CLECO CAJUN LLC
LOUISIANA GENERATING LLC
BIG CAJUN II POWER PLANT

BOTTOM ASH BASIN AND
FLY ASH BASIN
NEW ROADS, LA

2019 Annual Groundwater Monitoring Report for the Coal Combustion Residuals Rule

January 2020

TABLE OF CONTENTS

Figures

Tables

1.0 INTRODUCTION

Louisiana Generating LLC hereby presents the 2019 Annual Groundwater Monitoring report for the Bottom Ash and Fly Ash Basins at the Big Cajun II Power Plant (BC2) located in New Roads, 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

Louisiana Generating LLC owns and operates BC2 located at 10431 Cajun II Road, New Roads, Louisiana 70760. The Bottom Ash and Fly Ash Basins 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, BC2 has a groundwater monitoring well system to evaluate the groundwater quality conditions near the Bottom Ash and Fly Ash Basins. The monitoring system has been historically used to conduct groundwater monitoring required by BC2's LDEQ approved solid waste permits. A total of fifteen 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 is provided in Table 1.

3.0 FIELD ACTIVITIES

Groundwater sampling events were conducted by approved contract personnel in accordance with applicable portions of §257.93. Semi-annual assessment monitoring sampling events were conducted in April and October 2019.

The depth-to-water below the top of each well casing was measured and recorded prior to purging and sampling 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 suction lift pumps. These activities were conducted in accordance with applicable portions of Sections 6.1, 6.2, 6.5 through 6.8, and 8.1.3 of the *Standard Guide for Sampling Groundwater Monitoring Wells* (ASTM International, Publication D4448). 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 collected in April 2019 were properly preserved on ice in the field and shipped to Eurofins TestAmerica in Pensacola, Florida. Samples were analyzed for the CCR groundwater monitoring parameters by the following methods: chloride, fluoride and sulfate by 4500; total dissolved solids by 2540C; metals by 6020/7470; and radium by 9315/9320.

Samples collected in October 2019 were properly preserved on ice in the field and shipped to Pace Analytical Services, LLC in St. Rose, Louisiana. Samples were analyzed for the CCR groundwater

monitoring parameters by the following methods: chloride by 4500, sulfate by D516, fluoride by 300.0, total dissolved solids by 2540C; metals by 6020/7470, and radium by 903.1/904.

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 BC2. An evaluation of groundwater flow indicates that, similar to previous monitoring, the groundwater flow direction varied but was predominantly away from the Mississippi River (east to west) with localized variability in the area of the Bottom Ash Basin and eastern portion of the Fly Ash Basin.

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 Basins 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)
April 2019	0.0004 to 0.005	0.0001 to 0.135
October 2019	0.0002 to 0.0027	0.0002 to 0.25

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 BC2 were analyzed for the CCR Rule groundwater monitoring parameters using appropriate EPA approved analytical methods. Results show frequent detections of all parameters in both up- and downgradient monitoring wells at BC2. Analytical results are compared to Groundwater Protection Standards (GWPS) which are presented in Table 2. Analytical results are provided in Table 3 (April 2019) and Table 4 (October 2019).

6.0 DATA EVALUATION

Statistical evaluations of groundwater data have been performed per applicable portions of §257.93.f. When Assessment Monitoring is initiated because of confirmed SSIs observed during the Detection Monitoring program, detected Appendix IV parameters are compared to Groundwater Protection Standards (GWPS) through the use of Confidence Intervals. The GWPS will be either the Maximum

Contaminant Level (MCL) or a statistical limit based on background, whichever is higher (§257.95.h). CCR Rule specified levels are used for parameters without MCLs (unless background is higher) which include: cobalt, lithium and molybdenum. Alternate contaminant levels (ACLs) will be established from upgradient wells through the use of Tolerance Limits. For this monitoring period, arsenic is the only parameter which has a GWPS based on background.

On an annual basis, all Appendix IV parameters will be sampled (§257.95.b) and newly detected parameters added to the list of parameters sampled semi-annually (§257.95.d). Note that during the April 2019 sampling event, mercury was detected at an estimated concentration of 0.00008 milligrams per liter (mg/l) in the laboratory method blank; therefore, in accordance with EPA *National Functional Guidelines for Inorganic Superfund Data Review*, the estimated concentrations (0.00015 mg/l) at compliance wells MW-10B and MW-10CR1 were considered non-detects.

Confidence intervals have been calculated to evaluate data for parameters which have been detected above the GWPS in at least one discrete sample collected from a downgradient/compliance well during the baseline or assessment monitoring program events. Confidence intervals require a minimum of four samples; however, eight samples are recommended.

In Assessment Monitoring, a well is determined to be out of compliance when the Lower Confidence Limit (LCL), or the entire interval, exceeds the GWPS. Evaluation of the 2019 groundwater monitoring data at BC2 indicate that no Appendix IV constituents are present at Statistically Significant Levels (SSLs) above the constituents' GWPS.

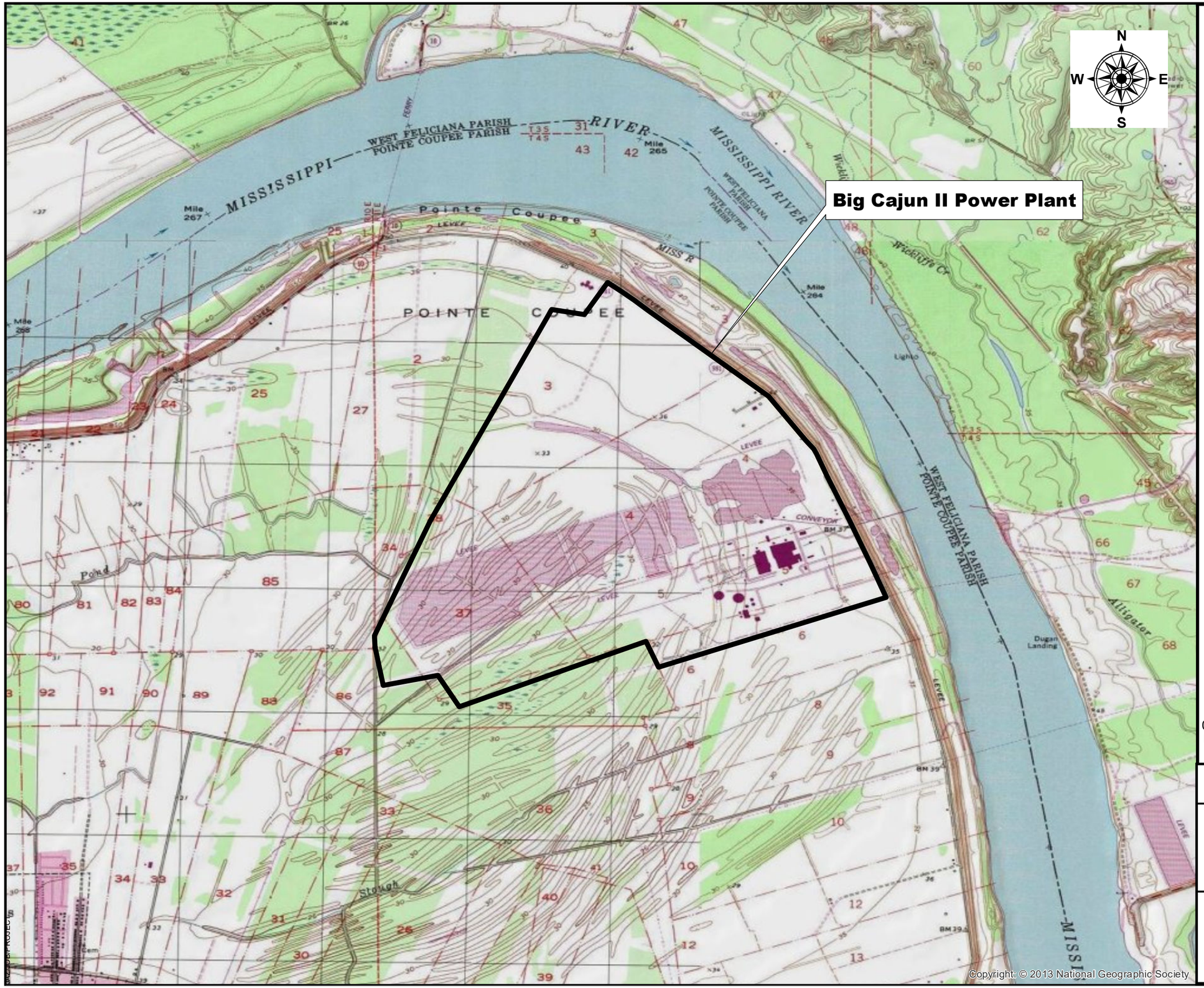
7.0 CONCLUSIONS AND RECOMMENDATIONS

- BC2 has a monitoring well system to monitor groundwater quality at the Bottom Ash and Fly Ash Basins per applicable portions of §257.91. The network consists of one upgradient and fourteen downgradient monitoring wells.
- BC2 conducted sufficient groundwater monitoring sampling events, per applicable portions of §257.93 and §257.95.
- Potentiometric surface evaluation at BC2 indicates variable groundwater flow patterns due to the site's close proximity to the Mississippi River.
- Statistical evaluations of data conducted per applicable portions of §257.93 indicate that no Appendix IV constituents are present at SSLs above the constituents' GWPS.
- Semi-annual assessment monitoring sampling events are tentatively scheduled for April and October of 2020. 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 the Louisiana Generating LLC Big Cajun II Power Plant. 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.	*1/9/2020*
Company	**Date**



Legend

Approximate Property Boundary

0 1,250 2,500 5,000 7,500 Feet

CLECO Cajun, LLC

Big Cajun II Power Plant

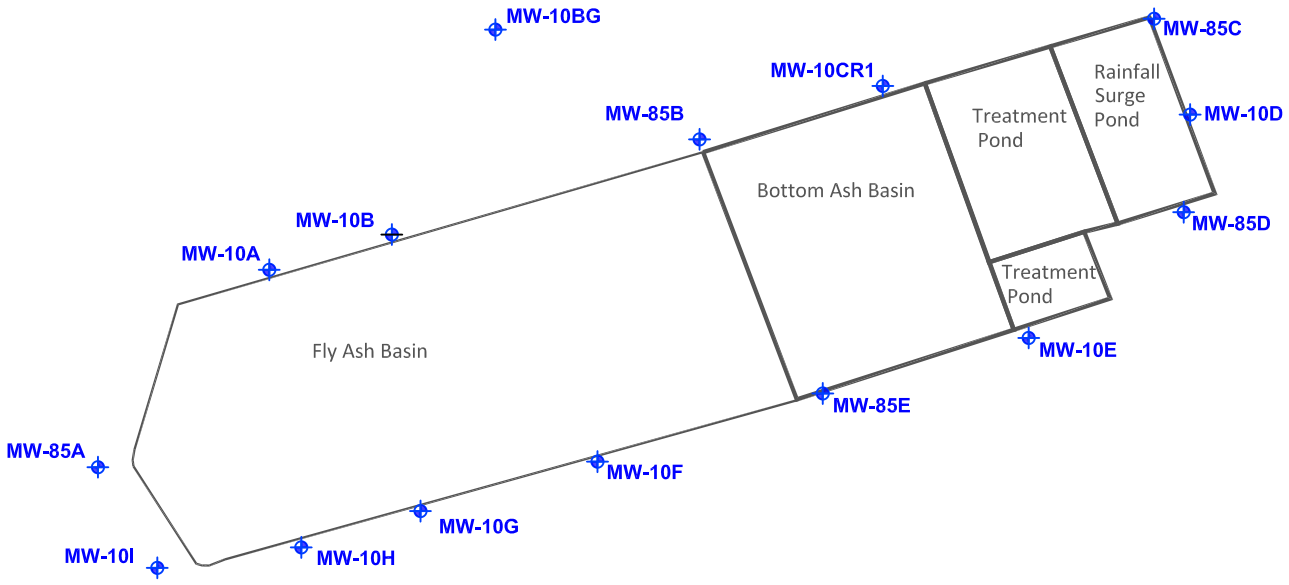
Site Location Map

Pointe Coupee Parish

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

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	7/11/19
Dwg. No.:	367-19-0001-A001

Figure 1



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

Legend

MW-10B Monitoring Well

CLECO Cajun, LLC

Big Cajun II Power Plant

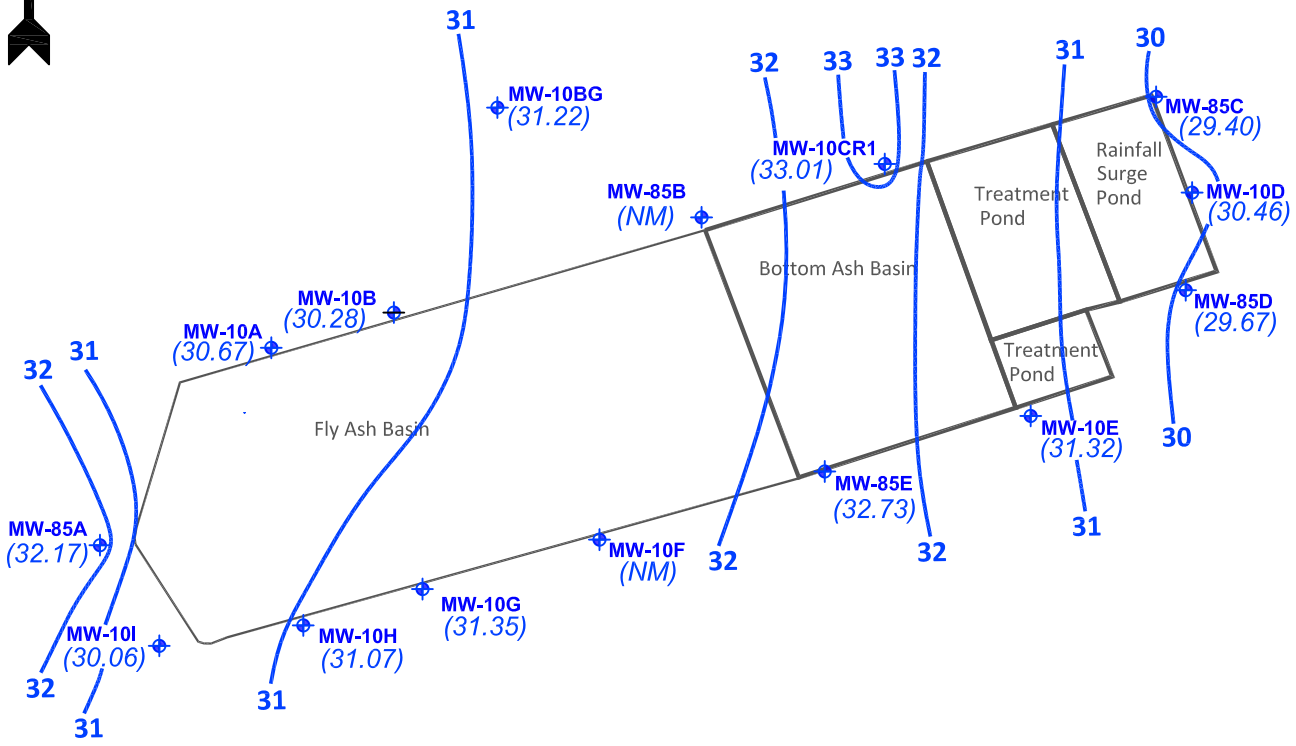
Monitoring Well Location Map

Pointe Coupee Parish

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

Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/11/19
Dwg. No.:	367-19-0002-A001

Figure 2



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

Legend

MW-10B	Monitoring Well
(32.17)	Measured Potentiometric Elevation (ft. NGVD)
31	Potentiometric Surface Elevation (ft. NGVD)
NM	Not Measured. Flowing Well Conditions

CLECO Cajun, LLC

Big Cajun II Power Plant

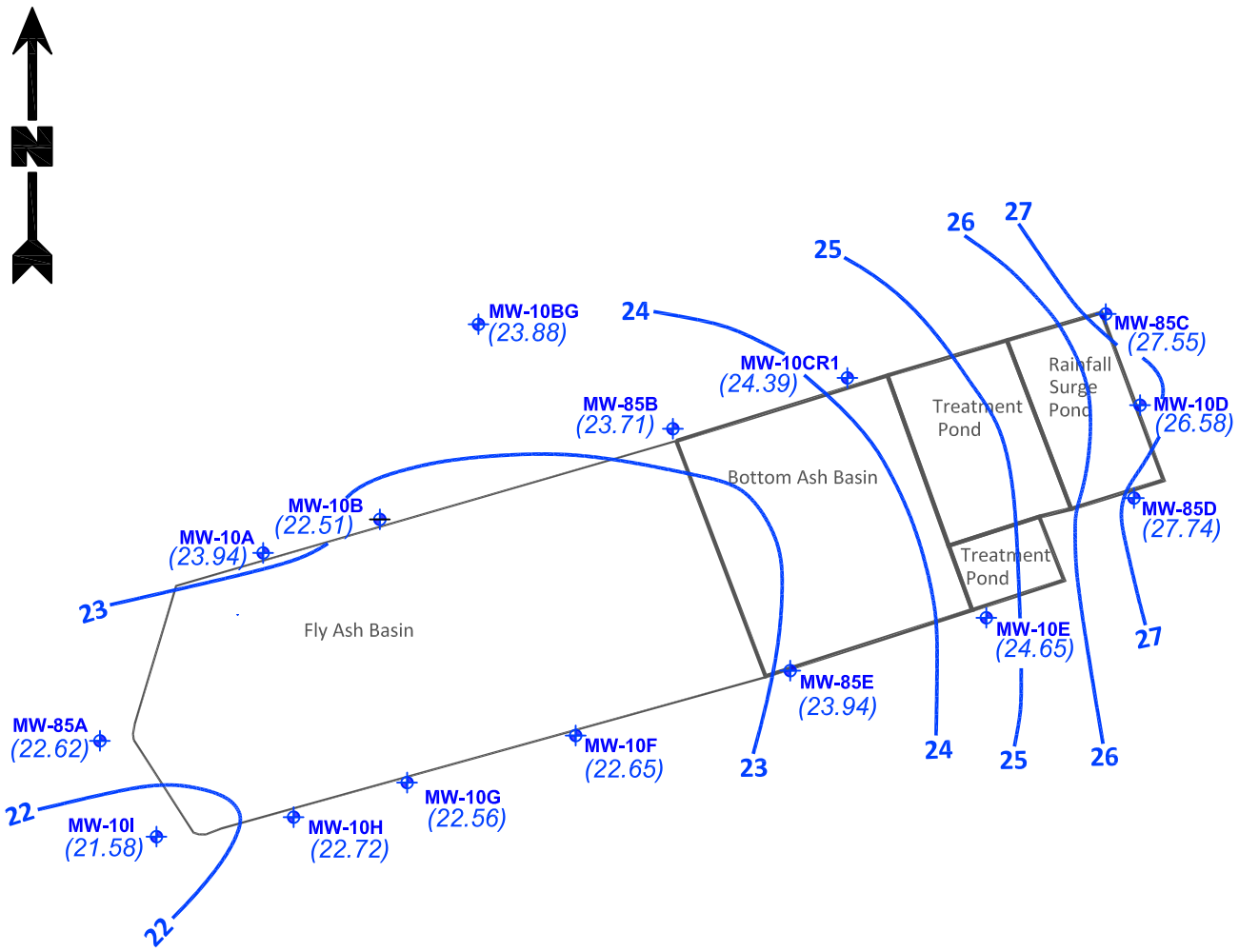
Potentiometric Surface Map
April 2019

Pointe Coupee Parish

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

Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/11/19
Dwg. No.:	367-19-0002-B001

Figure 3



Legend

MW-10B — Monitoring Well

(23.94) — Measured Potentiometric Elevation (ft. NGVD)

25 — Potentiometric Surface Elevation (ft. NGVD)

CLECO Cajun, LLC

Big Cajun II Power Plant

Potentiometric Surface Map
October 2019

Pointe Coupee Parish

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

Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/11/19
Dwg. No.:	367-19-0002-B002

Figure 4

TABLE 1

Monitoring Well Information

Well ID	Latitude (DMS)	Longitude (DMS)	Installation Date	Zone Monitored	Gradient	Top of Casing Elevation (ft NGVD)	Ground Surface Elevation (ft NGVD)	Top of Screen Elevation (ft NGVD)	Bottom of Screen Elevation (ft NGVD)	Well Depth (ft bgs)	Well Diameter (in)
MW-85A	30°43'44"	91°23'50"	Jun 1985	Uppermost	Down	34.82	33.17	-1.58	-21.58	55.75	2
MW-85B	30°43'47"	91°22'37"	Jun 1985	Uppermost	Down	32.25	30.60	21.55	1.15	30.45	2
MW-85C	30°43'57"	91°22'37"	Jun 1985	Uppermost	Down	35.05	33.46	15.61	-4.74	39.20	2
MW-85D	30°43'44"	91°22'25"	Jun 1985	Uppermost	Down	35.71	34.20	16.20	-3.80	39.00	2
MW-85E	30°43'30"	91°23'01"	Jun 1985	Uppermost	Down	33.52	32.07	22.97	2.67	30.40	2
MW-10A	30°43'37"	91°23'40"	Jun 2011	Uppermost	Down	32.97	29.89	10.57	0.57	29.57	2
MW-10B	30°43'39"	91°23'31"	Jun 2011	Uppermost	Down	31.13	27.86	7.98	-2.02	30.13	2
MW-10CR1	30°43'50"	91°22'55"	Oct 2016	Uppermost	Down	35.48	32.43	12.95	2.95	29.73	2
MW-10D	30°43'48"	91°22'32"	Jun 2011	Uppermost	Down	33.18	30.22	9.83	-0.17	30.64	2
MW-10E	30°43'23"	91°23'15"	May 2011	Uppermost	Down	33.54	30.42	9.94	-0.06	30.74	2
MW-10F	30°43'32"	91°22'44"	May 2011	Uppermost	Down	31.27	28.97	2.92	-7.08	36.30	2
MW-10G	30°43'19"	91°23'28"	Jun 2011	Uppermost	Down	32.17	29.30	0.42	-9.58	39.13	2
MW-10H	30°43'17"	91°23'37"	Jun 2011	Uppermost	Down	32.01	29.21	-9.74	-19.74	49.20	2
MW-10I	30°43'15"	91°23'48"	Jun 2011	Uppermost	Down	33.12	30.06	0.31	-9.69	40.00	2
MW-10BG	30°43'55"	91°23'23"	Jun 2011	Uppermost	Up	33.74	30.79	10.39	0.39	30.65	2

Notes:
DMS = Degrees Minutes Seconds
NGVS = National Geodetic Vertical Datum
BGS = Below Ground Surface

TABLE 2

April 2019 Analytical Data Summary

Parameter/Well	MW-85A	MW-85B	MW-85C	MW-85D	MW-85E	MW-10A	MW-10B	MW-10CR1	MW-10D
	4/15/19	4/17/19	4/17/19	4/16/19	4/15/19	4/16/19	4/17/19	4/17/19	4/17/19
Boron (mg/l)	0.076	0.051	0.21	0.15	5.7	0.76	0.53	0.3	0.23
Calcium (mg/l)	72	94	110	110	160	110	97	110	150
Chloride (mg/l)	17	44	56	27	96	78	67	57	79
pH (S.U.)	6.84	7.87	7.86	7.51	7.26	7.61	7.68	7.89	7.9
Sulfate (mg/l)	<5	160	190	79	770	280	87	150	360
TDS (mg/l)	290	610	670	590	1,500	800	590	670	960
Antimony (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic (mg/l)	0.0022	0.0011 J	0.0052	0.0049	0.0096	0.0027	0.0026	0.012	0.0029
Barium (mg/l)	0.29	0.47	0.24	0.22	0.06	0.24	0.45	0.37	0.22
Beryllium (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Cadmium (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Chromium (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Cobalt (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.00061 J	<0.0025
Fluoride (mg/l)	0.37	0.2	0.3	0.32	0.28	0.4	0.19	0.31	0.16
Lead (mg/l)	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
Lithium (mg/l)	0.016	0.016	0.013	0.018	0.018	0.014	0.017	0.018	0.014
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00015 J	0.00015 J	<0.0002
Molybdenum (mg/l)	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.0025 J	0.0022 J	<0.015
Selenium (mg/l)	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
Thallium (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Combined Radium-226,228 (pCi/l)	0.655	0.697	0.56	0.412	0.652	0.697	0.681	0.412	0.642

Notes:
mg/l = milligrams per liter
S.U. = standard units
pCi/l = picocuries per liter

TABLE 2

April 2019 Analytical Data Summary

Parameter/Well	MW-10E	MW-10F	MW-10G	MW-10H	MW-10I	MW-10BG
	4/15/19	4/16/19	4/16/19	4/16/19	4/15/19	4/15/19
Boron (mg/l)	0.21	2.1	0.82	0.18	0.14	0.066
Calcium (mg/l)	100	150	87	120	88	71
Chloride (mg/l)	42	35	81	56	25	5.4
pH (S.U.)	7.08	7.53	7.49	7.51	7.33	7.54
Sulfate (mg/l)	140	390	120	55	3.7 J	<5
TDS (mg/l)	620	910	600	600	450	350
Antimony (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic (mg/l)	0.01	0.0026	0.0021	0.0094	0.00058 J	0.0046
Barium (mg/l)	0.28	0.055	0.33	0.41	0.32	0.22
Beryllium (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Cadmium (mg/l)	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Chromium (mg/l)	0.0011 J	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Cobalt (mg/l)	0.00077 J	0.00053 J	<0.0025	<0.0025	<0.0025	<0.0025
Fluoride (mg/l)	0.27	0.29	0.24	0.28	0.21	0.39
Lead (mg/l)	0.00037 J	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
Lithium (mg/l)	0.018	0.018	0.021	0.019	0.024	0.012
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Selenium (mg/l)	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
Thallium (mg/l)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Combined Radium-226,228 (pCi/l)	0.567	0.208	0.699	0.564	0.177	0.796

Notes:
mg/l = milligrams per liter
S.U. = standard units
pCi/l = picocuries per liter

TABLE 3

October 2019 Analytical Data Summary

Parameter/Well	MW-85A	MW-85B	MW-85C	MW-85D	MW-85E	MW-10A	MW-10B	MW-10CR1	MW-10D
	10/8/19	10/8/19	10/8/19	10/9/19	10/8/19	10/8/19	10/8/19	10/8/19	10/8/19
Boron (mg/l)	0.07	0.046	0.18	0.13	5.9	0.79	0.74	0.35	0.15
Calcium (mg/l)	60.8	85	111	109	158	109	92.8	118	130
Chloride (mg/l)	15.7	51	57	25.9	9.4	8.6	83.6	69.8	76.4
pH (S.U.)	6.12	7.51	7.35	6.57	6.5	6.93	6.9	7.16	7.56
Sulfate (mg/l)	<1	180	197	67.5	737	293	97.9	246	323
TDS (mg/l)	320	6,500	540	1,390	775	645	735	855	4,040
Arsenic (mg/l)	0.0016	0.0011	0.0045	0.0047	0.0099	0.002	0.006	0.007	0.0026
Barium (mg/l)	0.3	0.46	0.25	0.22	0.061	0.26	0.48	0.41	0.19
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0012	<0.001
Fluoride (mg/l)	0.37	0.31	0.41	0.47	0.15	0.52	0.32	0.46	0.44
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (mg/l)	0.015	0.014	0.012	<0.001	0.015	0.012	0.016	0.015	<0.001
Molybdenum (mg/l)	<0.003	<0.003	<0.003	<0.003	0.014	<0.003	<0.003	0.003	<0.003
Combined Radium-226,228 (pCi/l)	0.766	1.919	1.954	1.683	1.811	1.07	0.772	1.155	1.29

Notes:
mg/l = milligrams per liter
S.U. = standard units
pCi/l = picocuries per liter

TABLE 3

October 2019 Analytical Data Summary

Parameter/Well	MW-10E	MW-10F	MW-10G	MW-10H	MW-10I	MW-10BG
	10/9/19	10/8/19	10/8/19	10/8/19	10/8/19	10/9/19
Boron (mg/l)	0.19	5.1	0.94	0.11	0.094	0.066
Calcium (mg/l)	118	359	81.7	124	81.2	68.5
Chloride (mg/l)	50.3	46.9	77.8	57.7	25.7	5.7
pH (S.U.)	6.57	6.73	6.49	6.38	6.21	6.52
Sulfate (mg/l)	200	1,510	141	35.1	4.1	<1
TDS (mg/l)	2,340	620	805	575	370	340
Arsenic (mg/l)	0.0091	0.0052	0.0016	0.0072	<0.001	0.025
Barium (mg/l)	0.33	0.076	0.35	0.41	0.32	0.23
Chromium (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (mg/l)	<0.001	0.0021	<0.001	<0.001	<0.001	<0.001
Fluoride (mg/l)	0.16	<0.10	0.23	0.18	0.2	0.36
Lead (mg/l)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (mg/l)	<0.001	0.027	0.018	<0.001	<0.001	<0.001
Molybdenum (mg/l)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Combined Radium-226,228 (pCi/l)	0.794	0.924	0.621	2.119	1.2148	-0.265

Notes:
mg/l = milligrams per liter
S.U. = standard units
pCi/l = picocuries per liter