COAL COMBUSTION RESIDUAL RULE
GROUNDWATER MONITORING SYSTEM CERTIFICATION

OAK GROVE STEAM ELECTRIC STATION
FGD POND AREA
ROBERTSON COUNTY, TEXAS

OCTOBER 16, 2017

Prepared For:

Luminant Generation Company, LLC
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Irving, TX 75039

Prepared By:

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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

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Luminant Power (Luminant) operates the Oak Grove Steam Electric Station (OGSES) located approximately 10 miles north of Franklin, Robertson County, Texas (Figure 1). The OGSES consists of two 800-megawatt power generation units which burn lignite and coal (PBW, 2008a). Coal Combustion Residuals (CCR) including fly ash, bottom ash, and gypsum are generated as part of OGSES unit operations. Currently, CCRs generated at the OGSES are managed by Luminant in surface impoundments located on the OGSES property or the Ash Landfill 1. Two CCR units have been identified within the OGSES operations, the FGD Pond Area and the Ash Landfill 1. This report discusses the FGD Pond Area (the Site), which includes FGD-A Pond, FGD-B Pond, and FGD-C Pond. The FGD Ponds meet the definition of CCR surface impoundments and are 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 has been designed and constructed to meet the requirements of Section 257.91 of the CCR Rule.

1.1 Description of the FGD Ponds

The FGD-A Pond, FGD-B Pond, and FGD-C Pond (collectively referred to as the "FGD Ponds") are located approximately 2,500 feet northwest of the power generation units (Figure 2). FGD-A Pond was originally constructed in the mid-1980s during the initial facility construction phase. Plant and pond construction were halted in the 1980s prior to activation of the pond. OGSES construction began again in 2007 and an assessment of the pond's condition was conducted as part of the OGSES project. Two phases of pond assessment were conducted and it was determined that reconstruction was required to

bring the pond into compliance with Texas Commission on Environmental Quality (TCEQ) regulations. The FGD-A Pond was reconstructed by Fluor Enterprises, Inc., and is approximately 9.5 acres in size (PBW, 2008b). The FGD-A Pond contains combustion byproducts generated from the OGSES, which consists of fly ash, bottom ash, and gypsum/scrubber sludge. Other wastes, including but not limited to, low volume wastewaters and ash contact water which are periodically generated during OGSES operation and stored in the FGD-A Pond prior to treatment for recycling or disposal (PBW, 2008b). FGD-A is lined with a 3-foot thick compacted clay liner (Golder, 2015a).

The FGD-B Pond was originally constructed in the mid-1980s during the initial OGSES construction phase for use as a storm water retention pond. Plant and pond construction were halted in the 1980s prior to activation of the pond. The former retention pond was reconstructed in 2012 as FGD-B Pond to supplement the adjacent FGD-A Pond, and is approximately 12 acres in size. FGD-B Pond receives combustion byproducts generated from the OGSES similar to FGD-A Pond (PBW, 2011). FGD-B is lined with an approximately 3-foot thick compacted clay liner (Golder, 2015a).

FGD-C Pond construction commenced in June 2015 and was completed in 2016. FGD-C Pond is approximately 25 acres in size and used to manage flue gas desulfurization (FGD) system wastewater and scrubber sludge/gypsum from the OGSES. The pond is also used to manage lesser amounts of low volume wastewaters, ash contact water, metal cleaning wastewaters, and storm water runoff prior to treatment for recycling or disposal (Golder, 2015b).

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 decommissionings 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 FGD Ponds Groundwater Monitoring System

The CCR groundwater monitoring well system at the FGD Ponds consists of nine monitoring wells (FGD-1, FGD-2, FGD-3, FGD-4, FGD-5, FGD-6, FGD-8, FGD-11, and FGD-12) 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

The FGD Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1970). PBW reviewed historical soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions in the FGD Pond Area. 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.

Historical soil borings indicate the geology in the FGD Pond Area primarily consists of an upper zone of relatively thick, interbedded sand and clay strata and a lower zone of interbedded silty to clayey sand and well sorted sand. The uppermost aquifer at the Site occurs in the lower zone of interbedded silty to clayey sand.

2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the FGD Pond Area CCR monitoring well system from October 2015 to December 2016. Static water levels measured during the background monitoring period indicated water elevations ranging from 409.34 feet above mean sea level (amsl) to 431.61 feet amsl, and depths to water ranging from 13.25 feet bgs to 42.01 feet bgs (Table 2). Groundwater potentiometric surface maps based on data collected during the background monitoring period are presented in Appendix C.

Groundwater elevations were generally highest to the west of the FGD Pond Area and lowest to the east of the FGD Pond Area, with an inferred groundwater flow direction to the east. Based on the inferred

groundwater flow direction, the location of each CCR monitoring well relative to the FGD Ponds is as follows:

Upgradient Wells	Downgradient Wells
FGD-8	FGD-1
FGD-11	FGD-2
	FGD-3
	FGD-4
	FGD-5
	FGD-6
	FGD-12

2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells FGD-5, FGD-11, and FGD-12 on September 23, 2015 to evaluate groundwater linear flow velocities of 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^{-3} cm/sec (well FGD-12) to 9.07×10^{-5} cm/sec (well FGD-11), with a geometric mean for the test wells of 4.19×10^{-4} cm/sec.

2.5 Conclusions

The CCR groundwater monitoring well system at the FGD Pond Area 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 – two upgradient monitoring wells and seven downgradient monitoring wells.
- Each monitoring well is screened in the uppermost aquifer at the Site. Samples collected from upgradient monitoring wells will be representative of the quality of background groundwater that has not been affected by leakage from the CCR units and samples collected from downgradient wells will ensure detection of groundwater contamination in the uppermost aquifer from the CCR units.
- 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., 1970. Geologic Atlas of Texas, Waco Sheet. Texas Bureau of Economic Geology.

Golder Associates (Golder), 2015a. Coal Combustion Residuals Regulations and Their Effect on Existing Landfills and Surface Impoundments, Oak Grove Steam Electric Station. May 26.

Golder, 2015b. TCEQ Registration Package, Oak Grove Steam Electric Station FGD-C Pond. June.

Pastor, Behling & Wheeler, LLC (PBW), 2008a. Draft TCEQ Registration Package, Oak Grove Ash Landfill. June 16.

PBW, 2008b. TCEQ Registration Package, Oak Grove Steam Electric Station, FGD-A Pond. August 21.

PBW, 2011. TCEQ Registration Package, Oak Grove Steam Electric Station, FGD-B Pond. April 5.

Tables

TABLE 1
CCR WELL CONSTRUCTION SUMMARY
FGD POND AREA
OAK GROVE 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)
FGD-1	08/27/08	572070	3200059	421.71	424.44	13	33	20	34	2
FGD-2	08/22/08	572478	3201212	436.58	439.36	31	51	20	52	2
FGD-3	08/21/08	572934	3200961	432.20	434.90	27	47	20	48	2
FGD-4	08/20/08	573005	3200595	429.34	432.03	22.5	42.5	20	44	2
FGD-5	03/03/10	571950	3200628	430.20	433.01	40	50	10	50	2
FGD-6	03/04/10	573195	3200526	425.42	428.62	18	28	10	28	2
FGD-8	03/04/10	573033	3198862	436.80	440.15	30	40	10	40	2
FGD-11	11/26/14	572064	3198637	448.80	452.22	40.8	49.8	9	50.8	2
FGD-12	11/26/14	571336	3199826	439.46	443.16	30.7	39.7	9	40.7	2

Notes:
1. Abbreviations: ft - feet; amsl - above mean sea level; bgs - below ground surface.
2. Coordinates in NAD 27 Texas State Plane Central 4208.

TABLE 2
GROUNDWATER ELEVATION SUMMARY
FGD POND AREA
OAK GROVE STEAM ELECTRIC STATION

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
FGD-1	424.44	11/03/15	14.27	410.17
		12/17/15	14.22	410.22
		02/09/16	13.89	410.55
		04/14/16	13.79	410.65
		06/14/16	13.54	410.90
		08/24/16	13.37	411.07
		10/04/16	13.28	411.16
		12/19/16	13.25	411.19
FGD-2	439.36	11/03/15	29.31	410.05
		12/17/15	29.39	409.97
		02/09/16	29.03	410.33
		04/14/16	28.89	410.47
		06/14/16	28.21	411.15
		08/24/16	28.22	411.14
		10/04/16	28.06	411.30
		12/19/16	28.50	410.86
FGD-3	434.90	11/03/15	24.76	410.14
		12/17/15	24.33	410.57
		02/09/16	24.08	410.82
		04/14/16	24.11	410.79
		06/14/16	23.21	411.69
		08/24/16	23.74	411.16
		10/04/16	23.39	411.51
		12/19/16	23.69	411.21
FGD-4	432.03	11/03/15	21.84	410.19
		12/17/15	21.89	410.14
		02/09/16	21.31	410.72
		04/14/16	21.21	410.82
		06/14/16	20.47	411.56
		08/24/16	20.99	411.04
		10/04/16	20.79	411.24
		12/19/16	21.02	411.01
FGD-5	433.01	11/03/15	22.81	410.20
		12/17/15	22.58	410.43
		02/09/16	22.73	410.28
		04/14/16	22.27	410.74
		06/14/16	21.81	411.20
		08/24/16	21.68	411.33
		10/04/16	21.68	411.33
		12/19/16	21.69	411.32
FGD-6	428.62	11/03/15	18.44	410.18
		12/17/15	18.04	410.58
		02/09/16	17.96	410.66
		04/14/16	17.89	410.73
		06/14/16	17.22	411.40
		08/24/16	17.51	411.11
		10/04/16	17.37	411.25
		12/19/16	17.72	410.90

TABLE 2
GROUNDWATER ELEVATION SUMMARY
FGD POND AREA
OAK GROVE STEAM ELECTRIC STATION

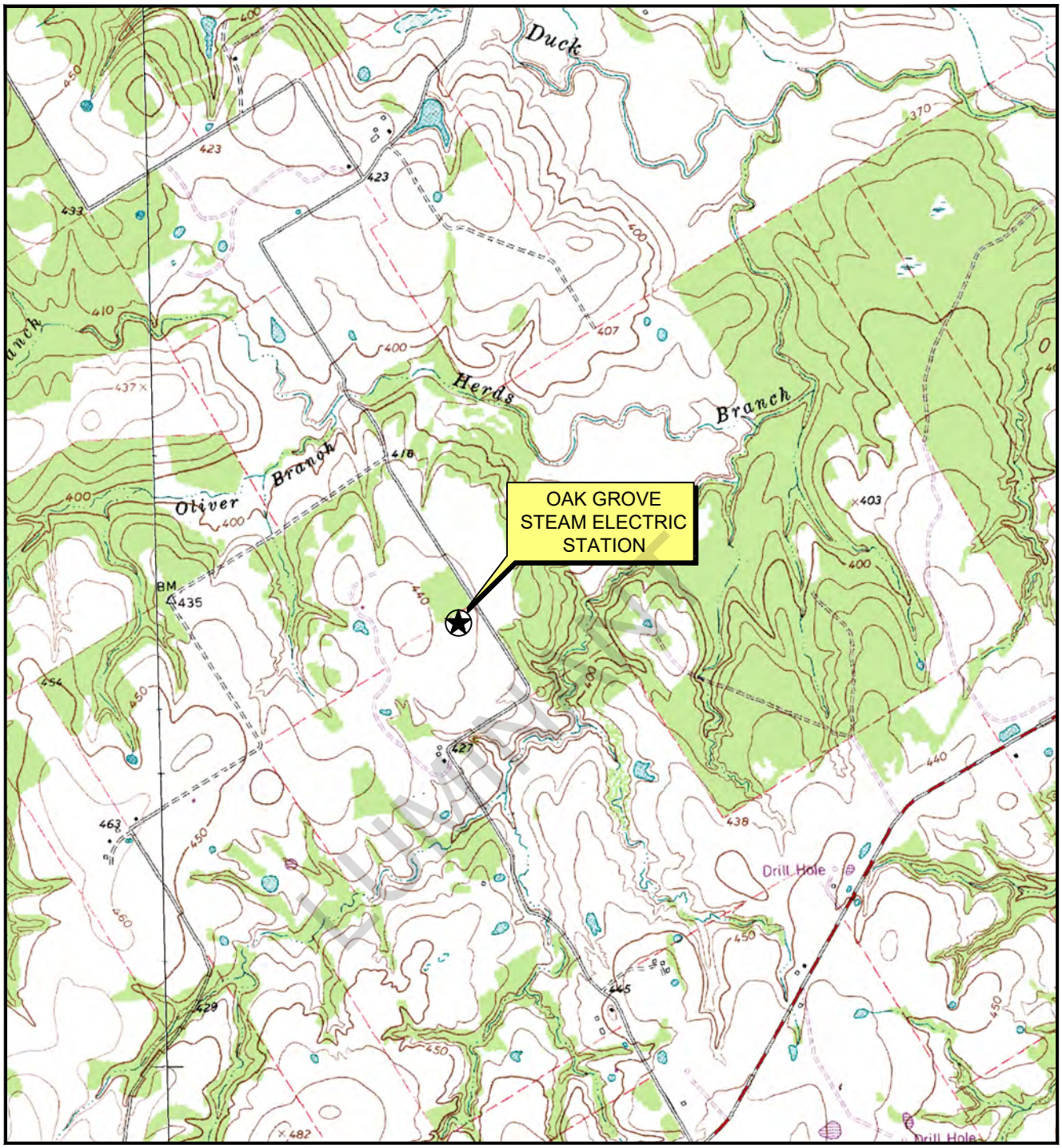
Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
FGD-8	440.15	11/03/15	16.39	423.76*
		12/17/15	16.26	423.89*
		02/09/16	29.64	410.51
		04/14/16	29.54	410.61
		06/14/16	29.37	410.78
		08/24/16	29.16	410.99
		10/04/16	28.81	411.34
		12/19/16	29.21	410.94
FGD-11	452.22	11/03/15	20.67	431.55*
		12/17/15	20.61	431.61*
		02/09/16	41.62	410.60
		04/14/16	40.04	412.18
		06/14/16	39.81	412.41
		08/24/16	39.59	412.63
		10/04/16	41.59	410.63
		12/19/16	42.01	410.21
FGD-12	443.16	11/03/15	33.82	409.34
		12/17/15	33.69	409.47
		02/09/16	32.42	410.74
		04/14/16	32.04	411.12
		06/14/16	32.02	411.14
		08/24/16	31.89	411.27
		10/04/16	31.77	411.39
		12/19/16	31.96	411.20

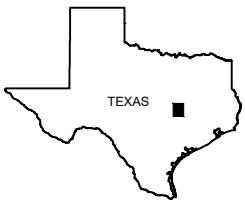
Notes:
1. Abbreviations: TOC - top of casing; ft - feet, amsl - above mean sea level.
2. * - Measurement appears to be erroneous based on subsequent measurements. Result was not used to construct groundwater potentiometric surface map.

TABLE 3
SUMMARY OF AQUIFER TEST RESULTS
FGD POND AREA
OAK GROVE STEAM ELECTRIC STATION

Well ID	Test Type	Aquifer Type	Analysis Method	Saturated Thickness (feet)	Results	
					T (cm^2/sec)	K (cm/sec)
FGD Pond Area						
FGD-5	Slug-Out	Unconfined	Bouwer-Rice	12.65	**1.23E-01**	**3.19E-04**
FGD-11	Slug-Out	Unconfined	Bouwer-Rice	12.86	**3.55E-02**	**9.07E-05**
FGD-12	Slug-In	Unconfined	Bouwer-Rice	11.45	6.00E-01	1.72E-03
FGD-12	Slug-Out	Unconfined	Bouwer-Rice	11.45	1.13E+00	3.25E-03
				Mean	**8.67E-01**	**2.48E-03**
				Geometric mean for all tests	**1.56E-01**	**4.16E-04**

Figures





QUADRANGLE LOCATION

N

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.gov, Bald Prairie, TX 7.5 min. USGS quadrangle dated 1965, revised 1982.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 1

FGD POND AREA
SITE LOCATION MAP

PROJECT: 5164D	BY: AJD	REVISIONS
DATE: NOV, 2015	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

CCR Monitoring Well

N

Scale in Feet

0 350 700

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

Figure 2

FGD POND AREA DETAILED SITE PLAN

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

CCR Monitoring Well

A A' Geologic Cross Section Location Lines

N

Scale in Feet

0 350 700

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

Figure 3

FGD POND AREA CROSS SECTION LOCATION MAP

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

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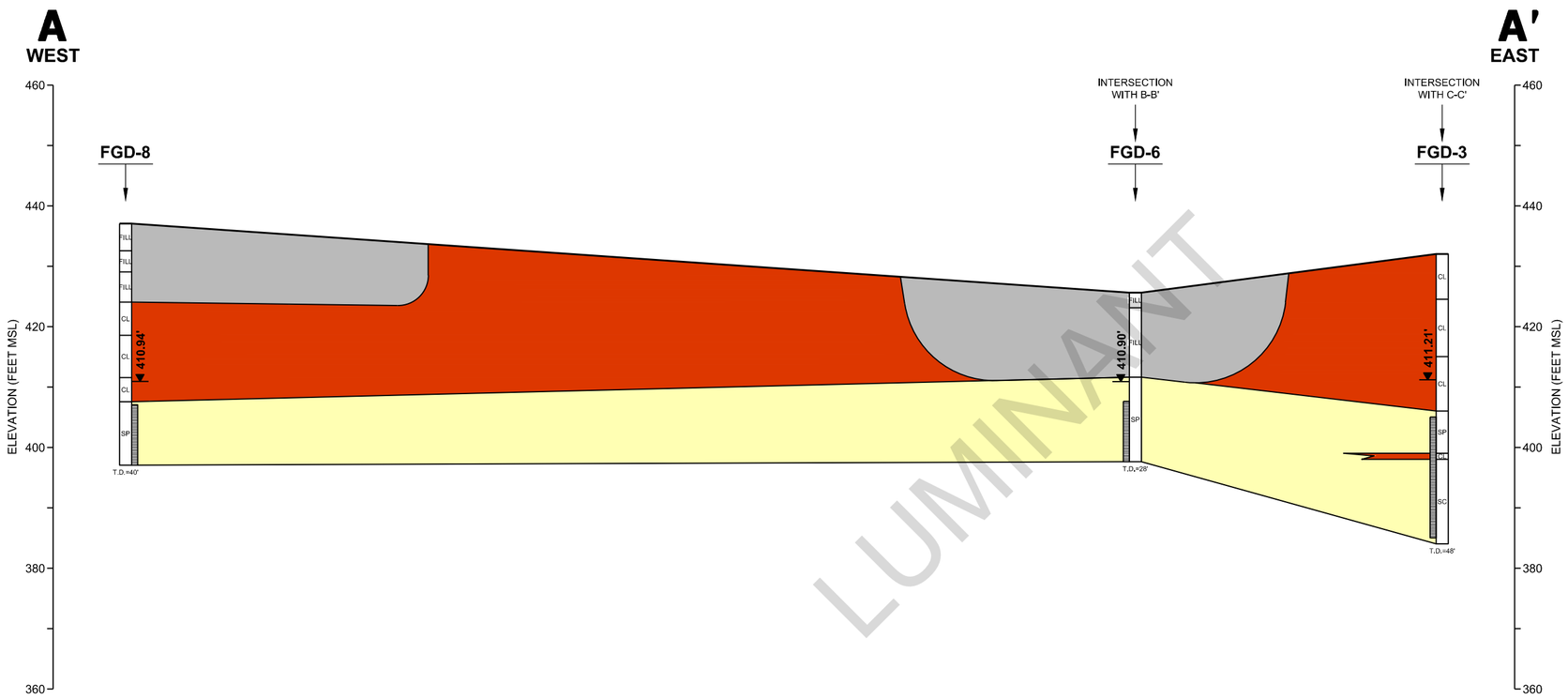
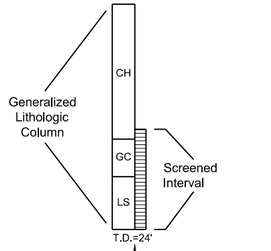
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

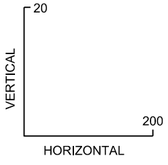
- SAND
- CLAY
- FILL

MONITORING WELL CONSTRUCTION



Water Level (Ft MSL)
Measured 12/19/16

SCALE IN FEET



10x Vertical Exaggeration

OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

Figure 4

FGD POND AREA
A-A' CROSS SECTION

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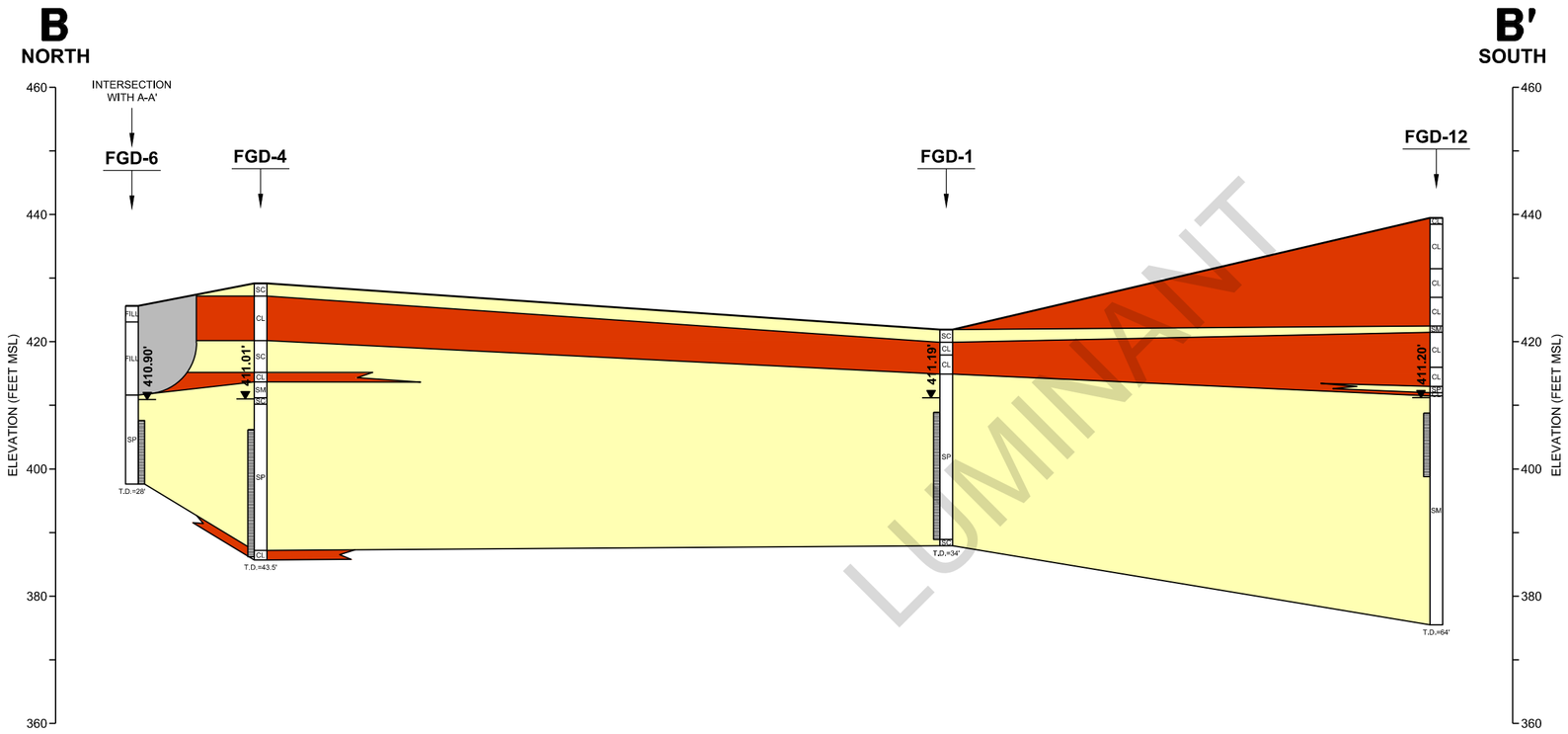


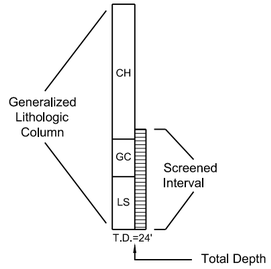
EXPLANATION

SAND

CLAY

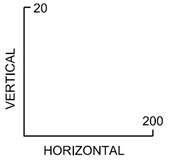
FILL

MONITORING WELL CONSTRUCTION



Water Level (Ft MSL)
Measured 12/19/16

SCALE IN FEET



10x Vertical Exaggeration

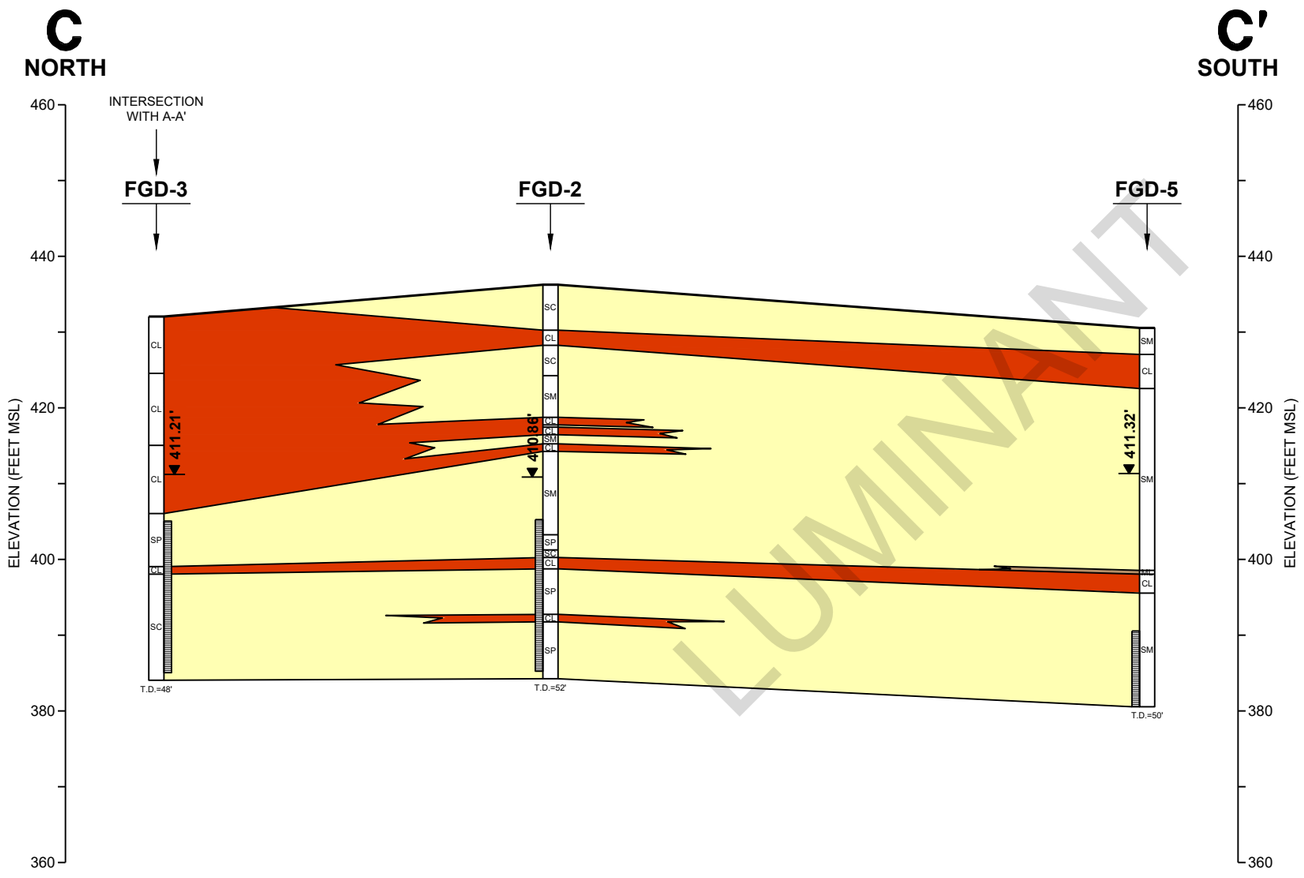
OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

Figure 5

FGD POND AREA
B-B′ CROSS SECTION

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

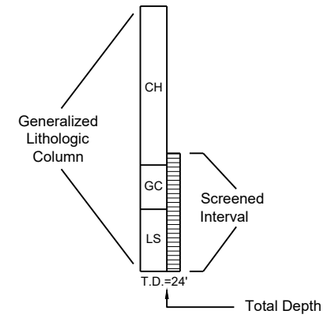
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



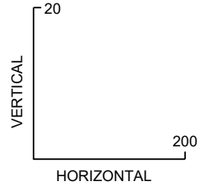
EXPLANATION

- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



SCALE IN FEET



10x Vertical Exaggeration

OAK GROVE STEAM ELECTRIC STATION
ROBERTSON COUNTY, TEXAS

Figure 6

FGD POND AREA
C-C' CROSS SECTION

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix A

CCR Monitoring Well Logs

RECORD OF BOREHOLE MW-FGD-01

SHEET 1 OF 2
DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		Muddy with vegetation										
		GROUND SURFACE		421.9								
0		Firm, brown to light brown, sandy CLAY, some vegetative presence, dry		0.0	SB-1		2 3 3 N6	40				
		trace red at 1.5'										
2		Hard, grayish brown with red, CLAY, with sand, dry		2.0	SB-2		8 20 32 N52	67				
4		Hard, gray, trace red, silty CLAY, dry		4.0	SB-3		10 14 18 N32	73				
6		red, some iron oxide at 6'			SB-4		7 13 14 N27	87				
		Compact, grayish brown, SAND, with silt, damp		7.0								
8		reddish brown, some clay at 8'			SB-5		6 7 8 N15	87				
10		trace red at 10'			SB-6		7 8 8 N16	87				
12					SB-7		3 10 13 N23	67				
14		wet at 14'			SB-8		7 9 9 N18	100				▼ 14' 08/27/2008
16					SB-9		1 10 12 N22	87				
18					SB-10		1 10 19 N29	93				
20		some yellowish brown at 19.5'										
		--- CONTINUED NEXT PAGE ---										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

RECORD OF BOREHOLE MW-FGD-01

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 27-Aug-2008
BORING FINISHED: 27-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4549.42
EASTING (ft): 2454.41
ELEVATION (ft): 421.91

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
20		very dense at 20'		20.0	SB-11		15 26 35 N61	87				
22		dense, grayish brown and mottled yellow at 22'			SB-12		17 21 27 N48	100				
24		very dense, moist at 24'			SB-13		18 25 35 N60	87				
26					SB-14		16 17 35 N52	93				
28					SB-15		20 35 36 N71	100				
30					SB-16		18 28 32 N60	87				
32												
		Very dense, dark brownish gray, clayey SAND, trace iron oxide, damp		33.0	SB-17		21 36 50/5"	93				
34		BORING TERMINATED AT 34'		34.0								
36												
38												
40												

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-02

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		Muddy										
		GROUND SURFACE		436.2								
0		Stiff, brown with some dark brown, sandy CLAY, some gravel, damp		0.0	SB-1		4 4 5 N9	27				
2		very stiff, dark brown at 2'			SB-2		4 7 16 N23	47				
4		very stiff, brown to yellowish brown, some iron oxide traces, possible lignite traces, dry at 4'			SB-3		7 10 13 N23	53				
6		Very stiff, mottled gray and brown, CLAY, some gravel, dry		6.0	SB-4		5 13 15 N28	67				
8		Very stiff, brown, yellow, and gray, mottled, sandy CLAY		8.0	SB-5		5 13 16 N29	53				
10		hard at 10'										
		gray at 11'			SB-6		7 13 20 N33	80				
12		Dense, light gray, fine, silty SAND, with a seam of clay, damp		12.0	SB-7		14 17 21 N38	87				
14					SB-8		10 19 27 N46	93				
16					SB-9		16 23 24 N47	87				
		seam of hard CLAY		17.5								
18		very dense at 18'										
				18.5								
		seam of very hard CLAY		18.8	SB-10		10 25 36 N61	87				
				19.8								
20		--- CONTINUED NEXT PAGE ---										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: BLT

RECORD OF BOREHOLE MW-FGD-02

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
20		dense at 20'		20.0	SB-11		14 19 27 N46	92				
		seam of hard CLAY		21.0								
22		very dense at 22'		22.0	SB-12		13 27 37 N64	100				
24					SB-13		17 29 28 N57	87				
26					SB-14		17 25 42 N67	67				
		yellow at 27.5'										
28					SB-15		20 39 50/5"	87				
30		gray at 30.5'			SB-16		25 45 24 N69	87				
32												▼ 32' 08/22/2008
		Very loose, brown, SAND, moist		33.0	SB-17		4 1 2 N3	80				
34					SB-18		7 14 14 N28	73				
		Very stiff, brown, sandy CLAY, moist		35.0								
36		Hard, brown, CLAY, with silt, moist		36.0	SB-19		8 25 50/4"	93				
		Very dense, brown, SAND		37.5								
38		gray and yellow, mottled at 39'			SB-20		20 45 50/3"	80				
40		*--- CONTINUED NEXT PAGE ---*										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-02

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 22-Aug-2008
BORING FINISHED: 25-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4261.32
EASTING (ft): 3643.72
ELEVATION (ft): 436.24

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
40		brownish gray at 40'		40.0	SB-21		24 42 50/4"	87				
42		gray at 41' dense at 42'			SB-22		32 25 22 N47	100				
44		seam of hard, yellowish gray and brown, CLAY at 43.5'		43.5								
		very dense at 44'		44.5	SB-23		18 36 50/4"	100				
46					SB-24		32 45 50/3"	73				
48					SB-25		24 24 50/5"	80				
50					SB-26		32 45 50/3"	87				
52		BORING TERMINATED AT 52'		52.0								
54												
56												
58												
60												

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-03

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		Muddy										
0		GROUND SURFACE		432.0								
		Soft to firm, reddish brown, CLAY, with sand, some gravel		0.0	SB-1		2 2 2 N4	33				
2					ST-2			70	⊕			
4		very stiff, brown, mottled at 4'			SB-3		5 7 12 N19	83				
6					SB-4		5 12 15 N27	93				
		Very stiff, gray, silty CLAY		7.5								
8					SB-5		5 8 12 N20	87				
10		trace brown at 10'			SB-6		4 7 9 N16	93				
12		stiff, light brown at 12'			SB-7		3 5 7 N12	73				
14					SB-8		3 5 6 N11	87				
16					ST-9			55	⊕			
		Stiff, brown, CLAY, damp		17.0								
18		firm to stiff at 18'			SB-10		2 3 5 N8	100				
20		*--- CONTINUED NEXT PAGE ---*										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-03

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
20		firm at 20'		20.0	SB-11		2 2 3 N5	100				
22		firm to stiff at 22'			SB-12		2 3 5 N8	100				
24		dark brown, some silt at 24'			SB-13		2 3 5 N8	87				
26		Dense, light brown, SAND, moist		26.0	SB-14		12 15 30 N45	73				*26' 08/21/2008*
28		very dense, gray at 28'			SB-15		12 31 30 N61	73				
30		dense, trace yellowish brown at 30'			SB-16		5 14 17 N31	67				
32		Hard, brown, some mottled dark brown, CLAY, damp		33.0	SB-17		3 13 21 N34	67				
34		Hard, gray and yellowish brown mottled, sandy CLAY, some iron staining		34.0	SB-18		6 21 23 N44	67				
36					SB-19		5 13 20 N33	87				
38					SB-20		7 16 25 N41	80				
40		*--- CONTINUED NEXT PAGE ---*										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-03

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 21-Aug-2008
BORING FINISHED: 21-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 4780.02
EASTING (ft): 3685.25
ELEVATION (ft): 432.04

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★) / WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
40		trace iron oxide at 40'		40.0	SB-21		7 16 25 N41	80				
42					SB-22		10 19 29 N48	74				
44					ST-23			100				
46					SB-24		13 23 36 N59	73				
48		BORING TERMINATED AT 48'		48.0								
50												
52												
54												
56												
58												
60												

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: DH
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-04

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

DATUM: LOCAL
NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✪ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL — W — LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		Muddy										
0		GROUND SURFACE		429.2								
		Brown, sandy CLAY, damp		0.0	ST-1			75				
2		Brown, CLAY, with silt, damp		2.0	ST-2			65				
4		very stiff, reddish and yellowish brown, mottled, with occasional calcareous nodules at 4'			SB-3		4 6 10 N16	67				
6					ST-4			87				
8					SB-5		9 11 14 N25	27				
		Very stiff, brown, sandy CLAY, damp		9.0								
10		with occasional coarse, angular gravel at 9.5' reddish brown at 10'			SB-6		7 9 9 N18	53				
12		stiff at 12'			SB-7		10 5 4 N9	40				
14		Stiff, reddish brown, CLAY, with sand, damp		14.0	SB-8		4 6 5 N11	27				
		Compact, brown, fine, silty SAND, damp		15.5								
16		light brown at 16.25'			SB-9		7 12 14 N26	93				
		reddish brown at 17.25'										
18		Compact, reddish brown, clayey SAND, moist		18.0	SB-10		5 8 15 N23	87				
		Compact, light brown, fine, SAND, moist		19.0								
20		--- CONTINUED NEXT PAGE ---										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-04

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % (20 40 60 80 ★); WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
20		dense, occasional seams of gray at 20'		20.0	SB-11		6 20 20 N40	100				
22		occasional streaks of yellowish brown at 22'			SB-12		12 15 19 N34	93				▼ 22' 08/20/2008
24		very dense, gray with mottled reddish brown at 24'			SB-13		14 28 30 N58	100				
26		dense, mottled, reddish brown, yellowish brown, and gray at 26'			SB-14		13 21 22 N43	100				
28		very dense at 28'			SB-15		11 15 50 N65	87				
30		dense at 30'			SB-16		8 15 21 N36	87				
32					SB-17		14 18 27 N45	80				
34		very dense at 34'			SB-18		20 31 35 N66	100				
36					SB-19		20 31 31 N62	100				
38					SB-20		21 42 50/5"	100				
40		*--- CONTINUED NEXT PAGE ---*										

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

RECORD OF BOREHOLE MW-FGD-04

DATUM: LOCAL

PROJECT: OAK GROVE SES
LOCATION: FRANKLIN, TEXAS

BORING STARTED: 20-Aug-2008
BORING FINISHED: 20-Aug-2008

DRILLING EQUIPMENT: MOBILE B-57 BUGGY
DRILLING OPERATOR: Lewis Environmental Drilling

NORTHING (ft): 5039.72
EASTING (ft): 3414.63
ELEVATION (ft): 429.19

DEPTH SCALE FEET	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.5 FT	RECOVERY%	UNDRAINED SHEAR STRENGTH Cu (CU - ● P.P. - ⊕ Field Vane Shear ■; UU - ✿ TORV. - ▲ UCS - ✳; 400 800 1200 1600)	ROCK QUALITY DESIGNATION (RQD) % ★ (20 40 60 80); WATER CONTENT PERCENT (PL W LL; 20 40 60 80)	ADDITIONAL LAB. TESTING	INSTALLATION NOTES AND GROUNDWATER OBSERVATIONS
		--- CONTINUED FROM PREVIOUS PAGE ---										
40				40.0	SB-21		18 35 33 N68	*100*				
42		Hard, gray, CLAY, with sand		42.0	SB-22		11 21 34 N55	*100*				
44		BORING TERMINATED AT 43.5'		43.5								
46												
48												
50												
52												
54												
56												
58												
60												

DEPTH SCALE
1 inch to 2.5 feet

Golder Associates

LOGGED: CS
CHECKED: *BLT*

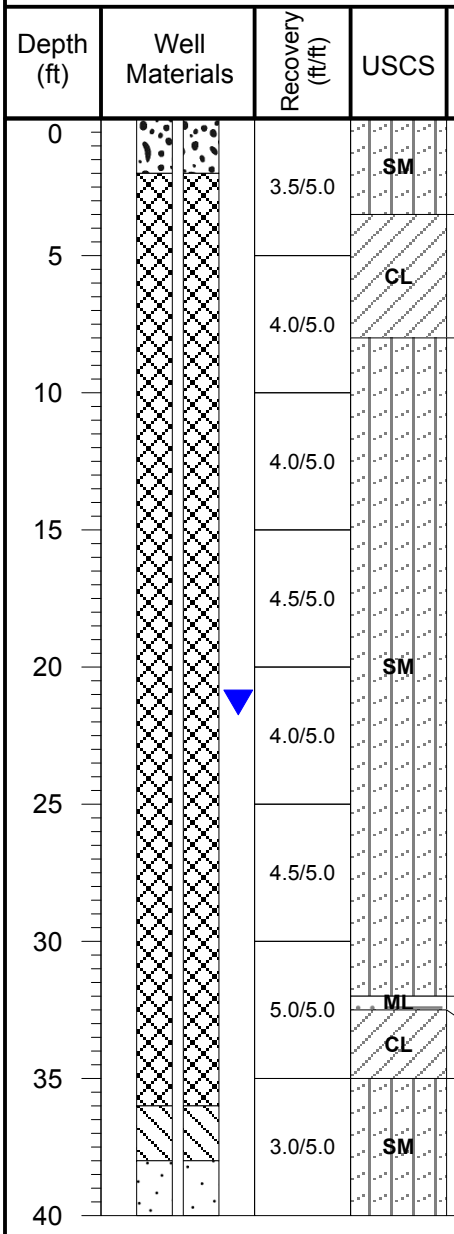
Luminant Power

Log of Boring: FGD-5

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

Completion Date:	3/3/10	Drilling Method:	HSA
Drilling Company:	Strata Core, Inc.	Borehole Diameter (in.):	6
Driller:	Roddy Qualls	Total Depth (ft):	50
Driller's License:	3121	Northing:	571950.33
Field Supervisor:	Chris Moore	Easting:	3200628.33
Sampling Method:	3"x5' Barrel	Ground Elev. (ft AMSL):	430.54



Lithologic Description

SILTY SAND, SM, brown, moist, soft.

SILTY CLAY, CL, mottled yellowish brown and yellowish red, moist, firm, with sand from 6'-8'.

SILTY SAND, SM, banded very pale brown and brownish yellow, moist, soft to firm, laminated, very fine grained, trace thinly laminated silt lenses.

SILT, ML, brown, moist to wet, very soft to soft.

CLAY, CL, dark gray, moist, firm to hard, with thinly laminated silt and sand lenses.

SILTY SAND, SM, dark gray to gray, moist, soft to firm, very fine grained, some thinly laminated silt lenses, trace thin carbonaceous lenses, wet at 40', clayey lenses at: 40.5' -41', 44'-44.5, and, 47'-48'.

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

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 23.67 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 36.0) Cement/Bentonite Grout
(36.0 - 38.0) Bentonite Chips
(38.0 - 50.0) 12/20 Silica Sand

Well Materials
(+2.4 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

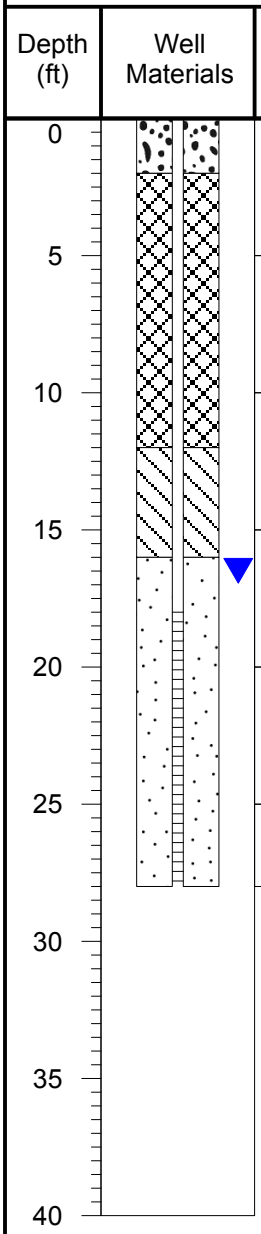
Luminant Power

Log of Boring: FGD-6

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

Completion Date:	3/4/10	Drilling Method:	HSA
Drilling Company:	Strata Core, Inc.	Borehole Diameter (in.):	6
Driller:	Roddy Qualls	Total Depth (ft):	28
Driller's License:	3121	Northing:	573195.06
Field Supervisor:	Chris Moore	Easting:	3200525.61
Sampling Method:	3"x5' Barrel	Ground Elev. (ft AMSL):	425.63



Lithologic Description

FILL, sandy clay, yellowish brown, moist, soft to firm, very fine grained sand.

FILL, clay, olive gray, moist, firm, with concrete fragments.

SAND, SP, yellowish brown, wet, soft, laminated, very fine grained, becomes gray at 26'.

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

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 19.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 14.0) Cement/Bentonite Grout
(14.0 - 16.0) Bentonite Chips
(16.0 - 28.0) 12/20 Silica Sand

Well Materials
(+3.0 - 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 - 28.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

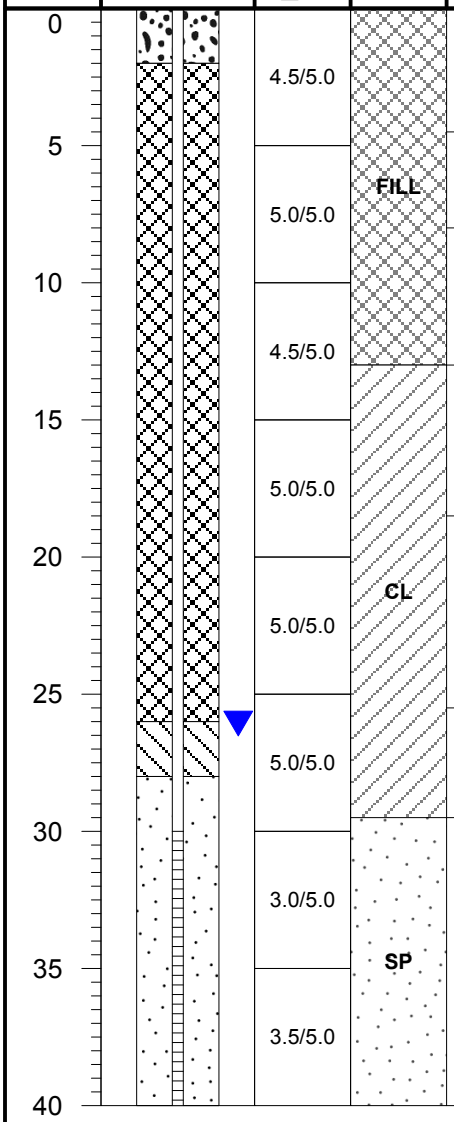
Luminant Power

Log of Boring: FGD-8

Oak Grove Steam Electric Station
Franklin, TX

PBW Project No. 1602

Completion Date:	3/4/10	Drilling Method:	HSA
Drilling Company:	Strata Core, Inc.	Borehole Diameter (in.):	6
Driller:	Roddy Qualls	Total Depth (ft):	40
Driller's License:	3121	Northing:	573033.29
Field Supervisor:	Chris Moore	Easting:	3198862.3
Sampling Method:	3"x5' Barrel	Ground Elev. (ft AMSL):	437.06



Lithologic Description
FILL, silty clay, CL, brown, moist, soft to firm.
FILL, silty sand, SM, very pale brown, dry to moist, soft, very fine grained.
FILL, silty clay, CL, dark gray, moist, firm, crumbles easily, some sand layers.
SANDY, CLAY, CL, strong brown, moist, firm, laminated, very fine grained sand
SILTY CLAY, CL, dark gray, moist, firm, with sand laminae.
SILTY CLAY, CL, mottled gray and brown, moist, firm to hard, some sand laminae, some oxidized staining.
SAND, SP, dark gray, wet, very soft to soft, very fine grained, some silty laminae.

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

Notes:

Initial Fluid Level (3/9/10)
▼ Depth to water: 29.11 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Cement/Bentonite Grout
(26.0 - 28.0) Bentonite Chips
(28.0 - 40.0) 12/20 Silica Sand

Well Materials
(+3.0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

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

BOREHOLE FGD-11

CLIENT Luminant Power
PROJECT NUMBER 1406296
DATE STARTED 11/25/14 **COMPLETED** 11/26/14
DRILLING CONTRACTOR Envirotech
DRILLING METHOD Auger
LOGGED BY DMW **CHECKED BY** CFR
NOTES

PROJECT NAME Luminant
PROJECT LOCATION Oak Grove SES
GROUND ELEVATION 448.67 ft **HOLE SIZE** 6 inches
GROUND WATER LEVELS:
AT TIME OF DRILLING 40 40' bgs
AT END OF DRILLING
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		Firm, brown and green, CLAY, and topsoil, moist						
		Hard, brown and tan, SANDY CLAY, moist	ST	75		1.0		
			ST	50		4.5		
5			ST	54		4.5		
			SS	58	3-5-7-10 (12)			
			SS	79	6-8-8-9 (16)			
10			SS	67	5-9-10-12 (19)			
			SS	71	6-8-9-12 (17)			
		Very stiff, red and black, CLAY, with brown sand, moist						
15		Stiff, brown and tan, SANDY CLAY, moist	SS	67	6-8-6-7 (14)			
		maroon, gravel sized rocks at 15.0'	SS	92	5-6-8-9 (14)			
			SS	79	4-6-8-9 (14)			
20		Compact, brown and tan, CLAYEY SAND, moist						
		with gray and brown clay lenses at 21.0'	SS	71	6-8-7-8 (15)			
		loosely consolidated sand at 23.0'	SS	79	7-8-11-15 (19)			
25		orange mottlings at 25.0'	SS	83	9-13-17-19 (30)			
			SS	83	9-10-14-16 (24)			
			SS	92	8-9-18-21 (27)			
30		Very stiff, gray, SAND and CLAY, moist dense at 29.5'						

(Continued Next Page)

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Fax: (281) 821-6870

BOREHOLE FGD-11

CLIENT Luminant Power **PROJECT NAME** Luminant

PROJECT NUMBER 1406296 **PROJECT LOCATION** Oak Grove SES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN (tsf)	DRY UNIT WT. (pcf)
30		Very stiff, gray, SAND and CLAY, moist *(continued)*	SS	83	9-13-17-19 (30)		
		without clay at 31.0'	SS	88	10-16-22-22 (38)		
		Dense, gray and tan, SILTY SAND, moist					
		poorly consoldiated at 33.0'	SS	83	7-11-17-17 (28)		
35			SS	71	6-13-14-15 (27)		
		Very stiff, gray, SILTY CLAY, moist	SS	75	4-6-13-17 (19)		
		Dense, gray and tan, SILTY SAND, moist moist to wet at 38.0'	SS	71	6-5-8-10 (13)		
40		Compact, gray and tan, SAND, moist to wet	SS	67	3-4-4-7 (8)		
		Compact, gray and tan, SILTY SAND, wet					
		Very stiff, gray, SILTY CLAY, moist	SS	88	7-9-10-13 (19)		
45		Dense, gray and tan, SILTY SAND, moist to wet	SS	92	3-8-24-28 (32)		
		moist at 46.0'	SS	83	4-8-26-40 (34)		
		slightly wet at 48.0'	SS	75	14-28-29-34 (57)		
50		very dense at 50.0'	SS	92	9-38-50 (88)		
		moist at 52.0'	SS	83	15-28-46-50 (74)		
		moist to wet at 54.0'	SS	71	14-36-50 (86)		
55			SS		21-39-48-113 (87)		

Bottom of borehole at 58.0 feet.

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

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BOREHOLE FGD-12

CLIENT Luminant Power
PROJECT NAME Luminant
PROJECT NUMBER 1406296
PROJECT LOCATION Oak Grove SES
DATE STARTED 11/26/14 **COMPLETED** 11/26/14
GROUND ELEVATION 439.48 ft **HOLE SIZE** 6 inches
DRILLING CONTRACTOR Envirotech
GROUND WATER LEVELS:
DRILLING METHOD Auger
AT TIME OF DRILLING 32 32' bgs
LOGGED BY DMW **CHECKED BY** CFR
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		Firm, brown, CLAY, topsoil, moist	ST	46		1.0		
		Hard, brown, SANDY CLAY, moist	ST	63		4.5		
5			ST	42		4.5		
			SS	75	6-8-10-7 (18)			▲
		Firm, red, orange and gray, CLAY, moist, with red and orange mottling	SS	75	5-8-10-11 (18)			▲
10			SS	75	6-8-12-14 (20)			▲
		Very stiff, gray and red, SILTY CLAY, moist, silt partings	SS	71	4-8-14-15 (22)			▲
15		increasing silt at 15.0'	SS	63	8-10-19-16 (29)			▲
		decreasing silt at 16.0'	SS	75	5-9-12-16 (21)			▲
		Dense, red and gray, SANDY SILT, moist increasing silt at 17.5'	SS	79	8-14-12-8 (26)			▲
		Compact, orange and tan, SILTY SAND, moist	SS	63	7-5-5-6 (10)			▲
20		loosely consoldiated at 19.0'	SS	83	9-12-13-15 (25)			▲
		increased clay at 20.0'	SS		17-11-16-20 (27)			▲
		more consolidated at 21.0'	SS		12-18-14-15 (32)			▲
		Stiff, gray, SILTY CLAY, moist, silt partings	SS	83	9-19-19-17 (38)			▲
25		intervals of gray sand mixed with silty clay at 25.0'						
		Dense, gray, SAND, moist						
		Stiff, gray, SILTY CLAY, moist						
		Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining						
30								

(Continued Next Page)

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BOREHOLE FGD-12

CLIENT Luminant Power **PROJECT NAME** Luminant

PROJECT NUMBER 1406296 **PROJECT LOCATION** Oak Grove SES

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
30		Dense, gray, SILTY SAND, with interbedded clay, moist, with red staining *(continued)*	SS	88	4-5-15-24 (20)			▲
		▽ red to moist, turning red at 32.0'	SS	67	10-16-30-28 (46)			▲
35		brown to gray at 34.0'	SS	63	14-24-48-42 (72)			▲
			SS	92	8-18-32-42 (50)			▲
		increasing sand at 38.0'	SS	92	8-26-48-50 (74)			▲
40			SS	92	3-4-10-26 (14)			▲
		gray and tan at 42.0'	SS	92	13-24-42-43 (66)			▲
45			SS	92	16-30-45-50 (75)			▲
			SS	58	20-36-50 (86)			▲
50			SS	88	16-40-50 (90)			▲
			SS	71	18-26-50 (76)			▲
			SS	63	4-30-50 (80)			▲
55			SS	50	7-24-50 (74)			▲
			SS	58	22-48-50 (98)			▲
			SS	54	24-48-50 (98)			▲
60		dark gray at 60.0'	SS	46	25-48-50 (98)			▲
			SS	50	30-50			

Bottom of borehole at 64.0 feet.

Appendix B

Photographs of CCR Groundwater Monitoring Wells

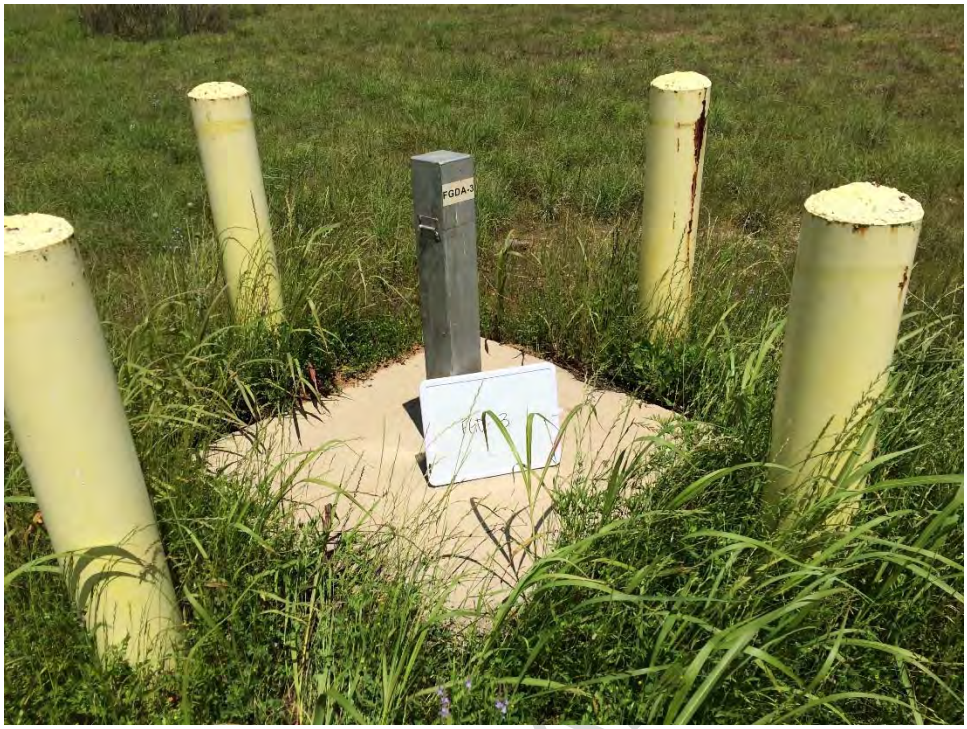
Appendix B – Photographs of CCR Groundwater Monitoring Wells
Oak Grove Steam Electric Station Monitoring Well Network

FGD AREA

Photograph 1: FGD-1

Photograph 2: FGD-2

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Oak Grove Steam Electric Station Monitoring Well Network



Photograph 3: FGD-3

Photograph 4: FGD-4

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Oak Grove Steam Electric Station Monitoring Well Network

Photograph 5: FGD-5

Photograph 6: FGD-6

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Oak Grove Steam Electric Station Monitoring Well Network

Photograph 7: FGD-8

Photograph 8: FGD-11

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Oak Grove Steam Electric Station Monitoring Well Network

Photograph 9: FGD-12

Appendix C

Groundwater Potentiometric Surface Maps

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.76*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 1

GROUNDWATER POTENTIOMETRIC SURFACE MAP NOVEMBER 3, 2015

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

Note:
423.89*-measurement appears erroneous based on subsequent measurements. Result was not used to construct potentiometric surface contours.

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 2

GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 12, 2015

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from www.tnris.gov, Robertson Co., aerial photographs, 2012.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 3

GROUNDWATER POTENTIOMETRIC SURFACE MAP FEBRUARY 9-10, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 4

GROUNDWATER POTENTIOMETRIC SURFACE MAP APRIL 14-15, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 5

GROUNDWATER POTENTIOMETRIC SURFACE MAP JUNE 16, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 6

GROUNDWATER POTENTIOMETRIC SURFACE MAP AUGUST 24, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 7

GROUNDWATER POTENTIOMETRIC SURFACE MAP OCTOBER 4, 2016

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

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- CCR Monitoring Well Location
- (410.06) Groundwater Potentiometric Surface (ft. MSL)
- 400 Groundwater Potentiometric Surface Contour (C.I. = 5 ft.)

N

Scale in Feet

0 500 1000

SOURCE:
Imagery from Google Earth dated 10/30/2014.

OAK GROVE STEAM ELECTRIC STATION

ROBERTSON COUNTY, TEXAS

Figure 8

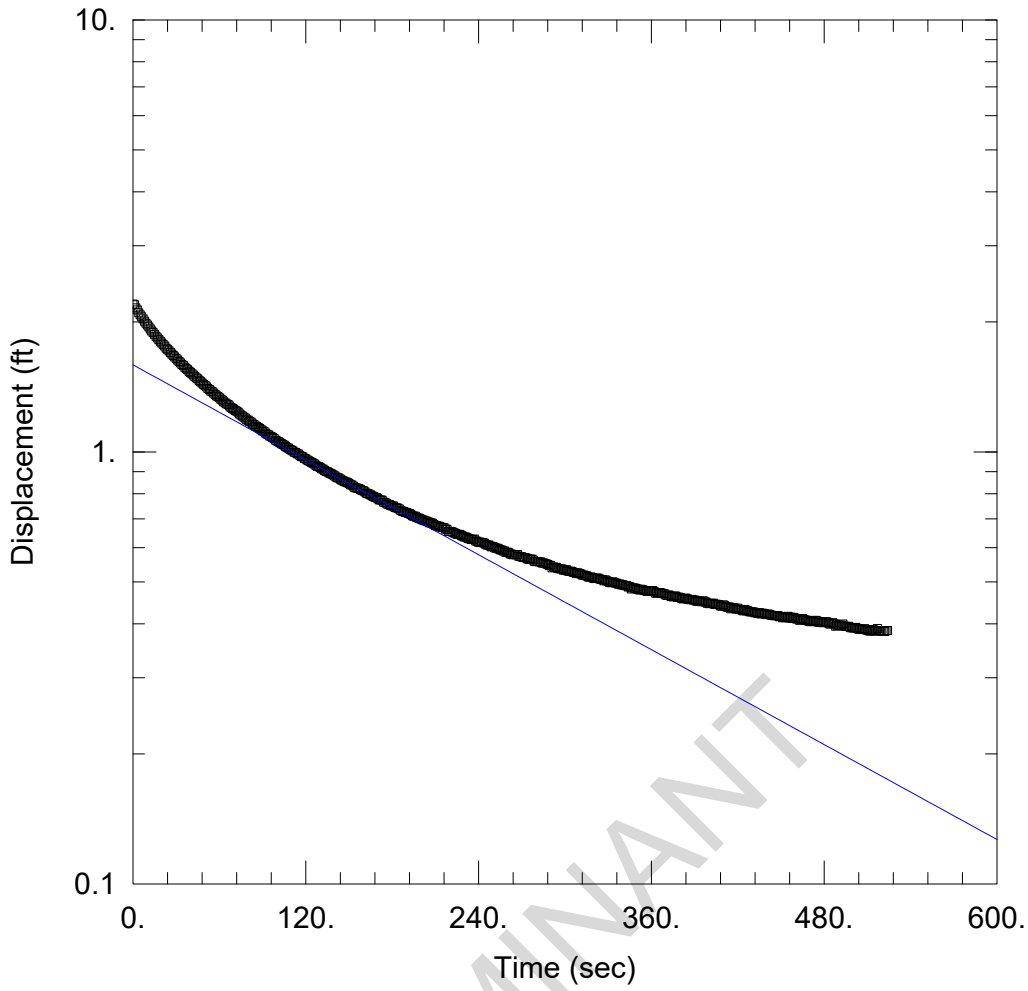
GROUNDWATER POTENTIOMETRIC SURFACE MAP DECEMBER 19, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix D

Aquifer Test Data



WELL TEST ANALYSIS

Data Set: J:\...\FGD-5 Slug OUT.aqt
Date: 10/02/17 Time: 14:47:55

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-5
Test Date: 9-23-15

AQUIFER DATA

Saturated Thickness: 12.65 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (FGD-5)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 8.65 ft
Casing Radius: 0.083 ft
Static Water Column Height: 8.65 ft
Screen Length: 8.65 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0003194 cm/sec y0 = 1.591 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-D_Oak Grove\OGSES Slug Tests Sept 2015\Aqtesolv files
Date: 10/02/17
Time: 14:48:13

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-5

AQUIFER DATA

Saturated Thickness: 12.65 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: FGD-5

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

Initial Displacement: 2.2 ft
Static Water Column Height: 8.65 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 8.65 ft
Total Well Penetration Depth: 8.65 ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1342 ft
Gravel Pack Porosity: 0.2

No. of Observations: 525

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	263.	0.5796
1.	2.19	264.	0.5779
2.	2.156	265.	0.5787
3.	2.131	266.	0.5775
4.	2.099	267.	0.5786
5.	2.076	268.	0.5732
6.	2.055	269.	0.5725
7.	2.033	270.	0.5718
8.	2.009	271.	0.57
9.	1.987	272.	0.5691
10.	1.968	273.	0.5682
11.	1.947	274.	0.5655
12.	1.926	275.	0.5642
13.	1.905	276.	0.565
14.	1.888	277.	0.5646
15.	1.871	278.	0.5621
16.	1.852	279.	0.5574
17.	1.837	280.	0.5578
18.	1.819	281.	0.5573
19.	1.803	282.	0.5567
20.	1.786	283.	0.5562
21.	1.772	284.	0.5533
22.	1.758	285.	0.5535
23.	1.738	286.	0.5518
24.	1.728	287.	0.5509
25.	1.713	288.	0.5488
26.	1.699	289.	0.5456
27.	1.685	290.	0.5467

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
28.	1.672	291.	0.5389
29.	1.658	292.	0.542
30.	1.645	293.	0.5402
31.	1.632	294.	0.5405
32.	1.62	295.	0.5366
33.	1.607	296.	0.5377
34.	1.594	297.	0.536
35.	1.584	298.	0.536
36.	1.571	299.	0.5324
37.	1.559	300.	0.533
38.	1.549	301.	0.5335
39.	1.536	302.	0.53
40.	1.526	303.	0.5293
41.	1.516	304.	0.5296
42.	1.506	305.	0.5281
43.	1.493	306.	0.526
44.	1.484	307.	0.5257
45.	1.476	308.	0.5228
46.	1.462	309.	0.5249
47.	1.453	310.	0.523
48.	1.443	311.	0.5219
49.	1.434	312.	0.5189
50.	1.426	313.	0.519
51.	1.415	314.	0.5175
52.	1.403	315.	0.5164
53.	1.395	316.	0.5139
54.	1.384	317.	0.5129
55.	1.378	318.	0.5135
56.	1.368	319.	0.5119
57.	1.359	320.	0.5095
58.	1.348	321.	0.5092
59.	1.342	322.	0.5103
60.	1.335	323.	0.5106
61.	1.325	324.	0.5084
62.	1.317	325.	0.5067
63.	1.306	326.	0.5065
64.	1.299	327.	0.5033
65.	1.292	328.	0.5058
66.	1.288	329.	0.5025
67.	1.278	330.	0.5017
68.	1.268	331.	0.4985
69.	1.261	332.	0.4982
70.	1.255	333.	0.5006
71.	1.247	334.	0.4994
72.	1.242	335.	0.4973
73.	1.236	336.	0.4969
74.	1.224	337.	0.4941
75.	1.218	338.	0.4944
76.	1.211	339.	0.4926
77.	1.204	340.	0.4927
78.	1.198	341.	0.4912
79.	1.186	342.	0.4901
80.	1.184	343.	0.4902
81.	1.177	344.	0.4866
82.	1.172	345.	0.4876
83.	1.162	346.	0.4819
84.	1.157	347.	0.4844
85.	1.149	348.	0.4842
86.	1.145	349.	0.4835
87.	1.139	350.	0.4812
88.	1.133	351.	0.4812
89.	1.125	352.	0.4787
90.	1.119	353.	0.4808
91.	1.116	354.	0.4798
92.	1.107	355.	0.4782
93.	1.1	356.	0.4771

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
94.	1.096	357.	0.4757
95.	1.088	358.	0.4774
96.	1.085	359.	0.4776
97.	1.079	360.	0.476
98.	1.075	361.	0.4775
99.	1.064	362.	0.4749
100.	1.06	363.	0.4709
101.	1.057	364.	0.4718
102.	1.051	365.	0.4718
103.	1.045	366.	0.4727
104.	1.04	367.	0.4711
105.	1.037	368.	0.4701
106.	1.029	369.	0.4697
107.	1.025	370.	0.4665
108.	1.021	371.	0.4652
109.	1.013	372.	0.4669
110.	1.01	373.	0.4643
111.	1.005	374.	0.4622
112.	0.9984	375.	0.4621
113.	0.9968	376.	0.4638
114.	0.99	377.	0.4637
115.	0.9883	378.	0.4605
116.	0.98	379.	0.4611
117.	0.9757	380.	0.4603
118.	0.9732	381.	0.458
119.	0.9658	382.	0.4569
120.	0.9637	383.	0.4575
121.	0.9578	384.	0.4588
122.	0.9538	385.	0.4567
123.	0.9499	386.	0.4552
124.	0.946	387.	0.4548
125.	0.9417	388.	0.4558
126.	0.9378	389.	0.4542
127.	0.9311	390.	0.4542
128.	0.9259	391.	0.452
129.	0.9249	392.	0.4516
130.	0.9206	393.	0.4511
131.	0.9136	394.	0.4511
132.	0.9126	395.	0.4501
133.	0.9061	396.	0.4522
134.	0.9016	397.	0.4494
135.	0.8999	398.	0.4492
136.	0.8946	399.	0.4461
137.	0.8924	400.	0.4453
138.	0.8887	401.	0.446
139.	0.885	402.	0.4462
140.	0.8805	403.	0.4465
141.	0.8754	404.	0.4435
142.	0.8715	405.	0.4442
143.	0.8696	406.	0.4433
144.	0.8645	407.	0.4427
145.	0.8599	408.	0.4401
146.	0.857	409.	0.4395
147.	0.8533	410.	0.4427
148.	0.8521	411.	0.4406
149.	0.8485	412.	0.4382
150.	0.846	413.	0.4366
151.	0.8392	414.	0.4377
152.	0.8383	415.	0.4334
153.	0.8334	416.	0.4352
154.	0.8265	417.	0.4361
155.	0.8255	418.	0.4347
156.	0.8239	419.	0.4327
157.	0.8219	420.	0.4349
158.	0.8183	421.	0.4314
159.	0.8141	422.	0.4319

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
160.	0.8135	423.	0.4302
161.	0.8084	424.	0.4287
162.	0.8031	425.	0.432
163.	0.801	426.	0.4285
164.	0.7985	427.	0.429
165.	0.7953	428.	0.4266
166.	0.7912	429.	0.4265
167.	0.7878	430.	0.4263
168.	0.7851	431.	0.4262
169.	0.7847	432.	0.4244
170.	0.7793	433.	0.4247
171.	0.7747	434.	0.4224
172.	0.7739	435.	0.4247
173.	0.7732	436.	0.4218
174.	0.7651	437.	0.4235
175.	0.7641	438.	0.4226
176.	0.761	439.	0.4213
177.	0.7566	440.	0.4201
178.	0.7556	441.	0.4218
179.	0.751	442.	0.4204
180.	0.7497	443.	0.4187
181.	0.7492	444.	0.4183
182.	0.7433	445.	0.4178
183.	0.7425	446.	0.4176
184.	0.7411	447.	0.4176
185.	0.738	448.	0.4178
186.	0.7314	449.	0.4153
187.	0.7288	450.	0.416
188.	0.7277	451.	0.4132
189.	0.7248	452.	0.4138
190.	0.724	453.	0.4131
191.	0.7212	454.	0.4151
192.	0.7199	455.	0.4165
193.	0.7166	456.	0.4125
194.	0.7117	457.	0.4144
195.	0.7095	458.	0.4116
196.	0.7099	459.	0.4137
197.	0.7054	460.	0.4119
198.	0.7034	461.	0.41
199.	0.7014	462.	0.4113
200.	0.6986	463.	0.4076
201.	0.6961	464.	0.4091
202.	0.6943	465.	0.4114
203.	0.6926	466.	0.4088
204.	0.6907	467.	0.4081
205.	0.6885	468.	0.4077
206.	0.6851	469.	0.406
207.	0.6848	470.	0.4051
208.	0.6841	471.	0.4043
209.	0.6794	472.	0.4056
210.	0.6754	473.	0.4065
211.	0.6749	474.	0.4076
212.	0.6736	475.	0.4064
213.	0.6716	476.	0.4038
214.	0.6695	477.	0.4032
215.	0.6685	478.	0.403
216.	0.6677	479.	0.4025
217.	0.6624	480.	0.4045
218.	0.6621	481.	0.404
219.	0.6544	482.	0.404
220.	0.655	483.	0.4017
221.	0.6544	484.	0.3994
222.	0.6521	485.	0.4009
223.	0.65	486.	0.4024
224.	0.6477	487.	0.4001
225.	0.6449	488.	0.3949

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
226.	0.6443	489.	0.3969
227.	0.6445	490.	0.3973
228.	0.6407	491.	0.3971
229.	0.6384	492.	0.3968
230.	0.6356	493.	0.3995
231.	0.6353	494.	0.395
232.	0.6327	495.	0.3944
233.	0.6304	496.	0.3941
234.	0.6289	497.	0.395
235.	0.6271	498.	0.3921
236.	0.6267	499.	0.3916
237.	0.6284	500.	0.3914
238.	0.6219	501.	0.3911
239.	0.6211	502.	0.3924
240.	0.6178	503.	0.3902
241.	0.6187	504.	0.3886
242.	0.6171	505.	0.3891
243.	0.6168	506.	0.3885
244.	0.6147	507.	0.388
245.	0.6111	508.	0.3898
246.	0.6084	509.	0.3876
247.	0.609	510.	0.3868
248.	0.606	511.	0.3853
249.	0.603	512.	0.3854
250.	0.6045	513.	0.3851
251.	0.6003	514.	0.3881
252.	0.5988	515.	0.385
253.	0.5986	516.	0.3857
254.	0.5961	517.	0.3902
255.	0.5936	518.	0.3863
256.	0.5928	519.	0.385
257.	0.59	520.	0.3849
258.	0.5898	521.	0.3849
259.	0.5858	522.	0.3841
260.	0.586	523.	0.3859
261.	0.5839	524.	0.3859
262.	0.5804		

SOLUTION

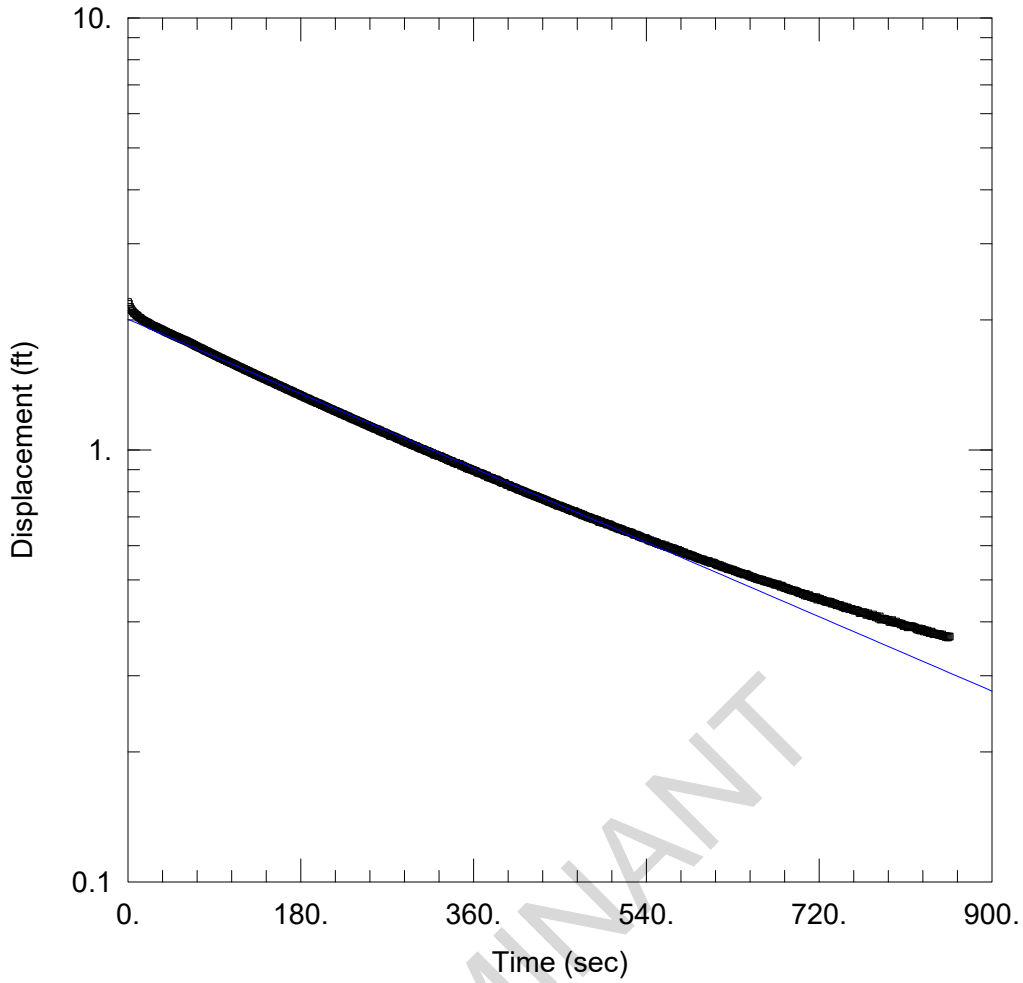
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.387

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003194	cm/sec
y0	1.591	ft

T = K*b = 0.1231 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\FGD-11 Slug OUT.aqt
Date: 01/18/16 Time: 16:57:34

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-11
Test Date: 9-23-15

AQUIFER DATA

Saturated Thickness: 6.1 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (FGD-11)

Initial Displacement: 2.2 ft Static Water Column Height: 6.1 ft
Total Well Penetration Depth: 6.1 ft Screen Length: 6.1 ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 9.068E-5 cm/sec y0 = 2.006 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 16:57:52

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-11

AQUIFER DATA

Saturated Thickness: 6.1 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: FGD-11

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

Initial Displacement: 2.2 ft
Static Water Column Height: 6.1 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 6.1 ft
Total Well Penetration Depth: 6.1 ft

No. of Observations: 857

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	429.	0.774
1.	2.178	430.	0.7729
2.	2.144	431.	0.7716
3.	2.123	432.	0.7693
4.	2.105	433.	0.7685
5.	2.092	434.	0.7661
6.	2.076	435.	0.7644
7.	2.07	436.	0.7642
8.	2.059	437.	0.7617
9.	2.052	438.	0.759
10.	2.045	439.	0.7576
11.	2.029	440.	0.757
12.	2.024	441.	0.7552
13.	2.02	442.	0.7543
14.	2.008	443.	0.752
15.	2.	444.	0.75
16.	1.994	445.	0.7484
17.	1.99	446.	0.7476
18.	1.982	447.	0.744
19.	1.977	448.	0.7423
20.	1.975	449.	0.744
21.	1.968	450.	0.7415
22.	1.962	451.	0.7406
23.	1.956	452.	0.7384
24.	1.95	453.	0.7383
25.	1.943	454.	0.7351
26.	1.94	455.	0.734
27.	1.935	456.	0.7332
28.	1.93	457.	0.7313
29.	1.925	458.	0.7305

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.922	459.	0.7284
31.	1.917	460.	0.7255
32.	1.913	461.	0.7257
33.	1.906	462.	0.7237
34.	1.902	463.	0.7211
35.	1.9	464.	0.7218
36.	1.892	465.	0.7219
37.	1.889	466.	0.7191
38.	1.883	467.	0.7175
39.	1.878	468.	0.7147
40.	1.875	469.	0.7156
41.	1.868	470.	0.7116
42.	1.865	471.	0.7116
43.	1.861	472.	0.7106
44.	1.856	473.	0.7061
45.	1.851	474.	0.7084
46.	1.847	475.	0.7053
47.	1.842	476.	0.7037
48.	1.838	477.	0.7024
49.	1.833	478.	0.7002
50.	1.83	479.	0.698
51.	1.828	480.	0.699
52.	1.821	481.	0.6962
53.	1.818	482.	0.697
54.	1.815	483.	0.6942
55.	1.808	484.	0.6919
56.	1.805	485.	0.691
57.	1.801	486.	0.6915
58.	1.799	487.	0.6896
59.	1.794	488.	0.6882
60.	1.792	489.	0.688
61.	1.786	490.	0.6832
62.	1.783	491.	0.6808
63.	1.776	492.	0.6833
64.	1.773	493.	0.6829
65.	1.769	494.	0.6786
66.	1.762	495.	0.6787
67.	1.761	496.	0.6782
68.	1.754	497.	0.6769
69.	1.75	498.	0.6749
70.	1.743	499.	0.6717
71.	1.739	500.	0.6732
72.	1.736	501.	0.6716
73.	1.73	502.	0.6722
74.	1.726	503.	0.6682
75.	1.722	504.	0.6675
76.	1.72	505.	0.6645
77.	1.716	506.	0.6644
78.	1.71	507.	0.6625
79.	1.705	508.	0.6618
80.	1.7	509.	0.6605
81.	1.696	510.	0.6578
82.	1.692	511.	0.6595
83.	1.689	512.	0.6549
84.	1.684	513.	0.6559
85.	1.679	514.	0.6548
86.	1.674	515.	0.6535
87.	1.672	516.	0.6516
88.	1.665	517.	0.649
89.	1.663	518.	0.6492
90.	1.659	519.	0.6484
91.	1.654	520.	0.6463
92.	1.65	521.	0.6455
93.	1.647	522.	0.6449
94.	1.643	523.	0.6443
95.	1.636	524.	0.6436

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
96.	1.634	525.	0.6419
97.	1.63	526.	0.6396
98.	1.627	527.	0.6369
99.	1.623	528.	0.6368
100.	1.617	529.	0.6366
101.	1.614	530.	0.6352
102.	1.611	531.	0.6342
103.	1.605	532.	0.6306
104.	1.604	533.	0.6315
105.	1.599	534.	0.6288
106.	1.595	535.	0.6277
107.	1.591	536.	0.6262
108.	1.589	537.	0.6252
109.	1.584	538.	0.6238
110.	1.579	539.	0.6246
111.	1.577	540.	0.6235
112.	1.573	541.	0.6202
113.	1.569	542.	0.6202
114.	1.563	543.	0.6163
115.	1.561	544.	0.6179
116.	1.555	545.	0.6143
117.	1.554	546.	0.614
118.	1.55	547.	0.6141
119.	1.545	548.	0.6123
120.	1.542	549.	0.6127
121.	1.539	550.	0.6087
122.	1.532	551.	0.6103
123.	1.533	552.	0.6062
124.	1.526	553.	0.6056
125.	1.522	554.	0.6056
126.	1.521	555.	0.6029
127.	1.515	556.	0.6048
128.	1.512	557.	0.6016
129.	1.508	558.	0.5997
130.	1.506	559.	0.5998
131.	1.501	560.	0.6011
132.	1.498	561.	0.596
133.	1.492	562.	0.5973
134.	1.492	563.	0.5956
135.	1.487	564.	0.5952
136.	1.484	565.	0.5922
137.	1.48	566.	0.5929
138.	1.476	567.	0.5913
139.	1.472	568.	0.592
140.	1.47	569.	0.5898
141.	1.465	570.	0.5893
142.	1.461	571.	0.586
143.	1.46	572.	0.5846
144.	1.456	573.	0.5872
145.	1.452	574.	0.5801
146.	1.448	575.	0.584
147.	1.447	576.	0.5808
148.	1.442	577.	0.5804
149.	1.438	578.	0.5776
150.	1.436	579.	0.5793
151.	1.432	580.	0.5765
152.	1.43	581.	0.5748
153.	1.424	582.	0.574
154.	1.422	583.	0.5739
155.	1.418	584.	0.5732
156.	1.413	585.	0.5694
157.	1.412	586.	0.5707
158.	1.409	587.	0.5687
159.	1.404	588.	0.5691
160.	1.401	589.	0.5676
161.	1.399	590.	0.5658

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
162.	1.396	591.	0.565
163.	1.391	592.	0.563
164.	1.389	593.	0.5633
165.	1.385	594.	0.5613
166.	1.38	595.	0.5604
167.	1.378	596.	0.5587
168.	1.376	597.	0.5585
169.	1.372	598.	0.5574
170.	1.37	599.	0.5578
171.	1.364	600.	0.5554
172.	1.364	601.	0.5541
173.	1.357	602.	0.5538
174.	1.357	603.	0.5525
175.	1.352	604.	0.5509
176.	1.35	605.	0.5529
177.	1.347	606.	0.5492
178.	1.344	607.	0.5478
179.	1.341	608.	0.5488
180.	1.336	609.	0.548
181.	1.333	610.	0.5484
182.	1.33	611.	0.5467
183.	1.328	612.	0.5444
184.	1.323	613.	0.5428
185.	1.32	614.	0.5406
186.	1.318	615.	0.5423
187.	1.315	616.	0.54
188.	1.314	617.	0.5404
189.	1.308	618.	0.537
190.	1.307	619.	0.5383
191.	1.302	620.	0.535
192.	1.299	621.	0.5351
193.	1.295	622.	0.5345
194.	1.295	623.	0.5332
195.	1.292	624.	0.5316
196.	1.288	625.	0.5297
197.	1.284	626.	0.5314
198.	1.284	627.	0.5291
199.	1.281	628.	0.5285
200.	1.276	629.	0.5282
201.	1.275	630.	0.5278
202.	1.269	631.	0.5264
203.	1.27	632.	0.5238
204.	1.265	633.	0.5242
205.	1.264	634.	0.5229
206.	1.258	635.	0.5219
207.	1.257	636.	0.5206
208.	1.253	637.	0.5196
209.	1.251	638.	0.5178
210.	1.247	639.	0.5183
211.	1.244	640.	0.5173
212.	1.242	641.	0.5153
213.	1.24	642.	0.5151
214.	1.236	643.	0.5164
215.	1.232	644.	0.5148
216.	1.23	645.	0.5148
217.	1.228	646.	0.5116
218.	1.224	647.	0.5117
219.	1.223	648.	0.5098
220.	1.219	649.	0.5092
221.	1.216	650.	0.508
222.	1.213	651.	0.5077
223.	1.209	652.	0.5063
224.	1.21	653.	0.5053
225.	1.206	654.	0.5045
226.	1.202	655.	0.5028
227.	1.2	656.	0.503

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
228.	1.198	657.	0.5012
229.	1.195	658.	0.5009
230.	1.192	659.	0.5014
231.	1.188	660.	0.4993
232.	1.186	661.	0.5
233.	1.183	662.	0.4974
234.	1.181	663.	0.4963
235.	1.177	664.	0.4966
236.	1.176	665.	0.4949
237.	1.174	666.	0.4958
238.	1.172	667.	0.4939
239.	1.168	668.	0.4938
240.	1.166	669.	0.4927
241.	1.163	670.	0.4915
242.	1.161	671.	0.4907
243.	1.158	672.	0.4908
244.	1.155	673.	0.4898
245.	1.152	674.	0.4876
246.	1.149	675.	0.4884
247.	1.147	676.	0.4874
248.	1.144	677.	0.4885
249.	1.142	678.	0.4853
250.	1.139	679.	0.4848
251.	1.137	680.	0.4823
252.	1.133	681.	0.4852
253.	1.131	682.	0.4825
254.	1.129	683.	0.4805
255.	1.125	684.	0.4796
256.	1.123	685.	0.4787
257.	1.119	686.	0.4796
258.	1.12	687.	0.477
259.	1.118	688.	0.4759
260.	1.114	689.	0.4758
261.	1.114	690.	0.4735
262.	1.107	691.	0.4741
263.	1.109	692.	0.4727
264.	1.103	693.	0.4724
265.	1.102	694.	0.4729
266.	1.097	695.	0.4711
267.	1.099	696.	0.4707
268.	1.093	697.	0.4696
269.	1.093	698.	0.4678
270.	1.088	699.	0.4673
271.	1.086	700.	0.4658
272.	1.084	701.	0.4666
273.	1.077	702.	0.465
274.	1.081	703.	0.463
275.	1.077	704.	0.4644
276.	1.076	705.	0.4606
277.	1.074	706.	0.4638
278.	1.072	707.	0.4597
279.	1.068	708.	0.4592
280.	1.064	709.	0.4607
281.	1.064	710.	0.4604
282.	1.06	711.	0.4567
283.	1.058	712.	0.4566
284.	1.056	713.	0.4569
285.	1.056	714.	0.4547
286.	1.051	715.	0.4552
287.	1.047	716.	0.4534
288.	1.046	717.	0.4561
289.	1.045	718.	0.4504
290.	1.04	719.	0.4533
291.	1.038	720.	0.4515
292.	1.037	721.	0.4519
293.	1.036	722.	0.4485

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
294.	1.032	723.	0.4491
295.	1.03	724.	0.449
296.	1.027	725.	0.4473
297.	1.026	726.	0.446
298.	1.023	727.	0.4449
299.	1.02	728.	0.4458
300.	1.021	729.	0.4447
301.	1.018	730.	0.4457
302.	1.013	731.	0.4431
303.	1.013	732.	0.4451
304.	1.01	733.	0.4409
305.	1.007	734.	0.4417
306.	1.006	735.	0.4415
307.	1.005	736.	0.4401
308.	1.002	737.	0.4405
309.	0.9991	738.	0.4371
310.	0.9966	739.	0.4375
311.	0.9937	740.	0.4374
312.	0.9954	741.	0.4359
313.	0.9915	742.	0.4369
314.	0.9895	743.	0.4346
315.	0.987	744.	0.4342
316.	0.9841	745.	0.4324
317.	0.9832	746.	0.4341
318.	0.9797	747.	0.4301
319.	0.9745	748.	0.4301
320.	0.9769	749.	0.4322
321.	0.9728	750.	0.4308
322.	0.9728	751.	0.4291
323.	0.9682	752.	0.4279
324.	0.9688	753.	0.4285
325.	0.9676	754.	0.4281
326.	0.9661	755.	0.4263
327.	0.9623	756.	0.4257
328.	0.96	757.	0.4245
329.	0.9568	758.	0.4265
330.	0.9574	759.	0.4242
331.	0.9535	760.	0.4246
332.	0.9519	761.	0.4232
333.	0.948	762.	0.4197
334.	0.9481	763.	0.4191
335.	0.9439	764.	0.4199
336.	0.9426	765.	0.4205
337.	0.943	766.	0.421
338.	0.9396	767.	0.42
339.	0.9354	768.	0.4199
340.	0.9344	769.	0.4157
341.	0.9323	770.	0.4151
342.	0.9327	771.	0.4184
343.	0.9269	772.	0.4157
344.	0.9279	773.	0.4139
345.	0.9272	774.	0.4136
346.	0.9268	775.	0.412
347.	0.9194	776.	0.416
348.	0.9211	777.	0.4127
349.	0.9189	778.	0.4129
350.	0.9142	779.	0.4096
351.	0.9147	780.	0.4119
352.	0.9106	781.	0.4096
353.	0.9063	782.	0.4067
354.	0.9093	783.	0.4118
355.	0.9034	784.	0.4047
356.	0.9047	785.	0.4056
357.	0.9025	786.	0.4069
358.	0.8994	787.	0.4065
359.	0.899	788.	0.4065

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
360.	0.8959	789.	0.4057
361.	0.8945	790.	0.4038
362.	0.8934	791.	0.4041
363.	0.8912	792.	0.4046
364.	0.8864	793.	0.4004
365.	0.8855	794.	0.3995
366.	0.8843	795.	0.4012
367.	0.8825	796.	0.4039
368.	0.8822	797.	0.3996
369.	0.8805	798.	0.3986
370.	0.8785	799.	0.3983
371.	0.8741	800.	0.4007
372.	0.8719	801.	0.3975
373.	0.873	802.	0.3973
374.	0.8722	803.	0.397
375.	0.8648	804.	0.3965
376.	0.864	805.	0.3944
377.	0.8629	806.	0.3959
378.	0.8617	807.	0.394
379.	0.8613	808.	0.3911
380.	0.8578	809.	0.393
381.	0.8569	810.	0.3918
382.	0.8541	811.	0.392
383.	0.8525	812.	0.3886
384.	0.8546	813.	0.3902
385.	0.8492	814.	0.3916
386.	0.8494	815.	0.3893
387.	0.8464	816.	0.3905
388.	0.8426	817.	0.3906
389.	0.8406	818.	0.389
390.	0.8384	819.	0.3887
391.	0.8384	820.	0.388
392.	0.8382	821.	0.3859
393.	0.8367	822.	0.3843
394.	0.8318	823.	0.3836
395.	0.8298	824.	0.3861
396.	0.8287	825.	0.3823
397.	0.8288	826.	0.382
398.	0.8264	827.	0.3854
399.	0.8215	828.	0.3828
400.	0.8224	829.	0.38
401.	0.8203	830.	0.3825
402.	0.8195	831.	0.3814
403.	0.8176	832.	0.3789
404.	0.8157	833.	0.3816
405.	0.8141	834.	0.3784
406.	0.8101	835.	0.3767
407.	0.809	836.	0.3781
408.	0.8093	837.	0.3796
409.	0.8068	838.	0.3766
410.	0.8047	839.	0.3747
411.	0.8038	840.	0.376
412.	0.8024	841.	0.3745
413.	0.8	842.	0.3753
414.	0.7971	843.	0.3748
415.	0.7969	844.	0.3737
416.	0.7938	845.	0.3732
417.	0.7934	846.	0.3741
418.	0.7916	847.	0.3719
419.	0.7896	848.	0.3738
420.	0.7878	849.	0.3707
421.	0.787	850.	0.371
422.	0.7859	851.	0.3703
423.	0.7834	852.	0.3687
424.	0.7804	853.	0.3705
425.	0.7818	854.	0.3678

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
426.	0.7795	855.	0.3697
427.	0.7773	856.	0.3698
428.	0.7759		

SOLUTION

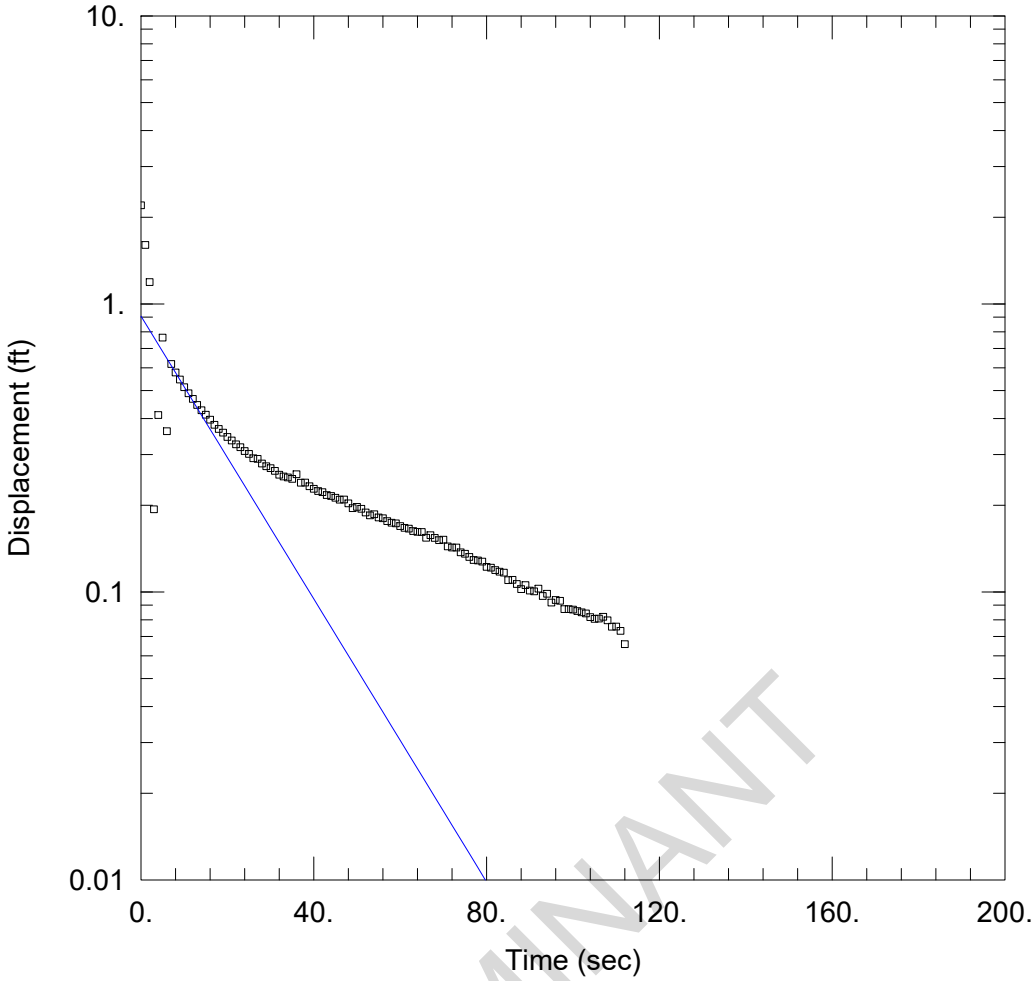
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.393

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	9.068E-5	cm/sec
y0	2.006	ft

T = K*b = 0.01686 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\FGD-12 Slug IN.aqt
Date: 01/18/16 Time: 17:04:18

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-12
Test Date: 9-23-15

AQUIFER DATA

Saturated Thickness: 11.45 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (FGD-12)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 11.45 ft
Casing Radius: 0.083 ft
Static Water Column Height: 11.45 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00172 cm/sec
y0 = 0.9069 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/18/16
Time: 17:04:38

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-12

AQUIFER DATA

Saturated Thickness: 11.45 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: FGD-12

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

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 10. ft
Total Well Penetration Depth: 11.45 ft

No. of Observations: 113

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	57.	0.1762
1.	1.603	58.	0.1739
2.	1.192	59.	0.173
3.	0.1935	60.	0.1692
4.	0.4115	61.	0.167
5.	0.7639	62.	0.1658
6.	0.3615	63.	0.1628
7.	0.6189	64.	0.1617
8.	0.5782	65.	0.1614
9.	0.5462	66.	0.1541
10.	0.5141	67.	0.1574
11.	0.4892	68.	0.154
12.	0.4681	69.	0.1513
13.	0.4456	70.	0.1518
14.	0.4276	71.	0.1439
15.	0.4124	72.	0.1427
16.	0.3961	73.	0.1426
17.	0.3803	74.	0.1373
18.	0.3678	75.	0.1356
19.	0.3574	76.	0.1323
20.	0.3453	77.	0.1291
21.	0.3357	78.	0.1286
22.	0.3254	79.	0.1274
23.	0.3179	80.	0.1222
24.	0.3086	81.	0.1214
25.	0.3013	82.	0.1191
26.	0.2913	83.	0.1176
27.	0.2897	84.	0.1166
28.	0.2792	85.	0.1099
29.	0.273	86.	0.1102

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	0.269	87.	0.1065
31.	0.2633	88.	0.1022
32.	0.2553	89.	0.1056
33.	0.2518	90.	0.1011
34.	0.2499	91.	0.1004
35.	0.2468	92.	0.1026
36.	0.2563	93.	0.0968
37.	0.2393	94.	0.0986
38.	0.2396	95.	0.0919
39.	0.2328	96.	0.0938
40.	0.228	97.	0.0931
41.	0.2239	98.	0.0871
42.	0.2219	99.	0.0872
43.	0.217	100.	0.0868
44.	0.2153	101.	0.0858
45.	0.2124	102.	0.085
46.	0.209	103.	0.0842
47.	0.2094	104.	0.0818
48.	0.203	105.	0.0806
49.	0.1953	106.	0.0808
50.	0.1973	107.	0.082
51.	0.1944	108.	0.0797
52.	0.1888	109.	0.0757
53.	0.1845	110.	0.0758
54.	0.186	111.	0.0732
55.	0.1814	112.	0.0659
56.	0.1803		

SOLUTION

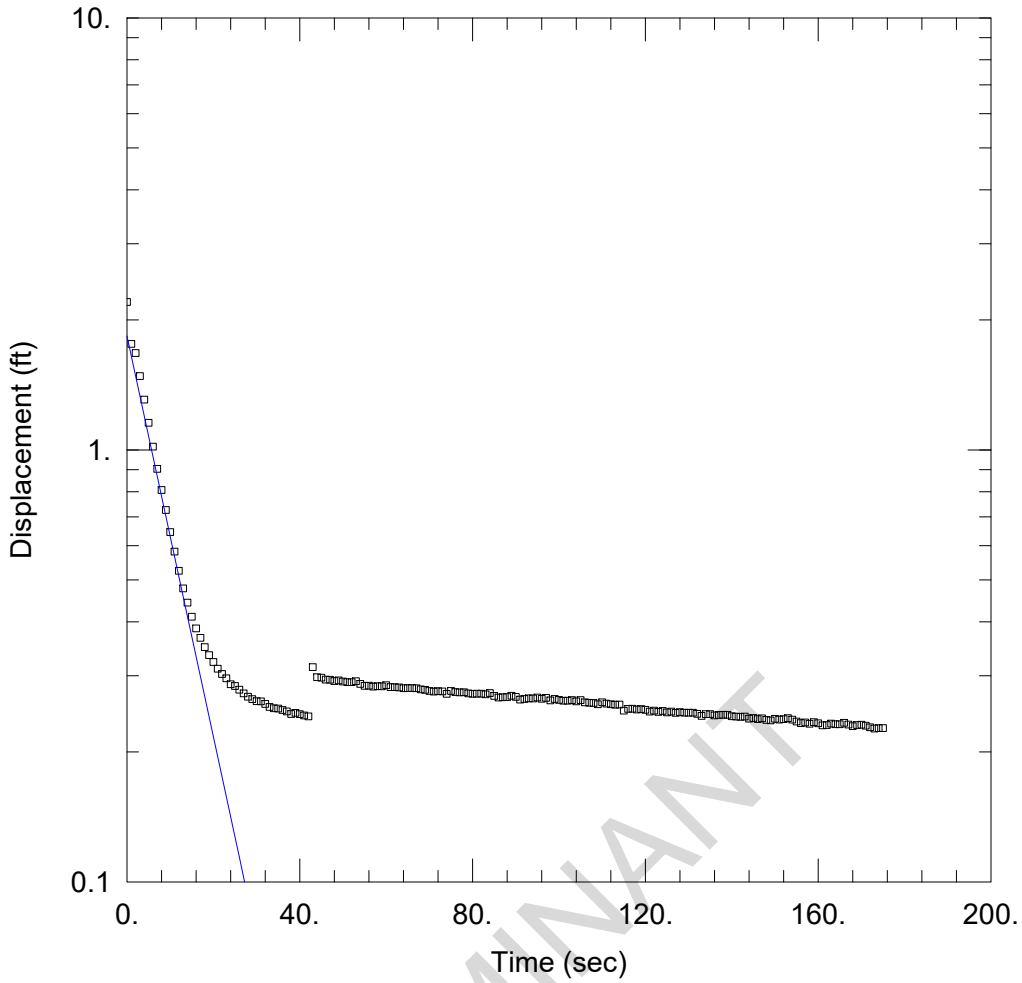
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.898

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00172	cm/sec
y0	0.9069	ft

T = K*b = 0.6003 cm²/sec



WELL TEST ANALYSIS

Data Set: J:\...\FGD-12 Slug OUT.aqt
Date: 01/18/16 Time: 17:09:49

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Well: FGD-12
Test Date: 9-23-15

AQUIFER DATA

Saturated Thickness: 11.45 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (FGD-12)

Initial Displacement: 2.2 ft Static Water Column Height: 11.45 ft
Total Well Penetration Depth: 11.45 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.003249 cm/sec y0 = 1.835 ft

Data Set: J:\5164 - Luminant CCR Well Installation and GW Sampling\5164-D_Oak Grove\OGSES Slug Tests Sept 201
Date: 01/19/16
Time: 09:27:57

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164-D
Location: OGSES
Test Date: 9-23-15
Test Well: FGD-12

AQUIFER DATA

Saturated Thickness: 11.45 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: FGD-12

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

Initial Displacement: 2.2 ft
Static Water Column Height: 11.45 ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Screen Length: 10. ft
Total Well Penetration Depth: 11.45 ft

No. of Observations: 176

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	88.	0.2678
1.	1.76	89.	0.2697
2.	1.675	90.	0.2682
3.	1.483	91.	0.2643
4.	1.308	92.	0.2652
5.	1.155	93.	0.266
6.	1.018	94.	0.2659
7.	0.9038	95.	0.2673
8.	0.8075	96.	0.2655
9.	0.7261	97.	0.2667
10.	0.6453	98.	0.2632
11.	0.5815	99.	0.2651
12.	0.5251	100.	0.2638
13.	0.4779	101.	0.2627
14.	0.4432	102.	0.2628
15.	0.4112	103.	0.2637
16.	0.3861	104.	0.2619
17.	0.3672	105.	0.2637
18.	0.3495	106.	0.2605
19.	0.3349	107.	0.2598
20.	0.3228	108.	0.2595
21.	0.3115	109.	0.2579
22.	0.3028	110.	0.2604
23.	0.2959	111.	0.2587
24.	0.2869	112.	0.2579
25.	0.2841	113.	0.2572
26.	0.2786	114.	0.2574
27.	0.2733	115.	0.2492
28.	0.2684	116.	0.2516
29.	0.265	117.	0.2517

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	0.2621	118.	0.2507
31.	0.2618	119.	0.2513
32.	0.2582	120.	0.2502
33.	0.2541	121.	0.2478
34.	0.2523	122.	0.2491
35.	0.2519	123.	0.2475
36.	0.25	124.	0.2487
37.	0.2481	125.	0.2469
38.	0.2448	126.	0.2478
39.	0.2463	127.	0.2462
40.	0.2445	128.	0.2472
41.	0.2429	129.	0.2464
42.	0.2417	130.	0.2464
43.	0.3141	131.	0.2465
44.	0.2977	132.	0.245
45.	0.2969	133.	0.2423
46.	0.2941	134.	0.2446
47.	0.2937	135.	0.2445
48.	0.2917	136.	0.2429
49.	0.2927	137.	0.2435
50.	0.2911	138.	0.2437
51.	0.2899	139.	0.2436
52.	0.2901	140.	0.2418
53.	0.2915	141.	0.2414
54.	0.2872	142.	0.241
55.	0.2843	143.	0.2414
56.	0.2845	144.	0.2388
57.	0.2831	145.	0.2395
58.	0.284	146.	0.2382
59.	0.2837	147.	0.2391
60.	0.2854	148.	0.2372
61.	0.2824	149.	0.2366
62.	0.2825	150.	0.2385
63.	0.2819	151.	0.2376
64.	0.2807	152.	0.2381
65.	0.281	153.	0.2394
66.	0.2811	154.	0.2376
67.	0.2807	155.	0.2352
68.	0.279	156.	0.2332
69.	0.2784	157.	0.234
70.	0.2768	158.	0.2324
71.	0.2758	159.	0.2344
72.	0.2764	160.	0.233
73.	0.2759	161.	0.2303
74.	0.2726	162.	0.2308
75.	0.2767	163.	0.2325
76.	0.2751	164.	0.2318
77.	0.2746	165.	0.2317
78.	0.2749	166.	0.2335
79.	0.2732	167.	0.2314
80.	0.2725	168.	0.2294
81.	0.2728	169.	0.2308
82.	0.2727	170.	0.2312
83.	0.2717	171.	0.2299
84.	0.2737	172.	0.228
85.	0.2694	173.	0.2265
86.	0.2673	174.	0.2271
87.	0.2677	175.	0.2271

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.003249	cm/sec
y0	1.835	ft

T = K*b = 1.134 cm²/sec