CLECO POWER LLC
BRAME ENERGY CENTER

BOTTOM ASH POND AND
FLY ASH POND
LENA, LA

2024 Annual Groundwater Monitoring Report for the Coal Combustion Residuals Rule

January 2025

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EXECUTIVE SUMMARY

- Current groundwater monitoring program status: detection monitoring.
- Confirmed Statistically Significant Increases in downgradient monitoring wells for this reporting period: None.

1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the 2024 Annual Groundwater Monitoring report for the Bottom Ash and Fly Ash Ponds at the Brame Energy Center (BEC) located in Lena, Louisiana (**Figure 1**). This report summarizes groundwater sampling and analysis activities completed in accordance with applicable portions of the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule.

2.0 FACILITY INFORMATION

Cleco owns and operates the BEC located at 275 Rodemacher Road, Lena, Louisiana 71447. The Bottom Ash and Fly Ash Ponds in service at the plant have been permitted to operate by the Louisiana Department of Environmental Quality (LDEQ) Waste Permits Division. The materials handled by these facilities are non-hazardous, on-site-generated materials only.

As required by the CCR Rule part §257.90, BEC has a groundwater monitoring well system to evaluate the groundwater quality conditions near the Bottom Ash and Fly Ash Ponds. The monitoring system consists of monitoring wells installed previously to conduct groundwater monitoring required by BEC's LDEQ approved solid waste permits, and other monitoring wells installed more recently. A total of nine monitoring wells have been installed per applicable portions of §257.91. Locations of the monitoring wells can be found on **Figure 2**, and a table of monitoring well construction details can be found in **Table 1**.

3.0 FIELD ACTIVITIES

Groundwater sampling events were conducted by Cleco approved contract personnel in accordance with applicable portions of §257.93. Semi-annual detection monitoring sampling events were conducted in March and September 2024.

The depth-to-water below the top of each well casing was measured and recorded prior to purging each well during each sampling event. Water levels were measured to the nearest 0.01 foot from the top of casing using an electronic water level indicator. Total depth of each well was also measured to confirm that the screened interval was open to groundwater flow. Water level measurements were recorded in groundwater sampling forms. The water level measurements were subtracted from the top of casing elevations to obtain the groundwater elevations.

Groundwater purging and sampling activities were conducted using electric submersible pumps. These activities were conducted in accordance with applicable portions of Sections 6.1, 6.2, 6.3 and 8.1.4 of the *Standard Guide for Sampling Groundwater Monitoring Wells* (ASTM International, Publication D4448). Non-dedicated sampling equipment which came into contact with groundwater samples was decontaminated prior to sampling each well to reduce the potential for cross-contamination. Groundwater samples were collected by filling the sample containers directly from the disposable tubing connected to the pump or from a disposable bailer. Care was taken to minimize agitation of the samples. Samples were placed in laboratory-provided plastic containers with appropriate preservatives, per Section 9 of ASTM D4448. Samples were properly preserved on ice in the field and shipped to Waypoint Analytical of Ridgeland, Mississippi, for analysis of the CCR groundwater detection monitoring parameters by the following methods: chloride, fluoride and sulfate by 300.0; total dissolved solids (TDS) by 2540C; and metals by 6010/6020. Full chain-of-custody protocols were observed during sample collection, transportation, and analysis. Sample shipment/transport procedures were conducted per Sections 9.9 through 9.11 of ASTM D4448.

4.0 GROUNDWATER FLOW EVALUATION

Horizontal groundwater flow was evaluated in the uppermost water bearing zone by construction of potentiometric surface maps (**Figures 3 and 4**) from data measured in monitoring wells at BEC. An evaluation of groundwater flow indicates that horizontal groundwater flow at BEC is consistently towards local surface water bodies with flow towards Lake Rodemacher in the power station portion of the property and towards Bayou Jean de Jean in the area of the Bottom Ash Pond, Fly Ash Pond, and Ash Management Area. Based on USGS topographic quadrangles of the Lake Rodemacher area, the spillway elevation of Lake Rodemacher is 100 feet NGVD. Groundwater elevations determined in monitoring wells near the lake are generally higher than this maximum lake elevation, supporting groundwater flow towards the lake.

Groundwater flow rate was evaluated using the groundwater flow equation, $v = [k (dh/dl)] / n_e$. For this equation, v is groundwater flow velocity in ft/day, k is hydraulic conductivity in ft/day, dh/dl is hydraulic gradient in ft/ft, and n_e is effective porosity (unitless).

Hydraulic conductivity (k) value ranging from 10 to 100 ft/day was assumed (Heath, 1989) based on the silty sand and fine- to coarse-grained sand observed in soil cuttings from soil borings completed at the site. Hydraulic gradient (dh/dl) value estimates from potentiometric surface maps representing each sampling event for the Ash Ponds areas are summarized below. An effective porosity (n_e) of 0.2 was assumed based on the soil types of the uppermost water bearing zone (Fetter, 2001). Using these values, the groundwater flow rates (v) are listed below.

Date	Hydraulic Gradient (feet/feet)	Estimated Groundwater Flow Velocity (feet/day)
March 2024	0.00006 to 0.05	0.003 to 25
September 2024	0.0009 to 0.06	0.045 to 30

It is important to note that this is an advective rate and does not take into account potential hydrogeological heterogeneities such as adsorption, biodegradation, dispersion, or other retarding factors in the groundwater flow in this zone. Additionally, variations in the advective flow may occur due to potential lateral geological heterogeneities.

5.0 ANALYTICAL RESULTS

Groundwater samples collected at BEC were analyzed for the CCR Rule detection monitoring parameters pH, boron, calcium, chloride, fluoride, sulfate and TDS using appropriate EPA approved analytical methods. Results show frequent detections of all parameters in both up- and downgradient monitoring wells at BEC. Analytical results are presented in **Table 2**.

6.0 STATISTICAL EVALUATION

Statistical evaluations of groundwater data have been performed per applicable portions of §257.93.f. The goal of the statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality. Statistical evaluations are conducted to determine if there are any statistically significant increases (SSIs) between groundwater quality upgradient and groundwater quality downgradient of the Bottom Ash and Fly Ash Ponds.

Prediction limits are used to conduct statistical evaluations at BEC. Normal distributions of data values use parametric methods. Non-normal distributions use non-parametric methods, in which case, the prediction limit is based on the highest value in the background data set.

Statistical evaluations at BEC were performed using interwell prediction limits for boron, calcium, fluoride and pH. Prediction limits were constructed from the upgradient well data and based on the distribution of that data. Both upper and lower prediction limits were constructed for pH. The most recent result for each downgradient well for each parameter was compared to the applicable prediction limit.

Results of the interwell prediction limits for the 2024 detection monitoring sampling events at BEC indicated that no SSIs were generated.

Due to statistically significant variation found in upgradient monitoring well data, detection monitoring parameters chloride, sulfate and TDS were statistically evaluated using intrawell prediction limits. Intrawell tests are within well comparisons. In the case of limit-based tests, historical data from within a given monitoring well for a given parameter are used to construct a limit. Compliance points are compared to the limit to determine whether a change is occurring on a per-well/per-parameter basis.

Intrawell limit-based tests are recommended when there is evidence of spatial variation in groundwater quality, particularly among upgradient monitoring wells, as it is inappropriate to pool those data across monitoring wells for the purpose of creating interwell limits for comparison with compliance monitoring well data. Intrawell tests may be used at both new and existing facilities. Data used in the intrawell limit-based tests were screened for outliers, which, if found, were removed from the background data set prior to constructing limits for each well/parameter pair.

Verification resampling for SSIs is only conducted for SSIs generated in downgradient wells via intrawell methodology. Intrawell statistics have been performed on all wells; however, since the goal of the statistical evaluation is to determine if there is statistically significant evidence to show that facility operations may have adversely affected groundwater quality downgradient of the facilities, only downgradient wells are subject to verification resampling.

Intrawell statistical analysis of the 2024 detection monitoring groundwater data showed that no SSIs were generated in downgradient wells at the Bottom Ash and Fly Ash Ponds.

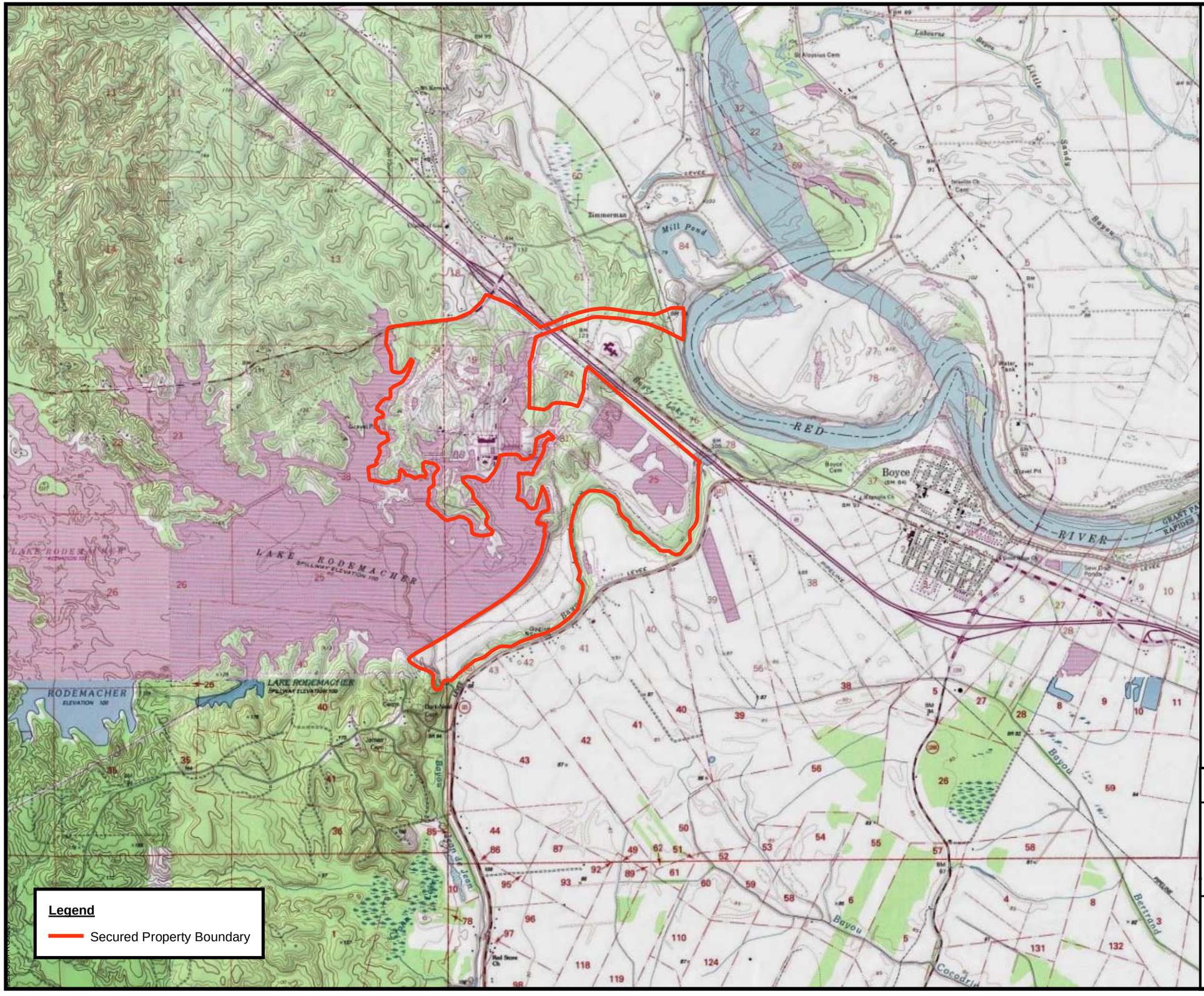
7.0 CONCLUSIONS AND RECOMMENDATIONS

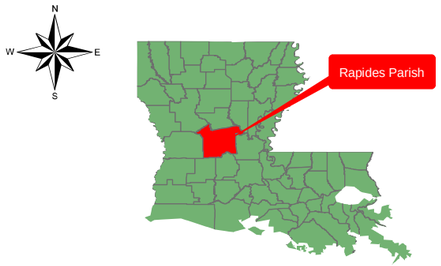
- Cleco BEC has a monitoring well system to monitor groundwater quality at the Bottom Ash and Fly Ash Ponds per applicable portions of §257.91. The network consists of five upgradient and four downgradient monitoring wells.
- Cleco conducted sufficient detection monitoring sampling events, per applicable portions of §257.93 and §257.94.
- Potentiometric surface evaluation at BEC indicates consistent groundwater flow towards local surface water bodies.
- Statistical evaluations of data conducted per applicable portions of §257.93 indicate that no SSIs were observed in downgradient/compliance wells at BEC.
- Semi-annual detection monitoring sampling events are tentatively scheduled for March and September 2025. Data generated during these sampling events will be included in the next annual report.

8.0 CERTIFICATION

I hereby certify this annual groundwater monitoring report for Cleco Power LLC. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

	27124
Signature	**PE Registration Number**
Bradley E. Bates	*Professional Engineer*
Name	**Title**
Eagle Environmental Services, Inc.	*12/11/2024*
Company	**Date**





0 1,500 3,000 6,000 9,000 Feet

Reference

U.S.G.S. TOPOGRAPHIC MAPS "LENA, LOUISIANA", "BOYCE, LOUISIANA", "JERICHO, LOUISIANA", AND "GARDNER, LOUISIANA."

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Brame Energy Center

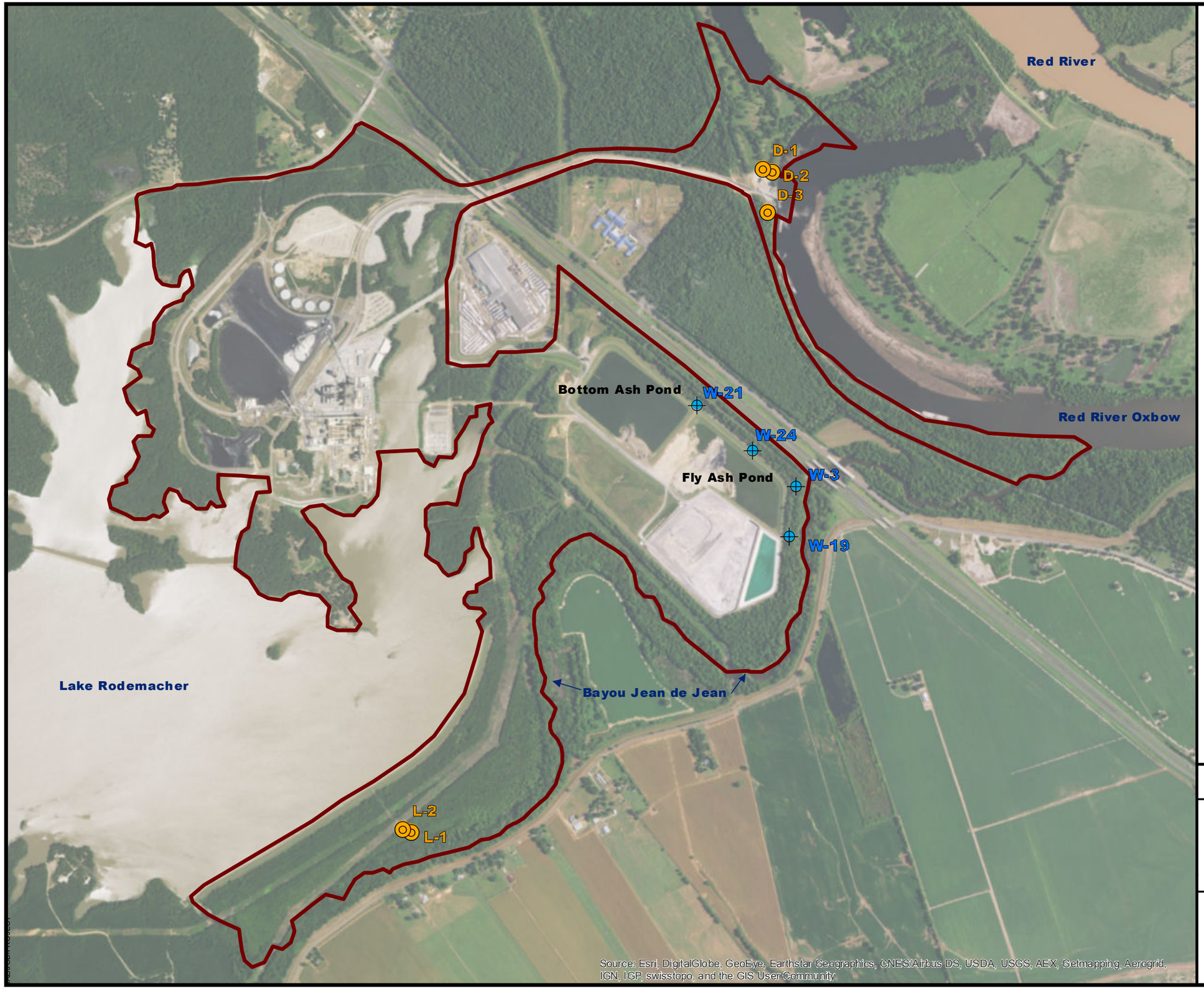
Site Location Map

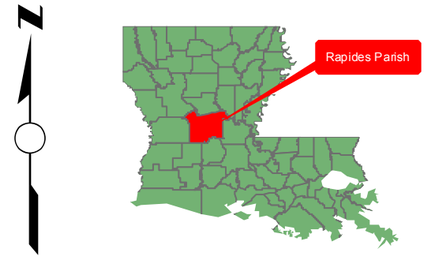
Rapides Parish, Louisiana

E·A·G·L·E ENVIRONMENTAL SERVICES

Drawn:	jbh
Checked:	JM
Approved:	RS
Date:	11/08/10
Dwg. No.:	01-10-0071-A003

Figure 1





Legend

- CCR Rule Compliance Wells
- CCR Rule Background Wells
- Secured Property Boundary

Feet
0 500 1,000 2,000 3,000

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CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

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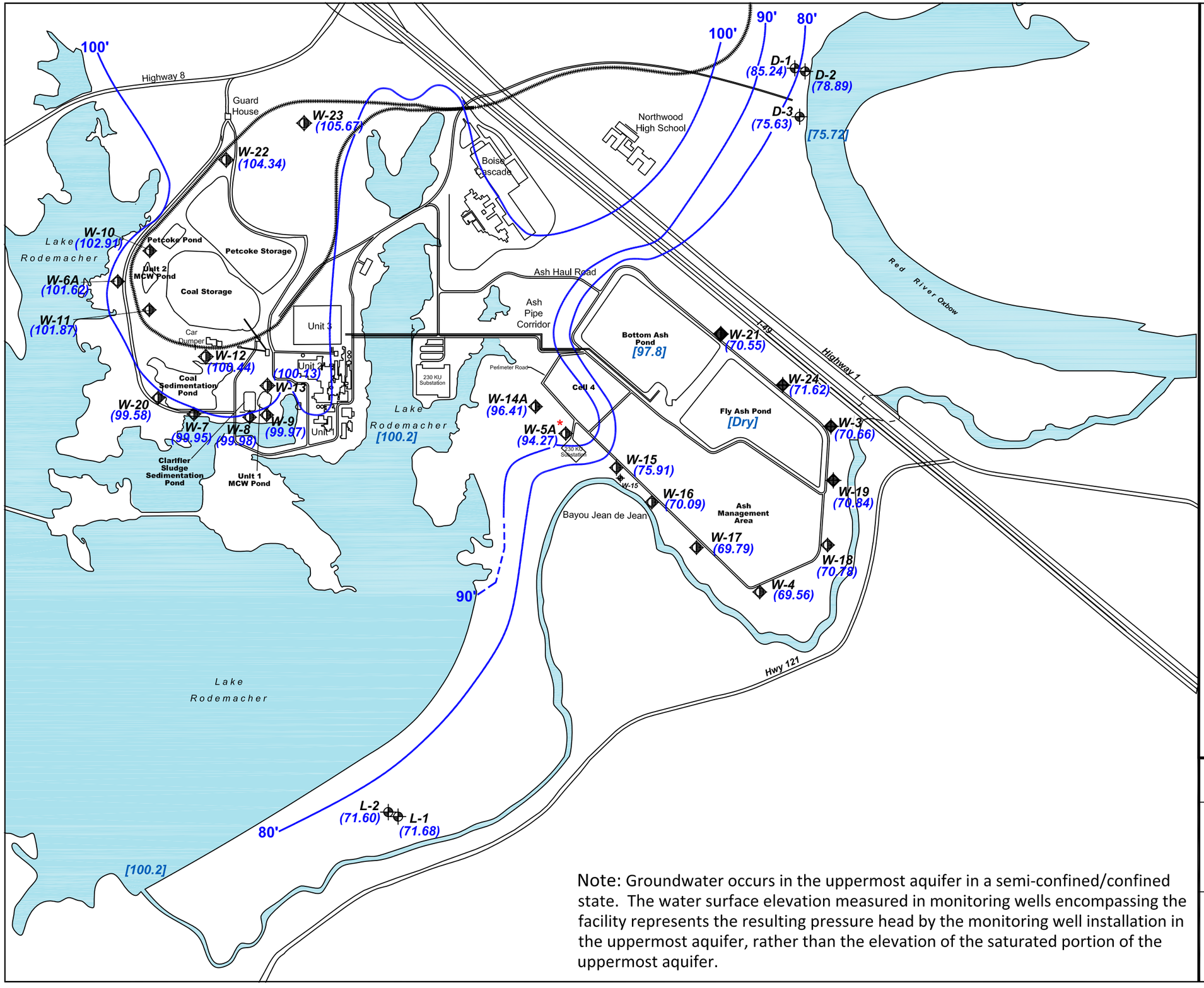
Checked:	RS
Approved:	JM
Date:	10/4/16
Dwg. No.:	01-16-0160-A003

Figure 2



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (85.24) Potentiometric Surface Elevation, Ft. NGVD
- 80' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [75.72] Surface Water Elevation ft. NGVD
- * Flowing Well Conditions

Note: Red River elevation reflects difference of Red River at Lock & Dam No. 3 Lower and Red River at Alexandria, LA.

1,200 0 1,200

Scale: 1" = 1,200'

Note: Groundwater occurs in the uppermost aquifer in a semi-confined/confined state. The water surface elevation measured in monitoring wells encompassing the facility represents the resulting pressure head by the monitoring well installation in the uppermost aquifer, rather than the elevation of the saturated portion of the uppermost aquifer.

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Potentiometric Surface Map March 2024

Rapides Parish, Louisiana

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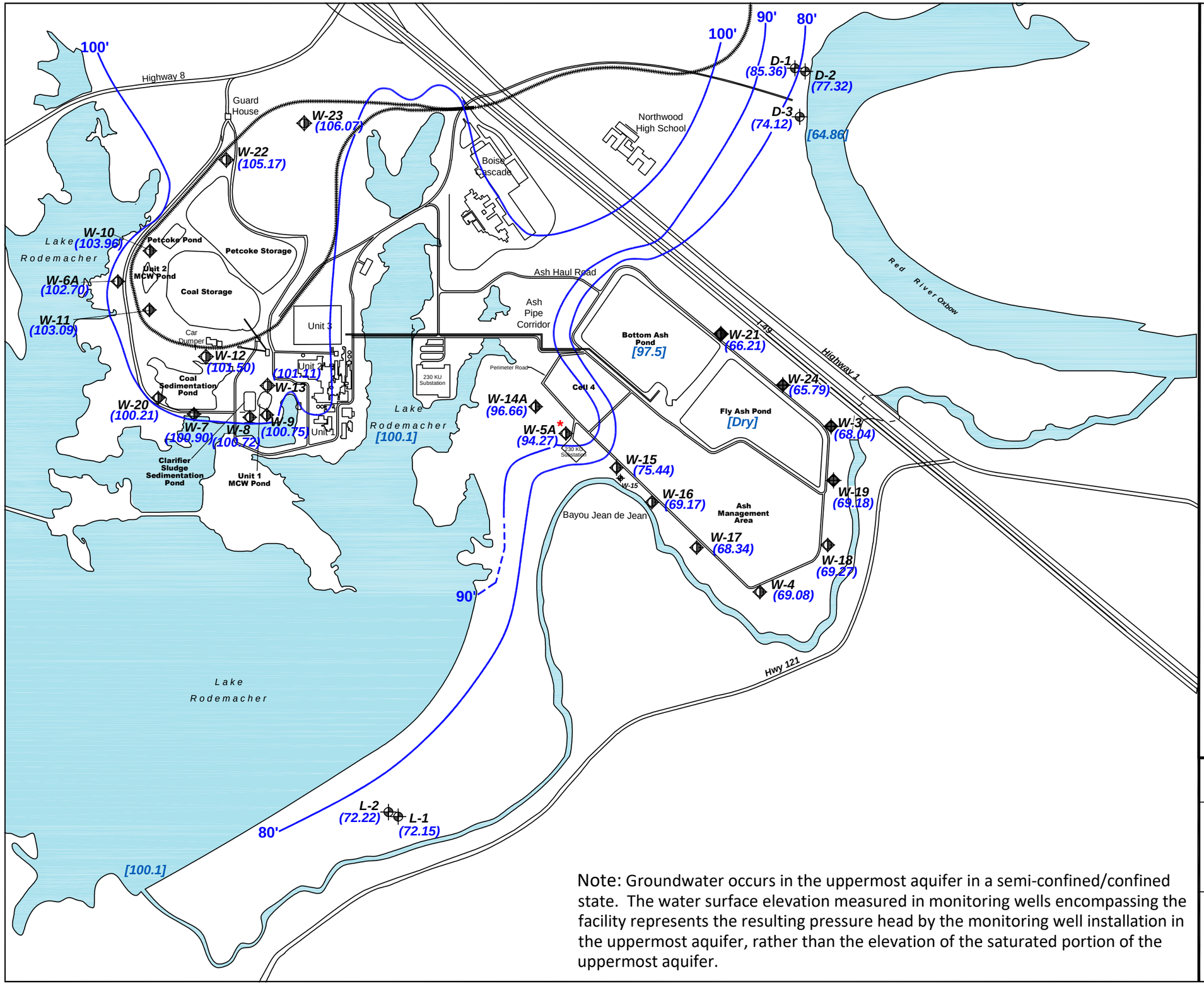
Approved:	JM
Date:	4/4/24
Dwg. No.:	01-24-0242-A001

Figure 3



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (68.04) Potentiometric Surface Elevation, Ft. NGVD
- 80' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [64.86] Surface Water Elevation ft. NGVD
- * Flowing Well Conditions

Note: Red River elevation reflects difference of Red River at Lock & Dam No. 3 Lower and Red River at Alexandria, LA.

1,200 0 1,200

Scale: 1" = 1,200'

Note: Groundwater occurs in the uppermost aquifer in a semi-confined/confined state. The water surface elevation measured in monitoring wells encompassing the facility represents the resulting pressure head by the monitoring well installation in the uppermost aquifer, rather than the elevation of the saturated portion of the uppermost aquifer.

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Potentiometric Surface Map September 2024

Rapides Parish, Louisiana

E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	10/24/24
Dwg. No.:	01-24-0242-A002

Figure 4

Table 1
Monitoring Well Information

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Well Number	D-1	D-2	D-3	L-1	L-2
Background (B) or Compliance (C)	B	B	B	B	B
Latitude (dd°mm'ss")	31°24'23.84"	31°24'23.41"	31°24'17.52"	31°22'47.68"	31°22'48.17"
Longitude (dd°mm'ss")	92°41' 53.62"	92°41'52.12"	92°41'52.95"	92°42'53.61"	92°42'55.01"
Casing Elevation (ft NGVD)	99.38	99.36	97.37	86.15	86.68
Concrete Pad Elevation (ft NGVD)	96.59	97.10	94.50	83.05	83.73
Well Depth (ft bgs)	40	46	35.5	36	40
Screen Length (ft)	10	10	10	10	10
Top of Screen (ft NGVD)	67.2	61.7	69.3	58.8	54.6
Bottom of Screen (ft NGVD)	57.2	51.7	59.3	48.8	44.6
Screen Slot Size (inches)	0.010	0.010	0.010	0.010	0.010
Casing Diameter (inches) & Material	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC

Well Number	W-3	W-19	W-21	W-24
Background (B) or Compliance (C)	C	C	C	C
Latitude (dd°mm'ss")	31°23'37.79"	31°23'30.48"	31°23'49.57"	31°23'43.05"
Longitude (dd°mm'ss")	92°41'48.33"	92°41'50.26"	92°42'05.00"	92°41'55.61"
Casing Elevation (ft NGVD)	92.12	94.99	87.86	83.71
Concrete Pad Elevation (ft NGVD)	88.87	92.47	85.23	81.03
Well Depth (ft bgs)	77	55	54.5	55
Screen Length (ft)	10	10	10	10
Top of Screen (ft NGVD)	25.7	48.0	41.2	38.4
Bottom of Screen (ft NGVD)	15.7	38.0	31.2	28.4
Screen Slot Size (inches)	0.010	0.010	0.010	0.010
Casing Diameter (inches) & Material	2" PVC	2" PVC	2" PVC	2" PVC

Notes:
bgs = below ground surface
PVC = polyvinyl chloride

Table 2
2024 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/Date		Boron	Calcium	Chloride	Fluoride	pH	Sulfate	TDS
D-1 (BG)	3/19/24	<0.05	6.23	15.6	<1.25	4.73	<10	116
	9/26/24	<0.05	5.86	13.6	<1.25	4.93	<10	130
D-2 (BG)	3/19/24	0.122	89.7	6.34	<1.25	6.75	51.4	426
	9/26/24	0.122	87.5	6.31	<1.25	6.59	54.1	455
D-3 (BG)	3/19/24	0.417	91.5	7.76	<1.25	7.29	44.2	440
	9/26/24	0.405	92.4	10.5	<1.25	7.23	58.1	685
L-1 (BG)	3/19/24	0.122	132	6.38	<1.25	6.04	22.3	490
	9/26/24	0.0913	69.4	4.25	<1.25	6.1	34.9	866
L-2 (BG)	3/19/24	0.099	58	<4.00	<1.25	6.06	<10	270
	9/26/24	0.114	60.3	<4	1.27	6.08	<10	263
W-3	3/19/24	0.184	70.1	214	<1.25	6.2	<10	670
	9/26/24	0.192	66.3	212	<1.25	6.19	<10	706
W-19	3/19/24	0.208	97.1	80.8	<1.25	5.9	<10	712
	9/26/24	0.207	94.8	76.2	<1.25	6.06	<1	680
W-21	3/19/24	0.427	129	56.4	<1.25	6.48	179	1,150
	9/26/24	0.379	118	51.8	1.31	6.26	188	1,280
W-24	3/19/24	0.16	102	90.5	<1.25	6.55	17.6	726
	9/26/24	0.0731	70.6	<4	<1.25	6.4	43	356

Notes:
pH in standard units
All other parameters in milligrams per liter