2		Pipet Rp	6.7	cm^3
M_1 =	0.030180	C = 0.000431384		Annulus Ra	1.5	cm^3
M_2 =	1.040953	T = 0.201511953				

SAMPLE DATA

					Before Test		After Test
Wet Wt. sample + ring or tare :			538.68 g				
Tare or ring Wt. :			0.0 g				
Wet Wt: of Sample :			538.68 g	Tare No.:	T-17	Tare No.:	21-A
Diameter :	2.75	in	6.97 cm^2	Wet Wt+tare:	363.02	Wet Wt+tare	677.15
Length :	2.73	In	6.93 cm	Dry Wt+tare:	330.46	Dry Wt+tare:	582.93
Area:	5.92	in^2	38.21 cm^2	Tare Wt:	146.74	Tare Wt:	134.57
Volume :	16.17	in^3	264.94 cm^3	Dry Wt.:	183.72	Dry Wt.:	448.36
Unit Wt.(wet):	**126.87**	pcf	**2.03** $g/cm^{\wedge 3}$	Water Wt.:	32.56	Water Wt.:	94.22
Unit Wt.(dry):	**107.77**	pcf	**1.73** $g/cm^{\wedge 3}$	% moist.:	**17.7**	% moist.:	**21.0**

Assumed Specific Gravity: **2.71**

Calculated % saturation: 99.93 Void ratio (e) = **0.57** Porosity (n)= **0.36**

TEST READINGS

Z_1(Mercury Height Difference @ t_i): 5.2 cm Hydraulic Gradient = 9.40

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZp (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
5/3/2010	4980	6.0	0.66048	25	0.889	1.10E-08	3.11E-05	
5/3/2010	6180	5.9	0.76048	25	0.889	1.03E-08	2.92E-05	
5/3/2010	7560	5.85	0.81048	25	0.889	9.02E-09	2.56E-05	
5/3/2010	8340	5.8	0.86048	25	0.889	8.73E-09	2.48E-05	

SUMMARY

ka =	9.76E-09	cm/sec		Acceptance criteria =	50 %
ki			Vm		
k1 =	1.10E-08	cm/sec	12.5	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	1.03E-08	cm/sec	5.5	%	
k3 =	9.02E-09	cm/sec	7.5	%	
k4 =	8.73E-09	cm/sec	10.5	%	

Hydraulic conductivity	k =	**9.76E-09** cm/sec	**2.77E-05**	ft/day
Void Ratio	e =	**0.57**		
Porosity	n =	**0.36**		
Bulk Density	γ =	**2.03** g/cm^3	**126.9**	pcf
Water Content	W =	**0.31** cm^3/cm^3	(at 20 deg C)	
Intrinsic Permeability	k_{int} =	**9.99E-14** cm^2	(at 20 deg C)	

Liquid Limit LL	44	
Plastic Limit PL	16	
Plasticity Index PI	28	
- 200 Sieve	68	%
+ No 40 Sieve	4	%
+ No 4 Sieve	2	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/16/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 28	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9871	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C =	0.000439726	Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T =	0.203790089			

Material Description : Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.86	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			516.86	g	Tare No.:	T 17	Tare No.:	T 5
Diameter :	2.73	in	6.92	cm2	Wet Wt.+tare:	267.95	Wet Wt.+tare:	743.31
Length :	2.72	in	6.91	cm	Dry Wt.+tare:	246.61	Dry Wt.+tare:	640.01
Area:	5.83	in^2	37.64	cm2	Tare Wt:	146.75	Tare Wt:	218.76
Volume :	15.87	in^3	260.10	cm3	Dry Wt.:	99.86	Dry Wt.:	421.25
Unit Wt.(wet):	**124.00**	pcf	**1.99**	g/cm^3	Water Wt.:	21.34	Water Wt.:	103.3
Unit Wt.(dry):	**102.17**	pcf	**1.64**	g/cm^3	% moist.:	**21.4**	% moist.:	**24.5**

Assumed Specific Gravity: **2.75** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.11 Void ratio (e) = **0.68** Porosity (n)= **0.40**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.31

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/16/2010	1260	5.7	0.95701	25	0.889	6.73E-08	1.91E-04	
8/16/2010	1500	5.6	1.05701	25	0.889	6.32E-08	1.79E-04	
8/16/2010	2280	5.5	1.15701	25	0.889	4.61E-08	1.31E-04	
8/16/2010	2700	5.4	1.25701	25	0.889	4.29E-08	1.21E-04	

SUMMARY

ka = 5.49E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	6.73E-08 cm/sec	22.7	%
k2 =	6.32E-08 cm/sec	15.2	%
k3 =	4.61E-08 cm/sec	16.0	%
k4 =	4.29E-08 cm/sec	21.9	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**5.49E-08**	cm/sec	**1.56E-04** ft/day
Void Ratio	e =	**0.68**		
Porosity	n =	**0.40**		
Bulk Density	γ =	**1.99**	g/cm3	**124.0** pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	**5.62E-13**	cm2	(at 20 deg C)

Liquid Limit	LL	33
Plastic Limit	PL	16
Plasticity Index	**PI**	**17**
- 200 Sieve		62 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/6/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9948	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4, Density P-140	M1 =	0.030180	C =	0.000444594	Annulus Ra	1.5	cm3
Other Location:	South Perimeter	M2 =	1.040953	T =	0.203791995			

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			509.12	g	Tare No.:	T 19	Tare No.:	T 12
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	569.76	Wet Wt.+tare:	738.44
Wet Wt: of Sample :			509.12	g	Dry Wt.+tare:	502.43	Dry Wt.+tare:	640.94
Diameter :	2.71	in	6.87	cm2	Tare Wt:	186.29	Tare Wt:	220.20
Length :	2.71	in	6.88	cm	Dry Wt.:	316.14	Dry Wt.:	420.74
Area:	5.75	in^2	37.08	cm2	Water Wt.:	67.33	Water Wt.:	97.5
Volume :	15.58	in^3	255.26	cm3	% moist.:	21.3	% moist.:	23.2
Unit Wt.(wet):	124.46	pcf	1.99	g/cm^3				
Unit Wt.(dry):	102.60	pcf	1.64	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.33 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/6/2010	1320	6.1	0.556964	25.5	0.879	3.57E-08	1.01E-04	
10/6/2010	1860	6	0.656964	25.5	0.879	3.02E-08	8.56E-05	
10/6/2010	2520	5.9	0.756964	25.5	0.879	2.60E-08	7.37E-05	
10/6/2010	3240	5.8	0.856964	25.5	0.879	2.32E-08	6.56E-05	

SUMMARY

ka = 2.88E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.57E-08 cm/sec	24.1	%	Vm = |ka-ki| / ka x 100
k2 =	3.02E-08 cm/sec	5.0	%	
k3 =	2.60E-08 cm/sec	9.6	%	
k4 =	2.32E-08 cm/sec	19.5	%	

Hydraulic conductivity	k =	**2.88E-08**	cm/sec	**8.15E-05**	ft/day
Void Ratio	e =	**0.64**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**1.99**	g/cm3	**124.5**	pcf
Water Content	W =	**0.35**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.95E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	22
Plasticity Index	**PI**	**22**
- 200 Sieve		95 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/11/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9954 A	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4, Density P-202	M1 =	0.030180	C = 0.00044233		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			535.11	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 23	Tare No.:	T 10
Wet Wt: of Sample :			535.11	g	Wet Wt.+tare:	309.73	Wet Wt.+tare:	760.58
Diameter :	2.72	in	6.92	cm2	Dry Wt.+tare:	281.56	Dry Wt.+tare:	670.00
Length :	2.73	in	6.94	cm	Tare Wt:	140.29	Tare Wt:	221.13
Area:	5.83	in^2	37.59	cm2	Dry Wt.:	141.27	Dry Wt.:	448.87
Volume :	15.92	in^3	260.95	cm3	Water Wt.:	28.17	Water Wt.:	90.58
Unit Wt.(wet):	127.96	pcf	2.05	g/cm^3	% moist.:	19.9	% moist.:	20.2
Unit Wt.(dry):	106.69	pcf	1.71	g/cm^3				

Assumed Specific Gravity: 2.65 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.11 Void ratio (e) = 0.55 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.27

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	900	6.3	0.357171	25	0.889	3.30E-08	9.36E-05	
10/11/2010	1560	6.1	0.557171	25	0.889	3.04E-08	8.61E-05	
10/11/2010	2580	5.9	0.757171	25	0.889	2.55E-08	7.24E-05	
10/11/2010	3480	5.8	0.857171	25	0.889	2.17E-08	6.15E-05	

SUMMARY

ka = 2.77E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.30E-08 cm/sec	19.4	%
k2 =	3.04E-08 cm/sec	9.8	%
k3 =	2.55E-08 cm/sec	7.6	%
k4 =	2.17E-08 cm/sec	21.6	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	2.77E-08	cm/sec	7.84E-05	ft/day
Void Ratio	e =	0.55			
Porosity	n =	0.36			
Bulk Density	γ =	2.05	g/cm3	128.0	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.83E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	17
Plasticity Index	**PI**	21
- 200 Sieve		90 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 4; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9959 D	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4, Density P-203	M1 =	0.030180	C =	0.000442591	Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.53	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 13	Tare No.:	T 10
Wet Wt: of Sample :			516.53	g				
Diameter :	2.72	in	6.91	cm2	Wet Wt.+tare:	836.26	Wet Wt.+tare:	739.78
Length :	2.73	in	6.94	cm	Dry Wt.+tare:	722.45	Dry Wt.+tare:	635.56
Area:	5.82	in^2	37.54	cm2	Tare Wt:	219.68	Tare Wt:	221.14
Volume :	15.89	in^3	260.45	cm3	Dry Wt.:	502.77	Dry Wt.:	414.42
Unit Wt.(wet):	123.75	pcf	1.98	g/cm^3	Water Wt.:	113.81	Water Wt.:	104.22
Unit Wt.(dry):	100.91	pcf	1.62	g/cm^3	% moist.:	22.6	% moist.:	25.1

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.61 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.28

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	1680	6.2	0.457171	25	0.889	2.29E-08	6.49E-05	
10/12/2010	1920	6.15	0.507171	25	0.889	2.24E-08	6.34E-05	
10/12/2010	2220	6.1	0.557171	25	0.889	2.14E-08	6.06E-05	
10/12/2010	2580	6.05	0.607171	25	0.889	2.01E-08	5.71E-05	

SUMMARY

ka = 2.17E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.29E-08 cm/sec	5.6	%	Vm = |ka-ki| / ka x 100
k2 =	2.24E-08 cm/sec	3.1	%	
k3 =	2.14E-08 cm/sec	1.5	%	
k4 =	2.01E-08 cm/sec	7.1	%	

Hydraulic conductivity	k =	**2.17E-08**	cm/sec	**6.15E-05**	ft/day
Void Ratio	e =	**0.70**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**1.98**	g/cm3	**123.8**	pcf
Water Content	W =	**0.37**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.22E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	21
Plasticity Index	**PI**	**22**
- 200 Sieve		86 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 5; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9960 A	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 4, Density P-204	M1 =	0.030180	C =	0.00044258	Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.51	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 14	Tare No.:	T 12
Wet Wt: of Sample :			516.51	g	Wet Wt.+tare:	897.78	Wet Wt.+tare:	739.03
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	767.96	Dry Wt.+tare:	641.48
Length :	2.71	in	6.90	cm	Tare Wt:	221.17	Tare Wt:	220.23
Area:	5.78	in^2	37.32	cm2	Dry Wt.:	546.79	Dry Wt.:	421.25
Volume :	15.70	in^3	257.32	cm3	Water Wt.:	129.82	Water Wt.:	97.55
Unit Wt.(wet):	125.25	pcf	2.01	g/cm^3	% moist.:	23.7	% moist.:	23.2
Unit Wt.(dry):	101.22	pcf	1.62	g/cm^3				

Assumed Specific Gravity: 2.65 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.73 Void ratio (e) = 0.63 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.33

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	1440	6.1	0.557171	25	0.889	3.29E-08	9.34E-05	
10/12/2010	1860	6	0.657171	25	0.889	3.04E-08	8.62E-05	
10/12/2010	2340	5.9	0.757171	25	0.889	2.82E-08	7.99E-05	
10/12/2010	2880	5.8	0.857171	25	0.889	2.62E-08	7.44E-05	

SUMMARY

ka = 2.94E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.29E-08 cm/sec	11.9	%	Vm = |ka-ki| / ka x 100
k2 =	3.04E-08 cm/sec	3.3	%	
k3 =	2.82E-08 cm/sec	4.3	%	
k4 =	2.62E-08 cm/sec	10.9	%	

Hydraulic conductivity	k =	2.94E-08	cm/sec	8.35E-05	ft/day
Void Ratio	e =	0.63			
Porosity	n =	0.39			
Bulk Density	γ =	2.01	g/cm3	125.3	pcf
Water Content	W =	0.39	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.02E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	20
Plasticity Index	**PI**	**23**
- 200 Sieve		95 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/12/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 389	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9403	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000445454		Annulus Ra	1.5	cm3
Other Location:	South-East Berm	M2 =	1.040953	T = 0.203776249				

Material Description : Red, Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			532.68	g	Tare No.:	T 17	Tare No.:	T 18
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	460.48	Wet Wt.+tare:	681.92
Wet Wt: of Sample :			532.68	g	Dry Wt.+tare:	410.23	Dry Wt.+tare:	581.02
Diameter :	2.73	in	6.93	cm2	Tare Wt:	146.76	Tare Wt:	146.71
Length :	2.76	in	7.01	cm	Dry Wt.:	263.47	Dry Wt.:	434.31
Area:	5.84	in^2	37.71	cm2	Water Wt.:	50.25	Water Wt.:	100.9
Volume :	16.14	in^3	264.45	cm3	% moist.:	19.1	% moist.:	23.2
Unit Wt.(wet):	125.69	pcf	2.01	g/cm^3				
Unit Wt.(dry):	105.56	pcf	1.69	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 105.6038 OMC = 19.0723802
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 101.99 Void ratio (e) = 0.63 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.18

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/12/2009	960	5.7	0.957343	24.5	0.899	9.06E-08	2.57E-04	
12/12/2009	1080	5.6	1.057343	24.5	0.899	9.00E-08	2.55E-04	
12/12/2009	1200	5.5	1.157343	24.5	0.899	8.98E-08	2.55E-04	
12/12/2009	1320	5.4	1.257343	24.5	0.899	8.98E-08	2.55E-04	

SUMMARY

ka = 9.01E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	9.06E-08 cm/sec	0.6	%	Vm = |ka-ki| / ka x 100
k2 =	9.00E-08 cm/sec	0.0	%	
k3 =	8.98E-08 cm/sec	0.3	%	
k4 =	8.98E-08 cm/sec	0.2	%	

Hydraulic conductivity	k =	9.01E-08	cm/sec	2.55E-04	ft/day
Void Ratio	e =	0.63			
Porosity	n =	0.39			
Bulk Density	γ =	2.01	g/cm3	125.7	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.23E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	17
Plasticity Index	**PI**	**22**
- 200 Sieve		71 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/14/2009	Panel Number :			P 1 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 398	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9406	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000445354		Annulus Ra	1.5	cm3
Other Location:	South Berm	M2 =	1.040953	T = 0.203783953				
Material Description :	Tan & Gray Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			503.95	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 25	Tare No.:	T 16
Wet Wt: of Sample :			503.95	g				
Diameter :	2.70	in	6.85	cm2	Wet Wt.+tare:	547.00	Wet Wt.+tare:	658.12
Length :	2.70	in	6.86	cm	Dry Wt.+tare:	462.23	Dry Wt.+tare:	554.26
Area:	5.72	in^2	36.88	cm2	Tare Wt:	116.18	Tare Wt:	151.96
Volume :	15.44	in^3	252.95	cm3	Dry Wt.:	346.05	Dry Wt.:	402.3
Unit Wt.(wet):	124.32	pcf	1.99	g/cm^3	Water Wt.:	84.77	Water Wt.:	103.86
Unit Wt.(dry):	99.86	pcf	1.60	g/cm^3	% moist.:	24.5	% moist.:	25.8

Specific Gravity:	2.75	Max Dry Density(pcf) =	99.89923	OMC =	24.4964601
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.70	Void ratio (e) =	0.72	Porosity (n)=	0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/14/2009	1080	5.7	0.957158	23.5	0.920	8.24E-08	2.33E-04	
12/14/2009	1260	5.6	1.057158	23.5	0.920	7.89E-08	2.24E-04	
12/14/2009	1440	5.5	1.157158	23.5	0.920	7.66E-08	2.17E-04	
12/14/2009	1620	5.4	1.257158	23.5	0.920	7.49E-08	2.12E-04	

SUMMARY

ka = 7.82E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	8.24E-08 cm/sec	5.3	%
k2 =	7.89E-08 cm/sec	1.0	%
k3 =	7.66E-08 cm/sec	2.1	%
k4 =	7.49E-08 cm/sec	4.2	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**7.82E-08**	cm/sec	**2.22E-04**	ft/day
Void Ratio	e =	**0.72**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.99**	g/cm3	**124.3**	pcf
Water Content	W =	**0.39**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**8.01E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	22
Plasticity Index	**PI**	**20**
- 200 Sieve		83 %
+ No 40 Sieve		4 %
+ No 4 Sieve		0 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/14/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 . Permometer Data

Boring No.:	Density # 405	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9407	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.000439459	Annulus Ra	1.5	cm3
Other Location:	South Berm	M2 =	1.040953	T =	0.203783703			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			493.67	g	Tare No.:	T 20	Tare No.:	T 25
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	568.84	Wet Wt.+tare:	612.39
Wet Wt: of Sample :			493.67	g	Dry Wt.+tare:	484.76	Dry Wt.+tare:	507.04
Diameter :	2.71	in	6.89	cm2	Tare Wt:	160.24	Tare Wt:	116.18
Length :	2.69	in	6.83	cm	Dry Wt.:	324.52	Dry Wt.:	390.86
Area:	5.77	in^2	37.24	cm2	Water Wt.:	84.08	Water Wt.:	105.35
Volume :	15.53	in^3	254.45	cm3	% moist.:	25.9	% moist.:	27.0
Unit Wt.(wet):	121.07	pcf	1.94	g/cm^3				
Unit Wt.(dry):	96.15	pcf	1.54	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 96.19398 OMC = 25.9090349
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.64 Void ratio (e) = 0.75 Porosity (n)= 0.43

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.42

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/14/2009	1740	6.1	0.557164	23	0.931	2.83E-08	8.04E-05	
12/14/2009	2160	6	0.657164	23	0.931	2.72E-08	7.72E-05	
12/14/2009	2640	5.9	0.757164	23	0.931	2.60E-08	7.36E-05	
12/14/2009	3180	5.8	0.857164	23	0.931	2.47E-08	7.00E-05	

SUMMARY

ka = 2.66E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.83E-08 cm/sec	6.7	%
k2 =	2.72E-08 cm/sec	2.5	%
k3 =	2.60E-08 cm/sec	2.2	%
k4 =	2.47E-08 cm/sec	7.0	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.66E-08**	cm/sec	**7.53E-05**	ft/day
Void Ratio	e =	**0.75**			
Porosity	n =	**0.43**			
Bulk Density	γ =	**1.94**	g/cm3	**121.1**	pcf
Water Content	W =	**0.40**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.72E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	46	
Plastic Limit PL	22	
Plasticity Index PI	**24**	
- 200 Sieve	75	%
+ No 40 Sieve	14	%
+ No 4 Sieve	11	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/14/2009 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 413	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9408	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.000442226	Annulus Ra	1.5	cm3
Other Location:	South-East Berm	M2 =	1.040953	T =	0.203781267			

Material Description : Red, Gray & Tan Fat Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			504.68	g	Tare No.:	T 17	Tare No.:	T 24
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	551.15	Wet Wt.+tare:	621.39
Wet Wt. of Sample :			504.68	g	Dry Wt.+tare:	462.74	Dry Wt.+tare:	506.69
Diameter :	2.73	in	6.93	cm2	Tare Wt:	146.75	Tare Wt:	112.36
Length :	2.74	in	6.97	cm	Dry Wt.:	315.99	Dry Wt.:	394.33
Area:	5.85	in^2	37.74	cm2	Water Wt.:	88.41	Water Wt.:	114.7
Volume :	16.04	in^3	262.92	cm3	% moist.:	28.0	% moist.:	29.1
Unit Wt.(wet):	119.78	pcf	1.92	g/cm^3				
Unit Wt.(dry):	93.59	pcf	1.50	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 93.6321 OMC = 27.9787335
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.04 Void ratio (e) = 0.80 Porosity (n)= 0.44

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.24

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/14/2009	1320	5.7	0.957222	23.5	0.920	6.69E-08	1.90E-04	
12/14/2009	1500	5.6	1.057222	23.5	0.920	6.58E-08	1.87E-04	
12/14/2009	1680	5.5	1.157222	23.5	0.920	6.52E-08	1.85E-04	
12/14/2009	1860	5.4	1.257222	23.5	0.920	6.48E-08	1.84E-04	

SUMMARY

ka = 6.57E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	6.69E-08 cm/sec	1.9	%	Vm = |ka-ki| / ka x 100
k2 =	6.58E-08 cm/sec	0.3	%	
k3 =	6.52E-08 cm/sec	0.8	%	
k4 =	6.48E-08 cm/sec	1.4	%	

Hydraulic conductivity	k =	6.57E-08	cm/sec	1.86E-04	ft/day
Void Ratio	e =	0.80			
Porosity	n =	0.44			
Bulk Density	γ =	1.92	g/cm3	119.8	pcf
Water Content	W =	0.42	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.73E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	54
Plastic Limit	PL	25
Plasticity Index	**PI**	**29**
- 200 Sieve		90 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/21/2009 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 425	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9439	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000439315		Annulus Ra	1.5	cm3
Other Location:	East Berm	M2 =	1.040953	T = 0.203879538				

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			531.36	g	Tare No.:	H 4	Tare No.:	H 6
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	646.10	Wet Wt.+tare:	897.07
Wet Wt: of Sample :			531.36	g	Dry Wt.+tare:	595.99	Dry Wt.+tare:	793.70
Diameter :	2.75	in	6.97	cm2	Tare Wt:	362.32	Tare Wt:	359.90
Length :	2.76	in	7.01	cm	Dry Wt.:	233.67	Dry Wt.:	433.8
Area:	5.92	in^2	38.21	cm2	Water Wt.:	50.11	Water Wt.:	103.37
Volume :	16.34	in^3	267.76	cm3	% moist.:	21.4	% moist.:	23.8
Unit Wt.(wet):	123.83	pcf	1.98	g/cm^3				
Unit Wt.(dry):	101.96	pcf	1.63	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 102.0086 OMC = 21.4447725
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.51 Void ratio (e) = 0.65 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.18

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/21/2009	960	5.7	0.954857	24	0.910	9.01E-08	2.56E-04	
12/21/2009	1080	5.55	1.104857	24	0.910	9.45E-08	2.68E-04	
12/21/2009	1200	5.4	1.254857	24	0.910	9.84E-08	2.79E-04	
12/21/2009	1320	5.25	1.404857	24	0.910	1.02E-07	2.90E-04	

SUMMARY

ka = 9.63E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.01E-08 cm/sec	6.4	%
k2 =	9.45E-08 cm/sec	1.9	%
k3 =	9.84E-08 cm/sec	2.2	%
k4 =	1.02E-07 cm/sec	6.1	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.63E-08	cm/sec	2.73E-04	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.40			
Bulk Density	γ =	1.98	g/cm3	123.8	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.87E-13	cm2	(at 20 deg C)	

Liquid Limit LL	38	
Plastic Limit PL	20	
Plasticity Index PI	18	
- 200 Sieve	77	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/5/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 524	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9478	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.000454375	Annulus Ra	1.5	cm3
Other Location:	S.W. Berm	M2 =	1.040953	T =	0.203774962			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			519.04	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 20	Tare No.:	T- 22
Wet Wt: of Sample :			519.04	g	Wet Wt.+tare:	681.02	Wet Wt.+tare:	662.18
Diameter :	2.68	in	6.80	cm2	Dry Wt.+tare:	597.67	Dry Wt.+tare:	572.42
Length :	2.71	in	6.89	cm	Tare Wt:	160.27	Tare Wt:	140.44
Area:	5.63	in^2	36.34	cm2	Dry Wt.:	437.4	Dry Wt.:	431.98
Volume :	15.29	in^3	250.51	cm3	Water Wt.:	83.35	Water Wt.:	89.76
Unit Wt.(wet):	129.29	pcf	2.07	g/cm^3	% moist.:	19.1	% moist.:	20.8
Unit Wt.(dry):	108.60	pcf	1.74	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 108.6422 OMC = 19.0557842
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.36 Void ratio (e) = 0.58 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.34

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/7/2010	1560	5.65	1.007374	24.5	0.899	6.02E-08	1.71E-04	
1/7/2010	1800	5.5	1.157374	24.5	0.899	6.11E-08	1.73E-04	
1/7/2010	2040	5.35	1.307374	24.5	0.899	6.21E-08	1.76E-04	
1/7/2010	2220	5.2	1.457374	24.5	0.899	6.49E-08	1.84E-04	

SUMMARY

ka = 6.20E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	6.02E-08 cm/sec	3.0	%
k2 =	6.11E-08 cm/sec	1.6	%
k3 =	6.21E-08 cm/sec	0.0	%
k4 =	6.49E-08 cm/sec	4.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**6.20E-08**	cm/sec	**1.76E-04**	ft/day
Void Ratio	e =	**0.58**			
Porosity	n =	**0.37**			
Bulk Density	γ =	**2.07**	g/cm3	**129.3**	pcf
Water Content	W =	**0.33**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**6.36E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	36
Plastic Limit	PL	19
Plasticity Index	**PI**	**17**
- 200 Sieve		74 %
+ No 40 Sieve		6 %
+ No 4 Sieve		2 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/8/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 539	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9480	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000439321		Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T = 0.203777664				

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			496.85	g	Tare No.:	T 23	Tare No.:	T- 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	527.43	Wet Wt.+tare:	649.22
Wet Wt: of Sample :			496.85	g	Dry Wt.+tare:	437.92	Dry Wt.+tare:	528.09
Diameter :	2.74	in	6.96	cm2	Tare Wt:	140.29	Tare Wt:	151.97
Length :	2.75	in	6.98	cm	Dry Wt.:	297.63	Dry Wt.:	376.12
Area:	5.90	in^2	38.07	cm2	Water Wt.:	89.51	Water Wt.:	121.13
Volume :	16.22	in^3	265.82	cm3	% moist.:	30.1	% moist.:	32.2
Unit Wt.(wet):	116.63	pcf	1.87	g/cm^3				
Unit Wt.(dry):	89.67	pcf	1.44	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 89.7058 OMC = 30.0742533
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.83 Void ratio (e) = 0.88 Porosity (n)= 0.47

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/8/2010	2880	6.1	0.557309	24	0.910	1.67E-08	4.74E-05	
1/8/2010	3120	6.05	0.607309	24	0.910	1.69E-08	4.80E-05	
1/8/2010	3420	6	0.657309	24	0.910	1.68E-08	4.76E-05	
1/8/2010	3780	5.95	0.707309	24	0.910	1.65E-08	4.67E-05	

SUMMARY

ka = 1.67E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.67E-08 cm/sec	0.0	%
k2 =	1.69E-08 cm/sec	1.2	%
k3 =	1.68E-08 cm/sec	0.5	%
k4 =	1.65E-08 cm/sec	1.6	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**1.67E-08**	cm/sec	**4.74E-05**	ft/day
Void Ratio	e =	**0.88**			
Porosity	n =	**0.47**			
Bulk Density	γ =	**1.87**	g/cm3	**116.6**	pcf
Water Content	W =	**0.43**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.71E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	39	
Plastic Limit PL	20	
Plasticity Index PI	19	
- 200 Sieve	90	%
+ No 40 Sieve	1	%
+ No 4 Sieve	0	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/20/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 39	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9884	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.00041646	Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T =	0.203781725			

Material Description : Red, Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			529.35	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 9	Tare No.:	T 14
Wet Wt: of Sample :			529.35	g	Wet Wt.+tare:	558.47	Wet Wt.+tare:	762.11
Diameter :	2.78	in	7.05	cm2	Dry Wt.+tare:	508.64	Dry Wt.+tare:	666.45
Length :	2.67	in	6.78	cm	Tare Wt:	220.52	Tare Wt:	221.17
Area:	6.05	in^2	39.02	cm2	Dry Wt.:	288.12	Dry Wt.:	445.28
Volume :	16.15	in^3	264.72	cm3	Water Wt.:	49.83	Water Wt.:	95.66
Unit Wt.(wet):	124.78	pcf	2.00	g/cm^3	% moist.:	17.3	% moist.:	21.5
Unit Wt.(dry):	106.38	pcf	1.70	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.24 Void ratio (e) = 0.61 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.49

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/20/2010	780	5.9	0.757211	25	0.889	7.96E-08	2.26E-04	
8/20/2010	960	5.8	0.857211	25	0.889	7.41E-08	2.10E-04	
8/20/2010	1140	5.7	0.957211	25	0.889	7.05E-08	2.00E-04	
8/20/2010	1380	5.6	1.057211	25	0.889	6.51E-08	1.85E-04	

SUMMARY

ka = 7.23E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.96E-08 cm/sec	10.0	%	Vm = |ka-ki| / ka x 100
k2 =	7.41E-08 cm/sec	2.4	%	
k3 =	7.05E-08 cm/sec	2.5	%	
k4 =	6.51E-08 cm/sec	10.0	%	

Hydraulic conductivity	k =	7.23E-08	cm/sec	2.05E-04	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.00	g/cm3	124.8	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	7.41E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	18
Plasticity Index	**PI**	**22**
- 200 Sieve		79 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	9/7/2010	Panel Number :			P 2; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	P - 53	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9906	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000450356		Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T = 0.203785086				
Material Description :	Tan & Gray Sandy Lean Clay							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			538.60	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 17	Tare No.:	T 20
Wet Wt: of Sample :			538.60	g	Wet Wt.+tare:	618.87	Wet Wt.+tare:	706.09
Diameter :	2.70	in	6.85	cm2	Dry Wt.+tare:	552.12	Dry Wt.+tare:	620.97
Length :	2.73	in	6.93	cm	Tare Wt:	146.72	Tare Wt:	160.23
Area:	5.71	in^2	36.86	cm2	Dry Wt.:	405.4	Dry Wt.:	460.74
Volume :	15.59	in^3	255.41	cm3	Water Wt.:	66.75	Water Wt.:	85.12
Unit Wt.(wet):	131.58	pcf	2.11	g/cm^3	% moist.:	16.5	% moist.:	18.5
Unit Wt.(dry):	112.98	pcf	1.81	g/cm^3				

Assumed Specific Gravity:	2.75	Max Dry Density(pcf) =		OMC =	
		% of max =		+/- OMC =	
Calculated % saturation:	97.79	Void ratio (e) =	0.52	Porosity (n)=	0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/7/2010	1620	5.7	0.95713	25.1	0.887	5.35E-08	1.52E-04	
9/7/2010	1860	5.6	1.05713	25.2	0.885	5.20E-08	1.47E-04	
9/7/2010	2160	5.5	1.15713	25.2	0.885	4.96E-08	1.41E-04	
9/7/2010	2520	5.4	1.25713	25.2	0.885	4.68E-08	1.33E-04	

SUMMARY

ka =	5.05E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	5.35E-08	cm/sec	6.0	%	Vm = |ka-ki| / ka x 100
k2 =	5.20E-08	cm/sec	3.0	%	
k3 =	4.96E-08	cm/sec	1.7	%	
k4 =	4.68E-08	cm/sec	7.3	%	

Hydraulic conductivity	k =	5.05E-08	cm/sec	1.43E-04	ft/day
Void Ratio	e =	0.52			
Porosity	n =	0.34			
Bulk Density	γ =	2.11	g/cm3	131.6	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.17E-13	cm2	(at 20 deg C)	

Liquid Limit LL	34	
Plastic Limit PL	17	
Plasticity Index PI	17	
- 200 Sieve	66	%
+ No 40 Sieve	1	%
+ No 4 Sieve	0	%

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/11/2010 Panel Number : P 5; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9953 B	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5, Density P-205	M1 =	0.030180	C =	0.000447631	Annulus Ra	1.5	cm3
Other Location:	East Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			540.00	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 4
Wet Wt: of Sample :			540.00	g	Wet Wt.+tare:	715.57	Wet Wt.+tare:	764.56
Diameter :	2.70	in	6.87	cm2	Dry Wt.+tare:	635.77	Dry Wt.+tare:	677.24
Length :	2.73	in	6.93	cm	Tare Wt:	186.30	Tare Wt:	219.52
Area:	5.75	in^2	37.07	cm2	Dry Wt.:	449.47	Dry Wt.:	457.72
Volume :	15.67	in^3	256.78	cm3	Water Wt.:	79.8	Water Wt.:	87.32
Unit Wt.(wet):	131.22	pcf	2.10	g/cm^3	% moist.:	17.8	% moist.:	19.1
Unit Wt.(dry):	111.44	pcf	1.79	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.05 Void ratio (e) = 0.54 Porosity (n)= 0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	1320	6.1	0.557171	25	0.889	3.63E-08	1.03E-04	
10/11/2010	1740	6	0.657171	25	0.889	3.29E-08	9.32E-05	
10/11/2010	2280	5.9	0.757171	25	0.889	2.93E-08	8.29E-05	
10/11/2010	2880	5.8	0.857171	25	0.889	2.65E-08	7.52E-05	

SUMMARY

ka = 3.13E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.63E-08 cm/sec	16.3	%	Vm = |ka-ki| / ka x 100
k2 =	3.29E-08 cm/sec	5.2	%	
k3 =	2.93E-08 cm/sec	6.4	%	
k4 =	2.65E-08 cm/sec	15.1	%	

Hydraulic conductivity	k =	3.13E-08	cm/sec	8.86E-05	ft/day
Void Ratio	e =	0.54			
Porosity	n =	0.35			
Bulk Density	γ =	2.10	g/cm3	131.2	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.20E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	19
Plasticity Index	**PI**	21
- 200 Sieve		87 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/11/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9954 B	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5, Density P-206	M1 =	0.030180	C =	0.000450998	Annulus Ra	1.5	cm3
Other Location:	East Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			510.25	g	Tare No.:	T 20	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	379.78	Wet Wt.+tare:	730.84
Wet Wt: of Sample :			510.25	g	Dry Wt.+tare:	339.50	Dry Wt.+tare:	628.59
Diameter :	2.70	in	6.86	cm2	Tare Wt:	160.22	Tare Wt:	217.27
Length :	2.74	in	6.96	cm	Dry Wt.:	179.28	Dry Wt.:	411.32
Area:	5.73	in^2	36.97	cm2	Water Wt.:	40.28	Water Wt.:	102.25
Volume :	15.70	in^3	257.30	cm3	% moist.:	22.5	% moist.:	24.9
Unit Wt.(wet):	123.75	pcf	1.98	g/cm^3				
Unit Wt.(dry):	101.04	pcf	1.62	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.79 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.25

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	480	6.25	0.407171	25	0.889	7.24E-08	2.05E-04	
10/11/2010	780	6.05	0.607171	25	0.889	6.79E-08	1.92E-04	
10/11/2010	1080	5.85	0.807171	25	0.889	6.67E-08	1.89E-04	
10/11/2010	1680	5.5	1.157171	25	0.889	6.42E-08	1.82E-04	

SUMMARY

ka = 6.78E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	7.24E-08 cm/sec	6.7	%	Vm = |ka-ki| / ka x 100
k2 =	6.79E-08 cm/sec	0.2	%	
k3 =	6.67E-08 cm/sec	1.6	%	
k4 =	6.42E-08 cm/sec	5.3	%	

Hydraulic conductivity	k =	6.78E-08	cm/sec	1.92E-04 ft/day
Void Ratio	e =	0.70		
Porosity	n =	0.41		
Bulk Density	γ =	1.98	g/cm3	123.7 pcf
Water Content	W =	0.36	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	6.95E-13	cm2	(at 20 deg C)

Liquid Limit	LL	41
Plastic Limit	PL	18
Plasticity Index	**PI**	**23**
- 200 Sieve		85 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/12/2010 Panel Number : P 6; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9960 B	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5, Density P-207	M1 =	0.030180	C =	0.000446641	Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			556.20	g	Tare No.:	T 11	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	940.49	Wet Wt.+tare:	782.32
Wet Wt: of Sample :			556.20	g	Dry Wt.+tare:	832.62	Dry Wt.+tare:	693.22
Diameter :	2.73	in	6.92	cm2	Tare Wt:	219.28	Tare Wt:	217.27
Length :	2.76	in	7.02	cm	Dry Wt.:	613.34	Dry Wt.:	475.95
Area:	5.84	in^2	37.65	cm2	Water Wt.:	107.87	Water Wt.:	89.1
Volume :	16.13	in^3	264.38	cm3	% moist.:	17.6	% moist.:	18.7
Unit Wt.(wet):	131.28	pcf	2.10	g/cm^3				
Unit Wt.(dry):	111.64	pcf	1.79	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.14 Void ratio (e) = 0.51 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.17

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/12/2010	2220	5.7	0.957171	25	0.889	3.88E-08	1.10E-04	
10/12/2010	2820	5.6	1.057171	25	0.889	3.42E-08	9.69E-05	
10/12/2010	3480	5.5	1.157171	25	0.889	3.07E-08	8.70E-05	
10/12/2010	4140	5.4	1.257171	25	0.889	2.84E-08	8.05E-05	

SUMMARY

ka = 3.30E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	3.88E-08 cm/sec	17.6	%	Vm = |ka-ki| / ka x 100
k2 =	3.42E-08 cm/sec	3.5	%	
k3 =	3.07E-08 cm/sec	7.0	%	
k4 =	2.84E-08 cm/sec	14.0	%	

Hydraulic conductivity	k =	3.30E-08	cm/sec	9.36E-05	ft/day
Void Ratio	e =	0.51			
Porosity	n =	0.34			
Bulk Density	γ =	2.10	g/cm3	131.3	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.38E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	19
Plasticity Index	**PI**	**20**
- 200 Sieve		80 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/13/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9960 C	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5, Density P-208	M1 =	0.030180	C =	0.000448197	Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			526.08	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 18	Tare No.:	T 8
Wet Wt: of Sample :			526.08	g	Wet Wt.+tare:	517.23	Wet Wt.+tare:	749.87
Diameter :	2.71	in	6.88	cm2	Dry Wt.+tare:	449.33	Dry Wt.+tare:	652.58
Length :	2.74	in	6.95	cm	Tare Wt:	146.74	Tare Wt:	221.91
Area:	5.76	in^2	37.14	cm2	Dry Wt.:	302.59	Dry Wt.:	430.67
Volume :	15.75	in^3	258.10	cm3	Water Wt.:	67.9	Water Wt.:	97.29
Unit Wt.(wet):	127.19	pcf	2.04	g/cm^3	% moist.:	22.4	% moist.:	22.6
Unit Wt.(dry):	103.88	pcf	1.66	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.96 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/13/2010	3180	5.7	0.957171	25	0.889	2.72E-08	7.71E-05	
10/13/2010	3720	5.6	1.057171	25	0.889	2.60E-08	7.37E-05	
10/13/2010	4320	5.5	1.157171	25	0.889	2.48E-08	7.03E-05	
10/13/2010	4980	5.4	1.257171	25	0.889	2.37E-08	6.71E-05	

SUMMARY

ka = 2.54E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.72E-08 cm/sec	7.0	%
k2 =	2.60E-08 cm/sec	2.3	%
k3 =	2.48E-08 cm/sec	2.4	%
k4 =	2.37E-08 cm/sec	6.8	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.54E-08**	cm/sec	**7.21E-05**	ft/day
Void Ratio	e =	**0.62**			
Porosity	n =	**0.38**			
Bulk Density	γ =	**2.04**	g/cm3	**127.2**	pcf
Water Content	W =	**0.37**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.60E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	19
Plasticity Index	**PI**	**24**
- 200 Sieve		85 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/13/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9960 D	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5, Density P-209	M1 =	0.030180	C = 0.000440841		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Lean Clay w/ Sand (5psi pressure)

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			554.60	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 21	Tare No.:	T 12
Wet Wt: of Sample :			554.60	g	Wet Wt.+tare:	331.02	Wet Wt.+tare:	782.75
Diameter :	2.72	in	6.91	cm2	Dry Wt.+tare:	304.46	Dry Wt.+tare:	698.15
Length :	2.72	in	6.90	cm	Tare Wt:	140.34	Tare Wt:	220.22
Area:	5.81	in^2	37.50	cm2	Dry Wt.:	164.12	Dry Wt.:	477.93
Volume :	15.79	in^3	258.77	cm3	Water Wt.:	26.56	Water Wt.:	84.6
Unit Wt.(wet):	133.74	pcf	2.14	g/cm^3	% moist.:	16.2	% moist.:	17.7
Unit Wt.(dry):	115.11	pcf	1.84	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.04 Void ratio (e) = 0.49 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.33

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/13/2010	960	5.7	0.957171	25	0.889	8.86E-08	2.51E-04	
10/13/2010	1140	5.6	1.057171	25	0.889	8.34E-08	2.36E-04	
10/13/2010	1320	5.5	1.157171	25	0.889	7.99E-08	2.26E-04	
10/13/2010	1500	5.4	1.257171	25	0.889	7.73E-08	2.19E-04	

SUMMARY

ka = 8.23E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	8.86E-08 cm/sec	7.6	%	Vm = |ka-ki| / ka x 100
k2 =	8.34E-08 cm/sec	1.4	%	
k3 =	7.99E-08 cm/sec	3.0	%	
k4 =	7.73E-08 cm/sec	6.0	%	

Hydraulic conductivity	k =	8.23E-08	cm/sec	2.33E-04	ft/day
Void Ratio	e =	0.49			
Porosity	n =	0.33			
Bulk Density	γ =	2.14	g/cm3	133.7	pcf
Water Content	W =	0.30	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	8.43E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	19
Plasticity Index	**PI**	**20**
- 200 Sieve		84 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/21/2009 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 417	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9438	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000440827	Annulus Ra	1.5	cm3
Other Location:	South-East Berm	M2 =	1.040953	T =	0.203793169			

Material Description : Tan, Gray & Red Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			543.06	g				
Tare or ring Wt. :			0.0	g	Tare No.:	H 5	Tare No.:	E 3
Wet Wt: of Sample :			543.06	g	Wet Wt.+tare:	774.08	Wet Wt.+tare:	692.72
Diameter :	2.77	in	7.03	cm2	Dry Wt.+tare:	694.68	Dry Wt.+tare:	586.99
Length :	2.81	in	7.14	cm	Tare Wt:	361.30	Tare Wt:	146.15
Area:	6.01	in^2	38.79	cm2	Dry Wt.:	333.38	Dry Wt.:	440.84
Volume :	16.90	in^3	276.99	cm3	Water Wt.:	79.4	Water Wt.:	105.73
Unit Wt.(wet):	122.34	pcf	1.96	g/cm^3	% moist.:	23.8	% moist.:	24.0
Unit Wt.(dry):	98.81	pcf	1.58	g/cm^3				

Specific Gravity: 2.65 Max Dry Density(pcf) = 98.84823 OMC = 23.8166657
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 94.24 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.01

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/21/2009	1740	5.7	0.956936	24	0.910	5.00E-08	1.42E-04	
12/21/2009	1980	5.6	1.056936	24	0.910	4.91E-08	1.39E-04	
12/21/2009	2220	5.5	1.156936	24	0.910	4.86E-08	1.38E-04	
12/21/2009	2460	5.4	1.256936	24	0.910	4.82E-08	1.37E-04	

SUMMARY

ka = 4.90E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	5.00E-08 cm/sec	2.1	%	Vm = |ka-ki| / ka x 100
k2 =	4.91E-08 cm/sec	0.3	%	
k3 =	4.86E-08 cm/sec	0.8	%	
k4 =	4.82E-08 cm/sec	1.5	%	

Hydraulic conductivity	k =	4.90E-08	cm/sec	1.39E-04	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	1.96	g/cm3	122.3	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.02E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	37
Plastic Limit	PL	18
Plasticity Index	**PI**	**19**
- 200 Sieve		69 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	12/21/2009	Panel Number :			P 5 ; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	Density # 435	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9440	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C = 0.000434814		Annulus Ra	1.5	cm3
Other Location:	South-East Berm	M2 =	1.040953	T = 0.203794311				
Material Description :	Tan, Gray & Red Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			506.73	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 16	Tare No.:	A-3
Wet Wt: of Sample :			506.73	g	Wet Wt.+tare:	401.51	Wet Wt.+tare:	659.80
Diameter :	2.73	in	6.93	cm2	Dry Wt.+tare:	350.05	Dry Wt.+tare:	550.90
Length :	2.70	in	6.86	cm	Tare Wt:	151.91	Tare Wt:	147.96
Area:	5.85	in^2	37.76	cm2	Dry Wt.:	198.14	Dry Wt.:	402.94
Volume :	15.80	in^3	258.89	cm3	Water Wt.:	51.46	Water Wt.:	108.9
Unit Wt.(wet):	122.14	pcf	1.96	g/cm^3	% moist.:	26.0	% moist.:	27.0
Unit Wt.(dry):	96.95	pcf	1.55	g/cm^3				

Specific Gravity:	2.70	Max Dry Density(pcf) =	96.99635	OMC =	25.9715353
		% of max =	100.0	+/- OMC =	0.00
Calculated % saturation:	98.80	Void ratio (e) =	0.74	Porosity (n)=	0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.39

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/21/2009	2280	6.1	0.556908	24	0.910	2.09E-08	5.93E-05	
12/21/2009	2760	6	0.656908	24	0.910	2.06E-08	5.84E-05	
12/21/2009	3360	5.9	0.756908	24	0.910	1.97E-08	5.59E-05	
12/21/2009	4140	5.8	0.856908	24	0.910	1.83E-08	5.20E-05	

SUMMARY

ka =	1.99E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	2.09E-08	cm/sec	5.1	%	Vm = |ka-ki| / ka x 100
k2 =	2.06E-08	cm/sec	3.6	%	
k3 =	1.97E-08	cm/sec	0.8	%	
k4 =	1.83E-08	cm/sec	7.8	%	

Hydraulic conductivity	k =	1.99E-08	cm/sec	5.64E-05	ft/day
Void Ratio	e =	0.74			
Porosity	n =	0.42			
Bulk Density	γ =	1.96	g/cm3	122.1	pcf
Water Content	W =	0.40	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.04E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	25
Plasticity Index	**PI**	**22**
- 200 Sieve		83 %
+ No 40 Sieve		7 %
+ No 4 Sieve		2 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 12/21/2009 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 436	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9441	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000446004	Annulus Ra	1.5	cm3
Other Location:	South-West Berm	M2 =	1.040953	T =	0.203783792			

Material Description : Tan, Gray & Red Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			501.82	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 23	Tare No.:	T 22
Wet Wt: of Sample :			501.82	g	Wet Wt.+tare:	352.04	Wet Wt.+tare:	653.17
Diameter :	2.71	in	6.87	cm2	Dry Wt.+tare:	313.15	Dry Wt.+tare:	547.64
Length :	2.72	in	6.91	cm	Tare Wt:	140.29	Tare Wt:	140.45
Area:	5.75	in^2	37.10	cm2	Dry Wt.:	172.86	Dry Wt.:	407.19
Volume :	15.64	in^3	256.34	cm3	Water Wt.:	38.89	Water Wt.:	105.53
Unit Wt.(wet):	122.16	pcf	1.96	g/cm^3	% moist.:	22.5	% moist.:	25.9
Unit Wt.(dry):	99.72	pcf	1.60	g/cm^3				

Specific Gravity: 2.75 Max Dry Density(pcf) = 99.76402 OMC = 22.4979752
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.76 Void ratio (e) = 0.72 Porosity (n)= 0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.32

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
12/21/2009	480	6.1	0.557162	25	0.889	9.96E-08	2.82E-04	
12/21/2009	600	6	0.657162	25	0.889	9.50E-08	2.69E-04	
12/21/2009	720	5.9	0.757162	25	0.889	9.23E-08	2.62E-04	
12/21/2009	840	5.8	0.857162	25	0.889	9.06E-08	2.57E-04	

SUMMARY

ka = 9.44E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.96E-08 cm/sec	5.5	%
k2 =	9.50E-08 cm/sec	0.7	%
k3 =	9.23E-08 cm/sec	2.2	%
k4 =	9.06E-08 cm/sec	4.0	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**9.44E-08**	cm/sec	**2.68E-04**	ft/day
Void Ratio	e =	**0.72**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.96**	g/cm3	**122.2**	pcf
Water Content	W =	**0.36**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**9.67E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	42	
Plastic Limit PL	23	
Plasticity Index PI	19	
- 200 Sieve	79	%
+ No 40 Sieve	6	%
+ No 4 Sieve	2	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/8/2010 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 566	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9483	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000433914	Annulus Ra	1.5	cm3
Other Location:	North-East Berm	M2 =	1.040953	T =	0.2037868			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			535.09	g	Tare No.:	T 19	Tare No.:	T- 22
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	695.77	Wet Wt.+tare:	676.68
Wet Wt. of Sample :			535.09	g	Dry Wt.+tare:	601.14	Dry Wt.+tare:	577.38
Diameter :	2.75	in	6.99	cm2	Tare Wt:	186.33	Tare Wt:	140.45
Length :	2.74	in	6.95	cm	Dry Wt.:	414.81	Dry Wt.:	436.93
Area:	5.95	in^2	38.38	cm2	Water Wt.:	94.63	Water Wt.:	99.3
Volume :	16.28	in^3	266.79	cm3	% moist.:	22.8	% moist.:	22.7
Unit Wt.(wet):	125.16	pcf	2.01	g/cm^3				
Unit Wt.(dry):	101.91	pcf	1.63	g/cm^3				

Specific Gravity: 2.65 Max Dry Density(pcf) = 101.9508 OMC = 22.8128541
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 96.60 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/8/2010	1320	6.1	0.557089	24	0.910	3.60E-08	1.02E-04	
1/8/2010	1500	6.05	0.607089	24	0.910	3.48E-08	9.85E-05	
1/8/2010	1680	6	0.657089	24	0.910	3.38E-08	9.58E-05	
1/8/2010	1860	5.95	0.707089	24	0.910	3.30E-08	9.36E-05	

SUMMARY

ka = 3.44E-08 cm/sec Acceptance criteria = 25 %

ki			Vm		
k1 =	3.60E-08	cm/sec	4.8	%	Vm = |ka-ki| / ka x 100
k2 =	3.48E-08	cm/sec	1.0	%	
k3 =	3.38E-08	cm/sec	1.8	%	
k4 =	3.30E-08	cm/sec	4.0	%	

Hydraulic conductivity	k =	3.44E-08	cm/sec	9.75E-05	ft/day
Void Ratio	e =	0.62			
Porosity	n =	0.38			
Bulk Density	γ =	2.01	g/cm3	125.2	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.52E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	35
Plastic Limit	PL	19
Plasticity Index	**PI**	**16**
- 200 Sieve		71 %
+ No 40 Sieve		7 %
+ No 4 Sieve		5 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/16/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 577	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9503	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000442556	Annulus Ra	1.5	cm3
Other Location:	South-West Berm	M2 =	1.040953	T =	0.203803738			

Material Description : Red, Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			548.36	g	Tare No.:	T 22	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	482.08	Wet Wt.+tare:	708.62
Wet Wt: of Sample :			548.36	g	Dry Wt.+tare:	435.02	Dry Wt.+tare:	623.11
Diameter :	2.72	in	6.92	cm2	Tare Wt:	140.44	Tare Wt:	151.99
Length :	2.74	in	6.95	cm	Dry Wt.:	294.58	Dry Wt.:	471.12
Area:	5.83	in^2	37.60	cm2	Water Wt.:	47.06	Water Wt.:	85.51
Volume :	15.94	in^3	261.19	cm3	% moist.:	16.0	% moist.:	18.2
Unit Wt.(wet):	131.00	pcf	2.10	g/cm^3				
Unit Wt.(dry):	112.96	pcf	1.81	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 113.0077 OMC = 15.9752869
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.56 Void ratio (e) = 0.49 Porosity (n)= 0.33

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.26

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/16/2010	840	6.1	0.556681	24	0.910	5.77E-08	1.64E-04	
1/16/2010	1080	6	0.656681	24	0.910	5.36E-08	1.52E-04	
1/16/2010	1320	5.9	0.756681	24	0.910	5.11E-08	1.45E-04	
1/16/2010	1560	5.8	0.856681	24	0.910	4.95E-08	1.40E-04	

SUMMARY

ka = 5.30E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	5.77E-08 cm/sec	9.0	%	Vm = |ka-ki| / ka x 100
k2 =	5.36E-08 cm/sec	1.1	%	
k3 =	5.11E-08 cm/sec	3.6	%	
k4 =	4.95E-08 cm/sec	6.5	%	

Hydraulic conductivity	k =	5.30E-08	cm/sec	1.50E-04	ft/day
Void Ratio	e =	0.49			
Porosity	n =	0.33			
Bulk Density	γ =	2.10	g/cm3	131.0	pcf
Water Content	W =	0.29	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.43E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	34
Plastic Limit	PL	18
Plasticity Index	**PI**	**16**
- 200 Sieve		67 %
+ No 40 Sieve		1 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/29/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 609	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9531	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000444177	Annulus Ra	1.5	cm3
Other Location:	West Berm	M2 =	1.040953	T =	0.203781267			

Material Description : Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			550.21	g	Tare No.:	T 12	Tare No.:	T 13
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	621.02	Wet Wt.+tare:	773.69
Wet Wt: of Sample :			550.21	g	Dry Wt.+tare:	559.95	Dry Wt.+tare:	686.11
Diameter :	2.72	in	6.92	cm2	Tare Wt:	220.18	Tare Wt:	219.66
Length :	2.74	in	6.97	cm	Dry Wt.:	339.77	Dry Wt.:	466.45
Area:	5.82	in^2	37.57	cm2	Water Wt.:	61.07	Water Wt.:	87.58
Volume :	15.97	in^3	261.77	cm3	% moist.:	18.0	% moist.:	18.8
Unit Wt.(wet):	131.16	pcf	2.10	g/cm^3				
Unit Wt.(dry):	111.18	pcf	1.78	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 111.2246 OMC = 17.9739235
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 98.22 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.24

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/29/2010	2760	6.1	0.557222	24.5	0.899	1.74E-08	4.95E-05	
1/29/2010	3900	6	0.657222	24.5	0.899	1.47E-08	4.18E-05	
1/29/2010	5040	5.9	0.757222	24.5	0.899	1.33E-08	3.77E-05	
1/29/2010	6240	5.8	0.857222	24.5	0.899	1.23E-08	3.48E-05	

SUMMARY

ka = 1.44E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.74E-08 cm/sec	20.8	%
k2 =	1.47E-08 cm/sec	2.0	%
k3 =	1.33E-08 cm/sec	8.0	%
k4 =	1.23E-08 cm/sec	14.9	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**1.44E-08**	cm/sec	**4.09E-05**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.10**	g/cm3	**131.2**	pcf
Water Content	W =	**0.32**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.48E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	16
Plasticity Index	**PI**	**24**
- 200 Sieve		69 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 1/29/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 620	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9532	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C = 0.000447562		Annulus Ra	1.5	cm3
Other Location:	North Berm	M2 =	1.040953	T = 0.203802532				

Material Description : Red & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			530.19	g	Tare No.:	T 11	Tare No.:	T 3
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	629.42	Wet Wt.+tare:	753.31
Wet Wt: of Sample :			530.19	g	Dry Wt.+tare:	551.02	Dry Wt.+tare:	647.63
Diameter :	2.73	in	6.92	cm2	Tare Wt:	219.28	Tare Wt:	220.69
Length :	2.77	in	7.04	cm	Dry Wt.:	331.74	Dry Wt.:	426.94
Area:	5.84	in^2	37.65	cm2	Water Wt.:	78.4	Water Wt.:	105.68
Volume :	16.17	in^3	264.92	cm3	% moist.:	23.6	% moist.:	24.8
Unit Wt.(wet):	124.88	pcf	2.00	g/cm^3				
Unit Wt.(dry):	101.01	pcf	1.62	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 101.0521 OMC = 23.6329656
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 99.93 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.15

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
1/29/2010	4680	6.1	0.55671	24.5	0.899	1.04E-08	2.94E-05	
1/29/2010	5520	6	0.65671	24.5	0.899	1.05E-08	2.97E-05	
1/29/2010	6360	5.9	0.75671	24.5	0.899	1.06E-08	3.01E-05	
1/29/2010	7320	5.8	0.85671	24.5	0.899	1.06E-08	2.99E-05	

SUMMARY

ka = 1.05E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.04E-08 cm/sec	1.3	%
k2 =	1.05E-08 cm/sec	0.2	%
k3 =	1.06E-08 cm/sec	1.0	%
k4 =	1.06E-08 cm/sec	0.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.05E-08	cm/sec	2.98E-05	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	2.00	g/cm3	124.9	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.08E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	47
Plastic Limit	PL	19
Plasticity Index	**PI**	**28**
- 200 Sieve		72 %
+ No 40 Sieve		2 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 2/8/2010 Panel Number : P 4 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	Density # 644	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9541	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000440291	Annulus Ra	1.5	cm3
Other Location:	North - West Berm	M2 =	1.040953	T =	0.203784587			

Material Description : Tan & Red Fat Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			510.34	g	Tare No.:	T 1	Tare No.:	T 4
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	624.53	Wet Wt.+tare:	731.83
Wet Wt: of Sample :			510.34	g	Dry Wt.+tare:	543.21	Dry Wt.+tare:	626.16
Diameter :	2.73	in	6.92	cm2	Tare Wt:	217.27	Tare Wt:	219.48
Length :	2.72	in	6.92	cm	Dry Wt.:	325.94	Dry Wt.:	406.68
Area:	5.83	in^2	37.63	cm2	Water Wt.:	81.32	Water Wt.:	105.67
Volume :	15.88	in^3	260.24	cm3	% moist.:	24.9	% moist.:	26.0
Unit Wt.(wet):	122.37	pcf	1.96	g/cm^3				
Unit Wt.(dry):	97.94	pcf	1.57	g/cm^3				

Specific Gravity: 2.70 Max Dry Density(pcf) = 97.97702 OMC = 24.9493772
% of max = 100.0 +/- OMC = 0.00
Calculated % saturation: 97.28 Void ratio (e) = 0.72 Porosity (n)= 0.42

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.31

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
2/8/2010	3600	5.8	0.857142	23.5	0.920	2.16E-08	6.13E-05	
2/8/2010	4260	5.75	0.907142	23.5	0.920	1.94E-08	5.51E-05	
2/8/2010	4920	5.7	0.957142	23.5	0.920	1.79E-08	5.07E-05	
2/8/2010	5580	5.65	1.007142	23.5	0.920	1.67E-08	4.73E-05	

SUMMARY

ka = 1.89E-08 cm/sec Acceptance criteria = 25 %

ki			Vm	
k1 =	2.16E-08	cm/sec	14.3	%
k2 =	1.94E-08	cm/sec	2.9	%
k3 =	1.79E-08	cm/sec	5.5	%
k4 =	1.67E-08	cm/sec	11.7	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**1.89E-08**	cm/sec	**5.36E-05**	ft/day
Void Ratio	e =	**0.72**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.96**	g/cm3	**122.4**	pcf
Water Content	W =	**0.39**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.94E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	54
Plastic Limit	PL	18
Plasticity Index	**PI**	**36**
- 200 Sieve		74 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/20/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 43	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9885	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C = 0.000442691		Annulus Ra	1.5	cm3
Other Location:	North-West Perimeter	M2 =	1.040953	T = 0.203792627				

Material Description : Red, Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			553.59	g	Tare No.:	T 6	Tare No.:	T 11
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	786.38	Wet Wt.+tare:	784.60
Wet Wt: of Sample :			553.59	g	Dry Wt.+tare:	699.41	Dry Wt.+tare:	691.19
Diameter :	2.73	in	6.93	cm2	Tare Wt:	217.35	Tare Wt:	219.27
Length :	2.75	in	6.98	cm	Dry Wt.:	482.06	Dry Wt.:	471.92
Area:	5.85	in^2	37.77	cm2	Water Wt.:	86.97	Water Wt.:	93.41
Volume :	16.09	in^3	263.70	cm3	% moist.:	18.0	% moist.:	19.8
Unit Wt.(wet):	131.00	pcf	2.10	g/cm^3				
Unit Wt.(dry):	110.98	pcf	1.78	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.51 Void ratio (e) = 0.55 Porosity (n)= 0.35

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.22

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/20/2010	1380	6.1	0.556949	25	0.889	3.44E-08	9.74E-05	
8/20/2010	1740	6	0.656949	25	0.889	3.25E-08	9.22E-05	
8/20/2010	2160	5.9	0.756949	25	0.889	3.05E-08	8.66E-05	
8/20/2010	2580	5.8	0.856949	25	0.889	2.93E-08	8.30E-05	

SUMMARY

ka = 3.17E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.44E-08 cm/sec	8.5	%
k2 =	3.25E-08 cm/sec	2.7	%
k3 =	3.05E-08 cm/sec	3.6	%
k4 =	2.93E-08 cm/sec	7.5	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	3.17E-08	cm/sec	8.98E-05	ft/day
Void Ratio	e =	0.55			
Porosity	n =	0.35			
Bulk Density	γ =	2.10	g/cm3	131.0	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.25E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	40
Plastic Limit	PL	19
Plasticity Index	**PI**	**21**
- 200 Sieve		99 %
+ No 40 Sieve		0 %
+ No 4 Sieve		0 %

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 9/7/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 59	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9907	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000445735	Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T =	0.20378286			

Material Description : Tan & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.67	g	Tare No.:	T 22	Tare No.:	T 17
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	375.56	Wet Wt.+tare:	678.13
Wet Wt. of Sample :			511.67	g	Dry Wt.+tare:	345.66	Dry Wt.+tare:	592.79
Diameter :	2.69	in	6.84	cm2	Tare Wt:	140.48	Tare Wt:	146.73
Length :	2.69	in	6.84	cm	Dry Wt.:	205.18	Dry Wt.:	446.06
Area:	5.70	in^2	36.77	cm2	Water Wt.:	29.9	Water Wt.:	85.34
Volume :	15.35	in^3	251.56	cm3	% moist.:	**14.6**	% moist.:	**19.1**
Unit Wt.(wet):	**126.92**	pcf	**2.03**	g/cm^3				
Unit Wt.(dry):	**110.78**	pcf	**1.78**	g/cm^3				

Assumed Specific Gravity: **2.70** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.03 Void ratio (e) = **0.52** Porosity (n)= **0.34**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.41

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/7/2010	480	5.7	0.957184	25.1	0.887	1.79E-07	5.07E-04	
9/7/2010	540	5.6	1.057184	25.1	0.887	1.78E-07	5.04E-04	
9/7/2010	600	5.5	1.157184	25.1	0.887	1.77E-07	5.02E-04	
9/7/2010	660	5.4	1.257184	25.1	0.887	1.77E-07	5.03E-04	

SUMMARY

ka = 1.78E-07 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.79E-07 cm/sec	0.6	%
k2 =	1.78E-07 cm/sec	0.0	%
k3 =	1.77E-07 cm/sec	0.3	%
k4 =	1.77E-07 cm/sec	0.2	%

$Vm = \frac{|ka-ki|}{ka} \times 100$

Hydraulic conductivity	k =	**1.78E-07**	cm/sec	**5.04E-04**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.03**	g/cm3	**126.9**	pcf
Water Content	W =	**0.26**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**1.82E-12**	cm2	(at 20 deg C)	

Liquid Limit LL	27	
Plastic Limit PL	18	
Plasticity Index PI	9	
- 200 Sieve	51	%
+ No 40 Sieve	0	%
+ No 4 Sieve	0	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 9/20/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	P - 76	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9920	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C = 0.000436843		Annulus Ra	1.5	cm3
Other Location:	North Perimeter	M2 =	1.040953	T = 0.203789852				

Material Description : Red & Gray Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			546.43	g	Tare No.:	T 4	Tare No.:	T 16
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	925.20	Wet Wt.+tare:	705.02
Wet Wt: of Sample :			546.43	g	Dry Wt.+tare:	835.13	Dry Wt.+tare:	626.13
Diameter :	2.71	in	6.89	cm2	Tare Wt:	219.50	Tare Wt:	151.95
Length :	2.68	in	6.81	cm	Dry Wt.:	615.63	Dry Wt.:	474.18
Area:	5.79	in^2	37.33	cm2	Water Wt.:	90.07	Water Wt.:	78.89
Volume :	15.51	in^3	254.17	cm3	% moist.:	14.6	% moist.:	16.6
Unit Wt.(wet):	134.15	pcf	2.15	g/cm^3				
Unit Wt.(dry):	117.03	pcf	1.88	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 97.97 Void ratio (e) = 0.47 Porosity (n)= 0.32

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.45

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/20/2010	1560	5.7	0.957016	25	0.889	5.40E-08	1.53E-04	
9/20/2010	1860	5.6	1.057016	25	0.889	5.07E-08	1.44E-04	
9/20/2010	2220	5.5	1.157016	25	0.889	4.71E-08	1.33E-04	
9/20/2010	2700	5.4	1.257016	25	0.889	4.26E-08	1.21E-04	

SUMMARY

ka = 4.86E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	5.40E-08 cm/sec	11.2	%	Vm = |ka-ki| / ka x 100
k2 =	5.07E-08 cm/sec	4.3	%	
k3 =	4.71E-08 cm/sec	3.1	%	
k4 =	4.26E-08 cm/sec	12.4	%	

Hydraulic conductivity	k =	4.86E-08	cm/sec	1.38E-04	ft/day
Void Ratio	e =	0.47			
Porosity	n =	0.32			
Bulk Density	γ =	2.15	g/cm3	134.2	pcf
Water Content	W =	0.27	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	4.98E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	31
Plastic Limit	PL	15
Plasticity Index	**PI**	**16**
- 200 Sieve		57 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/11/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9954 C	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6, Density P-210	M1 =	0.030180	C =	0.000443805	Annulus Ra	1.5	cm3
Other Location:	East Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			507.02	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 18	Tare No.:	T 12
Wet Wt: of Sample :			507.02	g	Wet Wt.+tare:	270.93	Wet Wt.+tare:	744.45
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	249.31	Dry Wt.+tare:	638.72
Length :	2.72	in	6.90	cm	Tare Wt:	146.72	Tare Wt:	220.20
Area:	5.78	in^2	37.26	cm2	Dry Wt.:	102.59	Dry Wt.:	418.52
Volume :	15.70	in^3	257.23	cm3	Water Wt.:	21.62	Water Wt.:	105.73
Unit Wt.(wet):	122.99	pcf	1.97	g/cm^3	% moist.:	21.1	% moist.:	25.3
Unit Wt.(dry):	101.59	pcf	1.63	g/cm^3				

Assumed Specific Gravity: 2.77 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.64 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.32

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/11/2010	240	5.6	1.057171	25	0.889	3.99E-07	1.13E-03	
10/11/2010	300	5.4	1.257171	25	0.889	3.89E-07	1.10E-03	
10/11/2010	360	5.2	1.457171	25	0.889	3.86E-07	1.09E-03	
10/11/2010	420	5	1.657171	25	0.889	3.87E-07	1.10E-03	

SUMMARY

ka = 3.90E-07 cm/sec

ki		Vm		
k1 =	3.99E-07 cm/sec	2.2	%	
k2 =	3.89E-07 cm/sec	0.3	%	
k3 =	3.86E-07 cm/sec	1.1	%	
k4 =	3.87E-07 cm/sec	0.8	%	

Acceptance criteria = 25 %

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**3.90E-07**	cm/sec	**1.11E-03**	ft/day
Void Ratio	e =	**0.70**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**1.97**	g/cm3	**123.0**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**4.00E-12**	cm2	(at 20 deg C)	

Liquid Limit LL	41	
Plastic Limit PL	20	
Plasticity Index PI	**21**	
- 200 Sieve	86	%
+ No 40 Sieve	4	%
+ No 4 Sieve	0	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/21/2010 Panel Number : P 7; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9978	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6, Density P-210A	M1 =	0.030180	C =	0.000440008	Annulus Ra	1.5	cm3
Other Location:	South-East Perimeter	M2 =	1.040953	T =	0.203783414			

Material Description : Tan & Gray Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			540.28	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 16	Tare No.:	T 3
Wet Wt: of Sample :			540.28	g	Wet Wt.+tare:	508.03	Wet Wt.+tare:	769.03
Diameter :	2.74	in	6.96	cm2	Dry Wt.+tare:	452.71	Dry Wt.+tare:	671.55
Length :	2.75	in	6.99	cm	Tare Wt:	151.95	Tare Wt:	220.96
Area:	5.90	in^2	38.07	cm2	Dry Wt.:	300.76	Dry Wt.:	450.59
Volume :	16.25	in^3	266.23	cm3	Water Wt.:	55.32	Water Wt.:	97.48
Unit Wt.(wet):	126.63	pcf	2.03	g/cm^3	% moist.:	18.4	% moist.:	21.6
Unit Wt.(dry):	106.96	pcf	1.71	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.31 Void ratio (e) = 0.61 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.20

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/21/2010	1800	6.1	0.557171	25.5	0.879	2.59E-08	7.34E-05	
10/21/2010	2040	6	0.657171	25.5	0.879	2.73E-08	7.73E-05	
10/21/2010	2280	5.9	0.757171	25.5	0.879	2.84E-08	8.06E-05	
10/21/2010	2580	5.8	0.857171	25.5	0.879	2.88E-08	8.16E-05	

SUMMARY

ka = 2.76E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.59E-08 cm/sec	6.1	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	2.73E-08 cm/sec	1.2	%	
k3 =	2.84E-08 cm/sec	3.0	%	
k4 =	2.88E-08 cm/sec	4.3	%	

Hydraulic conductivity	k =	2.76E-08	cm/sec	7.82E-05	ft/day
Void Ratio	e =	0.61			
Porosity	n =	0.38			
Bulk Density	γ =	2.03	g/cm3	126.6	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	2.83E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	20
Plasticity Index	**PI**	**21**
- 200 Sieve		91 %
+ No 40 Sieve		3 %
+ No 4 Sieve		0 %

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 10/13/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:		ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9960 E	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 6, Density P-211	M1 =	0.030180	C = 0.00045426		Annulus Ra	1.5	cm3
Other Location:	Perimeter	M2 =	1.040953	T = 0.203783414				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			541.01	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 19	Tare No.:	T 2
Wet Wt: of Sample :			541.01	g	Wet Wt.+tare:	443.32	Wet Wt.+tare:	764.12
Diameter :	2.71	in	6.87	cm2	Dry Wt.+tare:	401.89	Dry Wt.+tare:	671.30
Length :	2.77	in	7.03	cm	Tare Wt:	186.32	Tare Wt:	216.57
Area:	5.75	in^2	37.08	cm2	Dry Wt.:	215.57	Dry Wt.:	454.73
Volume :	15.91	in^3	260.70	cm3	Water Wt.:	41.43	Water Wt.:	92.82
Unit Wt.(wet):	129.49	pcf	2.08	g/cm^3	% moist.:	19.2	% moist.:	20.4
Unit Wt.(dry):	108.62	pcf	1.74	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.87 Void ratio (e) = 0.55 Porosity (n)= 0.36

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.15

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
10/13/2010	1800	6.1	0.557171	25	0.889	2.70E-08	7.67E-05	
10/13/2010	2040	6.05	0.607171	25	0.889	2.62E-08	7.41E-05	
10/13/2010	2280	6	0.657171	25	0.889	2.55E-08	7.22E-05	
10/13/2010	2580	5.95	0.707171	25	0.889	2.44E-08	6.91E-05	

SUMMARY

ka = 2.58E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	2.70E-08 cm/sec	5.0	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	2.62E-08 cm/sec	1.5	%	
k3 =	2.55E-08 cm/sec	1.1	%	
k4 =	2.44E-08 cm/sec	5.4	%	

Hydraulic conductivity	k =	**2.58E-08**	cm/sec	**7.30E-05**	ft/day
Void Ratio	e =	**0.55**			
Porosity	n =	**0.36**			
Bulk Density	γ =	**2.08**	g/cm3	**129.5**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.64E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	44
Plastic Limit	PL	20
Plasticity Index	**PI**	**24**
- 200 Sieve		85 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/7/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 1	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9850	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000435198	Annulus Ra	1.5	cm3
Other Location:	East Berm	M2 =	1.040953	T =	0.203783491			

Material Description : Tan & Gray

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			508.04	g	Tare No.:	T 25	Tare No.:	T 24
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	469.56	Wet Wt.+tare:	625.19
Wet Wt: of Sample :			508.04	g	Dry Wt.+tare:	400.92	Dry Wt.+tare:	521.46
Diameter :	2.73	in	6.92	cm2	Tare Wt:	116.15	Tare Wt:	112.33
Length :	2.69	in	6.84	cm	Dry Wt.:	284.77	Dry Wt.:	409.13
Area:	5.83	in^2	37.63	cm2	Water Wt.:	68.64	Water Wt.:	103.73
Volume :	15.70	in^3	257.23	cm3	% moist.:	24.1	% moist.:	25.4
Unit Wt.(wet):	123.24	pcf	1.98	g/cm^3				
Unit Wt.(dry):	99.31	pcf	1.59	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.16 Void ratio (e) = 0.70 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.41

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/10/2010	1200	5.7	0.957169	25.2	0.885	6.97E-08	1.97E-04	
8/10/2010	1380	5.6	1.057169	25.2	0.885	6.77E-08	1.92E-04	
8/10/2010	1560	5.5	1.157169	25.2	0.885	6.64E-08	1.88E-04	
8/10/2010	1800	5.4	1.257169	25.2	0.885	6.33E-08	1.80E-04	

SUMMARY

ka = 6.68E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	6.97E-08 cm/sec	4.3	%	Vm = |ka-ki| / ka x 100
k2 =	6.77E-08 cm/sec	1.4	%	
k3 =	6.64E-08 cm/sec	0.6	%	
k4 =	6.33E-08 cm/sec	5.2	%	

Hydraulic conductivity	k =	6.68E-08	cm/sec	1.89E-04	ft/day
Void Ratio	e =	0.70			
Porosity	n =	0.41			
Bulk Density	γ =	1.98	g/cm3	123.2	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	6.84E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	20
Plasticity Index	**PI**	**23**
- 200 Sieve		77 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/12/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 9	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9859	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 1	M1 =	0.030180	C =	0.000449744	Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T =	0.203779934			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.72	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 3	Tare No.:	T 21
Wet Wt: of Sample :			511.72	g	Wet Wt.+tare:	830.76	Wet Wt.+tare:	655.41
Diameter :	2.70	in	6.85	cm2	Dry Wt.+tare:	719.84	Dry Wt.+tare:	555.53
Length :	2.73	in	6.92	cm	Tare Wt:	220.65	Tare Wt:	140.33
Area:	5.71	in^2	36.87	cm2	Dry Wt.:	499.19	Dry Wt.:	415.2
Volume :	15.57	in^3	255.18	cm3	Water Wt.:	110.92	Water Wt.:	99.88
Unit Wt.(wet):	125.13	pcf	2.01	g/cm^3	% moist.:	22.2	% moist.:	24.1
Unit Wt.(dry):	102.38	pcf	1.64	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 100.48 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.30

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/12/2010	840	6.1	0.557255	25	0.889	5.74E-08	1.63E-04	
8/12/2010	1080	6	0.657255	25	0.889	5.32E-08	1.51E-04	
8/12/2010	1320	5.9	0.757255	25	0.889	5.08E-08	1.44E-04	
8/12/2010	1560	5.8	0.857255	25	0.889	4.92E-08	1.40E-04	

SUMMARY

ka = 5.27E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	5.74E-08 cm/sec	9.0	%
k2 =	5.32E-08 cm/sec	1.1	%
k3 =	5.08E-08 cm/sec	3.6	%
k4 =	4.92E-08 cm/sec	6.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	5.27E-08	cm/sec	1.49E-04	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.39			
Bulk Density	γ =	2.01	g/cm3	125.1	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	5.39E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	38
Plastic Limit	PL	18
Plasticity Index	PI	20
- 200 Sieve		79 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/11/2010 Panel Number : P 1 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 4	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9853	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C = 0.000444527		Annulus Ra	1.5	cm3
Other Location:	East Berm	M2 =	1.040953	T = 0.203786912				

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			516.90	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 1	Tare No.:	T 24
Wet Wt: of Sample :			516.90	g	Wet Wt.+tare:	595.65	Wet Wt.+tare:	639.20
Diameter :	2.73	in	6.92	cm2	Dry Wt.+tare:	524.61	Dry Wt.+tare:	530.11
Length :	2.75	in	6.98	cm	Tare Wt:	217.25	Tare Wt:	112.34
Area:	5.83	in^2	37.63	cm2	Dry Wt.:	307.36	Dry Wt.:	417.77
Volume :	16.04	in^3	262.86	cm3	Water Wt.:	71.04	Water Wt.:	109.09
Unit Wt.(wet):	122.71	pcf	1.97	g/cm^3	% moist.:	23.1	% moist.:	26.1
Unit Wt.(dry):	99.67	pcf	1.60	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 102.00 Void ratio (e) = 0.69 Porosity (n)= 0.41

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.21

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/11/2010	960	5.7	0.957086	25.2	0.885	8.89E-08	2.52E-04	
8/11/2010	1080	5.6	1.057086	25.2	0.885	8.84E-08	2.51E-04	
8/11/2010	1200	5.5	1.157086	25.2	0.885	8.82E-08	2.50E-04	
8/11/2010	1380	5.4	1.257086	25.2	0.885	8.44E-08	2.39E-04	

SUMMARY

ka =	8.75E-08	cm/sec		Acceptance criteria = 25 %
ki			Vm	
k1 =	8.89E-08	cm/sec	1.7	% Vm = |ka-ki| / ka x 100
k2 =	8.84E-08	cm/sec	1.1	%
k3 =	8.82E-08	cm/sec	0.8	%
k4 =	8.44E-08	cm/sec	3.5	%

Hydraulic conductivity	k =	8.75E-08	cm/sec	2.48E-04	ft/day
Void Ratio	e =	0.69			
Porosity	n =	0.41			
Bulk Density	γ =	1.97	g/cm3	122.7	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	8.96E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	22
Plasticity Index	**PI**	**20**
- 200 Sieve		88 %
+ No 40 Sieve		5 %
+ No 4 Sieve		0 %

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/12/2010 Panel Number : P 3; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 12	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9860	aa =	0.767120 cm2			Pipet Rp	6.6	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000440042	Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T =	0.204083911			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			501.22	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 17	Tare No.:	T 23
Wet Wt: of Sample :			501.22	g	Wet Wt.+tare:	487.09	Wet Wt.+tare:	644.41
Diameter :	2.72	in	6.90	cm2	Dry Wt.+tare:	419.97	Dry Wt.+tare:	540.62
Length :	2.71	in	6.87	cm	Tare Wt:	146.70	Tare Wt:	140.25
Area:	5.80	in^2	37.42	cm2	Dry Wt.:	273.27	Dry Wt.:	400.37
Volume :	15.70	in^3	257.24	cm3	Water Wt.:	67.12	Water Wt.:	103.79
Unit Wt.(wet):	**121.58**	pcf	**1.95**	g/cm^3	% moist.:	**24.6**	% moist.:	**25.9**
Unit Wt.(dry):	**97.61**	pcf	**1.56**	g/cm^3				

Assumed Specific Gravity: **2.70** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.29 Void ratio (e) = **0.73** Porosity (n)= **0.42**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.35

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/12/2010	480	6.1	0.549945	25	0.889	9.70E-08	2.75E-04	
8/12/2010	600	6	0.649945	25	0.889	9.28E-08	2.63E-04	
8/12/2010	720	5.9	0.749945	25	0.889	9.03E-08	2.56E-04	
8/12/2010	840	5.8	0.849945	25	0.889	8.87E-08	2.52E-04	

SUMMARY

ka =	9.22E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	9.70E-08	cm/sec	5.2	%	Vm = |ka-ki| / ka x 100
k2 =	9.28E-08	cm/sec	0.6	%	
k3 =	9.03E-08	cm/sec	2.1	%	
k4 =	8.87E-08	cm/sec	3.8	%	

Hydraulic conductivity	k =	**9.22E-08**	cm/sec	**2.61E-04** ft/day
Void Ratio	e =	**0.73**		
Porosity	n =	**0.42**		
Bulk Density	γ =	**1.95**	g/cm3	**121.6** pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)
Intrinsic Permeability	kint =	**9.45E-13**	cm2	(at 20 deg C)

Liquid Limit LL	40	
Plastic Limit PL	21	
Plasticity Index PI	19	
- 200 Sieve	82	%
+ No 40 Sieve	4	%
+ No 4 Sieve	0	%

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/16/2010 Panel Number : P 4; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 23	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9869	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 2	M1 =	0.030180	C =	0.000431741	Annulus Ra	1.5	cm3
Other Location:	West Berm	M2 =	1.040953	T =	0.203778524			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			507.97	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 22	Tare No.:	T 3
Wet Wt: of Sample :			507.97	g	Wet Wt.+tare:	280.19	Wet Wt.+tare:	731.89
Diameter :	2.73	in	6.94	cm2	Dry Wt.+tare:	251.90	Dry Wt.+tare:	630.12
Length :	2.68	in	6.81	cm	Tare Wt:	140.46	Tare Wt:	220.68
Area:	5.86	in^2	37.79	cm2	Dry Wt.:	111.44	Dry Wt.:	409.44
Volume :	15.71	in^3	257.36	cm3	Water Wt.:	28.29	Water Wt.:	101.77
Unit Wt.(wet):	**123.16**	pcf	**1.97**	g/cm^3	% moist.:	**25.4**	% moist.:	**24.9**
Unit Wt.(dry):	**98.23**	pcf	**1.57**	g/cm^3				

Assumed Specific Gravity: **2.65** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.26 Void ratio (e) = **0.68** Porosity (n)= **0.41**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.45

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/16/2010	1620	6.1	0.557288	25	0.889	2.86E-08	8.10E-05	
8/16/2010	2100	6	0.657288	25	0.889	2.63E-08	7.45E-05	
8/16/2010	2640	5.9	0.757288	25	0.889	2.44E-08	6.91E-05	
8/16/2010	3240	5.8	0.857288	25	0.889	2.28E-08	6.45E-05	

SUMMARY

	ka =	2.55E-08	cm/sec		Acceptance criteria = 25 %
	ki			Vm	
	k1 =	2.86E-08	cm/sec	12.0 %	Vm = |ka-ki| / ka x 100
	k2 =	2.63E-08	cm/sec	3.1 %	
	k3 =	2.44E-08	cm/sec	4.4 %	
	k4 =	2.28E-08	cm/sec	10.8 %	

Hydraulic conductivity	k =	**2.55E-08**	cm/sec	**7.23E-05**	ft/day
Void Ratio	e =	**0.68**			
Porosity	n =	**0.41**			
Bulk Density	γ =	**1.97**	g/cm3	**123.2**	pcf
Water Content	W =	**0.40**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.61E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	39
Plastic Limit	PL	17
Plasticity Index	**PI**	**22**
- 200 Sieve		78 %
+ No 40 Sieve		3 %
+ No 4 Sieve		1 %

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GEOTECHNICAL * MATERIALS * ENVIRONMENTAL * DRILLING * LANDFILLS

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/11/2010 Panel Number : P 2 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 5	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9854	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C =	0.000444547	Annulus Ra	1.5	cm3
Other Location:	East Berm	M2 =	1.040953	T =	0.203782532			

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			525.11	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 6	Tare No.:	T 21
Wet Wt: of Sample :			525.11	g	Wet Wt.+tare:	618.26	Wet Wt.+tare:	667.95
Diameter :	2.73	in	6.93	cm2	Dry Wt.+tare:	543.53	Dry Wt.+tare:	567.76
Length :	2.76	in	7.01	cm	Tare Wt:	217.31	Tare Wt:	140.31
Area:	5.85	in^2	37.75	cm2	Dry Wt.:	326.22	Dry Wt.:	427.45
Volume :	16.14	in^3	264.42	cm3	Water Wt.:	74.73	Water Wt.:	100.19
Unit Wt.(wet):	123.92	pcf	1.99	g/cm^3	% moist.:	22.9	% moist.:	23.4
Unit Wt.(dry):	100.82	pcf	1.62	g/cm^3				

Assumed Specific Gravity: 2.65 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.92 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.19

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/11/2010	1320	6.1	0.557192	25.1	0.887	3.60E-08	1.02E-04	
8/11/2010	1860	6	0.657192	25.1	0.887	3.05E-08	8.64E-05	
8/11/2010	2400	5.9	0.757192	25.1	0.887	2.75E-08	7.81E-05	
8/11/2010	3000	5.8	0.857192	25.1	0.887	2.52E-08	7.15E-05	

SUMMARY

ka = 2.98E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	3.60E-08 cm/sec	20.8	%
k2 =	3.05E-08 cm/sec	2.2	%
k3 =	2.75E-08 cm/sec	7.6	%
k4 =	2.52E-08 cm/sec	15.4	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	2.98E-08	cm/sec	8.45E-05	ft/day
Void Ratio	e =	0.64			
Porosity	n =	0.39			
Bulk Density	γ =	1.99	g/cm3	123.9	pcf
Water Content	W =	0.37	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	3.06E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	19
Plasticity Index	PI	22
- 200 Sieve		81 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/12/2010 Panel Number : P 4; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 14	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9861	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 3	M1 =	0.030180	C = 0.000438109		Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T = 0.203851591				

Material Description : Gray & Tan Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			511.35	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 16	Tare No.:	T 22
Wet Wt: of Sample :			511.35	g	Wet Wt.+tare:	428.86	Wet Wt.+tare:	656.50
Diameter :	2.72	in	6.90	cm2	Dry Wt.+tare:	376.65	Dry Wt.+tare:	555.59
Length :	2.70	in	6.85	cm	Tare Wt:	151.95	Tare Wt:	140.44
Area:	5.80	in^2	37.43	cm2	Dry Wt.:	224.7	Dry Wt.:	415.15
Volume :	15.64	in^3	256.30	cm3	Water Wt.:	52.21	Water Wt.:	100.91
Unit Wt.(wet):	124.50	pcf	2.00	g/cm^3	% moist.:	23.2	% moist.:	24.3
Unit Wt.(dry):	101.02	pcf	1.62	g/cm^3				

Assumed Specific Gravity: 2.70 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 98.17 Void ratio (e) = 0.67 Porosity (n)= 0.40

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.40

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/12/2010	480	6.1	0.55553	25	0.889	9.75E-08	2.77E-04	
8/12/2010	600	6	0.65553	25	0.889	9.31E-08	2.64E-04	
8/12/2010	720	5.9	0.75553	25	0.889	9.05E-08	2.57E-04	
8/12/2010	840	5.8	0.85553	25	0.889	8.89E-08	2.52E-04	

SUMMARY

ka = 9.25E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	9.75E-08 cm/sec	5.4	%
k2 =	9.31E-08 cm/sec	0.7	%
k3 =	9.05E-08 cm/sec	2.2	%
k4 =	8.89E-08 cm/sec	3.9	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	9.25E-08	cm/sec	2.62E-04	ft/day
Void Ratio	e =	0.67			
Porosity	n =	0.40			
Bulk Density	γ =	2.00	g/cm3	124.5	pcf
Water Content	W =	0.38	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	9.48E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	21
Plasticity Index	**PI**	**20**
- 200 Sieve		86 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/11/2010 Panel Number : P 3 ; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 7	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9855	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000446463		Annulus Ra	1.5	cm3
Other Location:	East Berm	M2 =	1.040953	T = 0.203789737				

Material Description : Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			507.47	g				
Tare or ring Wt. :			0.0	g				
Wet Wt: of Sample :			507.47	g	Tare No.:	T 5	Tare No.:	T 19
Diameter :	2.70	in	6.87	cm2	Wet Wt.+tare:	723.86	Wet Wt.+tare:	699.49
Length :	2.72	in	6.90	cm	Dry Wt.+tare:	626.41	Dry Wt.+tare:	589.88
Area:	5.74	in^2	37.04	cm2	Tare Wt:	218.76	Tare Wt:	186.30
Volume :	15.61	in^3	255.73	cm3	Dry Wt.:	407.65	Dry Wt.:	403.58
Unit Wt.(wet):	**123.83**	pcf	**1.98**	g/cm^3	Water Wt.:	97.45	Water Wt.:	109.61
Unit Wt.(dry):	**99.94**	pcf	**1.60**	g/cm^3	% moist.:	**23.9**	% moist.:	**27.2**

Specific Gravity: **2.75** Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
ulated % saturation: 104.03 /oid ratio (e) = **0.72** Porosity (n)= **0.42**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.32

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/11/2010	1140	6.1	0.557018	25.3	0.883	4.17E-08	1.18E-04	
8/11/2010	1500	6	0.657018	25.3	0.883	3.78E-08	1.07E-04	
8/11/2010	1860	5.9	0.757018	25.3	0.883	3.55E-08	1.01E-04	
8/11/2010	2220	5.8	0.857018	25.2	0.885	3.42E-08	9.69E-05	

SUMMARY

ka = 3.73E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	4.17E-08 cm/sec	11.8	%
k2 =	3.78E-08 cm/sec	1.3	%
k3 =	3.55E-08 cm/sec	4.7	%
k4 =	3.42E-08 cm/sec	8.4	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**3.73E-08**	cm/sec	**1.06E-04**	ft/day
Void Ratio	e =	**0.72**			
Porosity	n =	**0.42**			
Bulk Density	γ =	**1.98**	g/cm3	**123.8**	pcf
Water Content	W =	**0.38**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**3.82E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	42
Plastic Limit	PL	20
Plasticity Index	**PI**	22
- 200 Sieve		83 %
+ No 40 Sieve		5 %
+ No 4 Sieve		1 %

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

Project :	Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas							
Date:	8/12/2010	Panel Number :			P 5; ASTM D 5084			
Project No. :	L 213-09	Permometer Data						
Boring No.:	S - 15	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9862	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 4	M1 =	0.030180	C = 0.000426305		Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T = 0.203782386				
Material Description :	Brown, Gray & Tan Lean Clay w/ Sand							

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			535.80	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 23	Tare No.:	T 17
Wet Wt: of Sample :			535.80	g	Wet Wt.+tare:	497.78	Wet Wt.+tare:	687.31
Diameter :	2.74	in	6.96	cm2	Dry Wt.+tare:	449.45	Dry Wt.+tare:	606.88
Length :	2.67	in	6.78	cm	Tare Wt:	140.25	Tare Wt:	146.76
Area:	5.91	in^2	38.10	cm2	Dry Wt.:	309.2	Dry Wt.:	460.12
Volume :	15.76	in^3	258.32	cm3	Water Wt.:	48.33	Water Wt.:	80.43
Unit Wt.(wet):	**129.43**	pcf	**2.07**	g/cm^3	% moist.:	**15.6**	% moist.:	**17.5**
Unit Wt.(dry):	**111.93**	pcf	**1.79**	g/cm^3				

Assumed Specific Gravity:	**2.65**	Max Dry Density(pcf) =		OMC =	
		% of max =		+/- OMC =	
Calculated % saturation:	96.90	Void ratio (e) =	**0.48**	Porosity (n)=	**0.32**

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.49

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/12/2010	600	6.1	0.557195	25	0.889	7.61E-08	2.16E-04	
8/12/2010	840	6	0.657195	25	0.889	6.49E-08	1.84E-04	
8/12/2010	1140	5.9	0.757195	25	0.889	5.57E-08	1.58E-04	
8/12/2010	1440	5.8	0.857195	25	0.889	5.05E-08	1.43E-04	

SUMMARY

ka =	6.18E-08	cm/sec		Acceptance criteria =	25 %
ki			Vm		
k1 =	7.61E-08	cm/sec	23.2	%	Vm = $\frac{\lvert ka-ki \rvert}{ka} \times 100$
k2 =	6.49E-08	cm/sec	5.0	%	
k3 =	5.57E-08	cm/sec	9.9	%	
k4 =	5.05E-08	cm/sec	18.3	%	

Hydraulic conductivity	k =	**6.18E-08**	cm/sec	**1.75E-04**	ft/day
Void Ratio	e =	**0.48**			
Porosity	n =	**0.32**			
Bulk Density	γ =	**2.07**	g/cm3	**129.4**	pcf
Water Content	W =	**0.28**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**6.33E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	38	
Plastic Limit PL	19	
Plasticity Index PI	19	
- 200 Sieve	81	%
+ No 40 Sieve	5	%
+ No 4 Sieve	1	%

Respectfully Submitted

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FLEXIBLE WALL PERMEAMETER - CONSTANT VOLUME
(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/18/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 33	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9874	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C =	0.000439132	Annulus Ra	1.5	cm3
Other Location:	East Berm Slope	M2 =	1.040953	T =	0.20378142			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			522.04	g	Tare No.:	T 2	Tare No.:	T 1
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	607.84	Wet Wt.+tare:	748.01
Wet Wt: of Sample :			522.04	g	Dry Wt.+tare:	539.94	Dry Wt.+tare:	649.93
Diameter :	2.72	in	6.91	cm2	Tare Wt:	216.57	Tare Wt:	217.27
Length :	2.71	in	6.88	cm	Dry Wt.:	323.37	Dry Wt.:	432.66
Area:	5.82	in^2	37.52	cm2	Water Wt.:	67.9	Water Wt.:	98.08
Volume :	15.75	in^3	258.10	cm3	% moist.:	21.0	% moist.:	22.7
Unit Wt.(wet):	126.21	pcf	2.02	g/cm^3				
Unit Wt.(dry):	104.31	pcf	1.67	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 96.52 Void ratio (e) = 0.65 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.36

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/18/2010	2220	6.1	0.557219	25	0.889	2.12E-08	6.01E-05	
8/18/2010	2940	6	0.657219	25	0.889	1.91E-08	5.41E-05	
8/18/2010	3720	5.9	0.757219	25	0.889	1.76E-08	4.99E-05	
8/18/2010	4500	5.8	0.857219	25	0.889	1.67E-08	4.72E-05	

SUMMARY

ka = 1.86E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.12E-08 cm/sec	13.8	%
k2 =	1.91E-08 cm/sec	2.5	%
k3 =	1.76E-08 cm/sec	5.6	%
k4 =	1.67E-08 cm/sec	10.6	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.86E-08	cm/sec	5.28E-05	ft/day
Void Ratio	e =	0.65			
Porosity	n =	0.39			
Bulk Density	γ =	2.02	g/cm3	126.2	pcf
Water Content	W =	0.35	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.91E-13	cm2	(at 20 deg C)	

Liquid Limit LL	45	
Plastic Limit PL	22	
Plasticity Index PI	**23**	
- 200 Sieve	82	%
+ No 40 Sieve	9	%
+ No 4 Sieve	3	%

Respectfully Submitted

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(Mercury Permometer Test)

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/19/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 41	ap =	0.031416	cm2	Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9878	aa =	0.767120	cm2		Pipet Rp	6.7	cm3
Depth (ft):	Lift 5	M1 =	0.030180	C = 0.000446433		Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T = 0.203782101				

Material Description : Red, Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			534.76	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 13	Tare No.:	T 2
Wet Wt: of Sample :			534.76	g	Wet Wt.+tare:	673.63	Wet Wt.+tare:	754.90
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	598.88	Dry Wt.+tare:	664.03
Length :	2.73	in	6.95	cm	Tare Wt:	219.69	Tare Wt:	216.57
Area:	5.78	in^2	37.27	cm2	Dry Wt.:	379.19	Dry Wt.:	447.46
Volume :	15.80	in^3	258.87	cm3	Water Wt.:	74.75	Water Wt.:	90.87
Unit Wt.(wet):	128.90	pcf	2.07	g/cm^3	% moist.:	19.7	% moist.:	20.3
Unit Wt.(dry):	107.68	pcf	1.73	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 93.95 Void ratio (e) = 0.59 Porosity (n)= 0.37

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.27

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/19/2010	480	5.7	0.957202	25	0.889	1.79E-07	5.09E-04	
8/19/2010	540	5.6	1.057202	25	0.889	1.78E-07	5.06E-04	
8/19/2010	600	5.5	1.157202	25	0.889	1.78E-07	5.04E-04	
8/19/2010	660	5.4	1.257202	25	0.889	1.78E-07	5.05E-04	

SUMMARY

ka = 1.78E-07 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.79E-07 cm/sec	0.6	%
k2 =	1.78E-07 cm/sec	0.0	%
k3 =	1.78E-07 cm/sec	0.3	%
k4 =	1.78E-07 cm/sec	0.2	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.78E-07	cm/sec	5.06E-04	ft/day
Void Ratio	e =	0.59			
Porosity	n =	0.37			
Bulk Density	γ =	2.07	g/cm3	128.9	pcf
Water Content	W =	0.34	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.83E-12	cm2	(at 20 deg C)	

Liquid Limit	LL	41
Plastic Limit	PL	21
Plasticity Index	**PI**	**20**
- 200 Sieve		86 %
+ No 40 Sieve		4 %
+ No 4 Sieve		1 %

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 PDP 1 - 3 Liner, Tatum, Texas
Date: 9/20/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 41 A	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9918	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 5 (8 PS pressure)	M1 =	0.030180	C =	0.0004446	Annulus Ra	1.5	cm3
Other Location:	South Slope	M2 =	1.040953	T =	0.203783313			

Material Description : Gray & Tan Sandy Lean Clay

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			537.26	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 6	Tare No.:	T 19
Wet Wt: of Sample :			537.26	g	Wet Wt.+tare:	582.58	Wet Wt.+tare:	739.27
Diameter :	2.71	in	6.89	cm2	Dry Wt.+tare:	535.27	Dry Wt.+tare:	651.28
Length :	2.73	in	6.93	cm	Tare Wt:	217.36	Tare Wt:	186.30
Area:	5.79	in^2	37.34	cm2	Dry Wt.:	317.91	Dry Wt.:	464.98
Volume :	15.79	in^3	258.76	cm3	Water Wt.:	47.31	Water Wt.:	87.99
Unit Wt.(wet):	129.56	pcf	2.08	g/cm^3	% moist.:	14.9	% moist.:	18.9
Unit Wt.(dry):	112.78	pcf	1.81	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.63 Void ratio (e) = 0.52 Porosity (n)= 0.34

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.29

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
9/20/2010	840	5.7	0.957173	25	0.889	1.02E-07	2.89E-04	
9/20/2010	1020	5.6	1.057173	25	0.889	9.40E-08	2.67E-04	
9/20/2010	1200	5.5	1.157173	25	0.889	8.86E-08	2.51E-04	
9/20/2010	1560	5.3	1.357173	25	0.889	8.20E-08	2.33E-04	

SUMMARY

ka = 9.17E-08 cm/sec Acceptance criteria = 25 %

ki		Vm		
k1 =	1.02E-07 cm/sec	11.4	%	Vm = |ka-ki| / ka x 100
k2 =	9.40E-08 cm/sec	2.5	%	
k3 =	8.86E-08 cm/sec	3.4	%	
k4 =	8.20E-08 cm/sec	10.5	%	

Hydraulic conductivity	k =	**9.17E-08**	cm/sec	**2.60E-04**	ft/day
Void Ratio	e =	**0.52**			
Porosity	n =	**0.34**			
Bulk Density	γ =	**2.08**	g/cm3	**129.6**	pcf
Water Content	W =	**0.27**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**9.40E-13**	cm2	(at 20 deg C)	

Liquid Limit LL	33	
Plastic Limit PL	17	
Plasticity Index PI	16	
- 200 Sieve	63	%
+ No 40 Sieve	2	%
+ No 4 Sieve	0	%

Respectfully Submitted

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/18/2010 Panel Number : P 1; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 35	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9875	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000440351	Annulus Ra	1.5	cm3
Other Location:	East Berm Slope	M2 =	1.040953	T =	0.203787565			

Material Description : Gray & Tan Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			520.31	g				
Tare or ring Wt. :			0.0	g	Tare No.:	T 13	Tare No.:	T 5
Wet Wt: of Sample :			520.31	g				
Diameter :	2.72	in	6.90	cm2	Wet Wt.+tare:	752.01	Wet Wt.+tare:	750.40
Length :	2.71	in	6.88	cm	Dry Wt.+tare:	661.59	Dry Wt.+tare:	650.55
Area:	5.80	in^2	37.41	cm2	Tare Wt:	219.67	Tare Wt:	218.78
Volume :	15.70	in^3	257.31	cm3	Dry Wt.:	441.92	Dry Wt.:	431.77
Unit Wt.(wet):	126.18	pcf	2.02	g/cm^3	Water Wt.:	90.42	Water Wt.:	99.85
Unit Wt.(dry):	104.75	pcf	1.68	g/cm^3	% moist.:	20.5	% moist.:	23.1

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 99.53 Void ratio (e) = 0.64 Porosity (n)= 0.39

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.36

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/18/2010	1680	6.1	0.557071	25	0.889	2.81E-08	7.96E-05	
8/18/2010	2160	6	0.657071	25	0.889	2.61E-08	7.39E-05	
8/18/2010	2640	5.9	0.757071	25	0.889	2.49E-08	7.05E-05	
8/18/2010	3120	5.8	0.857071	25	0.889	2.41E-08	6.83E-05	

SUMMARY

ka = 2.58E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	2.81E-08 cm/sec	9.0	%
k2 =	2.61E-08 cm/sec	1.1	%
k3 =	2.49E-08 cm/sec	3.6	%
k4 =	2.41E-08 cm/sec	6.5	%

$$Vm = \frac{|ka - ki|}{ka} \times 100$$

Hydraulic conductivity	k =	**2.58E-08**	cm/sec	**7.31E-05**	ft/day
Void Ratio	e =	**0.64**			
Porosity	n =	**0.39**			
Bulk Density	γ =	**2.02**	g/cm3	**126.2**	pcf
Water Content	W =	**0.34**	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	**2.64E-13**	cm2	(at 20 deg C)	

Liquid Limit	LL	43
Plastic Limit	PL	21
Plasticity Index	**PI**	**22**
- 200 Sieve		73 %
+ No 40 Sieve		9 %
+ No 4 Sieve		2 %

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

Project : Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Date: 8/19/2010 Panel Number : P 2; ASTM D 5084
Project No. : L 213-09 Permometer Data

Boring No.:	S - 44	ap =	0.031416 cm2		Set Mercury to Pipet Rp at	Equilibrium	1.8	cm3
Sample:	9879	aa =	0.767120 cm2			Pipet Rp	6.7	cm3
Depth (ft):	Lift 6	M1 =	0.030180	C =	0.000442267	Annulus Ra	1.5	cm3
Other Location:	South Berm Slope	M2 =	1.040953	T =	0.203784368			

Material Description : Red, Tan & Gray Lean Clay w/ Sand

SAMPLE DATA

					Before Test		After Test	
Wet Wt. sample + ring or tare :			533.63	g	Tare No.:	T 6	Tare No.:	T 5
Tare or ring Wt. :			0.0	g	Wet Wt.+tare:	628.82	Wet Wt.+tare:	762.77
Wet Wt: of Sample :			533.63	g	Dry Wt.+tare:	563.04	Dry Wt.+tare:	662.31
Diameter :	2.73	in	6.94	cm2	Tare Wt:	217.36	Tare Wt:	218.81
Length :	2.75	in	6.99	cm	Dry Wt.:	345.68	Dry Wt.:	443.5
Area:	5.87	in^2	37.84	cm2	Water Wt.:	65.78	Water Wt.:	100.46
Volume :	16.13	in^3	264.37	cm3	% moist.:	19.0	% moist.:	22.7
Unit Wt.(wet):	125.95	pcf	2.02	g/cm^3				
Unit Wt.(dry):	105.82	pcf	1.70	g/cm^3				

Assumed Specific Gravity: 2.75 Max Dry Density(pcf) = OMC =
% of max = +/- OMC =
Calculated % saturation: 100.07 Void ratio (e) = 0.62 Porosity (n)= 0.38

TEST READINGS

Z1(Mercury Height Difference @ t1): 5.1 cm Hydraulic Gradient = 9.21

Date	elapsed t (seconds)	Z (pipet @ t)	ΔZπ (cm)	temp (deg C)	α (temp corr)	k (cm/sec)	k (ft./day)	Reset = *
8/19/2010	2940	6.1	0.557148	25	0.889	1.61E-08	4.57E-05	
8/19/2010	3360	6.05	0.607148	25	0.889	1.55E-08	4.38E-05	
8/19/2010	3840	6	0.657148	25	0.889	1.47E-08	4.17E-05	
8/19/2010	4320	5.95	0.707148	25	0.889	1.42E-08	4.02E-05	

SUMMARY

ka = 1.51E-08 cm/sec Acceptance criteria = 25 %

ki		Vm	
k1 =	1.61E-08 cm/sec	6.6	%
k2 =	1.55E-08 cm/sec	2.3	%
k3 =	1.47E-08 cm/sec	2.6	%
k4 =	1.42E-08 cm/sec	6.3	%

$$Vm = \frac{|ka-ki|}{ka} \times 100$$

Hydraulic conductivity	k =	1.51E-08	cm/sec	4.29E-05	ft/day
Void Ratio	e =	0.62			
Porosity	n =	0.38			
Bulk Density	γ =	2.02	g/cm3	126.0	pcf
Water Content	W =	0.32	cm3/cm3	(at 20 deg C)	
Intrinsic Permeability	kint =	1.55E-13	cm2	(at 20 deg C)	

Liquid Limit	LL	48
Plastic Limit	PL	14
Plasticity Index	**PI**	34
- 200 Sieve		79 %
+ No 40 Sieve		2 %
+ No 4 Sieve		1 %

Respectfully Submitted

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Mechanical Sieve Analysis ASTM D422, ASTM C136

Project Information

Project: Luminant Martin Lake PDP 1 - 3 Liner, Tatum, Texas
Client/Arch./Engr.: HDR
Contractor: MSI
Job No.: L 213-09

Sample Information

Boring No: N/A
Sample No.: 9789 Depth: N/A ft Date Sampled: 6/21/2010
Material Origin:
Sampling Info. provided By: Jacob LeNoir
Material Description: Leachate Collection Stone
Sampled By: Jacob LeNoir
Technician: Todd Sliger Test Date:

Test Data

Sieve Number	Sieve Size (mm)	Accumulated Mass Retained (grams)	Sample Retained (%)	Sample Finer (%)
1-1/2"	37.5	0	0.0	100.0
1"	25	581.6	2.6	97.4
3/4"	19	5014	22.6	77.4
5/8"	16	10198.9	46.0	54.0
1/2"	12.5	17187.7	77.5	22.5
3/8"	9.5	21581.5	97.4	2.6
No. 8	2.36	22065.9	99.5	0.5
No. 40	0.425	22113.9	99.8	0.2
No. 200	0.075	22144.3	99.9	0.1

Sample Properties

L.L.	P.L.	P.I.
N/T	N/T	N/T

D 10 (mm)=	10.52
D 15 (mm)=	11.27
D 30 (mm)=	13.26
D 50 (mm)=	15.51
D 60 (mm)=	16.72
D 85 (mm)=	21.09
Cu =	2
Cc =	1
Shape of Particles:	Rounded
Hardness of Particles:	Hard

Sample Washed over No. 200 Sieve
Starting Dry Weight: 22,165.9 grams

Hazen's Permeability ($K = D_{10}^2$)

$K = (10.52)^2$

$K = 111$ cm/sec

Respectfully Submitted

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/07/2009
Report Date:	10/30/2009	Previously Reported: 10/23/2009	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12843
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000010
			Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Grading subgrade and surveying PDP.

Equipment on site: Dozer, excavator, loader.

Duties and Tests Performed by Technician:

Technician collected samples of road base and collections materials.

Preparation and paperwork (office).

Test Results and Procedures:

See report # 1-1165-000009 dated 10-7-09 for Sieve Analysis Aggregate report.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/12/2009
Report Date: 10/22/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12830
Test Method: See Below

TEST RESULTS Report No: 1-1165-000001
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Updating maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/13/2009
Report Date:	10/22/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12831
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000002
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Updating maps, photos and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/14/2009
Report Date:	10/22/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12832
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000003
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Updating maps, photos and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 10/15/2009
Report Date: 10/22/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12833
Test Method: See Below

TEST RESULTS Report No: 1-1165-000004
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Prepping subgrade and clearing drainage ditches.

Equipment on site: Compactor, dozer, scraper, excavator.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/16/2009
Report Date:	10/22/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12834
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000005
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Surveying, prepping subgrade and starting leachate collection.

Equipment on site: Compactor, dozer, scraper, excavator.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/17/2009
Report Date: 10/22/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12835
Test Method: See Below

TEST RESULTS Report No: 1-1165-000006
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Constructing maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/18/2009
Report Date: 10/22/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12836
Test Method: See Below

TEST RESULTS Report No: 1-1165-000007
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Building maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/19/2009
Report Date: 10/27/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12860
Test Method: See Below

TEST RESULTS Report No: 1-1165-000011
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 1.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Processing and grading southern PDP.

Equipment on site: Two dozers, scraper, two compactors.

Duties and Tests Performed by Technician:

Observed construction activities.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/20/2009
Report Date: 10/27/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12861
Test Method: See Below

TEST RESULTS Report No: 1-1165-000012
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Communication, map and spreadsheet preparation (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/21/2009
Report Date: 10/27/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12862
Test Method: See Below

TEST RESULTS Report No: 1-1165-000013
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Installing leachate transmission and grading south PDP.

Equipment on site: Excavator, two dozers, two compactors.

Duties and Tests Performed by Technician:

Observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/22/2009
Report Date:	10/27/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12863
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000014
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Communication, map and spreadsheet preparation (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/23/2009
Report Date:	10/27/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12864
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000015
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Surveyed construction progress.

Preparation and paperwork (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/24/2009
Report Date: 10/27/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12865
Test Method: See Below

TEST RESULTS Report No: 1-1165-000016
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Communication, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/25/2009
Report Date: 10/27/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12866
Test Method: See Below

TEST RESULTS Report No: 1-1165-000017
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 1.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Communication, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/26/2009
Report Date: 11/02/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12936
Test Method: See Below

TEST RESULTS Report No: 1-1165-000018
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 10/27/2009
Report Date: 11/02/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12937
Test Method: See Below

TEST RESULTS Report No: 1-1165-000019
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Equipment on site: Two dozers, maintainer, smooth drum, compactor.

Duties and Tests Performed by Technician:

Grading and prepping subgrade.

Preparation and paperwork (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/28/2009
Report Date: 11/02/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12938
Test Method: See Below

TEST RESULTS Report No: 1-1165-000020
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Checked drainage of borrow and PDP.

Preparation and paperwork (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/29/2009
Report Date:	11/02/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 12939
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000021
			Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Checked drainage of PDP and borrow area.

Preparation and paperwork (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/30/2009
Report Date: 11/02/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 12940
Test Method: See Below

TEST RESULTS Report No: 1-1165-000022
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Checked drainage of PDP and borrow area.

Preparation and paperwork.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/31/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13123
Test Method: See Below

TEST RESULTS Report No: 1-1165-000036
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Prepared paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/01/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13124
Test Method: See Below

TEST RESULTS Report No: 1-1165-000037
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician prepared paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/02/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13125
Test Method: See Below

TEST RESULTS Report No: 1-1165-000038
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor removing material from north PDP for lift 1 in south PDP with scrapers and grading with dozers. Contractor also prepping subgrade with maintainers.

Equipment on site: Two dozers, two scrapers, two maintainers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Technician preparing paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/03/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13126
Test Method: See Below

TEST RESULTS Report No: 1-1165-000039
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing lift 1 in south berm area with scrapers and grading with dozers. Contractor also prepping subgrade with maintainers.

Equipment on site: Two dozers, two scrapers, two maintainers, compactor, disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations. One perm and eight density tests taken.

Preparation and paperwork and updating map and spreadsheet (office).

Test Results and Procedures:

See report 1-1165-000040.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/03/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13126W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000040
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1	1st	N32.26015 W094.58103	126.6	104.9	20.7	96.2	S-8801	
2	1st	N32.25959 W094.58095	127.5	104.4	22.1	95.7	S-8801	
3	1st	N32.25985 W094.58104	126.9	103.6	22.5	100.4	S-8894	
4	1st	N32.26004 W094.58081	128.4	105.8	21.4	97.0	S-8801	
5	1st	N32.26031 W094.58121	127.3	104.2	22.2	95.5	S-8801	
6	1st	N32.26052 W094.58102	130.1	109.7	18.6	100.5	S-8801	
7	1st	N32.26073 W094.53127	130.9	106.8	22.6	97.9	S-8801	
8	1st	N32.26081 W094.58111	130.3	105.6	23.4	96.8	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Gauge No.: 36842 Daily Standard Counts: 11/03/2009 DS: 2,599 MS: 632
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/04/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13127
Test Method: See Below

TEST RESULTS Report No: 1-1165-000041
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift 1 on southern berm. One perm and eight density tests taken.

Equipment on site: Two maintainers, two dozers, disc, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Preparation of paperwork, updating maps and spreadsheet (office).

Test Results and Procedures:

See report number 1-1165-000041.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 11/04/2009
Report Date: 11/17/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13127W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000042
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
9	1st	N32.25940 W094.58080	130.7	109.1	19.8	100.0	S-8801	
10	1st	N32.25930 W094.58057	130.0	106.9	21.6	98.0	S-8801	
11	1st	N32.25916 W094.58108	127.8	104.5	22.3	95.8	S-8801	
12	1st	N32.25924 W094.58157	127.6	103.9	22.8	95.2	S-8801	
13	1st	N32.25900 W094.58173	127.4	105.9	20.3	97.1	S-8801	
14	1st	N32.25908 W094.58202	127.2	107.3	18.5	98.4	S-8801	
15	1st	N32.25875 W094.58220	126.5	105.2	20.2	96.4	S-8801	
16	1st	N32.25893 W094.58252	127.0	107.0	18.7	98.1	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Gauge No.: 36842 Daily Standard Counts: 11/04/2009 DS: 2,612 MS: 678
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/05/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13022
Test Method: See Below

TEST RESULTS Report No: 1-1165-000023
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift #1.

Equipment on site: Maintainer, two dozers, disc, water truck, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Updated paperwork, maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/06/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13023
Test Method: See Below

TEST RESULTS Report No: 1-1165-000024
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1 & 2.

Equipment on site: Equipment on site: Maintainer, two dozers, disc, water truck, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed placing and processing of lifts 1 & 2. Two perms and two density taken.

Updated paperwork, maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/06/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13023W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000025
Page 1 of 1

Material: Clay Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
17	1st	N32.25832 W094.58383	128.9	105.2	22.5	96.4	S-8801	
18	1st	N32.25906 W094.58501	124.8	103.1	21.0	99.9	S-8894	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Gauge No.: 36842 Daily Standard Counts: 11/06/2009 DS: 2,621 MS: 682
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/07/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13024
Test Method: See Below

TEST RESULTS Report No: 1-1165-000026
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1 & 2.

Equipment on site: Equipment on site: Maintainer, two dozers, disc, water truck, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed contractor operations. Three perms and 15 density tests taken.

Updated paperwork, maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/07/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13024W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000027

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
19	1st	N32.26269 W094.58176	129.5	99.8	29.8	96.7	S-8894	
20	1st	N32.26157 W094.58118	127.4	105.9	20.3	96.4	S-8910	
21	1st	N32.25914 W094.58244	126.1	104.2	21.0	101.0	S-8894	
22	1st	N32.25871 W094.58244	126.8	107.4	18.1	98.4	S-8801	
23	1st	N32.25880 W094.58288	127.5	107.5	18.6	98.5	S-8801	
24	1st	N32.25851 W094.58303	128.4	109.1	17.7	100.0	S-8801	
25	1st	N32.25859 W094.58350	128.6	109.8	17.1	100.6	S-8801	
26	1st	N32.25815 W094.58411	131.1	110.7	18.4	101.5	S-8801	
27	1st	N32.25823 W094.58440	129.0	106.8	20.8	97.9	S-8801	
28	1st	N32.25799 W094.58469	130.2	111.1	17.2	101.8	S-8801	
29	1st	N32.25834 W094.58472	129.0	108.0	19.4	99.0	S-8801	
30	1st	N32.25849 W094.58498	129.0	108.6	18.8	99.5	S-8801	
31	1st	N32.25883 W094.58486	126.7	104.5	21.2	95.8	S-8801	
32	1st	N32.25894 W094.58517	126.3	104.6	20.7	95.9	S-8801	
33	1st	N32.25927 W094.58501	121.4	96.6	25.7	97.9	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/07/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13024W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000027

Gauge No.: 34271 Daily Standard Counts: 11/07/2009 DS: 2,549 MS: 671
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/08/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13025
Test Method: See Below

TEST RESULTS Report No: 1-1165-000028
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 1 & 2.

Equipment on site: Equipment on site: Maintainer, two dozers, disc, water truck, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed contractor operations. One perm and 30 density tests taken.

Updated paperwork, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/08/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13025W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000029

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
34	1st	N32.25852 W094.58427	125.7	104.7	20.1	101.5	S-8894	
35	1st	N32.25877 W094.58399	127.1	104.8	21.3	95.4	S-8910	
36	1st	N32.25870 W094.58353	127.6	106.8	19.5	97.3	S-8910	
37	1st	N32.25900 W094.58334	127.9	106.4	20.2	96.9	S-8910	
38	1st	N32.25890 W094.58292	127.8	105.7	20.9	96.3	S-8910	
39	1st	N32.25922 W094.58279	128.5	104.9	22.5	95.5	S-8910	
40	1st	N32.25915 W094.58233	128.6	106.3	21.0	96.8	S-8910	
41	1st	N32.25941 W094.58223	128.3	105.1	22.1	95.7	S-8910	
42	1st	N32.25925 W094.58181	128.7	105.9	21.5	96.4	S-8910	
43	1st	N32.25957 W094.58168	131.8	108.2	21.8	98.5	S-8910	
44	1st	N32.25944 W094.58158	131.0	109.0	20.2	99.3	S-8910	
45	1st	N32.25972 W094.58121	128.8	106.1	21.4	96.6	S-8910	
46	1st	N32.26093 W094.58134	124.3	100.9	23.2	97.8	S-8894	
47	1st	N32.26124 W094.58118	124.0	102.0	21.6	98.8	S-8894	
48	1st	N32.26139 W094.58139	124.2	99.9	24.3	96.8	S-8894	
49	1st	N32.26188 W094.58128	123.3	99.9	23.4	96.8	S-8894	
50	1st	N32.26211 W094.58091	124.0	101.4	22.3	98.3	S-8894	
51	1st	N32.26234 W094.58105	127.4	104.3	22.1	95.6	S-8801	
52	1st	N32.26256 W094.58133	127.4	104.4	22.0	95.7	S-8801	
53	1st	N32.26245 W094.58159	129.2	106.6	21.2	97.7	S-8801	
54	1st	N32.26273 W094.58176	129.5	107.8	20.1	98.8	S-8801	
55	1st	N32.26267 W094.58218	128.4	106.5	20.6	97.6	S-8801	
56	1st	N32.26292 W094.58236	126.8	105.7	20.0	96.9	S-8801	
57	1st	N32.26250 W094.58276	125.9	103.8	21.3	95.1	S-8801	
58	2nd	N32.26003 W094.58084	126.3	104.6	20.7	95.9	S-8801	
59	2nd	N32.25977 W094.58106	127.3	103.6	22.9	95.0	S-8801	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/08/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13025W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000029

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
60	2nd	N32.25971 W094.58067	127.6	104.5	22.1	95.8	S-8801	
61	2nd	N32.26028 W094.58124	126.9	105.3	20.5	96.5	S-8801	
62	2nd	N32.26054 W094.58100	127.7	104.7	22.0	96.0	S-8801	
63	2nd	N32.26072 W094.58126	128.7	105.6	21.9	96.8	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 11/08/2009 DS: 2,552 MS: 675
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/09/2009
Report Date: 11/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13026
Test Method: See Below

TEST RESULTS Report No: 1-1165-000030
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 15.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 1 & 2.

Equipment on site: Equipment on site: Maintainer, two dozers, disc, water truck, compactor, two scrapers, excavator, loader.

Duties and Tests Performed by Technician:

Technician observed contractor operations. One perm and seven density tests taken.

Updated paperwork, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/09/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13026W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000031
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
64	2nd	N32.25909 W094.58192	130.0	106.0	22.6	96.5	S-8910	
65	2nd	N32.25892 W094.58168	128.3	105.4	21.7	96.6	S-8801	
66	2nd	N32.25920 W094.58156	126.7	104.3	21.5	95.6	S-8801	
67	2nd	N32.25908 W094.58118	128.6	106.9	20.3	98.0	S-8801	
68	2nd	N32.25937 W094.58112	126.7	103.8	22.1	95.1	S-8801	
69	2nd	N32.25920 W094.58083	128.2	104.2	23.0	95.5	S-8801	
70	2nd	N32.25953 W094.58069	128.6	107.4	19.7	98.4	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 11/09/2009 DS: 2,545 MS: 665
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/10/2009
Report Date: 11/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13043
Test Method: See Below

TEST RESULTS Report No: 1-1165-000032
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 17.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1 and 2.

Equipment on site: Excavator, loader, maintainer, two dozers, three scrapers, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Updated paperwork, maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/10/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13043W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000033
Page 1 of 1

Material: Clay Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
71	2nd	N32.25843 W094.58401	124.3	102.3	21.5	99.1	S-8894	
72	2nd	N32.25894 W094.58247	125.3	102.4	22.4	99.2	S-8894	
73	2nd	N32.25864 W094.58254	123.8	101.5	22.0	98.4	S-8894	
74	2nd	N32.25881 W094.58292	129.8	108.0	20.2	99.0	S-8801	
75	2nd	N32.25847 W094.58308	128.3	106.5	20.5	97.6	S-8801	
76	2nd	N32.25857 W094.58360	129.1	108.5	19.0	99.5	S-8801	
77	2nd	N32.25829 W094.58367	124.7	100.4	24.2	97.3	S-8894	
78	2nd	N32.25814 W094.58416	124.4	101.3	22.8	98.2	S-8894	
79	2nd	N32.25831 W094.58443	125.4	101.3	23.8	98.2	S-8894	
80	2nd	N32.25898 W094.58251	127.6	106.7	19.6	97.2	S-8910	
81	2nd	N32.25803 W094.58448	125.8	98.9	27.2	95.8	S-8894	
82	2nd	N32.25809 W094.58475	125.9	99.5	26.5	96.4	S-8894	
83	2nd	N32.25835 W094.58462	125.7	101.3	24.1	98.2	S-8894	
84	2nd	N32.25862 W094.58501	123.8	100.1	23.7	97.0	S-8894	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 11/10/2009 DS: 2,536 MS: 669
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/11/2009
Report Date:	11/12/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13060
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000034
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1, 2 and 3.

Equipment on site: Four scrapers, compactor, two dozers, disc, water truck and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations and performed 32 density tests.

Updated paperwork, maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/11/2009
Report Date: 11/12/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13060W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000035
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location		Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
85	2nd	N32.25891	W094.58483	126.8	105.2	20.5	96.4	S-8801	
86	2nd	N32.25913	W094.58528	125.5	101.8	23.3	98.6	S-8894	
87	2nd	N32.25932	W094.58491	125.2	100.9	24.1	97.8	S-8894	
88	2nd	N32.25946	W094.58491	125.1	101.8	22.9	98.6	S-8894	
89	2nd	N32.25959	W094.58482	126.5	104.2	21.4	101.0	S-8894	
90	2nd	N32.25975	W094.58503	127.1	104.9	21.2	101.6	S-8894	
91	2nd	N32.25839	W094.58334	128.0	106.5	20.2	97.6	S-8801	
92	1st	N32.26001	W094.58486	124.0	101.3	22.4	98.2	S-8894	
93	1st	N32.26011	W094.58455	125.1	102.7	21.8	99.5	S-8894	
94	1st	N32.26040	W094.58474	125.5	104.0	20.7	100.8	S-8894	
95	1st	N32.26057	W094.58435	126.7	104.1	21.7	100.9	S-8894	
96	1st	N32.26086	W094.58449	124.5	102.3	21.7	99.1	S-8894	
97	1st	N32.26099	W094.58414	124.0	102.5	21.0	99.3	S-8894	
98	1st	N32.26127	W094.58429	123.4	102.6	20.3	99.4	S-8894	
99	1st	N32.26138	W094.58395	124.2	98.8	25.7	95.7	S-8894	
100	1st	N32.26165	W094.58410	125.3	101.1	23.9	98.0	S-8894	
101	1st	N32.26176	W094.58379	127.3	103.6	22.9	100.4	S-8894	
102	1st	N32.26204	W094.58391	127.2	101.9	24.8	98.7	S-8894	
103	1st	N32.26212	W094.58356	131.4	108.0	21.7	99.0	S-8801	
104	1st	N32.26242	W094.58372	126.5	103.2	22.6	100.0	S-8894	
105	1st	N32.26250	W094.58342	125.7	101.5	23.8	98.4	S-8894	
106	1st	N32.26278	W094.58356	127.5	104.2	22.4	101.0	S-8894	
107	1st	N32.26289	W094.58321	126.6	103.4	22.4	100.2	S-8894	
108	1st	N32.26315	W094.58337	127.1	105.0	21.0	96.2	S-8801	
109	1st	N32.26320	W094.58302	127.6	105.0	21.5	96.2	S-8801	
110	1st	N32.26292	W094.58280	126.8	106.7	18.8	97.8	S-8801	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/11/2009
Report Date: 11/12/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13060W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000035

Material: Soil Required: 0 to +3 95

Test No	Lift	Location		Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
111	1st	N32.26300	W094.58252	126.9	105.4	20.4	96.6	S-8801	
112	1st	N32.26282	W094.58205	127.2	105.6	20.5	96.8	S-8801	
113	1st	N32.26251	W094.58187	128.3	106.1	20.9	97.3	S-8801	
114	1st	N32.26238	W094.58152	128.6	107.7	19.4	98.7	S-8801	
115	1st	N32.26252	W094.58125	128.2	107.2	19.6	98.3	S-8801	
116	1st	N32.26226	W094.58115	128.0	107.5	19.1	98.5	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Gauge No.: 34271 Daily Standard Counts: 11/11/2009 DS: 2,533 MS: 670
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/12/2009
Report Date: 11/19/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13151
Test Method: See Below

TEST RESULTS Report No: 1-1165-000043
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1, 2 and 3.

Equipment on site: Four scrapers, compactor, two dozers, disc, water truck, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Preparation of paperwork, updated maps, spreadsheet and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/12/2009
Report Date: 12/03/2009 Previously Reported: 11/19/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13151W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000044
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
117	3rd	N32.25898 W094.58221	126.5	104.1	21.5	95.4	S-8801	
118	3rd	N32.25891 W094.58189	127.8	106.3	20.2	97.4	S-8801	
119	3rd	N32.25920 W094.58170	127.0	106.7	19.0	97.8	S-8801	
120	3rd	N32.25909 W094.58144	128.5	105.5	21.8	96.7	S-8801	
121	3rd	N32.25912 W094.58121	127.6	107.2	19.0	98.3	S-8801	
122	3rd	N32.25940 W094.58106	126.5	104.6	20.9	95.9	S-8801	
123	3rd	N32.25925 W094.58176	128.5	106.0	21.2	97.2	S-8801	
124	3rd	N32.25951 W094.58060	128.8	107.4	19.9	98.4	S-8801	
125	3rd	N32.25964 W094.58102	127.1	104.8	21.3	96.1	S-8801	
126	3rd	N32.25996 W094.58080	129.0	107.6	19.9	98.6	S-8801	
127	3rd	N32.26008 W094.58118	128.2	104.5	22.7	95.8	S-8801	
128	3rd	N32.26035 W094.58100	127.7	105.4	21.2	96.6	S-8801	
129	3rd	N32.26052 W094.58128	127.2	105.0	21.1	96.2	S-8801	
130	3rd	N32.26068 W094.58108	130.9	107.0	22.3	98.1	S-8801	
131	2nd	N32.26094 W094.58116	129.7	108.0	20.1	99.0	S-8801	
132	2nd	N32.26105 W094.58135	130.3	108.6	20.0	99.5	S-8801	
133	2nd	N32.26123 W094.58112	130.5	108.0	20.8	99.0	S-8801	
134	2nd	N32.26143 W094.58138	131.2	110.5	18.7	101.3	S-8801	
135	2nd	N32.26157 W094.58117	127.6	107.6	18.6	98.6	S-8801	
136	2nd	N32.26178 W094.58128	125.7	106.1	18.5	97.3	S-8801	
137	2nd	N32.26191 W094.58103	126.9	104.3	21.7	95.6	S-8801	
138	2nd	N32.26204 W094.58094	127.2	104.5	21.7	95.8	S-8801	
139	2nd	N32.26223 W094.58109	127.6	104.6	22.0	95.9	S-8801	
140	2nd	N32.26229 W094.58083	128.7	108.3	18.8	99.3	S-8801	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/12/2009
Report Date: 12/03/2009 Previously Reported: 11/19/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13151W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000044
Page 2 of 2

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 11/12/2009 DS: 2,518 MS: 660
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/13/2009
Report Date: 11/19/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13152
Test Method: See Below

TEST RESULTS Report No: 1-1165-000045
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1, 2 and 3.

Equipment on site: Four scrapers, compactor, two dozers, disc, water truck, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Preparation of paperwork, updated maps, spreadsheet and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Area Offices
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/13/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13152W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000046

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
141	3rd	N32.25994 W094.58128	126.8	105.5	20.2	96.7	S-8801	
142	3rd	N32.25971 W094.58077	128.0	105.5	21.3	96.7	S-8801	
143	3rd	N32.25930 W094.58139	127.7	107.0	19.3	98.1	S-8801	
144	3rd	N32.25880 W094.58139	127.9	106.6	20.0	97.7	S-8801	
145	1st	N32.26003 W094.58132	131.7	109.9	19.8	100.7	S-8801	
146	1st	N32.26016 W094.58163	130.6	110.4	18.3	101.2	S-8801	
147	1st	N32.26040 W094.58144	130.2	109.6	18.8	100.5	S-8801	
148	1st	N32.26061 W094.58173	129.1	108.0	19.5	99.0	S-8801	
149	1st	N32.26082 W094.58147	129.9	109.6	18.5	100.5	S-8801	
150	1st	N32.26100 W094.58171	128.0	105.7	21.1	96.9	S-8801	
151	1st	N32.26124 W094.58152	129.7	108.1	20.0	99.1	S-8801	
152	1st	N32.26144 W094.58173	125.9	105.8	19.0	97.0	S-8801	
153	1st	N32.26168 W094.58151	129.2	109.5	18.0	100.4	S-8801	
154	1st	N32.26189 W094.58167	128.3	105.4	21.7	96.6	S-8801	
155	1st	N32.26206 W094.58138	127.2	103.9	22.4	100.7	S-8894	
156	1st	N32.26220 W094.58147	126.1	101.8	23.9	98.6	S-8894	
157	3rd	N32.25894 W094.58239	130.8	107.4	21.8	98.4	S-8801	
158	3rd	N32.25866 W094.58256	125.2	105.1	19.1	96.3	S-8801	
159	3rd	N32.25876 W094.58288	127.6	107.5	18.7	97.9	S-8910	
160	3rd	N32.25851 W094.58312	128.1	107.9	18.7	98.3	S-8910	
161	3rd	N32.25859 W094.58343	128.6	107.2	20.0	97.6	S-8910	
162	3rd	N32.25834 W094.58353	125.0	104.9	19.2	96.2	S-8801	
163	3rd	N32.25845 W094.58383	128.9	108.4	18.9	99.4	S-8801	
164	3rd	N32.25817 W094.58401	129.0	109.2	18.1	100.1	S-8801	
165	3rd	N32.25821 W094.58421	128.3	106.6	20.4	97.7	S-8801	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Home Office - 1717 East Erwin Street
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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/13/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13152W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000046

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
166	1st	N32.25892 W094.58495	131.0	108.5	20.7	99.5	S-8801	
167	1st	N32.25948 W094.58482	128.2	104.4	22.8	95.7	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 11/13/2009 DS: 2,520 MS: 658
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/14/2009
Report Date:	12/03/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13251
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000047
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor grading and processing lifts 2 and 3.

Equipment on site: Two dozers, maintainer, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Prepared paperwork, updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/14/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13251W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000048
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
168	2nd	N32.25970 W094.58125	126.7	104.0	21.8	95.3	S-8801	
169	2nd	N32.25940 W094.58138	127.6	104.3	22.3	95.6	S-8801	
170	2nd	N32.25953 W094.58173	127.9	106.0	20.7	97.2	S-8801	
171	2nd	N32.25927 W094.58193	127.9	105.2	21.6	96.4	S-8801	
172	2nd	N32.25938 W094.58234	125.2	104.4	19.9	95.7	S-8801	
173	2nd	N32.25907 W094.58248	126.6	107.0	18.3	98.1	S-8801	
174	2nd	N32.25911 W094.58282	125.5	106.7	17.6	97.8	S-8801	
175	2nd	N32.25907 W094.58313	128.4	108.5	18.3	99.5	S-8801	
176	2nd	N32.25881 W094.58318	127.6	108.1	18.0	99.1	S-8801	
177	2nd	N32.25893 W094.58354	128.3	107.6	19.2	98.6	S-8801	
178	2nd	N32.25863 W094.58379	127.9	108.5	17.9	99.5	S-8801	
179	2nd	N32.25868 W094.58400	129.1	108.0	19.5	99.0	S-8801	
180	2nd	N32.25872 W094.58419	128.4	108.2	18.7	99.2	S-8801	
181	2nd	N32.25845 W094.58439	126.7	105.0	20.7	96.2	S-8801	
182	3rd	N32.25894 W097.58503	127.4	105.6	20.6	96.8	S-8801	
183	2nd	N32.26104 W094.58424	126.3	104.8	20.5	96.1	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Gauge No.: 36842 Daily Standard Counts: 11/14/2009 DS: 2,536 MS: 664
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 11/15/2009
Report Date: 12/03/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13252
Test Method: See Below

TEST RESULTS Report No: 1-1165-000049

Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Updated spreadsheets, paperwork and maps (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/16/2009
Report Date: 12/03/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13253
Test Method: See Below

TEST RESULTS Report No: 1-1165-000050

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Rained out.

Duties and Tests Performed by Technician:

Updated spreadsheets, maps, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/17/2009
Report Date: 12/03/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13254
Test Method: See Below

TEST RESULTS Report No: 1-1165-000051

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading lifts 1, 2 and 3.

Equipment on site: Two dozers, compactor, water truck, maintainer, four scrapers, disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Technician updated maps, spreadsheet and paperwork (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/18/2009
Report Date: 12/04/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13257
Test Method: See Below

TEST RESULTS Report No: 1-1165-000052

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 18.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1, 2 and 3.

Equipment on site: Three scrapers, maintainer, two dozers, water truck, compactor, disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Technician updated and prepared paperwork, maps and spreadsheet (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/18/2009
Report Date: 12/04/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13257W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000053

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
184	3rd	N32.25808 W094.58459	130.4	110.0	18.5	96.7	S-8928	
185	3rd	N32.25825 W094.58487	130.6	109.8	18.9	96.5	S-8928	
186	3rd	N32.25851 W094.58469	130.2	109.5	18.9	96.2	S-8928	
187	3rd	N32.25864 W094.58504	129.5	108.7	19.1	99.6	S-8801	
188	3rd	N32.25897 W094.58494	129.9	106.1	22.4	97.3	S-8801	
189	3rd	N32.25898 W094.58526	129.3	108.3	19.4	99.3	S-8801	
190	3rd	N32.25919 W094.58492	127.7	104.3	22.4	95.6	S-8801	
191	3rd	N32.25937 W094.58520	129.4	108.5	19.3	99.5	S-8801	
192	3rd	N32.25946 W094.58492	128.9	108.6	18.7	99.5	S-8801	
193	3rd	N32.25971 W094.58502	128.9	106.5	21.0	97.6	S-8801	
194	3rd	N32.25972 W094.58475	129.7	108.8	19.2	99.7	S-8801	
195	2nd	N32.25994 W094.58453	128.4	107.2	19.8	98.3	S-8801	
196	2nd	N32.26009 W094.58459	128.6	107.9	19.2	98.9	S-8801	
197	2nd	N32.26033 W094.58474	128.5	106.8	20.3	97.9	S-8801	
198	2nd	N32.26030 W094.58473	129.3	108.9	18.7	99.8	S-8801	
199	2nd	N32.26044 W094.58443	124.9	104.4	19.6	95.7	S-8801	
200	2nd	N32.26067 W094.58455	124.5	104.2	19.5	95.5	S-8801	
201	2nd	N32.26077 W094.58424	125.5	105.1	19.4	96.3	S-8801	
202	2nd	N32.26103 W094.58437	125.3	105.0	19.3	96.2	S-8801	
203	2nd	N32.26110 W094.58409	128.1	107.0	19.7	98.1	S-8801	
204	2nd	N32.26135 W094.58420	127.6	105.2	21.3	96.4	S-8801	
205	2nd	N32.26154 W094.58398	127.9	105.4	21.3	96.6	S-8801	
206	2nd	N32.26180 W094.58395	128.3	104.7	22.5	96.0	S-8801	
207	2nd	N32.26211 W094.58364	128.8	106.2	21.3	97.3	S-8801	

Charge: HDR Engineering Inc.
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E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/18/2009
Report Date: 12/04/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13257W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000053

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
208	2nd	N32.26236 W094.58367	128.6	107.8	19.3	98.8	S-8801	
209	2nd	N32.26257 W094.58347	127.9	107.2	19.3	98.3	S-8801	
210	2nd	N32.26286 W094.58349	128.7	107.1	20.2	98.2	S-8801	
211	2nd	N32.26295 W094.58323	129.0	108.1	19.3	99.1	S-8801	
212	2nd	N32.26321 W094.58325	128.0	105.1	21.8	96.3	S-8801	
213	2nd	N32.26307 W094.58295	129.0	107.2	20.3	98.3	S-8801	
214	2nd	N32.26291 W094.58280	127.8	104.5	22.3	95.8	S-8801	
215	2nd	N32.26299 W094.58257	128.7	108.6	18.5	99.5	S-8801	
216	2nd	N32.26279 W094.58240	129.5	107.8	20.1	98.8	S-8801	
217	2nd	N32.26284 W094.58215	129.8	109.7	18.3	100.5	S-8801	
218	2nd	N32.26263 W094.58199	128.8	108.6	18.6	99.5	S-8801	
219	2nd	N32.26288 W094.58173	130.8	111.1	17.7	97.6	S-8928	
220	2nd	N32.26245 W094.58154	131.3	111.8	17.4	98.2	S-8928	
221	2nd	N32.26254 W094.58126	130.6	109.8	18.9	96.5	S-8928	
222	2nd	N32.26225 W094.58118	130.7	109.8	19.0	100.6	S-8801	
223	1st	N32.26281 W094.58298	127.1	104.7	21.4	96.0	S-8801	
224	1st	N32.26273 W094.58321	129.0	110.6	16.6	100.7	S-8910	
225	1st	N32.26247 W094.58312	130.7	111.4	17.3	101.5	S-8910	
226	1st	N32.26238 W094.58334	125.5	102.6	22.3	99.4	S-8894	
227	1st	N32.26212 W094.58329	124.4	101.5	22.6	98.4	S-8894	
228	1st	N32.26200 W094.58357	126.0	104.4	20.7	95.1	S-8910	
229	1st	N32.26170 W094.58351	126.6	105.4	20.1	96.0	S-8910	
230	1st	N32.26160 W094.58379	127.3	106.7	19.3	97.2	S-8910	
231	1st	N32.26137 W094.58370	131.0	111.1	17.9	101.2	S-8910	

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E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/18/2009
Report Date: 12/04/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13257W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000053

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
232	1st	N32.26125 W094.58394	128.4	108.3	18.6	98.6	S-8910	
233	1st	N32.26105 W094.58382	127.9	107.1	19.4	98.2	S-8801	
234	1st	N32.26094 W094.58409	127.9	107.3	19.2	98.4	S-8801	
235	1st	N32.26072 W094.58400	127.3	106.6	19.4	97.7	S-8801	
236	1st	N32.26061 W094.58421	125.6	104.8	19.8	96.1	S-8801	
237	1st	N32.26038 W094.58412	125.4	104.6	19.9	95.9	S-8801	
238	1st	N32.26031 W094.58439	126.0	105.2	19.8	96.4	S-8801	
239	1st	N32.26011 W094.58430	129.8	109.8	18.2	100.6	S-8801	
240	1st	N32.26000 W094.58450	137.8	108.5	27.0	99.5	S-8801	
241	1st	N32.25973 W094.58441	127.4	105.2	21.1	95.8	S-8910	
242	1st	N32.25964 W094.58462	128.3	106.5	20.5	97.0	S-8910	
243	1st	N32.25972 W094.58453	129.3	106.8	21.1	97.3	S-8910	
244	1st	N32.25927 W094.58475	127.3	104.8	21.5	96.1	S-8801	
245	1st	N32.25910 W094.58460	128.8	106.5	20.9	97.6	S-8801	
246	1st	N32.25889 W094.58472	132.7	111.4	19.1	97.9	S-8928	
247	1st	N32.25879 W094.58451	131.7	112.1	17.5	98.5	S-8928	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/18/2009
Report Date: 12/04/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Order Number:
ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13257W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000053

Gauge No.: 36872 Daily Standard Counts: 11/18/2009 DS: 2,594 MS: 683
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 11/19/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13336
Test Method: See Below

TEST RESULTS Report No: 1-1165-000058
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 3 and 4.

Equipment on site: Four scrapers, water truck, compactor, two dozers, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/19/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13336W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000059

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
248	3rd	N32.26239 W094.58100	129.4	106.8	21.2	97.9	S-8801	
249	3rd	N32.26219 W094.58091	127.5	105.3	21.1	96.5	S-8801	
250	3rd	N32.26205 W094.58118	127.6	104.5	22.1	95.8	S-8801	
251	3rd	N32.26184 W094.58109	129.1	106.2	21.6	97.3	S-8801	
252	3rd	N32.26169 W094.58132	128.6	105.9	21.4	96.4	S-8910	
253	3rd	N32.26149 W094.58139	128.5	107.4	19.6	98.4	S-8801	
254	3rd	N32.26132 W094.58118	125.2	102.5	22.1	99.3	S-8894	
255	3rd	N32.26111 W094.58135	124.7	101.0	23.5	97.9	S-8894	
256	3rd	N32.26094 W094.58111	127.8	104.4	22.4	95.7	S-8801	
257	3rd	N32.26072 W094.58131	128.7	104.9	22.7	96.2	S-8801	
258	4th	N32.26057 W094.58115	129.0	106.9	20.7	98.0	S-8801	
259	4th	N32.26038 W094.58098	128.3	106.3	20.7	97.4	S-8801	
260	4th	N32.26014 W094.58117	128.4	107.6	19.3	98.6	S-8801	
261	4th	N32.25990 W094.58111	122.4	100.9	21.3	97.8	S-8894	
262	4th	N32.25986 W094.58076	127.5	104.5	22.0	95.8	S-8801	
263	4th	N32.25962 W094.58097	126.7	103.7	22.2	95.1	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Charge: HDR Engineering Inc.
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/19/2009
Report Date:	09/23/2010	Previously Reported: 09/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		

REPORT: **Soil Densities** LAB NO: 13336W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000059
Page 2 of 2

Gauge No.: 36842 Daily Standard Counts: 11/19/2009 DS: 2,589 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/19/2009
Report Date:	12/07/2009		Sampled By: James Griffith
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13278
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000054
			Page 1 of 1

Weather: **Technician(s):** James Griffith **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor hauling material from borrow source to PDP 1-3.

Equipment on site: 4 Pan scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/20/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13337
Test Method: See Below

TEST RESULTS Report No: 1-1165-000060
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift 4.

Equipment on site: Four scrapers, two dozers, water truck, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/20/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13337W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000061

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
264	4th	N32.25816 W094.58472	126.2	102.1	23.6	98.9	S-8894	
265	4th	N32.25804 W094.58445	125.1	103.8	20.5	100.6	S-8894	
266	4th	N32.25830 W094.58434	123.6	97.6	26.6	98.1	S-9028	
267	4th	N32.25816 W094.58398	128.1	106.2	20.6	97.3	S-8801	
268	4th	N32.25843 W094.58386	127.7	105.1	21.5	96.3	S-8801	
269	4th	N32.25833 W094.58348	128.2	107.9	18.8	98.9	S-8801	
270	4th	N32.25854 W094.58328	125.9	105.8	19.0	97.0	S-8801	
271	4th	N32.25871 W094.58313	126.5	102.2	23.8	99.0	S-8894	
272	4th	N32.58862 W094.58282	125.9	102.8	22.5	99.6	S-8894	
273	4th	N32.25880 W094.58270	125.6	102.0	23.1	98.8	S-8894	
274	4th	N32.25872 W094.58242	128.1	106.7	20.1	97.8	S-8801	
275	4th	N32.25895 W094.58230	126.9	104.0	22.0	95.3	S-8801	
276	4th	N32.25889 W094.58197	126.7	104.8	20.9	96.1	S-8801	
277	4th	N32.25914 W094.58178	126.6	105.8	19.7	97.0	S-8801	
278	4th	N32.25902 W094.58141	125.4	102.4	22.5	99.2	S-8894	
279	4th	N32.25909 W094.58124	126.4	105.1	20.3	96.3	S-8801	
280	4th	N32.25938 W094.58115	128.8	106.2	21.3	97.3	S-8801	
281	4th	N32.25922 W094.58081	129.4	107.1	20.8	98.2	S-8801	
282	4th	N32.25940 W094.58064	129.5	106.8	21.3	97.9	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/20/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13337W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000061

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay

Gauge No.: 36842 Daily Standard Counts: 11/20/2009 DS: 2,589 MS: 685
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/20/2009
Report Date:	12/07/2009		Sampled By: James Griffith
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13279
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000055
			Page 1 of 1

Weather: **Technician(s):** James Griffith **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor hauling material from borrow source to PDP 1-3.

Equipment on site: 4 pan scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/21/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13338
Test Method: See Below

TEST RESULTS Report No: 1-1165-000062
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 3 and 4.

Equipment on site: Maintainer, four scrapers, water truck, two dozers, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/21/2009
Report Date:	12/07/2009		Sampled By: James Griffith
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13280
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000056
			Page 1 of 1

Weather: **Technician(s):** James Griffith **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor hauling material from borrow source to PDP 1-3.

Equipment on site: 4 pan scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/22/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13340
Test Method: See Below

TEST RESULTS Report No: 1-1165-000063
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 3 and 4.

Equipment on site: Two dozers, water truck, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/22/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13340W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000064
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
283	4th	N32.25907 W094.58503	128.1	107.1	19.6	98.2	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Gauge No.: 36842 Daily Standard Counts: 11/22/2009 DS: 2,590 MS: 684
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/23/2009
Report Date:	12/07/2009		Sampled By: James Griffith
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion ProjectLuminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13281
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000057
			Page 1 of 1

Weather: **Technician(s):** James Griffith **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor hauling material from borrow source to PDP 1-3.

Equipment on site: 4 pan scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/23/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13342
Test Method: See Below

TEST RESULTS Report No: 1-1165-000065
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updating maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/24/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13343
Test Method: See Below

TEST RESULTS Report No: 1-1165-000066
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 1, 2, 3 and 4.

Equipment on site: Two dozers, four scrapers, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/25/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13344
Test Method: See Below

TEST RESULTS Report No: 1-1165-000067
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 17.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 3 and 4.

Equipment on site: Four scrapers, two dozers, maintainer, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contactor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/25/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13344W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000068

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
278B	4th	N32.25902 W094.58141	128.9	106.9	20.6	98.0	S-8801	
283B	4th	N32.25907 W094.58503	129.1	109.0	18.4	99.9	S-8801	
284	4th	N32.25964 W094.58484	128.5	107.3	19.8	98.4	S-8801	
285	4th	N32.25954 W094.58514	128.3	106.3	20.7	97.4	S-8801	
286	4th	N32.25925 W094.58498	128.5	105.1	22.3	96.3	S-8801	
287	4th	N32.25875 W094.58511	129.6	106.3	21.9	97.4	S-8801	
288	4th	N32.25865 W094.58478	129.1	105.6	22.3	96.8	S-8801	
289	4th	N32.25830 W094.58491	129.0	106.0	21.7	97.2	S-8801	
290	4th	N32.25821 W094.58458	129.6	106.6	21.6	97.7	S-8801	
291	4th	N32.25796 W094.58471	130.6	107.5	21.5	98.5	S-8801	
292	4th	N32.25879 W094.58216	131.1	108.5	20.8	99.5	S-8801	
293	4th	N32.25906 W094.58208	128.6	107.0	20.2	98.1	S-8801	
294	4th	N32.25900 W094.58173	129.4	107.3	20.6	98.4	S-8801	
295	4th	N32.25927 W094.58147	129.6	107.2	20.9	98.3	S-8801	
296	4th	N32.25914 W094.58107	128.8	106.2	21.3	97.3	S-8801	
297	4th	N32.25941 W094.58105	128.5	106.8	20.3	97.9	S-8801	
298	3rd	N32.25981 W094.58475	127.2	104.3	22.0	95.6	S-8801	
299	3rd	N32.26002 W094.58486	129.6	106.5	21.7	97.6	S-8801	
300	3rd	N32.26017 W094.58465	128.6	105.9	21.4	97.1	S-8801	
301	3rd	N32.26043 W094.58471	129.0	106.5	21.1	97.6	S-8801	
302	3rd	N32.26051 W094.58440	126.3	104.4	21.0	95.7	S-8801	
303	3rd	N32.26076 W094.58448	127.1	105.0	21.0	96.2	S-8801	
304	3rd	N32.26093 W094.58418	127.8	107.0	19.4	98.1	S-8801	
305	3rd	N32.26119 W094.58427	129.7	108.0	20.1	99.0	S-8801	
306	3rd	N32.26134 W0984.58404	128.3	107.0	19.9	98.1	S-8801	
307	3rd	N32.26155 W094.58411	129.4	107.3	20.6	98.4	S-8801	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/25/2009
Report Date: 12/10/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13344W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000068

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
308	3rd	N32.26172 W094.58385	126.8	103.7	22.3	95.1	S-8801	
309	3rd	N32.26192 W094.58395	128.2	106.5	20.4	97.6	S-8801	
310	3rd	N32.26201 W094.58366	128.4	106.5	20.6	97.6	S-8801	
311	3rd	N32.26228 W094.58378	124.0	98.6	25.8	95.5	S-8894	
312	3rd	N32.26240 W094.58352	125.8	99.0	27.1	95.9	S-8894	
313	3rd	N32.26265 W094.58358	126.7	98.8	28.2	95.7	S-8894	
314	3rd	N32.26275 W094.58334	124.2	99.4	24.9	96.3	S-8894	
315	3rd	N32.26297 W094.58344	123.8	99.1	24.9	96.0	S-8894	
316	3rd	N32.26271 W094.58212	125.8	99.8	26.1	96.7	S-8894	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Gauge No.: 36842 Daily Standard Counts: 11/25/2009 DS: 2,584 MS: 684
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/27/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13350
Test Method: See Below

TEST RESULTS Report No: 1-1165-000069
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 11/28/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13351
Test Method: See Below

TEST RESULTS Report No: 1-1165-000070
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 11/29/2009
Report Date:	12/11/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13352
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000071
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 11/30/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13353
Test Method: See Below

TEST RESULTS Report No: 1-1165-000072
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/01/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13354
Test Method: See Below

TEST RESULTS Report No: 1-1165-000073
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 1, 2, 3 and 4.

Equipment on site: Two dozers, water truck, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/01/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13354W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000074
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
317	3rd	N32.26229 W094.58119	127.7	106.1	20.4	97.3	S-8801	
318	3rd	N32.26257 W094.58133	127.5	106.9	19.3	98.0	S-8801	
319	3rd	N32.26254 W094.58167	128.2	106.5	20.4	97.6	S-8801	
320	3rd	N32.26277 W094.58183	131.8	107.4	22.7	98.4	S-8801	
321	3rd	N32.26266 W094.58215	131.9	107.3	22.9	98.4	S-8801	
322	3rd	N32.26290 W094.58222	129.1	104.8	23.2	96.1	S-8801	
323	3rd	N32.26294 W094.58231	127.9	104.1	22.9	95.4	S-8801	
324	3rd	N32.26286 W094.58261	130.4	107.2	21.6	98.3	S-8801	
325	3rd	N32.26313 W094.58278	130.3	106.8	22.0	97.9	S-8801	
326	3rd	N32.26307 W094.58316	126.6	104.9	20.7	96.2	S-8801	
327	3rd	N32.26323 W094.58322	126.7	104.1	21.7	95.4	S-8801	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 12/01/2009 DS: 2,538 MS: 659
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/02/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13356
Test Method: See Below

TEST RESULTS Report No: 1-1165-000075
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/03/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13357
Test Method: See Below

TEST RESULTS Report No: 1-1165-000076
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/04/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13358
Test Method: See Below

TEST RESULTS Report No: 1-1165-000077
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and drying liner lift 1.

Equipment on site: Two dozers, disc, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/05/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13359
Test Method: See Below

TEST RESULTS Report No: 1-1165-000078
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift 1 on liner.

Equipment on site: Four scrapers, two dozers, disc, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contactor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/05/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13359W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000079

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
328	1st	N32.26241 W094.58202	128.8	107.5	19.8	98.5	S-8801	
329	1st	N32.26244 W094.58229	128.5	106.6	20.5	97.7	S-8801	
330	1st	N32.26214 W094.58221	129.0	105.7	22.0	96.9	S-8801	
331	1st	N32.26200 W094.58255	128.9	106.1	21.5	97.3	S-8801	
332	1st	N32.26166 W094.58243	128.6	106.4	20.9	96.9	S-8910	
333	1st	N32.26158 W094.58271	128.8	106.0	21.5	97.2	S-8801	
334	1st	N32.26132 W094.58273	128.1	105.2	21.8	96.4	S-8801	
335	1st	N32.26116 W094.58295	127.9	107.7	18.8	98.7	S-8801	
336	1st	N32.26080 W094.58288	127.2	106.8	19.1	97.9	S-8801	
337	1st	N32.26067 W094.58318	124.8	99.7	25.2	96.6	S-8894	
338	1st	N32.26037 W094.58317	125.8	104.4	20.5	95.1	S-8910	
339	1st	N32.26028 W094.58344	125.7	101.0	24.5	97.9	S-8894	
340	1st	N32.26001 W094.58335	127.6	107.7	18.5	98.7	S-8801	
341	1st	N32.25990 W094.58364	126.4	104.8	20.6	101.6	S-8894	
342	1st	N32.25968 W094.58352	127.3	102.1	24.7	98.9	S-8894	
343	1st	N32.25978 W094.58384	126.0	103.0	22.3	99.8	S-8894	
344	1st	N32.26003 W094.58392	125.7	103.6	21.3	100.4	S-8894	
345	1st	N32.26016 W094.58363	125.1	101.5	23.3	98.4	S-8894	
346	1st	N32.26038 W094.58376	124.0	100.2	23.8	97.1	S-8894	
347	1st	N32.26055 W094.58346	123.9	99.4	24.6	96.3	S-8894	
348	1st	N32.26090 W094.58341	124.5	100.4	24.0	101.7	S-8895	
349	1st	N32.26098 W094.58317	123.6	101.1	22.3	98.0	S-8894	
350	1st	N32.26124 W094.58324	124.2	102.4	21.3	99.2	S-8894	
351	1st	N32.26139 W094.58292	125.9	103.0	22.2	99.8	S-8894	
352	1st	N32.26176 W094.58300	123.5	102.4	20.6	99.2	S-8894	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/05/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13359W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000079

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
353	1st	N32.26188 W094.58268	126.0	104.1	21.0	100.9	S-8894	
354	1st	N32.26205 W094.58276	126.1	104.7	20.4	96.0	S-8801	
355	1st	N32.26219 W094.58257	124.3	102.3	21.5	99.1	S-8894	
356	1st	N32.26243 W094.58264	126.3	101.5	24.4	98.4	S-8894	
357	1st	N32.26247 W094.58234	123.4	100.6	22.7	97.5	S-8894	
358	1st	N32.26267 W094.58246	125.1	99.5	25.7	96.4	S-8894	
359	1st	N32.26268 W094.58265	125.1	100.7	24.2	97.6	S-8894	
360	1st	N32.26258 W094.58288	124.6	100.6	23.9	97.5	S-8894	
361	1st	N32.26232 W094.58281	126.2	100.9	25.1	97.8	S-8894	
362	1st	N32.26214 W094.58304	127.9	105.5	21.2	96.7	S-8801	
363	1st	N32.26202 W094.58319	127.3	105.1	21.1	96.3	S-8801	
364	1st	N32.26174 W094.58311	124.3	103.0	20.7	99.8	S-8894	
365	1st	N32.26160 W094.58344	124.1	101.3	22.5	98.2	S-8894	
366	1st	N32.26130 W094.58343	124.4	102.6	21.2	99.4	S-8894	
367	1st	N32.26115 W094.58367	124.2	101.4	22.5	98.3	S-8894	
368	1st	N32.26089 W094.58365	123.9	101.4	22.2	98.3	S-8894	
369	1st	N32.26072 W094.58387	126.0	103.9	21.3	100.7	S-8894	
370	1st	N32.26052 W094.58386	125.4	104.3	20.2	95.0	S-8910	
371	1st	N32.26041 W094.58405	124.2	103.9	19.5	100.7	S-8894	
372	1st	N32.26020 W094.58395	121.6	101.0	20.4	97.9	S-8894	
373	1st	N32.26009 W094.58420	121.6	101.6	19.7	98.4	S-8894	
374	1st	N32.25985 W094.58408	123.7	102.6	20.6	99.4	S-8894	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/05/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13359W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000079

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 34271 Daily Standard Counts: 12/05/2009 DS: 2,504 MS: 657
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/06/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13363
Test Method: See Below

TEST RESULTS Report No: 1-1165-000080
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/07/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13367
Test Method: See Below

TEST RESULTS Report No: 1-1165-000081
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor cleaning borrow area using a dozer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/08/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13368
Test Method: See Below

TEST RESULTS Report No: 1-1165-000082
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/09/2009
Report Date: 12/11/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13369
Test Method: See Below

TEST RESULTS Report No: 1-1165-000083
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork, maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/10/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13416
Test Method: See Below

TEST RESULTS Report No: 1-1165-000088
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 4 and 5 on east berm and placing lift 1 on southeast liner.

Equipment on site: Maintainer, two dozers, four scrapers, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/10/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13416W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000095

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
375	4th	N32.26241 W094.58104	125.1	98.9	26.5	95.8	S-8894	
376	4th	N32.26216 W094.58096	127.4	103.5	23.1	100.3	S-8894	
377	4th	N32.26205 W094.58121	127.7	102.8	24.2	99.6	S-8894	
378	4th	N32.26184 W094.58106	125.6	102.0	23.1	98.8	S-8894	
379	4th	N32.26170 W094.58134	126.2	101.8	24.0	98.6	S-8894	
380	4th	N32.26146 W094.58116	125.2	101.0	24.0	97.9	S-8894	
381	4th	N32.26129 W094.58138	125.8	102.4	22.9	99.2	S-8894	
382	4th	N32.26109 W094.58109	125.6	102.1	23.0	98.9	S-8894	
383	4th	N32.26091 W094.58136	122.6	98.4	24.6	95.3	S-8894	
384	4th	N32.26081 W094.58107	122.5	98.1	24.9	95.1	S-8894	
385	5th	N32.26055 W094.58137	126.3	101.4	24.6	98.3	S-8894	
386	5th	N32.26040 W094.58102	123.9	99.7	24.3	96.6	S-8894	
387	5th	N32.26014 W094.58121	123.7	99.4	24.4	96.3	S-8894	
388	5th	N32.25996 W094.58086	124.1	98.6	25.9	95.5	S-8894	
389	5th	N32.25972 W094.58102	125.5	99.8	25.8	95.7	S-9405	
390	5th	N32.25954 W094.58063	127.6	104.4	22.2	101.2	S-8894	
391	5th	N32.25940 W094.58089	127.3	102.4	24.3	99.2	S-8894	
392	5th	N32.25943 W094.58057	126.6	100.8	25.6	97.7	S-8894	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/10/2009
Report Date:	09/23/2010	Previously Reported: 09/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**Soil Densities**		LAB NO: 13416W
			Test Method: See Below

TEST RESULTS Report No: 1-1165-000095

Gauge No.: 34271 Daily Standard Counts: 12/10/2009 DS: 2,501 MS: 655
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/11/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13417
Test Method: See Below

TEST RESULTS Report No: 1-1165-000089
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing lift 2 on liner and processing lift 5 on south and southeast berm.

Equipment on site: Two dozers, water truck, compactor, maintainer and four scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/11/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13417W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000096

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
393	5th	N32.25915 W094.58090	122.3	95.2	28.5	96.6	S-9410	
394	5th	N32.25936 W094.58118	122.0	95.3	28.0	96.8	S-9410	
395	5th	N32.25906 W094.58131	122.7	96.7	26.9	98.2	S-9410	
396	5th	N32.25919 W094.58169	121.6	94.8	28.3	96.2	S-9410	
397	5th	N32.25896 W094.58182	121.9	95.3	27.9	96.8	S-9410	
398	5th	N32.25904 W094.58215	121.3	96.1	26.2	97.6	S-9410	
399	5th	N32.25877 W094.58223	118.5	96.2	23.2	97.7	S-9410	
400	5th	N32.25888 W094.58256	120.0	97.2	23.5	98.7	S-9410	
401	5th	N32.25860 W094.58274	118.2	95.4	23.9	96.9	S-9410	
402	5th	N32.25866 W094.58305	117.5	94.1	24.9	95.5	S-9410	
403	5th	N32.25843 W094.58321	120.5	94.9	27.0	96.3	S-9410	
404	5th	N32.25854 W094.58352	121.3	94.9	27.8	96.3	S-9410	
405	5th	N32.25831 W094.58367	122.3	98.4	24.3	99.9	S-9410	
406	5th	N32.25844 W094.58398	121.4	94.8	28.1	96.2	S-9410	
407	5th	N32.25814 W094.58407	120.4	95.2	26.5	96.6	S-9410	
408	5th	N32.25824 W094.58433	122.0	93.6	30.3	95.0	S-9410	
409	5th	N32.25801 W094.58453	123.9	95.1	30.3	96.5	S-9410	
410	5th	N32.25814 W094.58479	124.1	95.6	29.8	97.1	S-9410	
411	5th	N32.25843 W094.58469	123.7	94.6	30.8	96.0	S-9410	
412	5th	N32.25861 W094.58499	122.7	96.7	26.9	98.2	S-9410	
413	5th	N32.25893 W094.58492	119.1	93.6	27.2	95.0	S-9410	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/11/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13417W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000096

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Gauge No.: 34271 Daily Standard Counts: 02/05/2200 DS: 671 MS:
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/12/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13418
Test Method: See Below

TEST RESULTS Report No: 1-1165-000090
Page 1 of 1

Weather: Rain **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment due to rain.

Duties and Tests Performed by Technician:

Technician updated communication, paperwork, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/13/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13419
Test Method: See Below

TEST RESULTS Report No: 1-1165-000091
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheet, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/14/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13420
Test Method: See Below

TEST RESULTS Report No: 1-1165-000092
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor attempting to process and dry in place material.

Equipment on site: Compactor, maintainer, two dozers, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/15/2009
Report Date: 12/17/2009 Sampled By: Blake Hobbs
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13409
Test Method: See Below

TEST RESULTS Report No: 1-1165-000087
Page 1 of 1

Weather: Overcast **Technician(s):** Blake Hobbs **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor hauled soil from borrow area to PDP 1-3 and conditioned soil on PDP 1-3.

Equipment on site: Three dozers, four haulers, maintainer, water truck, processor, disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/15/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13421
Test Method: See Below

TEST RESULTS Report No: 1-1165-000093
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing liner material, processing berm and liner material.

Equipment on site: Four scrapers, maintainer, two dozers, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/16/2009
Report Date: 12/18/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13422
Test Method: See Below

TEST RESULTS Report No: 1-1165-000094
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing lift 6 on southeast and south berm and processing lift 5 on berm.

Equipment on site: Maintainer, two dozers, compactor, water truck, four scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/17/2009
Report Date:	12/21/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13432
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000097
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and opening up wet material.

Equipment on site: Compactor, two dozers, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/18/2009
Report Date: 12/21/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13433
Test Method: See Below

TEST RESULTS Report No: 1-1165-000098
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and opening up wet material.

Equipment on site: Compactor, two dozers, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/18/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13433W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000099

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
414	6th	N32.25956 W094.58092	120.3	97.0	24.0	98.5	S-9410	
415	6th	N32.25981 W094.58073	120.5	97.0	24.2	98.5	S-9410	
416	6th	N32.25993 W094.58110	120.3	96.7	24.4	98.2	S-9410	
417	6th	N32.26021 W094.58096	124.0	100.6	23.3	96.5	S-9405	
418	6th	N32.26029 W094.58123	120.4	97.8	23.1	99.3	S-9410	
419	6th	N32.26047 W094.58102	119.6	98.2	21.8	99.7	S-9410	
420	6th	N32.26062 W094.58134	122.0	97.9	24.6	99.4	S-9410	
421	5th	N32.26088 W094.58105	121.8	98.1	24.2	99.6	S-9410	
422	5th	N32.26108 W094.58140	122.2	98.2	24.4	99.7	S-9410	
423	5th	N32.26120 W094.58138	123.7	100.3	23.3	101.8	S-9410	
424	5th	N32.26146 W094.58118	125.8	102.2	23.1	98.0	S-9405	
425	5th	N32.26169 W094.58138	129.0	106.2	21.5	96.7	S-8910	
426	5th	N32.26183 W094.58109	125.8	103.3	21.8	99.0	S-9405	
427	5th	N32.26210 W094.58125	121.2	98.3	23.3	97.9	S-8896	
428	5th	N32.26210 W094.58092	127.2	104.4	21.8	95.7	S-8801	
429	5th	N32.26238 W094.58107	126.5	104.1	21.5	95.4	S-8801	
430	5th	N32.26226 W094.58087	126.3	103.5	22.0	99.2	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8896	06/03/2009	21.8	100.4	Tan & Red / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/18/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13433W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000099
Page 2 of 2

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Gauge No.: 33200 Daily Standard Counts: 12/18/2009 DS: 2,600 MS: 606
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 12/19/2009
Report Date: 12/30/2009 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13478
Test Method: See Below

TEST RESULTS Report No: 1-1165-000100
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and compacting trench for transmission and processing lifts 5 and 6 on berm.

Equipment on site: Excavator, loader, two dozers, compactor, water truck, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/19/2009
Report Date: 09/28/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13478W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000101
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
431	5th	N32.25915 W094.58523	121.8	96.7	26.0	98.2	S-9410	
432	5th	N32.25929 W094.58494	121.7	96.3	26.4	97.8	S-9410	
433	5th	N32.25958 W094.58511	121.4	95.4	27.3	96.9	S-9410	
434	5th	N32.25970 W094.58475	121.5	96.1	26.4	97.6	S-9410	
435	6th	N32.25903 W094.58183	120.7	95.2	26.8	96.6	S-9410	
436	6th	N32.25853 W094.58342	119.9	95.9	25.0	97.4	S-9410	
437	4th	N32.26120 W094.58405	122.5	95.5	28.3	97.0	S-9410	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Gauge No.: 33200 Daily Standard Counts: 12/19/2009 DS: 2,593 MS: 609
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/20/2009
Report Date:	12/30/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13479
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000102
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lifts 2, 5 and 6.

Equipment on site: Dozer, excavator, maintainer, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/20/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13479W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000103

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
438	6th	N32.25943 W094.58079	118.9	96.8	22.8	98.3	S-9410	
439	6th	N32.25938 W094.58116	118.3	97.0	22.0	98.5	S-9410	
440	6th	N32.25907 W094.58134	119.8	97.4	23.0	98.9	S-9410	
441	6th	N32.25921 W094.58174	118.2	94.9	24.6	96.3	S-9410	
442	6th	N32.25886 W094.58196	119.0	95.6	24.5	97.1	S-9410	
443	6th	N32.25897 W094.58237	122.2	97.2	25.7	98.7	S-9410	
444	6th	N32.25864 W094.58257	123.1	99.1	24.2	100.6	S-9410	
445	6th	N32.25878 W094.58295	120.0	94.6	26.8	96.0	S-9410	
446	6th	N32.25845 W094.58313	121.8	97.0	25.6	98.5	S-9410	
447	6th	N32.25861 W094.58356	120.8	98.2	23.0	99.7	S-9410	
448	6th	N32.25830 W094.58372	120.3	97.9	22.9	99.4	S-9410	
449	6th	N32.25842 W094.58410	122.3	97.2	25.8	98.7	S-9410	
450	6th	N32.25813 W094.58418	120.8	96.6	25.0	98.1	S-9410	
451	6th	N32.25829 W094.58447	123.0	99.2	24.0	100.7	S-9410	
452	4th	N32.25976 W094.58470	124.0	99.9	24.1	101.4	S-9410	
453	4th	N32.25994 W094.58479	123.9	99.9	24.0	101.4	S-9410	
454	4th	N32.26304 W094.58280	122.5	99.1	23.6	96.0	S-8894	
455	4th	N32.26244 W094.58144	120.2	96.5	24.6	98.0	S-9410	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/20/2009
Report Date:	09/23/2010	Previously Reported: 09/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**Soil Densities**		LAB NO: 13479W
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000103

Gauge No.: 33200 Daily Standard Counts: 12/20/2009 DS: 2,613 MS: 601
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/21/2009
Report Date:	12/30/2009		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13480
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000104
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor compacting transmission trench, processing lift 1 on liner and placing lifts 5 and 6 on berm.

Equipment on site: Excavator, loader, two scrapers, water truck, compactor, two dozers, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/21/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13480W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000105

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
456	4th	N32.26018 W094.58457	125.2	99.4	26.0	100.9	S-9410	
457	4th	N32.26041 W094.58467	124.2	99.2	25.2	100.7	S-9410	
458	4th	N32.26056 W094.58442	123.0	96.7	27.2	98.2	S-9410	
459	4th	N32.26080 W094.58444	124.3	99.2	25.3	95.1	S-9405	
460	4th	N32.26099 W094.58415	126.6	104.3	21.4	100.0	S-9405	
461	4th	N32.26125 W094.58425	123.2	100.6	22.5	96.5	S-9405	
462	4th	N32.26139 W094.58404	123.1	100.0	23.1	95.9	S-9405	
463	4th	N32.26165 W094.58406	124.4	101.8	22.2	97.6	S-9405	
464	4th	N32.26180 W094.58379	124.5	102.5	21.5	98.3	S-9405	
465	4th	N32.26213 W094.58384	124.7	101.5	22.9	97.3	S-9405	
466	4th	N32.26228 W094.58356	122.8	97.9	25.4	99.4	S-9410	
467	4th	N32.26254 W094.58363	122.9	97.9	25.5	99.4	S-9410	
468	4th	N32.26269 W094.58331	123.8	99.3	24.7	100.8	S-9410	
469	4th	N32.26294 W094.58344	123.1	98.7	24.7	100.2	S-9410	
470	4th	N32.26319 W094.58321	122.0	98.3	24.1	99.8	S-9410	
471	4th	N32.26303 W094.58302	123.6	99.5	24.2	101.0	S-9410	
472	4th	N32.26285 W094.58263	124.6	99.5	25.2	101.0	S-9410	
473	4th	N32.26295 W094.58231	125.6	101.3	24.0	102.8	S-9410	
474	4th	N32.26264 W094.58212	124.5	100.0	24.5	101.5	S-9410	
475	4th	N32.26275 W094.58181	123.7	100.4	23.2	101.9	S-9410	
476	4th	N32.26250 W094.58165	123.3	98.5	25.2	100.0	S-9410	
477	4th	N32.26234 W094.58128	123.3	98.9	24.7	100.4	S-9410	
478	4th	N32.26243 W094.58109	123.6	97.9	26.3	99.4	S-9410	
479	1st	N32.25969 W094.58336	127.4	108.7	17.2	95.5	S-8928	
480	1st	N32.25996 W094.58311	129.9	109.4	18.7	96.1	S-8928	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/21/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13480W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000105

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
481	1st	N32.26030 W094.58307	132.3	112.3	17.8	98.7	S-8928	
482	1st	N32.26051 W094.58279	128.2	107.1	19.7	97.5	S-8910	
483	1st	N32.26087 W094.58279	129.6	108.7	19.2	99.0	S-8910	
484	1st	N32.26107 W094.58243	125.8	103.0	22.1	98.8	S-9405	
485	1st	N32.26152 W094.58237	125.8	102.2	23.1	98.0	S-9405	
486	1st	N32.26166 W094.58210	123.7	99.2	24.7	96.1	S-8894	
487	1st	N32.26203 W094.58213	126.1	101.6	24.1	97.4	S-9405	
488	1st	N32.26217 W094.58183	126.6	102.1	24.0	97.9	S-9405	
489	1st	N32.26244 W094.58188	122.3	99.2	23.3	96.1	S-8894	
490	1st	N32.26232 W094.58164	123.8	100.9	22.7	97.8	S-8894	
491	1st	N32.26146 W094.58212	125.1	101.7	23.0	98.5	S-8894	
492	1st	N32.26171 W094.58188	128.7	107.5	19.7	104.2	S-8894	
493	1st	N32.26146 W094.58212	127.6	106.6	19.7	103.3	S-8894	
494	1st	N32.26115 W094.58207	128.1	106.1	20.7	102.8	S-8894	
495	1st	N32.26094 W094.58230	127.0	106.8	18.9	103.5	S-8894	
496	1st	N32.26073 W094.58253	127.7	105.9	20.6	102.6	S-8894	
497	1st	N32.26047 W094.58253	129.1	107.4	20.2	104.1	S-8894	
498	1st	N32.26025 W094.58250	123.5	100.7	22.6	97.6	S-8894	
499	1st	N32.26011 W094.58281	123.7	99.4	24.4	96.3	S-8894	
500	1st	N32.25981 W094.58276	124.4	100.8	23.4	97.7	S-8894	
501	1st	N32.25970 W094.58307	121.4	98.7	23.0	95.6	S-8894	
502	1st	N32.25949 W094.58294	122.7	100.6	22.0	97.5	S-8894	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/21/2009
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13480W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000105

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Gauge No.: 33200 Daily Standard Counts: 12/21/2009 DS: 2,605 MS: 603
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 12/22/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13492
Test Method: See Below

TEST RESULTS Report No: 1-1165-000106
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing liner and berm.

Equipment on site: Compactor, maintainer, two dozers, water truck, two scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/22/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13492W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000107
Page 1 of 1

Material: Soil Required: 0 tp +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
503	1st	N32.25939 W094.58267	122.7	100.2	22.5	96.1	S-9405	
504	1st	N32.25951 W094.58241	123.4	99.6	23.9	95.5	S-9405	
505	1st	N32.25962 W094.58214	124.5	102.9	21.0	98.7	S-9405	
506	1st	N32.25975 W094.58185	124.1	102.1	21.5	97.9	S-9405	
507	1st	N32.26003 W094.58174	123.7	99.8	23.9	95.7	S-9405	
508	1st	N32.25997 W094.58207	123.8	100.5	23.2	96.4	S-9405	
509	1st	N32.25982 W094.58241	123.2	100.3	22.8	96.2	S-9405	
510	1st	N32.26007 W094.58242	120.8	99.3	21.7	95.2	S-9405	
511	1st	N32.26015 W094.58211	124.8	101.6	22.8	97.4	S-9405	
512	1st	N32.26031 W094.58189	127.5	105.3	21.1	101.0	S-9405	
513	1st	N32.26037 W094.58215	128.0	104.1	23.0	99.8	S-9405	
514	1st	N32.26028 W094.58236	126.4	103.0	22.7	98.8	S-9405	
515	1st	N32.26058 W094.58513	125.6	102.4	22.7	98.2	S-9405	
516	1st	N32.26063 W094.58182	121.8	99.3	22.7	95.2	S-9405	
517	1st	N32.26078 W094.58201	122.6	99.5	23.2	95.4	S-9405	
518	1st	N32.26097 W094.58197	126.6	103.2	22.7	98.9	S-9405	
519	1st	N32.26130 W094.58186	126.9	103.2	23.0	98.9	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 33200 Daily Standard Counts: 12/22/2009 DS: 2,605 MS: 603
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/23/2009
Report Date:	01/04/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13496
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000108
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment - rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheet and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/24/2009
Report Date:	01/04/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13497
			Test Method: See Below

TEST RESULTS Report No: 1-1165-000109
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/25/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13498
Test Method: See Below

TEST RESULTS Report No: 1-1165-000110
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheet and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/27/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13499
Test Method: See Below

TEST RESULTS Report No: 1-1165-000111
Page 1 of 1

Weather: **Technician(s):** 5Jacob LeNoir **Time:** **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 12/28/2009
Report Date:	01/04/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13500
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000112
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/29/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13501
Test Method: See Below

TEST RESULTS Report No: 1-1165-000113
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift 5 berm.

Equipment on site: Two scrapers, water truck, maintainer, two dozers, excavator, two dump trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/30/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13502
Test Method: See Below

TEST RESULTS Report No: 1-1165-000114
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 12/31/2009
Report Date: 01/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13503
Test Method: See Below

TEST RESULTS Report No: 1-1165-000115
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated communication, paperwork, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 01/02/2010
Report Date:	01/14/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13554
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000116
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/03/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13555
Test Method: See Below

TEST RESULTS Report No: 1-1165-000117
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/04/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13556
Test Method: See Below

TEST RESULTS Report No: 1-1165-000118
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor drying and spreading wet material.

Equipment on site: Compactor, two dozers, scraper, disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 01/05/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13557
Test Method: See Below

TEST RESULTS Report No: 1-1165-000119
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner materials.

Equipment on site: Two scrapers, water truck, compactor, maintainer, three dozers.

Duties and Tests Performed by Technician:

Technician observed contractor operations and performed density tests.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/05/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13557W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000120
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
520	5th	N32.25972 W094.58503	127.9	103.6	23.5	99.3	S-9405	
521	5th	N32.25988 W094.58472	132.1	102.2	29.3	98.0	S-9405	
522	5th	N32.26009 W094.58484	127.4	104.5	21.9	100.2	S-9405	
523	5th	N32.26019 W094.58456	125.1	101.2	23.6	97.0	S-9405	
524	5th	N32.26040 W094.58471	125.1	101.8	22.9	97.6	S-9405	
525	5th	N32.26054 W094.58444	125.6	102.4	22.7	98.2	S-9405	
526	5th	N32.26074 W094.58453	121.9	100.6	21.2	96.5	S-9405	
527	5th	N32.26093 W094.58421	119.1	94.0	26.7	95.2	S-8895	
528	5th	N32.26115 W094.58431	122.8	99.2	23.8	100.5	S-8895	
529	5th	N32.26132 W094.58461	121.1	97.3	24.5	98.6	S-8895	
530	5th	N32.26156 W094.58412	120.2	95.3	26.1	96.6	S-8895	
531	5th	N32.26166 W094.58385	119.2	95.1	25.3	96.4	S-8895	
532	5th	N32.26189 W094.58398	122.0	96.7	26.2	98.0	S-8895	
533	5th	N32.26213 W094.58366	123.3	99.3	24.2	100.6	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 33200 Daily Standard Counts: 01/05/2010 DS: 2,606 MS: 608
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/06/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13558
Test Method: See Below

TEST RESULTS Report No: 1-1165-000121
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner material.

Equipment on site: Three dozers, maintainer, three scrapers, excavator, two dump trucks, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations and performed density tests.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/06/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13558W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000122

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
534	5th	N32.26323 W094.58319	122.9	97.4	26.2	98.7	S-8895	
535	5th	N32.26300 W094.58301	125.6	102.7	22.3	98.5	S-9405	
536	5th	N32.26309 W094.58273	124.7	100.5	24.1	96.4	S-9405	
537	5th	N32.26285 W094.58257	124.2	101.4	22.5	97.2	S-9405	
538	5th	N32.26292 W094.58228	124.6	102.1	22.0	97.9	S-9405	
539	5th	N32.26275 W094.58210	123.9	100.8	22.9	96.6	S-9405	
540	5th	N32.26276 W094.58183	123.7	100.0	23.7	95.9	S-9405	
541	5th	N32.26256 W094.58170	123.9	100.5	23.3	96.4	S-9405	
542	5th	N32.26260 W094.58140	125.0	101.4	23.3	97.2	S-9405	
543	5th	N32.26234 W094.58136	124.9	101.7	22.8	97.5	S-9405	
544	5th	N32.26248 W094.58111	124.6	101.6	22.6	97.4	S-9405	
545	2nd	N32.26245 W094.58182	125.3	102.3	22.5	98.1	S-9405	
546	2nd	N32.26225 W094.58180	125.4	103.8	20.8	99.5	S-9405	
547	2nd	N32.26215 W094.58206	123.6	99.5	24.2	95.4	S-9405	
548	2nd	N32.26186 W094.58199	125.2	102.9	21.7	98.7	S-9405	
549	2nd	N32.26171 W094.58227	125.9	103.8	21.3	99.5	S-9405	
550	2nd	N32.26147 W094.58223	123.7	100.4	23.2	96.3	S-9405	
551	2nd	N32.26132 W094.58249	124.2	99.9	24.3	95.8	S-9405	
552	2nd	N32.26108 W094.58242	123.6	99.5	24.2	95.4	S-9405	
553	2nd	N32.26093 W094.58265	125.7	102.2	23.0	98.0	S-9405	
554	2nd	N32.26066 W094.58264	124.4	101.9	22.1	97.7	S-9405	
555	2nd	N32.26054 W094.58292	125.3	103.8	20.7	99.5	S-9405	
556	2nd	N32.26028 W094.58282	125.2	101.2	23.7	97.0	S-9405	
557	2nd	N32.26021 W094.58311	124.5	101.8	22.3	97.6	S-9405	
558	2nd	N32.25997 W094.58302	125.4	101.2	23.9	97.0	S-9405	
559	2nd	N32.25991 W094.58327	124.4	103.0	20.8	98.8	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/06/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13558W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000122

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
560	2nd	N32.25966 W094.58323	125.1	102.9	21.6	98.7	S-9405	
561	2nd	N32.25962 W094.58346	124.1	100.3	23.7	96.2	S-9405	
562	6th	N32.26233 W094.58089	125.4	101.7	23.3	97.5	S-9405	
563	6th	N32.26219 W094.58115	124.5	99.8	24.7	95.7	S-9405	
564	6th	N32.26196 W094.58103	123.9	99.5	24.5	95.4	S-9405	
565	6th	N32.26184 W094.58125	123.7	99.6	24.2	95.5	S-9405	
566	6th	N32.26162 W094.58118	124.3	100.4	23.8	96.3	S-9405	
567	6th	N32.26149 W094.58136	124.0	99.6	24.5	95.5	S-9405	
568	6th	N32.26131 W094.58118	125.5	100.9	24.4	96.7	S-9405	
569	6th	N32.26106 W094.58137	124.4	99.4	25.2	95.3	S-9405	
570	6th	N32.26089 W094.58115	121.2	95.4	27.0	96.7	S-8895	
571	6th	N32.26070 W094.58131	126.3	103.6	21.9	99.3	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 33200 Daily Standard Counts: 01/06/2010 DS: 2,624 MS: 606
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/07/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13560
Test Method: See Below

TEST RESULTS Report No: 1-1165-000123
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/08/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13561
Test Method: See Below

TEST RESULTS Report No: 1-1165-000124
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/09/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13562
Test Method: See Below

TEST RESULTS Report No: 1-1165-000125
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/10/2010
Report Date: 01/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13563
Test Method: See Below

TEST RESULTS Report No: 1-1165-000126
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 01/11/2010
Report Date:	01/14/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13564
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000127
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated spreadsheets, maps, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 01/12/2010
Report Date:	01/14/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13565
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000128
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm, liner and grading outer berm.

Equipment on site: Three dozers, compactor, water truck, three scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/13/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13630
Test Method: See Below

TEST RESULTS Report No: 1-1165-000129
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner.

Equipment on site: Three dozers, compactor, water truck, three scrapers, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/14/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13631
Test Method: See Below

TEST RESULTS Report No: 1-1165-000130
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner.

Equipment on site: Three dozers, compactor, water truck, three scrapers, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/23/2010 Previously Reported: 09/17/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Martin Lake SES PDP 1-3 Vertical Expansion
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

Date Sampled: 01/14/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 13631W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000131

Material: Soils

Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
572	6th	N32.25794 W094.58467	126.3	103.0	22.6	98.8	S-9405	
573	6th	N32.25819 W094.58451	130.6	102.7	27.2	98.5	S-9405	
574	6th	N32.25840 W094.58491	125.9	103.7	21.4	99.4	S-9405	
575	6th	N32.25875 W094.58479	126.5	103.3	22.5	99.0	S-9405	
576	6th	N32.25890 W094.58511	126.2	103.2	22.3	98.9	S-9405	
577	6th	N32.25919 W094.58495	131.2	109.4	19.9	96.1	S-8928	
578	6th	N32.25940 W094.58517	131.6	110.8	18.8	97.4	S-8928	
579	6th	N32.25954 W094.58477	131.7	110.4	19.3	97.0	S-8928	
580	6th	N32.25980 W094.58498	131.1	108.4	20.9	95.3	S-8928	
581	2nd	N32.26245 W094.58236	125.3	104.3	20.1	95.6	S-8801	
582	2nd	N32.26232 W094.58268	127.0	104.4	21.6	95.7	S-8801	
583	2nd	N32.26204 W094.58256	125.8	104.8	20.0	96.1	S-8801	
584	2nd	N32.26193 W094.58288	119.0	95.0	25.3	96.4	S-9410	
585	2nd	N32.26163 W094.58278	120.0	95.9	25.1	97.4	S-9410	
586	2nd	N32.26151 W094.58308	120.4	96.0	25.4	97.5	S-9410	
587	2nd	N32.26121 W094.58300	122.4	97.5	25.5	99.0	S-9410	
588	2nd	N32.26109 W094.58334	122.8	98.6	24.5	100.1	S-9410	
589	2nd	N32.26096 W094.58347	120.2	95.8	25.5	97.3	S-9410	
590	2nd	N32.26070 W094.58333	122.5	98.3	24.6	99.8	S-9410	
591	2nd	N32.26060 W094.58360	120.9	96.2	25.7	97.7	S-9410	
592	5th	N32.26208 W094.58376	124.9	102.7	21.6	98.5	S-9405	
593	5th	N32.26213 W094.58357	125.6	102.0	23.1	97.8	S-9405	
594	5th	N32.26232 W094.58367	125.0	100.3	24.6	96.2	S-9405	
595	5th	N32.26244 W094.58345	124.0	101.0	22.8	96.8	S-9405	
596	5th	N32.26273 W094.58351	125.4	103.0	21.7	98.8	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/14/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

REPORT: **Soil Densities** LAB NO: 13631W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000131

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
597	5th	N32.26286 W094.58323	123.8	100.2	23.6	96.1	S-9405	
598	5th	N32.26308 W094.58338	124.5	101.5	22.7	97.3	S-9405	
599	2nd	N32.26031 W094.58356	121.8	98.3	23.9	99.8	S-9410	
600	2nd	N32.26022 W094.58382	121.4	98.6	23.1	100.1	S-9410	
601	2nd	N32.25994 W094.58376	122.0	98.4	24.0	99.9	S-9410	
602	2nd	N32.25982 W094.58401	124.1	99.3	25.0	100.8	S-9410	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand
S-9410	12/14/2009	21.3	98.5	Tan, Gray & Red / Lean Clay

Gauge No.: 36842 Daily Standard Counts: 01/14/2010 DS: 2,613 MS: 607
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/15/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13638
Test Method: See Below

TEST RESULTS Report No: 1-1165-000132
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner.

Equipment on site: Three dozers, compactor, water truck, three scrapers, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/16/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13639
Test Method: See Below

TEST RESULTS Report No: 1-1165-000133
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork, communication, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/17/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13640
Test Method: See Below

TEST RESULTS Report No: 1-1165-000134
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork, communication, maps and spreadsheets (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/18/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13641
Test Method: See Below

TEST RESULTS Report No: 1-1165-000135
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/19/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13642
Test Method: See Below

TEST RESULTS Report No: 1-1165-000136
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets, paperwork and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/20/2010
Report Date: 01/22/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13643
Test Method: See Below

TEST RESULTS Report No: 1-1165-000137
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork, spreadsheets and communication (office).

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/21/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13758
Test Method: See Below

TEST RESULTS Report No: 1-1165-000138
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor opening up to dry.

Equipment on site: Two scrapers, two dozers, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/22/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13759
Test Method: See Below

TEST RESULTS Report No: 1-1165-000139
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician drove to job site but site was rained out.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 01/23/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13760
Test Method: See Below

TEST RESULTS Report No: 1-1165-000140
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/24/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13761
Test Method: See Below

TEST RESULTS Report No: 1-1165-000141
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated communication, maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 01/25/2010
Report Date:	02/09/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Martin Lake SES PDP 1-3 Vertical Expansion		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13762
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000142
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing liner and berm.

Equipment on site: Two scrapers, two dozers, excavator, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 01/26/2010
Report Date:	02/09/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Martin Lake SES PDP 1-3 Vertical Expansion		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13763
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000143
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 7.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing liner and berm.

Equipment on site: Two scrapers, two dozers, excavator, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 01/27/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13764
Test Method: See Below

TEST RESULTS Report No: 1-1165-000144
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing liner, berm and berm fill.

Equipment on site: Two scrapers, two dozers, excavator, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 01/27/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13764W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000145

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
603	6th	N32.25972 W094.58472	127.1	105.0	21.0	100.7	S-9405	
604	6th	N32.25997 W094.58488	128.7	107.4	19.8	97.8	S-8910	
605	6th	N32.26007 W094.58468	131.5	109.4	20.2	99.6	S-8910	
606	6th	N32.26032 W094.58469	131.3	109.0	20.5	99.3	S-8910	
607	6th	N32.26046 W094.58440	131.4	109.9	19.6	100.1	S-8910	
608	6th	N32.26075 W094.58451	130.9	109.2	19.9	99.5	S-8910	
609	6th	N32.26088 W094.58421	129.3	108.3	19.4	98.6	S-8910	
610	6th	N32.26115 W094.58432	129.2	109.6	17.9	99.8	S-8910	
611	6th	N32.26126 W094.58404	129.3	109.1	18.5	99.4	S-8910	
612	6th	N32.26147 W094.58414	127.7	106.9	19.5	97.4	S-8910	
613	6th	N32.26159 W094.58383	126.8	104.8	21.0	95.4	S-8910	
614	6th	N32.26187 W094.58396	125.8	107.9	16.6	98.3	S-8910	
615	6th	N32.26326 W094.58327	126.0	104.7	20.3	95.4	S-8910	
616	6th	N32.26302 W094.58312	127.1	105.0	21.0	96.2	S-8801	
617	6th	N32.26310 W094.58277	120.4	94.9	26.9	95.4	S-9028	
618	6th	N32.26285 W094.58266	123.5	102.0	21.1	98.8	S-8894	
619	6th	N32.26292 W094.58229	121.9	96.9	25.8	98.2	S-8895	
620	6th	N32.26265 W094.58208	121.2	96.2	26.0	97.5	S-8895	
621	6th	N32.26272 W094.58181	124.6	100.2	24.4	97.1	S-8894	
622	6th	N32.26248 W094.58168	123.2	99.7	23.6	96.6	S-8894	
623	6th	N32.26260 W094.58141	124.3	100.3	23.9	100.8	S-9028	
624	6th	N32.26234 W094.58137	123.8	100.0	23.8	100.5	S-9028	
625	6th	N32.26246 W094.58112	123.5	101.0	22.3	101.5	S-9028	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/27/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13764W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000145

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 33200 Daily Standard Counts: 01/27/2010 DS: 2,573 MS: 608
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 01/27/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13791W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000146
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F1	1st	N32.25950 W094.58093	130.5	115.1	13.4	101.3	S-8911	
F2	1st	N32.25978 W094.58075	127.5	113.0	12.8	99.5	S-8911	
F3	1st	N32.25993 W094.58110	127.2	112.1	13.5	98.7	S-8911	
F4	1st	N32.26021 W094.58092	128.3	114.0	12.5	100.4	S-8911	
F5	1st	N32.26036 W094.58128	128.0	113.2	13.1	99.6	S-8911	
F6	1st	N32.26068 W094.58102	124.3	106.8	16.4	95.7	S-8906	
F7	1st	N32.26090 W094.58128	128.8	114.2	12.8	97.3	S-8905	
F8	1st	N32.26123 W094.58110	127.5	112.4	13.4	95.7	S-8905	
F9	1st	N32.26141 W094.58140	129.8	114.4	13.5	97.4	S-8905	
F10	1st	N32.26160 W094.58113	129.7	114.3	13.5	97.4	S-8905	
F11	1st	N32.26178 W094.58131	130.1	115.4	12.7	98.3	S-8905	
F12	1st	N32.26189 W094.58098	124.4	104.6	18.9	95.3	S-8910	
F13	1st	N32.26213 W094.58116	126.0	110.8	13.7	97.5	S-8911	
F14	1st	N32.26222 W094.58085	125.7	111.2	13.0	97.9	S-8911	
F15	1st	N32.26237 W094.58109	126.5	110.8	14.2	97.5	S-8911	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8911	06/05/2009	12.6	113.6	Red, Tan & Gray / Silty, Clayey Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/27/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13791W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000146

Gauge No.: 33200 Daily Standard Counts: 01/27/2010 DS: 2,573 MS: 608
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 01/28/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13794
Test Method: See Below

TEST RESULTS Report No: 1-1165-000147
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing liner berm and berm fill.

Equipment on site: Two scrapers, two dozers, excavator, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 01/28/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13794W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000148

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F16	1st	N32.25956 W094.58064	129.7	110.1	17.8	98.7	S-8906	
F17	1st	N32.25924 W094.58073	130.8	111.9	16.9	100.3	S-8906	
F18	1st	N32.25937 W094.58109	130.2	111.0	17.3	99.5	S-8906	
F19	1st	N32.25908 W094.58126	124.7	104.6	19.2	100.3	S-9405	
F20	1st	N32.25921 W094.58170	123.2	102.4	20.3	98.2	S-9405	
F21	1st	N32.25885 W094.58189	128.4	107.5	19.4	96.3	S-8906	
F22	1st	N32.25899 W094.58229	126.1	106.3	18.6	95.3	S-8906	
F23	1st	N32.25867 W094.58245	128.1	109.5	17.0	98.1	S-8906	
F24	1st	N32.25879 W094.58279	128.1	108.2	18.4	97.0	S-8906	
F25	1st	N32.25851 W094.58294	133.8	120.3	11.2	102.5	S-8905	
F26	1st	N32.25867 W094.58325	132.1	117.5	12.4	100.1	S-8905	
F27	1st	N32.25835 W094.58344	127.0	112.0	13.4	95.4	S-8905	
F28	1st	N32.25847 W094.58384	126.9	113.2	12.1	96.4	S-8905	
F29	1st	N32.25817 W094.58395	125.5	102.1	22.9	97.9	S-9405	
F30	1st	N32.25833 W094.58430	124.0	101.3	22.4	97.1	S-9405	
F31	1st	N32.25802 W094.58439	132.8	109.1	21.7	97.8	S-8906	
F32	1st	N32.25793 W094.58463	123.8	100.4	23.3	96.3	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/28/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13794W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000148
Page 2 of 2

Gauge No.: 33200 Daily Standard Counts: 01/28/2010 DS: 2,621 MS: 611
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/28/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13796W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000149
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
626	2nd	N32.26245 W094.58206	126.5	104.3	21.3	95.0	S-8910	
627	2nd	N32.26236 W094.58229	129.6	107.4	20.7	97.8	S-8910	
628	2nd	N32.26209 W094.58221	128.0	107.2	19.4	97.6	S-8910	
629	2nd	N32.26196 W094.58253	131.3	110.1	19.3	96.7	S-8928	
630	2nd	N32.26174 W094.58243	131.6	109.7	20.0	96.4	S-8928	
631	2nd	N32.26160 W094.58270	128.4	104.7	22.6	95.4	S-8910	
632	2nd	N32.26128 W094.58266	128.7	105.3	22.2	95.9	S-8910	
633	2nd	N32.26112 W094.58298	126.7	103.4	22.5	99.1	S-9405	
634	2nd	N32.26081 W094.58291	128.4	104.6	22.8	100.3	S-9405	
635	2nd	N32.26060 W094.58324	129.0	106.3	21.4	96.8	S-8910	
636	2nd	N32.26035 W094.58317	125.5	102.8	22.1	98.6	S-9405	
637	2nd	N32.26017 W094.58348	126.7	103.4	22.5	99.1	S-9405	
638	2nd	N32.25990 W094.58343	127.0	104.4	21.6	100.1	S-9405	
639	2nd	N32.25938 W094.58367	124.4	99.9	24.5	95.8	S-9405	
640	2nd	N32.25966 W094.58353	124.9	101.0	23.7	96.8	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 33200 Daily Standard Counts: 01/28/2010 DS: 2,621 MS: 611
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/29/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13797
Test Method: See Below

TEST RESULTS Report No: 1-1165-000150
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing liner and berm.

Equipment on site: Two scrapers, two dozers, excavator, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 01/30/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13798
Test Method: See Below

TEST RESULTS Report No: 1-1165-000151
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing berm and liner.

Equipment on site: Two dozers, scrapper.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/01/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13799
Test Method: See Below

TEST RESULTS Report No: 1-1165-000152
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing liner and berm and berm fill.

Equipment on site: Two dozers, two scrapers, excavator, two dump trucks, maintainer, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/02/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13800
Test Method: See Below

TEST RESULTS Report No: 1-1165-000153
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner and over berm subgrade.

Equipment on site: Two dozers, two scrapers, maintainer, excavator, water truck, compactor, two dump trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 02/03/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13801
Test Method: See Below

TEST RESULTS Report No: 1-1165-000154
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm, liner, berm fill and over berm subgrade.

Equipment on site: Two dozers, two scrapers, maintainer, compactor, water truck, excavator, two dump trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 02/03/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13801W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000155
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
641	6th	N32.26218 W094.58385	124.0	97.9	26.7	97.5	S-8896	
642	6th	N32.26218 W094.58382	123.7	98.8	25.2	98.4	S-8896	
643	6th	N32.26247 W094.58370	124.1	97.7	27.0	97.3	S-8896	
644	6th	N32.26250 W094.58346	124.4	98.5	26.3	98.1	S-8896	
645	6th	N32.26284 W094.58353	122.5	95.7	28.0	95.3	S-8896	
646	6th	N32.26289 W094.58326	128.6	99.1	29.8	98.7	S-8896	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8896	06/03/2009	21.8	100.4	Tan & Red / Fat Clay

Gauge No.: 33200 Daily Standard Counts: 02/03/2010 DS: 2,608 MS: 602
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/03/2010
Report Date: 02/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13802W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000156
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F33	2nd	N32.26236 W094.55109	130.1	110.9	17.3	98.2	S-8803	
F34	2nd	N32.26217 W094.58095	127.2	107.7	18.1	95.4	S-8803	
F35	2nd	N32.26209 W094.58122	129.4	109.5	18.2	97.0	S-8803	
F36	2nd	N32.26184 W094.58109	130.3	111.5	16.9	98.8	S-8803	
F37	2nd	N32.26163 W094.58141	129.4	111.4	16.2	98.7	S-8803	
F38	2nd	N32.26141 W094.58115	128.6	108.5	18.5	96.1	S-8803	
F39	2nd	N32.26118 W094.58139	128.9	110.4	16.8	97.8	S-8803	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8803	04/21/2009	14.0	112.9	Brown, Gray & Red / Clayey Sand

Gauge No.: 33200 Daily Standard Counts: 02/03/2010 DS: 2,608 MS: 602
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 02/04/2010
Report Date: 02/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13803
Test Method: See Below

TEST RESULTS Report No: 1-1165-000157
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated paperwork, maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 02/10/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Martin Lake SES PDP 1-3 Vertical Expansion
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

Date Sampled: 02/05/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 13804
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000158
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/06/2010
Report Date:	02/10/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Martin Lake SES PDP 1-3 Vertical Expansion		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13805
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000159
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork, maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 02/07/2010
Report Date: 02/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Martin Lake SES PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13806
Test Method: See Below

TEST RESULTS Report No: 1-1165-000160
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/08/2010
Report Date:	02/10/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Martin Lake SES PDP 1-3 Vertical Expansion		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13807
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000161
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/09/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13882
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000162
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated maps, communication and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/10/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13883
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000163
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/11/2010
Report Date: 02/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13884
Test Method: See Below

TEST RESULTS Report No: 1-1165-000164
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/12/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13886
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000165
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/15/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13887
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000166
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/16/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13888
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000167
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/17/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13889
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000168
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, paperwork and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/18/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13890
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000169
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/19/2010
Report Date: 02/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13891
Test Method: See Below

TEST RESULTS Report No: 1-1165-000170
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated paperwork and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/20/2010
Report Date:	02/24/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13892
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000171
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated communication and paperwork.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/21/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13992
Test Method: See Below

TEST RESULTS Report No: 1-1165-000172
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 02/22/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13994
Test Method: See Below

TEST RESULTS Report No: 1-1165-000173
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner.

Equipment on site: Two dozers, two dump trucks, excavator, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/22/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13994W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000174

Material: Soils Required: 0 to +3 95

Test No	Lift	Location		Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
647	2nd	N32.26225	W094.58160	121.2	100.2	21.0	96.1	S-9405	
648	2nd	N32.26203	W094.58145	120.5	99.3	21.3	95.2	S-9405	
649	2nd	N32.26188	W094.58144	122.5	100.6	21.8	96.5	S-9405	
650	2nd	N32.26185	W094.58169	125.2	103.9	20.5	99.6	S-9405	
651	2nd	N32.26172	W094.58192	130.1	110.7	17.5	100.8	S-8910	
652	2nd	N32.26161	W094.58179	123.2	102.2	20.5	98.0	S-9405	
653	2nd	N32.26154	W094.58163	125.4	101.5	23.5	98.4	S-8894	
654	2nd	N32.26133	W094.58153	121.1	100.5	20.5	96.4	S-9405	
655	2nd	N32.26131	W094.58181	128.0	109.7	16.7	99.9	S-8910	
656	2nd	N32.26132	W094.58208	127.1	107.2	18.6	97.6	S-8910	
657	2nd	N32.26109	W094.58200	121.7	102.0	19.3	97.8	S-9405	
658	2nd	N32.26096	W094.58180	124.4	102.8	21.0	98.6	S-9405	
659	2nd	N32.26078	W094.58172	124.1	101.6	22.1	97.4	S-9405	
660	2nd	N32.26073	W094.58204	124.3	105.3	18.0	95.9	S-8910	
661	2nd	N32.26077	W094.58237	128.4	108.7	18.1	99.0	S-8910	
662	2nd	N32.26056	W094.58241	127.5	108.0	18.1	98.4	S-8910	
663	2nd	N32.26051	W094.58220	125.9	107.0	17.7	97.4	S-8910	
664	2nd	N32.26037	W094.58204	124.0	106.2	16.8	96.7	S-8910	
665	2nd	N32.26027	W094.58228	124.7	103.0	21.1	98.8	S-9405	
666	2nd	N32.26034	W094.58262	126.0	105.9	19.0	96.4	S-8910	
667	2nd	N32.26013	W094.58260	126.4	105.3	20.0	101.0	S-9405	
668	2nd	N32.26002	W094.58232	124.8	100.8	23.8	96.6	S-9405	
669	2nd	N32.25980	W094.58236	124.6	103.7	20.2	99.4	S-9405	
670	2nd	N32.25982	W094.58266	124.6	102.1	22.0	97.9	S-9405	
671	2nd	N32.25981	W094.58294	125.2	107.0	17.0	97.4	S-8910	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/22/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 13994W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000174

Material: Soils Required: 0 to +3 95

Test No	Lift	Location		Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
672	2nd	N32.25961	W094.58295	124.1	101.3	22.5	97.1	S-9405	
673	2nd	N32.25948	W094.58277	125.6	106.6	17.8	97.1	S-8910	
674	2nd	N32.25946	W094.58244	124.0	102.7	20.7	98.5	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 34271 Daily Standard Counts: 02/22/2010 DS: 2,574 MS: 686
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/23/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13995
Test Method: See Below

TEST RESULTS Report No: 1-1165-000175
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 02/24/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13996
Test Method: See Below

TEST RESULTS Report No: 1-1165-000176
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 02/25/2010
Report Date:	03/09/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 13997
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000177
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner.

Equipment on site: Two dozers, two dump trucks, excavator, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/26/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13998
Test Method: See Below

TEST RESULTS Report No: 1-1165-000178
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor grading and drying liner and fill.

Equipment on site: Dozer, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/27/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 13999
Test Method: See Below

TEST RESULTS Report No: 1-1165-000179
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 02/28/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14000
Test Method: See Below

TEST RESULTS Report No: 1-1165-000180
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/01/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14001
Test Method: See Below

TEST RESULTS Report No: 1-1165-000181
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/02/2010
Report Date:	03/09/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14002
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000182
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner (drying).

Equipment on site: Two dump trucks, excavator, maintainer, compactor, two dozers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/03/2010
Report Date:	03/09/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14003
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000183
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor drying and placing fill and liner.

Equipment on site: Two dump trucks, two dozers, maintainer, excavator, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/04/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14004
Test Method: See Below

TEST RESULTS Report No: 1-1165-000184
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing, processing and drying fill and liner.

Equipment on site: Two dozers, two dump trucks, excavator, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/05/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14005
Test Method: See Below

TEST RESULTS Report No: 1-1165-000185
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing fill and liner.

Equipment on site: Three dozers, compactor, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/05/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14005W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000186
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F-40	1st	N32.25913 W094.58504	130.5	111.6	16.9	98.8	S-8803	
F-41	1st	N32.25924 W094.58526	127.5	108.6	17.4	96.2	S-8803	
F-42	1st	N32.25937 W094.58498	128.8	109.4	17.7	96.9	S-8803	
F-43	1st	N32.25951 W094.58489	124.1	106.4	16.6	95.3	S-8906	
F-44	1st	N32.25979 W094.58500	127.5	109.4	16.5	98.0	S-8906	
F-45	1st	N32.25988 W094.58469	125.1	106.7	17.2	95.6	S-8906	
F-46	1st	N32.26012 W094.58487	125.6	106.0	18.5	95.0	S-8906	
F-47	1st	N32.26023 W094.58447	124.6	107.9	15.5	96.7	S-8906	
F-48	1st	N32.26047 W094.58467	125.4	107.6	16.5	96.4	S-8906	
F-49	1st	N32.26066 W094.58440	127.2	104.2	22.1	95.5	S-8801	
F-50	1st	N32.26094 W094.58444	125.8	107.1	17.5	96.0	S-8906	
F-51	1st	N32.26101 W094.58415	125.8	102.6	22.6	99.4	S-8894	
F-52	1st	N32.26128 W094.58426	126.4	108.1	16.9	96.9	S-8906	
F-53	1st	N32.26142 W094.58400	125.5	101.0	24.3	97.9	S-8894	
F-54	1st	N32.26169 W094.58408	126.0	109.3	15.3	97.9	S-8906	
F-55	1st	N32.26181 W094.58376	125.7	107.6	16.8	96.4	S-8906	
F-56	1st	N32.26207 W094.58392	125.4	99.7	25.8	96.6	S-8894	
F-57	1st	N32.26219 W094.58360	125.3	100.0	25.3	96.9	S-8894	
F-58	1st	N32.26245 W094.58368	124.2	99.6	24.7	96.5	S-8894	
F-59	1st	N32.26263 W094.58339	124.3	100.2	24.1	97.1	S-8894	
F-60	1st	N32.26291 W094.58351	124.1	98.8	25.6	95.7	S-8894	
F-61	1st	N32.26299 W094.58324	124.0	98.0	26.5	95.0	S-8894	
F-62	1st	N32.26322 W094.58332	124.9	104.6	19.4	101.4	S-8894	
F-63	1st	N32.26312 W094.58309	124.5	100.8	23.5	97.7	S-8894	
F-64	1st	N32.26312 W094.58280	125.0	103.7	20.5	100.5	S-8894	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/05/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14005W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000186

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F-65	1st	N32.26283 W094.58269	127.8	110.2	16.0	98.7	S-8906	
F-66	1st	N32.26296 W094.58237	125.3	103.5	21.1	100.3	S-8894	
F-67	1st	N32.26268 W094.58226	124.6	102.4	21.7	99.2	S-8894	
F-68	1st	N32.26278 W094.58196	125.0	102.6	21.8	99.4	S-8894	
F-69	1st	N32.26250 W094.58179	129.7	112.9	14.9	100.4	S-9151	
F-70	1st	N32.26266 W094.58144	128.8	109.0	18.2	97.7	S-8906	
F-71	1st	N32.26233 W094.58135	127.6	109.8	16.2	98.4	S-8906	
F-72	1st	N32.26245 W094.58112	127.5	107.6	18.5	96.4	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8803	04/21/2009	14.0	112.9	Brown, Gray & Red / Clayey Sand
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-9151	08/05/2009	14.7	112.5	Red & Tan / Clayey Sand

Gauge No.: 34271 Daily Standard Counts: 03/05/2010 DS: 2,574 MS: 686
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/06/2010
Report Date: 03/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14006
Test Method: See Below

TEST RESULTS Report No: 1-1165-000187
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor grading and placing berm fill and processing liner.

Equipment on site: Two dump trucks, maintainer, compactor, excavator, two dozers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/06/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14006W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000188
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F-73	2nd	N32.26083 W094.58125	130.1	110.7	17.5	97.4	S-8911	
F-74	2nd	N32.26066 W094.58135	121.9	110.1	10.7	96.9	S-8911	
F-75	2nd	N32.26058 W094.58107	129.3	109.8	17.8	96.7	S-8911	
F-76	2nd	N32.26040 W094.58128	129.4	111.3	16.3	98.0	S-8911	
F-77	2nd	N32.26029 W094.58099	129.0	110.6	16.6	97.4	S-8911	
F-78	2nd	N32.26008 W094.58110	130.8	112.6	16.2	99.1	S-8911	
F-79	2nd	N32.25995 W094.58084	130.3	110.8	17.6	97.5	S-8911	
F-80	2nd	N32.25977 W094.58102	130.8	111.0	17.8	97.7	S-8911	
F-81	2nd	N32.25970 W094.58071	129.2	109.8	17.7	96.7	S-8911	
F-82	2nd	N32.25951 W094.58091	130.8	111.6	17.2	98.2	S-8911	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8911	06/05/2009	12.6	113.6	Red, Tan & Gray / Silty, Clayey Sand

Gauge No.: 36842 Daily Standard Counts: 03/06/2010 DS: 2,576 MS: 689
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/06/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14006W-1
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000189

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
675	3rd	N32.25959 W094.58114	125.2	103.0	21.6	98.8	S-9405	
676	3rd	N32.25963 W094.58158	126.5	105.6	19.8	101.2	S-9405	
677	3rd	N32.25931 W094.58161	127.2	103.3	23.1	99.0	S-9405	
678	3rd	N32.25946 W094.58192	125.5	102.7	22.2	98.5	S-9405	
679	3rd	N32.25918 W094.58192	124.9	103.7	20.4	99.4	S-9405	
680	3rd	N32.25941 W094.58232	125.4	103.2	21.5	98.9	S-9405	
681	3rd	N32.25908 W094.58244	124.4	102.0	22.0	97.8	S-9405	
682	3rd	N32.25925 W094.58283	124.4	103.6	20.1	99.3	S-9405	
683	3rd	N32.25983 W094.58284	123.7	103.9	19.1	99.6	S-9405	
684	3rd	N32.25910 W094.58321	126.0	102.0	23.5	97.8	S-9405	
685	3rd	N32.25879 W094.58329	127.5	106.2	20.1	101.8	S-9405	
686	3rd	N32.25893 W094.58360	125.1	107.2	16.7	97.6	S-8910	
687	3rd	N32.25866 W094.58373	125.3	100.6	24.6	96.5	S-9405	
688	3rd	N32.25879 W094.58407	128.1	108.9	17.6	99.2	S-8910	
689	3rd	N32.25851 W094.58411	124.8	106.4	17.3	96.9	S-8910	
690	3rd	N32.25866 W094.58436	125.5	103.0	21.8	98.8	S-9405	
691	3rd	N32.25842 W094.58447	123.8	101.8	21.6	97.6	S-9405	
692	1st	N32.25980 W094.58432	122.5	98.6	24.2	95.5	S-8894	
693	1st	N32.25957 W094.58436	123.1	98.9	24.5	95.8	S-8894	
694	1st	N32.25932 W094.58440	124.0	103.5	19.8	99.2	S-9405	
695	1st	N32.25911 W094.58444	123.5	103.7	19.1	99.4	S-9405	
696	1st	N32.25888 W094.58434	124.9	101.3	23.3	98.2	S-8894	
697	1st	N32.25912 W094.58421	122.1	101.8	19.9	97.6	S-9405	
698	1st	N32.25930 W094.58418	126.1	104.3	20.9	100.0	S-9405	
699	1st	N32.25950 W094.58411	122.8	100.8	21.8	96.6	S-9405	

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/06/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14006W-1
Test Method: See Below

TEST RESULTS Report No: 1-1165-000189
Page 2 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
700	1st	N32.25962 W094.58382	122.3	98.5	24.2	99.8	S-8895	
701	1st	N32.25929 W094.58391	126.4	105.3	20.0	101.0	S-9405	
702	1st	N32.25895 W094.58400	124.9	103.1	21.1	98.8	S-9405	
703	1st	N32.25913 W094.58375	123.0	96.6	27.3	97.9	S-8895	
704	1st	N32.25939 W094.58366	123.5	97.2	27.1	98.5	S-8895	
705	1st	N32.25952 W094.58336	125.7	103.9	21.0	99.6	S-9405	
706	1st	N32.25920 W094.58351	126.7	105.0	20.7	100.7	S-9405	
707	1st	N32.25926 W094.58326	123.5	100.8	22.5	96.6	S-9405	
708	1st	N32.25931 W094.58297	122.4	99.3	23.3	100.6	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/06/2010 DS: 2,576 MS: 683
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/07/2010
Report Date: 03/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14053
Test Method: See Below

TEST RESULTS Report No: 1-1165-000190
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/08/2010
Report Date: 03/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14054
Test Method: See Below

TEST RESULTS Report No: 1-1165-000191
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and sealing liner and berm fill.

Equipment on site: Two dump trucks, compactor, maintainer, two dozers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/08/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14054W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000192

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
709	2nd	N32.26268 W094.58290	125.7	104.2	20.6	95.5	S-8801	
710	2nd	N32.26240 W094.58276	125.1	103.4	21.0	99.1	S-9405	
711	2nd	N32.26229 W094.58308	122.7	98.6	24.4	95.5	S-8894	
712	2nd	N32.26200 W094.58298	123.4	100.7	22.5	97.6	S-8894	
713	2nd	N32.26186 W094.58330	118.9	104.6	13.7	100.3	S-9405	
714	2nd	N32.26163 W094.58324	122.7	100.6	22.0	97.5	S-8894	
715	2nd	N32.26140 W094.58343	122.3	96.5	26.7	97.8	S-8895	
716	2nd	N32.26123 W094.58356	125.7	102.1	23.1	98.9	S-8894	
717	2nd	N32.26106 W094.58350	125.1	102.7	21.8	99.5	S-8894	
718	2nd	N32.26093 W094.58376	122.8	98.2	25.0	99.5	S-8895	
719	2nd	N32.26071 W094.58372	122.7	98.2	24.9	99.5	S-8895	
720	2nd	N32.26095 W094.58386	123.0	97.5	26.2	98.8	S-8895	
721	2nd	N32.26045 W094.58405	121.7	98.8	23.2	100.1	S-8895	
722	2nd	N32.26022 W094.58400	121.9	96.1	26.8	97.4	S-8895	
723	2nd	N32.26011 W094.58421	121.3	96.0	26.4	97.3	S-8895	
724	2nd	N32.25992 W094.58414	122.2	96.8	26.2	98.1	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/08/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14054W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000192

Gauge No.: 36842 Daily Standard Counts: 03/08/2010 DS: 2,589 MS: 686
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/09/2010
Report Date:	03/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14058
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000193
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/10/2010
Report Date:	03/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14059
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000194
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing liner and berm fill.

Equipment on site: Two dump trucks, excavator, three dozers, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/11/2010
Report Date:	03/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14061
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000195
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/12/2010
Report Date:	03/16/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14086
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000196
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing berm fill and liner.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/13/2010
Report Date:	03/16/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14087
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000197
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and liner.

Equipment on site: Three dump trucks, two dozers, compactor, excavator, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/13/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14087W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000198

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
725	2nd	W32.26005 W094.58448	126.0	102.5	22.9	98.3	S-9405	
726	2nd	W32.26020 W094.58421	124.8	98.6	26.6	99.9	S-8895	
727	2nd	W32.26041 W094.58434	124.3	97.3	27.7	98.6	S-8895	
728	2nd	W32.26056 W094.58405	126.4	104.3	21.2	100.0	S-9405	
729	2nd	W32.26080 W094.58416	124.5	97.9	27.2	99.2	S-8895	
730	2nd	W32.26095 W094.58385	126.8	103.4	22.6	99.1	S-9405	
731	2nd	W32.26121 W094.58394	125.3	100.5	24.7	96.4	S-9405	
732	2nd	W32.26137 W094.58366	125.6	100.8	24.6	96.6	S-9405	
733	2nd	W32.26170 W094.58372	125.6	101.9	23.3	97.7	S-9405	
734	2nd	W32.26188 W094.58340	126.8	103.9	22.0	99.6	S-9405	
735	2nd	W32.26213 W094.58353	126.1	100.8	25.1	96.6	S-9405	
736	2nd	W32.26225 W094.58319	127.1	102.5	24.0	98.3	S-9405	
737	2nd	W32.26251 W094.58332	123.1	98.5	25.0	99.8	S-8895	
738	2nd	W32.26259 W094.58302	124.5	97.9	27.2	99.2	S-8895	
739	2nd	W32.26284 W094.58316	122.3	96.2	27.1	97.5	S-8895	
740	2nd	W32.26289 W094.58285	123.2	96.2	28.1	97.5	S-8895	
741	3rd	W32.26255 W094.58224	127.0	101.5	25.1	97.3	S-9405	
742	3rd	W32.26225 W094.58211	125.4	101.4	23.7	97.2	S-9405	
743	3rd	W32.26213 W094.58244	126.9	100.7	26.0	96.5	S-9405	
744	3rd	W32.26191 W094.58232	125.0	101.2	23.5	97.0	S-9405	
745	3rd	W32.26184 W094.58260	121.1	94.7	27.9	95.9	S-8895	
746	3rd	W32.26158 W094.58256	125.6	101.1	24.2	96.9	S-9405	
747	3rd	W32.26142 W094.58283	125.7	100.0	25.7	95.9	S-9405	
748	3rd	W32.26112 W094.58273	127.4	101.3	25.8	97.1	S-9405	
749	3rd	W32.26101 W094.58306	125.3	100.0	25.3	95.9	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/13/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14087W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000198

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
750	3rd	W32.26078 W094.58294	125.3	100.1	25.2	96.0	S-9405	
751	3rd	W32.26068 W094.58321	126.3	101.2	24.8	97.0	S-9405	
752	3rd	W32.26042 W094.58313	124.6	100.7	23.7	96.5	S-9405	
753	3rd	W32.26031 W094.58340	126.0	100.1	25.9	96.0	S-9405	
754	3rd	W32.26007 W094.58331	125.0	99.6	25.5	95.5	S-9405	
755	3rd	W32.25999 W094.58356	126.0	99.8	26.3	95.7	S-9405	
756	3rd	W32.25982 W094.58358	125.7	101.3	24.1	97.1	S-9405	
757	3rd	W32.25971 W094.58352	125.2	100.7	24.3	96.5	S-9405	
758	3rd	W32.25967 W094.58333	126.4	101.9	24.0	97.7	S-9405	
759	3rd	W32.25978 W094.58308	125.1	99.2	26.1	95.1	S-9405	
760	3rd	W32.26004 W094.58318	124.9	100.4	24.4	96.3	S-9405	
761	3rd	W32.26014 W094.58286	124.5	99.8	24.7	95.7	S-9405	
762	3rd	W32.26036 W094.58299	127.6	105.1	21.4	100.8	S-9405	
763	3rd	W32.26055 W094.58279	126.5	101.2	25.0	97.0	S-9405	
764	3rd	W32.26073 W094.58256	125.9	100.8	24.9	96.6	S-9405	
765	3rd	W32.26094 W094.58253	125.0	100.1	24.9	96.0	S-9405	
766	3rd	W32.26122 W094.58253	125.9	102.9	22.4	98.7	S-9405	
767	3rd	W32.26140 W094.58234	127.5	102.4	24.5	98.2	S-9405	
768	3rd	W32.26151 W094.58215	125.7	102.0	23.2	97.8	S-9405	
769	3rd	W32.26173 W094.58213	127.0	103.7	22.5	99.4	S-9405	
770	3rd	W32.26189 W094.58213	126.4	101.9	24.0	97.7	S-9405	
771	3rd	W32.26210 W094.58208	125.5	100.8	24.5	96.6	S-9405	
772	3rd	W32.26218 W094.58172	126.0	102.3	23.2	98.1	S-9405	
773	3rd	W32.26234 W094.58194	127.7	102.1	25.1	97.9	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/13/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14087W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000198

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/13/2010 DS: MS:
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/13/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14087W-1
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000199

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F-83	2nd	N32.26316 W094.58334	128.8	107.4	19.9	96.2	S-8906	
F-84	2nd	N32.26291 W094.58327	129.9	108.3	19.9	97.0	S-8906	
F-85	2nd	N32.26284 W094.58356	130.7	110.8	18.0	99.3	S-8906	
F-86	2nd	N32.26265 W094.58339	124.4	107.5	15.7	96.3	S-8906	
F-87	2nd	N32.26252 W094.58373	130.6	113.4	15.2	101.6	S-8906	
F-88	2nd	N32.26235 W094.58363	129.1	107.8	19.8	96.6	S-8906	
F-89	2nd	N32.26222 W094.58385	129.0	109.1	18.2	97.8	S-8906	
F-90	2nd	N32.26204 W094.58373	128.7	107.5	19.7	96.3	S-8906	
F-91	2nd	N32.26189 W094.58398	128.0	108.0	18.5	96.8	S-8906	
F-92	2nd	N32.26168 W094.58389	126.3	108.9	16.0	97.6	S-8906	
F-93	2nd	N32.26157 W094.58414	130.4	109.5	19.1	98.1	S-8906	
F-94	2nd	N32.26130 W094.58406	130.2	107.2	21.5	96.1	S-8906	
F-95	2nd	N32.26117 W094.58431	132.0	110.7	19.2	99.2	S-8906	
F-96	2nd	N32.26098 W094.58424	131.8	111.4	18.3	99.8	S-8906	
F-97	2nd	N32.26082 W094.58450	128.5	107.7	19.3	96.5	S-8906	
F-98	2nd	N32.26064 W094.58445	131.7	112.5	17.1	100.8	S-8906	
F-99	2nd	N32.26043 W094.58469	132.3	110.7	19.5	99.2	S-8906	
F100	2nd	N32.26022 W094.58461	133.8	108.6	23.2	97.3	S-8906	
F101	2nd	N32.26007 W094.58490	132.6	112.6	17.8	100.9	S-8906	
F102	2nd	N32.25985 W094.58485	135.6	113.4	19.6	101.6	S-8906	
F103	2nd	N32.25960 W094.58514	129.8	106.2	22.2	95.2	S-8906	
F104	2nd	N32.25933 W094.58493	130.2	107.5	21.1	96.3	S-8906	
F105	2nd	N32.25926 W094.58525	131.6	111.5	18.0	99.9	S-8906	
F106	2nd	N32.25907 W094.58516	129.8	107.0	21.3	95.9	S-8906	
F107	1st	N32.25895 W094.58487	129.3	110.4	17.1	98.9	S-8906	

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/13/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14087W-1
Test Method: See Below

TEST RESULTS Report No: 1-1165-000199
Page 2 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F108	1st	N32.25871 W094.58511	131.2	111.6	17.6	100.0	S-8906	
F109	1st	N32.25867 W094.58475	128.3	106.4	20.6	95.3	S-8906	
F110	1st	N32.25844 W094.58494	128.5	108.9	18.0	97.6	S-8906	
F111	1st	N32.25824 W094.58474	129.1	108.6	18.9	97.3	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 36842 Daily Standard Counts: 03/13/2010 DS: MS:
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/14/2010
Report Date: 03/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14114
Test Method: See Below

TEST RESULTS Report No: 1-1165-000200
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and grading berm fill and liner.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/15/2010
Report Date:	03/17/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14115
			Test Method: See Below

TEST RESULTS Report No: 1-1165-000201
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and liner.

Equipment on site: Two dump trucks, two dozers, compactor, water truck, excavator, maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/15/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14115W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000202

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
774	2nd	N32.26156 W094.58151	124.5	102.6	21.3	98.4	S-9405	
775	2nd	N32.26134 W094.58152	124.6	100.3	24.2	96.2	S-9405	
776	2nd	N32.26119 W094.58168	122.6	99.5	23.2	95.4	S-9405	
777	2nd	N32.26104 W094.58145	124.4	101.2	22.9	97.0	S-9405	
778	2nd	N32.26090 W094.58168	123.2	102.5	20.2	98.3	S-9405	
779	2nd	N32.26077 W094.58186	129.7	109.2	18.8	96.0	S-8928	
780	2nd	N32.26069 W094.58154	124.8	101.4	23.1	97.2	S-9405	
781	2nd	N32.26047 W094.58202	123.9	103.6	19.6	99.3	S-9405	
782	2nd	N32.26053 W094.58179	126.3	105.6	19.6	96.2	S-8910	
783	2nd	N32.26047 W094.58202	126.3	106.2	18.9	96.7	S-8910	
784	2nd	N32.26030 W094.58150	124.0	104.8	18.3	95.4	S-8910	
785	2nd	N32.26013 W094.58134	130.4	110.0	18.5	96.7	S-8928	
786	2nd	N32.26021 W094.58180	123.3	100.9	22.2	96.7	S-9405	
787	2nd	N32.26015 W094.58218	122.8	101.3	21.2	97.1	S-9405	
788	2nd	N32.25997 W094.58188	125.0	105.2	18.8	95.8	S-8910	
789	2nd	N32.25995 W094.58147	125.0	106.3	17.6	96.8	S-8910	
790	2nd	N32.25974 W094.58173	122.8	100.2	22.6	101.5	S-8895	
791	2nd	N32.25985 W094.58218	121.4	98.4	23.4	99.7	S-8895	
792	2nd	N32.25972 W094.58240	124.2	99.1	25.3	95.0	S-9405	
793	2nd	N32.25965 W094.58204	124.2	100.3	23.8	96.2	S-9405	
794	2nd	N32.25948 W094.58245	123.8	99.8	24.0	95.7	S-9405	
795	2nd	N32.25989 W094.58251	123.6	102.8	20.2	98.6	S-9405	
796	2nd	N32.25981 W094.58421	132.4	110.7	19.6	97.3	S-8928	
797	2nd	N32.25969 W094.58382	124.4	102.1	21.8	97.9	S-9405	
798	2nd	N32.25958 W094.58350	125.9	104.8	20.1	100.5	S-9405	

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/15/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14115W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000202

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
799	2nd	N32.25949 W094.58322	122.3	100.3	21.9	96.2	S-9405	
800	2nd	N32.25938 W094.58286	119.9	100.5	19.3	96.4	S-9405	
801	2nd	N32.25928 W094.58318	123.5	101.7	21.4	97.5	S-9405	
802	2nd	N32.25936 W094.58356	120.6	100.2	20.4	96.1	S-9405	
803	2nd	N32.25947 W094.58407	120.9	101.7	18.9	97.5	S-9405	
804	2nd	N32.25953 W094.58441	118.8	99.1	19.9	95.0	S-9405	
805	2nd	N32.25947 W094.58472	121.9	102.6	18.8	98.4	S-9405	
806	2nd	N32.25928 W094.58434	124.5	102.6	21.3	98.4	S-9405	
807	2nd	N32.25919 W094.58392	118.7	100.0	18.7	95.9	S-9405	
808	2nd	N32.25913 W094.58353	119.6	100.6	18.9	96.5	S-9405	
809	2nd	N32.25894 W094.58395	121.4	99.9	21.5	95.8	S-9405	
810	2nd	N32.25898 W094.58434	124.1	102.4	21.2	98.2	S-9405	
811	2nd	N32.25916 W094.58464	123.4	102.1	20.9	97.9	S-9405	
812	2nd	N32.25884 W094.58461	124.0	103.7	19.6	99.4	S-9405	
813	2nd	N32.25877 W094.58427	124.5	104.0	19.7	99.7	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/15/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14115W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000202

Gauge No.: 36842 Daily Standard Counts: 03/15/2010 DS: MS:
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/16/2010
Report Date: 03/31/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14216
Test Method: See Below

TEST RESULTS Report No: 1-1165-000203
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Two dozers, compactor, two excavators, two dump trucks, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/16/2010
Report Date: 09/28/2010 Previously Reported: 09/28/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14216W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000204

Material: Soil Required: 0 tp +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F112	2nd	N32.25951 W094.58060	131.1	114.6	14.4	97.6	S-8905	
F113	2nd	N32.25925 W094.58071	130.6	115.9	12.7	98.7	S-8905	
F114	2nd	N32.25931 W094.58099	126.4	108.8	16.2	97.5	S-8906	
F115	2nd	N32.25932 W094.58131	131.2	114.3	14.8	102.4	S-8906	
F116	2nd	N32.25911 W094.58156	128.2	109.3	17.3	97.9	S-8906	
F117	2nd	N32.25894 W094.58176	127.4	109.2	16.7	97.8	S-8906	
F118	2nd	N32.25892 W094.58205	128.7	112.7	14.2	96.0	S-8905	
F119	2nd	N32.25893 W094.58241	130.8	115.1	13.6	98.0	S-8905	
F120	2nd	N32.25877 W094.58260	128.6	111.0	15.9	99.5	S-8906	
F121	2nd	N32.25856 W094.58281	130.9	114.9	13.9	97.9	S-8905	
F122	2nd	N32.25856 W094.58312	127.4	112.5	13.2	100.8	S-8906	
F123	2nd	N32.25858 W094.58344	130.2	114.9	13.3	97.9	S-8905	
F124	2nd	N32.25839 W094.58365	127.1	111.3	14.2	99.7	S-8906	
F125	2nd	N32.25818 W094.58381	123.9	106.3	16.6	95.3	S-8906	
F126	2nd	N32.25822 W094.58408	133.6	118.1	13.1	100.6	S-8905	
F127	2nd	N32.25826 W094.58441	124.9	107.5	16.2	96.3	S-8906	
F128	2nd	N32.25813 W094.58454	133.1	117.9	12.9	100.4	S-8905	
F129	2nd	N32.25798 W094.58472	121.1	107.8	12.3	96.6	S-8906	
F130	2nd	N32.25825 W094.58475	119.6	106.5	12.3	95.4	S-8906	
F131	2nd	N32.25855 W094.58472	133.1	117.2	13.6	99.8	S-8905	
F132	2nd	N32.25870 W094.58496	119.8	106.1	12.9	95.1	S-8906	
F133	2nd	N32.25888 W094.58518	120.9	108.8	11.1	97.5	S-8906	
F134	2nd	N32.25912 W094.58504	125.8	106.1	18.6	95.1	S-8906	

Charge: HDR Engineering Inc.
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/16/2010
Report Date: 09/28/2010 Previously Reported: 09/28/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14216W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000204
Page 2 of 2

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 30842 Daily Standard Counts: 03/16/2010 DS: 6,579 MS: 683
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/17/2010
Report Date:	03/31/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14221
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000205
			Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing liner and berm.

Equipment on site: Two dozers, compactor, two excavators, two dump trucks, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/18/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14222
Test Method: See Below

TEST RESULTS Report No: 1-1165-000206
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner.

Equipment on site: Two dozers, two dump trucks, two excavators, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/19/2010
Report Date:	04/01/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14223
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000207
			Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner.

Equipment on site: Two dump trucks, two dozers, two excavators, compactor, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/19/2010
Report Date: 12/02/2010 Previously Reported: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14223W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000208

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
814	4th	N32.25950 W094.58109	124.2	102.8	20.8	98.6	S-9405	
815	4th	N32.25971 W094.58140	125.8	104.1	20.8	99.8	S-9405	
816	4th	N32.25938 W094.58151	124.8	102.0	22.4	97.8	S-9405	
817	4th	N32.25938 W094.58184	122.4	99.2	23.4	95.1	S-9405	
818	4th	N32.25941 W094.58221	122.1	99.8	22.3	95.7	S-9405	
819	4th	N32.25920 W094.58238	120.9	99.7	21.3	95.6	S-9405	
820	4th	N32.25902 W094.58257	124.0	101.0	22.8	96.8	S-9405	
821	4th	N32.25906 W094.58286	123.0	100.9	21.9	96.7	S-9405	
822	4th	N32.25908 W094.58311	125.5	104.2	20.4	99.9	S-9405	
823	4th	N32.25890 W094.58327	125.3	104.3	20.1	100.0	S-9405	
824	4th	N32.25871 W094.58343	123.5	103.3	19.6	99.0	S-9405	
825	4th	N32.25874 W094.58370	124.5	101.7	22.4	97.5	S-9405	
826	4th	N32.25880 W094.58389	121.0	101.4	19.3	97.2	S-9405	
827	4th	N32.25867 W094.58406	122.8	103.0	19.2	98.8	S-9405	
828	4th	N32.25848 W094.58421	123.8	101.9	21.5	97.7	S-9405	
829	4th	N32.25855 W094.58449	120.9	101.8	18.8	97.6	S-9405	
830	3rd	N32.25934 W094.58276	124.6	103.2	20.7	98.9	S-9405	
831	3rd	N32.25958 W094.58277	120.7	99.5	21.3	95.4	S-9405	
832	3rd	N32.25974 W094.58260	123.8	101.2	22.3	97.0	S-9405	
833	3rd	N32.25991 W094.58240	123.7	101.4	22.0	97.2	S-9405	
834	3rd	N32.26012 W094.58237	120.8	96.1	25.7	97.4	S-8895	
835	3rd	N32.26036 W094.58237	126.2	104.2	21.1	99.9	S-9405	
836	3rd	N32.26055 W094.58220	122.8	100.3	22.4	96.2	S-9405	
837	3rd	N32.26067 W094.58199	124.2	101.0	23.0	96.8	S-9405	
838	3rd	N32.26092 W094.58198	117.3	93.8	25.0	95.0	S-8895	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/19/2010
Report Date: 12/02/2010 Previously Reported: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14223W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000208

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
839	3rd	N32.26114 W094.58201	126.3	104.3	21.1	100.0	S-9405	
840	3rd	N32.26129 W094.58177	126.2	103.1	22.4	98.8	S-9405	
841	3rd	N32.26145 W094.58163	124.8	100.7	23.9	96.5	S-9405	
842	3rd	N32.26165 W094.58160	123.9	101.8	21.7	97.6	S-9405	
843	3rd	N32.26184 W094.58162	125.9	104.0	21.1	99.7	S-9405	
844	3rd	N32.26199 W094.58142	119.4	95.0	25.7	96.3	S-8895	
845	3rd	N32.26214 W094.58123	127.1	104.3	21.9	100.0	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/19/2010 DS: 2,559 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/20/2010
Report Date:	04/01/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14224
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000209
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/21/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14225
Test Method: See Below

TEST RESULTS Report No: 1-1165-000210
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/22/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14226
Test Method: See Below

TEST RESULTS Report No: 1-1165-000211
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/23/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14227
Test Method: See Below

TEST RESULTS Report No: 1-1165-000212
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing fill and liner.

Equipment on site: Two dump trucks, two dozers, two excavators, maintainer, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/24/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14228
Test Method: See Below

TEST RESULTS Report No: 1-1165-000213
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm and liner.

Equipment on site: Two dozers, two excavators, two dump trucks, maintainer, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/25/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14229
Test Method: See Below

TEST RESULTS Report No: 1-1165-000214
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/26/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14230
Test Method: See Below

TEST RESULTS Report No: 1-1165-000215
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor drying and processing liner and berm.

Equipment on site: Two dozers, water truck, maintainer, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/27/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14231
Test Method: See Below

TEST RESULTS Report No: 1-1165-000216
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/28/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14232
Test Method: See Below

TEST RESULTS Report No: 1-1165-000217
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing berm and liner.

Equipment on site: Compactor, two dozers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/28/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14232W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000218
Page 1 of 1

Material: Tan & Gray Le Cl w/ Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
846	3rd	N32.26089 W094.58160	124.8	102.2	22.1	98.0	S-9405	
847	3rd	N32.26161 W094.58183	126.2	104.7	20.5	100.4	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/28/2010 DS: 2,582 MS: 603
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 03/29/2010
Report Date:	04/01/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14233
			Test Method: See Below

TEST RESULTS Report No: 1-1165-000219
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner.

Equipment on site: Two dozers, two dump trucks, maintainer, two excavators, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/29/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14233W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000220

Material: Tan & Gray Le Cl w/ Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
848	3rd	N32.25949 W094.58321	124.7	101.0	23.5	96.8	S-9405	
849	3rd	N32.25953 W094.58344	124.9	102.5	21.9	98.3	S-9405	
850	3rd	N32.25961 W094.58364	123.8	102.3	21.0	98.1	S-9405	
851	3rd	N32.25969 W094.58390	124.0	103.8	19.5	99.5	S-9405	
852	3rd	N32.25975 W094.58414	124.3	103.1	20.6	98.8	S-9405	
853	3rd	N32.25983 W094.58444	122.4	99.9	22.5	95.8	S-9405	
854	3rd	N32.25962 W094.58446	123.9	101.8	21.7	97.6	S-9405	
855	3rd	N32.25953 W094.58418	124.0	102.7	20.7	98.5	S-9405	
856	3rd	N32.25945 W094.58390	122.4	100.9	21.3	96.7	S-9405	
857	3rd	N32.25938 W094.58359	125.5	104.3	20.3	100.0	S-9405	
858	3rd	N32.25934 W094.58327	124.2	103.7	19.8	99.4	S-9405	
859	3rd	N32.25915 W094.58334	125.0	104.3	19.8	100.0	S-9405	
860	3rd	N32.25921 W094.58368	120.9	99.7	21.3	95.6	S-9405	
861	3rd	N32.25933 W094.58404	122.4	102.3	19.6	98.1	S-9405	
862	3rd	N32.25946 W094.58438	124.9	105.4	18.5	101.1	S-9405	
863	3rd	N32.25955 W094.58472	123.1	102.7	19.9	98.5	S-9405	
864	3rd	N32.25931 W094.58443	125.9	104.3	20.7	100.0	S-9405	
865	3rd	N32.25922 W094.58410	124.0	103.1	20.3	98.8	S-9405	
866	3rd	N32.25909 W094.58379	121.7	99.9	21.8	95.8	S-9405	
867	3rd	N32.25910 W094.58439	123.2	101.8	21.0	97.6	S-9405	
868	3rd	N32.25920 W094.58466	125.2	105.2	19.0	100.9	S-9405	
869	3rd	N32.25902 W094.58453	122.8	101.5	21.0	97.3	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 03/29/2010
Report Date: 04/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14233W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000220
Page 2 of 2

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/29/2010 DS: 2,566 MS: 678
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/30/2010
Report Date: 04/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14268
Test Method: See Below

TEST RESULTS Report No: 1-1165-000221
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and liner. Contractor exposing existing clay cap.

Equipment on site: Two dozers, water truck, two excavators, maintainer, compactor, three dump trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/30/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

REPORT: **Soil Densities** LAB NO: 14268W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000222
Page 1 of 4

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
870	3rd	N32.25871 W094.58456	125.0	105.3	18.7	101.0	S-9405	
871	3rd	N32.25917 W094.58318	122.8	100.0	22.8	95.9	S-9405	
872	3rd	N32.25945 W094.58250	125.6	102.5	22.5	98.3	S-9405	
873	3rd	N32.25960 W094.58238	126.2	105.2	20.0	100.9	S-9405	
874	3rd	N32.25990 W094.58226	125.2	103.9	20.5	99.6	S-9405	
875	3rd	N32.26015 W094.58212	128.0	108.4	18.1	98.7	S-8910	
876	3rd	N32.26038 W094.58188	124.6	103.4	20.5	99.1	S-9405	
877	3rd	N32.26061 W094.58188	129.0	110.5	16.7	100.6	S-8910	
878	3rd	N32.26096 W094.58172	127.4	108.0	18.0	98.4	S-8910	
879	3rd	N32.26133 W094.58155	129.9	110.2	17.9	100.4	S-8910	
880	3rd	N32.26089 W094.58157	128.7	109.1	18.0	99.4	S-8910	
881	3rd	N32.26066 W094.58169	128.2	108.8	17.8	99.1	S-8910	
882	3rd	N32.26030 W094.58189	128.4	109.4	17.4	99.6	S-8910	
883	3rd	N32.25995 W094.58208	127.8	109.5	16.7	99.7	S-8910	
884	3rd	N32.25959 W094.58221	123.2	102.8	19.8	98.6	S-9405	
885	3rd	N32.25979 W094.58199	123.7	104.5	18.4	100.2	S-9405	
886	3rd	N32.26005 W094.58186	124.7	104.3	19.6	100.0	S-9405	
887	3rd	N32.26010 W094.58178	125.0	107.0	16.8	102.6	S-9405	
888	3rd	N32.26052 W094.58159	124.2	103.6	19.9	99.3	S-9405	
889	3rd	N32.26041 W094.58145	123.8	105.8	17.0	101.4	S-9405	
890	3rd	N32.26018 W094.58157	125.5	107.3	17.0	97.7	S-8910	
891	3rd	N32.25995 W094.58169	125.0	104.6	19.5	95.3	S-8910	
892	3rd	N32.25980 W094.58157	126.6	106.5	18.9	97.0	S-8910	
893	3rd	N32.25999 W094.58147	124.8	105.7	18.1	96.3	S-8910	
894	3rd	N32.26027 W094.58137	124.7	106.2	17.4	96.7	S-8910	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/30/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

REPORT: **Soil Densities** LAB NO: 14268W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000222

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
895	3rd	N32.26000 W094.58127	126.5	108.2	16.9	98.5	S-8910	
896	3rd	N32.25953 W094.58291	121.2	99.1	22.3	95.0	S-9405	
897	3rd	N32.25972 W094.58296	124.2	103.5	20.0	99.2	S-9405	
898	3rd	N32.25986 W094.58276	123.4	102.4	20.5	98.2	S-9405	
899	3rd	N32.26013 W094.58279	127.3	106.1	20.0	101.7	S-9405	
900	3rd	N32.26034 W094.58250	123.7	102.2	21.0	98.0	S-9405	
901	3rd	N32.20655 W094.58252	125.3	104.3	20.1	100.0	S-9405	
902	3rd	N32.26067 W094.58231	124.8	105.2	18.6	100.9	S-9405	
903	3rd	N32.26098 W094.58234	124.6	104.1	19.7	99.8	S-9405	
904	3rd	N32.26114 W094.58208	127.2	107.7	18.1	98.1	S-8910	
905	3rd	N32.26148 W094.58211	125.6	106.3	18.2	96.8	S-8910	
906	3rd	N32.26158 W094.58187	127.3	106.4	19.6	96.9	S-8910	
907	2nd	N32.26160 W094.58193	126.5	105.4	20.0	96.0	S-8910	
908	2nd	N32.26187 W094.58170	127.1	107.5	18.2	97.9	S-8910	
909	2nd	N32.29204 W094.58178	126.0	106.7	18.1	97.2	S-8910	
910	2nd	N32.26220 W094.58156	124.2	105.1	18.2	95.7	S-8910	
911	2nd	N32.26234 W094.58162	128.6	107.5	19.6	97.9	S-8910	
912	2nd	N32.26238 W094.58141	127.3	105.3	20.9	95.9	S-8910	
F135	2nd	N32.26280 W094.58235	132.1	114.0	15.9	100.4	S-8911	
F136	2nd	N32.26281 W094.58212	131.4	111.7	17.6	98.3	S-8911	
F137	2nd	N32.26277 W094.58190	124.9	113.5	10.0	99.9	S-8911	
F138	2nd	N32.26262 W094.58173	132.4	114.7	15.4	101.0	S-8911	
F139	2nd	N32.26244 W094.58150	131.1	111.1	18.0	97.8	S-8911	
F140	2nd	N32.26248 W094.58119	129.9	111.7	16.3	98.3	S-8911	
F141	3rd	N32.26230 W094.58096	128.9	112.1	15.0	98.7	S-8911	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 03/30/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

REPORT: **Soil Densities** LAB NO: 14268W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000222

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F142	3rd	N32.26202 W094.58118	128.9	112.0	15.1	98.6	S-8911	
F143	3rd	N32.26184 W094.58110	128.3	110.1	16.5	96.9	S-8911	
F144	3rd	N32.26163 W094.58136	127.9	111.2	15.0	97.9	S-8911	
F145	3rd	N32.26141 W094.58116	125.8	110.9	13.4	97.6	S-8911	
F146	3rd	N32.26122 W094.58133	123.5	108.1	14.2	95.2	S-8911	
F147	3rd	N32.26100 W094.58107	126.5	111.0	14.0	97.7	S-8911	
F148	3rd	N32.26086 W094.58125	126.0	109.7	14.9	96.6	S-8911	
F149	3rd	N32.26067 W094.58133	124.4	108.8	14.3	95.8	S-8911	
F150	3rd	N32.26049 W094.58118	124.9	109.5	14.1	96.4	S-8911	
F151	3rd	N32.26035 W094.58099	132.4	114.7	15.4	101.0	S-8911	
F152	3rd	N32.26015 W094.58091	127.0	112.8	12.6	99.3	S-8911	
F153	3rd	N32.29997 W094.58109	125.8	110.0	14.4	96.8	S-8911	
F154	3rd	N32.25979 W094.58094	127.1	110.0	15.5	96.8	S-8911	
F155	3rd	N32.25964 W094.58070	126.6	110.9	14.2	97.6	S-8911	
F156	3rd	N32.25943 W094.58076	125.3	109.2	14.7	96.1	S-8911	
F157	3rd	N32.25926 W094.58083	123.8	107.9	14.7	95.0	S-8911	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8911	06/05/2009	12.6	113.6	Red, Tan & Gray / Silty, Clayey Sand
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
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E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/30/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman Excavation, Frisco, TX

REPORT: **Soil Densities** LAB NO: 14268W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000222

Gauge No.: 36842 Daily Standard Counts: 03/30/2010 DS: 2,573 MS: 633
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/31/2010
Report Date: 04/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14269
Test Method: See Below

TEST RESULTS Report No: 1-1165-000223
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing fill and liner.

Equipment on site: Two dozers, maintainer, water truck, three dump trucks, excavator, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 03/31/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14269W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000224
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
913	3rd	N32.26178 W094.58274	125.0	102.2	22.3	98.0	S-9405	
914	3rd	N32.26144 W094.58337	123.1	100.6	22.4	96.5	S-9405	
915	3rd	N32.26056 W094.58413	123.9	102.8	20.5	98.6	S-9405	
F158	2nd	N32.26294 W094.58260	125.7	111.2	13.0	97.9	S-8911	
F159	2nd	N32.26310 W094.58270	128.0	113.2	13.1	99.6	S-8911	
F160	2nd	N32.26304 W094.58292	130.1	110.7	17.5	97.4	S-8911	
F161	2nd	N32.26316 W094.58310	126.0	110.8	13.7	97.5	S-8911	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8911	06/05/2009	12.6	113.6	Red, Tan & Gray / Silty, Clayey Sand
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 03/31/2010 DS: 2,556 MS: 688
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/01/2010
Report Date:	04/06/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14270
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000225
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/02/2010
Report Date:	04/06/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14271
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000226
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/03/2010
Report Date: 04/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14272
Test Method: See Below

TEST RESULTS Report No: 1-1165-000227
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/05/2010
Report Date:	04/06/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14273
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000228
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/06/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14346
Test Method: See Below

TEST RESULTS Report No: 1-1165-000229
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing existing lift 3 and relocating overburden.

Equipment on site: One dozer, maintainer, four tractors w/ scrapers, water truck, compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/06/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14346W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000230
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
916	3rd	N32.26170 W094.58295	124.8	102.5	21.8	98.3	S-9405	
917	3rd	N32.26185 W094.58276	124.0	103.4	19.9	99.1	S-9405	
918	3rd	N32.26204 W094.58284	121.8	100.1	21.7	96.0	S-9405	
919	3rd	N32.26219 W094.58262	125.0	103.9	20.3	99.6	S-9405	
920	3rd	N32.26238 W094.58262	123.0	100.2	22.8	96.1	S-9405	
921	3rd	N32.26253 W094.58238	121.4	99.8	21.6	95.7	S-9405	
922	3rd	N32.26274 W094.58251	127.6	104.4	22.2	100.1	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/06/2010 DS: 2,546 MS: 678
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/07/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14347
Test Method: See Below

TEST RESULTS Report No: 1-1165-000231
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing liner until rained out.

Duties and Tests Performed by Technician:

Technician observed contractor operations until rain out.

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/08/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14348
Test Method: See Below

TEST RESULTS Report No: 1-1165-000232
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing lift 3 central liner.

Equipment on site: Three tractors, compactor, dozer, maintainer, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/08/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14348W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000233
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
923	3rd	N32.26259 W094.58271	125.8	103.0	22.1	98.8	S-9405	
924	3rd	N32.26250 W094.58303	124.5	100.4	24.0	96.3	S-9405	
925	3rd	N32.26233 W094.58298	126.2	103.8	21.6	99.5	S-9405	
926	3rd	N32.26204 W094.58298	123.4	100.4	22.9	96.3	S-9405	
927	3rd	N32.26189 W094.58316	124.9	103.0	21.3	98.8	S-9405	
928	3rd	N32.26175 W094.58335	125.0	102.7	21.7	98.5	S-9405	
929	3rd	N32.26155 W094.58339	126.4	103.5	22.1	99.2	S-9405	
930	3rd	N32.26133 W094.58336	124.0	102.0	21.6	97.8	S-9405	
931	3rd	N32.26115 W094.58355	124.2	100.2	24.0	96.1	S-9405	
932	3rd	N32.26097 W094.58374	126.1	102.3	23.3	98.1	S-9405	
933	3rd	N32.26075 W094.58373	124.7	101.9	22.4	97.7	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/08/2010 DS: 2,551 MS: 685
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/09/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14350
Test Method: See Below

TEST RESULTS Report No: 1-1165-000234
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lifts 3 and 4 of liner.

Equipment on site: Dozer, maintainer, four tractors w/ scrapers, water truck, compactor, back hoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/09/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14350W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000235

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
934	3rd	N32.26272 W094.58306	125.4	102.0	22.9	97.8	S-9405	
935	3rd	N32.26262 W094.58322	126.7	104.5	21.2	100.2	S-9405	
936	3rd	N32.26242 W094.58336	127.8	106.2	20.3	101.8	S-9405	
937	3rd	N32.26220 W094.58340	124.4	101.9	22.1	97.7	S-9405	
938	3rd	N32.26197 W094.58339	127.2	104.5	21.7	95.2	S-8910	
939	3rd	N32.29175 W094.58366	128.5	106.4	20.8	96.9	S-8910	
940	3rd	N32.26155 W094.58376	127.0	105.6	20.3	96.2	S-8910	
941	3rd	N32.26136 W094.58375	128.5	104.4	23.1	95.1	S-8910	
942	3rd	N32.26110 W094.58375	128.4	107.1	19.9	97.5	S-8910	
943	3rd	N32.26096 W094.58394	127.5	106.2	20.1	101.8	S-9405	
944	3rd	N32.26085 W094.58404	125.9	104.8	20.1	100.5	S-9405	
945	3rd	N32.26048 W094.58403	125.7	103.1	21.9	98.8	S-9405	
946	3rd	N32.26036 W094.58424	129.5	107.9	20.0	98.3	S-8910	
947	3rd	N32.26020 W094.58437	126.7	106.6	18.9	97.1	S-8910	
948	3rd	N32.25995 W094.58432	127.6	105.1	21.4	95.7	S-8910	
949	3rd	N32.25980 W094.58456	128.9	108.1	19.2	98.5	S-8910	
950	3rd	N32.25957 W094.58469	128.1	106.8	19.9	97.3	S-8910	
951	3rd	N32.25958 W094.58423	127.5	106.3	19.9	101.9	S-9405	
952	3rd	N32.25977 W094.58410	128.1	106.6	20.2	97.1	S-8910	
953	3rd	N32.25998 W094.58393	127.5	104.8	21.7	100.5	S-9405	
954	3rd	N32.26016 W094.58397	122.8	100.3	22.4	96.2	S-9405	
955	3rd	N32.26033 W094.58395	126.6	103.1	22.8	98.8	S-9405	
956	3rd	N32.26055 W094.58391	126.3	104.8	20.5	95.4	S-8910	
957	3rd	N32.26067 W094.58373	126.4	104.3	21.2	95.0	S-8910	
958	3rd	N32.26085 W094.58391	126.0	104.6	20.5	100.3	S-9405	
959	3rd	N32.26107 W094.58349	124.4	103.5	20.2	99.2	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/09/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14350W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000235

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
960	3rd	N32.26124 W094.58353	124.1	102.2	21.4	98.0	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/09/2010 DS: 2,595 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/10/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14351
Test Method: See Below

TEST RESULTS Report No: 1-1165-000236
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/11/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14352
Test Method: See Below

TEST RESULTS Report No: 1-1165-000237
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing lift 4.

Equipment on site: Dozer, maintainer, back hoe, three scrapers, compactor, water truck.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/11/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14352W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000238

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
961	3rd	N32.26142 W094.58305	126.4	103.3	22.4	99.0	S-9405	
962	3rd	N32.26118 W094.58304	126.6	103.5	22.3	99.2	S-9405	
963	3rd	N32.26097 W094.58334	127.3	104.4	21.9	100.1	S-9405	
964	3rd	N32.26072 W094.58326	123.8	100.8	22.8	96.6	S-9405	
965	3rd	N32.26064 W094.58353	124.4	102.6	21.2	98.4	S-9405	
966	3rd	N32.26037 W094.58346	126.0	104.3	20.8	100.0	S-9405	
967	3rd	N32.26023 W094.58374	123.8	100.4	23.3	96.3	S-9405	
968	3rd	N32.25996 W094.58367	126.6	105.2	20.3	100.9	S-9405	
969	3rd	N32.25980 W094.58393	127.0	105.4	20.5	101.1	S-9405	
970	3rd	N32.25956 W094.58387	127.9	106.8	19.8	102.4	S-9405	
971	4th	N32.26120 W094.58272	127.3	102.9	23.7	98.7	S-9405	
972	4th	N32.26154 W094.58272	127.8	106.0	20.6	101.6	S-9405	
973	4th	N32.26162 W094.58246	122.8	101.9	20.5	97.7	S-9405	
974	4th	N32.26188 W094.58250	123.6	99.7	24.0	95.6	S-9405	
975	4th	N32.26201 W094.58224	124.5	102.5	21.5	98.3	S-9405	
976	4th	N32.26219 W094.58209	125.9	103.4	21.8	99.1	S-9405	
977	4th	N32.26245 W094.58225	123.4	100.9	22.3	96.7	S-9405	
978	4th	N32.26243 W094.58192	124.3	99.4	25.0	95.3	S-9405	
979	4th	N32.26256 W094.58216	124.3	100.1	24.2	96.0	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/11/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14352W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000238
Page 2 of 2

Gauge No.: 36842 Daily Standard Counts: 04/11/2010 DS: 2,559 MS: 684
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/12/2010
Report Date: 04/14/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14353
Test Method: See Below

TEST RESULTS Report No: 1-1165-000239
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/13/2010
Report Date:	04/14/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14354
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000240
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing lift 4.

Equipment on site: Dozer, maintainer, compactor, water truck, three scrapers.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/14/2010
Report Date: 05/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14545
Test Method: See Below

TEST RESULTS Report No: 1-1165-000241
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/15/2010
Report Date:	05/04/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14546
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000242
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment used on site: Four scrapers, disc, dozer, compactor, maintainer and two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/15/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14546W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000243
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
980	4th	N32.26129 W094.58282	126.0	104.5	20.6	95.2	S-8910	
981	4th	N32.26111 W094.58292	125.0	102.2	22.3	98.0	S-9405	
982	4th	N32.26096 W094.58294	124.4	102.2	21.7	98.0	S-9405	
983	4th	N32.26074 W094.58292	124.8	101.0	23.6	96.8	S-9405	
984	4th	N32.26062 W094.58307	125.5	104.1	20.6	99.8	S-9405	
985	4th	N32.26052 W094.58327	122.2	99.6	22.7	95.5	S-9405	
986	4th	N32.26031 W094.58327	123.1	100.2	22.9	96.1	S-9405	
987	4th	N32.26010 W094.58324	122.8	99.4	23.5	95.3	S-9405	
988	4th	N32.26001 W094.58344	123.5	100.1	23.4	96.0	S-9405	
989	4th	N32.25991 W094.58359	125.1	102.9	21.6	98.7	S-9405	
990	4th	N32.25972 W094.58355	122.1	99.6	22.6	95.5	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/15/2010 DS: 2,558 MS: 683
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/16/2010
Report Date:	05/04/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14549
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000244
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 15.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/16/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luninant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14549W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000245

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
991	4th	N32.26238 W094.58166	125.8	102.0	23.3	97.8	S-9405	
992	4th	N32.26228 W094.58188	122.7	99.5	23.3	95.4	S-9405	
993	4th	N32.26211 W094.58206	123.3	99.8	23.5	95.7	S-9405	
994	4th	N32.26192 W094.58209	122.8	99.8	23.0	95.7	S-9405	
995	4th	N32.26176 W094.58206	123.5	100.8	22.5	96.6	S-9405	
996	4th	N32.26160 W094.58224	128.3	107.3	19.6	97.7	S-8910	
997	4th	N32.26148 W094.58243	123.9	101.1	22.6	96.9	S-9405	
998	4th	N32.26133 W094.58237	125.4	103.3	21.4	99.0	S-9405	
999	4th	N32.26111 W094.58236	124.2	102.2	21.5	98.0	S-9405	
1,000	4th	N32.26094 W094.58257	125.1	102.8	21.7	98.6	S-9405	
1,001	4th	N32.26086 W094.58274	126.5	104.3	21.3	100.0	S-9405	
1,002	4th	N32.26070 W094.58273	131.4	112.0	17.3	102.0	S-8910	
1,003	4th	N32.26053 W094.58269	124.1	107.7	15.2	98.1	S-8910	
1,004	4th	N32.26032 W094.58276	123.8	102.5	20.8	98.3	S-9405	
1,005	4th	N32.26020 W094.58295	124.4	102.1	21.8	97.9	S-9405	
1,006	4th	N32.26009 W094.58316	127.4	106.1	20.1	101.7	S-9405	
1,007	4th	N32.25993 W094.58318	124.6	101.8	22.4	97.6	S-9405	
1,008	4th	N32.25975 W094.58314	122.9	99.5	23.5	95.4	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/16/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luninant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14549W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000245

Gauge No.: 36842 Daily Standard Counts: 04/16/2010 DS: 2,590 MS: 692
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/17/2010
Report Date: 05/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14550
Test Method: See Below

TEST RESULTS Report No: 1-1165-000246
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No Active Equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/18/2010
Report Date: 05/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14551
Test Method: See Below

TEST RESULTS Report No: 1-1165-000247
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/19/2010
Report Date: 05/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14553
Test Method: See Below

TEST RESULTS Report No: 1-1165-000248
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Area Offices
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/20/2010
Report Date: 05/04/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14555
Test Method: See Below

TEST RESULTS Report No: 1-1165-000249
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/20/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14555W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000250

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,009	4th	N32.26238 W094.58159	125.3	102.3	22.5	98.1	S-9405	
1,010	4th	N32.26223 W094.58150	122.8	100.8	21.8	96.6	S-9405	
1,011	4th	N32.26203 W094.58162	123.0	100.2	22.8	96.1	S-9405	
1,012	4th	N32.26192 W094.58183	123.1	100.5	22.5	96.4	S-9405	
1,013	4th	N32.26169 W094.58181	124.2	102.1	21.6	97.9	S-9405	
1,014	4th	N32.26148 W094.58179	123.7	99.4	24.4	95.3	S-9405	
1,015	4th	N32.26135 W094.58199	126.9	102.5	23.8	98.3	S-9405	
1,016	4th	N32.26125 W094.58217	126.9	102.4	23.9	98.2	S-9405	
1,017	4th	N32.26104 W094.58221	124.5	101.0	23.3	96.8	S-9405	
1,018	4th	N32.26083 W094.58221	127.0	104.2	21.9	99.9	S-9405	
1,019	4th	N32.26066 W094.58235	124.5	99.9	24.6	95.8	S-9405	
1,020	4th	N32.26056 W094.58251	124.6	101.8	22.4	97.6	S-9405	
1,021	4th	N32.26043 W094.58261	126.4	104.2	21.3	99.9	S-9405	
1,022	4th	N32.26027 W094.58255	127.1	105.3	20.7	101.0	S-9405	
1,023	4th	N32.26011 W094.58253	127.1	105.1	20.9	100.8	S-9405	
1,024	4th	N32.25999 W094.58276	126.2	102.8	22.8	98.6	S-9405	
1,025	4th	N32.25983 W094.58291	129.1	108.4	19.1	98.7	S-8910	
1,026	4th	N32.25960 W094.58282	129.1	108.7	18.8	99.0	S-8910	
1,027	4th	N32.26223 W094.58128	123.7	100.1	23.6	97.0	S-8894	
1,028	4th	N32.26205 W094.58128	123.2	99.3	24.1	96.2	S-8894	
1,029	4th	N32.26191 W094.58141	123.1	99.5	23.7	100.0	S-9028	
1,030	4th	N32.26169 W094.58157	121.8	98.2	24.0	98.7	S-9028	
1,031	4th	N32.26154 W094.58157	122.8	95.3	28.9	95.8	S-9028	
1,032	4th	N32.26136 W094.58154	124.8	100.9	23.7	101.4	S-9028	
1,033	4th	N32.26117 W094.58173	126.0	100.4	25.5	100.9	S-9028	

Charge: HDR Engineering Inc.
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/20/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14555W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000250
Page 2 of 2

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,034	4th	N32.26101 W094.58189	123.5	97.9	26.1	98.4	S-9028	
1,035	4th	N32.26079 W094.58189	121.7	97.6	24.7	98.1	S-9028	
1,036	4th	N32.26060 W094.58188	124.3	98.7	25.9	99.2	S-9028	
1,037	4th	N32.26047 W094.58210	122.0	96.7	26.2	97.2	S-9028	
1,038	4th	N32.26035 W094.58226	124.7	101.7	22.6	97.5	S-9405	
1,039	4th	N32.26015 W094.58221	122.4	97.9	25.0	98.4	S-9028	
1,040	4th	N32.25993 W094.58224	122.7	100.0	22.7	100.5	S-9028	
1,041	4th	N32.25978 W094.58241	125.1	99.4	25.9	99.9	S-9028	
1,042	4th	N32.25964 W094.58260	124.1	97.0	27.9	97.5	S-9028	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/20/2010 DS: 2,502 MS: 688
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
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E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/21/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14560
Test Method: See Below

TEST RESULTS Report No: 1-1165-000251
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/22/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14561
Test Method: See Below

TEST RESULTS Report No: 1-1165-000252
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/23/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14562
Test Method: See Below

TEST RESULTS Report No: 1-1165-000253
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/24/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminatn-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14563
Test Method: See Below

TEST RESULTS Report No: 1-1165-000254
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/24/2010
Report Date: 09/23/2010 Previously Reported: 09/23/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14563W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000255

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,043	4th	N32.26130 W094.58150	126.2	104.4	20.9	95.1	S-8910	
1,044	4th	N32.26100 W094.58155	124.4	100.3	24.0	96.2	S-9405	
1,045	4th	N32.26079 W094.58159	119.7	95.1	25.9	95.6	S-9028	
1,046	4th	N32.26049 W094.58170	126.5	104.6	20.9	100.3	S-9405	
1,047	4th	N32.26024 W094.58182	124.0	102.5	21.0	98.3	S-9405	
1,048	4th	N32.25999 W094.58192	122.0	100.2	21.8	96.1	S-9405	
1,049	4th	N32.25974 W94.58184	125.4	102.9	21.9	98.7	S-9405	
1,050	4th	N32.26004 W094.58170	128.5	105.9	21.3	96.4	S-8910	
1,051	4th	N32.26030 W094.58160	127.6	104.6	22.0	95.3	S-8910	
1,052	4th	N32.26059 W094.58150	124.8	101.3	23.2	97.1	S-9405	
1,053	4th	N32.26023 W094.58141	123.6	101.3	22.0	97.1	S-9405	
1,054	4th	N32.25999 W094.58151	122.1	98.1	24.5	98.6	S-9028	
1,055	4th	N32.25975 W094.58158	123.4	100.4	22.9	96.3	S-9405	
1,056	4th	N32.25952 W094.58169	123.5	100.5	22.9	96.4	S-9405	
1,057	4th	N32.25952 W094.58147	127.0	105.8	20.0	96.4	S-8910	
1,058	4th	N32.25972 W094.58142	127.4	105.9	20.3	96.4	S-8910	
1,059	4th	N32.25991 W094.58134	127.0	105.6	20.3	96.2	S-8910	
1,060	4th	N32.26014 W094.58126	128.7	106.7	20.6	97.2	S-8910	
1,061	4th	N32.26019 W094.58147	128.2	106.0	20.9	96.5	S-8910	
1,062	4th	N32.25974 W094.58188	126.9	107.5	18.0	97.9	S-8910	
1,063	4th	N32.25959 W094.58205	130.2	109.5	18.9	99.7	S-8910	
1,064	4th	N32.25961 W094.58233	128.0	107.0	19.6	97.4	S-8910	
1,065	4th	N32.25960 W094.58259	126.9	104.8	21.1	100.5	S-9405	
1,066	4th	N32.25952 W094.58281	124.7	102.3	21.9	98.1	S-9405	
1,067	4th	N32.25938 W094.58297	122.6	100.3	22.2	96.2	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/24/2010
Report Date: 09/23/2010 Previously Reported: 09/23/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14563W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000255

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,068	4th	N32.25921 W094.58315	126.3	103.8	21.7	99.5	S-9405	
1,069	4th	N32.25917 W094.58340	126.7	103.5	22.4	99.2	S-9405	
1,070	4th	N32.25911 W094.58370	126.4	105.3	20.0	96.5	S-8801	
1,071	4th	N32.25988 W094.58212	130.1	106.4	22.3	96.9	S-8910	
1,072	4th	N32.25957 W094.58228	129.2	108.4	19.2	98.7	S-8910	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/24/2010 DS: 2,555 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/25/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14570
Test Method: See Below

TEST RESULTS Report No: 1-1165-000256
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 04/26/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14571
Test Method: See Below

TEST RESULTS Report No: 1-1165-000257
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/26/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14571W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000258

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,073	4th	N32.25899 W094.58389	126.8	109.4	15.9	99.6	S-8910	
1,074	4th	N32.25916 W094.58906	130.2	110.0	18.4	100.2	S-8910	
1,075	4th	N32.25923 W094.58423	131.3	109.9	19.5	100.1	S-8910	
1,076	4th	N32.25909 W094.58438	130.5	111.1	17.5	101.2	S-8910	
1,077	4th	N32.25889 W094.58425	128.9	105.3	22.4	95.9	S-8910	
1,078	4th	N32.25875 W094.58443	129.9	109.9	18.2	100.1	S-8910	
1,079	4th	N32.25898 W094.58456	126.6	104.8	20.8	100.5	S-9405	
1,080	4th	N32.25911 W094.58470	121.6	99.1	22.7	95.0	S-9405	
1,081	4th	N32.25877 W094.58468	126.5	105.0	20.5	100.7	S-9405	
1,082	4th	N32.25986 W094.58385	123.3	100.7	22.4	96.5	S-9405	
1,083	4th	N32.25989 W094.58389	126.6	108.4	16.8	98.7	S-8910	
1,084	4th	N32.26004 W094.58371	125.4	104.5	20.0	95.2	S-8910	
1,085	4th	N32.26019 W094.58355	125.3	105.2	19.1	95.8	S-8910	
1,086	4th	N32.26040 W094.58351	123.7	104.3	18.6	100.0	S-9405	
1,087	4th	N32.26064 W094.58351	124.5	103.7	20.1	99.4	S-9405	
1,088	4th	N32.26082 W094.58336	124.0	102.6	20.9	98.4	S-9405	
1,089	4th	N32.26096 W094.58315	126.5	106.1	19.2	101.7	S-9405	
1,090	4th	N32.26118 W094.58310	126.6	105.4	20.1	96.0	S-8910	
1,091	4th	N32.26140 W094.58307	127.4	105.8	20.4	96.4	S-8910	
1,092	4th	N32.26163 W094.58289	127.6	105.0	21.5	95.6	S-8910	
1,093	4th	N32.26183 W094.58271	128.2	106.1	20.8	96.6	S-8910	
1,094	4th	N32.26207 W094.58268	126.7	104.3	21.5	95.0	S-8910	
1,095	4th	N32.26234 W094.58256	128.1	107.7	18.9	98.1	S-8910	
1,096	4th	N32.26250 W094.58237	127.1	103.8	22.4	99.5	S-9405	
1,097	4th	N32.26271 W094.58241	126.9	103.9	22.1	99.6	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/26/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14571W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000258

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,098	4th	N32.26098 W094.58359	124.7	101.2	23.2	97.0	S-9405	
1,099	4th	N32.26206 W094.58310	126.0	102.0	23.5	97.8	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/26/2010 DS: 2,579 MS: 688
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/27/2010
Report Date:	05/05/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14575
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000259
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 04/28/2010
Report Date:	05/05/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14576
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000260
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/29/2010
Report Date: 05/05/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14577
Test Method: See Below

TEST RESULTS Report No: 1-1165-000261
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 16.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing Lift 4.

Equipment on site: Two water trucks, dozer, compactor, four scrapers, maintainer and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/29/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14577W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000262

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,100	4th	N32.25950 W094.58419	125.8	113.3	11.0	99.6	S-8928	
1,101	4th	N32.25972 W094.58421	131.1	111.5	17.6	98.0	S-8928	
1,102	4th	N32.26000 W094.58425	129.5	107.9	20.0	98.3	S-8910	
1,103	4th	N32.26012 W094.58405	124.4	107.5	15.7	97.9	S-8910	
1,104	4th	N32.26031 W094.58381	129.7	107.9	20.2	98.3	S-8910	
1,105	4th	N32.26050 W094.58380	128.6	106.7	20.5	97.2	S-8910	
1,106	4th	N32.26076 W094.58383	122.7	101.3	21.1	97.1	S-9405	
1,107	4th	N32.26092 W094.58365	124.0	102.8	20.6	98.6	S-9405	
1,108	4th	N32.26107 W094.58340	126.0	105.8	19.1	101.4	S-9405	
1,109	4th	N32.26126 W094.58345	127.0	106.2	19.6	96.7	S-8910	
1,110	4th	N32.26156 W094.58347	128.0	106.9	19.7	97.4	S-8910	
1,111	4th	N32.26171 W094.58321	129.4	109.5	18.2	99.7	S-8910	
1,112	4th	N32.26184 W094.58302	129.7	109.0	19.0	99.3	S-8910	
1,113	4th	N32.26212 W094.58303	127.7	106.9	19.5	97.4	S-8910	
1,114	4th	N32.26231 W094.58307	129.2	108.0	19.6	98.4	S-8910	
1,115	4th	N32.26246 W094.58288	128.8	106.5	20.9	97.0	S-8910	
1,116	4th	N32.26257 W094.58261	128.6	106.6	20.6	97.1	S-8910	
1,117	4th	N32.26271 W094.58277	130.0	109.0	19.3	99.3	S-8910	
1,118	4th	N32.25933 W094.58470	123.8	103.0	20.2	98.8	S-9405	
1,119	4th	N32.25955 W094.58475	126.6	104.4	21.3	100.1	S-9405	
1,120	4th	N32.25975 W094.58459	123.1	99.9	23.2	95.8	S-9405	
1,121	4th	N32.25994 W094.58443	127.2	104.7	21.5	100.4	S-9405	
1,122	4th	N32.26015 W094.58437	125.4	104.2	20.3	99.9	S-9405	
1,123	4th	N32.26043 W094.58433	126.4	105.3	20.0	101.0	S-9405	
1,124	4th	N32.26065 W094.58418	124.3	102.4	21.4	98.2	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 04/29/2010
Report Date: 09/23/2010 Previously Reported: 09/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **Soil Densities** LAB NO: 14577W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000262

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1,125	4th	N32.26088 W094.58398	127.3	104.8	21.5	100.5	S-9405	
1,126	4th	N32.26111 W094.58396	124.3	102.4	21.4	98.2	S-9405	
1,127	4th	N32.26135 W094.58392	123.4	100.1	23.3	96.0	S-9405	
1,128	4th	N32.26161 W094.58370	124.8	103.1	21.0	98.8	S-9405	
1,129	4th	N32.26180 W094.58353	125.7	105.4	19.3	101.1	S-9405	
1,130	4th	N32.26207 W094.58346	127.0	104.0	22.1	99.7	S-9405	
1,131	4th	N32.26234 W094.58343	126.9	103.0	23.2	98.8	S-9405	
1,132	4th	N32.26256 W094.58324	123.4	99.9	23.5	95.8	S-9405	
1,133	4th	N32.26277 W094.58306	126.2	105.8	19.3	101.4	S-9405	
1,134	4th	N32.26293 W094.58307	124.3	103.6	20.0	99.3	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 36842 Daily Standard Counts: 04/29/2010 DS: 2,575 MS: 686
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 04/30/2010
Report Date: 05/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14578
Test Method: See Below

TEST RESULTS Report No: 1-1165-000263
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/01/2010
Report Date:	05/06/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14579
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000264
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/02/2010
Report Date:	05/06/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14580
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000265
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 05/03/2010
Report Date: 05/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14735
Test Method: See Below

TEST RESULTS Report No: 1-1165-000276
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three Scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 05/04/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14693
Test Method: See Below

TEST RESULTS Report No: 1-1165-000266
Page 1 of 1

Weather: Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three Scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/05/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14694
Test Method: See Below

TEST RESULTS Report No: 1-1165-000267
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three Scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/06/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14695
Test Method: See Below

TEST RESULTS Report No: 1-1165-000268
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/07/2010
Report Date:	05/19/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Rodman LLC, Frisco, Texas		
REPORT:	**General Inspection**		LAB NO: 14696
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000269
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/08/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14697
Test Method: See Below

TEST RESULTS Report No: 1-1165-000270
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 05/10/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14698
Test Method: See Below

TEST RESULTS Report No: 1-1165-000271
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/11/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminatn-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14699
Test Method: See Below

TEST RESULTS Report No: 1-1165-000272
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/12/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14700
Test Method: See Below

TEST RESULTS Report No: 1-1165-000273
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/13/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14701
Test Method: See Below

TEST RESULTS Report No: 1-1165-000274
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 6.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/14/2010
Report Date: 05/19/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14702
Test Method: See Below

TEST RESULTS Report No: 1-1165-000275
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing protective cover.

Equipment on site: Three scrapers, dozer, maintainer, two water trucks, backhoe and disc.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/17/2010
Report Date: 05/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Rodman LLC, Frisco, Texas

REPORT: **General Inspection** LAB NO: 14736
Test Method: See Below

TEST RESULTS Report No: 1-1165-000277
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/18/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin LakePDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14851
			Test Method: See Below

TEST RESULTS Report No: 1-1165-000280
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 12.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/18/2010
Report Date: 09/17/2010 Previously Reported: 05/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14737W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000279
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F162	3rd	N32.25892 W094.58517	125.7	119.4	5.3	101.7	S-8905	
F163	3rd	N32.25914 W094.58509	122.6	115.1	6.5	98.0	S-8905	
F164	3rd	N32.25944 W094.58515	120.7	113.5	6.3	96.7	S-8905	
F165	3rd	N32.25972 W094.58478	123.1	114.6	7.4	97.6	S-8905	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand

Gauge No.: 35605 Daily Standard Counts: 05/18/2010 DS: 2,485 MS: 743
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/19/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 14857
Test Method: See Below

TEST RESULTS Report No: 1-1165-000282
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/20/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14859
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000283
			Page 1 of 1

Weather: Partly cloudy **Technician(s):** Jacob LeNoir **Time:** 7.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/20/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14859W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000284

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F166	3rd	N32.25804 W094.58473	116.4	107.0	8.8	97.4	S-8910	
F167	3rd	N32.25835 W094.58460	114.0	104.4	9.2	95.1	S-8910	
F168	3rd	N32.25852 W094.58480	117.9	109.2	8.0	99.5	S-8910	
F169	3rd	N32.25868 W094.58506	118.3	110.5	7.1	100.6	S-8910	
F170	3rd	N32.25889 W094.58458	117.1	109.2	7.2	99.5	S-8910	
F171	3rd	N32.25915 W094.58504	117.9	110.1	7.1	100.3	S-8910	
F172	3rd	N32.25989 W094.58475	118.7	109.3	8.6	99.5	S-8910	
F173	3rd	N32.26010 W094.58456	128.6	107.5	19.6	97.9	S-8910	
F174	3rd	N32.26031 W094.58459	131.4	109.2	20.3	99.5	S-8910	
F175	3rd	N32.26057 W094.58455	127.9	106.7	19.9	97.2	S-8910	
F176	3rd	N32.26075 W094.58441	119.1	114.3	4.2	97.4	S-8905	
F177	3rd	N32.26103 W094.58414	126.0	116.8	7.9	99.5	S-8905	
F178	3rd	N32.26120 W094.58419	124.4	116.5	6.8	99.2	S-8905	
F179	3rd	N32.26141 W094.58421	124.4	117.1	6.2	99.7	S-8905	
F180	3rd	N32.26155 W094.58402	126.9	120.4	5.4	102.6	S-8905	
F181	3rd	N32.26168 W094.58385	120.6	115.1	4.8	98.0	S-8905	
F182	3rd	N32.26191 W094.58384	124.1	118.1	5.1	100.6	S-8905	
F183	3rd	N32.26220 W094.58376	124.5	118.0	5.5	100.5	S-8905	
F184	3rd	N32.26239 W094.58355	122.3	116.4	5.1	99.1	S-8905	
F185	3rd	N32.26259 W094.58338	132.5	121.3	9.2	103.3	S-8905	
F186	3rd	N32.26278 W094.58341	129.0	118.2	9.1	100.7	S-8905	
F187	3rd	N32.26301 W094.58340	129.0	119.7	7.8	102.0	S-8905	
F188	3rd	N32.26310 W094.58315	130.3	121.2	7.5	103.2	S-8905	
F189	3rd	N32.26308 W094.58289	128.2	120.4	6.5	102.6	S-8905	
F190	3rd	N32.26307 W094.58260	128.7	118.6	8.5	101.0	S-8905	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/20/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14859W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000284
Page 2 of 2

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F191	3rd	N32.26290 W094.58240	130.4	120.7	8.0	102.8	S-8905	
F192	3rd	N32.26271 W094.58220	134.2	125.5	6.9	106.9	S-8905	
F193	3rd	N32.26268 W094.58199	133.1	123.5	7.8	105.2	S-8905	
F194	3rd	N32.26271 W094.58171	133.9	124.1	7.9	105.7	S-8905	
F195	3rd	N32.26256 W094.58150	127.9	121.7	5.1	103.7	S-8905	
F196	3rd	N32.26236 W094.58136	134.4	122.4	9.8	104.3	S-8905	
F197	3rd	N32.26239 W094.58115	132.9	121.5	9.4	103.5	S-8905	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 35605 Daily Standard Counts: 05/20/2010 DS: 2,496 MS: 743
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/21/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14860
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000285
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/22/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14862
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000286
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/22/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminat-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14862W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000287

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F198	3rd	N32.25937 W094.58067	125.4	109.3	14.7	97.9	S-8906	
F199	3rd	N32.25936 W094.58093	127.7	112.0	14.0	100.4	S-8906	
F200	3rd	N32.25935 W094.58121	126.0	111.3	13.2	99.7	S-8906	
F201	3rd	N32.25919 W094.58144	127.9	109.3	17.0	97.9	S-8906	
F202	3rd	N32.25900 W094.58164	126.7	108.9	16.3	97.6	S-8906	
F203	3rd	N32.25898 W094.58195	123.5	107.6	14.8	96.4	S-8906	
F204	2rd	N32.25900 W094.58225	124.6	108.9	14.4	97.6	S-8906	
F205	3rd	N32.25883 W094.58247	126.5	110.5	14.5	99.0	S-8906	
F206	3rd	N32.25864 W094.58269	126.7	107.4	18.0	96.2	S-8906	
F207	3rd	N32.25864 W094.58298	129.4	114.0	13.5	102.2	S-8906	
F208	3rd	N32.25866 W094.58327	127.2	112.2	13.4	100.5	S-8906	
F209	3rd	N32.25849 W094.58356	124.1	108.2	14.7	97.0	S-8906	
F210	3rd	N32.25834 W094.58378	124.8	109.6	13.9	98.2	S-8906	
F211	3rd	N32.25832 W094.58402	120.9	108.7	11.2	97.4	S-8906	
F212	3rd	N32.25821 W094.58430	126.9	112.0	13.3	100.4	S-8906	
F213	4th	N32.25813 W094.58456	124.4	111.5	11.6	99.9	S-8906	
F214	4th	N32.25825 W094.58475	117.4	104.5	12.3	95.2	S-8910	
F215	4th	N32.25843 W094.58421	127.0	111.7	13.7	100.1	S-8906	
F216	4th	N32.25868 W094.58477	117.9	106.5	10.7	95.4	S-8906	
F217	4th	N32.25892 W094.58497	126.1	110.7	13.9	99.2	S-8906	
F218	4th	N32.25912 W094.58515	123.1	108.9	13.0	97.6	S-8906	
F219	4th	N32.25937 W094.58514	124.0	107.6	15.2	96.4	S-8906	
F220	4th	N32.25953 W094.58498	124.3	109.4	13.6	99.6	S-8910	
F221	4th	N32.25969 W094.58479	122.4	108.4	12.9	97.1	S-8906	
F222	4th	N32.25901 W094.58470	123.1	110.4	11.5	98.9	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/22/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminat-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14862W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000287
Page 2 of 2

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F223	4th	N32.26012 W094.58471	122.3	109.0	12.2	97.7	S-8906	
F224	4th	N32.26038 W094.58464	125.4	110.9	13.1	99.4	S-8906	
F225	4th	N32.26053 W094.58447	130.8	114.4	14.3	102.5	S-8906	
F226	4th	N32.26072 W094.58431	130.6	111.4	17.2	99.8	S-8906	
F227	4th	N32.26095 W094.58429	129.7	113.8	14.0	102.0	S-8906	
F228	4th	N32.26116 W094.58427	131.2	113.6	15.5	101.8	S-8906	
F229	4th	N32.26133 W094.58410	129.4	114.3	13.2	102.4	S-8906	
F230	4th	N32.26158 W094.58395	123.0	109.1	12.7	97.8	S-8906	
F231	4th	N32.26184 W094.58386	122.8	108.6	13.1	97.3	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 35605 Daily Standard Counts: 05/22/2010 DS: 2,476 MS: 745
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/24/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14863
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000288
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/24/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14863W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000289

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F232	4th	N32.26212 W094.58368	125.4	117.7	6.5	100.3	S-8905	
F233	4th	N32.26233 W094.58365	125.6	118.4	6.1	100.9	S-8905	
F234	4th	N32.26257 W094.58363	127.5	114.0	11.8	97.1	S-8905	
F235	4th	N32.26276 W094.58344	129.9	118.5	9.6	100.9	S-8905	
F236	4th	N32.26893 W094.58324	129.6	113.2	14.5	96.4	S-8905	
F237	4th	N32.26311 W094.58323	130.5	119.2	9.5	101.5	S-8905	
F238	4th	N32.26812 W094.58293	122.5	113.0	8.4	96.3	S-8905	
F239	4th	N32.26297 W094.58270	135.6	121.1	12.0	103.2	S-8905	
F240	4th	N32.26278 W094.58239	125.7	116.5	7.9	99.2	S-8905	
F241	4th	N32.26274 W094.58210	134.6	119.1	13.0	101.4	S-8905	
F242	4th	N32.26270 W094.58175	128.5	116.6	10.2	99.3	S-8905	
F243	4th	N32.26251 W094.58147	129.6	118.0	9.8	100.5	S-8905	
F244	4th	N32.26236 W094.58121	128.0	113.5	12.8	96.7	S-8905	
F245	4th	N32.26232 W094.58089	126.7	114.8	10.4	97.8	S-8905	
F246	4th	N32.26204 W094.58096	127.6	113.5	12.4	96.7	S-8905	
F247	4th	N32.26181 W094.58115	127.1	112.5	13.0	95.8	S-8905	
F248	4th	N32.26155 W094.58132	131.8	116.8	12.8	99.5	S-8905	
F249	4th	N32.26128 W094.58126	131.1	115.8	13.2	98.6	S-8905	
F250	4th	N32.26097 W094.58111	130.4	116.1	12.3	98.9	S-8905	
F251	4th	N32.26072 W094.58120	131.3	117.2	12.0	99.8	S-8905	
F252	4th	N32.26044 W094.58124	128.6	114.5	12.3	97.5	S-8905	
F253	4th	N32.26019 W094.58116	126.1	111.9	12.7	95.3	S-8905	
F254	4th	N32.25998 W094.58099	131.9	114.6	15.1	97.6	S-8905	
F255	4th	N32.25978 W094.58071	130.8	114.3	14.4	97.4	S-8905	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/24/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14863W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000289

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F256	4th	N32.25954 W094.58083	131.7	114.5	15.0	97.5	S-8905	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand

Gauge No.: 35605 Daily Standard Counts: 05/24/2010 DS: 2,472 MS: 743
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/25/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14864
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000290
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 05/26/2010
Report Date:	09/17/2010	Previously Reported: 06/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14865
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000291
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 05/27/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Laake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 14866
Test Method: See Below

TEST RESULTS Report No: 1-1165-000292
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 05/28/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 14867
Test Method: See Below

TEST RESULTS Report No: 1-1165-000293
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 05/28/2010
Report Date: 09/17/2010 Previously Reported: 06/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14867W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000294
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F257	4th	N32.25913 W094.58090	121.3	108.7	11.6	96.6	S-9151	
F258	4th	N32.25922 W094.58123	121.1	109.2	10.9	97.1	S-9151	
F259	4th	N32.25925 W094.58160	120.5	108.3	11.3	96.3	S-9151	
F260	4th	N32.25905 W094.58181	123.5	111.0	11.3	98.7	S-9151	
F261	4th	N32.25880 W094.58206	124.6	112.9	10.4	100.4	S-9151	
F262	4th	N32.25882 W094.58236	125.1	113.1	10.6	100.5	S-9151	
F263	4th	N32.25882 W094.58270	125.2	112.7	11.1	100.2	S-9151	
F264	4th	N32.25866 W094.58293	126.6	113.4	11.6	100.8	S-9151	
F265	4th	N32.25847 W094.58311	125.6	112.1	12.0	99.6	S-9151	
F266	4th	N32.25848 W094.58337	124.3	110.7	12.3	98.4	S-9151	
F267	4th	N32.25848 W094.58366	124.0	111.6	11.1	99.2	S-9151	
F268	4th	N32.25834 W094.58384	122.8	110.3	11.3	98.0	S-9151	
F269	4th	N32.25814 W094.58401	123.5	110.8	11.5	98.5	S-9151	
F270	4th	N32.25817 W094.58373	125.7	111.9	12.3	99.5	S-9151	
F271	4th	N32.25820 W094.52420	125.1	110.4	13.3	98.1	S-9151	
F272	4th	N32.25823 W094.58443	123.2	108.8	13.2	96.7	S-9151	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9151	08/05/2009	14.7	112.5	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 05/28/2010 DS: 2,477 MS: 745
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/01/2010
Report Date: 09/23/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 14872
Test Method: See Below

TEST RESULTS Report No: 1-1165-000295
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000296.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/01/2010
Report Date: 09/23/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14872W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000296

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F273	5th	N32.25805 W094.58457	123.4	108.5	13.7	96.4	S-9151	
F274	5th	N32.25829 W094.58962	124.0	110.6	12.1	98.3	S-9151	
F275	5th	N32.25842 W094.58483	126.1	111.5	13.1	99.1	S-9151	
F276	5th	N32.25858 W094.58501	123.5	110.8	11.5	98.5	S-9151	
F277	5th	N32.25278 W094.58501	122.8	111.6	10.0	99.2	S-9151	
F278	5th	N32.25901 W094.58498	124.2	111.6	11.3	99.2	S-9151	
F279	5th	N32.25920 W094.58507	120.1	109.7	9.5	97.5	S-9151	
F280	5th	N32.25945 W094.58513	121.8	110.8	9.9	98.5	S-9151	
F281	5th	N32.25958 W094.58501	124.7	111.7	11.6	99.3	S-9151	
F282	5th	N32.25971 W094.58980	131.0	119.6	9.5	101.9	S-8905	
F283	5th	N32.25990 W094.58469	127.3	115.0	10.7	98.0	S-8905	
F284	5th	N32.26012 W094.58472	130.7	120.0	8.9	102.2	S-8905	
F285	5th	N32.26032 W094.58472	123.9	111.8	10.8	99.4	S-9151	
F286	5th	N32.26046 W094.58455	128.8	118.1	9.1	100.6	S-8905	
F287	5th	N32.26064 W094.58434	132.0	120.7	9.4	102.8	S-8905	
F288	5th	N32.26086 W094.58437	125.3	114.6	9.3	97.6	S-8905	
F289	5th	N32.26109 W094.58435	125.7	116.9	7.5	99.6	S-8905	
F290	5th	N32.26128 W094.58415	125.9	115.3	9.2	98.2	S-8905	
F291	5th	N32.26144 W094.58396	129.6	119.0	8.9	101.4	S-8905	
F292	5th	N32.26168 W094.58395	125.7	116.2	8.2	99.0	S-8905	
F293	5th	N32.26192 W094.58392	126.2	115.4	9.4	98.3	S-8905	
F294	5th	N32.26206 W094.58375	127.1	116.1	9.5	98.9	S-8905	
F295	5th	N32.26227 W094.58360	128.5	117.0	9.8	99.7	S-8905	
F296	5th	N32.26245 W094.53357	127.9	117.6	8.8	100.2	S-8905	
F297	5th	N32.26259 W094.58359	124.5	113.7	9.5	96.8	S-8905	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/01/2010
Report Date: 09/23/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14872W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000296

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F298	5th	N32.26276 W094.58347	128.8	118.8	8.4	101.2	S-8905	
F299	5th	N32.26297 W094.58326	127.6	118.4	7.8	100.9	S-8905	
F300	5th	N32.28312 W094.58321	126.0	116.1	8.5	98.9	S-8905	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-9151	08/05/2009	14.7	112.5	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/01/2010 DS: 2,475 MS: 741
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/02/2010
Report Date:	09/23/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14873
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000297
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Three scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/03/2010
Report Date:	09/23/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14874
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000298
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000299.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/03/2010
Report Date: 09/24/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14874W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000299
Page 1 of 3

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F301	5th	N32.26320 W094.58318	120.0	110.4	8.7	98.9	S-8906	
F302	5th	N32.26202 W094.58294	119.7	108.9	9.9	97.6	S-8906	
F303	5th	N32.26292 W094.58275	120.7	109.6	10.1	98.2	S-8906	
F304	5th	N32.26209 W094.58019	117.5	107.5	9.3	96.3	S-8906	
F305	5th	N32.26287 W094.58217	119.8	108.8	10.1	97.5	S-8906	
F306	5th	N32.26867 W094.58200	119.2	108.5	9.9	97.2	S-8906	
F307	5th	N32.26254 W094.58179	125.2	112.9	10.9	101.2	S-8906	
F308	5th	N32.26252 W094.58152	124.5	111.7	11.5	100.1	S-8906	
F309	5th	N32.26249 W094.58125	121.4	102.1	18.9	97.9	S-9405	
F310	5th	N32.26236 W094.58108	129.5	114.1	13.5	97.2	S-8905	
F311	5th	N32.26226 W094.58099	132.5	118.8	11.5	101.2	S-8905	
F312	5th	N32.26206 W094.58096	129.7	114.5	13.3	97.5	S-8905	
F313	5th	N32.26192 W094.58110	126.4	111.8	13.1	95.2	S-8905	
F314	5th	N32.26177 W094.58125	133.2	117.7	13.2	100.3	S-8905	
F315	5th	N32.26563 W094.58126	132.8	116.5	14.0	99.2	S-8905	
F316	5th	N32.26146 W094.58168	132.1	116.3	13.6	99.1	S-8905	
F317	5th	N32.26127 W094.58120	126.2	109.7	15.0	98.3	S-8906	
F318	5th	N32.261.3 W094.58130	130.7	113.3	15.4	96.5	S-8905	
F319	5th	N32.26080 W094.58121	128.9	114.2	12.9	97.3	S-8905	
F320	5th	N32.26065 W094.58105	128.4	110.8	15.9	99.3	S-8906	
F321	5th	N32.26040 W094.58109	129.5	112.1	15.5	100.4	S-8906	
F322	5th	N32.26017 W094.58115	131.0	114.6	14.3	97.6	S-8905	
F323	5th	N32.25998 W094.58099	126.1	111.8	12.8	100.2	S-8906	
F324	5th	N32.25978 W094.58075	131.7	117.1	12.5	99.7	S-8905	
F325	5th	N32.25953 W094.58076	123.8	107.0	15.7	97.4	S-8910	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/03/2010
Report Date: 09/24/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14874W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000299

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F326	5th	N32.25936 W094.58073	125.8	109.6	14.8	99.8	S-8910	
F327	5th	N32.25919 W094.58094	131.3	115.4	13.8	98.3	S-8905	
F328	5th	N32.25919 W094.58121	124.4	108.1	15.1	98.5	S-8910	
F329	5th	N32.25920 W094.58154	129.7	113.0	14.8	96.3	S-8905	
F330	5th	N32.25904 W094.58180	130.2	112.2	16.0	95.6	S-8905	
F331	5th	N32.25883 W094.58202	128.0	115.3	11.0	98.2	S-8905	
F332	5th	N32.25882 W094.58230	129.8	113.6	14.3	96.8	S-8905	
F333	5th	N32.25883 W094.58265	130.1	115.1	13.0	98.0	S-8905	
F334	5th	N32.25866 W094.58291	128.1	113.1	13.3	96.3	S-8905	
F335	5th	N32.25848 W094.58309	125.3	111.8	12.1	100.2	S-8906	
F336	5th	N32.25848 W094.58334	122.8	109.1	12.6	97.8	S-8906	
F337	5th	N32.25850 W094.58363	127.5	113.3	12.5	101.5	S-8906	
F338	5th	N32.25834 W094.58389	125.0	110.2	13.4	98.7	S-8906	
F339	5th	N32.25815 W094.58409	125.2	112.7	11.1	101.0	S-8906	
F340	5th	N32.25823 W094.58437	125.2	109.6	14.2	98.2	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/03/2010
Report Date: 09/24/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14874W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000299

Gauge No.: 35605 Daily Standard Counts: 06/03/2010 DS: 2,475 MS: 741
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/04/2010
Report Date:	09/24/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14875
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000300
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, maintainer, water truck, compactor, disc and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/05/2010
Report Date:	09/24/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14877
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000301
Page 1 of 1

Weather: Partly cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/07/2010
Report Date:	09/24/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14878
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000302
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/08/2010
Report Date:	09/24/2010	Previously Reported: 06/10/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14879
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000303
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000304.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/08/2010
Report Date: 09/24/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14879W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000304
Page 1 of 2

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F341	6th	N32.25826 W094.58466	121.2	104.0	16.5	99.7	S-9405	
F342	6th	N32.25848 W094.58494	128.1	113.7	12.7	96.8	S-8905	
F343	6th	N32.25863 W094.58490	129.3	113.4	14.0	96.6	S-8905	
F344	6th	N32.26888 W094.58491	123.7	107.4	15.2	97.8	S-8910	
F345	6th	N32.25908 W094.58511	131.0	115.5	13.4	98.4	S-8905	
F346	6th	N32.25936 W094.58520	130.6	113.9	14.7	97.0	S-8905	
F347	6th	N32.25954 W094.58501	124.4	110.2	12.9	98.7	S-8906	
F348	6th	N32.25974 W094.58481	127.6	110.8	15.2	99.3	S-8906	
F349	6th	N32.25999 W094.58482	125.5	111.5	12.6	99.9	S-8906	
F350	6th	N32.26020 W094.58477	125.1	110.1	13.6	98.7	S-8906	
F351	6th	N32.26037 W094.58458	128.8	111.9	15.1	100.3	S-8906	
F352	6th	N32.26051 W094.58443	129.2	111.4	16.0	99.8	S-8906	
F353	6th	N32.26075 W094.58440	128.0	114.7	11.6	97.7	S-8905	
F354	6th	N32.26100 W094.58437	128.2	115.0	11.5	98.0	S-8905	
F355	6th	N32.26112 W094.58421	128.6	115.5	11.3	98.4	S-8905	
F356	6th	N32.26130 W094.58408	127.9	115.0	11.2	98.0	S-8905	
F357	6th	N32.26150 W094.58406	126.4	111.8	13.1	95.2	S-8905	
F358	6th	N32.26170 W094.58401	132.8	117.0	13.5	99.7	S-8905	
F359	6th	N32.26187 W094.58986	134.1	116.3	15.3	99.1	S-8905	
F360	6th	N32.26205 W094.58371	132.1	116.9	13.0	99.6	S-8905	
F361	6th	N32.26227 W094.58366	131.8	115.9	13.7	98.7	S-8905	
F362	6th	N32.26252 W094.58362	129.6	115.1	12.6	98.0	S-8905	
F363	6th	N32.26271 W094.58345	132.1	116.3	13.6	99.1	S-8905	
F364	6th	N32.26291 W094.58331	134.3	118.0	13.8	100.5	S-8905	
F365	6th	N32.26308 W094.58327	128.1	113.5	12.9	96.7	S-8905	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/08/2010
Report Date: 09/24/2010 Previously Reported: 06/10/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14879W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000304

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F366	6th	N32.26320 W094.58315	132.3	118.8	11.4	101.2	S-8905	
F367	5th	N32.26304 W094.58291	126.7	107.5	17.9	96.3	S-8906	
F368	5th	N32.26289 W094.58272	125.1	106.5	17.5	95.4	S-8906	
F369	5th	N32.26287 W094.58247	127.4	107.3	18.7	96.1	S-8906	
F370	5th	N32.26284 W094.58218	129.5	109.5	18.3	98.1	S-8906	
F371	5th	N32.26270 W094.58202	126.7	107.2	18.2	96.1	S-8906	
F372	5th	N32.26248 W094.58164	129.6	109.8	18.0	98.4	S-8906	
F373	5th	N32.26247 W094.58141	131.2	111.0	18.2	99.5	S-8906	
F374	5th		126.2	106.6	18.4	95.5	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 06/08/2010 DS: 2,470 MS: 739
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/09/2010
Report Date:	09/24/2010	Previously Reported: 06/23/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14969
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000305
Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000306.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/09/2010
Report Date: 09/24/2010 Previously Reported: 06/23/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luninant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14969W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000306
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
375	6th	N32.26228 W094.58098	123.0	105.3	16.8	96.5	S-8801	
376	6th	N32.26201 W094.58115	121.1	104.0	16.4	95.3	S-8801	
377	6th	N32.26173 W094.58115	129.0	111.4	15.8	98.7	S-8803	
378	6th	N32.26148 W094.58124	126.6	110.4	14.7	97.8	S-8803	
379	6th	N32.26110 W094.58128	124.6	107.8	15.6	95.5	S-8803	
380	6th	N32.26080 W094.58118	125.4	108.8	15.3	96.4	S-8803	
381	6th	N32.26045 W094.58121	121.3	106.4	14.0	97.5	S-8801	
382	6th	N32.26025 W094.58104	124.9	107.0	16.7	95.9	S-8906	
383	6th	N32.25999 W094.58084	125.7	106.6	17.9	95.5	S-8906	
384	6th	N32.25972 W094.58071	121.1	105.4	14.9	96.6	S-8801	
385	6th	N32.25943 W094.58083	126.7	106.4	19.1	95.3	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8803	04/21/2009	14.0	112.9	Brown, Gray & Red / Clayey Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 02/04/6100 DS: 739 MS:
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/10/2010
Report Date:	09/24/2010	Previously Reported: 06/23/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14972
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000307
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/11/2010
Report Date:	09/24/2010	Previously Reported: 06/23/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14973
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000308
			Page 1 of 1

Weather: Overcast **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/12/2010
Report Date:	09/24/2010	Previously Reported: 06/24/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14994
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000311
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/14/2010
Report Date:	09/24/2010	Previously Reported: 06/24/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14995
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000312
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, excavator, five scrapers, maintainer, water truck and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/15/2010
Report Date:	09/24/2010	Previously Reported: 06/24/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Proejct		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14996
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000313
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer compactor, excavator, five scrapers, maintainer, water truck and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000314.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/15/2010
Report Date: 09/24/2010 Previously Reported: 06/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14996W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000314

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F386	6th	N32.25945 W094.58085	120.5	105.4	14.3	96.6	S-8801	
F387	6th	N32.25931 W094.58104	120.1	104.4	15.0	95.1	S-8910	
F388	6th	N32.25914 W094.58123	120.4	105.7	13.9	96.9	S-8801	
F389	6th	N32.25913 W094.58154	125.6	107.9	16.4	96.7	S-8906	
F390	6th	N32.25914 W094.58182	126.7	111.1	14.0	99.6	S-8906	
F391	6th	N32.25900 W094.58208	122.9	107.0	14.9	98.1	S-8801	
F392	6th	N32.25889 W094.58222	127.1	109.4	16.2	98.0	S-8906	
F393	6th	N32.25874 W094.58247	127.9	110.8	15.4	99.3	S-8906	
F394	6th	N32.25869 W094.58280	124.7	107.5	16.0	98.5	S-8801	
F395	6th	N32.25871 W094.58306	122.9	105.7	16.3	96.9	S-8801	
F396	6th	N32.25856 W094.58328	120.2	105.1	14.4	96.3	S-8801	
F397	6th	N32.25842 W094.58345	125.5	108.9	15.2	97.6	S-8906	
F398	6th	N32.25839 W094.58372	125.3	109.3	14.6	97.9	S-8906	
F399	6th	N32.25836 W094.58408	125.5	108.4	15.8	99.4	S-8801	
F400	6th	N32.25822 W094.58426	125.1	107.7	16.2	96.5	S-8906	
F401	6th	N32.25806 W094.58453	119.5	103.6	15.3	95.0	S-8801	
F402	6th	N32.25819 W094.58478	122.1	105.8	15.4	97.0	S-8801	
F403	7th	N32.25841 W094.58479	125.7	106.8	17.7	95.7	S-8906	
F404	7th	N32.25869 W094.58481	126.3	108.4	16.5	97.1	S-8906	
F405	7th	N32.25891 W094.58504	125.8	106.9	17.7	95.8	S-8906	
F406	7th	N32.25917 W094.58521	127.2	107.1	18.8	96.0	S-8906	
F407	7th	N32.25938 W094.58501	128.4	107.7	19.2	96.5	S-8906	
F408	7th	N32.25962 W094.58485	126.3	111.1	13.7	99.6	S-8906	
F409	7th	N32.25991 W094.58484	125.0	107.6	16.2	96.4	S-8906	
F410	7th	N32.26025 W094.58473	126.8	109.2	16.1	97.8	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/15/2010
Report Date: 09/24/2010 Previously Reported: 06/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14996W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000314

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F411	7th	N32.26048 W094.58454	124.7	108.7	14.7	97.4	S-8906	
F412	7th	N32.26076 W094.58436	126.3	110.1	14.7	98.7	S-8906	
F413	7th	N32.26105 W094.58427	125.8	108.1	16.4	96.9	S-8906	
F414	7th	N32.26130 W094.58423	125.3	108.1	15.9	96.9	S-8906	
F415	7th	N32.26153 W094.58405	126.9	109.8	15.6	98.4	S-8906	
F416	7th	N32.26180 W094.58385	126.7	108.4	16.9	97.1	S-8906	
F417	7th	N32.26202 W094.58382	127.8	108.8	17.5	97.5	S-8906	
F418	7th	N32.26222 W094.58379	127.8	108.1	18.2	96.9	S-8906	
F419	7th	N32.26242 W094.58360	131.5	112.2	17.2	100.5	S-8906	
F420	7th	N32.26267 W094.58340	130.6	112.3	16.3	100.6	S-8906	
F421	7th	N32.26291 W094.58337	129.3	110.0	17.5	98.6	S-8906	
F422	7th	N32.26315 W094.58330	130.1	110.8	17.4	99.3	S-8906	
F423	7th	N32.26316 W094.58299	130.9	110.9	18.0	99.4	S-8906	
F424	7th	N32.26303 W094.58278	129.9	110.5	17.6	99.0	S-8906	
F425	7th	N32.26287 W094.58248	130.3	109.8	18.7	98.4	S-8906	
F426	7th	N32.26277 W094.58219	128.5	109.1	17.8	97.8	S-8906	
F427	7th	N32.26274 W094.58189	127.9	107.9	18.5	96.7	S-8906	
F428	7th	N32.26259 W094.58165	127.8	108.0	18.3	96.8	S-8906	
F429	7th	N32.26242 W094.58133	130.2	110.7	17.6	99.2	S-8906	
F430	7th	N32.26238 W094.58109	128.1	107.5	19.2	96.3	S-8906	
F431	7th	N32.26215 W094.58097	124.2	110.5	12.4	99.0	S-8906	
F432	7th	N32.26193 W094.58114	125.2	108.9	15.0	97.6	S-8906	
F433	7th	N32.26160 W094.58130	128.6	109.1	17.9	97.8	S-8906	
F434	7th	N32.26135 W094.58124	130.5	111.9	16.6	100.3	S-8906	
F435	7th	N32.26104 W094.58116	125.4	106.1	18.2	95.1	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/15/2010
Report Date: 09/24/2010 Previously Reported: 06/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14996W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000314

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F436	7th	N32.26070 W094.58119	127.2	109.3	16.4	97.9	S-8906	
F437	7th	N32.26029 W094.58117	126.3	108.0	16.9	96.8	S-8906	
F438	7th	N32.26004 W094.58096	124.2	107.2	15.9	96.1	S-8906	
F439	7th	N32.25969 W094.58071	124.0	105.8	17.2	96.4	S-8910	
F440	7th	N32.25945 W094.58077	129.5	108.4	19.5	97.1	S-8906	
F441	7th	N32.25926 W094.58107	127.4	108.2	17.7	97.0	S-8906	
F442	7th	N32.25914 W 094.58131	129.0	109.5	17.8	98.1	S-8906	
F443	7th	N32.25906 W094.58162	128.1	108.2	18.4	97.0	S-8906	
F444	7th	N32.25907 W094.58203	128.7	108.3	18.8	97.0	S-8906	
F445	7th	N32.25887 W094.58238	129.1	108.7	18.8	97.4	S-8906	
F446	7th	N32.25872 W094.58257	128.4	109.1	17.7	97.8	S-8906	
F447	7th	N32.25864 W094.58292	129.0	108.2	19.2	97.0	S-8906	
F448	7th	N32.25867 W094.58327	124.0	109.4	13.3	98.0	S-8906	
F449	7th	N32.25848 W094.58355	129.4	109.6	18.1	98.2	S-8906	
F450	7th	N32.25829 W094.58375	128.6	108.8	18.2	97.5	S-8906	
F451	7th	N32.25826 W094.58407	122.9	108.9	12.9	97.6	S-8906	
F452	7th	N32.25826 W094.58441	128.3	108.4	18.4	97.1	S-8906	
F453	7th	N32.25809 W094.58466	122.8	108.4	13.3	97.1	S-8906	
F454	7th	N32.25830 W094.58485	123.0	108.2	13.7	97.0	S-8906	
F455	7th	N32.25856 W094.58488	123.3	108.5	13.6	97.2	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/15/2010
Report Date: 09/24/2010 Previously Reported: 06/24/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14996W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000314

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 35605 Daily Standard Counts: 06/15/2010 DS: 2,470 MS: 727
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/16/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15000
Test Method: See Below

TEST RESULTS Report No: 1-1165-000315
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000316.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/16/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15000W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000316

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F456	8th	N32.25880 W094.58485	122.7	107.7	13.9	96.5	S-8906	
F457	8th	N32.25900 W094.58503	126.7	107.7	17.6	96.5	S-8906	
F458	8th	N32.225925 W094.58520	121.5	107.3	13.2	96.1	S-8906	
F459	8th	N32.25953 W094.58503	127.2	111.0	14.6	99.5	S-8906	
F460	8th	N32.25980 W094.58479	128.2	108.9	17.7	97.6	S-8906	
F461	8th	N32.26010 W094.58472	124.0	105.6	17.4	96.2	S-8910	
F462	8th	N32.26034 W094.58469	126.2	111.2	13.5	99.6	S-8906	
F463	8th	N32.26058 W094.58450	132.2	113.3	16.7	101.5	S-8906	
F464	8th	N32.26085 W094.58431	128.0	109.1	17.3	97.8	S-8906	
F465	8th	N32.26110 W094.58424	131.4	113.4	15.9	101.6	S-8906	
F466	8th	N32.26140 W094.58416	127.7	108.8	17.4	97.5	S-8906	
F467	8th	N32.26163 W094.55.99	127.7	108.9	17.3	97.6	S-8906	
F468	8th	N32.26189 W094.58381	130.2	112.4	15.8	100.7	S-8906	
F469	8th	N32.26213 W094.58372	127.5	109.2	16.8	97.8	S-8906	
F470	8th	N32.26244 W094.58367	126.5	106.8	18.4	95.7	S-8906	
F471	8th	N32.26265 W094.58351	132.8	114.1	16.4	102.2	S-8906	
F472	8th	N32.26286 W094.58334	127.0	106.9	18.8	95.8	S-8906	
F473	8th	N32.26306 W094.58326	128.3	108.9	17.8	97.6	S-8906	
F474	8th	N32.26314 W094.58298	129.0	107.4	20.1	96.2	S-8906	
F475	8th	N32.26297 W094.58270	127.7	108.6	17.6	97.3	S-8906	
F476	8th	N32.26277 W094.58228	128.5	108.0	19.0	96.8	S-8906	
F477	8th	N32.26271 W094.58197	129.5	109.3	18.5	97.9	S-8906	
F478	8th	N32.26258 W094.58156	129.5	109.0	18.8	97.7	S-8906	
F479	8th	N32.26250 W094.58146	124.0	108.8	14.0	97.5	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/16/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15000W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000316

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F480	8th	N32.26235 W094.58115	129.0	108.1	19.3	96.9	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay

Gauge No.: 35605 Daily Standard Counts: 06/16/2010 DS: 2,475 MS: 743
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/17/2010
Report Date:	09/24/2010	Previously Reported: 06/25/2010	Sampled By: Jacob leNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15006
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000317
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000318.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/17/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15006W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000318
Page 1 of 1

Material: Soils Required: 0 TO +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F481	8th	N32.26220 W094.58102	128.1	108.6	18.0	97.3	S-8906	
F482	8th	N32.26190 W094.58104	127.2	106.8	19.1	95.7	S-8906	
F483	8th	N32.26171 W094.58125	124.3	107.5	15.6	96.3	S-8906	
F484	8th	N32.26145 W094.58123	125.1	107.9	15.9	96.7	S-8906	
F485	8th	N32.26119 W094.58127	125.5	107.5	16.7	96.3	S-8906	
F486	8th	N32.26095 W094.58116	121.9	106.4	14.6	95.3	S-8906	
F487	8th	N32.26067 W094.58125	124.8	107.6	16.0	96.4	S-8906	
F488	8th	N32.26041 W094.58109	123.8	106.9	15.8	95.8	S-8906	
F489	8th	N32.26017 W094.58111	128.1	108.6	18.0	97.3	S-8906	
F490	8th	N32.25995 W094.58092	125.0	108.5	15.2	97.2	S-8906	
F491	8th	N32.25965 W094.58088	127.4	107.0	19.1	95.9	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/17/2010 DS: 2,472 MS: 745
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/18/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15007
Test Method: See Below

TEST RESULTS Report No: 1-1165-000319
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000320.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/18/2010
Report Date: 09/24/2010 Previously Reported: 06/25/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15007W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000320
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F492	9th	N32.26314 W094.58316	124.3	109.7	13.3	98.3	S-8906	
F493	9th	N32.26307 W094.58286	124.1	111.3	11.5	99.7	S-8906	
F494	9th	N32.26289 W094.58253	121.1	108.9	11.2	97.6	S-8906	
F495	9th	N32.26281 W094.58215	126.5	110.5	14.5	99.0	S-8906	
F496	9th	N32.26262 W094.58181	121.9	112.7	8.2	101.0	S-8906	
F497	9th	N32.26254 W094.58143	125.5	110.3	13.8	98.8	S-8906	
F498	9th	N32.26236 W094.58114	121.7	111.9	8.8	100.3	S-8906	
F499	9th	N32.26212 W094.58101	121.5	108.5	12.0	97.2	S-8906	
F500	9th	N32.26188 W094.58120	127.5	113.9	11.9	102.1	S-8906	
F501	9th	N32.26156 W094.58121	123.2	109.9	12.1	98.5	S-8906	
F502	9th	N32.26125 W094.58128	126.3	113.4	11.4	101.6	S-8906	
F503	9th	N32.26086 W094.58115	127.6	113.6	12.3	101.8	S-8906	
F504	9th	N32.26039 W094.58117	124.2	110.2	12.7	98.7	S-8906	
F505	9th	N32.26013 W094.58092	127.5	114.7	11.2	97.7	S-8905	
F506	9th	N32.25980 W094.58095	123.9	108.4	14.3	97.1	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/18/2010 DS: 2,461 MS: 749
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/19/2010
Report Date:	09/24/2010	Previously Reported: 06/25/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15010
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000321
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Five scrapers, dozer, backhoe, compactor, disc, water truck and maintainer

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/21/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 14954
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000324
			Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, excavator, five scrapers, maintainer, water truck and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/21/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14954W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000337

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F507	8th	N32.25966 W094.58073	119.0	107.7	10.5	96.5	S-8906	
F508	8th	N32.25941 W094.58079	123.2	111.8	10.2	100.2	S-8906	
F509	8th	N32.25925 W094.58099	119.0	107.0	11.2	95.9	S-8906	
F510	8th	N32.25925 W094.58143	123.7	111.5	10.9	99.9	S-8906	
F511	8th	N32.25909 W094.58170	117.9	107.3	9.9	96.1	S-8906	
F512	8th	N32.25893 W094.58193	210.8	109.9	91.8	98.5	S-8906	
F513	8th	N32.25891 W094.58228	122.4	110.8	10.5	99.3	S-8906	
F514	8th	N32.25880 W094.58270	120.5	109.9	9.6	98.5	S-8906	
F515	8th	N32.25869 W094.58286	119.9	108.6	10.4	97.3	S-8906	
F516	8th	N32.25852 W094.58314	118.9	108.1	10.0	96.9	S-8906	
F517	8th	N32.25850 W094.58350	119.8	111.5	7.4	99.9	S-8906	
F518	8th	N32.25844 W094.58386	119.9	110.7	8.3	99.2	S-8906	
F519	8th	N32.25826 W094.58420	119.6	108.5	10.2	97.2	S-8906	
F520	8th	N32.25809 W094.58447	126.3	107.6	17.4	96.4	S-8906	
F521	9th	N32.25813 W094.58472	120.0	108.7	10.4	97.4	S-8906	
F522	9th	N32.25849 W094.58476	129.3	107.7	20.1	96.5	S-8906	
F523	9th	N32.25876 W094.58498	122.8	106.9	14.9	95.8	S-8906	
F524	9th	N32.25901 W094.58517	124.9	107.8	15.9	96.6	S-8906	
F525	9th	N32.25928 W094.58509	124.8	108.6	14.9	97.3	S-8906	
F526	9th	N32.25956 W094.58491	123.3	106.9	15.3	95.8	S-8906	
F527	9th	N32.25987 W094.58482	126.0	108.9	15.7	97.6	S-8906	
F528	9th	N32.26020 W094.58475	119.7	106.6	12.3	95.5	S-8906	
F529	9th	N32.26047 W094.58455	125.7	110.2	14.1	98.7	S-8906	
F530	9th	N32.26079 W094.58435	120.4	107.6	11.9	96.4	S-8906	
F531	9th	N32.26106 W094.58427	118.5	106.4	11.4	95.3	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/21/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14954W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000337

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F532	9th	N32.26134 W094.58418	126.6	111.4	13.6	99.8	S-8906	
F533	9th	N32.26159 W094.58401	129.2	114.7	12.6	97.7	S-8905	
F534	9th	N32.26190 W094.58382	119.0	108.4	9.8	97.1	S-8906	
F535	9th	N32.26232 W094.58372	120.4	106.9	12.6	95.8	S-8906	
F536	9th	N32.26268 W094.58347	121.6	107.4	13.2	96.2	S-8906	
F537	9th	N32.26303 W094.58337	124.7	110.0	13.4	98.6	S-8906	
F538	10th	N32.26313 W094.58306	118.0	108.2	9.1	97.0	S-8906	
F539	10th	N32.26297 W094.58273	120.3	107.5	11.9	96.3	S-8906	
F540	10th	N32.26287 W094.58232	124.6	110.4	12.9	98.9	S-8906	
F541	10th	N32.26266 W094.58200	128.9	110.2	17.0	98.7	S-8906	
F542	10th	N32.26261 W094.58170	128.7	108.9	18.2	97.6	S-8906	
F543	10th	N32.26243 W094.58138	129.7	111.9	15.9	100.3	S-8906	
F544	10th	N32.26237 W094.58109	125.9	107.4	17.2	96.2	S-8906	
F545	10th	N32.26214 W094.58102	128.3	106.3	20.7	95.3	S-8906	
F546	10th	N32.26185 W094.58120	129.7	109.3	18.7	97.9	S-8906	
F547	10th	N32.26152 W094.58120	125.9	106.1	18.7	95.1	S-8906	
F548	10th	N32.26117 W094.58128	128.2	107.0	19.8	95.9	S-8906	
F549	10th	N32.26077 W094.58118	127.4	107.4	18.6	96.2	S-8906	
F550	10th	N32.26048 W094.58122	127.8	108.4	17.9	97.1	S-8906	
F551	10th	N32.26019 W094.58098	120.4	108.5	11.0	97.2	S-8906	
F552	10th	N32.25903 W094.58100	120.7	109.8	9.9	98.4	S-8906	
F553	10th	N32.25951 W094.58073	122.9	111.1	10.6	99.6	S-8906	
F554	10th	N32.26104 W094.58422	121.7	111.3	9.3	99.7	S-8906	
F555	10th	N32.26134 W094.58418	126.4	107.0	18.1	95.9	S-8906	
F556	10th	N32.26166 W094.58395	132.0	110.2	19.8	98.7	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/21/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 14954W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000337
Page 3 of 3

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F557	10th	N32.26197 W094.58388	123.8	106.7	16.0	95.6	S-8906	
F558	10th	N32.26232 W094.58374	129.2	110.7	16.7	99.2	S-8906	
F559	10th	N32.26256 W094.58351	126.5	107.3	17.9	96.1	S-8906	
F560	10th	N32.26300 W094.58338	125.5	106.5	17.8	95.4	S-8906	
F561	11th	N32.26318 W094.58312	124.0	108.8	14.0	97.5	S-8906	
F562	11th	N32.26299 W094.58278	128.6	112.6	14.2	100.9	S-8906	
F563	11th	N32.26289 W094.58233	129.7	111.8	16.0	100.2	S-8906	
F564	11th	N32.26265 W094.58192	127.3	109.1	16.7	97.8	S-8906	
F565	11th	N32.26256 W094.58150	127.7	109.4	16.7	98.0	S-8906	
F566	11th	N32.26238 W094.58120	125.1	109.1	14.7	97.8	S-8906	
F567	11th	N32.26222 W094.58097	123.9	106.5	16.3	95.4	S-8906	
F568	11th	N32.26190 W094.58119	125.8	107.8	16.7	96.6	S-8906	
F569	11th	N32.26154 W094.58120	123.8	109.2	13.4	97.8	S-8906	
F570	11th	N32.26124 W094.58128	127.4	109.0	16.9	97.7	S-8906	
F571	11th	N32.26098 W094.58119	127.9	110.6	15.6	99.1	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/21/2010 DS: 2,472 MS: 738
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/22/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15103
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000325
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, excavator, four scrapers, maintainer, water truck, backhoe, excavator and vibratory compactor.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000338.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/22/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15103W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000338
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F572	11th	N32.26082 W094.58117	119.3	100.6	18.6	96.5	S-9405	
F573	11th	N32.26057 W094.58120	120.8	102.6	17.7	98.4	S-9405	
F574	11th	N32.26022 W094.58102	122.0	102.0	19.6	97.8	S-9405	
F575	11th	N32.25994 W094.58100	126.3	106.3	18.8	101.9	S-9405	
F576	11th	N32.25967 W094.58080	126.3	111.1	13.7	99.6	S-8906	
F577	11th	N32.25942 W094.58067	127.3	111.7	14.0	100.1	S-8906	
F578	9th	N32.25926 W094.58083	128.5	112.0	14.7	100.4	S-8906	
F579	9th	N32.25925 W094.58136	124.6	109.8	13.5	98.4	S-8906	
F580	9th	N32.25906 W094.58168	126.6	110.5	14.6	99.0	S-8906	
F581	9th	N32.25903 W094.58208	127.5	112.1	13.7	100.4	S-8906	
F582	9th	N32.25883 W094.58233	120.7	110.6	9.1	99.1	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 06/22/2010 DS: 2,467 MS: 742
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/22/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15103W-1
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000339
Page 1 of 1

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
T-1	1st	N32.25875 W094.58245	127.7	110.2	15.9	98.7	S-8906	
T-2	2nd	N32.25891 W094.58249	126.3	110.1	14.7	98.7	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/22/2010 DS: 2,467 MS: 742
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/23/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15104
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000326
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, excavator, five scrapers, maintainer, water truck and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000340.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/23/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15104W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000340
Page 1 of 2

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F583	9th	N32.25880 W094.58265	128.6	112.9	13.9	101.2	S-8906	
F584	9th	N32.25864 W094.58284	125.4	106.5	17.7	95.4	S-8906	
F585	9th	N32.25860 W094.58318	121.9	111.6	9.2	100.0	S-8906	
F586	9th	N32.25856 W094.58352	121.2	106.4	13.9	95.3	S-8906	
F587	9th	N32.25831 W094.58380	117.9	107.3	9.9	96.1	S-8906	
F588	9th	N32.25830 W094.58420	122.9	108.0	13.8	96.8	S-8906	
F589	10th	N32.25810 W094.58448	125.3	110.5	13.4	99.0	S-8906	
F590	10th	N32.25837 W094.58469	129.1	108.7	18.8	97.4	S-8906	
F591	10th	N32.25866 W094.58499	126.3	108.0	16.9	96.8	S-8906	
F592	10th	N32.25905 W094.58504	126.7	107.3	18.1	96.1	S-8906	
F593	10th	N32.25945 W094.58511	126.7	109.2	16.0	97.8	S-8906	
F594	10th	N32.25971 W094.58484	128.4	106.9	20.1	95.8	S-8906	
F595	10th	N32.26009 W094.58473	127.1	107.2	18.6	96.1	S-8906	
F596	10th	N32.26039 W094.58453	128.3	108.4	18.4	97.1	S-8906	
F597	10th	N32.26070 W094.58444	128.1	108.8	17.7	97.5	S-8906	
F598	11th	N32.26100 W094.58424	126.2	106.1	18.9	95.1	S-8906	
F599	11th	N32.26127 W094.58416	121.7	110.3	10.3	98.8	S-8906	
F600	11th	N32.26165 W094.58393	122.4	111.4	9.9	99.8	S-8906	
F601	11th	N32.26209 W094.58380	122.9	112.3	9.4	100.6	S-8906	
F602	11th	N32.26234 W094.58360	123.7	112.8	9.7	101.1	S-8906	
F603	11th	N32.26265 W094.58353	122.4	110.1	11.2	98.7	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/23/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15104W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000340

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/23/2010 DS: 2,467 MS: 742
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/24/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15105
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000327
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/25/2010
Report Date: 09/24/2010 Previously Reported: 07/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15106
Test Method: See Below

TEST RESULTS Report No: 1-1165-000328
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment. Rained out.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 06/26/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15107
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000329
			Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/28/2010
Report Date: 09/24/2010 Previously Reported: 07/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15108
Test Method: See Below

TEST RESULTS Report No: 1-1165-000330
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, two excavators, five scrapers, maintainer, water truck, vibratory roller and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000341.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/28/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15108W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000341
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F604	11th	N32.26284 W094.58337	124.0	106.2	16.8	95.2	S-8906	
F605	12th	N32.26315 W094.58311	125.1	106.0	18.0	95.0	S-8906	
F606	12th	N32.26302 W094.58285	127.1	108.9	16.7	97.6	S-8906	
F607	12th	N32.26291 W094.58247	127.4	106.4	19.7	95.3	S-8906	
F608	12th	N32.26274 W094.58215	126.1	110.7	13.9	99.2	S-8906	
F609	12th	N32.26263 W094.58176	118.0	108.5	8.8	97.2	S-8906	
F610	12th	N32.26246 W094.58143	125.7	106.6	17.9	95.5	S-8906	
F611	12th	N32.26241 W094.58117	127.1	113.7	11.8	96.8	S-8905	
F612	12th	N32.26219 W094.58102	125.8	109.7	14.7	98.3	S-8906	
F613	12th	N32.26184 W094.58112	125.5	108.9	15.2	97.6	S-8906	
F614	12th	N32.26154 W094.58127	125.7	106.8	17.7	95.7	S-8906	
F615	12th	N32.26114 W094.58120	129.0	109.5	17.8	98.1	S-8906	
F616	12th	N32.26072 W094.58124	123.0	110.1	11.7	98.7	S-8906	
F617	12th	N32.26034 W094.58106	123.0	108.2	13.7	97.0	S-8906	
F618	12th	N32.25987 W094.58098	124.5	111.0	12.2	99.5	S-8906	
F619	12th	N32.25951 W094.58074	125.7	106.6	17.9	95.5	S-8906	
F620	10th	N32.25924 W094.58092	127.0	106.9	18.8	95.8	S-8906	
F621	10th	N32.25914 W094.58131	123.2	108.6	13.4	97.3	S-8906	
F622	10th	N32.25912 W094.58173	126.3	113.4	11.4	101.6	S-8906	
F623	10th	N32.25894 W094.58210	128.5	108.0	19.0	96.8	S-8906	
F624	10th	N32.25872 W094.58238	124.0	108.5	14.3	97.2	S-8906	
F625	10th	N32.25869 W094.58272	129.1	108.7	18.8	97.4	S-8906	
F626	10th	N32.25863 W094.58311	123.8	110.2	12.3	98.7	S-8906	
F627	10th	N32.25842 W094.58353	125.5	108.9	15.2	97.6	S-8906	
F628	10th	N32.25827 W094.58384	124.6	109.0	14.3	97.7	S-8906	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/28/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15108W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000341

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F629	10th	N32.25822 W094.58433	118.5	106.4	11.4	95.3	S-8906	
F630	11th	N32.25829 W094.58475	124.5	111.0	12.2	99.5	S-8906	
F631	11th	N32.25854 W094.58494	123.8	109.2	13.4	97.8	S-8906	
F632	11th	N32.25882 W094.58497	127.8	108.8	17.5	97.5	S-8906	
F633	11th	N32.25923 W094.58501	119.6	112.1	6.7	100.4	S-8906	
F634	11th	N32.25954 W094.58499	120.4	106.9	12.6	95.8	S-8906	
F635	11th	N32.25985 W094.58482	123.1	107.5	14.5	96.3	S-8906	
F636	11th	N32.26013 W094.58463	126.7	106.4	19.1	95.3	S-8906	
F637	11th	N32.26042 W094.58453	119.5	108.3	10.3	97.0	S-8906	
F638	11th	N32.26070 W094.58446	128.5	112.0	14.7	100.4	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 09/28/2010 DS: 2,467 MS: 742
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 06/29/2010
Report Date: 09/24/2010 Previously Reported: 07/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15109
Test Method: See Below

TEST RESULTS Report No: 1-1165-000331
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, two excavators, five scrapers, maintainer, water truck, vibratory roller and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000342.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/29/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15109W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000342

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F639	12th	N32.26099 W094.58425	124.3	106.8	16.4	95.7	S-8906	
F640	12th	N32.26134 W094.58413	125.5	108.4	15.8	97.1	S-8906	
F641	12th	N32.26160 W094.58395	126.5	107.2	18.0	96.1	S-8906	
F642	12th	N32.26197 W094.58382	125.5	107.0	17.3	95.9	S-8906	
F643	12th	N32.26239 W094.58357	124.9	107.0	16.7	95.9	S-8906	
F644	12th	N32.26288 W094.58340	126.3	108.4	16.5	97.1	S-8906	
F645	13th	N32.26309 W094.58299	124.3	106.6	16.6	95.5	S-8906	
F646	13th	N32.26282 W094.58238	126.2	108.3	16.5	97.0	S-8906	
F647	13th	N32.26262 W094.58171	125.8	106.2	18.5	95.2	S-8906	
F648	13th	N32.26230 W094.58105	125.4	108.3	15.8	97.0	S-8906	
F649	13th	N32.26182 W094.58115	126.4	110.0	14.9	98.6	S-8906	
F650	13th	N32.26124 W094.58125	124.4	106.3	17.0	95.3	S-8906	
F651	13th	N32.26063 W094.58113	127.7	112.3	13.7	100.6	S-8906	
F652	13th	N32.26006 W094.58105	124.8	107.6	16.0	96.4	S-8906	
F653	13th	N32.25951 W094.58073	125.6	109.2	15.0	97.8	S-8906	
F654	11th	N32.25910 W094.58128	127.0	111.8	13.6	100.2	S-8906	
F655	11th	N32.25903 W094.58186	128.6	111.8	15.0	100.2	S-8906	
F656	11th	N32.25886 W094.58250	126.4	109.4	15.5	98.0	S-8906	
F657	11th	N32.25856 W094.58321	119.3	107.0	11.5	95.9	S-8906	
F658	11th	N32.25827 W094.58382	122.7	106.8	14.9	95.7	S-8906	
F659	11th	N32.25817 W094.58434	127.0	109.0	16.5	97.7	S-8906	
F660	11th	N32.25831 W094.58479	124.8	108.2	15.3	97.0	S-8906	
F661	12th	N32.25886 W094.58495	119.8	106.6	12.4	95.5	S-8906	
F662	12th	N32.25937 W094.58508	124.1	106.5	16.5	95.4	S-8906	
F663	12th	N32.25998 W094.58469	128.3	109.6	17.1	98.2	S-8906	

Charge: HDR Engineering Inc.
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Acct ID: HDR File ID: L213-09 Date Sampled: 06/29/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15109W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000342
Page 2 of 2

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F664	12th	N32.26059 W094.58447	128.6	112.0	14.8	100.4	S-8906	
F665	13th	N32.26106 W094.58418	127.9	111.7	14.5	100.1	S-8906	
F666	13th	N32.26152 W094.58398	126.3	109.6	15.2	98.2	S-8906	
F667	13th	N32.26225 W094.58364	128.4	110.8	15.9	99.3	S-8906	
F668	13th	N32.26273 W094.58350	123.6	107.8	14.7	96.6	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 06/29/2010 DS: 2,467 MS: 742
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 06/30/2010
Report Date: 09/24/2010 Previously Reported: 07/09/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15110
Test Method: See Below

TEST RESULTS Report No: 1-1165-000332
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill.

Equipment on site: Dozer, compactor, two excavators, five scrapers, maintainer, water truck, vibratory roller and backhoe.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/01/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15111
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000333
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/02/2010
Report Date:	09/24/2010	Previously Reported: 07/09/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15113
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000335
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Progress meeting with Luminant, Mining Services, HDR and ETTL.

No active equipment.

Duties and Tests Performed by Technician:

Technician attended progress meeting.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/06/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15371
Test Method: See Below

TEST RESULTS Report No: 1-1165-000343
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/07/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15372
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000344
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/08/2010
Report Date:	09/24/2010	Previously Reported: 09/24/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15373
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000345
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/09/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15374
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000346
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/10/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15375
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000347
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 07/12/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15376
Test Method: See Below

TEST RESULTS Report No: 1-1165-000348
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/13/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15377
Test Method: See Below

TEST RESULTS Report No: 1-1165-000349
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/14/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15378
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000350
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill. Contractor also establishing subgrade outside of berm.

Equipment at the site: Five scrapers, two dozers, excavator, water tank, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/15/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15379
			Test Method: See Below
		TEST RESULTS	Report No: 1-1165-000351
			Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000352

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/15/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15379W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000352
Page 1 of 1

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F669	14th	N32.26206 W094.58376	127.1	108.7	16.9	97.4	S-8906	
F670	14th	N32.26252 W094.58352	127.8	109.4	16.8	98.0	S-8906	
F671	14th	N32.26289 W094.58336	125.9	106.7	18.0	95.6	S-8906	
F672	14th	N32.26307 W094.58294	123.8	106.1	16.7	95.1	S-8906	
F673	14th	N32.26282 W094.58241	125.7	107.9	16.5	96.7	S-8906	
F674	14th	N32.26272 W094.58202	127.8	112.0	14.1	100.4	S-8906	
F675	14th	N32.26249 W094.58141	120.6	108.0	11.7	96.8	S-8906	
F676	14th	N32.26233 W094.58102	119.3	106.5	12.0	95.4	S-8906	
F677	14th	N32.26187 W094.58116	122.3	106.8	14.5	95.7	S-8906	
F678	14th	N32.26133 W094.58126	123.3	107.5	14.7	96.3	S-8906	
F679	14th	N32.26060 W094.58125	122.8	108.0	13.7	96.8	S-8906	
F680	14th	N32.26004 W094.58099	124.4	107.3	15.9	96.1	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 07/15/2010 DS: 2,475 MS: 745
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 07/16/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15380
Test Method: See Below

TEST RESULTS Report No: 1-1165-000353
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000354

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 07/16/2010
Report Date: 09/24/2010 Previously Reported: 08/17/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15380W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000354
Page 1 of 1

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F681	14th	N32.26096 W094.58427	129.9	108.6	19.6	97.3	S-8906	
F682	14th	N32.26138 W094.58412	123.1	109.5	12.4	98.1	S-8906	
F683	15th	N32.26205 W094.58379	128.9	113.2	13.9	101.4	S-8906	
F684	15th	N32.26251 W094.58258	126.9	111.1	14.2	99.6	S-8906	
F685	15th	N32.26305 W094.58356	120.6	107.6	12.1	96.4	S-8906	
F686	15th	N32.26291 W094.58260	123.1	112.1	9.8	100.4	S-8906	
F687	15th	N32.26256 W094.58169	126.3	111.1	13.7	99.6	S-8906	
F688	15th	N32.26212 W094.58101	129.6	113.8	13.9	102.0	S-8906	
F689	15th	N32.26161 W094.58125	123.2	114.6	7.5	102.7	S-8906	
F690	15th	N32.26108 W094.58134	121.1	109.6	10.5	98.2	S-8906	
F691	15th	N32.26050 W094.58123	122.5	111.0	10.4	99.5	S-8906	
F692	15th	N32.25954 W094.58083	126.2	115.9	8.9	98.7	S-8905	
F693	12th	N32.25922 W094.58129	128.3	113.0	13.5	101.3	S-8906	
F694	12th	N32.25882 W094.58242	126.2	114.7	10.0	97.7	S-8905	
F695	12th	N32.25851 W094.58340	125.8	111.3	13.0	99.7	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 07/16/2010 DS: 2,480 MS: 737
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/17/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15381
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000355
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/19/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15382
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000356
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.52 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/20/2010
Report Date:	09/24/2010	Previously Reported: 08/17/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15384
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000357
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000358

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 07/20/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15384W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000358
Page 1 of 1

Material: Red & Tan Cl Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F696	13th	N32.25935 W094.58083	120.9	107.0	13.0	95.9	S-8906	
F697	13th	N32.25913 W094.58157	120.8	106.1	13.9	95.1	S-8906	
F698	13th	N32.25872 W094.58275	127.2	111.9	13.7	100.3	S-8906	
F699	13th	N32.25838 W094.58376	121.7	108.2	12.5	97.0	S-8906	
F700	13th	N32.25822 W094.58473	122.1	109.6	11.4	98.2	S-8906	
F701	13th	N32.25883 W094.58500	123.7	108.8	13.7	97.5	S-8906	
F702	13th	N32.25946 W094.58502	125.7	111.6	12.6	95.1	S-8905	
F703	14th	N32.25944 W094.58074	127.9	114.2	12.0	102.3	S-8906	
F704	14th	N32.25904 W094.58176	123.1	110.7	11.2	99.2	S-8906	
F705	14th	N32.25864 W094.58298	125.5	111.3	12.8	99.7	S-8906	
F706	14th	N32.25813 W094.58448	122.8	109.1	12.6	97.8	S-8906	
F707	14th	N32.25880 W094.58498	119.9	106.4	12.7	95.3	S-8906	
F708	14th	N32.25974 W094.58491	121.9	107.5	13.4	96.3	S-8906	
F709	14th	N32.26062 W094.58450	124.2	110.5	12.4	99.0	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 07/20/2010 DS: 2,471 MS: 736
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/21/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15387
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000360
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/22/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15386
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000359
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000361

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/22/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15386W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000361
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F710	15th	N32.25939 W094.58080	126.7	112.4	12.7	95.7	S-8905	
F711	15th	N32.25912 W094.58166	122.9	108.9	12.9	97.6	S-8906	
F712	15th	N32.25848 W094.58352	126.4	112.7	12.2	101.0	S-8906	
F713	15th	N32.25839 W094.58481	116.5	106.6	9.3	95.5	S-8906	
F714	15th	N32.25947 W094.58503	123.9	110.3	12.3	98.8	S-8906	
F715	15th	N32.26060 W094.58450	123.1	108.5	13.5	97.2	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Gauge No.: 35605 Daily Standard Counts: 07/22/2010 DS: 2,469 MS: 738
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 07/23/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15388
Test Method: See Below

TEST RESULTS Report No: 1-1165-000362
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/24/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15389
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000363
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000364

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/24/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15389W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000364
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F716	16th	N32.25934 W094.58093	119.6	109.1	9.6	95.9	S-8928	
F717	16th	N32.25900 W094.58205	119.2	108.5	9.9	97.2	S-8906	
F718	16th	N32.25837 W094.58390	117.0	106.6	9.8	95.5	S-8906	
F719	16th	N32.25874 W094.58497	129.2	114.6	12.7	97.6	S-8905	
F720	16th	N32.26001 W094.58478	118.9	108.1	10.0	96.9	S-8906	
F721	16th	N32.26132 W094.58417	121.4	110.8	9.6	97.4	S-8928	
F722	16th	N32.26265 W094.58353	130.3	117.1	11.3	99.7	S-8905	
F723	16th	N32.26302 W094.58273	116.5	108.0	7.9	96.8	S-8906	
F724	16th	N32.26258 W094.58158	129.6	115.5	12.2	98.4	S-8905	
F725	16th	N32.26191 W094.58113	117.3	106.1	10.6	95.1	S-8906	
F726	16th	N32.26098 W094.58119	127.8	112.9	13.2	96.2	S-8905	
F727	16th	N32.26004 W094.58096	129.7	117.1	10.8	99.7	S-8905	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand
S-8928	06/11/2009	16.9	113.8	Red & Gray / Sandy Lean Clay

Gauge No.: 35605 Daily Standard Counts: 07/24/2010 DS: 2,480 MS: 735
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 07/26/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15390
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000365
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/27/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15391
Test Method: See Below

TEST RESULTS Report No: 1-1165-000366
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 07/28/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15392
Test Method: See Below

TEST RESULTS Report No: 1-1165-000367
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/29/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15393
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000368
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/30/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15394
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000369
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID:	HDR	File ID: L213-09	Date Sampled: 07/31/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15395
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000370
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 08/01/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15396
Test Method: See Below

TEST RESULTS Report No: 1-1165-000371
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection**

Date Sampled: 08/02/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

LAB NO: 15397
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000372
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing berm fill and excavating "Key" trench in northwest PDP.

Equipment on site: Five scrapers, two dozers, excavator, water truck, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000373

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. — Longview, TX 75604 — (903) 758-0402

Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/02/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15397W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000373

Material: Red & Tan Cl Sa

Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
F728	17th	N32.26202 W094.58108	123.3	109.4	12.7	98.0	S-8906	
F729	17th	N32.26085 W094.58117	122.7	110.8	10.7	99.3	S-8906	
F730	17th	N32.25957 W094.58079	122.2	108.2	12.9	97.0	S-8906	
F731	17th	N32.25896 W094.58200	127.8	111.7	14.4	100.1	S-8906	
F732	17th	N32.25839 W094.58369	128.5	112.5	14.2	100.8	S-8906	
F733	17th	N32.25871 W094.58495	125.8	113.6	10.7	101.8	S-8906	
F734	17th	N32.26017 W094.58468	128.7	114.9	12.0	97.9	S-8905	
F735	17th	N32.26167 W094.58394	125.7	112.8	11.4	101.1	S-8906	
F736	17th	N32.26257 W094.58355	123.3	111.2	10.9	99.6	S-8906	
F737	18th	N32.26149 W094.58125	123.3	109.4	12.7	98.0	S-8906	
F738	18th	N32.26019 W094.58107	121.9	107.5	13.4	96.3	S-8906	
F739	18th	N32.25917 W094.58136	129.3	112.2	15.2	100.5	S-8906	
F740	18th	N32.25895 W094.58253	128.6	111.6	15.2	100.0	S-8906	
F741	18th	N32.25814 W094.58458	124.7	109.9	13.5	98.5	S-8906	
F742	18th	N32.25934 W094.58506	127.8	112.2	13.9	100.5	S-8906	
F743	18th	N32.26087 W094.58433	123.6	112.5	9.9	100.8	S-8906	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8905	06/05/2009	11.0	117.4	Tan / Silty Sand
S-8906	06/05/2009	15.2	111.6	Red & Tan / Clayey Sand

Charge: HDR Engineering Inc.
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/02/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15397W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000373

Gauge No.: 35605 Daily Standard Counts: 08/02/2010 DS: 2,478 MS: 745
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection**

Date Sampled: 08/03/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

LAB NO: 15398
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000374
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/04/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15399
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000375
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing clay slope liner and outer subgrade and liner.

Equipment on site: Five scrapers, two dozers, excavator, two water trucks, maintainer, compactor, pad foot.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010
Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection**

Date Sampled: 08/05/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:
LAB NO: 15400
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000376
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing clay slope liner and outer subgrade and liner.

Equipment on site: Five scrapers, two dozers, excavator, two water trucks, maintainer, compactor, pad foot, smooth drum.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Longview, TX 75604 (903) 758-0402

Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/06/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15401
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000377
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing clay slope liner and outer subgrade and liner.

Equipment on site: Five scrapers, two dozers, excavator, two water trucks, maintainer, compactor, pad foot, smooth drum.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection**

Date Sampled: 08/07/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

LAB NO: 15402
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000378
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and processing clay slope liner and outer subgrade and liner.

Equipment on site: Five scrapers, two dozers, excavator, two water trucks, maintainer, compactor, pad foot, smooth drum.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000379

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/07/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15402W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000379
Page 1 of 1

Material: Gray & Tan Le Cl Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-1	1st	N32.26128 W094.58133	119.4	95.0	25.7	96.3	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)

Gauge No.: 35605 Daily Standard Counts: 08/07/2010 DS: 2,452 MS: 733
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 08/09/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15404
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000380
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 13.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000381

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/09/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15404W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000381
Page 1 of 1

Material: Soil

Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-2	1st	N32.26152 W094.58133	120.6	97.7	23.4	99.0	S-8895	
S-3	2nd	N32.26118 W094.58127	118.5	96.6	22.7	97.9	S-8895	
S-4	2nd	N32.26179 W094.58126	119.9	97.1	23.5	98.4	S-8895	
S-5	3rd	N32.26135 W094.58132	122.8	99.7	23.2	95.6	S-9405	
S-6	3rd	N32.26166 W094.58131	122.2	99.6	22.7	100.9	S-8895	
S-7	4th	N32.26130 W094.58130	122.3	100.9	21.2	96.7	S-9405	
S-8	4th	N32.26171 W094.58130	122.7	99.7	23.1	101.0	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/09/2010 DS: 2,459 MS: 736
Test Methods: ASTM D2922-B
Remarks: S-Slope Clay Liner

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/09/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15404W-1
Test Method: See Below

TEST RESULTS Report No: 1-1165-000382
Page 1 of 1

Material: Gray & Tan Le Cl Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-1	1st	N32.26323 W094.58260	120.4	97.9	23.0	99.2	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)

Gauge No.: 35605 Daily Standard Counts: 08/09/2010 DS: 2,459 MS: 736
Test Methods: ASTM D2922-B
Remarks: P-Perimeter Clay Liner

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/10/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15405
Test Method: See Below

TEST RESULTS Report No: 1-1165-000383
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000384

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/10/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15405W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000384
Page 1 of 1

Material: Soil

Required: 0 to +3 95 Percent Proctor Density

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-2	1st	N32.26144 W094.58440	117.3	94.2	24.5	95.4	S-8895	
P-3	1st	N32.26214 W094.58411	120.4	100.6	19.7	96.5	S-9405	
P-4	1st	N32.26232 W094.58396	121.9	101.8	19.7	97.6	S-9405	
P-5	1st	N32.26290 W094.58369	127.7	104.4	22.3	100.1	S-9405	
P-34	1st	N32.26336 W094.58338	121.6	95.0	28.0	96.3	S-8895	
P-6	1st	N32.26319 W094.58279	125.8	103.6	21.4	99.3	S-9405	
P-7	1st	N32.26307 W094.58245	122.2	96.2	27.0	97.5	S-8895	
P-8	1st	N32.26291 W094.58177	122.3	101.4	20.6	97.2	S-9405	
P-9	1st	N32.26260 W094.58118	121.2	102.1	18.7	97.9	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/10/2010 DS: 2,463 MS: 610
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/10/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15405W-1
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000385
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-10	2nd	N32.26176 W094.58414	120.9	98.8	22.4	100.1	S-8895	
P-11	2nd	N32.26235 W094.58399	121.6	101.0	20.4	96.8	S-9405	
P-12	2nd	N32.26270 W094.58370	120.2	94.6	27.1	95.8	S-8895	
P-13	2nd	N32.26324 W094.58353	120.3	97.2	23.8	98.5	S-8895	
P-14	2nd	N32.26339 W094.58308	123.1	95.9	28.4	97.2	S-8895	
P-15	2nd	N32.26304 W094.58214	121.5	95.6	27.1	96.9	S-8895	
P-16	2nd	N32.26267 W094.58147	122.0	103.1	18.3	98.8	S-9405	
P-17	2nd	N32.26254 W094.58083	123.2	98.3	25.3	99.6	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/10/2010 DS: 2,463 MS: 610
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/10/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15405W-2
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000386
Page 1 of 1

Material: Soil

Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-9	1st	N32.25893 W094.58230	122.7	98.0	25.2	99.3	S-8895	
S-10	1st	N32.25882 W094.58269	120.6	95.4	26.4	96.7	S-8895	
S-11	2nd	N32.25890 W094.58250	125.4	106.8	17.4	97.9	S-8801	
S-12	2nd	N32.25874 W094.58283	121.0	95.0	27.4	96.3	S-8895	
S-13	3rd	N32.25899 W094.58229	121.7	95.6	27.3	96.9	S-8895	
S-14	3rd	N32.25880 W094.58287	119.8	93.9	27.6	95.1	S-8895	
S-15	4th	N32.25891 W094.58244	124.6	105.6	18.0	96.8	S-8801	
S-16	4th	N32.25885 W094.58261	120.5	95.8	25.8	97.1	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)

Gauge No.: 35605 Daily Standard Counts: 08/10/2010 DS: 2,463 MS: 610
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. — Longview, TX 75604 — (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/11/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15406
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000387
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/12/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15407
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000388
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/13/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15408
Test Method: See Below

TEST RESULTS Report No: 1-1165-000389
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000390

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. — Longview, TX 75604 (903) 758-0402

Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/13/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15408W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000390

Material: Soil

Required: 0 to +3 95 Percent Proctor Density

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Proctor Density	Proctor No	Comments
S-17	1st	N32.26110 W094.58411	118.0	95.2	24.0	96.5	S-8895	
S-18	1st	N32.26218 W094.58363	118.0	96.1	22.8	97.4	S-8895	
S-19	1st	N32.26242 W094.58350	120.5	98.3	22.6	99.6	S-8895	
S-20	1st	N32.26294 W094.58278	125.8	105.7	19.0	96.9	S-8801	
S-21	1st	N32.26259 W094.58194	123.0	100.5	22.4	96.4	S-9405	
S-22	1st	N32.26118 W094.58407	117.9	94.6	24.6	95.8	S-8895	
S-23	2nd	N32.26204 W094.58367	121.9	101.2	20.5	97.0	S-9405	
S-24	2nd	N32.26236 W094.58350	118.1	95.6	23.5	96.9	S-8895	
S-25	2nd	N32.26287 W094.58267	124.2	101.5	22.4	97.3	S-9405	
S-26	2nd	N32.26250 W094.58179	121.8	98.2	24.0	99.5	S-8895	
P-18	3rd	N32.26156 W094.58425	119.8	95.4	25.6	96.7	S-8895	
P-19	3rd	N32.26196 W094.58414	119.9	97.3	23.2	98.6	S-8895	
P-20	3rd	N32.26251 W094.58376	125.1	102.6	21.9	98.4	S-9405	
P-21	3rd	N32.26319 W094.58352	123.9	101.2	22.4	97.0	S-9405	
P-22	3rd	N32.26332 W094.58276	124.5	102.9	21.0	98.7	S-9405	
P-23	3rd	N32.26304 W094.58212	125.3	103.5	21.1	99.2	S-9405	
P-24	3rd	N32.26284 W094.58147	122.0	98.8	23.5	100.1	S-8895	
P-25	3rd	N32.26260 W094.58099	125.6	103.8	21.0	99.5	S-9405	
P-26	4th	N32.26159 W094.58424	119.9	97.5	23.0	98.8	S-8895	
P-27	4th	N32.26206 W094.58406	125.1	101.8	22.9	97.6	S-9405	
P-28	4th	N32.26268 W094.58369	120.5	96.8	24.5	98.1	S-8895	
P-29	4th	N32.26340 W094.58336	125.1	102.7	21.8	98.5	S-9405	
P-30	4th	N32.26319 W094.58246	122.0	100.0	22.0	95.9	S-9405	
P-31	4th	N32.26286 W094.58178	118.9	94.3	26.1	95.5	S-8895	
P-32	4th	N32.26268 W094.58121	126.0	103.7	21.5	99.4	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/13/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15408W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000390
Page 2 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-33	4th	N32.26249 W094.58073	120.7	97.2	24.2	98.5	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/13/2010 DS: 2,472 MS: 739
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. — Longview, TX 75604 — (903) 758-0402

Acct ID: HDR
File ID: L213-09
Report Date: 09/24/2010
Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/16/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15409
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000391
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000392

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 08/18/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **Soil Densities**

Date Sampled: 08/16/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

LAB NO: 15409W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000392
Page 1 of 1

Material: Tan & Gray Le Cl w/ Sa

Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-27	3rd	N32.26142 W094.58402	126.2	104.3	21.0	100.0	S-9405	
S-28	3rd	N32.26204 W094.58369	125.3	102.0	22.8	97.8	S-9405	
S-29	3rd	N32.26289 W094.58326	127.3	106.1	20.0	101.7	S-9405	
S-30	3rd	N32.26279 W094.58243	126.4	104.7	20.7	100.4	S-9405	
S-31	3rd	N32.26245 W094.58147	124.3	102.2	21.6	98.0	S-9405	
S-32	5th	N32.26177 W094.58131	125.3	103.9	20.6	99.6	S-9405	
S-33	5th	N32.26142 W094.58134	124.6	103.4	20.5	99.1	S-9405	
S-34	6th	N32.26130 W094.58138	124.9	101.6	22.9	97.4	S-9405	
S-35	6th	N32.26168 W094.58139	125.8	103.2	21.9	98.9	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/16/2010 DS: 2,467 MS: 738
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices

210 Beech Street	Texarkana, AR 71854	(870) 772-0013
707 West Cotton St.	Longview, TX 75604	(903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 08/17/2010
Report Date:	09/24/2010	Previously Reported: 08/18/2010	Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15412
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000394
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 13.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000395

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09
Report Date: 12/02/2010 Previously Reported: 09/24/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/17/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15412W-1
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000396
Page 1 of 1

Material: Tan & Gray Le Cl w/ Sa

Required: 0 to +3 95

Test No	Lift	Location		Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
1	3	Test No: P-22A W094.58276	N32.26332	125.8	101.0	24.6	96.8	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/17/2010 DS: 2,427 MS: 740
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 08/17/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15412W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000395
Page 1 of 1

Material: Tan & Gray Le Cl w/ Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-36	4th	N32.26213 W094.58112	125.6	102.9	22.1	98.7	S-9405	
S-37	4th	N32.26256 W094.58188	124.6	101.0	23.4	96.8	S-9405	
S-38	4th	N32.26292 W094.58324	123.0	99.3	23.9	95.2	S-9405	
S-39	4th	N32.26221 W094.58363	123.4	101.3	21.8	97.1	S-9405	
S-40	4th	N32.26118 W094.58411	124.1	101.0	22.9	96.8	S-9405	
S-41	5th	N32.25830 W094.58282	123.5	101.9	21.2	97.7	S-9405	
S-42	5th	N32.25895 W094.58234	123.7	100.4	23.2	96.3	S-9405	
S-43	6th	N32.25881 W094.58270	125.4	101.1	24.0	96.9	S-9405	
S-44	6th	N32.25893 W094.58221	124.4	100.5	23.8	96.4	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 35605 Daily Standard Counts: 08/17/2010 DS: 2,427 MS: 740
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 08/19/2010
Report Date: 09/24/2010 Previously Reported: 08/18/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15410
Test Method: See Below

TEST RESULTS Report No: 1-1165-000393
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 08/20/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection** LAB NO: 15518
Test Method: See Below

TEST RESULTS Report No: 1-1165-000397
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 08/21/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15519
Test Method: See Below

TEST RESULTS Report No: 1-1165-000398
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/23/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection** LAB NO: 15520
Test Method: See Below

TEST RESULTS Report No: 1-1165-000399
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 08/24/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15521
Test Method: See Below

TEST RESULTS Report No: 1-1165-000400
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000401

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 09/24/2010 Previously Reported: 09/24/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 08/24/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **Soil Densities**

LAB NO: 15521W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000401

Material: Tan & Gray Le Cl w/ Sa Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-55	1st	N32.25855 W094.58352	122.6	104.0	17.9	95.3	S-8801	
S-56	1st	N32.25821 W094.58443	125.7	99.9	25.8	95.8	S-9405	
S-57	1st	N32.25922 W094.58500	123.7	102.7	20.4	98.5	S-9405	
S-58	1st	N32.25977 W094.58475	124.5	99.1	25.6	95.0	S-9405	
S-59	1st	N32.26056 W094.58437	123.3	99.7	23.7	95.6	S-9405	
S-60	2nd	N32.25984 W094.58474	126.8	101.5	24.9	97.3	S-9405	
S-61	2nd	N32.25849 W094.58366	122.2	102.6	19.1	98.4	S-9405	
S-62	2nd	N32.25824 W094.58438	124.9	100.5	24.3	96.4	S-9405	
S-63	2nd	N32.25927 W094.58500	122.7	99.6	23.2	95.5	S-9405	
S-64	2nd	N32.26067 W094.58436	125.1	101.7	23.0	97.5	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8801	04/21/2009	17.0	109.1	Brown, Gray & Tan / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 08/24/2010 DS: 2,335 MS: 692
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/25/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15522
Test Method: See Below

TEST RESULTS Report No: 1-1165-000402
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR
File ID: L213-09
Date Sampled: 08/26/2010
Report Date: 09/01/2010
Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion
By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection**
LAB NO: 15523
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000403
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000404

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. — Longview, TX 75604 (903) 758-0402

Acct ID: HDR
File ID: L213-09
Date Sampled: 08/26/2010
Report Date: 09/01/2010
Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion
By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project
Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities**
LAB NO: 15523W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000404
Page 1 of 1

Material: Tan & Gray Le Cl w/ Sa
Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-65	3rd	N32.26050 W094.58442	124.2	101.5	22.4	97.3	S-9405	
S-66	3rd	N32.25996 W094.58469	125.7	103.7	21.2	99.4	S-9405	
S-67	3rd	N32.25860 W094.58476	125.2	101.4	23.5	97.2	S-9405	
S-68	3rd	N32.25828 W094.58429	122.7	102.8	19.4	98.6	S-9405	
S-69	3rd	N32.25871 W094.58308	124.7	104.5	19.3	100.2	S-9405	
S-70	4th	N32.26053 W094.58439	124.7	102.3	21.9	98.1	S-9405	
S-71	4th	N32.25988 W094.58469	124.0	102.2	21.3	98.0	S-9405	
S-72	4th	N32.25852 W094.58470	122.4	99.6	22.9	95.5	S-9405	
S-73	4th	N32.25829 W094.58440	122.1	100.5	21.5	96.4	S-9405	
S-74	4th	N32.25871 W094.58321	119.8	100.7	19.0	96.5	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 08/26/2010 DS: 2,344 MS: 689
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/27/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15524
Test Method: See Below

TEST RESULTS Report No: 1-1165-000405
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing slope clay liner and preparing and placing exterior liner and subgrade.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/28/2010
Report Date: 09/01/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15525
Test Method: See Below

TEST RESULTS Report No: 1-1165-000406
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communications.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. — Longview, TX 75604 — (903) 758-0402

Acct ID: HDR
File ID: L213-09
Date Sampled: 08/29/2010
Report Date: 10/06/2010
Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion
By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project
Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas
REPORT: **General Inspection**
LAB NO: 15831
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000410
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 6.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/30/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15832
Test Method: See Below

TEST RESULTS Report No: 1-1165-000411
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 7.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 08/31/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15833
Test Method: See Below

TEST RESULTS Report No: 1-1165-000412
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two Dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 09/01/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15834
Test Method: See Below

TEST RESULTS Report No: 1-1165-000413
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/02/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15835
Test Method: See Below

TEST RESULTS Report No: 1-1165-000414
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 09/03/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15836
Test Method: See Below

TEST RESULTS Report No: 1-1165-000416
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000415

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 09/03/2010
Report Date: 10/14/2010 Previously Reported: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15836W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000415

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-47	5	N32.26195 W094.58434	122.4	101.6	20.5	97.4	S-9405	
P-48	5	N32.26212 W094.58910	126.8	104.9	20.9	100.6	S-9405	
P-49	5	N32.26294 W094.58363	122.3	101.1	21.0	96.9	S-9405	
P-50	5	N32.26342 W094.58295	126.0	109.2	15.4	99.5	S-8910	
P-51	5	N32.26302 W094.58220	129.2	106.0	21.9	101.6	S-9405	
P-52	5	N32.26281 W094.58141	127.4	103.9	22.6	99.6	S-9405	
P-53	5	N32.26252 W094.58073	130.1	108.0	20.5	98.4	S-8910	
P-54	5	N32.26189 W094.58093	126.1	107.5	17.3	97.9	S-8910	
P-55	5	N32.26147 W094.58108	129.4	108.2	19.6	98.5	S-8910	
P-56	5	N32.26120 W094.58095	127.2	104.6	21.6	100.3	S-9405	
P-57	6	N32.26170 W094.58420	126.8	106.3	19.3	96.8	S-8910	
P-58	6	N32.26239 W094.58900	123.2	104.7	17.7	95.4	S-8910	
P-59	6	N32.26312 W094.58355	127.3	107.7	18.2	98.1	S-8910	
P-60	6	N32.26332 W094.50870	127.9	105.2	21.6	100.9	S-9405	
P-61	6	N32.26292 W094.58197	129.0	109.9	17.4	100.1	S-8910	
P-62	6	N32.26274 W094.58125	124.2	103.3	20.2	99.0	S-9405	
P-63	6	N32.26239 W094.58066	123.1	101.2	21.6	97.0	S-9405	
P-64	6	N32.26181 W094.58099	126.5	107.2	18.0	97.6	S-8910	
P-65	6	N32.26131 W094.58105	126.0	106.1	18.8	96.6	S-8910	
P-66	6	N32.26109 W094.58092	124.4	103.0	20.8	98.8	S-9405	
P-67	1	N32.26235 W094.58064	127.1	106.6	19.2	97.1	S-8910	
P-68	1	N32.26157 W094.58094	122.8	103.7	18.4	99.4	S-9405	
P-69	2	N32.26237 W094.58072	124.0	103.7	19.6	99.4	S-9405	
P-70	2	N32.26146 W094.58098	123.9	102.4	21.0	98.2	S-9405	
P-71	3	N32.26224 W094.58081	132.3	108.9	21.5	99.2	S-8910	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/03/2010
Report Date: 10/14/2010 Previously Reported: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15836W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000415
Page 2 of 2

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P-72	3	N32.26134 W094.58099	125.6	103.4	21.5	99.1	S-9405	
P-73	4	N32.26213 W094.58082	124.8	103.7	20.3	99.4	S-9405	
P-74	4	N32.26112 W094.58096	126.9	106.1	19.6	96.6	S-8910	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 09/03/2010 DS: 2,341 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 09/04/2010
Report Date: 10/06/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15837
Test Method: See Below

TEST RESULTS Report No: 1-1165-000417
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 10/11/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 09/06/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15864
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000418
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, backhoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR
File ID: L213-09
Report Date: 10/11/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 09/07/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15865
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000419
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing perimeter liner and processing slopes.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 10/11/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 09/08/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15866
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000420
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and process perimeter liner and installing drainage/collection systems.

Equipment on site: Two dozers, excavator, five scrapers, compactor, pad foot, smooth drum, two water trucks, back hoe and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. — Longview, TX 75604 — (903) 758-0402

Acct ID: HDR
File ID: L213-09
Report Date: 10/11/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: luminant-martin lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 09/09/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15867
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000421
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing perimeter subgrade, placing slope liner, placing concrete and assembling leachate collecting system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 09/10/2010
Report Date:	10/11/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15868
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000422
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/11/2010
Report Date: 10/11/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15869
Test Method: See Below

TEST RESULTS Report No: 1-1165-000423
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system

equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 09/12/2010
Report Date:	10/11/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15870
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000424
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/13/2010
Report Date: 10/11/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15871
Test Method: See Below

TEST RESULTS Report No: 1-1165-000425
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/14/2010
Report Date: 10/11/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15872
Test Method: See Below

TEST RESULTS Report No: 1-1165-000426
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/15/2010
Report Date: 10/11/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15873
Test Method: See Below

TEST RESULTS Report No: 1-1165-000427
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID:	HDR	File ID: L213-09	Date Sampled: 09/16/2010
Report Date:	10/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15885
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000429
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

See Report No. 1-1165-000428

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/16/2010
Report Date: 10/14/2010 Previously Reported: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 15885W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000428
Page 1 of 1

Material: Soils Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
S-75	5	N32.26049 W094.58444	121.1	99.1	22.2	95.0	S-9405	
S-76	5	N32.25970 W094.58476	121.8	101.9	19.5	97.7	S-9405	
S-77	5	N32.25853 W094.58471	126.0	101.2	24.5	97.0	S-9405	
S-78	5	N32.25851 W094.58367	127.2	104.2	22.1	99.9	S-9405	
S-79	6	N32.26043 W094.58443	120.7	100.3	20.3	96.2	S-9405	
S-80	6	N32.25965 W094.58475	123.1	99.6	23.6	95.5	S-9405	
S-81	6	N32.25830 W094.58967	131.8	101.7	29.6	97.5	S-9405	
S-82	6	N32.25856 W094.58364	124.9	100.8	23.9	96.6	S-9405	
S-41	5	N32.25880 W094.58282	129.2	108.3	19.3	98.6	S-8910	
P-75	1	N32.25949 W094.53527	120.4	97.2	23.9	98.5	S-8895	
P-76	6	N32.26332 W094.58288	129.9	110.0	18.1	100.2	S-8910	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 09/16/2010 DS: 2,361 MS: 691
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 09/17/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15886
Test Method: See Below

TEST RESULTS Report No: 1-1165-000430
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 09/18/2010
Report Date:	10/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15887
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000431
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 6.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/19/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15888
Test Method: See Below

TEST RESULTS Report No: 1-1165-000432
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 4.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 09/20/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15889
Test Method: See Below

TEST RESULTS Report No: 1-1165-000433
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot. compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/21/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15890
Test Method: See Below

TEST RESULTS Report No: 1-1165-000434
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/22/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15891
Test Method: See Below

TEST RESULTS Report No: 1-1165-000435
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/23/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15895
Test Method: See Below

TEST RESULTS Report No: 1-1165-000436
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/24/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15896
Test Method: See Below

TEST RESULTS Report No: 1-1165-000437
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/25/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15897
Test Method: See Below

TEST RESULTS Report No: 1-1165-000438
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 09/26/2010
Report Date:	10/12/2010		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of: Client
Location:	Luminant-Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 15898
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000439
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 5.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 09/27/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15899
Test Method: See Below

TEST RESULTS Report No: 1-1165-000440
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/28/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15900
Test Method: See Below

TEST RESULTS Report No: 1-1165-000441
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 09/29/2010
Report Date: 10/12/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15901
Test Method: See Below

TEST RESULTS Report No: 1-1165-000442
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 7.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updating maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09
Report Date: 10/12/2010
Project: Martin Lake SES PDP 1-3 Vertical Expansion
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

Date Sampled: 09/30/2010
Sampled By: Jacob LeNoir
By Order Of: Client
Order Number:

REPORT: **General Inspection**

LAB NO: 15902
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000443
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 12.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozer, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/01/2010
Report Date: 10/13/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15904
Test Method: See Below

TEST RESULTS Report No: 1-1165-000444
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/02/2010
Report Date: 10/13/2010 Sampled By:
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15905
Test Method: See Below

TEST RESULTS Report No: 1-1165-000445
Page 1 of 1

Weather: Clear **Technician(s):** Jacob LeNoir **Time:** 14.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor processing and placing perimeter liner and assembling leachate collection system.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/03/2010
Report Date: 10/13/2010 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of: Client
Location: Luminant-Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 15906
Test Method: See Below

TEST RESULTS Report No: 1-1165-000446
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 3.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

No active equipment.

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and communication.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/04/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16797
Test Method: See Below

TEST RESULTS Report No: 1-1165-000448
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor preparing and grading perimeter liner.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000447.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/04/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16797W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000447

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P117	3	N32.26090 W094.58080	125.7	104.2	20.6	99.9	S-9405	
P118	3	N32.26052 W094.58088	123.7	100.4	23.2	96.3	S-9405	
P119	3	N32.26020 W094.58060	127.8	103.2	23.8	98.9	S-9405	
P120	3	N32.25983 W094.58058	121.4	99.7	21.8	95.6	S-9405	
P121	3	N32.25969 W094.57994	119.4	95.0	25.7	96.3	S-8895	
P122	3	N32.25936 W094.58018	124.2	100.7	23.3	96.5	S-9405	
P123	3	N32.25899 W094.58067	122.9	99.6	23.4	95.5	S-9405	
P124	3	N32.25895 W094.58131	126.4	103.0	22.7	98.8	S-9405	
P125	3	N32.25865 W094.58167	123.8	101.9	21.5	97.7	S-9405	
P126	3	N32.25865 W094.58219	125.5	104.2	20.4	99.9	S-9405	
P127	3	N32.22833 W094.58265	125.7	102.1	23.1	98.9	S-8894	
P128	3	N32.25823 W094.58348	123.3	99.8	23.5	95.7	S-9405	
P129	3	N32.25784 W094.58417	121.3	96.0	26.4	97.3	s-8895	
P130	3	N32.25786 W094.58495	125.0	97.8	27.8	99.1	S-8895	
P131	3	N32.25848 W094.58509	122.7	98.6	24.4	95.5	S-8894	
P132	3	N32.25901 W094.58547	124.2	102.8	20.8	98.6	S-9405	
P133	3	N32.25982 W094.58510	123.8	101.2	22.3	97.0	S-9405	
P134	3	N32.26033 W094.58502	122.7	100.6	22.0	97.5	S-8894	
P135	3	N32.26083 W094.58463	126.3	104.3	21.1	100.0	S-9405	
P136	3	N32.26131 W094.58452	122.7	98.2	24.9	99.5	S-8895	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8894	06/03/2009	19.7	103.2	Red & Gray / Fat Clay

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/04/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16797W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000447

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 10/04/2010 DS: 2,398 MS: 694
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/05/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16798
Test Method: See Below

TEST RESULTS Report No: 1-1165-000450
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor preparing and grading perimeter liner.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000449.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/05/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16798W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000449

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P137	4	N32.26112 W094.58096	123.9	100.8	22.9	96.6	S-9405	
P138	4	N32.26067 W094.58079	123.6	99.5	24.2	95.4	S-9405	
P139	4	N32.26024 W094.58081	125.4	101.7	23.3	97.5	S-9405	
P140	4	N32.25981 W094.58047	121.7	101.0	20.5	96.8	S-9405	
P141	4	N32.25972 W094.57999	131.3	109.0	20.5	99.3	S-8910	
P142	4	N32.25957 W094.58032	126.8	104.8	21.0	95.4	S-8910	
P143	4	N32.25944 W094.57981	126.3	103.6	21.9	99.3	S-9405	
P144	4	N32.25913 W094.58032	125.6	100.3	25.2	101.6	S-8895	
P145	4	N32.25899 W094.58106	124.9	101.7	22.8	97.5	S-9405	
P146	4	N32.25870 W094.58153	129.5	107.2	20.8	97.6	S-8910	
P147	4	N32.25863 W094.58219	124.4	103.0	20.8	98.8	S-9405	
P148	4	N32.25827 W094.58280	128.9	106.2	21.4	96.7	S-8910	
P149	4	N32.25821 W094.58346	127.0	106.2	19.6	96.7	S-8910	
P150	4	N32.25990 W094.58391	125.4	103.8	20.8	99.5	S-9405	
P151	4	N32.25787 W094.58453	129.0	107.3	20.2	102.9	S-9405	
P152	4	N32.25799 W094.58501	125.5	102.7	22.2	98.5	S-9405	
P153	4	N32.25839 W094.58507	125.0	101.4	23.3	97.2	S-9405	
P154	4	N32.25867 W094.58535	130.2	110.9	17.4	101.0	S-8910	
P155	4	N32.25899 W094.58533	128.7	107.4	19.8	97.8	S-8910	
P156	4	N32.25931 W094.58549	124.5	102.0	22.1	97.8	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/05/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16798W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000449

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 10/05/2010 DS: 2,412 MS: 678
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/06/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16800
Test Method: See Below

TEST RESULTS Report No: 1-1165-000452
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor preparing and grading perimeter liner.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000451.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/06/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16800W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000451
Page 1 of 3

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P157	5	N32.26129 W094.58101	127.9	104.0	23.0	99.7	S-9405	
P158	5	N32.26101 W094.58082	128.0	104.1	23.0	99.8	S-9405	
P159	5	N32.26079 W094.58095	126.8	103.9	22.0	99.6	S-9405	
P160	5	N32.26058 W094.58076	126.5	105.6	19.8	101.2	S-9405	
P161	5	N32.26039 W094.58068	123.9	99.5	24.5	95.4	S-9405	
P162	5	N32.26024 W094.58062	124.2	101.2	22.7	97.0	S-9405	
P163	5	N32.26064 W094.58069	121.5	101.8	19.4	97.6	S-9405	
P164	5	N32.25991 W094.58034	124.4	99.4	25.2	95.3	S-9405	
P165	5	N32.25973 W094.58052	122.8	100.3	22.4	96.2	S-9405	
P166	5	N32.25967 W094.58019	128.1	108.9	17.6	99.2	S-8910	
P167	5	N32.25958 W094.58968	125.1	107.2	16.7	97.6	S-8910	
P168	5	N32.25948 W094.58036	127.4	103.8	22.7	99.5	S-9405	
P169	5	N32.25942 W094.57997	125.2	103.0	21.6	98.8	S-9405	
P170	5	N32.25938 W094.57963	125.1	102.9	21.6	98.7	S-9405	
P171	5	N32.25927 W094.58026	123.5	103.3	19.6	99.0	S-9405	
P172	5	N32.25904 W094.58056	124.9	103.1	21.1	98.8	S-9405	
P173	5	N32.25905 W094.58099	124.4	101.9	22.1	97.7	S-9405	
P174	5	N32.25879 W094.58124	123.5	100.8	22.5	96.6	S-9405	
P175	5	N32.25882 W094.58108	124.9	101.2	23.4	97.0	S-9405	
P176	5	N32.25857 W094.58192	123.7	101.4	22.0	97.2	S-9405	
P177	6	N32.26351 W094.58322	127.4	104.7	21.7	100.4	S-9405	
P178	6	N32.26328 W094.58355	131.2	107.8	21.7	98.2	S-8910	
P179	6	N32.26267 W094.58368	131.9	107.5	22.7	97.9	S-8910	
P180	6	N32.26244 W094.58397	127.1	104.4	21.7	95.1	S-8910	
P181	6	N32.26195 W094.58405	125.7	102.2	23.0	98.0	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/06/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16800W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000451

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P182	6	N32.26137 W094.58432	124.6	98.8	26.1	100.1	S-8895	
P183	6	N32.26115 W094.58462	124.6	97.9	27.3	99.2	S-8895	
P184	6	N32.26089 W094.58456	126.1	99.9	26.2	101.2	S-8895	
P185	6	N32.26066 W094.58484	125.2	97.1	28.9	98.4	S-8895	
P186	6	N32.26035 W094.58483	129.0	104.8	23.1	100.5	S-9405	
P187	6	N32.26012 W094.58511	125.7	99.6	26.2	100.9	S-8895	
P188	6	N32.25984 W094.58509	130.1	104.9	24.0	95.5	S-8910	
P189	6	N32.25957 W094.58537	124.0	99.6	24.5	95.5	S-9405	
P190	6	N32.25929 W094.58536	124.0	101.0	22.8	96.8	S-9405	
P191	6	N32.25895 W094.58534	129.2	107.4	20.3	97.8	S-8910	
P192	6	N32.25867 W094.58537	125.8	107.9	16.6	98.3	S-8910	
P193	6	N32.25849 W094.58511	129.2	109.6	17.9	99.8	S-8910	
P194	6	N32.25826 W094.58515	125.1	98.7	26.7	100.0	S-8895	
P195	6	N32.25807 W094.58490	127.4	103.8	22.7	99.5	S-9405	
P196	6	N32.25879 W094.58493	126.5	103.3	22.5	99.0	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/06/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16800W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000451

Gauge No.: 32446 Daily Standard Counts: 10/06/2010 DS: 2,408 MS: 689
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/07/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16802
Test Method: See Below

TEST RESULTS Report No: 1-1165-000453
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000454.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
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Acct ID: HDR File ID: L213-09 Date Sampled: 10/07/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16802W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000454

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P197	2	N32.26180 W094.58089	128.8	104.8	22.9	95.4	S-8910	
P198	2	N32.25835 W094.58308	126.8	105.3	20.4	95.9	S-8910	
P199	3	N32.26178 W094.58096	128.0	106.1	20.6	96.6	S-8910	
P200	3	N32.25838 W094.58313	130.3	109.2	19.3	99.5	S-8910	
P201	3	N32.25936 W094.58544	125.6	99.4	26.4	100.7	S-8895	
P202	4	N32.26164 W094.58089	127.1	104.3	21.9	100.0	S-9405	
P203	4	N32.25834 W094.58322	123.9	98.6	25.7	99.9	S-8895	
P204	4	N32.25921 W094.58546	124.6	98.8	26.1	100.1	S-8895	
P205	5	N32.26172 W094.58102	129.9	108.5	19.7	98.8	S-8910	
P206	5	N32.25959 W094.57997	121.2	97.1	24.8	98.4	S-8895	
P207	5	N32.25835 W094.58328	130.8	109.2	19.8	99.5	S-8910	
P208	5	N32.25906 W094.58546	127.8	105.0	21.7	95.6	S-8910	
P209	5	N32.26148 W094.58129	131.0	109.0	20.2	99.3	S-8910	
P210	6	N32.25956 W094.57999	121.1	100.3	20.7	96.2	S-9405	
P211	6	N32.25890 W094.58540	129.3	104.0	24.3	99.7	S-9405	
B-1	1	N32.26226 W094.58231	142.8	134.1	6.5	102.4	S-9823	
B-2	1	N32.26269 W094.58205	140.7	132.0	6.6	100.8	S-9823	
B-3	1	N32.26290 W094.58247	139.3	131.3	6.1	100.3	S-9823	
B-4	1	N32.26308 W094.58295	143.2	131.9	8.6	100.8	S-9823	
B-5	1	N32.26302 W094.58328	140.6	131.3	7.1	100.3	S-9823	
B-6	1	N32.26268 W094.58353	143.4	132.9	7.9	101.5	S-9823	
B-7	1	N32.26247 W094.58376	143.2	134.7	6.3	102.9	S-9823	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/07/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16802W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000454

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand
S-9823	07/13/2010	8.2	130.9	Gray / Crushed Limestone Base

Gauge No.: 32446 Daily Standard Counts: 10/07/2010 DS: 2,402 MS: 687
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/08/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16804
Test Method: See Below

TEST RESULTS Report No: 1-1165-000455
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000456.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/08/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16804W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000456

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P212	1	N32.26352 W094.58325	123.8	102.5	20.8	98.3	S-9405	
P213	1	N32.26339 W094.58294	125.2	97.1	28.9	98.4	S-8895	
P214	1	N32.26311 W094.58216	120.9	98.1	23.2	99.4	S-8895	
P215	1	N32.26291 W094.58200	124.1	102.1	21.5	97.9	S-9405	
P216	1	N32.26278 W094.58147	124.6	103.2	20.7	98.9	S-9405	
P217	1	N32.26258 W094.58082	127.5	105.3	21.1	101.0	S-9405	
P218	1	N32.26204 W094.58066	122.6	99.5	23.2	95.4	S-9405	
P219	1	N32.26174 W094.58079	123.8	100.5	23.2	96.4	S-9405	
P220	1	N32.26132 W094.58085	121.2	95.4	27.0	96.7	S-8895	
P221	1	N32.26106 W094.58098	124.6	102.1	22.0	97.9	S-9405	
P222	1	N32.26069 W094.58078	124.7	103.0	21.1	98.8	S-9405	
P223	1	N32.26025 W094.58062	122.9	97.4	26.2	98.7	S-8895	
P224	1	N32.26007 W094.58069	126.4	105.3	20.0	101.0	S-9405	
P225	1	N32.25981 W094.58012	125.9	103.8	21.3	99.5	S-9405	
P226	1	N32.25961 W094.58043	124.4	103.6	20.1	99.3	S-9405	
P227	1	N32.25951 W094.58007	127.2	105.1	21.0	100.8	S-9405	
P228	1	N32.25925 W094.58001	125.6	102.7	22.3	98.5	S-9405	
P229	1	N32.25919 W094.58090	125.9	107.0	17.7	97.4	S-8910	
P230	1	N32.25890 W094.58099	126.2	103.2	22.3	98.9	S-9405	
P231	1	N32.25868 W094.58161	125.2	104.6	19.7	100.3	S-9405	
P232	1	N32.25848 W094.58224	123.7	100.0	23.7	95.9	S-9405	
P233	1	N32.25837 W094.58301	123.8	101.8	21.6	97.6	S-9405	
P234	1	N32.25801 W094.58360	124.3	100.4	23.8	96.3	S-9405	
P235	1	N32.25802 W094.58404	125.0	100.3	24.6	96.2	S-9405	
P236	1	N32.25771 W094.58458	125.7	102.2	23.0	98.0	S-9405	

Charge: HDR Engineering Inc.
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E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/08/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16804W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000456

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P237	1	N32.25806 W094.58492	125.9	103.7	21.4	99.4	S-9405	
P238	1	N32.25841 W094.58514	126.3	103.0	22.6	98.8	S-9405	
P239	1	N32.25878 W094.58537	126.0	104.7	20.3	95.4	S-8910	
P240	1	N32.25937 W094.58546	124.5	101.8	22.3	97.6	S-9405	
P241	1	N32.25971 W094.58530	120.5	99.3	21.3	95.2	S-9405	
P242	1	N32.25986 W094.58512	124.9	102.7	21.6	98.5	S-9405	
P243	1	N32.26029 W094.58490	125.3	102.3	22.5	98.1	S-9405	
P244	1	N32.26080 W094.58477	128.3	109.9	16.7	100.1	S-8910	
P245	1	N32.26125 W094.58454	124.4	102.8	21.0	98.6	S-9405	
P246	1	N32.26167 W094.58434	123.8	100.2	23.6	96.1	S-9405	
P247	1	N32.26193 W094.58405	125.1	103.4	21.0	99.1	S-9405	
P248	1	N32.26234 W094.58385	129.4	99.8	29.7	95.7	S-9405	
P249	1	N32.26272 W094.58365	124.0	102.7	20.7	98.5	S-9405	
P250	1	N32.26303 W094.58349	126.1	104.3	20.9	100.0	S-9405	
P251	1	N32.26325 W094.58352	124.6	102.1	22.0	97.9	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/08/2010
Report Date: 01/25/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16804W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000456

Gauge No.: 32446 Daily Standard Counts: 10/08/2010 DS: 2,398 MS: 678
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Acct ID: HDR File ID: L213-09 Date Sampled: 10/09/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16805
Test Method: See Below

TEST RESULTS Report No: 1-1165-000457
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000458.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/09/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16805W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000458

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P252	2	N32.25829 W094.58278	124.7	103.0	21.1	98.8	S-9405	
P253	2	N32.25815 W094.58319	129.0	106.2	21.5	96.7	S-8910	
P254	2	N32.25805 W094.58359	123.2	102.2	20.5	98.0	S-9405	
P255	2	N32.25800 W094.58410	124.2	99.9	24.3	95.8	S-9405	
P256	2	N32.25777 W094.58443	128.9	105.6	22.1	96.2	S-8910	
P257	2	N32.25786 W094.58494	125.6	106.6	17.8	97.1	S-8910	
P258	2	N32.25818 W094.58495	124.2	101.4	22.5	97.2	S-9405	
P259	2	N32.25842 W094.58520	129.5	106.1	22.1	96.6	S-8910	
P260	2	N32.25872 W094.58520	123.7	99.6	24.2	95.5	S-9405	
P261	2	N32.25895 W094.58547	130.5	108.7	20.1	99.0	S-8910	
P262	2	N32.25930 W094.58532	127.9	103.6	23.5	99.3	S-9405	
P263	2	N32.25964 W094.58535	131.5	109.4	20.2	99.6	S-8910	
P264	2	N32.25985 W094.58509	131.4	109.3	20.2	99.5	S-8910	
P265	2	N32.26019 W094.58506	125.3	103.8	20.7	99.5	S-9405	
P266	2	N32.26041 W094.58481	131.7	110.8	18.9	100.9	S-8910	
P267	2	N32.26076 W094.58482	131.1	109.6	19.6	99.8	S-8910	
P268	2	N32.26094 W094.58453	131.0	111.9	17.1	101.9	S-8910	
P269	2	N32.26128 W094.58454	131.4	109.9	19.6	100.1	S-8910	
P270	2	N32.26156 W094.58423	124.1	97.4	27.4	98.7	S-8895	
P271	2	N32.26175 W094.58413	123.9	100.5	23.3	96.4	S-9405	
P272	2	N32.26211 W094.58414	125.5	101.2	24.0	97.0	S-9405	
P273	2	N32.26253 W094.58376	121.4	97.3	24.8	98.6	S-8895	
P274	2	N32.26300 W094.58368	120.9	101.7	18.9	97.5	S-9405	
P275	2	N32.26353 W094.58333	129.3	109.1	18.5	99.4	S-8910	
P276	2	N32.26318 W094.58267	129.8	109.0	19.1	99.3	S-8910	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/09/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16805W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000458

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P277	2	N32.26310 W094.58242	121.4	96.7	25.5	98.0	S-8895	
P278	2	N32.26286 W094.58186	126.0	104.7	20.3	95.4	S-8910	
P279	2	N32.26274 W094.58119	121.7	97.7	24.6	99.0	S-8895	
P280	2	N32.26219 W094.58061	122.7	102.1	20.2	97.9	S-9405	
P281	2	N32.26204 W094.58081	124.3	100.4	23.8	96.3	S-9405	
P282	2	N32.26219 W094.58085	121.2	96.2	26.0	96.7	S-9028	
P283	2	N32.26107 W094.58098	120.4	94.9	26.9	95.4	S-9028	
P284	2	N32.26088 W094.58080	124.6	101.6	22.6	97.4	S-9405	
P285	2	N32.26070 W094.58092	123.8	100.0	23.8	100.5	S-9028	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8895	06/03/2009	22.4	98.7	Gray & Tan / Lean Clay (Laminated)
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 10/09/2010 DS: 2,423 MS: 690
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/10/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16806
Test Method: See Below

TEST RESULTS Report No: 1-1165-000459
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

N/A

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/11/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16807
Test Method: See Below

TEST RESULTS Report No: 1-1165-000460
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps, spreadsheets and maintenance.

Test Results and Procedures:

N/A

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/12/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16808
Test Method: See Below

TEST RESULTS Report No: 1-1165-000461
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/13/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16809
Test Method: See Below

TEST RESULTS Report No: 1-1165-000462
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 8.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/14/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16810
Test Method: See Below

TEST RESULTS Report No: 1-1165-000463
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000464.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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Acct ID: HDR File ID: L213-09 Date Sampled: 10/14/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16810W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000464
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P286	4	N32.26320 W094.58357	130.0	106.8	21.7	97.3	S-8910	
P287	4	N32.26249 W094.58393	129.8	106.3	22.1	96.8	S-8910	
P288	4	N32.26139 W094.58433	127.2	104.0	22.3	99.7	S-9405	
P289	4	N32.26098 W094.58470	129.9	108.1	20.2	98.5	S-8910	
P290	4	N32.26046 W094.58478	126.0	101.4	24.3	97.2	S-9405	
P291	4	N32.26007 W094.58514	124.7	99.3	25.6	95.2	S-9405	
P292	4	N32.25967 W094.58519	129.3	105.4	22.7	96.0	S-8910	
P293	5	N32.25856 W094.58239	128.6	104.0	23.7	99.7	S-9405	
P294	5	N32.25829 W094.58275	132.2	107.8	22.6	98.2	S-8910	
P295	5	N32.25831 W094.58315	121.2	100.2	21.0	96.1	S-9405	
P296	5	N32.25800 W094.58359	127.9	105.0	21.8	100.7	S-9405	
P297	5	N32.25801 W094.58409	125.9	103.9	21.2	99.6	S-9405	
P298	5	N32.25774 W094.58443	129.2	106.2	21.7	96.7	S-8910	
P299	5	N32.25795 W094.58485	123.7	103.9	19.1	99.6	S-9405	
P300	5	N32.25816 W094.58511	126.9	104.6	21.3	100.3	S-9405	
P301	5	N32.25850 W094.58511	121.1	100.5	20.5	96.4	S-9405	
P302	5	N32.25867 W094.58536	125.2	103.9	20.5	99.6	S-9405	
P303	5	N32.25899 W094.58533	125.5	102.7	22.2	98.5	S-9405	
P304	5	N32.25925 W094.58552	124.3	105.3	18.0	95.9	S-8910	
P305	5	N32.25947 W094.58525	124.0	103.5	19.8	99.2	S-9405	
P306	5	N32.25973 W094.58532	123.5	103.7	19.1	99.4	S-9405	
P307	5	N32.25990 W094.58505	129.3	106.4	21.5	96.9	S-8910	
P308	5	N32.26018 W094.58509	124.9	103.1	21.1	98.8	S-9405	
P309	5	N32.26037 W094.58482	126.0	105.9	19.0	96.4	S-8910	
P310	5	N32.26065 W094.58486	124.1	101.3	22.5	97.1	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/14/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16810W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000464

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P311	5	N32.26091 W094.58454	128.7	103.4	24.5	99.1	S-9405	
P312	5	N32.26130 W094.58454	125.4	101.5	23.5	97.3	S-9405	
P313	5	N32.26159 W094.58421	129.4	110.1	17.5	100.3	S-8910	
P314	5	N32.26246 W094.58378	125.7	103.9	21.0	99.6	S-9405	
P315	5	N32.26317 W094.58344	128.4	108.7	18.1	99.0	S-8910	
P316	5	N32.26355 W094.58335	127.5	106.2	20.1	101.8	S-9405	
P317	5	N32.26328 W094.58265	127.5	105.4	21.0	96.0	S-8910	
P318	5	N32.26281 W094.58175	125.3	100.6	24.6	96.5	S-9405	
P319	5	N32.26261 W094.58119	122.5	100.6	21.8	96.5	S-9405	
P320	5	N32.26213 W094.58064	126.9	105.0	20.9	95.6	S-8910	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 10/14/2010 DS: 2,408 MS: 696
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID:	HDR	File ID: L213-09	Date Sampled: 10/15/2010
Report Date:	01/26/2011		Sampled By: Jacob LeNoir
Project:	Martin Lake SES PDP 1-3 Vertical Expansion		By Order Of:
Location:	Luminant - Martin Lake PDP 1-3 Vertical Expansion Project		Order Number:
Client:	HDR Engineering Inc., McKinney, Texas		
Contractor:	Mine Service, LTD, Rockdale, Texas		
REPORT:	**General Inspection**		LAB NO: 16812
			Test Method: See Below

TEST RESULTS

Report No: 1-1165-000465
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 11.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/16/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16813
Test Method: See Below

TEST RESULTS Report No: 1-1165-000466
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
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Area Offices
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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/17/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16815
Test Method: See Below

TEST RESULTS Report No: 1-1165-000467
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 2.50 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

Home Office - 1717 East Erwin Street
Tyler, Texas 75702-6398
Office: (903) 595-4421 Lab: (903) 595-6402 Fax: (903) 595-6113
Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/18/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16816
Test Method: See Below

TEST RESULTS Report No: 1-1165-000468
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.50 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000469.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

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707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/18/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16816W
Test Method: See Below

TEST RESULTS Report No: 1-1165-000469
Page 1 of 2

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P321	6	N32.26308 W094.58245	127.1	107.2	18.6	97.6	S-8910	
P322	6	N32.26308 W094.58209	127.2	103.3	23.1	99.0	S-9405	
P323	6	N32.29271 W094.58151	124.1	101.6	22.1	97.4	S-9405	
P324	6	N32.26263 W094.58094	126.0	102.0	23.5	97.8	S-9405	
P325	6	N32.26206 W094.58072	124.4	102.8	21.0	98.6	S-9405	
P326	6	N32.26163 W094.58099	125.8	104.1	20.8	99.8	S-9405	
P327	6	N32.26089 W094.58082	125.2	103.0	21.6	98.8	S-9405	
P328	6	N32.26065 W094.58091	127.5	108.0	18.1	98.4	S-8910	
P329	6	N32.26041 W094.58070	124.8	106.4	17.3	96.9	S-8910	
P330	6	N32.26013 W094.58074	122.8	103.0	19.2	98.8	S-9405	
P331	6	N32.25998 W094.58045	125.2	107.0	17.0	97.4	S-8910	
P332	6	N32.25979 W094.58056	125.9	104.0	21.1	99.7	S-9405	
P333	6	N32.25979 W094.58010	126.4	105.3	20.0	101.0	S-9405	
P334	6	N32.25963 W094.58035	120.9	101.8	18.8	97.6	S-9405	
P335	6	N32.25953 W094.57983	124.0	101.0	22.8	96.8	S-9405	
P336	6	N32.25942 W094.57957	125.4	103.2	21.5	98.9	S-9405	
P337	6	N32.25927 W094.57994	126.7	105.0	20.7	100.7	S-9405	
P338	6	N32.25938 W094.58013	124.0	106.2	16.8	96.7	S-8910	
P339	6	N32.25924 W094.58043	123.9	101.8	21.7	97.6	S-9405	
P340	6	N32.25902 W094.58062	124.8	100.7	23.9	96.5	S-9405	
P341	6	N32.25905 W094.58095	126.2	104.2	21.1	99.9	S-9405	
P342	6	N32.25883 W094.58116	124.6	103.7	20.2	99.4	S-9405	
P343	6	N32.25889 W094.58146	124.2	101.0	23.0	96.8	S-9405	
P344	6	N32.25867 W094.58164	120.7	99.5	21.3	95.4	S-9405	
P345	6	N32.25867 W094.58206	122.6	99.8	22.8	95.7	S-9405	

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/18/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16816W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000469

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
P346	6	N32.25847 W094.58226	126.2	103.1	22.4	98.8	S-9405	
P347	6	N32.25848 W094.58259	124.9	103.7	20.4	99.4	S-9405	
P348	6	N32.25827 W094.58280	121.4	99.2	22.4	95.1	S-9405	
P349	6	N32.25831 W094.58318	121.8	99.3	22.7	95.2	S-9405	
P350	6	N32.25812 W094.58331	124.5	102.9	21.0	98.7	S-9405	
P351	6	N32.25816 W094.58368	125.3	104.3	20.1	100.0	S-9405	
P352	6	N32.25796 W094.58378	125.6	106.6	17.8	97.1	S-8910	
P353	6	N32.25802 W094.58409	123.2	100.3	22.8	96.2	S-9405	
P354	6	N32.25779 W094.58428	124.5	101.7	22.4	97.5	S-9405	
P355	6	N32.25769 W094.58310	125.5	103.0	21.8	98.8	S-9405	
2,104	6	N32.25956 W094.57999	121.7	102.0	19.3	97.8	S-9405	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-8910	06/05/2009	16.6	109.8	Tannish Gray / Sandy Lean Clay
S-9405	12/11/2009	18.4	104.3	Tan & Gray / Lean Clay with Sand

Gauge No.: 32446 Daily Standard Counts: 10/18/2010 DS: 2,355 MS: 686
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/19/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16821
Test Method: See Below

TEST RESULTS Report No: 1-1165-000470
Page 1 of 1

Weather: **Technician(s):** Jacob LeNoir **Time:** 9.00 Hrs **Mileage:**

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

N/A

Duties and Tests Performed by Technician:

Technician updated maps and spreadsheets.

Test Results and Procedures:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/20/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **General Inspection** LAB NO: 16822
Test Method: See Below

TEST RESULTS Report No: 1-1165-000471
Page 1 of 1

Weather: Partly Cloudy **Technician(s):** Jacob LeNoir **Time:** 10.00 Hrs **Mileage:** 100.0

Type and Amount of Work Being Performed by Contractor Related to Technician's Duties: (List equipment also.)

Contractor placing and grading perimeter liner, compacting and placing road base.

Equipment on site: Loader, four pans, two excavators, disc, two dozers, two water trucks, smooth drum roller, pad foot, compactor and maintainer.

Duties and Tests Performed by Technician:

Technician observed contractor operations, updated maps and spreadsheets.

Test Results and Procedures:

See density report 1-1165-000472.

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

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Area Offices
210 Beech Street Texarkana, AR 71854 (870) 772-0013
707 West Cotton St. Longview, TX 75604 (903) 758-0402

Acct ID: HDR File ID: L213-09 Date Sampled: 10/20/2010
Report Date: 01/26/2011 Sampled By: Jacob LeNoir
Project: Martin Lake SES PDP 1-3 Vertical Expansion By Order Of:
Location: Luminant - Martin Lake PDP 1-3 Vertical Expansion Project Order Number:
Client: HDR Engineering Inc., McKinney, Texas
Contractor: Mine Service, LTD, Rockdale, Texas

REPORT: **Soil Densities** LAB NO: 16822W
Test Method: See Below

TEST RESULTS

Report No: 1-1165-000472
Page 1 of 1

Material: Soil Required: 0 to +3 95

Test No	Lift	Location	Wet Density	Dry Density	Percent Moisture	Percent Proctor Density	Proctor No	Comments
B-8	1	N32.25784 W094.58433	110.3	102.1	8.0	102.6	S-9028	
B-9	1	N32.25812 W094.58399	107.4	99.3	8.2	99.8	S-9028	
B-10	1	N32.25841 W094.58357	108.3	100.4	7.9	100.9	S-9028	
B-11	1	N32.25861 W094.58316	111.0	102.1	8.7	102.6	S-9028	
B-12	1	N32.25877 W094.58262	107.8	99.5	8.3	100.0	S-9028	

Proctor No	Proctor Date	Optimum Moisture	Maximum Dry Density	Color / Description
S-9028	07/07/2009	21.4	99.5	Red & Tan / Fat Clay

Gauge No.: 32446 Daily Standard Counts: 10/20/2010 DS: 2,331 MS: 630
Test Methods: ASTM D2922-B
Remarks:

Charge: HDR Engineering Inc.
Orig: HDR Engineering Inc., McKinney, Texas Attn: Dave Vogt
E-Mail: david.vogt@hdrinc.com

Respectfully Submitted,
ETTL Engineers & Consultants, Inc.

C. Brandon Quinn, P.E.

C. Brandon Quinn, PE, CPG, PG

Vice President and Manager of Engineering Services

AREAS OF EXPERTISE
Geotechnical Engineering
Engineering Geology

REGISTRATION
Professional Engineer: Texas, No. 72441
Certified Professional Geologist: CPG No. 8664
Registered LPST, CAPM 00262

EDUCATION
B.S. Engineering Geology
Texas A&M
1982

B.S. Mining Engineering
Texas A&M
1984

PROFESSIONAL MEMBERSHIPS
American Institute of Professional Geologists

American Society of Professional Engineers

National Groundwater Association

PROFESSIONAL HISTORY

Vice President
ETTL Engineers and Consultants, Inc.
2005-Present

Senior Project Manager
ETTL Engineers and Consultants, Inc.
1990-2005

Manager of Environmental Services, ETTL Engineers and Consultants, Inc.
1988-1990

Branch Manager, Longview Office, ETTL Engineers and Consultants, Inc.
1986-1988

Field Engineer
Welex, A Halliburton Company
1984-1986

EXPERIENCE

Mr. Quinn has over 25 years of experience in civil and environmental projects in the areas of geotechnical engineering, construction materials testing, engineering geology, hydrogeology, and environmental geology and engineering; design and quality control testing in FAA asphaltic concrete runways and taxiways; construction of liners in municipal landfills, groundwater monitoring and remediation systems; and design of asbestos abatement projects in occupied multi-story structures.

During his employment with ETTL, Mr. Quinn has had experience with many geotechnical projects for TxDOT; geotechnical investigations of solid waste landfills, water and wastewater treatment plants, and single and multi-storied facilities; design of groundwater and in-situ soil remediation systems for leading underground storage tank sites; design of asbestos abatement projects in public schools, industrial facilities and commercial buildings; field investigation and evaluation of RCRA and State Superfund sites. In the area of environmental site assessments, he has carried out Phase I and Phase II investigations, and Phase III site remediations of industrial facilities, commercial properties, agricultural properties, cemeteries, fueling facilities, and oil and gas exploration sites.

Landfill experience includes: permit modifications, alternate liner demonstrations, geotechnical and hydrogeological investigations, Professional of Record for the construction quality assurance (CQA) inspection and testing involving in-situ soil liners, constructed clay liners, geosynthetic clay liners, geomembrane liners, leachate collection systems, final cover systems and landfill gas extraction systems. Projects have included services for:

Texas Eastman Company
Hazardous Waste Landfill, Longview, Texas: Cells 1 & 3
Sanitary Landfill, Longview, Texas: Phase G

City of Cleburne
Cleburne Sanitary Landfill, Cleburne, Texas
Sector 5 Closure

Allied Waste
Pine Hill Landfill, Kilgore, Texas: Cells 23, 24
Greenwood Farms, Tyler, Texas: Cells 6B, 7A, 7B, 8A, 8B, 9A, 10A
Trinity Oaks, Mesquite, Texas: Cells 2, 3
Royal Oaks, Jacksonville, Texas: Cell 3, 4, 5A
Pleasant Oaks, Mt. Pleasant, Texas: Cell 1, 11A

Luminant Martin Lake (formerly TXU)
Tatum, Texas
Fly Ash Permanent Disposal Ponds 1-3

Jacob LeNoir

Construction Quality Control/Assurance

AREAS OF EXPERTISE
Geotechnical Engineering
Construction Materials Testing

EDUCATION
B.S. Mechanical Engineering
U.T. Tyler
2009

CERTIFICATIONS
FE Exam Passed

Nuclear Gauge Training and Safety

PROFESSIONAL HISTORY

CQA Monitor
ETTL Engineers and Consultants, Inc.
April 2009-Present

Engineering Intern
2007 – 2009

Designer I
Synergetic Design
2006-2009

Installation Manager
OS2S
2003-2006

Area Manager
Direct Installation
2002-2004

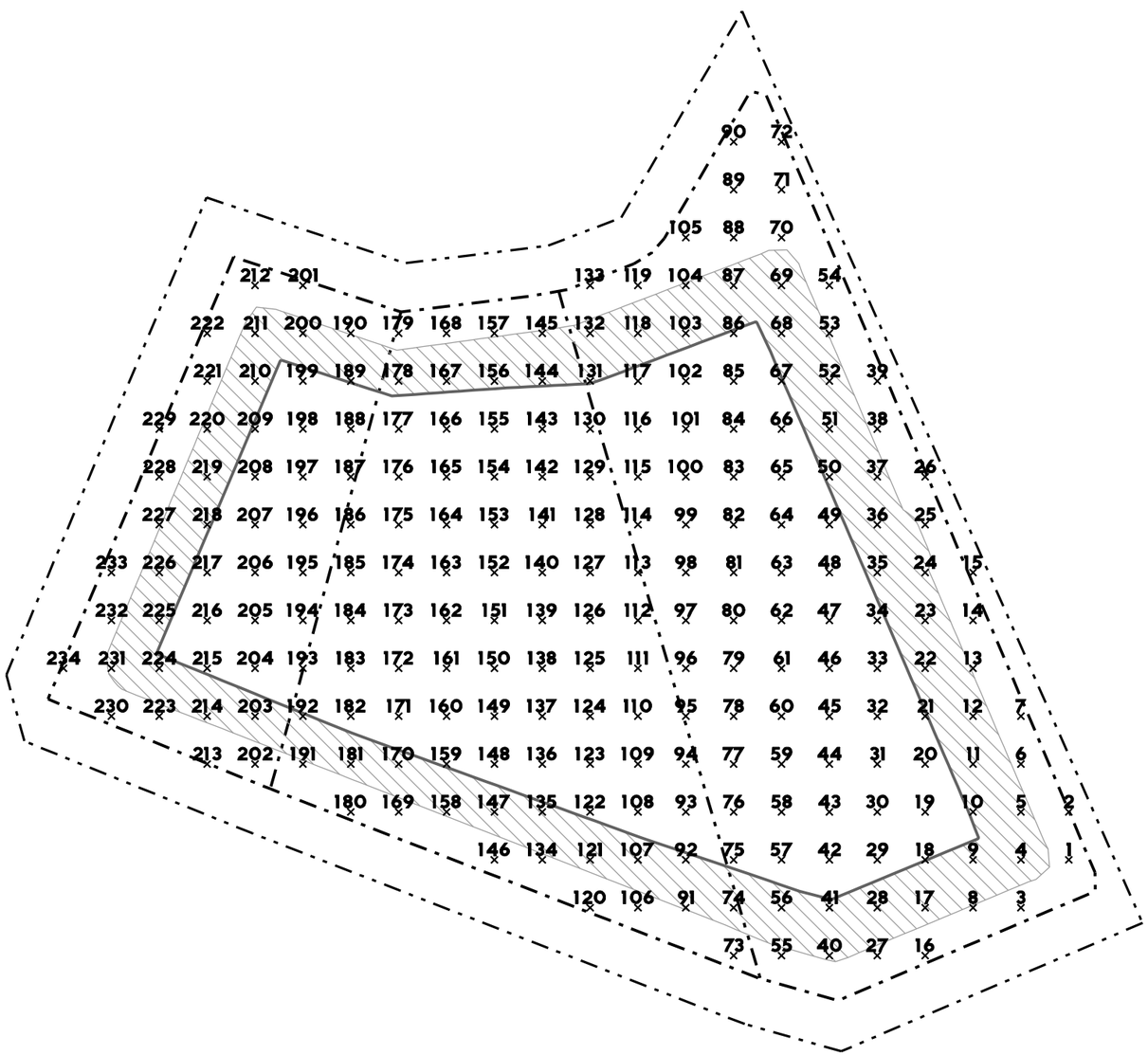
EXPERIENCE

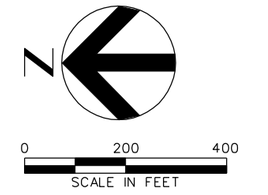
Mr. LeNoir brings 4 years of geotechnical and construction materials testing to the utmost use. Since being with ETTL, he has used his CAD skills and engineering training to its full capacity on a variety of transportation, levee and landfill projects.

As a Field Construction Quality Control Monitor, Mr. LeNoir was involved in many different projects at several levels ranging from testing and inspection to onsite project management. His computer skills include; AutoCAD, L-Pile, MathCAD, Mathematica, Matlab, Microstation, Pro-E and Microsoft Office.

Mr. LeNoir has a wide range of expertise in the geotechnical and construction material fields which makes him an excellent member to have on your team.

Section 8





NOTE: DATA SHOWN SUMMARIZES THE AS BUILT VERIFICATION SURVEYS PERFORMED BY COLLINS SURVEYING & MAPPING INC., LONGVIEW TX. FROM APRIL THROUGH DECEMBER 2010

PLTDRVER: 11X17LASER_BW_PDF.plt
PENTABLE: REISSUE 139-E001-304.tbl
FILENAME: ML-CLV01.dgn
DATE: 2/10/2011
TIME: 10:24:13 AM
USER: rcox
FILE: Luminant_Generation_Company_LLC/TXU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/139-E001-305/ETL

Luminant

HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

CLAY LINER VERIFICATION (FLOOR)

139-E001-305

FILENAME	ML-CLV01.dgn
SCALE	AS SHOWN

SHEET 1

POINT NO.	NORTHING	EASTING	TOP OF CLAY	TOP OF SUBGRADE	CLAY THICKNESS	PROT. COVER
1	227500.00	2901200.00	389.37	386.29	3.08	1.56
2	227500.00	2901300.00	387.59	384.50	3.09	1.60
3	227600.00	2901100.00	388.97	385.87	3.10	1.52
4	227600.00	2901200.00	390.73	387.46	3.27	11.71
5	227600.00	2901300.00	390.65	387.27	3.38	4.99
6	227600.00	2901400.00	389.52	386.46	3.06	7.47
7	227600.00	2901500.00	388.26	385.08	3.18	1.52
8	227700.00	2901100.00	389.77	386.59	3.18	1.99
9	227700.00	2901200.00	391.29	388.06	3.23	12.54
10	227700.00	2901300.00	392.23	389.10	3.13	3.44
11	227700.00	2901400.00	391.36	388.22	3.14	14.42
12	227700.00	2901500.00	390.43	387.32	3.11	13.72
13	227700.00	2901600.00	389.86	386.62	3.24	1.71
14	227700.00	2901700.00	388.62	385.56	3.06	1.52
15	227700.00	2901800.00	386.29	382.95	3.34	1.55
16	227800.00	2901000.00	388.26	385.11	3.15	1.68
17	227800.00	2901100.00	390.45	387.05	3.40	7.99
18	227800.00	2901200.00	391.48	389.11	2.37	0.53
19	227800.00	2901300.00	392.73	390.40	2.33	0.54
20	227800.00	2901400.00	392.86	390.82	2.04	0.51
21	227800.00	2901500.00	392.29	390.16	2.13	0.56
22	227800.00	2901600.00	391.42	388.39	3.03	12.78
23	227800.00	2901700.00	390.85	387.45	3.40	11.12
24	227800.00	2901800.00	389.96	386.71	3.25	2.61
25	227800.00	2901900.00	389.02	385.77	3.25	1.54
26	227800.00	2902000.00	387.36	384.19	3.17	1.57
27	227900.00	2901000.00	389.54	386.28	3.26	1.66
28	227900.00	2901100.00	390.90	387.69	3.21	15.16
29	227900.00	2901200.00	392.14	389.93	2.21	0.69
30	227900.00	2901300.00	392.91	390.85	2.06	0.82
31	227900.00	2901400.00	393.81	391.75	2.06	0.52
32	227900.00	2901500.00	393.46	391.34	2.12	0.60
33	227900.00	2901600.00	393.04	390.81	2.23	0.54
34	227900.00	2901700.00	392.50	390.24	2.26	0.69
35	227900.00	2901800.00	391.92	388.58	3.34	7.50
36	227900.00	2901900.00	390.79	387.60	3.19	14.54
37	227900.00	2902000.00	390.15	386.82	3.33	5.14
38	227900.00	2902100.00	389.19	386.00	3.19	1.59
39	227900.00	2902200.00	388.07	384.78	3.29	1.58
40	228000.00	2901000.00	389.84	386.72	3.12	2.80
41	228000.00	2901100.00	391.34	388.29	3.05	6.45
42	228000.00	2901200.00	392.25	390.19	2.06	1.05
43	228000.00	2901300.00	393.43	391.08	2.35	0.88
44	228000.00	2901400.00	394.28	391.95	2.33	0.53
45	228000.00	2901500.00	395.07	392.62	2.45	0.60
46	228000.00	2901600.00	394.19	392.09	2.10	0.58
47	228000.00	2901700.00	393.73	391.47	2.26	0.51
48	228000.00	2901800.00	393.02	390.79	2.23	0.53
49	228000.00	2901900.00	392.36	390.35	2.01	0.55
50	228000.00	2902000.00	391.79	388.73	3.06	3.31
51	228000.00	2902100.00	390.93	387.81	3.12	14.69
52	228000.00	2902200.00	390.00	386.95	3.05	8.65
53	228000.00	2902300.00	389.43	386.15	3.28	1.58
54	228000.00	2902400.00	388.54	385.16	3.38	1.60
55	228100.00	2901000.00	389.64	386.55	3.09	1.89
56	228100.00	2901100.00	391.53	388.10	3.43	14.32
57	228100.00	2901200.00	392.72	390.52	2.20	1.12
58	228100.00	2901300.00	393.71	391.38	2.33	0.96
59	228100.00	2901400.00	394.45	392.31	2.14	1.01
60	228100.00	2901500.00	395.33	393.22	2.11	0.62
61	228100.00	2901600.00	395.36	393.36	2.00	0.68
62	228100.00	2901700.00	395.04	392.66	2.38	0.57
63	228100.00	2901800.00	394.41	392.03	2.38	0.58
64	228100.00	2901900.00	393.93	391.60	2.33	0.50
65	228100.00	2902000.00	393.05	390.91	2.14	0.75
66	228100.00	2902100.00	392.53	390.37	2.16	0.50
67	228100.00	2902200.00	391.96	389.74	2.22	0.57
68	228100.00	2902300.00	391.22	387.89	3.33	12.60
69	228100.00	2902400.00	390.09	386.97	3.12	11.81
70	228100.00	2902500.00	388.71	385.58	3.13	2.81
71	228100.00	2902600.00	386.66	383.60	3.06	3.13
72	228100.00	2902700.00	386.74	383.68	3.06	1.52
73	228200.00	2901000.00	389.27	386.00	3.27	1.54
74	228200.00	2901100.00	391.70	388.28	3.42	10.03
75	228200.00	2901200.00	392.80	390.56	2.24	1.62
76	228200.00	2901300.00	393.87	391.54	2.33	1.03
77	228200.00	2901400.00	394.74	392.53	2.21	0.94
78	228200.00	2901500.00	395.80	393.45	2.35	0.72

POINT NO.	NORTHING	EASTING	TOP OF CLAY	TOP OF SUBGRADE	CLAY THICKNESS	PROT. COVER
79	228200.00	2901600.00	396.54	394.33	2.21	0.57
80	228200.00	2901700.00	396.09	393.92	2.17	0.65
81	228200.00	2901800.00	395.42	393.28	2.14	0.69
82	228200.00	2901900.00	395.01	392.86	2.15	0.51
83	228200.00	2902000.00	394.10	391.89	2.21	0.53
84	228200.00	2902100.00	393.20	391.01	2.19	0.50
85	228200.00	2902200.00	392.17	390.04	2.13	0.57
86	228200.00	2902300.00	391.40	389.14	2.26	0.59
87	228200.00	2902400.00	389.83	386.61	3.22	9.82
88	228200.00	2902500.00	388.12	384.85	3.27	3.90
89	228200.00	2902600.00	386.84	383.67	3.17	3.62
90	228200.00	2902700.00	386.84	383.67	3.17	2.47
91	228300.00	2901100.00	391.34	388.30	3.04	2.35
92	228300.00	2901200.00	393.72	390.44	3.28	5.00
93	228300.00	2901300.00	394.62	392.41	2.21	0.96
94	228300.00	2901400.00	395.59	393.10	2.49	0.76
95	228300.00	2901500.00	396.17	394.04	2.13	0.80
96	228300.00	2901600.00	397.24	394.93	2.31	0.60
97	228300.00	2901700.00	397.00	394.84	2.16	0.78
98	228300.00	2901800.00	395.81	393.51	2.30	0.89
99	228300.00	2901900.00	394.73	392.57	2.16	0.82
100	228300.00	2902000.00	393.78	391.63	2.15	0.67
101	228300.00	2902100.00	392.76	390.69	2.07	0.85
102	228300.00	2902200.00	392.09	389.68	2.41	0.54
103	228300.00	2902300.00	390.93	387.61	3.32	9.78
104	228300.00	2902400.00	389.51	386.06	3.45	2.98
105	228300.00	2902500.00	386.91	383.73	3.18	3.66
106	228400.00	2901100.00	391.00	387.61	3.39	1.51
107	228400.00	2901200.00	393.58	390.25	3.33	12.89
108	228400.00	2901300.00	395.40	393.08	2.32	0.77
109	228400.00	2901400.00	396.10	394.00	2.10	0.92
110	228400.00	2901500.00	396.95	394.85	2.10	0.99
111	228400.00	2901600.00	397.73	395.68	2.05	0.95
112	228400.00	2901700.00	398.30	396.06	2.24	0.52
113	228400.00	2901800.00	396.84	394.51	2.33	0.81
114	228400.00	2901900.00	395.38	393.02	2.36	0.59
115	228400.00	2902000.00	393.52	391.40	2.12	1.12
116	228400.00	2902100.00	392.77	390.37	2.40	0.68
117	228400.00	2902200.00	391.51	389.48	2.03	0.63
118	228400.00	2902300.00	390.43	387.07	3.36	14.60
119	228400.00	2902400.00	388.74	385.63	3.11	1.78
120	228500.00	2901100.00	389.40	386.22	3.18	2.01
121	228500.00	2901200.00	392.78	389.74	3.04	6.23
122	228500.00	2901300.00	395.60	393.30	2.30	0.64
123	228500.00	2901400.00	397.03	394.78	2.25	0.50
124	228500.00	2901500.00	398.00	395.55	2.45	0.51
125	228500.00	2901600.00	398.57	396.36	2.21	0.76
126	228500.00	2901700.00	399.44	397.33	2.11	0.61
127	228500.00	2901800.00	398.15	395.99	2.16	0.72
128	228500.00	2901900.00	396.62	394.31	2.31	0.70
129	228500.00	2902000.00	394.91	392.75	2.16	1.14
130	228500.00	2902100.00	393.33	391.17	2.16	1.02
131	228500.00	2902200.00	391.63	388.55	3.08	1.88
132	228500.00	2902300.00	389.97	386.70	3.27	6.63
133	228500.00	2902400.00	387.69	384.37	3.32	1.80
134	228600.00	2901200.00	392.52	389.11	3.41	1.61
135	228600.00	2901300.00	394.96	391.89	3.07	7.24
136	228600.00	2901400.00	397.21	394.77	2.44	0.52
137	228600.00	2901500.00	398.59	396.37	2.22	0.58
138	228600.00	2901600.00	399.49	397.22	2.27	0.83
139	228600.00	2901700.00	400.20	398.15	2.05	0.87
140	228600.00	2901800.00	399.41	397.23	2.18	0.82
141	228600.00	2901900.00	397.77	395.67	2.10	1.09
142	228600.00	2902000.00	396.49	394.12	2.37	0.84
143	228600.00	2902100.00	394.89	392.62	2.27	0.76
144	228600.00	2902200.00	393.41	389.90	3.51	3.78
145	228600.00	2902300.00	390.75	387.67	3.08	2.31
146	228700.00	2901200.00	391.46	388.43	3.03	1.51
147	228700.00	2901300.00	394.43	391.16	3.27	10.55
148	228700.00	2901400.00	396.82	394.51	2.31	1.67
149	228700.00	2901500.00	398.61	396.54	2.07	0.94
150	228700.00	2901600.00	400.11	397.99	2.12	3.06
151	228700.00	2901700.00	400.88	398.72	2.16	4.07
152	228700.00	2901800.00	400.99	398.56	2.43	3.64
153	228700.00	2901900.00	399.40	397.05	2.35	4.37
154	228700.00	2902000.00	397.96	395.49	2.47	3.26
155	228700.00	2902100.00	396.13	394.06	2.07	0.84
156	228700.00	2902200.00	394.45	391.19	3.26	5.69

POINT NO.	NORTHING	EASTING	TOP OF CLAY	TOP OF SUBGRADE	CLAY THICKNESS	PROT. COVER
157	228700.00	2902300.00	391.41	388.19	3.22	1.64
158	228800.00	2901300.00	393.71	390.58	3.13	2.29
159	228800.00	2901400.00	396.33	394.26	2.07	0.91
160	228800.00	2901500.00	398.19	396.12	2.07	1.99
161	228800.00	2901600.00	400.40	398.00	2.40	3.88
162	228800.00	2901700.00	401.89	399.59	2.30	3.63
163	228800.00	2901800.00	402.42	400.05	2.37	3.23
164	228800.00	2901900.00	400.59	398.48	2.11	3.90
165	228800.00	2902000.00	399.26	396.87	2.39	3.42
166	228800.00	2902100.00	397.16	394.88	2.28	1.79
167	228800.00	2902200.00	394.98	391.66	3.32	8.04
168	228800.00	2902300.00	391.88	388.68	3.20	1.91
169	228900.00	2901300.00	393.06	389.84	3.22	1.95
170	228900.00	2901400.00	395.74	392.63	3.11	10.27
171	228900.00	2901500.00	398.13	395.72	2.41	2.33
172	228900.00	2901600.00	400.02	397.72	2.30	4.34
173	228900.00	2901700.00	402.07	399.75	2.32	3.89
174	228900.00	2901800.00	403.35	401.12	2.23	3.15
175	228900.00	2901900.00	402.10	399.80	2.30	3.64
176	228900.00	2902000.00	399.90	397.63	2.27	4.74
177	228900.00	2902100.00	397.87	395.65	2.22	3.44
178	228900.00	2902200.00	395.43	392.34	3.09	10.84
179	228900.00	2902300.00	392.43	389.37	3.06	1.67
180	229000.00	2901300.00	391.68	388.65	3.03	2.01
181	229000.00	2901400.00	395.38	391.97	3.41	6.45
182	229000.00	2901500.00	397.73	395.36	2.37	2.25
183	229000.00	2901600.00	399.71	397.27	2.44	3.48
184	229000.00	2901700.00	401.28	399.22	2.06	4.32
185	229000.00	2901800.00	403.34	400.96	2.38	2.37
186	229000.00	2901900.00	402.33	400.13	2.20	3.03
187	229000.00	2902000.00	400.55	398.20	2.35	3.39
188	229000.00	2902100.00	398.31	396.21	2.10	2.63
189	229000.00	2902200.00	396.24	393.16	3.08	1.89
190	229000.00	2902300.00	393.21	390.07	3.14	1.69
191	229100.00	2901400.00	394.19	390.82	3.37	1.55
192	229100.00	2901500.00	396.84	393.55	3.29	1.99
193	229100.00	2901600.00	398.81	396.36	2.45	2.22
194	229100.00	2901700.00	400.39	398.31	2.08	3.84
195	229100.00	2901800.00	401.29	398.99	2.30	1.95
196	229100.00	2901900.00	400.28	398.05	2.23	3.38
197	229100.00	2902000.00	399.43	397.09	2.34	2.93
198	229100.00	2902100.00	398.38	396.25	2.13	2.18
199	229100.00	2902200.00	396.78	394.61	2.17	0.93
200	229100.00	2902300.00	394.05	390.97	3.08	6.93
201	229100.00	2902400.00	391.02	387.69	3.33	1.56
202	229200.00	2901400.00	393.05	389.71	3.34	2.76
203	229200.00	2901500.00	395.45	392.30	3.15	10.78
204	229200.00	2901600.00	397.85	395.56	2.29	1.54
205	229200.00	2901700.00	399.60	397.42	2.18	2.92
206	229200.00	2901800.00	399.19	396.98	2.21	3.30
207	229200.00	2901900.00	398.14	396.07	2.07	7.68
208	229200.00	2902000.00	397.23	395.09	2.14	1.66
209	229200.00	2902100.00	396.25	394.23	2.02	0.58
210	229200.00	2902200.00	395.40	392.04	3.36	10.53
211	229200.00	2902300.00	394.09	390.83	3.26	6.15
212	229200.00	2902400.00	392.15	388.86	3.29	1.54
213	229300.00	2901400.00	390.92	387.85	3.07	2.06
214	229300.00	2901500.00	394.44	391.11	3.33	6.98
215	229300.00	2901600.00	396.85	394.68	2.17	0.93
216	229300.00	2901700.00	398.05	395.73	2.32	0.56
217	229300.00	2901800.00	397.00	394.79	2.21	1.39
218	229300.00	2901900.00	396.09	393.03	3.06	3.12
219	229300.00	2902000.00	394.76	391.65	3.11	11.53
220	229300.00	2902100.00	393.78	390.47	3.31	2.66
221	229300.00	2902200.00	392.49	389.12	3.37	1.52
222	229300.00	2902300.00	390.98	387.63	3.35	1.60
223	229400.00	2901500.00	393.00	389.88	3.12	1.77
224	229400.00	2901600.00	395.89	392.53	3.36	9.05
225	229400.00	2901700.00	395.83	392.65	3.18	7.95
226	229400.00	2901800.00	394.63	391.32	3.31	7.76
227	229400.00	2901900.00	393.23	390.12	3.11	1.77
228	229400.00	2902000.00	391.97	388.76	3.21	1.63
229	229400.00	2902100.00	389.16	386.06	3.10	2.27
230	229500.00	2901500.00	391.79	388.47	3.32	1.71
231	229500.00	2901600.00	394.26	391.00	3.26	3.69
232	229500.00	2901700.00	393.14	389.71	3.43	1.71
233	229500.00	2901800.00	391.40	388.27	3.13	1.63
234	229600.00	2901600.00	390.90	387.58	3.32	1.51

PLTDRVER: 11X17LASER_BW_PDF.plt
PENTABLE: REISSUE 139-E001-304.tbl
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DATE: 2/10/2011
TIME: 10:24:23 AM
USER: rcox

Luminant

HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	
PROJECT NUMBER	53925

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

PERMANENT DISPOSAL POND #5
PHASE I

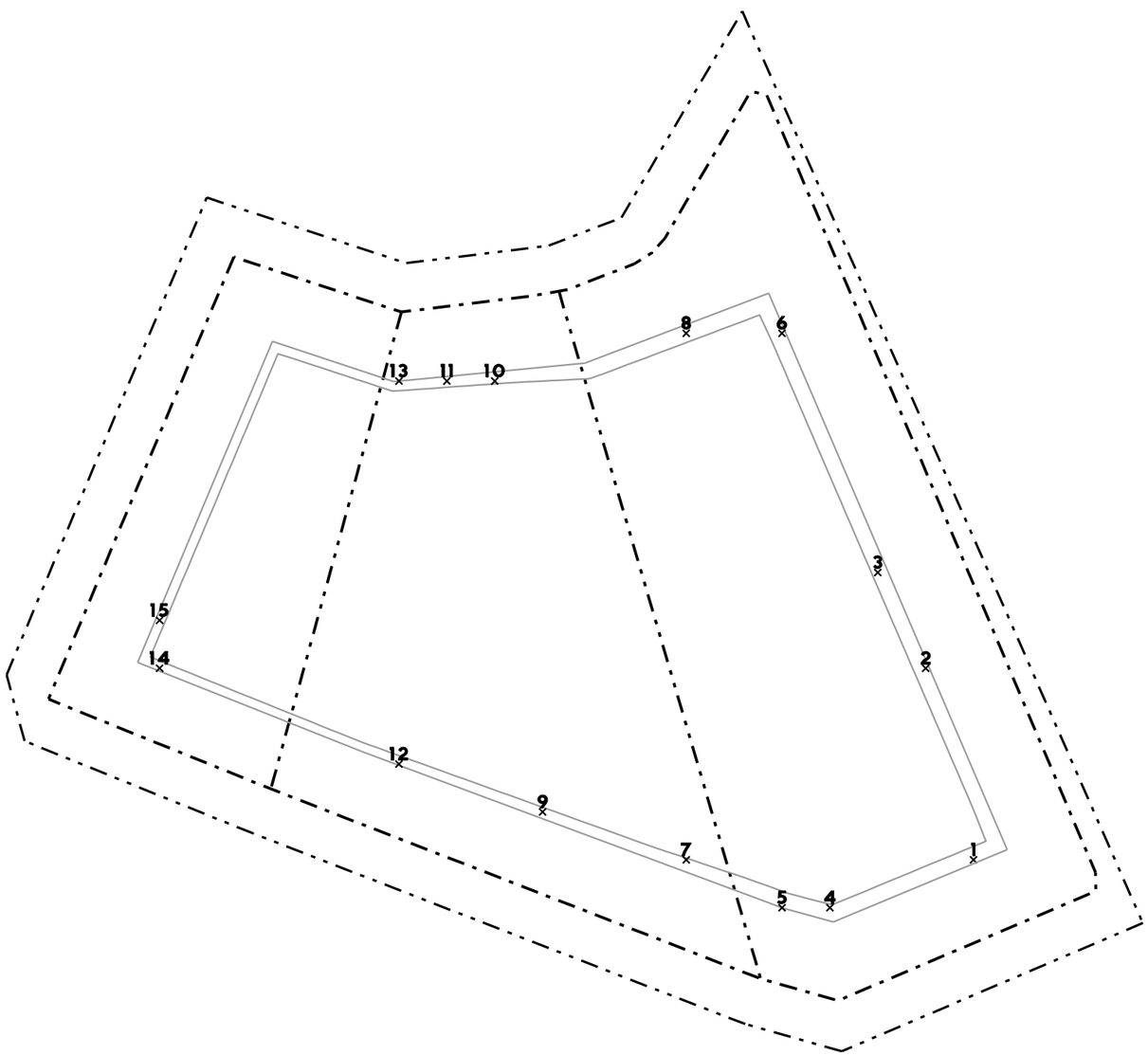
CLAY LINER VERIFICATION (FLOOR)

139-E001-305

FILENAME	ML-CLV01A.dgn
SCALE	

SHEET 2

POINT NO.	NORTHING	EASTING	TOP OF CLAY	BOTTOM OF CLAY	CLAY THICKNESS	PROT. COVER
1	227700.00	2901200.00	403.36	400.28	3.08	0.58
2	227800.00	2901600.00	403.59	400.38	3.21	0.70
3	227900.00	2901800.00	399.16	396.00	3.16	0.68
4	228000.00	2901100.00	396.99	393.89	3.10	0.62
5	228100.00	2901100.00	406.04	402.80	3.24	0.66
6	228100.00	2902300.00	403.56	400.37	3.19	0.72
7	228300.00	2901200.00	397.91	394.77	3.14	0.74
8	228300.00	2902300.00	400.42	397.25	3.17	0.69
9	228600.00	2901300.00	401.42	398.35	3.07	0.67
10	228700.00	2902200.00	399.52	396.39	3.13	0.71
11	228800.00	2902200.00	402.74	399.59	3.15	0.70
12	228900.00	2901400.00	405.02	401.94	3.08	0.62
13	228900.00	2902200.00	406.04	402.80	3.24	0.63
14	229400.00	2901600.00	404.23	401.02	3.21	0.66
15	229400.00	2901700.00	403.17	399.98	3.19	0.68



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0 200 400
SCALE IN FEET

LEGEND

- DEED RECORD BOUNDARY
- LIMITS OF FILL
- LIMITS OF 3' BERM LINER

NOTE: CONTOURS BASED ON AERIAL TOPOGRAPHY PROVIDED BY LUMINANT ON 2/19/07.

PLTDRVER: 11X17LASER_BW_PDF.plt
PENTABLE: REISSUE 139-E001-304.tbl
FILENAME: ML-CLV02.dgn
FILE: Luminant_Generation_Company_LLC/7XU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/139-E001-305/ETTL
DATE: 2/10/2011
TIME: 10:24:41 AM
USER: rcox

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070

Texas P.E. Firm
Firm Registration No.F-754

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	D.VOGT
CIVIL ENGINEER	D.VOGT
CHECKED BY	
DESIGNED	B.COX
DRAWN BY	B.COX
QA/QC	
PROJECT NUMBER	53925

THIS RECORD DRAWING IS A COMPILATION OF THE SEALED ENGINEERING DRAWINGS FOR THIS PROJECT, MODIFIED BY ADDENDA AND CHANGE ORDERS. INFORMATION FURNISHED BY THE CONTRACTOR OR OTHERS, NOT ASSOCIATED WITH THE DESIGN ENGINEER, CANNOT BE VERIFIED FOR ACCURACY OR COMPLETENESS. THE ORIGINAL SEALED DRAWINGS ARE ON FILE AT THE OFFICES OF HDR ENGINEERING INC.

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

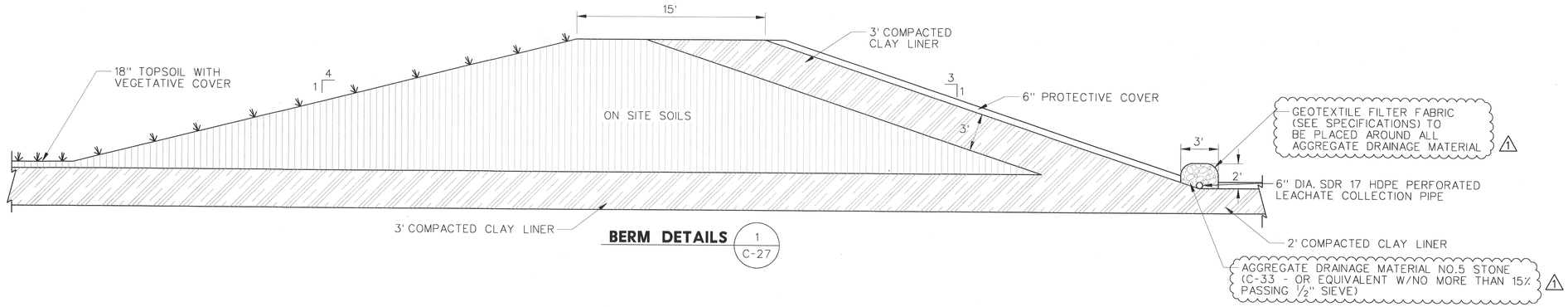
PERMANENT DISPOSAL POND #5
PHASE I

CLAY LINER VERIFICATION (BERM)

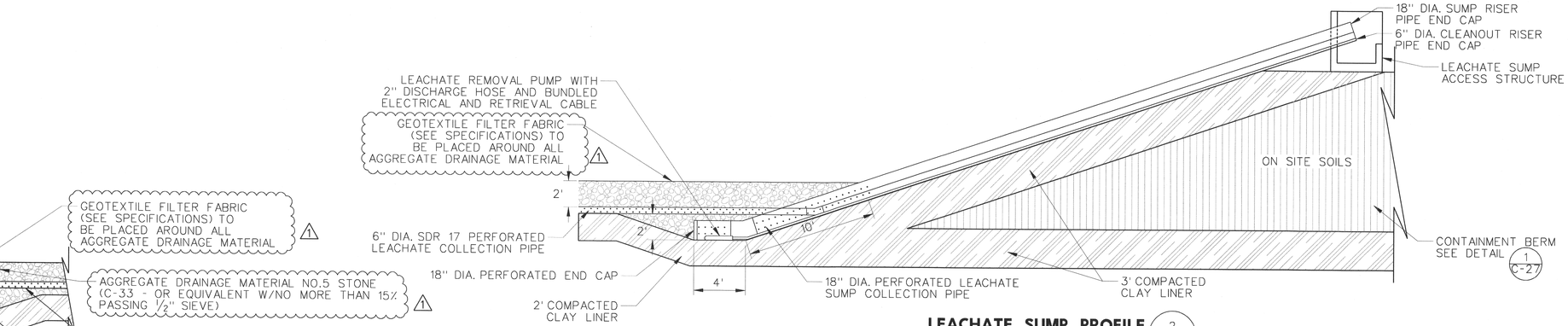
139-E001-305

FILENAME	ML-CLV02.dgn
SCALE	

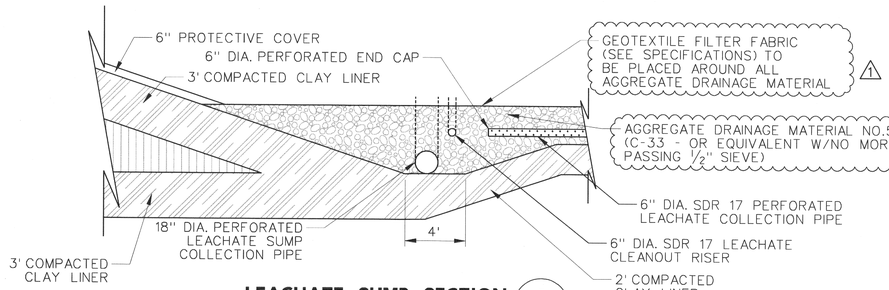
SHEET 3



BERM DETAILS 1 / C-27



LEACHATE SUMP PROFILE 2 / C-27



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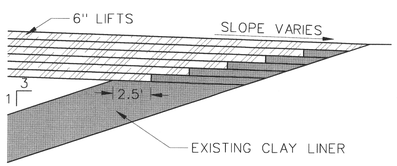
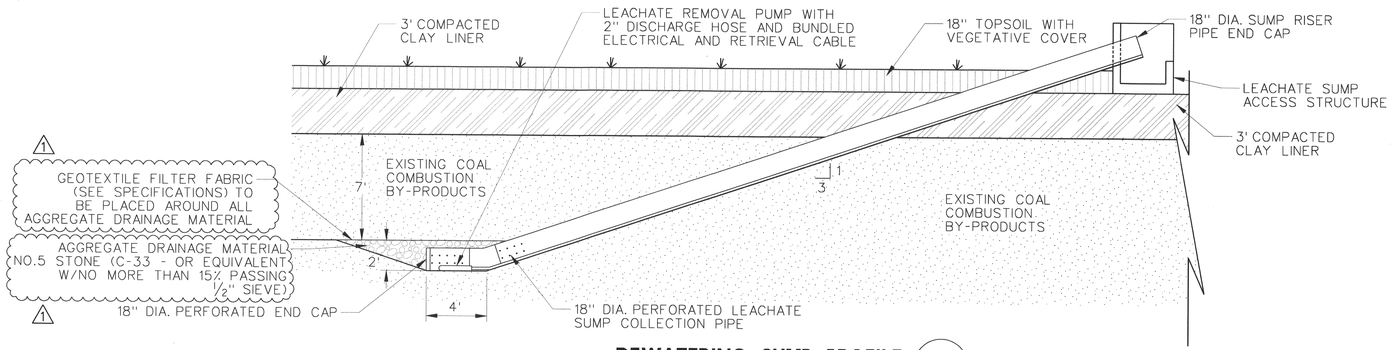


LINER TIE-IN PDPS #2 & 3 TYPICAL 5 / C-27



DEWATERING SUMP PROFILE 4 / C-27

PLTDRVER: LASER.plt
PENTABLE: 0000005392S.tbl
FILENAME: ML_DET01-P3.dgn
USER: rcox
FILE: TXU_Business_Service_Co/TXU_ML_SES_PDP_Closure/13.00_Project_Cad/Const Sheet Files/PDP 3 ONLY
DATE: 10/1/2009
TIME: 4:37:07 PM

Luminant

HDR
HDR ENGINEERING, INC.
4500 W. Eldorado Parkway
Suite 3500
McKinney, Texas 75070
Texas P.E. Firm
Firm Registration No.754

ISSUE	DATE	DESCRIPTION
2	9/09	REVISION NO.1 1
1	9/09	ISSUED FOR BID

PROJECT MANAGER	D. VOGT
CIVIL ENGINEER	D. VOGT
CHECKED BY	
DESIGNED	B. COX
DRAWN BY	B. COX
QA/QC	M. ODEN
PROJECT NUMBER	53925

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER
10/1/09

MARTIN LAKE STEAM ELECTRIC STATION
RUSK COUNTY, TEXAS

VERTICAL EXPANSION OF PDP # 3 PHASE I

MISCELLANEOUS DETAILS

139-E001-303 C-27

FILENAME	ML_DET01-P3.dgn
SCALE	N.T.S.
SHEET	C-27

Section 9

Pickett, mobilization, staging area

Pickett, placing first lift clay liner, NW PDP 1-2

Pickett, conditioned lift 1, PDP 1-2

Pickett, de-mobilization, staging area

Rodman, mobilization, staging area

Rodman, establishing sub-grade and perimeter, PDP 3

Rodman, establishing sub-grade and perimeter, PDP 2-3

Rodman, processing, PDP1-3

Rodman, liner compaction, Eastern PDP 1-3

Rodman, liner placement and processing, PDP 1-2

Rodman, berm structural fill processing, Western PDP 1-2

MSI, mobilization, staging area

MSI, liner grading and berm processing, SE PDP 2-3

MSI, protective cover placement, Eastern PDP 2

MSI, clay liner tie-in, PDP 1

MSI, berm penetration and compaction, PDP 3

MSI, exterior berm grading and clay liner tie in, SE PDP 2-3

MSI, clay liner tie in compaction, NW PDP 1

MSI, interior berm structural fill grading, PDP 3

MSI, interior slope liner processing, PDP 3

MSI, interior slope liner processing, PDP 1-2

MSI, interior slope liner placement and processing, PDP 1

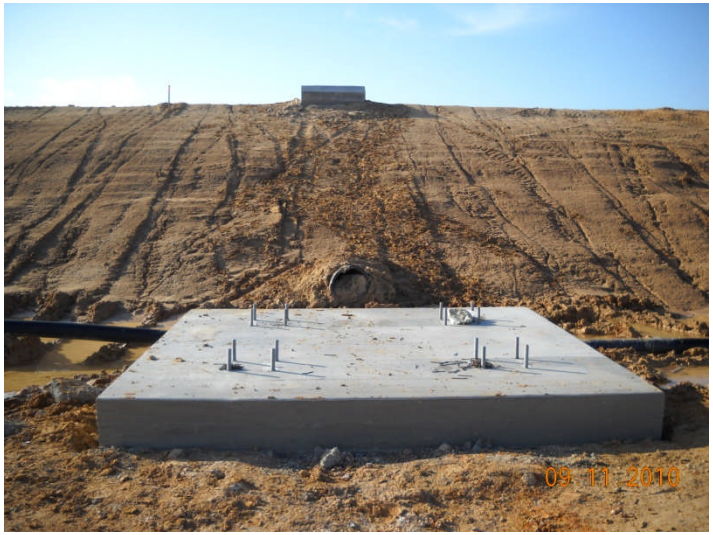
MSI, toe drain installation, PDP 3

MSI, leachate sump preparation, PDP 1

MSI, slurry channel preparation, PDP 1

MSI, complete slurry channel, PDP 1

MSI, decant pads preparation, PDP 3



MSI, complete decant pads, PDP 3

MSI, completed leachate sump, NE PDP 1

MSI, interior slope protective cover, SE PDP 3

MSI, access road construction, NW PDP 1

MSI, access road construction, NW PDP 1

MSI, final grading, NE PDP 1 looking South

MSI, final grading, NE PDP 1 looking West

MSI, final grading, SW PDP 3 looking North

MSI, final grading, SW PDP 3 looking East

Nuclear density and moisture testing

Permeability sampling

Section 10

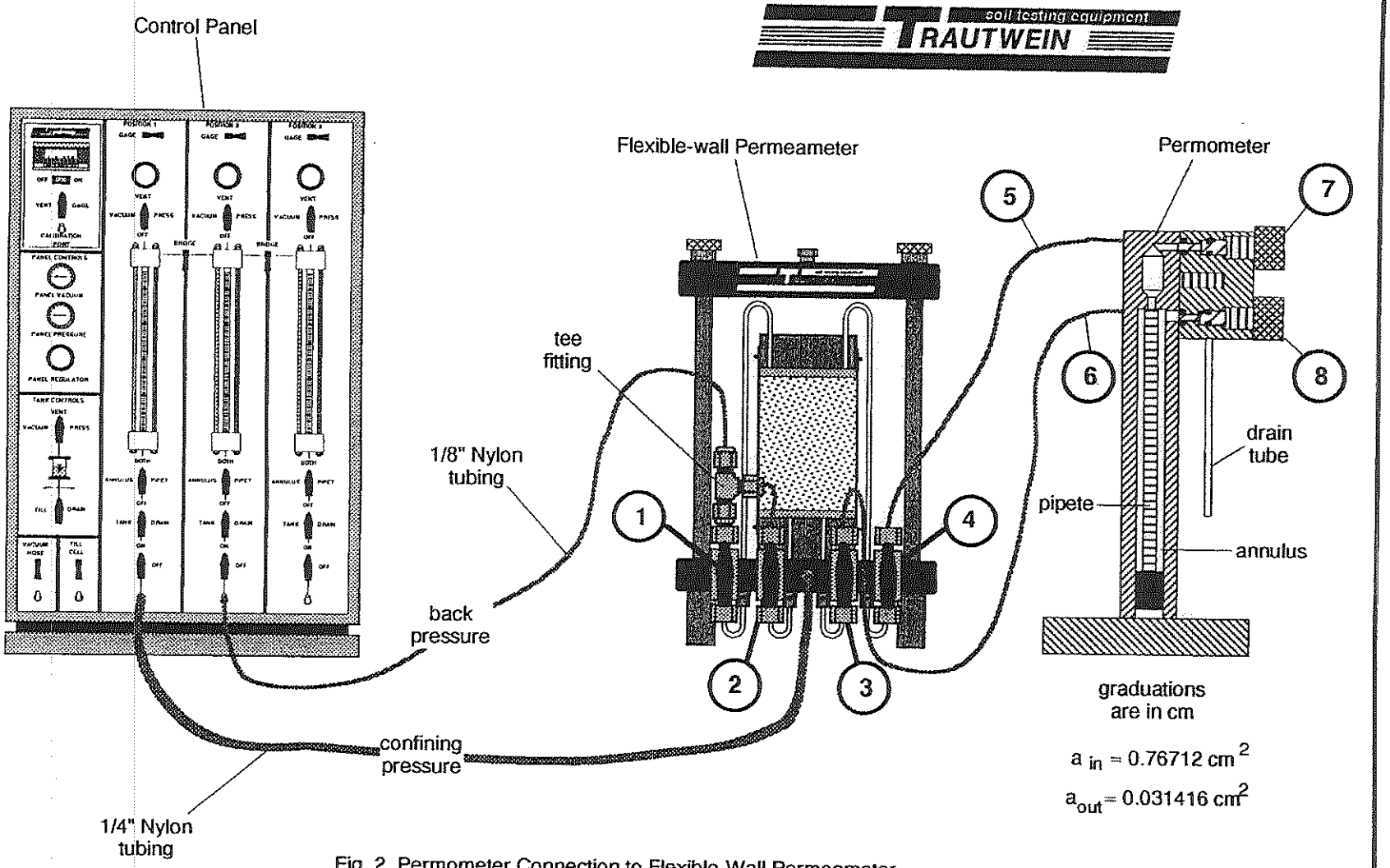
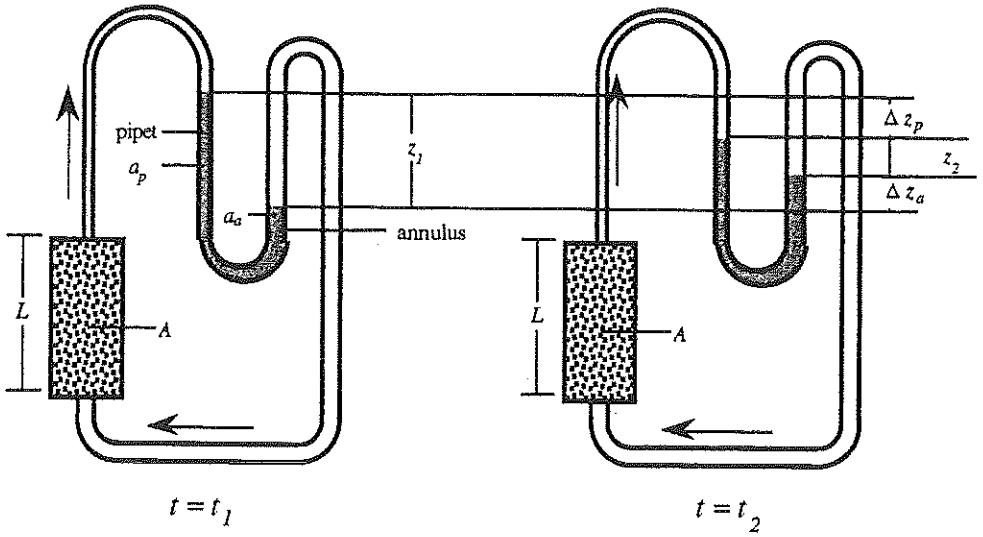


Fig. 2 Permometer Connection to Flexible-Wall Permeameter

APPENDIX

CALCULATION OF HYDRAULIC CONDUCTIVITY FROM A CONSTANT VOLUME TEST

A schematic of a constant volume hydraulic conductivity test is depicted below. The permometer is a well type manometer however, a u-tube manometer is depicted for ease in illustration. In the schematic below, the left side of the manometer represents the inner pipet, the right side represents the annulus.



where:

L	=	length of specimen (cm)
A	=	area of specimen (cm^2)
a_a	=	area of annulus (cm^2)
a_p	=	area of center pipet (cm^2)
z_1	=	height difference in mercury menisci at time t_1 (cm)
z_2	=	height difference in mercury menisci at time t_2 (cm) ($t_2 > t_1$)

Permeation of the specimen begins by displacing the mercury menisci by a distance z_1 at time t_1. Flow results as the menisci return to an equilibrium level. For the example shown above, flow is up through the sample. The bottom of the sample is the head side and the top of the sample is the tail side. As flow occurs, the distance between the mercury menisci decreases so that at t_2, that distance has been reduced to z_2.

Darcy's law requires that

$$\frac{dQ}{dt} = k\frac{h}{L}A \qquad (1)$$

where:

Q = quantity of flow (ml)
k = hydraulic conductivity (cm/s)
h = head loss across specimen (cm)
L = length of specimen (cm)
A = area of specimen (cm^2)

Integrating with respect to t and rearranging in terms of k,

$$k = \frac{LdQ}{Ath} \tag{2}$$

where:

t = $t_2 - t_1$ (s)

For a differential time dt, the differential head loss, dh, is

$$dh = \left(\Delta z_p + \Delta z_a\right)\delta_{Hg} - \left(\Delta z_p + \Delta z_a\right)\delta_w \tag{3}$$

or

$$dh = \left(\Delta z_p + \Delta z_a\right)\left(\delta_{Hg} - \delta_w\right) \tag{4}$$

where:

δ_{Hg} = specific gravity of mercury
δ_w = specific gravity of water

If the specimen-manometer loop is saturated, then continuity of flow requires

$$\Delta z_p + \Delta z_a = \frac{dQ}{a_a} + \frac{dQ}{a_p} \tag{5}$$

or

$$\Delta z_p + \Delta z_a = dQ\left(\frac{a_a + a_p}{a_a a_p}\right) \tag{6}$$

Substituting (6) into (4) and rearranging

$$dQ = \frac{\left(a_a a_p\right)dh}{\left(a_a + a_p\right)\left(\delta_{Hg} - \delta_w\right)} \tag{7}$$

Substituting (7) into (2)

$$k = \frac{\left(a_a a_p\right)L}{\left(a_a + a_p\right)At\left(\delta_{Hg} - \delta_w\right)}\frac{dh}{h} \tag{8}$$

Integrating with respect to h

$$k = \frac{(a_a\, a_p)L}{(a_a + a_p)At(\delta_{Hg} - \delta_w)} \ln \frac{h_1}{h_2} \tag{9}$$

where:

$$h_1 = z_1(\delta_{Hg} - \delta_w) \tag{10}$$

and

$$h_2 = z_2(\delta_{Hg} - \delta_w) \tag{11}$$

The permometer has been constructed such that a_a = 0.76712 cm^2 and a_p. = 0.031416 cm^2. For any given amount of flow, the resolution of meniscus elevation change is about 24 times as great on the tail side of the permometer. Therefore, readings are made on the tail side and h is defined in terms of z_a and Δz_p.

Note that

$$z_2 = z_1 - (\Delta z_p + \Delta z_a) \tag{12}$$

and

$$\Delta z_a = \Delta z_p \frac{a_p}{a_a} \tag{13}$$

Substituting (13) into (12) yields

$$z_2 = z_1 - \left(\Delta z_p + \Delta z_p \frac{a_p}{a_a}\right) \tag{14}$$

rearranging (14)

$$z_2 = z_1 - \Delta z_p\left(1 + \frac{a_p}{a_a}\right) \tag{15}$$

Finally, substituting (15) into (11) yields

$$h_2 = \left[z_1 - \Delta z_p\left(1 + \frac{a_p}{a_a}\right)\right](\delta_{Hg} - \delta_w) \tag{16}$$

The equation for k becomes

$$k = \frac{(a_a\, a_p)L}{(a_a + a_p)At(\delta_{Hg} - \delta_w)} \ln \frac{z_1(\delta_{Hg} - \delta_w)}{\left[z_1 - \Delta z_p\left(1 + \frac{a_p}{a_a}\right)\right](\delta_{Hg} - \delta_w)} \tag{17}$$

For a given trial, (i.e. readings made between resetting of menisci) (17) can be simplified by defining the following constants

Manometer constants: $$M_1 = \frac{a_a\, a_p}{a_a + a_p} \tag{18}$$

and

$$M_2 = 1 + \frac{a_p}{a_a} \tag{19}$$

Sample constant: $$S = \frac{L}{A} \tag{20}$$

Specific Gravity constant: $$\delta = \left(\delta_{Hg} - \delta_w\right) \tag{21}$$

(note that this term is temperature dependent)

Test constant: $$C = \frac{M_1 S}{\delta} \tag{22}$$

Trial constant: $$T = \frac{M_2}{z_1} \tag{23}$$

Substituting these constants into (17) yields

$$k = \frac{C}{t} \ln \frac{z_1 \delta}{\left[z_1 - \Delta z_p M_2\right]\delta} \tag{24}$$

Simplifying

$$k = \frac{C}{t} \ln \frac{1}{\left[1 - \Delta z_p \frac{M_2}{z_1}\right]} \tag{25}$$

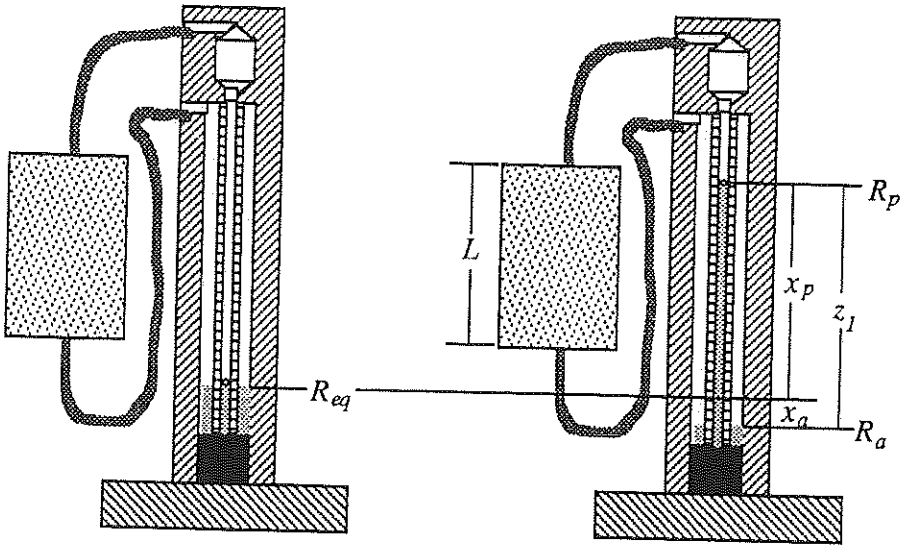
Equation (25) can be reduced further to

$$\boxed{k = -\frac{C}{t} \ln\left(1 - \Delta z_p\, T\right)} \tag{26}$$

Note that when using equation (26), only the terms t and Δz_p change for each reading. This is the case only if Δz_p is determined using the initial height of the mercury column at the beginning of the trial and hence, z_1 and T remain constant. If Δz_p is determined using the height of the mercury column corresponding to the last reading, then a new z_1 and T would need to be used.

EXAMPLE CALCULATION OF INITIAL MERCURY COLUMN HEIGHT FOR A GIVEN GRADIENT

The following is an example of the procedure for calculating the initial mercury column height in the pipet for a given gradient and specimen height.



The above figure depicts the terms that will be used to derive an equation for R_p in which the only variables are gradient, i, and specimen length, L.

To start, the gradient is defined as:

$$i = \frac{h}{L} \tag{27}$$

where:

h = head loss across specimen (cm)
L = length of specimen (cm)

and

$$h = z_1\left(\delta_{Hg} - \delta_w\right) \tag{28}$$

δ_{Hg} = specific gravity of mercury
δ_w = specific gravity of water

rearranging (28) and substituting in (27) yields:

$$z_1 = \frac{i\,L}{\left(\delta_{Hg} - \delta_w\right)} \tag{29}$$

Also,

$$z_1 = R_p - R_a \tag{30}$$

where:

R_p = mercury level reading in pipet corresponding to z_1 (cm)
R_a = mercury level reading in annulus corresponding z_1 (cm)

And,

$$z_1 = x_p + x_a \tag{31}$$

where:

$$x_p = R_p - R_{eq} \text{ (cm)} \tag{32}$$

$$x_a = R_{eq} - R_a \text{ (cm)} \tag{33}$$

$$R_{eq} = \text{equilibrium level of mercury menisci (cm)} \tag{34}$$

Note that,

$$x_a = \frac{a_p}{a_a} x_p \tag{35}$$

substituting (35) into (31)and rearranging

$$z_1 = x_a\left(1 + \frac{a_p}{a_a}\right) \qquad \frac{a_a}{a_p} \tag{36}$$

Rearranging (32) yields

$$R_p = R_{eq} + x_p \tag{37}$$

Rearranging (36) and substituting in (37) yields

$$R_p = R_{eq} + \frac{z_1}{\left(1 + \frac{a_p}{a_a}\right)} \tag{38}$$

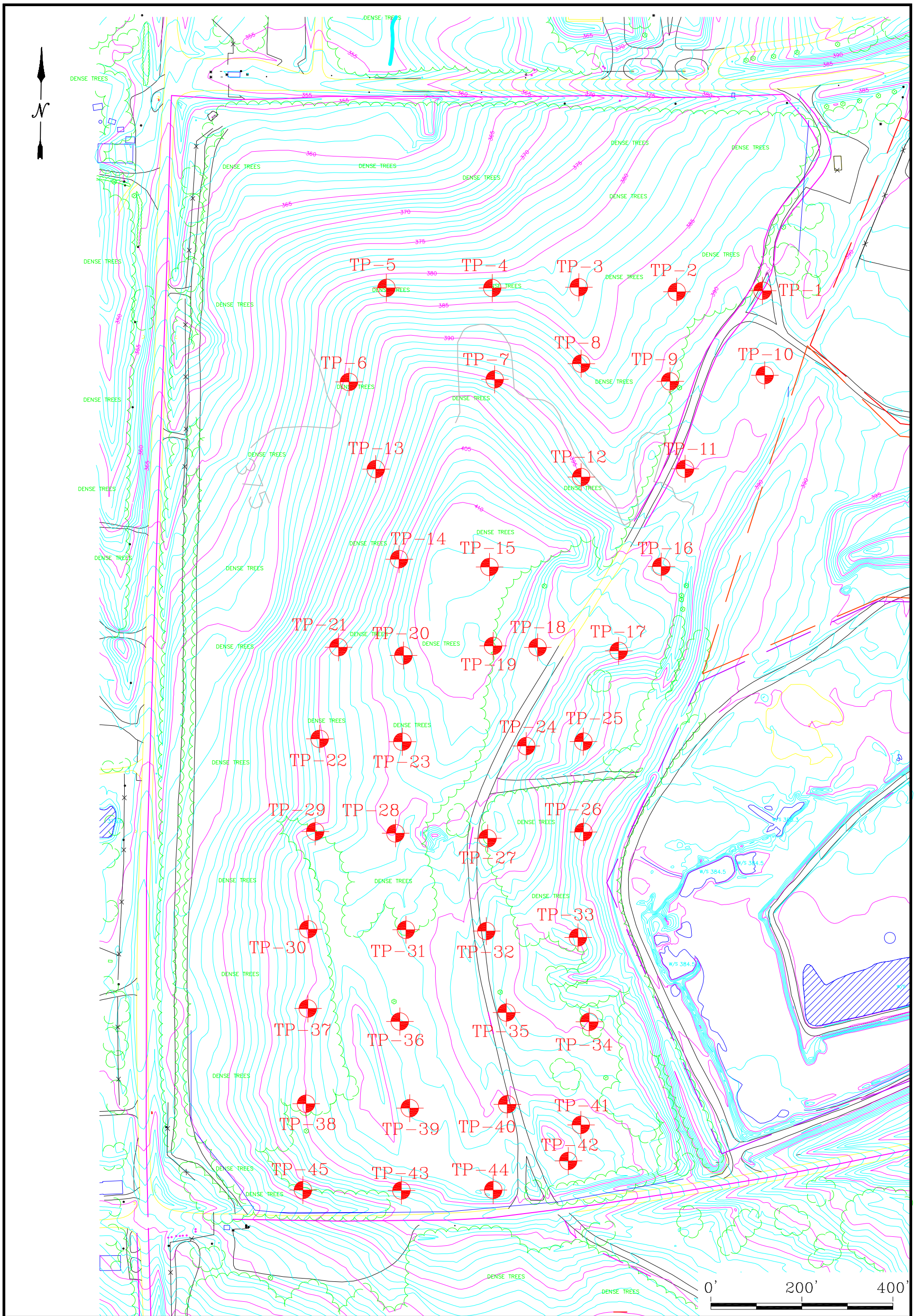
Finally substituting (29) into (38)

$$R_p = R_{eq} + \frac{iL}{\left(1 + \frac{a_p}{a_a}\right)\left(\delta_{Hg} - \delta_w\right)} \tag{39}$$

Substituting terms defined previously for k yields:

$$\boxed{R_p = R_{eq} + \frac{iL}{M_2 \delta}} \tag{40}$$

Section 11



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(903) 595-4421

LUMINANT
MARTIN LAKE PDP
TATUM, TEXAS

PDP EXISTING BORROW AREA –
TEST PIT LOCATIONS – AUGUST 2009

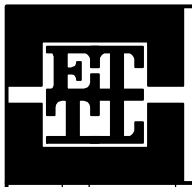
JOB NO.: L211-09

DATE: OCT. 2009

SCALE: N.T.S.

APPROVED BY:

DRAWN BY:
K.C.R.



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-1

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 391.28'

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. #)
0	B	SM		SILTY SAND(SM) tan												
		SC		CLAYEY SAND(SC) red and tan								35	14	21	44	+40 Sieve =5%, +4 Sieve =1%
5	B															
												34	16	18	30	+40 Sieve =4%, +4 Sieve =3%
10	B															
				--red, tan, and brown												
15	B															
	B	CH		SANDY FAT CLAY(CH) tan, gray, and red								53	19	34	64	+40 Sieve =6%, +4 Sieve =2%
				Bottom of Boring @ 17.5'												

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 32.26272°, W 94.58453°

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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-2

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 383.98'

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	WATER LEVEL	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. #)
0	B	CL	SANDY LEAN CLAY(CL) red and tan													
		CH	FAT CLAY(CH) red and gray									65	21	44	69	+40 Sieve =8%, +4 Sieve =1%
5	B	CL	SANDY LEAN CLAY(CL) reddish tan and gray									66	20	46	90	+40 Sieve =4%, +4 Sieve =3%
												37	22	15	68	+40 Sieve =4%, +4 Sieve =1%
10	B	CL	LEAN CLAY WITH SAND(CL) tan									36	17	19	83	+40 Sieve =4%, +4 Sieve =2%
15	B	SC	CLAYEY SAND(SC) tan									32	19	13	42	+40 Sieve =0%, +4 Sieve =0%
			Bottom of Boring @ 17.5'													

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 32.26273°, W 94.58514°

LOG OF BORING TP-3

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(903) 595-4421

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 378.62'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION
0	B	SC SM		SILTY CLAYEY SAND(SC-SM) tan and gray
	B			
5	B	CL		LEAN CLAY WITH SAND(CL) tan, gray, and red
	B	CL		SANDY LEAN CLAY(CL) tan
10	B			
15				Bottom of Boring @ 16'

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. #)
	17	13	4	46	+40 Sieve =1%, +4 Sieve =0%
	42	14	28	70	+40 Sieve =3%, +4 Sieve =1%
	37	22	15	55	+40 Sieve =1%, +4 Sieve =0%

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 32.26277°, W 94.58583°

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LOG OF BORING TP-4

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 377.86'

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. #)
0	B	SM		SILTY SAND(SM) tan												
		CL		SANDY LEAN CLAY(CL) red, tan, and gray								32	14	18	63	+40 Sieve =4%, +4 Sieve =1%
	B	CL		LEAN CLAY(CL) gray and tan								44	26	18	91	+40 Sieve =2%, +4 Sieve =1%
5																
		CL		LEAN CLAY WITH SAND(CL) tan and gray												
	B											48	25	23	76	+40 Sieve =7%, +4 Sieve =2%
10		SM		SILTY SAND(SM) tan												
	B															
15																
				Bottom of Boring @ 16.5'												

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 32.26278°, W 94.58645°

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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-5

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 372.64'

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. #)
0		SM		SILTY SAND(SM) tan												
		CH		FAT CLAY(CH) tan and gray												
	B											53	24	29	89	+40 Sieve =2%
		CH		FAT CLAY WITH SAND(CH) gray, tan, and red								53	25	28	82	+40 Sieve =9%, +4 Sieve =2%
5		CL		LEAN CLAY WITH SAND(CL) gray and tan								49	25	24	84	+40 Sieve =3%, +4 Sieve =0%
	B															
10		CL		SANDY LEAN CLAY(CL) brown and gray								39	24	15	55	+40 Sieve =6%, +4 Sieve =1%
	B															
15				Bottom of Boring @ 16.5'												

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 32.26280°, W 94.58720°

LOG OF BORING TP-6

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 373.67'

ETTL ENGINEERS & CONSULTANTS

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Tyler, Texas 75702
(903) 595-4421

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	WATER LEVEL
0	B	CH	FAT CLAY(CH) gray and tan	
5	B	SC	CLAYEY SAND(SC) tan	
10			Bottom of Boring @ 14'	

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)

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. #)
					52	25	27	96	+40 Sieve=0%, +4 Sieve=6%
					36	24	12	44	+40 Sieve=0%, +4 Sieve=0%

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 32.26224°, W 94.58748°

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LOG OF BORING TP-7

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 389.33'

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. #)
0		CL		LEAN CLAY(CL) gray and tan												
	B											45	21	24	88	+40 Sieve=2%, +4 Sieve=0%
5				--gray												
10	B											37	22	15	86	+40 Sieve=0%, +4 Sieve=0%
15				Bottom of Boring @ 16'												

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

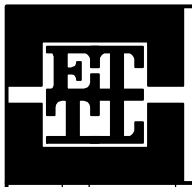
Water Observations:

Key to Abbrevations:

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

Notes:

GPS Coordinates: N 32.26223°, W 94.58645°



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-8

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 380.42'

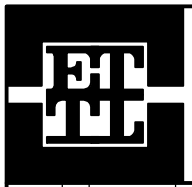
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	CL		LEAN CLAY WITH SAND(CL) red and gray								44	20	24	78	+40 Sieve=4%, +4 Sieve=1%
				--gray								48	24	24	85	+40 Sieve=1%, +4 Sieve=1%
5	B															
		SC		CLAYEY SAND(SC) tan								31	23	8	40	+40 Sieve=1%, +4 Sieve=0%
10	B															
15				Bottom of Boring @ 15'												

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 32.26231°, W 94.58583°



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-9

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 390.66'

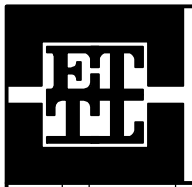
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0		SM		SILTY SAND(SM) tan												
5	B															
		SC		CLAYEY SAND(SC) red, tan, and gray								28	17	11	38	+40 Sieve=0%, +4 Sieve=0%
10	B															
		CL	▽	SANDY LEAN CLAY(CL) gray, tan, and red								39	19	20	67	+40 Sieve=5%, +4 Sieve=1%
15	B															
				Bottom of Boring @ 16.5'												

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

Water Observations: Seepage @ 13' 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 32.26219°, W 94.58520°



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MAIN OFFICE
1717 East Erwin
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(903) 595-4421

LOG OF BORING TP-10

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 393.87'

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. #)
0	B	SM		SILTY SAND(SM) tan												
5	B	SC		CLAYEY SAND(SC) red and tan								23	15	8	32	+40 Sieve=2%, +4 Sieve=6%
10	B			--red, tan, and gray								28	17	11	27	+40 Sieve=6%, +4 Sieve=2%
15	B	SC SM		SILTY CLAYEY SAND(SC-SM) gray, red, tan								24	18	6	42	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 18.5'												

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 32.26221°, W 94.58453°

LOG OF BORING TP-11

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MAIN OFFICE
1717 East Erwin
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(903) 595-4421

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 391.89'

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. #)
0	B	SM		SILTY SAND(SM) tan												
5	B	CL		SANDY LEAN CLAY(CL) tan and gray								36	18	18	53	+40 Sieve=1%, +4 Sieve=1%
10	B		▽	--sand seam @ 10'; saturated												
		CL		LEAN CLAY(CL) gray and tan								35	21	14	86	+40 Sieve=6%, +4 Sieve=2%
15	B			Bottom of Boring @ 15.5'												

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

Water Observations: Seepage @ 10' 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 32.26166°, W 94.58511°

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LOG OF BORING TP-12

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 397.35'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	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	B	CL		LEAN CLAY WITH SAND(CL) gray, red, and tan								40	21	19	78	+40 Sieve=4%, +4 Sieve=2%
5	B	CL		LEAN CLAY(CL) gray and tan								44	22	22	86	+40Sieve=13%, +4 Sieve=9%
10	B			--dark gray; laminated								47	25	22	93	+40 Sieve=2%, +4 Sieve=0%
15	B	CL		SANDY LEAN CLAY(CL) dark gray								40	19	21	56	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 18'												

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 32.26163°, W 94.58585°

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(903) 595-4421

LOG OF BORING TP-13

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 379.56'

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. #)
0		SM		SILTY SAND(SM) tan and gray												
	B															
5												25	22	3	31	+40 Sieve=0%, +4 Sieve=0%
	B															
10																
	B															
15																
	B															
				Bottom of Boring @ 17'												

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 32.26171°, W 94.58731°

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LOG OF BORING TP-14

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 383.90'

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. #)
0	B	SC SM		SILTY CLAYEY SAND(SC-SM) tan												
5	B															
	B											29	22	7	42	+40 Sieve=0%, +4 Sieve=0%
10	B															
15	B			Bottom of Boring @ 16'												

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 32.26116°, W 94.58716°

LOG OF BORING TP-15

ETTL ENGINEERS & CONSULTANTS

MAIN OFFICE
1717 East Erwin
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(903) 595-4421

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 400.4

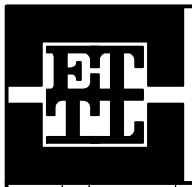
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	CL		LEAN CLAY WITH SAND(CL) tan and gray								37	21	16	85	+40 Sieve=1%, +4 Sieve=0%
5	B	CL		SANDY LEAN CLAY(CL) light gray								30	21	9	69	+40 Sieve=3%, +4 Sieve=2%
10	B	CL		LEAN CLAY(CL) tan and gray								42	21	21	93	+40 Sieve=2%, +4 Sieve=0%
15	B			--dark gray; laminated								46	24	22	99	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 18'												

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 32.26110°, W 94.58652°



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LOG OF BORING TP-16

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/13/09

SURFACE ELEVATION 397.18'

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. #)
0				Trash in Pit												
	B															
5				Bottom of Boring @ 5'												

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 32.26107°, W 94.58530°

LOG OF BORING TP-17

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 401.55'

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. #)
0	B	SM		SILTY SAND(SM) tan												
		CL		SANDY LEAN CLAY(CL) dark brown; with trash in pit												
5	B											38	16	22	67	+40 Sieve=4%, +4 Sieve=1%
		SC		CLAYEY SAND(SC) red and gray												
10	B											27	15	12	42	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 13'												

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 32.26057°, W 94.58562°

LOG OF BORING TP-18

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/13/09

SURFACE ELEVATION 405.44'

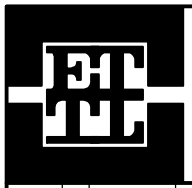
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	SM		SILTY SAND(SM) tan and brown												
5	B	CL		SANDY LEAN CLAY(CL) gray, tan, and red								43	21	22	66	+40 Sieve=1%, +4 Sieve=1%
10	B	ML		SANDY SILT(ML) light gray								22	19	3	50	+40 Sieve=0%, +4 Sieve=0%
	B	CL		SANDY LEAN CLAY(CL) gray and tan								28	18	10	62	+40 Sieve=1%, +4 Sieve=0%
15	B	CL		LEAN CLAY WITH SAND(CL) tan and gray								39	20	19	82	+40 Sieve=2%, +4 Sieve=1%
				Bottom of Boring @ 19'												

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 32.26060°, W 94.58620°



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

LOG OF BORING TP-19

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 404.62'

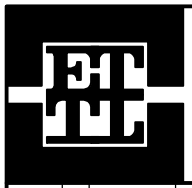
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	SM		SILTY SAND(SM) red and tan												
	B														18	+40 Sieve=1%
5	B	CL		LEAN CLAY WITH SAND(CL) gray and tan								31	19	12	83	+40 Sieve=3%
10	B	CL		SANDY LEAN CLAY(CL) gray, tan, and brown								33	20	13	66	+40 Sieve=1%
15				Bottom of Boring @ 16'												

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 32.26062°, W 94.58651°



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Tyler, Texas 75702
(903) 595-4421

LOG OF BORING TP-20

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 393.75'

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. #)
0		CL		LEAN CLAY(CL) gray and tan												
5	B											38	22	16	87	+40 Sieve=1%
				--dark gray and tan												
10	B											47	24	23	88	+40 Sieve=7%, +4 Sieve=1%
15	B	CL		SANDY LEAN CLAY(CL) dark gray and tan								42	25	17	62	+40 Sieve=14%, +4 Sieve=6%
				Bottom of Boring @ 17'												

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 32.26058°, W 94.58714°

LOG OF BORING TP-21

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 381.54'

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. #)
0		CL		LEAN CLAY(CL) gray and tan								49	24	25	90	+40 Sieve=7%, +4 Sieve=4%
5	B															
		CL		SANDY LEAN CLAY(CL) gray and tan								34	24	10	57	+40 Sieve=1%
10	B	CH		FAT CLAY(CH) dark gray								57	28	29	92	
15	B			Bottom of Boring @ 15.5'												

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 32.26064°, W 94.58761°

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MAIN OFFICE
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LOG OF BORING TP-22

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 381.99'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	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 (Plastic Limit / Moisture Content / Liquid Limit)	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) gray and tan												
	B											33	24	9	56	+40 Sieve=4%, +4 Sieve=1%
5																
		CH		FAT CLAY(CH) gray												
	B		▽													
10				Bottom of Boring @ 10'								61	24	37	96	+40 Sieve=2%

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

Water Observations: Seepage @ 9.5' 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 32.26009°, W 94.58776°

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LOG OF BORING TP-23

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 401.29'

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. #)
0	B	SC		CLAYEY SAND(SC) red and tan								31	15	16	27	+40 Sieve=3%, +4 Sieve=1%
5	B	CL		LEAN CLAY WITH SAND(CL) red and gray								36	21	15	79	+40 Sieve=1%
10	B	CL		LEAN CLAY(CL) tan and gray								42	22	20	87	+40 Sieve=5%, +4 Sieve=1%
15				Bottom of Boring @ 16.5'												

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 32.26006°, W 94.58718°

LOG OF BORING TP-24

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 405.24'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT (LL)	PLASTIC LIMIT (PL)	PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	B	SM		SILTY SAND(SM) tan					21	+40 Sieve=2%, +4 Sieve=1%
5	B	SC		CLAYEY SAND(SC) red and tan		37	16	21	30	+40 Sieve=18%, +4 Sieve=9%
10	B	CL		SANDY LEAN CLAY(CL) red and gray --gray		45	22	23	65	+40 Sieve=10%, +4 Sieve=5%
	B					38	17	21	64	+40 Sieve=1%
15				Bottom of Boring @ 15.5'						

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 32.26001°, W 94.58630°

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MAIN OFFICE
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(903) 595-4421

LOG OF BORING TP-25

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 396.63'

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	WATER LEVEL	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. #)
0	B	SM	SILTY SAND(SM) tan													
		SC	CLAYEY SAND(SC) red and tan													
	B											39	15	24	46	+40 Sieve=4%, +4 Sieve=1%
5		CL	SANDY LEAN CLAY(CL) gray									44	17	27	69	+40 Sieve=2%
	B															
10																
15			Bottom of Boring @ 15.5'													

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

Water Observations:

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

Notes:
GPS Coordinates: N 32.26003°, W 94.58589°

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MAIN OFFICE
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(903) 595-4421

LOG OF BORING TP-26

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 387.99'

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. #)
0	B	SM		SILTY SAND(SM) tan												
				--tan and brown								18	15	3	26	+40 Sieve=1%
5	B		▽													
		SC		CLAYEY SAND(SC) red and gray; saturated												
10	B											27	15	12	34	+40 Sieve=2%
				Bottom of Boring @ 12'												

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

Water Observations: Seepage @ 7' 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 32.25948°, W 94.58591°

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LOG OF BORING TP-27

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 401.67'

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. #)
0	B	SM		SILTY SAND(SM) tan												
5	B	SC		CLAYEY SAND(SC) red and gray								23	12	11	25	+40 Sieve=1%
10	B		▽									25	13	12	27	
				Bottom of Boring @ 14'												

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

Water Observations: Seepage @ 10' 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 32.25946°, W 94.58659°

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LOG OF BORING TP-28

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 399.06'

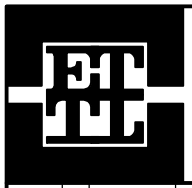
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	SC		CLAYEY SAND(SC) red and gray								28	14	14	28	+40 Sieve=1%
5	B			--tan and gray												
		SM		SILTY SAND(SM) tan								23	14	9	25	
10	B														32	
15				Bottom of Boring @ 15'												

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 32.25951°, W 94.58724°



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Tyler, Texas 75702
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LOG OF BORING TP-29

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 387.31'

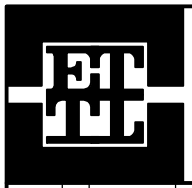
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0		CH		FAT CLAY(CH) gray and tan												
	B											51	26	25	93	+40 Sieve=5%
5																
		CL		SANDY LEAN CLAY(CL) gray												
	B											40	22	18	53	+40 Sieve=8%, +4 Sieve=2%
10				Bottom of Boring @ 10'												

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 32.25953°, W 94.58781°



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

LOG OF BORING TP-30

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 395.40'

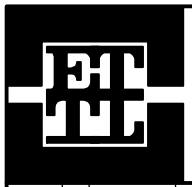
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0		CL		LEAN CLAY WITH SAND(CL) gray and tan												
5	B											40	20	20	80	+40 Sieve=3%
10			▽	--tan and gray												
	B											39	22	17	82	+40 Sieve=3%, +4 Sieve=0%
				Bottom of Boring @ 14.5'												

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

Water Observations: Seepage @ 13' 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 32.25894°, W 94.58788°



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LOG OF BORING TP-31

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 401.63'

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. #)
0	B	SC		CLAYEY SAND(SC) red								30	15	15	33	+40 Sieve=2%
5	B			--gray								46	15	31	35	
10	B	SM	▽	SILTY SAND(SM) red and tan											16	
15	B	CL		LEAN CLAY(CL) gray								46	22	24	87	+40 Sieve=4%
				Bottom of Boring @ 16'												

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

Water Observations: Seepage @ 11' 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 32.25892°, W 94.58719°

LOG OF BORING TP-32

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PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 397.46'

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(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0		SM		SILTY SAND(SM) dark gray												
	B														28	+40 Sieve=3%, +4 Sieve=1%
5		SC		CLAYEY SAND(SC) red and tan												
	B											29	14	15	32	+40 Sieve=1%
10				--yellow and tan												
	B											26	12	14	30	
15				Bottom of Boring @ 15'												

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:

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

Notes:
GPS Coordinates: N 32.25890°, W 94.58662°

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MAIN OFFICE
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(903) 595-4421

LOG OF BORING TP-33

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 388.67'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION
0		SM		SILTY SAND(SM) tan
	B			
5				--gray and tan
	B		▽	
10				
				Bottom of Boring @ 11.5'

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)

MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
				33	+40 Sieve=1%, +4 Sieve=1%

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

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

Water Observations: Seepage @ 9.5' 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 32.25885°, W 94.58597°

LOG OF BORING TP-34

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 394.68'

DEPTH (ft)	SAMPLES	USC	WATER LEVEL	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 (Plastic Limit / Moisture Content / Liquid Limit)	MOISTURE CONTENT (%)	ATTERBERG LIMITS(%) LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
0	B	SM		SILTY SAND(SM) tan												
5	B	CL		SANDY LEAN CLAY(CL) red and gray								34	14	20	64	+40 Sieve=9%, +4 Sieve=6%
	B	SC		CLAYEY SAND(SC) red and gray								24	15	9	32	+40 Sieve=0%, +4 Sieve=0%
10	B	SC SM		SILTY CLAYEY SAND(SC-SM) red, gray, and tan								23	16	7	27	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 13'												

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

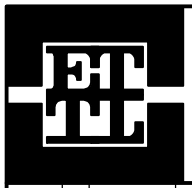
Water Observations:

Key to Abbrevations:

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

Notes:

GPS Coordinates: N 32.25834°, W 94.58591°



ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-35

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 395.85'

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. #)
0		SM		SILTY SAND(SM) tan												
	B															
5				--red												
	B									H		19	16	3	25	+40 Sieve=1%, +4 Sieve=0%
		CL		LEAN CLAY(CL) gray and tan								39	19	20	91	+40 Sieve=1%, +4 Sieve=0%
10	B															
15				Bottom of Boring @ 17'												

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 32.25841°, W 94.58649°

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-36

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/14/09

SURFACE ELEVATION 396.37'

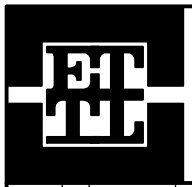
DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits (Plastic 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. #)
0	B	SM	SILTY SAND(SM) tan												
	B		--tan and red												
		CL	LEAN CLAY(CL) gray								20	18	2	31	+40 Sieve=1%, +4 Sieve=0%
5	B										43	23	20	97	+40 Sieve=0%, +4 Sieve=0%
		CL	LEAN CLAY WITH SAND(CL) red and gray												
	B										41	21	20	79	+40 Sieve=0%, +4 Sieve=0%
10		CL	SANDY LEAN CLAY(CL) gray and tan								31	23	8	63	+40 Sieve=0%, +4 Sieve=0%
	B														
15			Bottom of Boring @ 16'												

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

Water Observations:

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

Notes:
GPS Coordinates: N 32.25837°, W 94.58725°



ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-37

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/14/09

SURFACE ELEVATION 394.58'

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	WATER LEVEL
0	B	SC	CLAYEY SAND(SC) red and tan	
5	B	SM	SILTY SAND(SM) red and gray	
	B	CL	LEAN CLAY WITH SAND(CL) gray	
10	B			
15			Bottom of Boring @ 16.5'	

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. #)
	28	18	10	30	+40 Sieve=2%, +4 Sieve=2%
	19	18	1	21	+40 Sieve=2%, +4 Sieve=1%
	39	21	18	84	+40 Sieve=2%, +4 Sieve=0%

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 32.25846°, W 94.58790°

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-38

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/17/09

SURFACE ELEVATION 392.45'

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. #)
0	B	CH		FAT CLAY(CH) gray and orange								60	29	31	94	+40 Sieve=2%
5	B	SC		CLAYEY SAND(SC) light gray								27	18	9	42	+40 Sieve=2%, +4 Sieve=1%
	B	CL		LEAN CLAY WITH SAND(CL) orange and gray								44	23	21	84	+40 Sieve=11%, +4 Sieve=4%
10	B															
	B	ML	▽	SANDY SILT(ML) tan and gray								23	21	2	57	+40 Sieve=4%, +4 Sieve=2%
15				Bottom of Boring @ 16'												

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

Water Observations: Seepage @ 13' 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°15.473', W 94°35.276'

LOG OF BORING TP-39

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/17/09

SURFACE ELEVATION 396.82'

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. #)
0		SM		SILTY SAND(SM) orange and gray											19	+40 Sieve=2%
	B														18	
5	B		▽													
		CL		LEAN CLAY WITH SAND(CL) orange, gray, and black; with lignite seam								48	24	24	76	+40 Sieve=1%
	B															
		CL		SANDY LEAN CLAY(CL) light gray and tan								28	18	10	55	
10	B															
		SC		CLAYEY SAND(SC) light gray and tan								28	17	11	48	
15				Bottom of Boring @ 15'												

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°15.471', W 94°35.232'

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-40

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/17/09

SURFACE ELEVATION 400.02'

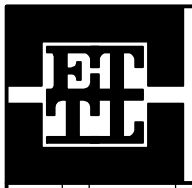
DEPTH (ft)	SAMPLES	USC	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA (BLOW COUNT 20 40 60 80; Qu (tsf) 1 2 3 4; PPR (tsf) 1.0 2.0 3.0 4.0; Torvane (tsf) 1.0 2.0 3.0 4.0)	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg 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. #)
0	B	SM		SILTY SAND(SM) brown; with grass and topsoil												
	B	SC		CLAYEY SAND(SC) dark brown and black; with lignite								37	16	21	45	+40 Sieve=17%, +4 Sieve=3%
	B	SM		SILTY SAND(SM) orange and tan											21	+40 Sieve=1%
5	B	SC		SILTY CLAYEY SAND(SC-SM) orangish tan								19	14	5	34	+40 Sieve=1%
	B	SM	▽	SILTY SAND(SM) orange, tan, and light gray											23	
	B															
10		CL		LEAN CLAY WITH SAND(CL) dark gray								32	17	15	82	
	B															
15	B	CL		SANDY LEAN CLAY(CL) light gray								25	16	9	50	
				Bottom of Boring @ 16'												

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

Water Observations: Seepage @ 8' 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°15.471', W 94°35.190'



ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-41

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/17/09

SURFACE ELEVATION 400.85'

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. #)
0	B	SM		SILTY SAND(SM) brown; with topsoil												
				--brown and black; with lignite												
5	B															
		CL		LEAN CLAY(CL) light gray and tan								36	21	15	97	+40 Sieve=0%, +4 Sieve=0%
	B															
10		SC SM		SILTY CLAYEY SAND(SC-SM) light gray and orange								26	19	7	49	+40 Sieve=0%, +4 Sieve=0%
	B															
15				Bottom of Boring @ 16'												

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°15.463', W 94°35.159'

LOG OF BORING TP-42

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/17/09

SURFACE ELEVATION 402.92'

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. #)
0	B	SM		SILTY SAND(SM) brown; with topsoil												
	B			--tan												
		SC		CLAYEY SAND(SC) orange and tan								38	18	20	47	+40 Sieve=0%, +4 Sieve=0%
5	B															
10	B	CL		LEAN CLAY WITH SAND(CL) light gray and orange								34	20	14	81	+40 Sieve=0%, +4 Sieve=0%
				Bottom of Boring @ 14'												

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°15.450', W 94°35.165'

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-43

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/17/09

SURFACE ELEVATION 396.29'

DEPTH (ft)	SAMPLES	USC	MATERIAL DESCRIPTION	WATER LEVEL	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. #)
0	B	SM	SILTY SAND(SM) brown; with topsoil													
	B	SC SM	SILTY CLAYEY SAND(SC-SM) orange, red, and tan									21	16	5	28	+40 Sieve=0%, +4 Sieve=0%
5	B	SM	SILTY SAND(SM) orange and tan												22	+40 Sieve=6%, +4 Sieve=3%
	B	CL	LEAN CLAY(CL) gray									40	23	17	99	+40 Sieve=0%, +4 Sieve=0%
10	B	SC SM	SILTY CLAYEY SAND(SC-SM) light gray and orange									23	19	4	46	+40 Sieve=0%, +4 Sieve=0%
			Bottom of Boring @ 13'													

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°15.441', W 94°35.236'

LOG OF BORING TP-44

ETTL ENGINEERS & CONSULTANTS

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

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09

BORING TYPE: Trackhoe

DATE 8/17/09

SURFACE ELEVATION 400.95'

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. #)
0	B	SM		SAND(SP) brown; with topsoil												
	B			--reddish orange								19	18	1	26	+40 Sieve=0%, +4 Sieve=0%
	B															
5	B	SC SM		SILTY CLAYEY SAND(SC-SM) orange and tan								22	16	6	36	+40 Sieve=0%, +4 Sieve=0%
	B	SM		SILTY SAND(S) yellow and gray											21	+40 Sieve=0%, +4 Sieve=0%
	B															
10	B	CL		LEAN CLAY WITH SAND(CL) light gray								30	20	10	76	+40 Sieve=0%, +4 Sieve=0%
				Bottom of Boring @ 13'												

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°15.440', W 94°35.197'

ETTL ENGINEERS & CONSULTANTS

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

LOG OF BORING TP-45

PROJECT: Luminant Martin Lake
Tatum, Texas

PROJECT NO.: L 211-09 **BORING TYPE:** Trackhoe

DATE 8/17/09

SURFACE ELEVATION 388.70'

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. #)
0	B	SM		SILTY SAND(SM) brown; with topsoil												
	B	CL		SANDY LEAN CLAY(CL) gray and orange; with lignite seam								42	20	22	59	+40 Sieve=1%, +4 Sieve=0%
5	B	CL		LEAN CLAY(CL) light gray and tan								45	23	22	94	+40 Sieve=0%, +4 Sieve=0%
10	B	CL		SANDY LEAN CLAY(CL) orange and tan; saturated								27	19	8	51	+40 Sieve=1%, +4 Sieve=0%
15	B			--orange and gray								32	19	13	69	+40 Sieve=1%, +4 Sieve=0%
				Bottom of Boring @ 16'												

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°15.442', W 94°35.278'

A

A'

KEY

Boring Designation

T-7A (386.5') — (Ground Elevation)

Typical Stratum Designation

CH
SC
CH
CH

Basic Soil Type

– Suitable Material

– Non-Suitable Material

TP-5 (372.6)

TP-4 (377.9)

TP-3 (378.6)

TP-2 (384.0)

TP-1 (391.3)

GROUND SURFACE

NON-SUITABLE

SUITABLE MATERIAL

SM
CL
CH
SC-SM
SC

Elevation

400
395
390
385
380
375
370
365
360
355

0
100
200
300
400
500
600
700
800
900

Distance Along Baseline

0 5 10

VERTICAL SCALE IN FEET

0 100 200

HORIZONTAL SCALE IN FEET

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Tyler, Texas 75702
(903) 595-4421

LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE A-A'

JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY: K.C.R.

B

B'

KEY

Boring Designation

T-7A (386.5') (Ground Elevation)

Typical Stratum Designation

CH
SC
CH
CH

Basic Soil Type

– Suitable Material

– Non-Suitable Material

TP-45 (388.7)
TP-38 (392.8)
TP-37 (394.6)
TP-29 (387.3)
TP-22 (382.0)
TP-21 (381.5)
TP-6 (373.3)
TP-5 (372.6)

SUITABLE MATERIAL
NON-SUITABLE
SUITABLE MATERIAL
GROUND SURFACE
NON-SUITABLE
SUITABLE MATERIAL
SUITABLE MATERIAL

SM
CL
CL
CL
SC
CH
SC
ML
SC
CL
CH
CL
CH
CL
CH
CL
CH
CH
SC
SM
CH
CH
CL
CL

Elevation

405
400
395
390
385
380
375
370
365
360
355

0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000

Distance Along Baseline

0 5 10

VERTICAL SCALE IN FEET

0 200 400

HORIZONTAL SCALE IN FEET

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LUMINANT
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TATUM, TEXAS

GEOLOGICAL PROFILE B-B'

JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY: K.C.R.

C

C'

KEY

Boring Designation

T-7A (386.5') — (Ground Elevation)

Typical Stratum Designation — CH / SC / CH / CH — Basic Soil Type

– Suitable Material

– Non-Suitable Material

Elevation

400 395 390 385 380 375 370 365 360 355

TP-6 (373.3)

TP-7 (389.3)

TP-8 (380.4)

TP-9 (390.7)

TP-10 (393.9)

GROUND SURFACE

CH

SC

CL

SM

SC-SM

SUITABLE MATERIAL

NON-SUITABLE

0 100 200 300 400 500 600 700 800 900

Distance Along Baseline

0 5 10

VERTICAL SCALE IN FEET

0 100 200

HORIZONTAL SCALE IN FEET

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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE C-C'

JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY: K.C.R.

KEY

– Suitable Material

– Non-Suitable Material

T-7A (386.5') — Boring Designation (Ground Elevation)

Typical Stratum Designation: CH / SC / CH / CH — Basic Soil Type

E

E'

TP-14 (393.9)

TP-13 (379.6)

TP-6 (373.3)

TP-5 (372.6)

SC-SM

SM

SC

CH

CL

GROUND SURFACE

NON-SUITABLE

SUITABLE MATERIAL

Elevation

Distance Along Baseline

D

D'

TP-12 (397.4)

TP-11 (391.9)

Elevation

Distance Along Baseline

0 5 10

VERTICAL SCALE IN FEET

0 100 200

HORIZONTAL SCALE IN FEET

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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILES D-D' & E-E'

JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

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F

F'

TP-44 (401.0)

TP-40 (400.0)

TP-35 (395.9)

TP-32 (397.5)

TP-27 (401.7)

TP-24 (405.2)

TP-19 (404.6)

TP-15 (400.4)

GROUND SURFACE

SUITABLE MATERIAL

NON-SUITABLE

SUITABLE MATERIAL

NON-SUITABLE

SUITABLE MATERIAL

NON-SUITABLE

NON-SUITABLE

SUITABLE MATERIAL

SUITABLE MATERIAL

SM

SC-SM

SC

CL

CH

Elevation

406
404
402
400
398
396
394
392
390
388
386
384
382
380
378

0
200
400
600
800
1,000
1,200
1,400

Distance Along Baseline

KEY

T-7A (386.5') — Boring Designation (Ground Elevation)

Typical Stratum Designation — CH, SC, CH, CH — Basic Soil Type

– Suitable Material

– Non-Suitable Material

0 4 8

VERTICAL SCALE IN FEET

0 200 400

HORIZONTAL SCALE IN FEET

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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE F–F'

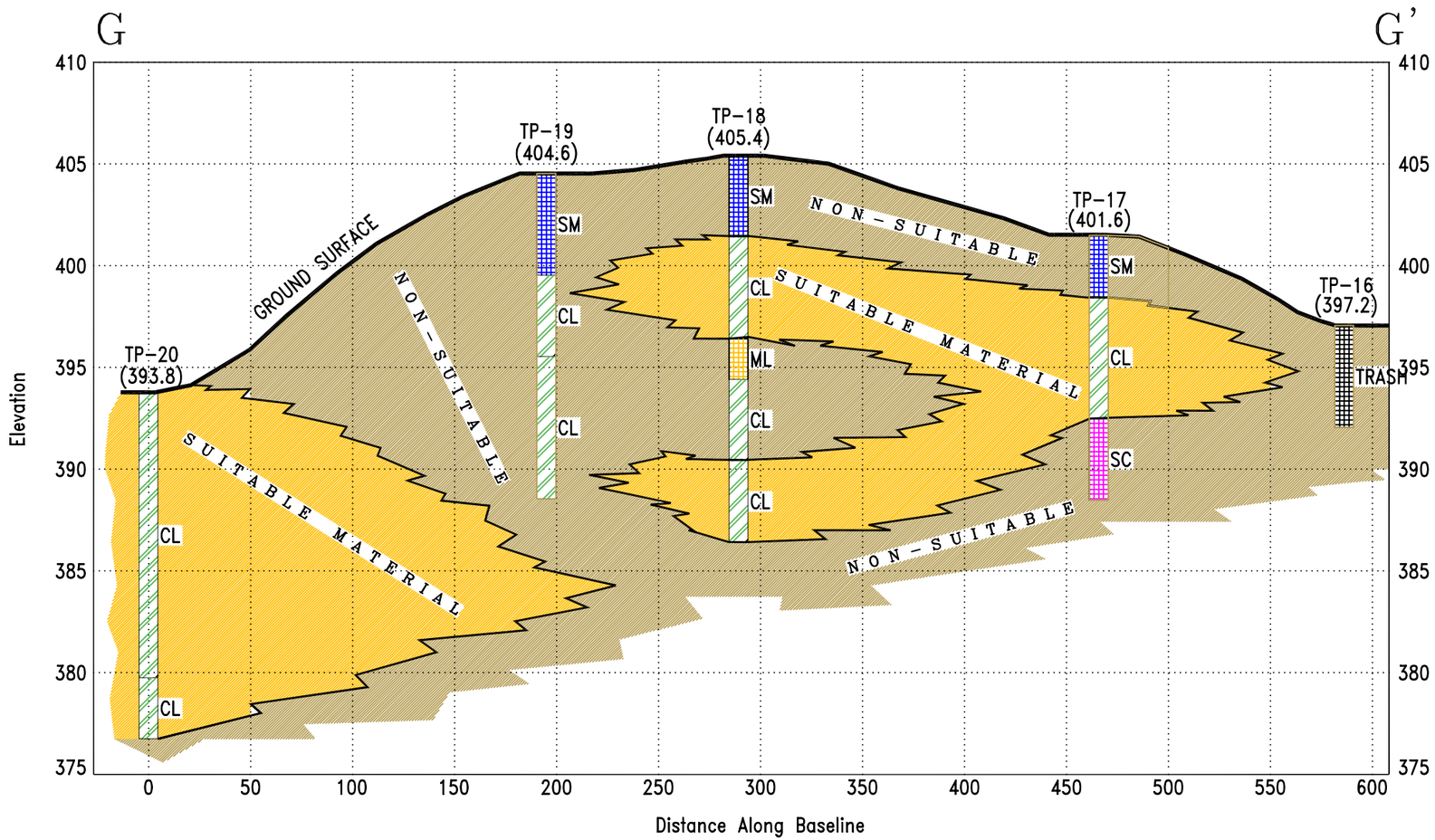
JOB No.: L211–09

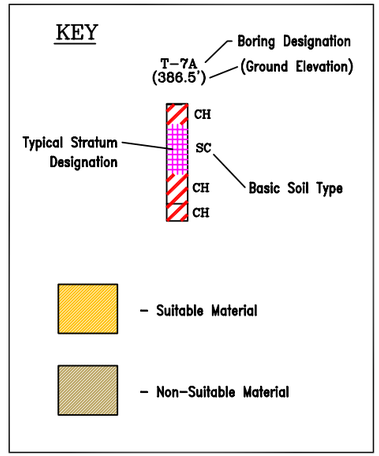
DATE: SEP. 2009

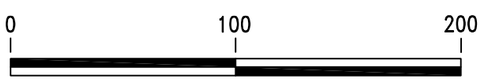
SCALE: AS SHOWN

APPROVED BY:

DRAWN BY: K.C.R.







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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE G-G'

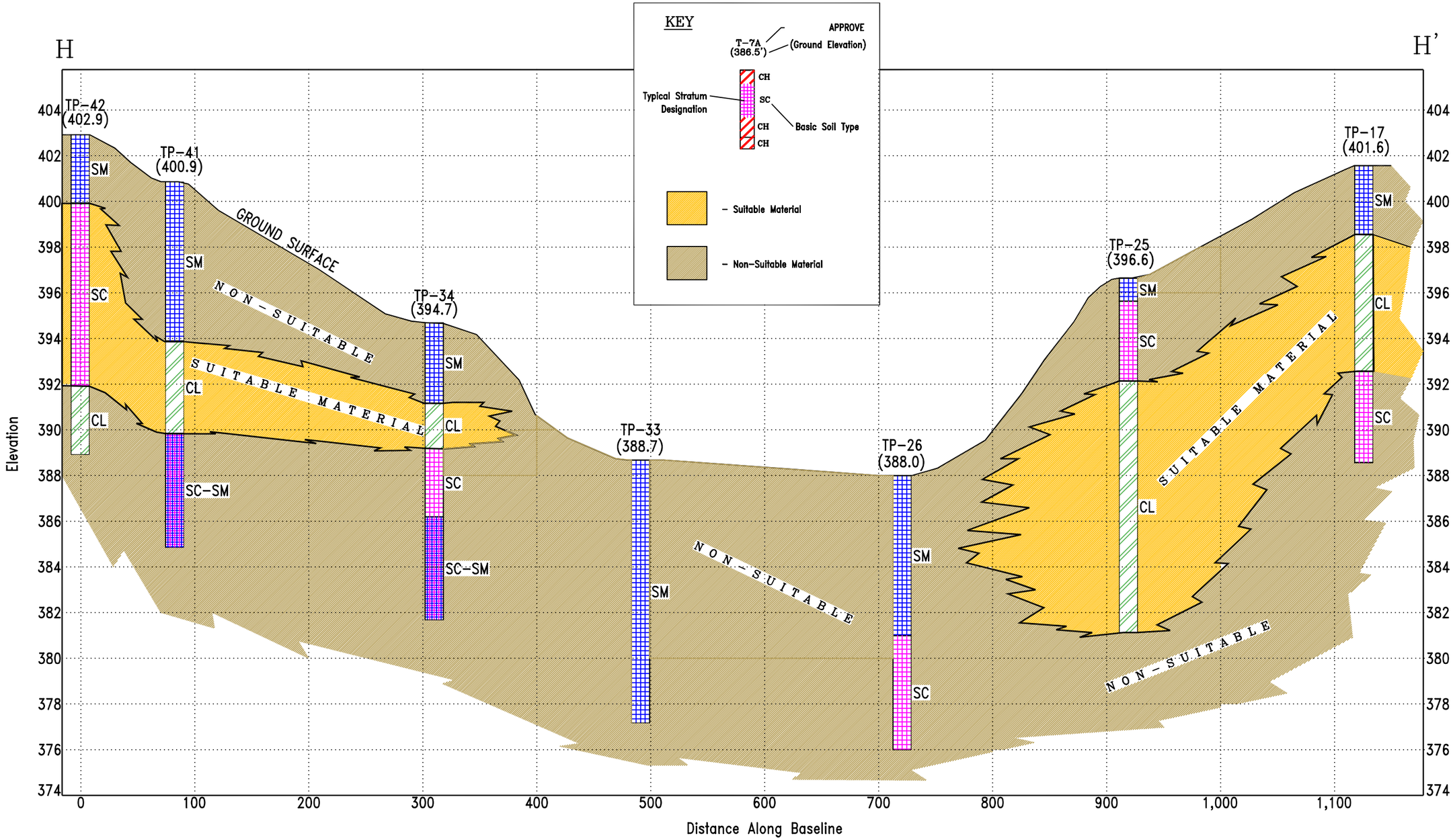
JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY:
K.C.R.



0 2 4

VERTICAL SCALE IN FEET

0 100 200

HORIZONTAL SCALE IN FEET

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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE H–H'

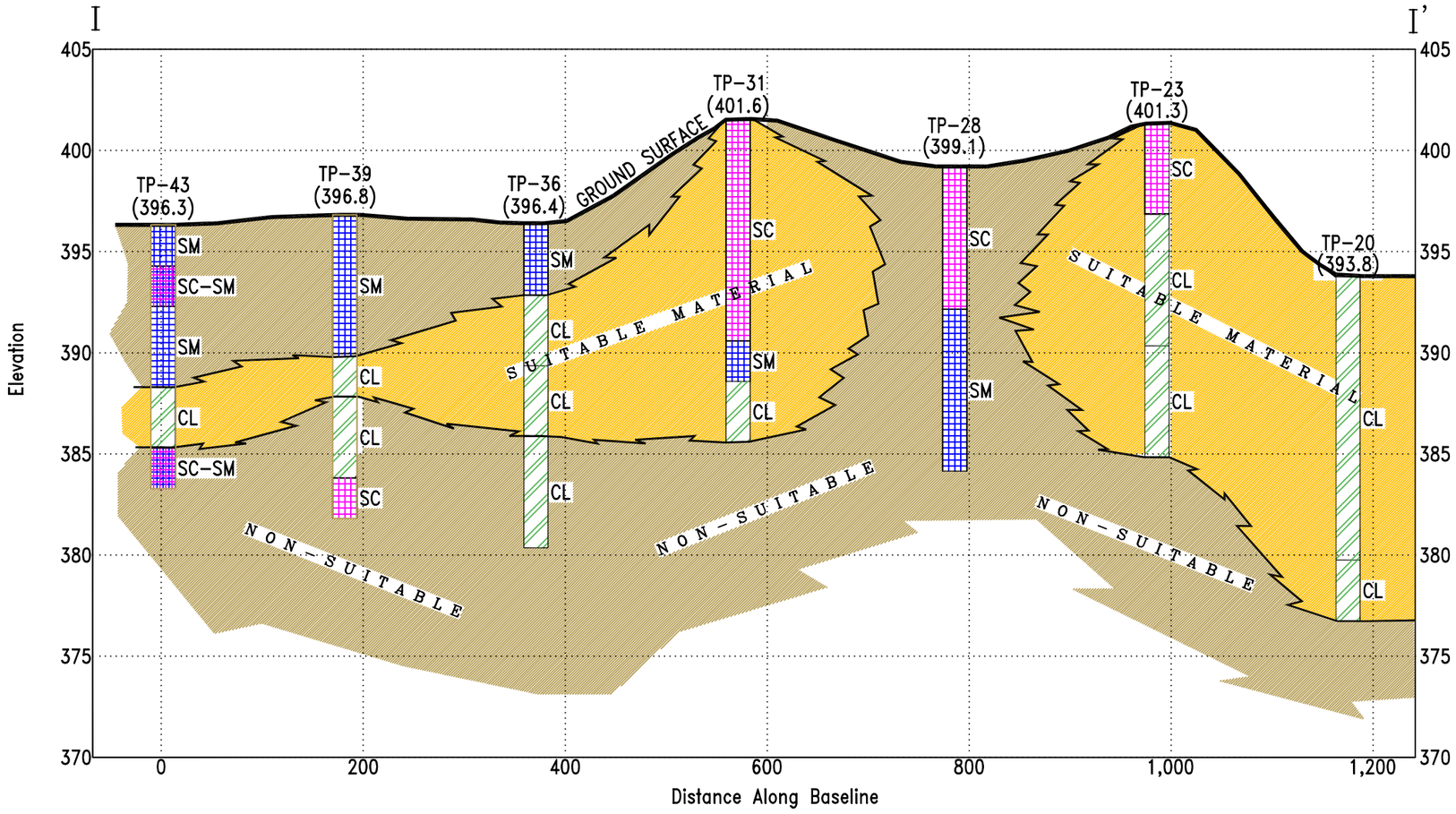
JOB No.: L211–09

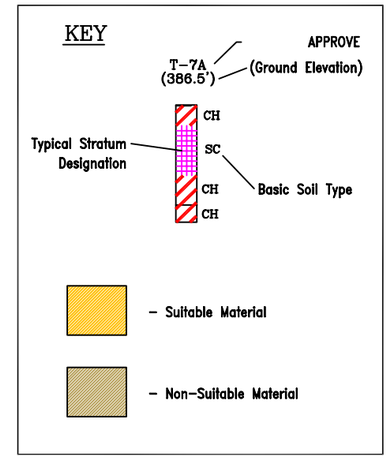
DATE: SEP. 2009

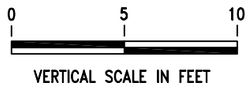
SCALE: AS SHOWN

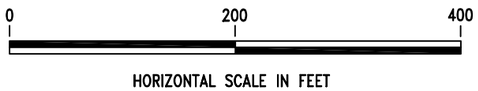
APPROVED BY:

DRAWN BY:
K.C.R.









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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE I-I'

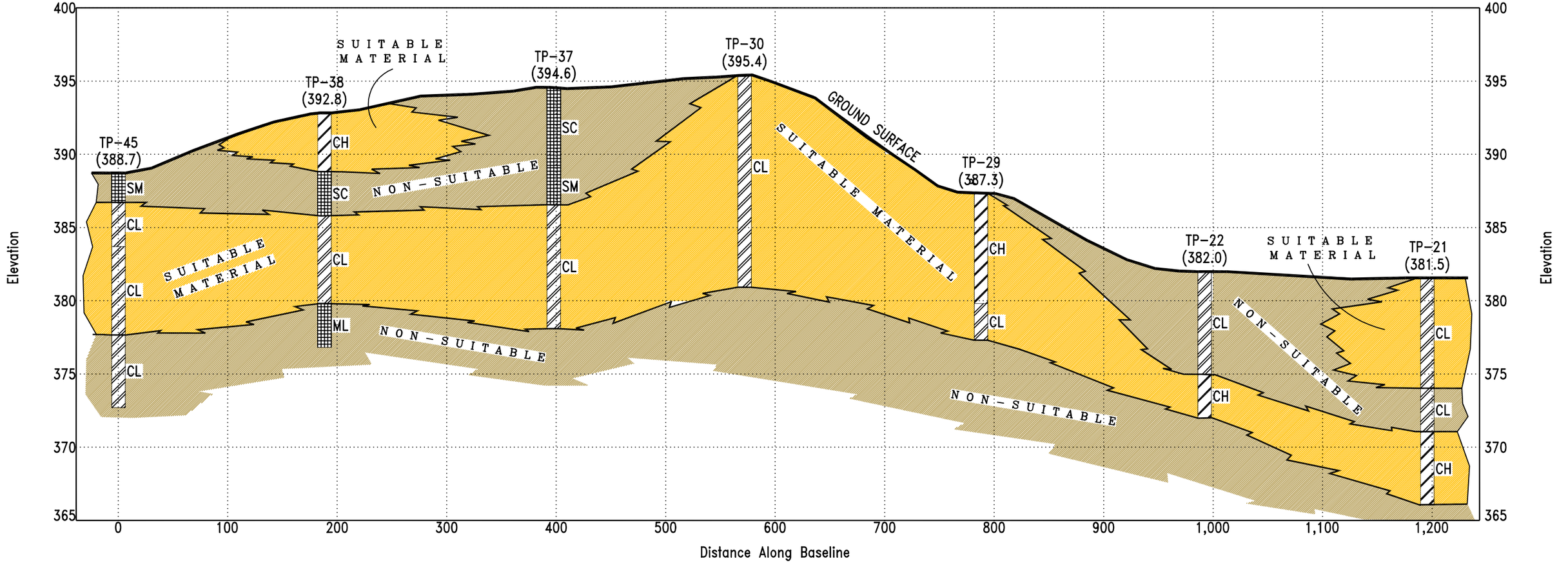
JOB No.: L211-09

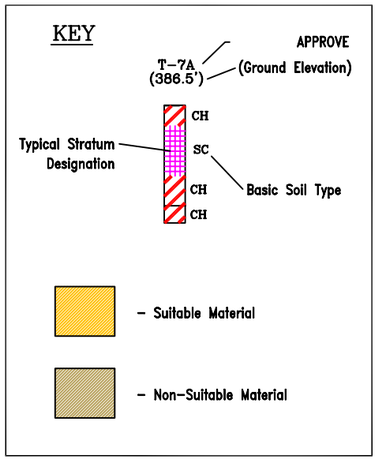
DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY:
K.C.R.





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LUMINANT
MARTIN LAKE
TATUM, TEXAS

GEOLOGICAL PROFILE J-J'

JOB No.: L211-09

DATE: SEP. 2009

SCALE: AS SHOWN

APPROVED BY:

DRAWN BY:
K.C.R.

VOLUME COMPUTATIONS

UPPER SURFACE
Grid File: C:/DOCUMENTS AND SETTINGS/JODOM/MY DOCUMENTS/DATA/SURFER6/MARTIN LAKE PDP 1-3/TOP OF CLAY REV.GRD
Grid size as read: 26 cols by 50 rows
Delta X: 25.0286
Delta Y: 40.4869
X-Range: 187.061 to 812.776
Y-Range: 7321.26 to 9305.12
Z-Range: 369.067 to 404.134

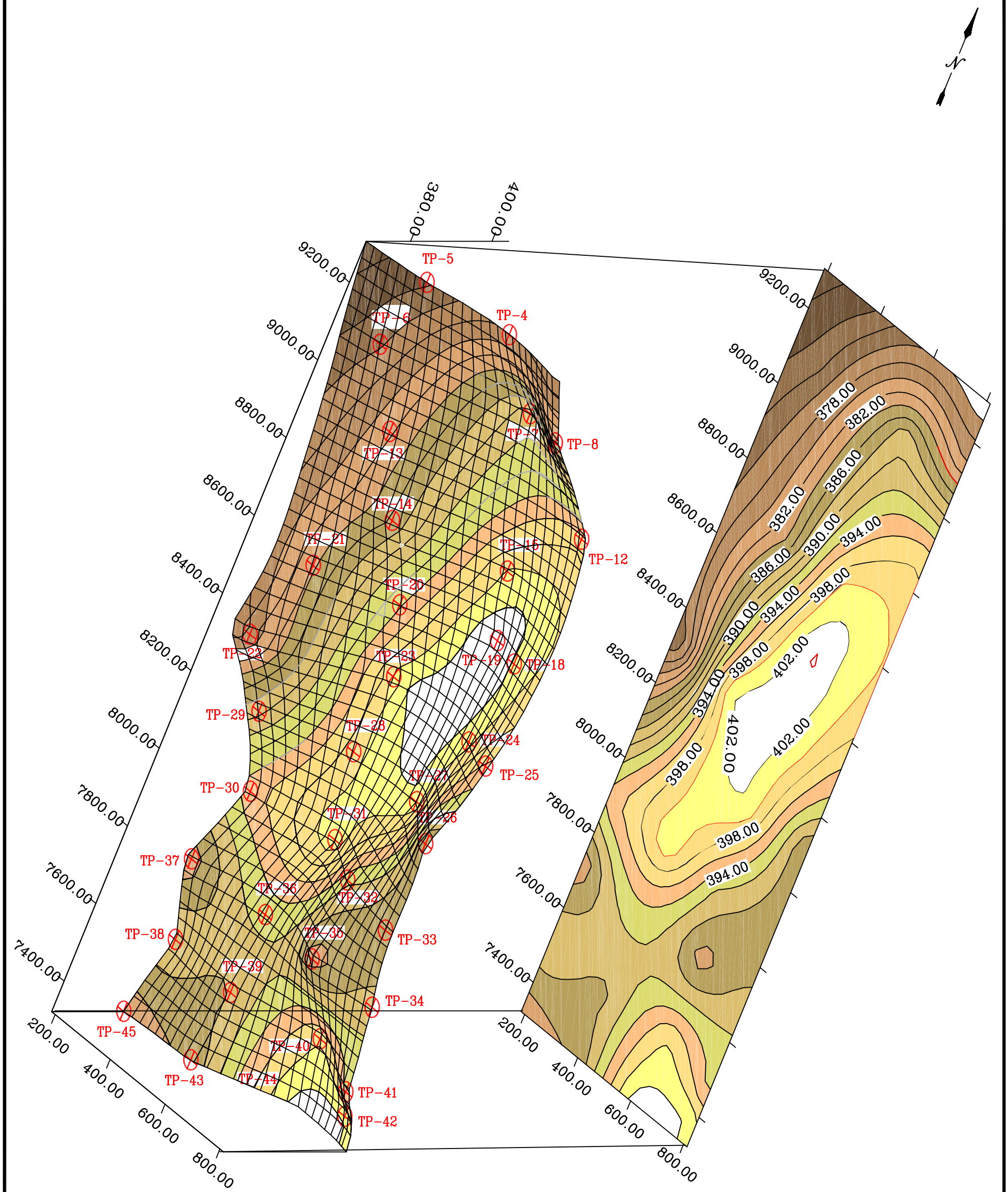
LOWER SURFACE
Grid File: C:/DOCUMENTS AND SETTINGS/JODOM/MY DOCUMENTS/DATA/SURFER6/MARTIN LAKE PDP 1-3/BOTOM OF CLAY REV.GRD
Grid size as read: 26 cols by 50 rows
Delta X: 25.0286
Delta Y: 40.4869
X-Range: 187.061 to 812.776
Y-Range: 7321.26 to 9305.12
Z-Range: 356.289 to 403.066

VOLUMES
Approximated Volume by
Trapezoidal Rule: 8.38414E+006
Simpson's Rule: 8.38217E+006
Simpson's 3/8 Rule: 8.38157E+006

CUT & FILL VOLUMES
Positive Volume [Cut]: 8.38521E+006
Negative Volume [Fill]: 1389.59
Cut minus Fill: 8.38382E+006

AREAS
Positive Planar Area
(Upper above Lower): 1.22625E+006
Negative Planar Area
(Lower above Upper): 15084.3
Blanked Planar Area: 0
Total Planar Area: 1.24133E+006

Positive Surface Area
(Upper above Lower): 1.22724E+006
Negative Surface Area
(Lower above Upper): 15084.6



ETTL ENGINEERS & CONSULTANTS MAIN OFFICE 1717 Edst Erwin Tyler, Texas 75702 (903) 595-4421	LUMINANT MARTIN LAKE TATUM, TEXAS	PDP EXISTING BORROW PIT – TOP OF CLAY		APPROVED BY:
		JOB NO.: L 211-09		DRAWN BY: K.C.R.
		DATE: AUGUST 2009	SCALE: N.T.S.	

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