COAL COMBUSTION RESIDUAL RULE
GROUNDWATER MONITORING SYSTEM CERTIFICATION

MONTICELLO STEAM ELECTRIC STATION
ASH PONDS
MOUNT PLEASANT, TEXAS

OCTOBER 16, 2017

Prepared For:

Luminant Generation Company, LLC
6555 Sierra Drive
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

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1.0 INTRODUCTION

Luminant Generation Company, LLC (Luminant) operates the Monticello Steam Electric Station (MOSES) located approximately six miles southwest of Mount Pleasant, Titus County, Texas (Figure 1). The three power generation units at the MOSES burn lignite and Powder River Basin coal. Coal Combustion Residuals (CCRs) including fly ash, bottom ash, and scrubber sludge are generated as part of MOSES unit operations. The CCRs are currently stored, treated, and disposed of in surface impoundments on-site, or at other Luminant facilities. Three surface impoundments are located within the MOSES operations, the West Ash Settling Pond, the Southwest Ash Settling Pond, and Northeast Ash Water Retention Pond (Ash Ponds). These ponds are collectively referred to as the Ash Ponds and are evaluated as one CCR unit. The Ash Ponds meet the definition of a CCR surface impoundment 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 Ash Pond Area

Bottom ash is sluiced to the NE and West Ash Ponds, and the SW Ash Pond is used for overflow from the other two ponds. In addition to the sluiced ash, overflow from the dewatering bins is also sent to these ponds. Based on drawings provided by Luminant, these ponds have compacted clay liners consisting of three feet of clay soil, and are considered existing lined surface impoundments under the CCR Rule. The clay soil is covered by a four-inch concrete revetment.

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 Ash Pond Groundwater Monitoring System

The CCR groundwater monitoring well system at the Ash Ponds consists of seven monitoring wells (W-29, W-30, W-31, W-32, W-33, W-34, and W-35) 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 Ash Ponds are located in the outcrop area of the Eocene-aged Wilcox Group (Barnes, 1966). PBW reviewed soil boring logs, monitoring well completion documentation, and historical reports to describe the geologic and hydrogeologic conditions in the Ash Pond area. Geologic cross sections were constructed using these data. The locations of the cross sections are shown on Figure 3 and the cross sections are shown on Figures 4 and 5.

The geology of the Ash Pond area consists of an upper clay and silt unit that extends from ground surface to about 5 to 25 feet below ground surface (bgs). The upper clay and silt unit is underlain by an approximately 20-foot to 40-foot thick unit of silty sand, which is underlain by a lower clay unit that ranged in thickness from less than 5 feet to about 15 feet. The uppermost aquifer at the Site occurs under unconfined to semi-confined conditions within the intermediate silty sand unit.

2.3 Groundwater Potentiometric Surface Elevations

Eight background groundwater monitoring events were performed using the Ash Pond CCR monitoring well system from October 2015 to December 2016. Static water levels measured during the background monitoring period indicated water elevations ranging from 354.80 feet above mean sea level (amsl) to 367.20 feet amsl, and depths to water ranging from 11.33 feet bgs to 25.74 feet bgs (Table 2). Groundwater potentiometric surface maps based on gauging data collected during the background monitoring period are presented in Appendix C.

Groundwater elevations were generally highest on the east side of the Ash Ponds, with an inferred groundwater flow direction to the west toward Lake Monticello. Based on the inferred direction of

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

Upgradient Wells	Downgradient Wells
W-31	W-29
W-32	W-30
W-33	W-34
	W-35

2.4 Uppermost Aquifer Hydraulic Conductivity Testing

PBW performed slug tests at monitoring wells W-32, W-33, and W-35 on October 5, 2015 to evaluate hydraulic properties 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 6.58×10^{-4} cm/sec (well W-35) to 8.42×10^{-3} cm/sec (well W-33), with a geometric mean for the test wells of 2.51×10^{-3}cm/sec.

2.5 Conclusions

The CCR groundwater monitoring well system at the Ash Ponds 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:

- Seven monitoring wells are included in the CCR groundwater monitoring system – three upgradient monitoring wells and four 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. 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., 1966. Geologic Atlas of Texas, Texarkana Sheet. Texas Bureau of Economic Geology.

Tables

TABLE 1

WELL CONSTRUCTION SUMMARY
MONTICELLO STEAM ELECTRIC STATION ASH PONDS

Well ID	Date Installed	Northing	Easting	Screen Interval (feet bgs)	Top of Pad Elev. (feet amsl)	TOC Elev. (feet amsl)	Casing Diameter (inches)
W-29	8/26/2015	527058	2754498	27-37	374.94	377.59	2
W-30	8/26/2015	527358	2755059	32-42	373.53	376.95	2
W-31	8/25/2015	526969	2755498	33-43	372.99	376.33	2
W-32	8/25/2015	526491	2755763	23-33	375.41	378.96	2
W-33	8/25/2015	525819	2755454	20-30	383.69	387.16	2
W-34	8/27/2015	525962	2754790	17-27	375.84	379.16	2
W-35	8/27/2015	526365	2754542	25-35	377.86	381.15	2

Notes:
1. Abbreviations: bgs - below ground surface; amsl - above mean sea level; TOC - top of casing.

TABLE 2
GROUNDWATER ELEVATION SUMMARY
MONTICELLO STEAM ELECTRIC STATION ASH PONDS

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
W-29	377.59	10/15/15	20.97	356.62
		12/07/15	18.46	359.13
		02/22/16	20.34	357.25
		04/04/16	20.13	357.46
		06/06/16	20.01	357.58
		08/08/16	20.72	356.87
		10/12/16	20.51	357.08
		12/29/16	20.93	356.66
W-30	376.95	10/15/15	19.49	357.46
		12/07/15	14.91	362.04
		02/22/16	17.19	359.76
		04/04/16	16.04	360.91
		06/06/16	14.77	362.18
		08/08/16	14.98	361.97
		10/12/16	17.62	359.33
		12/29/16	16.14	360.81
W-31	376.33	10/15/15	14.97	361.36
		12/07/15	13.12	363.21
		02/22/16	12.97	363.36
		04/04/16	12.74	363.59
		06/06/16	11.33	365.00
		08/08/16	13.56	362.77
		10/12/16	13.12	363.21
		12/29/16	12.98	363.35
W-32	378.96	10/15/15	15.46	363.50
		12/07/15	13.99	364.97
		02/22/16	13.49	365.47
		04/04/16	13.26	365.70
		06/06/16	11.76	367.20
		08/08/16	14.31	364.65
		10/12/16	13.72	365.24
		12/29/16	13.77	365.19
W-33	387.16	10/15/15	25.74	361.42
		12/07/15	23.54	363.62
		02/22/16	23.77	363.39
		04/04/16	23.01	364.15
		06/06/16	21.94	365.22
		08/08/16	23.78	363.38
		10/12/16	23.61	363.55
		12/29/16	24.25	362.91
W-34	379.16	10/15/15	24.36	354.80
		12/07/15	23.03	356.13
		02/22/16	22.51	356.65
		04/04/16	22.68	356.48
		06/06/16	24.09	355.07
		08/08/16	22.22	356.94
		10/12/16	22.58	356.58
		12/29/16	23.04	356.12

TABLE 2
GROUNDWATER ELEVATION SUMMARY
MONTICELLO STEAM ELECTRIC STATION ASH PONDS

Well ID	TOC Elevation (ft amsl)	Date	Depth to Water (ft btoc)	Water Elevation (ft amsl)
W-35	381.15	10/15/15	24.11	357.04
		12/07/15	22.33	358.82
		02/22/16	23.17	357.98
		04/04/16	22.93	358.22
		06/06/16	22.16	358.99
		08/08/16	23.47	357.68
		10/12/16	23.31	357.84
		12/29/16	23.65	357.50

Notes:
1. Abbreviations: TOC - top of casing; ft - feet; amsl - above mean sea level.

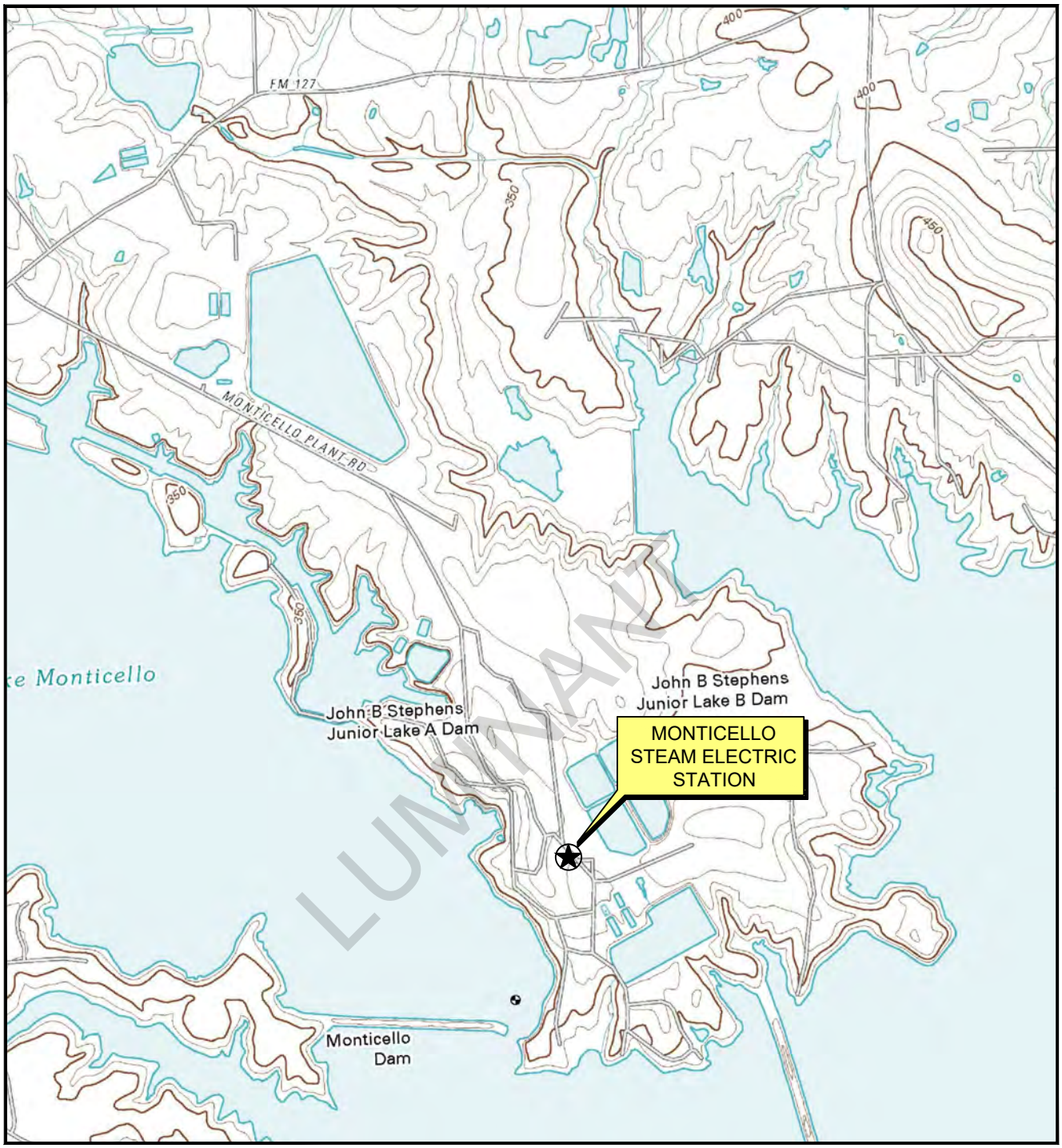
SUMMARY OF AQUIFER TEST RESULTS
MONTICELLO STEAM ELECTRIC STATION ASH PONDS

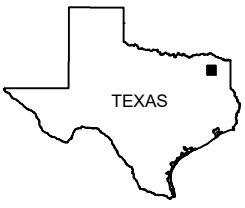
Well ID	Test Type	Aquifer Type	Analysis Method	Saturated Thickness (feet)	Results	
					T (cm^2/sec)	K (cm/sec)
W-32	Slug-In	Unconfined to Semi-Confined	Bouwer-Rice	18	1.95E+00	3.56E-03
W-32	Slug-Out	Unconfined to Semi-Confined	Bouwer-Rice	18	1.20E+00	2.19E-03
				MEAN	**1.58E+00**	**2.87E-03**
W-33	Slug-Out[1]	Unconfined	Bouwer-Rice	8	**1.97E+00**	**8.42E-03**
W-35	Slug-In	Unconfined to Semi-Confined	Bouwer-Rice	18	4.08E-01	7.43E-04
W-35	Slug-Out	Unconfined to Semi-Confined	Bouwer-Rice	18	3.14E-01	5.72E-04
				MEAN	**3.61E-01**	**6.58E-04**
				MEAN FOR ALL TESTS	**1.04E+00**	**2.51E-03**

Notes:

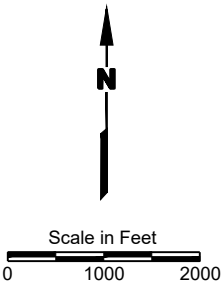
[1] - A slug-in test was not performed because the static water level was below top of screen.

Figures





□UADRANGLE LOCATIONS



SOURCE:
Base map □rom □□□.tnris.gov, Monticello, TX 7.5 min. USGS □uadrangle dated 2010.

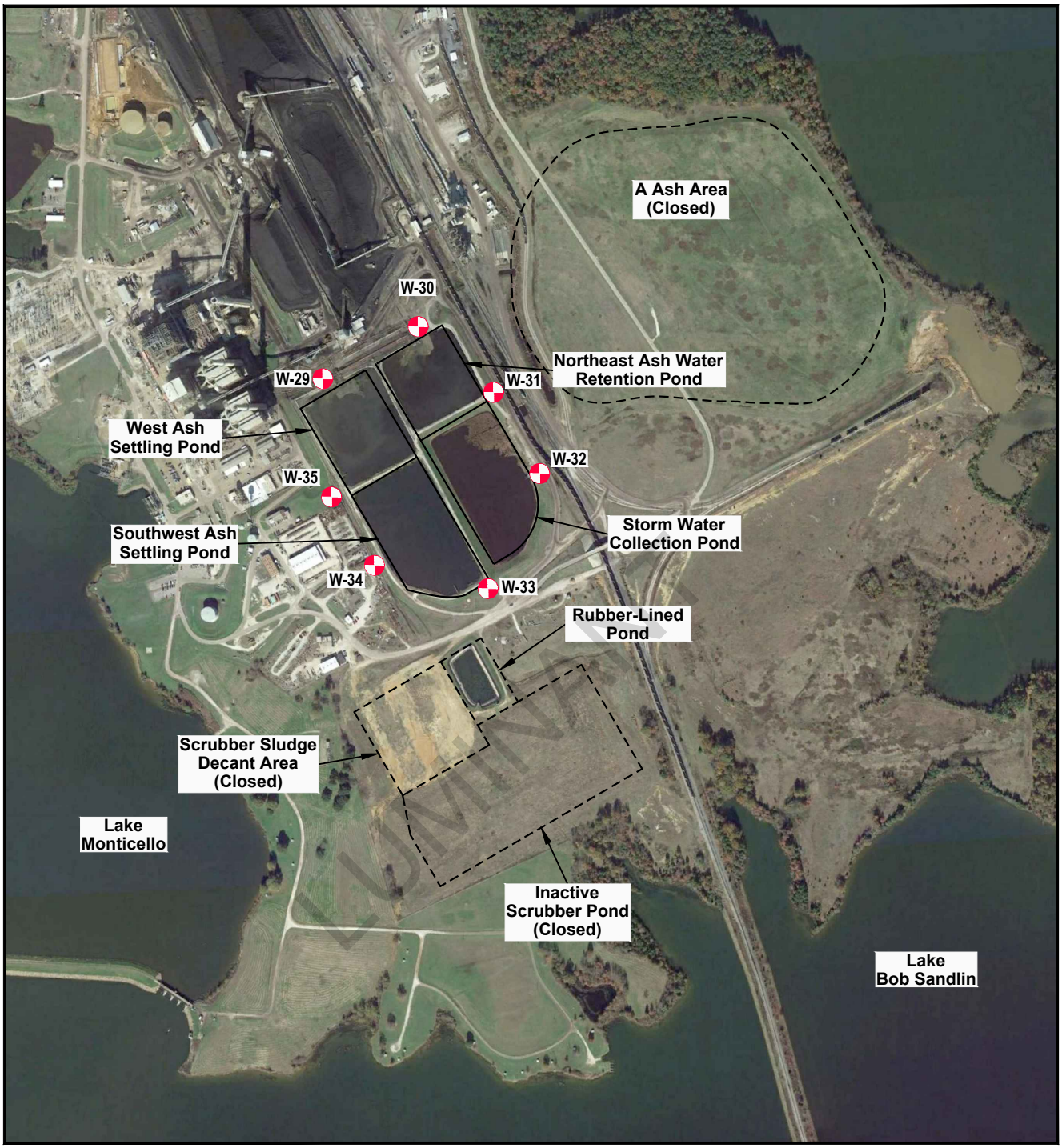
MONTICELLO STEAM ELECTRIC STATION
MONTICELLO, TEXAS

Figure 1

ASH PONDS
SITE LOCATION MAP

PROJECT: 5164C	BY: AJD	REVISIONS
DATE: SEPT., 2015	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

CCR Monitoring Well Location

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

MT. PLEASANT, TEXAS

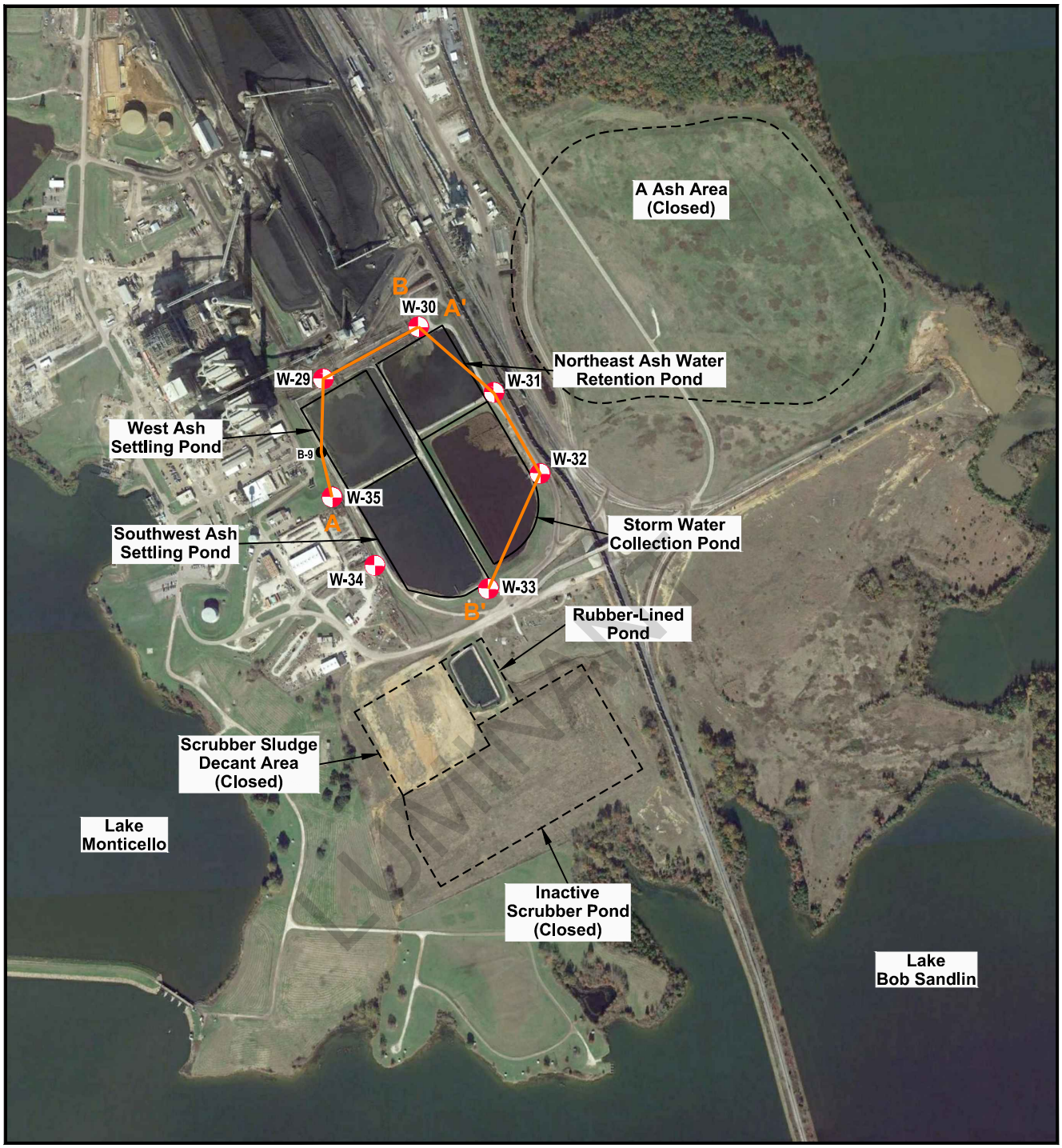
Figure 2

ASH PONDS
DETAILED SITE PLAN

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

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- Soil Boring Location
- A____A' Geologic Cross Section Location Lines

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION
MT. PLEASANT, TEXAS

Figure 3

ASH PONDS CROSS SECTION LOCATION MAP

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

PASTOR, BEHLING & WHEELER, LLC
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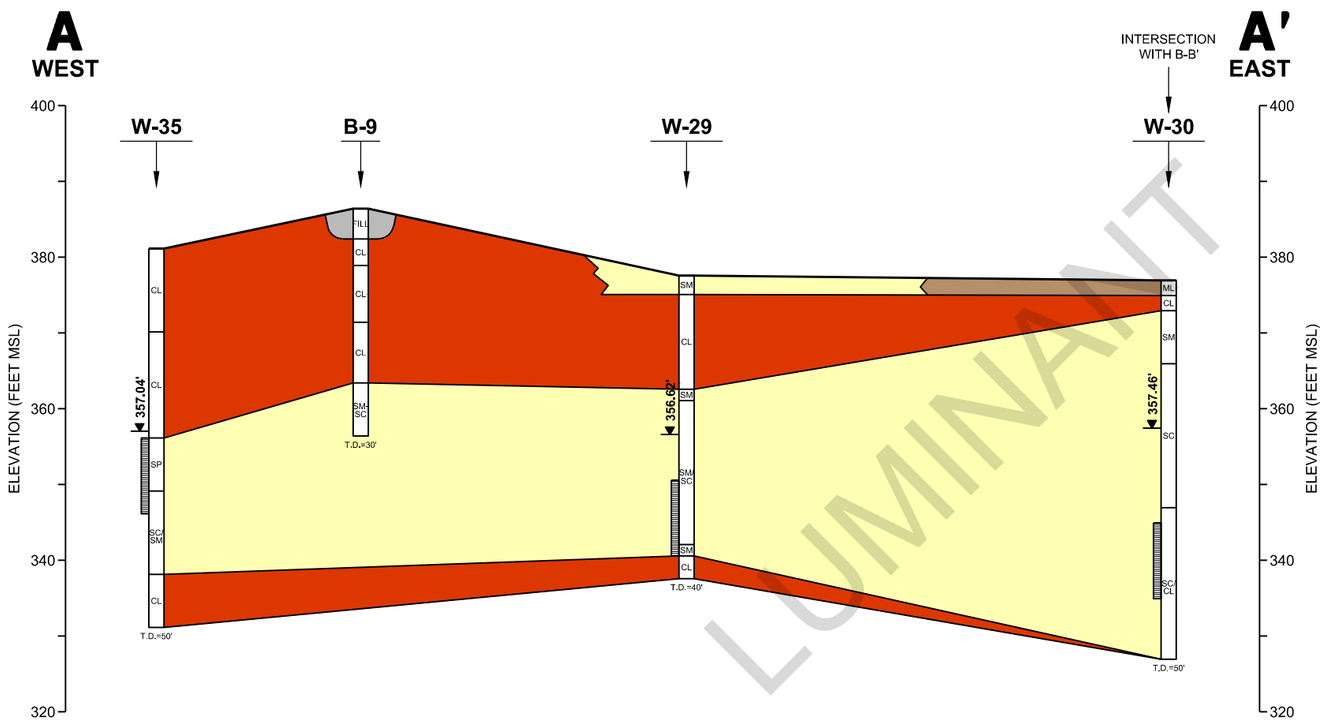


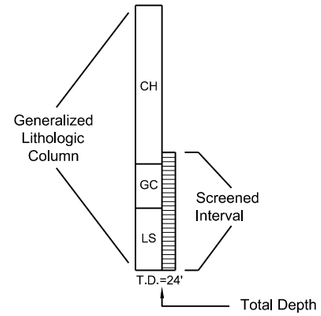
EXPLANATION

SAND

CLAY

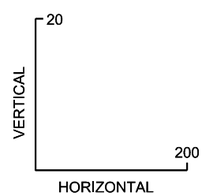
SILT

MONITORING WELL CONSTRUCTION



Water Level (Ft MSL)
Measured 10/15/15

SCALE IN FEET



10x Vertical Exaggeration

MONTICELLO STEAM ELECTRIC STATION
MT. PLEASANT, TEXAS

Figure 4

ASH PONDS
GEOLOGIC CROSS SECTION A-A'

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

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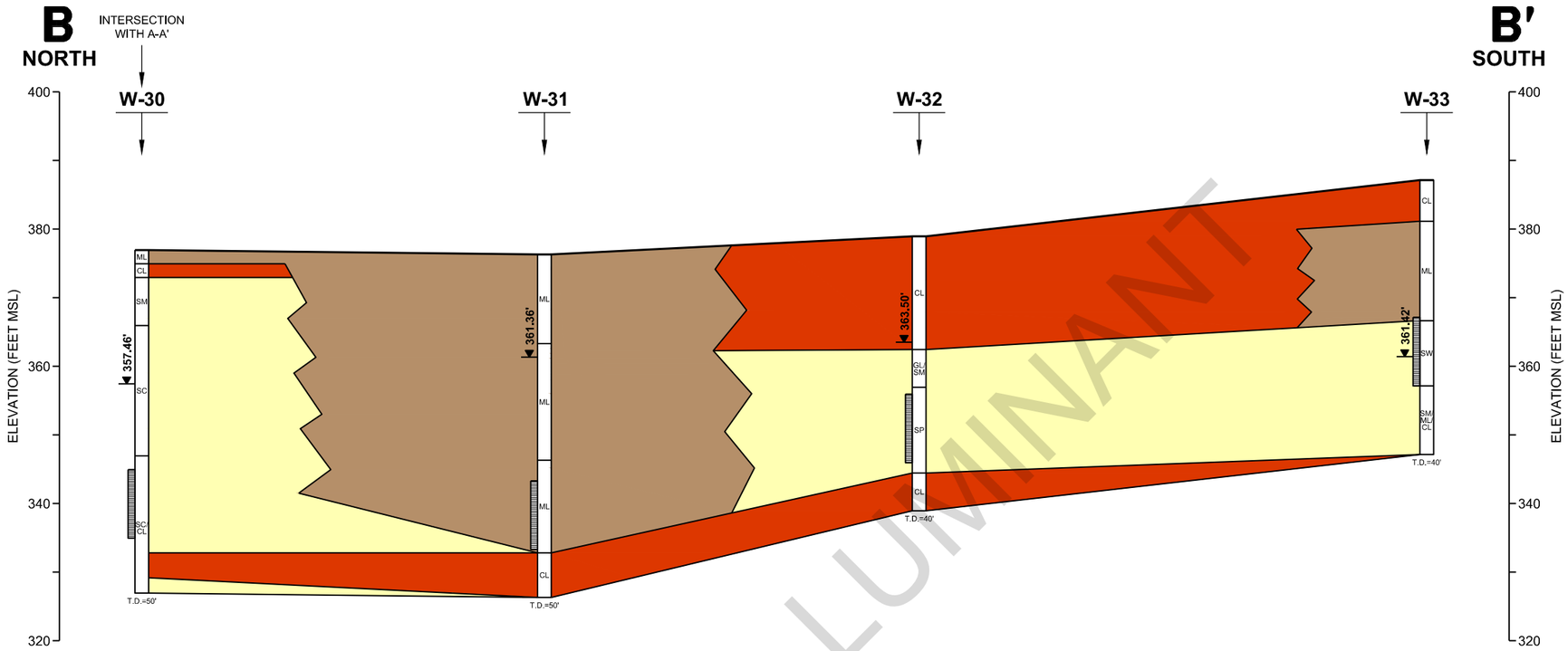
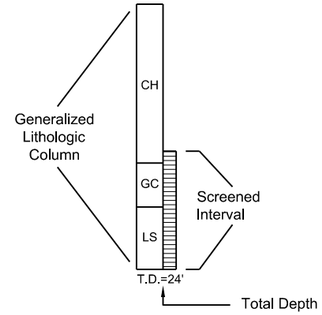


EXPLANATION

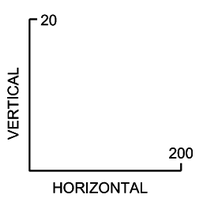
- FILL
- SAND
- CLAY
- SILT

MONITORING WELL CONSTRUCTION



Water Level (Ft MSL) Measured 10/15/15

SCALE IN FEET



10x Vertical Exaggeration

MONTICELLO STEAM ELECTRIC STATION
MT. PLEASANT, TEXAS

Figure 5

ASH PONDS
GEOLOGIC CROSS SECTION B-B'

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix A

CCR Monitoring Well Logs

Luminant

Log of Boring: W-29

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/26/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	377.59
Logged By:	Sara Taube	Northing:	527057.69
Sampling Method:	4"x10' Core barrel	Easting:	2754497.97

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0			SM	(0 - 2.5) FILL, silty sand, dark gray, fine grained, moist, soft
5		3.5/10.0	CL	(2.5 - 15) Silty CLAY, reddish brown with orange streaks, local gray sand lenses, gradually becoming sandy silty clay, more grays, gradational basal contact, moist, hard, low plasticity
10				
15		8.5/10.0	SM	(15 - 16.5) Silty SAND, gray, poorly sorted, sharp basal contact, slightly moist, soft
20				
25		8.5/10.0	SM/SC	(16.5 - 35.5) Silty clayey SAND, gray-light reddish brown with orange mottling, 2"-4" layers of light gray silty sand interspersed, 6" gray sand at 21.5-22', slightly moist, firm, low plasticity
30				
35		10.0/10.0	SM	(35.5 - 37) Silty SAND, light gray- reddish brown, very fine grained, poorly sorted, sharp basal contact, wet, soft
40			CL	(37 - 40) CLAY, light gray- purple, some orange mottling, moist, hard, low to medium plasticity

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 - 27) Casing, 2" Sch 40 FJT PVC
(27 - 37) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-23') Grout
(23'-25') Bentonite chips
(25'-37') 20/40 sand
(37'-40') Bentonite chips

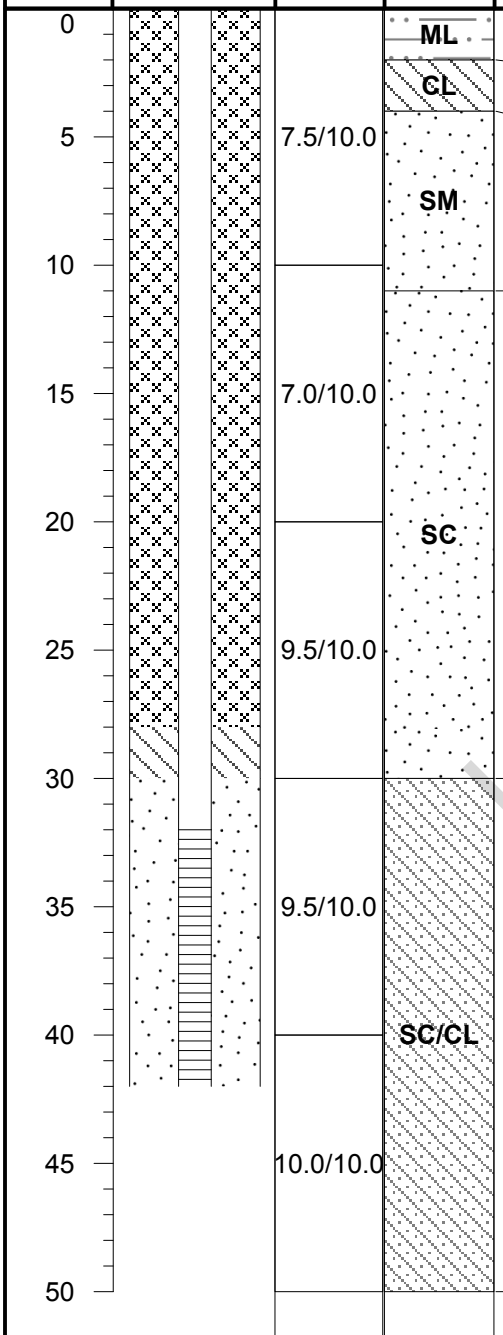
Luminant

Log of Boring: W-30

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/26/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	376.95
Logged By:	Sara Taube	Northing:	527358.15
Sampling Method:	4"x10' Core barrel	Easting:	2755059.04



Lithologic Description

(0 - 2) FILL, clayey silt, light gray-brown, roots, carbonate nodules, some orange clayey lenses, becomes sandy with depth, light gray sand lens at 2', dry, hard

(2 - 4) Silty sandy CLAY, orange-light gray mottling, sharp basal contact, dry, hard, low plasticity

(4 - 11) Silty SAND, very fine grained, light gray with some red-orange clay lesnes beginning at 9', dry, soft

(11 - 30) Clayey SAND with silt, light gray with orange and yellow mottling, sandier with depth and less cohesive, minimal clay below 18', very sandy to 22', becomes clayey and gray again (reddish brown sand), thin light gray sand layers interbedded, very fine grained, some purple clay mottling around 27.5', dry to slightly moist, soft to firm

(30 - 50) Interbedded clayey SAND and silty CLAY, light gray with purple or orange mottling in clay, sand typically uniform gray, mostly gray and sandy before 36', below 40' areas of gray and purple mottling in clayier layers, gray with red-orange mottling in sandier layers (40'-42', 47.5'-50'), generally clayier with depth from 42' to 47.5', moist, soft to firm, none to low plasicity

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 - 32) Casing, 2" Sch 40 FJT PVC
(32 - 42) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-28') Grout
(28'-30') Bentonite chips
(30'-42') 20/40 sand

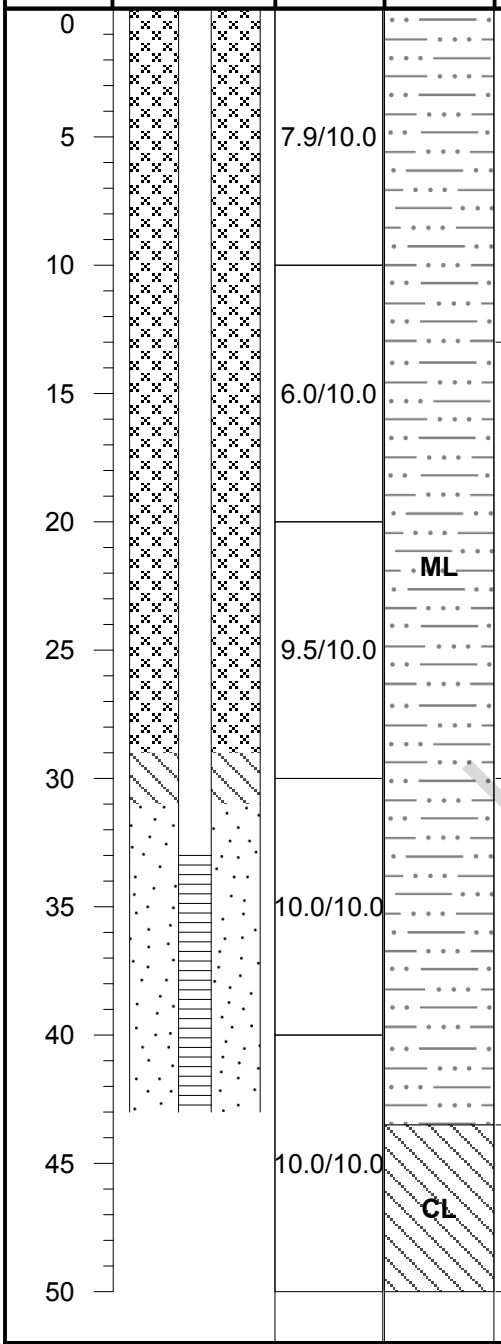
Luminant

Log of Boring: W-31

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/25/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	376.33
Logged By:	Sara Taube	Northing:	526968.69
Sampling Method:	4"x10' Core barrel	Easting:	2755497.73



Lithologic Description

(0 - 13) FILL, clayey silt, brown-orange, carbonate nodules to 4', clayier with gray and orange mottling 4'-6.5, sandier with depth, some rock fragments 0-4', sharp basal contact, fill potentially ends at 4', dry, soft to firm, none to low plasticity

(13 - 30) Clayey SILT, brown-gray with orange-red mottling, local gray sand lenses, interbedded silty sand and clayey silt: sandier brown-dark brown with red mottling (20'-23.5'), clayier brown with orange and gray mottling (23.5'- 27'), gray and sandy (27'-30'), dry, firm to hard, low to medium plasticity

(30 - 43.5) Sandy, clayey SILT, gray with orange mottling, fine grained sand, gray with orange mottling- appears bioturbated with interspersed very fine to fine grained sand lenses (2"-4") (33'-40'), sandier with depth and less orange mottling, moist

(43.5 - 50) Silty CLAY, with thin interbedded silty sands, gray with purple and orange mottling, sand is very fine grained, poorly sorrted, light gray, moist, hard, low plasticity

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 - 33) Casing, 2" Sch 40 FJT PVC
(33 - 43) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-29') Grout
(29'-31') Bentonite chips
(31'-43) 20/40 sand

Luminant

Log of Boring: W-32

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/26/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	378.96
Logged By:	Sara Taube	Northing:	526491.03
Sampling Method:	4"x10' Core barrel	Easting:	2755762.58

Depth (ft)	Well Materials	Recovery (ft/ft)	USCS	Lithologic Description
0 – 16.5		8.0/10.0 9.0/10.0	CL	(0 - 16.5) Silty CLAY, gray with red-orange mottling, interbedded silty sand intervals (gray and red) up to 4" thick, clay becomes more gray with depth, sand is very fine grained, slightly moist, hard, medium plasticity
16.5 – 22			SM/CL	(16.5 - 22) Interbedded silty CLAY and silty SAND, clay is light gray with some orange mottling, low plasticity, sand is very fine grained, poorly sorted, light red-brown, soft and wet, sand intervals are approximately 4.5" thick
22 – 34.5		6.5/10.0	SP	(22 - 34.5) SAND with some silt present, light red-brown, very fine to fine grained, 2"-3" lenses of light gray silty sand, increasing gray lenses with depth, moist to wet, soft
34.5 – 40		9.5/10.0	CL	(34.5 - 40) Silty CLAY, gray with orange and purple mottling, occasional gray sand lenses, reddish purple (36.5'-37'), no orange below 36', moist, hard, low to medium plasticity

PBW

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Round Rock, TX 78664
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Notes:
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Well Materials
(0 - 23) Casing, 2" Sch 40 FJT PVC
(23 - 33) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-19') Grout
(19'-21') Bentonite chips
(21'-33') 20/40 sand
(33'-40') Bentonite chips

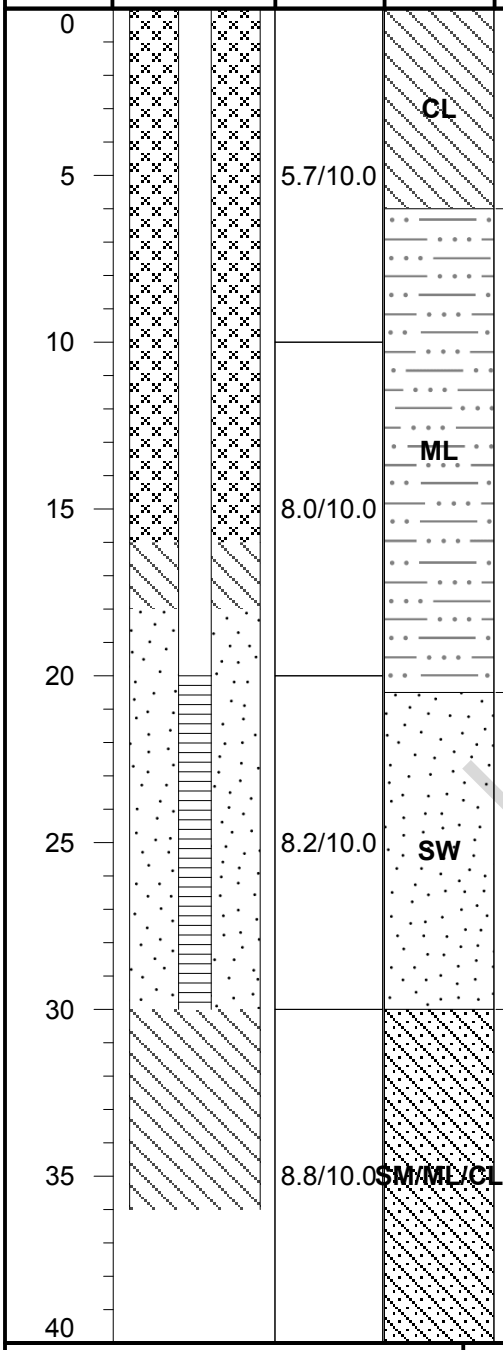
Luminant

Log of Boring: W-33

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/25/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	387.16
Logged By:	Will Vienne	Northing:	525819
Sampling Method:	4"x10' Core barrel	Easting:	2755454.17



Lithologic Description

(0 - 6) FILL, silty clay at 0-1.4', low plasticity, dark gray with grass/roots near surface; silty sand with thin clayey sand beds below 1.4', gray-brown to light brown, trace orange mottling, dry, soft to slightly firm, sharp basal contact

(6 - 20.5) Sandy, clayey SILT, red with orange mottling, becoming more orange below 11', abundant orange and gray laminae; sand is very fine grained, poorly sorted, unconsolidated to slightly consolidated, abundant organic very dark gray clay at 20-20.5', moist, gradational contact

(20.5 - 30) SAND, light yellow-brown and gray with reddish mottling, fining upward, very fine grained and poorly sorted at 20.5'-25' (very fine to fine grained and moderately sorted below 25', unconsolidated, fine grained black accessory minerals below 25'), petrified wood fragments at 30', wet

(30 - 40) Interbedded silty SAND, sandy SILT, and silty CLAY; silty clay at 32'-32.7, 36'-36.5', and 35.4'-36.4'; light gray with abundant orange and light brown mottling, low plasticity, wet, slightly firm

PBW

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

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

Annular Materials
(0-16') Grout
(16'-18') Bentonite chips
(18'-30) 20/40 sand
(30'-36') Bentonite chips

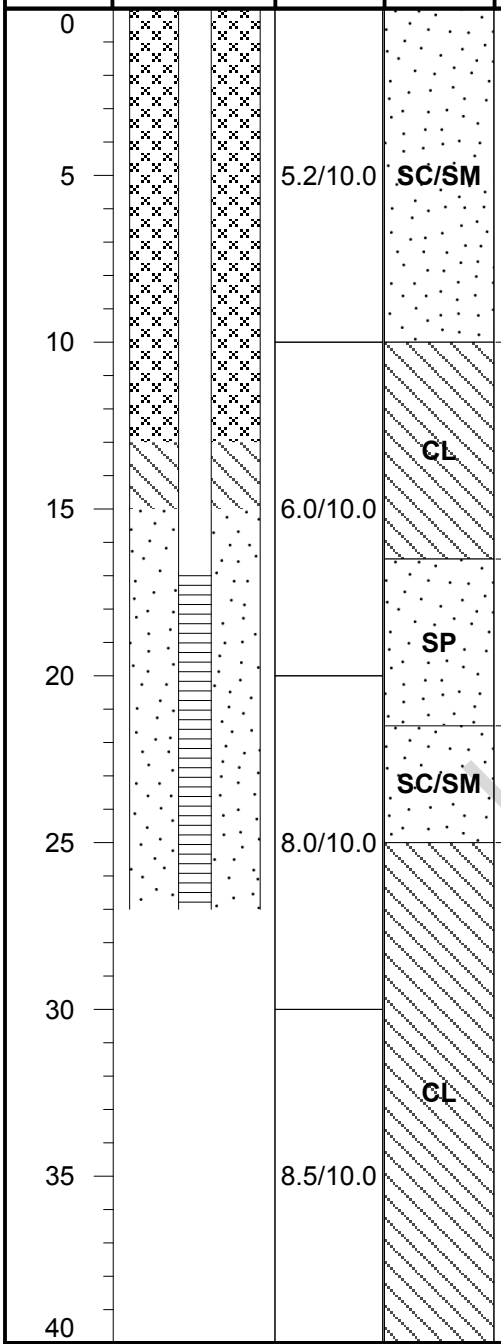
Luminant

Log of Boring: W-34

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/27/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	40
Driller's License:	5814M	TOC Elevation (ft. AMSL):	379.16
Logged By:	Sara Taube	Northing:	525962.02
Sampling Method:	4"x10' Core barrel	Easting:	2754789.66



Lithologic Description
(0 - 10) FILL; clayey, silty sand; light to dark gray with reddish brown, roots to 4', carbonate nodules to 1', orange clay layer 1'-1.5', dry to moist, soft to slightly firm
(10 - 16.5) Silty CLAY, light gray with orange mottling, small light gray sand lenses, gradational basal contact, slightly moist, firm to hard, low plasticity
(16.5 - 21.5) SAND, light gray, some fines, thin interbeds of sandy clay (reddish brown), slightly moist, soft
(21.5 - 25) Silty, clayey SAND, light reddish brown, fine-coarse black gravel at 25' and maroon/red staining, moist to wet, soft
(25 - 40) Silty, sandy CLAY, light gray with orange and purple mottling, thin red-brown sandy layers interbedded, 4" sandy layer at 27', mostly purple below 34', moist, hard, low plasticity

PBW

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

Notes:
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Well Materials
(0 - 17) Casing, 2" Sch 40 FJT PVC
(17 - 27) Screen, 2" Sch 40 FJT PVC, 0.010" slot

Annular Materials
(0-13') Grout
(13'-15') Bentonite chips
(15'-27) 20/40 sand

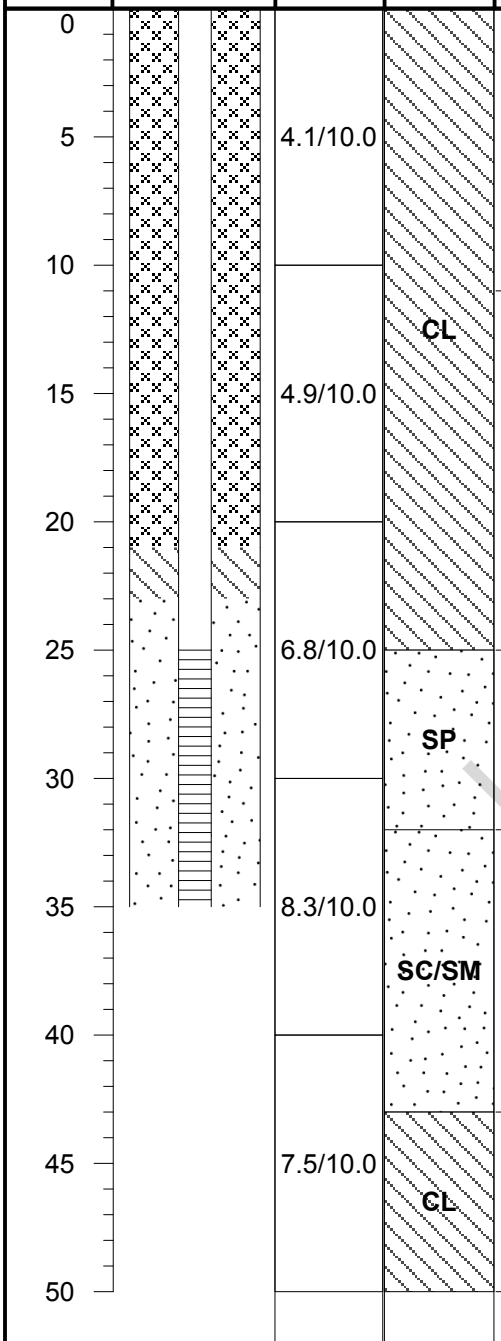
Luminant

Log of Boring: W-35

Monticello Steam Electric Station
Mount Pleasant, TX

PBW Project No. 5164C

Completion Date:	8/27/2015	Drilling Method:	Sonic
Drilling Company:	Walker-Hill Environmental	Borehole Diameter (in.):	6.5
Driller:	Dwayne Whitehead	Total Depth (ft):	50
Driller's License:	5814M	TOC Elevation (ft. AMSL):	381.15
Logged By:	Sara Taube	Northing:	526364.73
Sampling Method:	4"x10' Core barrel	Easting:	2754541.91



Lithologic Description

(0 - 11) FILL, silty clay, light gray-red, platey, friable, dry; becomes silt at 1.5', light brown, very soft; silty sand (2'-2.5'), brown, moist; clayey silty sand (2.5'-11'), dark brown, moist, sharp basal contact

(11 - 25) Silty, sandy CLAY, light gray with red and orange mottling, more clay with depth to 20', sandier to 25', sharp basal contact, slightly moist, firm, low plasticity

(25 - 32) SAND, some fines, very fine to fine grained, light brown-reddish brown-light gray, moist to wet, soft

(32 - 43) Silty, clayey SAND, light gray-light brown with reddish brown, sandier areas are light gray, clayier areas are reddish brown-light brown (32'-35'), light gray (35'-37'), red-brown (37'-43'), fine-medium black subangular gravel (40'-43'), all gradual changes, moist to wet, soft to firm

(43 - 50) Silty CLAY, light gray with purple and orange mottling, some very fine sand, intermittent 2" light gray sandy layers, moist, hard, low plasticity

PBW

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

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

Annular Materials
(0-21') Grout
(21'-23') Bentonite chips
(23'-35) 20/40 sand

Appendix B

Photographs of CCR Groundwater Monitoring Wells

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Monticello Steam Electric Station Ash Ponds

Photograph 1: W-29

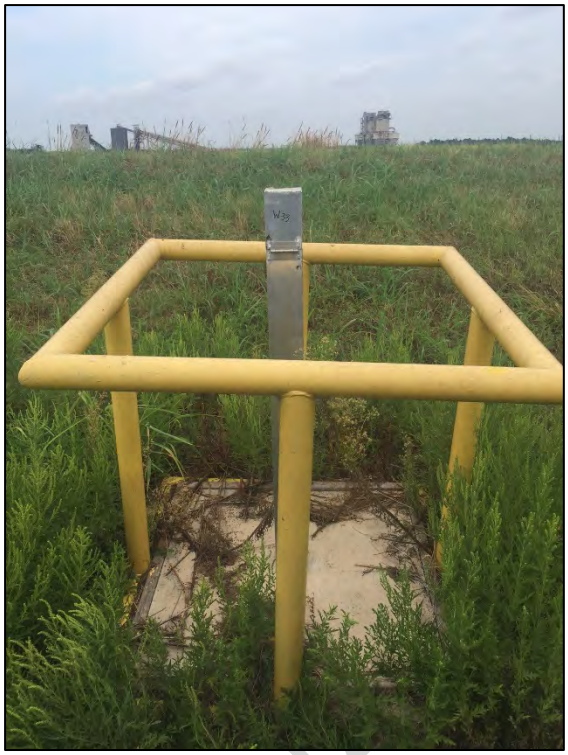
Photograph 2: W-30

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Monticello Steam Electric Station Ash Ponds

Photograph 3: W-31

Photograph 4: W-32

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Monticello Steam Electric Station Ash Ponds



Photograph 5: W-33

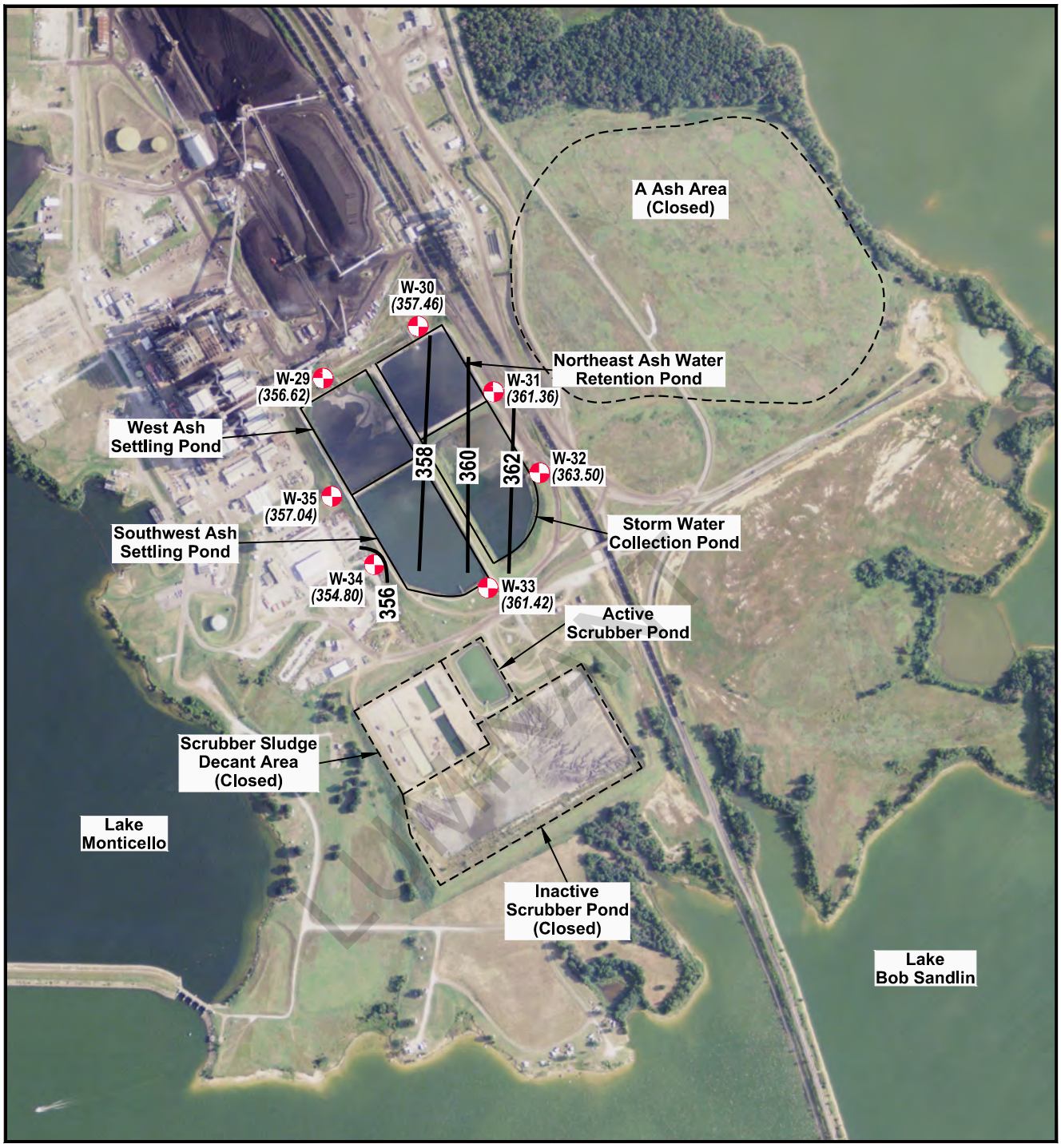
Photograph 6: W-34

Appendix B – Photographs of CCR Groundwater Monitoring Wells
Monticello Steam Electric Station Ash Ponds

Photograph 7: W-35

Appendix C

Groundwater Potentiometric Surface Maps



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- — 358 — Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

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

MONTICELLO STEAM ELECTRIC STATION

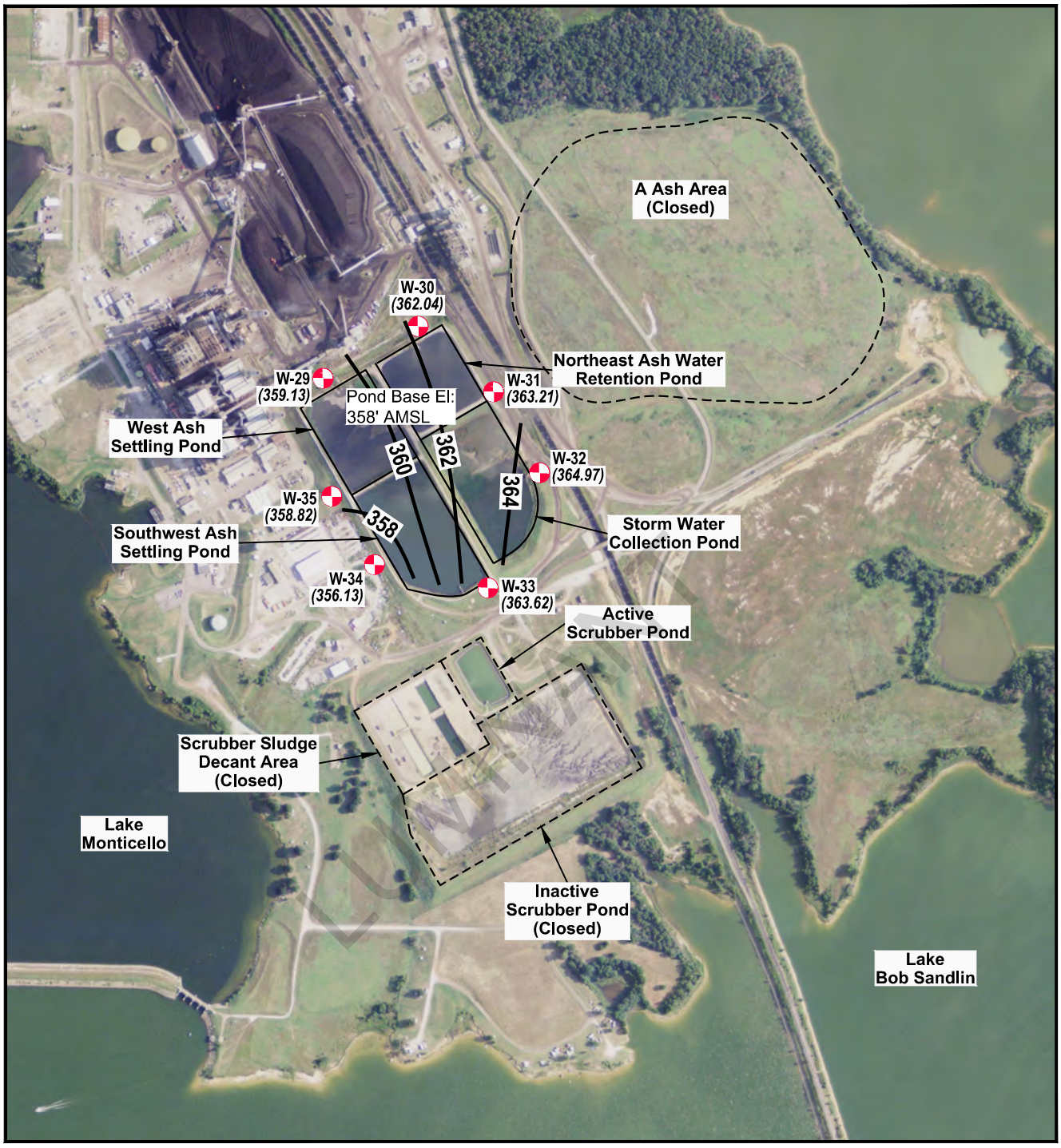
MT. PLEASANT, TEXAS

Figure 2

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - OCT. 15, 2015

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

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

MONTICELLO STEAM ELECTRIC STATION

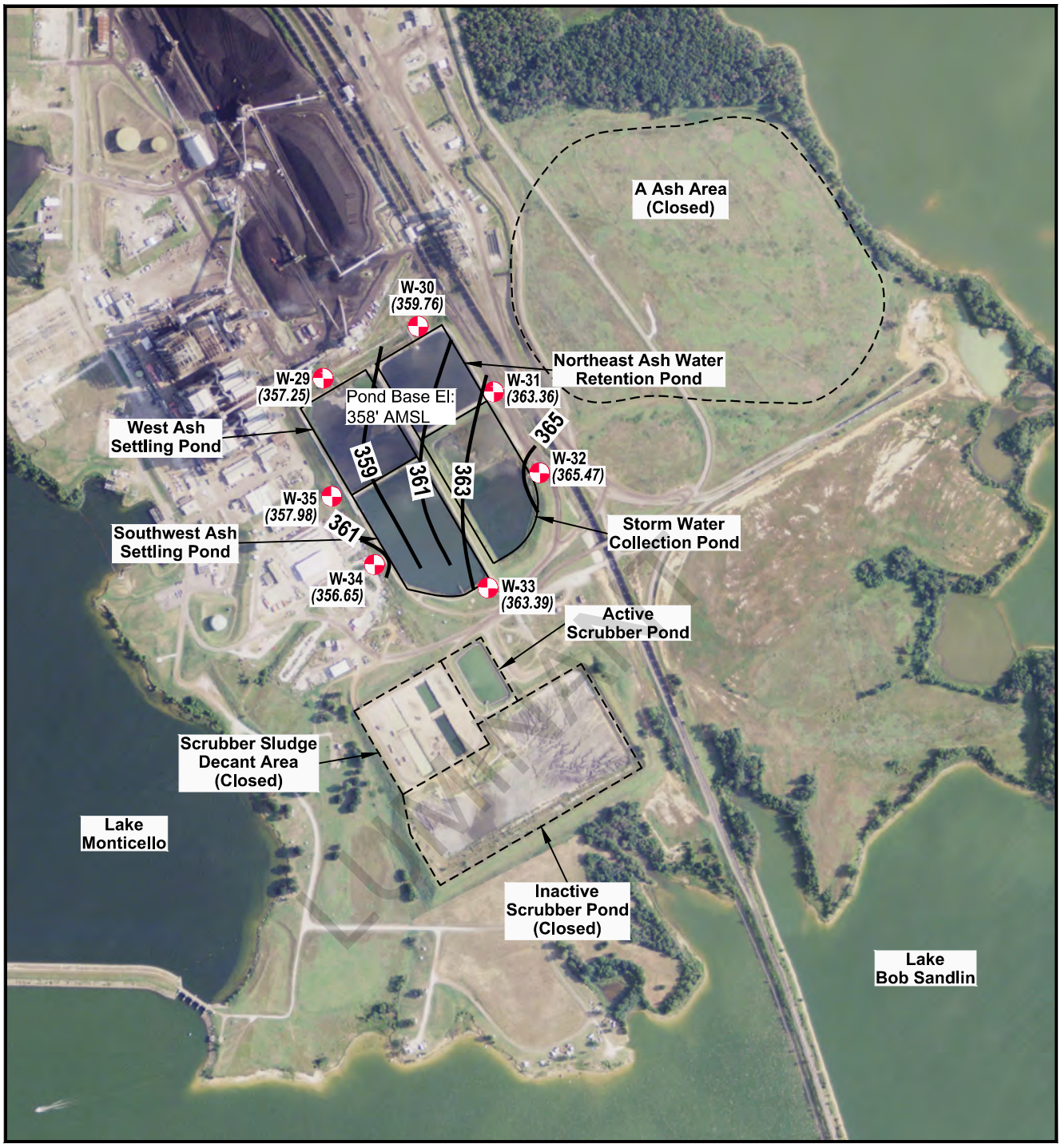
MT. PLEASANT, TEXAS

Figure 3

ASH PONDS
GROUNDWATER POTENTIOMETRIC SURFACE MAP - DEC. 7, 2015

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

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

MONTICELLO STEAM ELECTRIC STATION

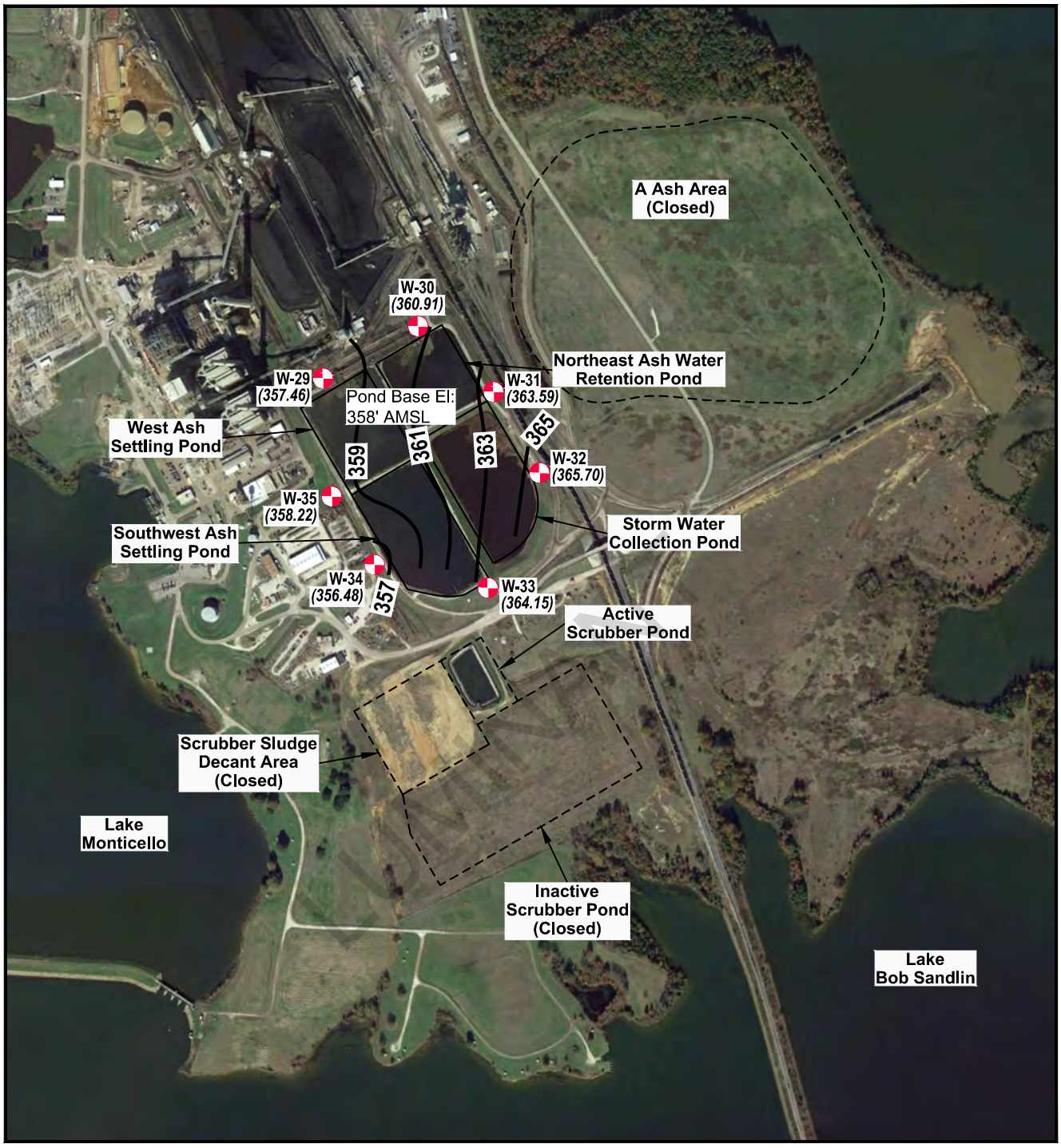
MT. PLEASANT, TEXAS

Figure 4

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - FEB. 22, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

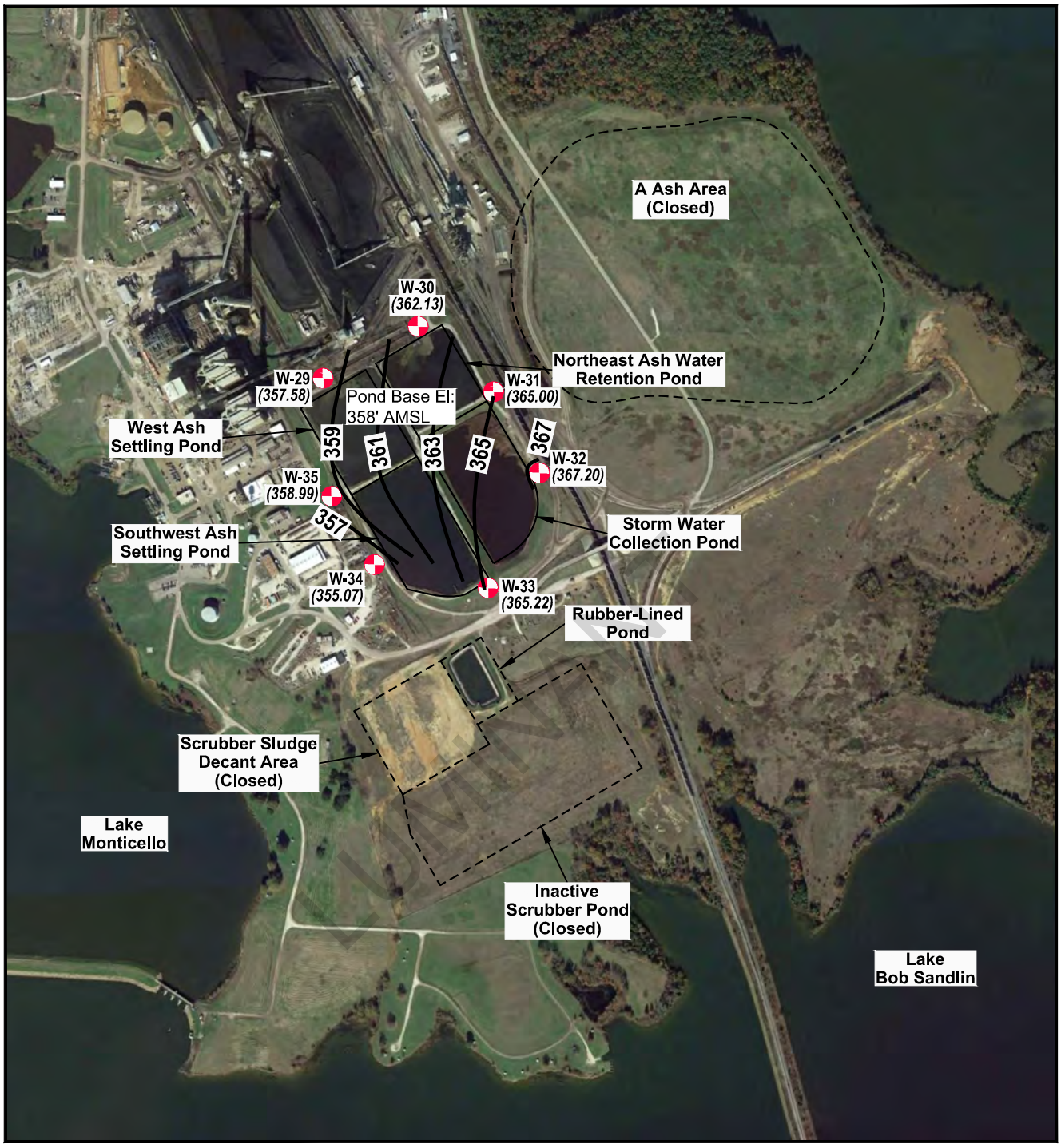
MT. PLEASANT, TEXAS

Figure 5

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - APRIL 4, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

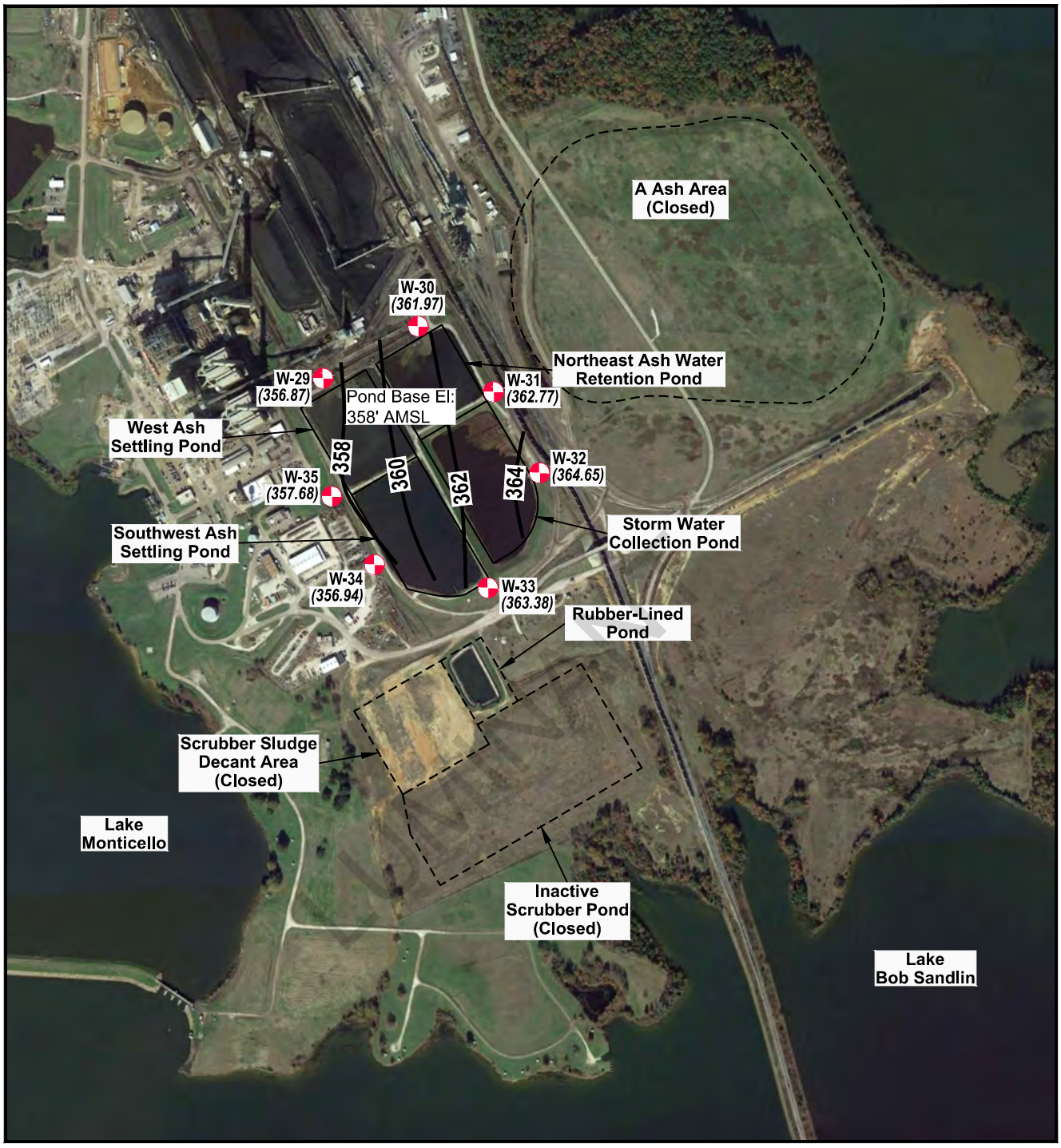
MT. PLEASANT, TEXAS

Figure 6

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - JUNE 6, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

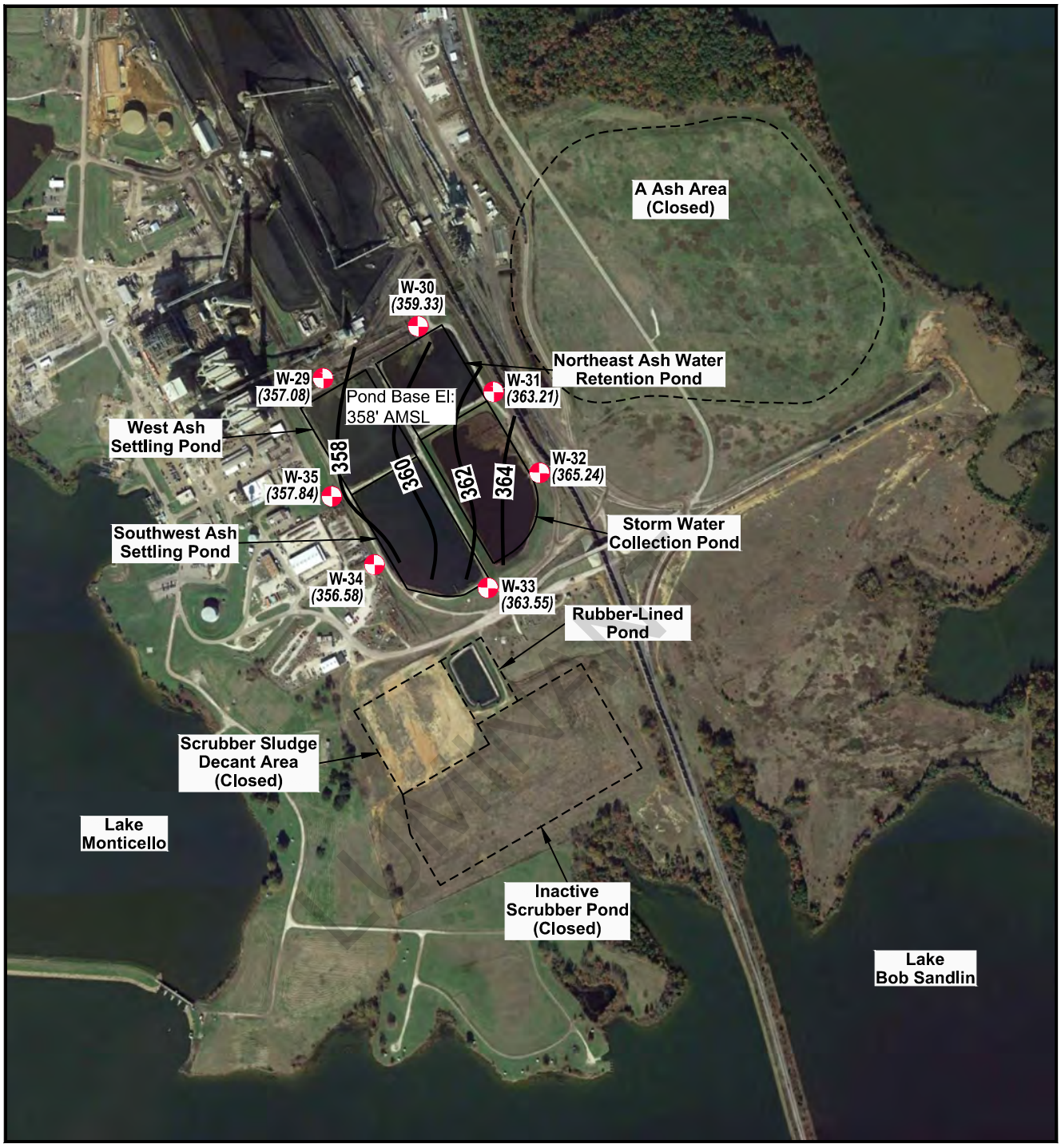
MT. PLEASANT, TEXAS

Figure 7

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - AUGUST 8, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

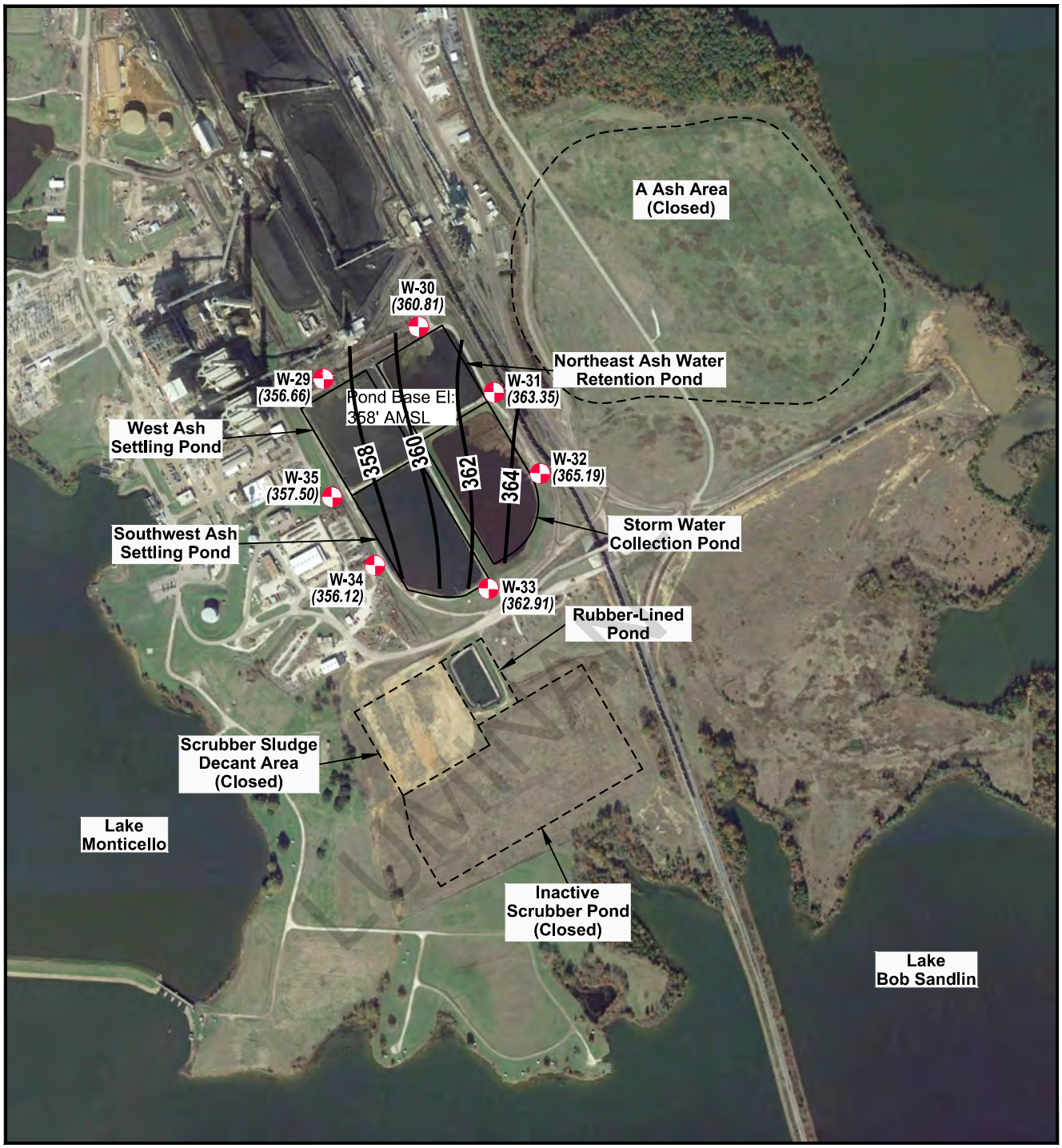
MT. PLEASANT, TEXAS

Figure 8

ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - OCTOBER 12, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- CCR Monitoring Well Location
- (357.26) Groundwater Potentiometric Surface (ft. AMSL)
- 358 Groundwater Potentiometric Surface Contour (C.I. = 2 ft.)

N

Scale in Feet

0 450 900

SOURCE:
Imagery from Google Earth dated 12/2/2015.

MONTICELLO STEAM ELECTRIC STATION

MT. PLEASANT, TEXAS

Figure 9

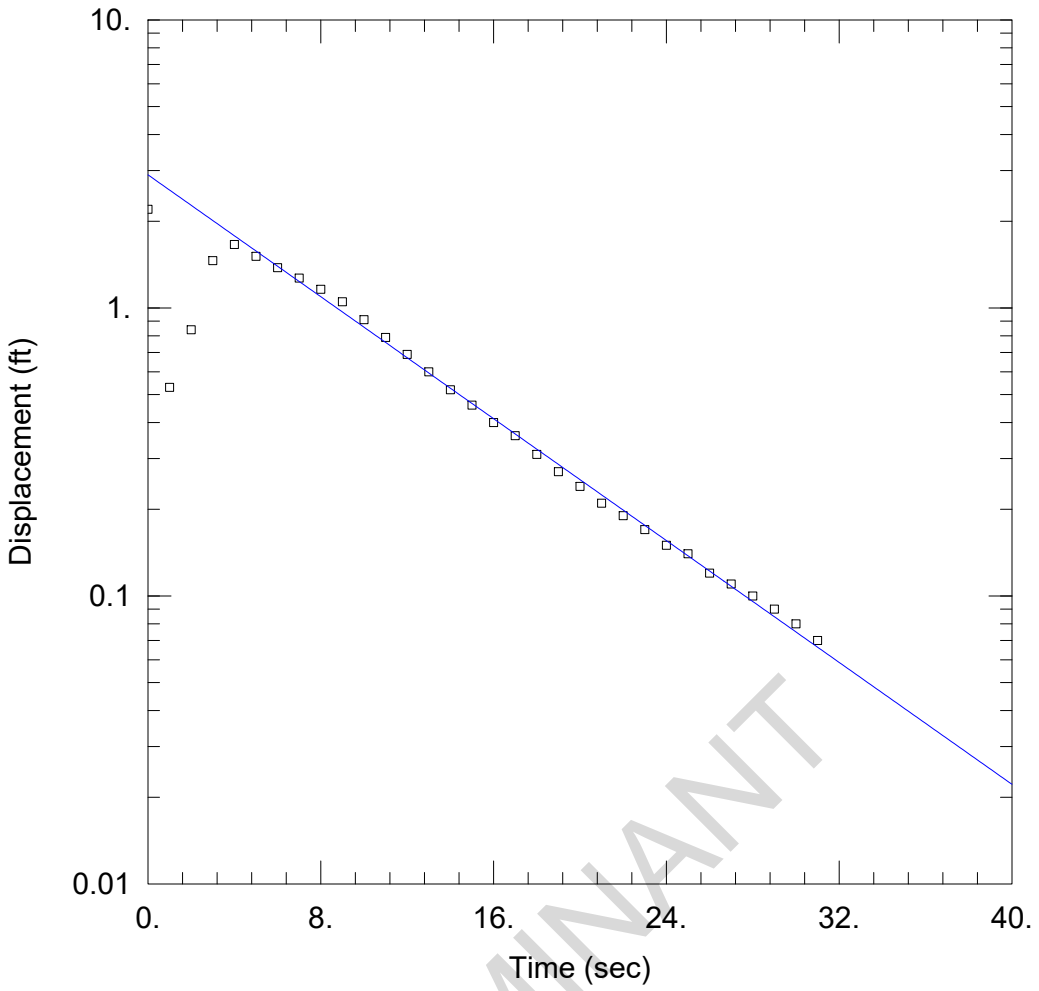
ASH PONDS GROUNDWATER POTENTIOMETRIC SURFACE MAP - DECEMBER 29, 2016

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

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Appendix D

Aquifer Test Data



W-32 SLUG IN

Data Set: J:\...\W-32 Slug In.aqt
Date: 09/26/17 Time: 11:41:55

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Well: W-32
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W-32)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 16.5 ft
Casing Radius: 0.083 ft
Static Water Column Height: 21.56 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003557 cm/sec
y0 = 2.898 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-C_Monticello\Slug Tests\Monticello Slug Tests\Aqtesolv Fi
Title: W-32 Slug In
Date: 09/26/17
Time: 11:42:21

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Date: 10/6/15
Test Well: W-32

AQUIFER DATA

Saturated Thickness: 18. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: W-32

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

Initial Displacement: 2.2 ft
Static Water Column Height: 21.56 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: 16.5 ft

No. of Observations: 31

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	0.53	17.	0.36
2.	0.84	18.	0.31
3.	1.46	19.	0.27
4.	1.66	20.	0.24
5.	1.51	21.	0.21
6.	1.38	22.	0.19
7.	1.27	23.	0.17
8.	1.16	24.	0.15
9.	1.05	25.	0.14
10.	0.91	26.	0.12
11.	0.79	27.	0.11
12.	0.69	28.	0.1
13.	0.6	29.	0.09
14.	0.52	30.	0.08
15.	0.46	31.	0.07
16.	0.4		

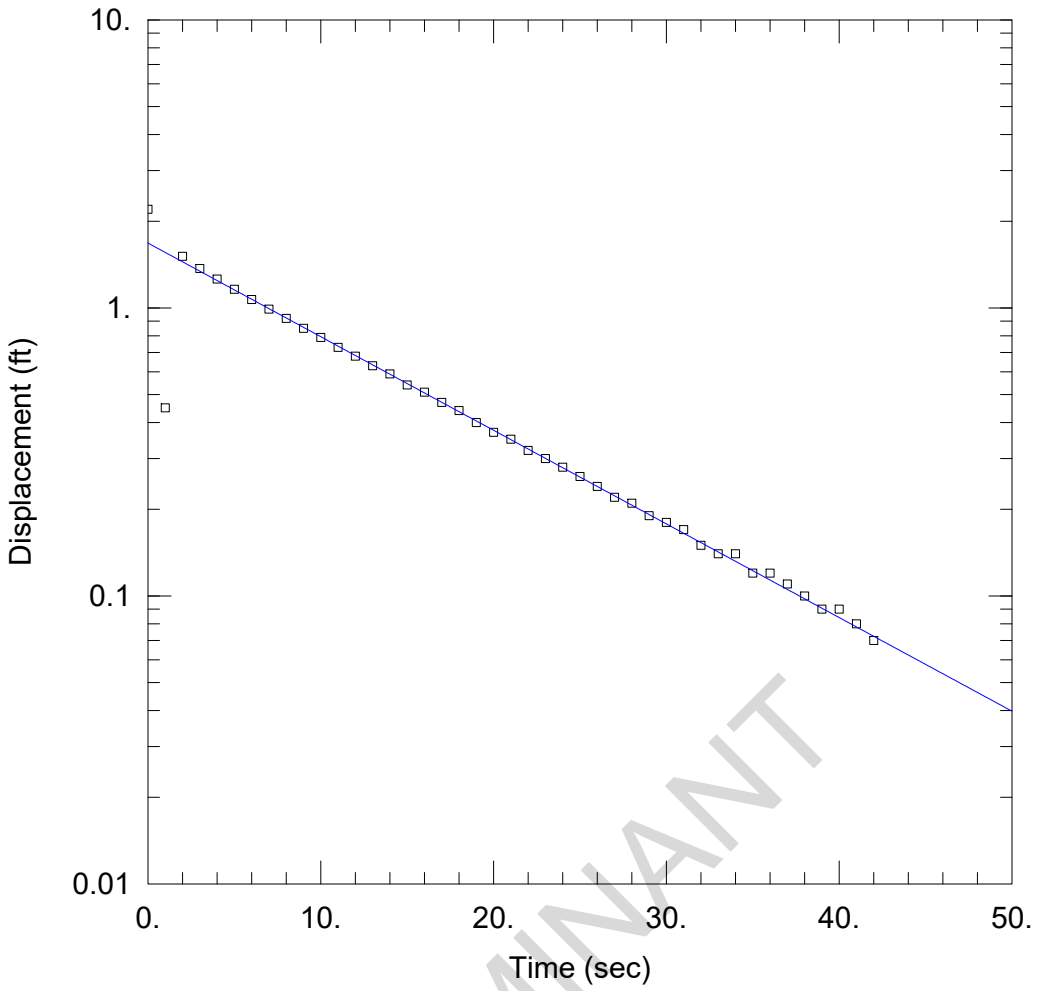
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.782

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate



W-32 SLUG OUT

Data Set: J:\...\W-32 Slug Out.aqt
Date: 09/26/17 Time: 11:42:50

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Well: W-32
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W-32)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 16.5 ft
Casing Radius: 0.083 ft
Static Water Column Height: 21.56 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.002185 cm/sec
y0 = 1.679 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-C_Monticello\Slug Tests\Monticello Slug Tests\Aqtesolv Fi
Title: W-32 Slug Out
Date: 09/26/17
Time: 11:43:03

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Date: 10/6/15
Test Well: W-32

AQUIFER DATA

Saturated Thickness: 18. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: W-32

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

Initial Displacement: 2.2 ft
Static Water Column Height: 21.56 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: 16.5 ft

No. of Observations: 42

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	0.45	22.	0.32
2.	1.51	23.	0.3
3.	1.37	24.	0.28
4.	1.26	25.	0.26
5.	1.16	26.	0.24
6.	1.07	27.	0.22
7.	0.99	28.	0.21
8.	0.92	29.	0.19
9.	0.85	30.	0.18
10.	0.79	31.	0.17
11.	0.73	32.	0.15
12.	0.68	33.	0.14
13.	0.63	34.	0.14
14.	0.59	35.	0.12
15.	0.54	36.	0.12
16.	0.51	37.	0.11
17.	0.47	38.	0.1
18.	0.44	39.	0.09
19.	0.4	40.	0.09
20.	0.37	41.	0.08
21.	0.35	42.	0.07

SOLUTION

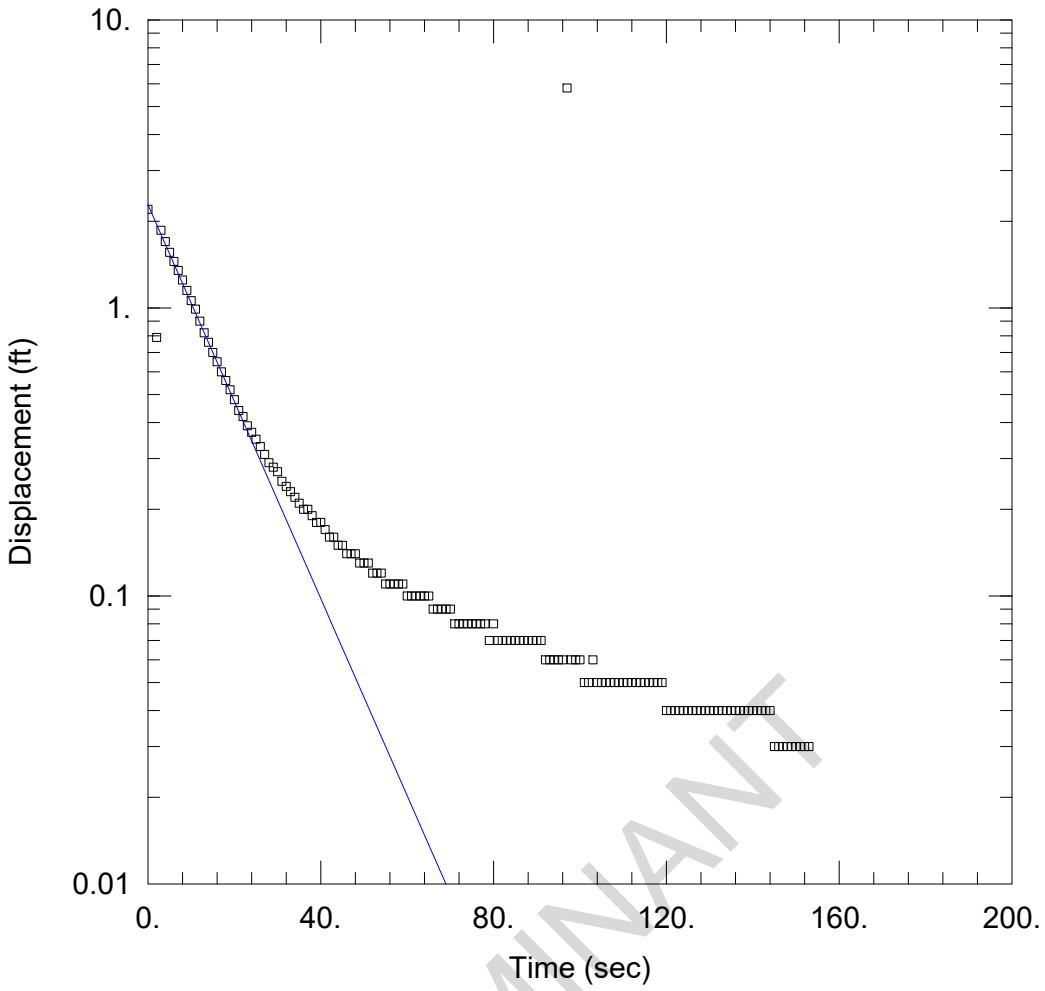
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.782

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002185	cm/sec
y0	1.679	ft

T = K*b = 1.199 cm²/sec



W-33 SLUG OUT

Data Set: J:\...\W-33 Slug Out.aqt
Date: 09/26/17 Time: 11:43:34

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Well: W-32
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 7.69 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W-33)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.69 ft
Screen Length: 10. ft
Well Radius: 0.27 ft
Gravel Pack Porosity: 0.2

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008423 cm/sec y0 = 2.281 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-C_Monticello\Slug Tests\Monticello Slug Tests\Aqtesolv Fi
Title: W-33 Slug Out
Date: 09/26/17
Time: 11:44:01

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Date: 10/6/15
Test Well: W-32

AQUIFER DATA

Saturated Thickness: 7.69 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: W-33

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

Initial Displacement: 2.2 ft
Static Water Column Height: 7.69 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: 10. ft
Corrected Casing Radius (Bouwer-Rice Method): 0.1417 ft
Gravel Pack Porosity: 0.2

No. of Observations: 154

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.	77.	0.08
1.	-0.08	78.	0.08
2.	0.79	79.	0.07
3.	1.86	80.	0.08
4.	1.7	81.	0.07
5.	1.56	82.	0.07
6.	1.45	83.	0.07
7.	1.35	84.	0.07
8.	1.25	85.	0.07
9.	1.15	86.	0.07
10.	1.06	87.	0.07
11.	0.99	88.	0.07
12.	0.9	89.	0.07
13.	0.82	90.	0.07
14.	0.76	91.	0.07
15.	0.7	92.	0.06
16.	0.65	93.	0.06
17.	0.6	94.	0.06
18.	0.56	95.	0.06
19.	0.52	96.	0.06
20.	0.48	97.	5.8
21.	0.44	98.	0.06
22.	0.42	99.	0.06
23.	0.39	100.	0.06
24.	0.37	101.	0.05
25.	0.35	102.	0.05
26.	0.33	103.	0.06

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
27.	0.31	104.	0.05
28.	0.29	105.	0.05
29.	0.28	106.	0.05
30.	0.27	107.	0.05
31.	0.25	108.	0.05
32.	0.24	109.	0.05
33.	0.23	110.	0.05
34.	0.22	111.	0.05
35.	0.21	112.	0.05
36.	0.2	113.	0.05
37.	0.2	114.	0.05
38.	0.19	115.	0.05
39.	0.18	116.	0.05
40.	0.18	117.	0.05
41.	0.17	118.	0.05
42.	0.16	119.	0.05
43.	0.16	120.	0.04
44.	0.15	121.	0.04
45.	0.15	122.	0.04
46.	0.14	123.	0.04
47.	0.14	124.	0.04
48.	0.14	125.	0.04
49.	0.13	126.	0.04
50.	0.13	127.	0.04
51.	0.13	128.	0.04
52.	0.12	129.	0.04
53.	0.12	130.	0.04
54.	0.12	131.	0.04
55.	0.11	132.	0.04
56.	0.11	133.	0.04
57.	0.11	134.	0.04
58.	0.11	135.	0.04
59.	0.11	136.	0.04
60.	0.1	137.	0.04
61.	0.1	138.	0.04
62.	0.1	139.	0.04
63.	0.1	140.	0.04
64.	0.1	141.	0.04
65.	0.1	142.	0.04
66.	0.09	143.	0.04
67.	0.09	144.	0.04
68.	0.09	145.	0.03
69.	0.09	146.	0.03
70.	0.09	147.	0.03
71.	0.08	148.	0.03
72.	0.08	149.	0.03
73.	0.08	150.	0.03
74.	0.08	151.	0.03
75.	0.08	152.	0.03
76.	0.08	153.	0.03

SOLUTION

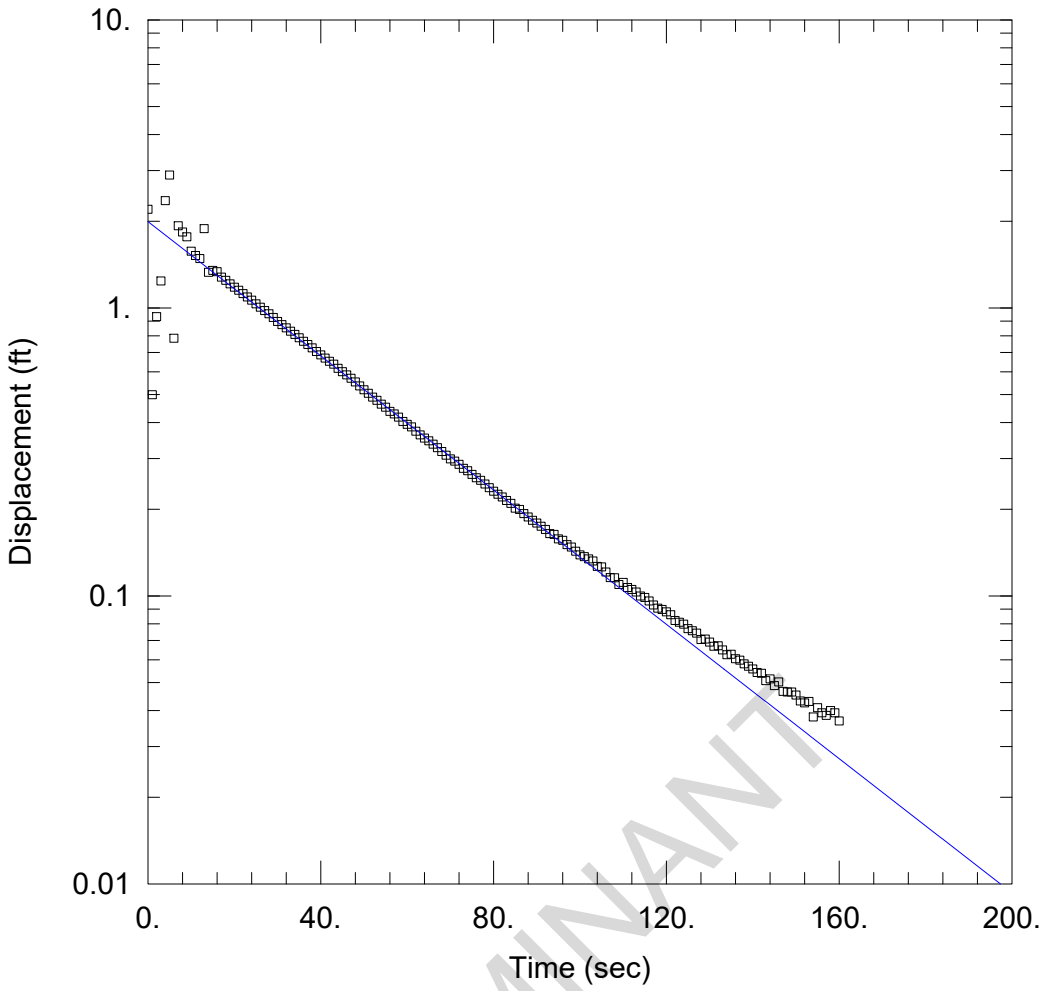
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.008423	cm/sec
y0	2.281	ft

T = K*b = 1.974 cm²/sec



W-35 SLUG IN

Data Set: J:\...\W-35 Slug In.aqt
Date: 09/26/17 Time: 11:49:25

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Well: W-35
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W-35)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 14.38 ft
Casing Radius: 0.083 ft
Static Water Column Height: 22.38 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0007432 cm/sec y0 = 1.994 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-C_Monticello\Slug Tests\Monticello Slug Tests\Aqtesolv Fi
Title: W-35 Slug In
Date: 09/26/17
Time: 11:44:39

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Date: 10/6/15
Test Well: W-35

AQUIFER DATA

Saturated Thickness: 18. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: W-35

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

Initial Displacement: 2.2 ft
Static Water Column Height: 22.38 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: 14.38 ft

No. of Observations: 160

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	0.4999	81.	0.2254
2.	0.9332	82.	0.2206
3.	1.24	83.	0.2146
4.	2.357	84.	0.2097
5.	2.894	85.	0.2017
6.	0.7846	86.	0.1997
7.	1.928	87.	0.193
8.	1.835	88.	0.188
9.	1.765	89.	0.183
10.	1.573	90.	0.179
11.	1.52	91.	0.1746
12.	1.483	92.	0.1701
13.	1.885	93.	0.1645
14.	1.329	94.	0.1635
15.	1.35	95.	0.1578
16.	1.336	96.	0.156
17.	1.279	97.	0.1506
18.	1.247	98.	0.1478
19.	1.212	99.	0.1429
20.	1.18	100.	0.1389
21.	1.152	101.	0.1369
22.	1.122	102.	0.1345
23.	1.092	103.	0.1322
24.	1.063	104.	0.1267
25.	1.033	105.	0.1262
26.	1.006	106.	0.121
27.	0.9786	107.	0.1158
28.	0.9549	108.	0.1156
29.	0.9264	109.	0.1096

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	0.897	110.	0.1114
31.	0.875	111.	0.1069
32.	0.8531	112.	0.1053
33.	0.8306	113.	0.1032
34.	0.8094	114.	0.0999
35.	0.7878	115.	0.0988
36.	0.7659	116.	0.0961
37.	0.7462	117.	0.093
38.	0.727	118.	0.0907
39.	0.7061	119.	0.0897
40.	0.6873	120.	0.088
41.	0.6698	121.	0.086
42.	0.653	122.	0.0822
43.	0.6381	123.	0.081
44.	0.6172	124.	0.0798
45.	0.6008	125.	0.077
46.	0.5857	126.	0.0757
47.	0.5699	127.	0.0743
48.	0.5532	128.	0.0706
49.	0.5358	129.	0.0708
50.	0.52	130.	0.0691
51.	0.5055	131.	0.0669
52.	0.4898	132.	0.0671
53.	0.4776	133.	0.0649
54.	0.4631	134.	0.0625
55.	0.4523	135.	0.0627
56.	0.4373	136.	0.0605
57.	0.4283	137.	0.0598
58.	0.4179	138.	0.0581
59.	0.4033	139.	0.057
60.	0.3943	140.	0.0558
61.	0.3861	141.	0.0542
62.	0.373	142.	0.0539
63.	0.3623	143.	0.0508
64.	0.3534	144.	0.0515
65.	0.3457	145.	0.0488
66.	0.3365	146.	0.0503
67.	0.327	147.	0.0466
68.	0.3173	148.	0.0464
69.	0.308	149.	0.0464
70.	0.2992	150.	0.0453
71.	0.2939	151.	0.0432
72.	0.2862	152.	0.0425
73.	0.2772	153.	0.043
74.	0.2721	154.	0.038
75.	0.2641	155.	0.0409
76.	0.2573	156.	0.0393
77.	0.2521	157.	0.0385
78.	0.2448	158.	0.04
79.	0.2376	159.	0.0393
80.	0.2309	160.	0.0368

SOLUTION

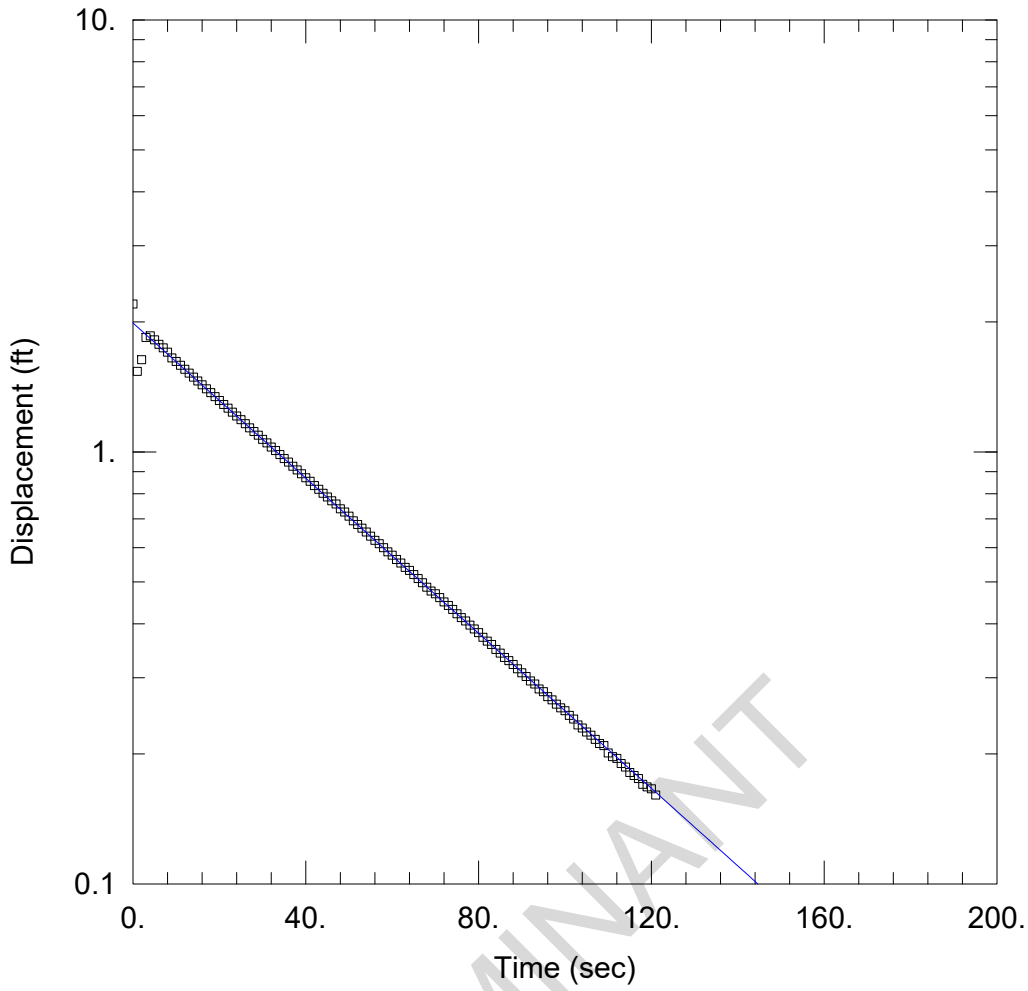
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.638

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0007432	cm/sec
y0	1.994	ft

T = K*b = 0.4077 cm²/sec



W-35 SLUG OUT

Data Set: J:\...\W-35 Slug Out.aqt
Date: 09/26/17 Time: 11:52:25

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Well: W-35
Test Date: 10/6/15

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (W-35)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 14.38 ft
Casing Radius: 0.083 ft
Static Water Column Height: 22.38 ft
Screen Length: 10. ft
Well Radius: 0.27 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0005724 cm/sec y0 = 1.988 ft

Data Set: J:\5164 - Luminant CCR GW Monitoring\5164-C_Monticello\Slug Tests\Monticello Slug Tests\Aqtesolv Fi
Title: W-35 Slug Out
Date: 09/26/17
Time: 11:52:48

PROJECT INFORMATION

Company: PBW
Client: Luminant
Project: 5164
Location: MOSES
Test Date: 10/6/15
Test Well: W-35

AQUIFER DATA

Saturated Thickness: 18. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: W-35

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

Initial Displacement: 2.2 ft
Static Water Column Height: 22.38 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: 14.38 ft

No. of Observations: 121

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.	1.537	62.	0.5529
2.	1.634	63.	0.5407
3.	1.841	64.	0.532
4.	1.857	65.	0.52
5.	1.817	66.	0.5091
6.	1.774	67.	0.4981
7.	1.742	68.	0.4862
8.	1.702	69.	0.4765
9.	1.651	70.	0.4697
10.	1.62	71.	0.46
11.	1.587	72.	0.4496
12.	1.553	73.	0.4411
13.	1.522	74.	0.4319
14.	1.489	75.	0.4221
15.	1.46	76.	0.4134
16.	1.43	77.	0.4061
17.	1.401	78.	0.3974
18.	1.371	79.	0.3891
19.	1.343	80.	0.3817
20.	1.315	81.	0.3723
21.	1.288	82.	0.3649
22.	1.263	83.	0.3583
23.	1.236	84.	0.3491
24.	1.211	85.	0.3423
25.	1.187	86.	0.3344
26.	1.162	87.	0.3288
27.	1.137	88.	0.322
28.	1.115	89.	0.3148
29.	1.093	90.	0.3082

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
30.	1.069	91.	0.3021
31.	1.049	92.	0.2949
32.	1.026	93.	0.2903
33.	1.007	94.	0.2828
34.	0.986	95.	0.2785
35.	0.9649	96.	0.2714
36.	0.9476	97.	0.2667
37.	0.9265	98.	0.2607
38.	0.9085	99.	0.2557
39.	0.8898	100.	0.2517
40.	0.8713	101.	0.2456
41.	0.855	102.	0.2409
42.	0.8357	103.	0.2334
43.	0.8197	104.	0.2296
44.	0.802	105.	0.2248
45.	0.7868	106.	0.2209
46.	0.7708	107.	0.216
47.	0.7575	108.	0.2114
48.	0.7383	109.	0.209
49.	0.7258	110.	0.2009
50.	0.7101	111.	0.197
51.	0.6927	112.	0.1952
52.	0.679	113.	0.1899
53.	0.666	114.	0.1865
54.	0.6525	115.	0.1811
55.	0.6385	116.	0.1782
56.	0.6244	117.	0.1753
57.	0.6134	118.	0.17
58.	0.6001	119.	0.1677
59.	0.5871	120.	0.1661
60.	0.5765	121.	0.1606
61.	0.5634		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.638

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0005724	cm/sec
y0	1.988	ft

T = K*b = 0.3141 cm²/sec