

**CLECO POWER LLC  
BRAME ENERGY CENTER**

**BOTTOM ASH POND  
LENA, LA**

**Placement Above Uppermost Aquifer  
Location Restriction Demonstration  
for the Coal Combustion Residuals Rule**

**October 2018**



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## **1.0 INTRODUCTION**

Cleco Power LLC (Cleco) hereby presents the evaluation for the Placement above the Uppermost Aquifer Location Restriction for the Bottom Ash Pond unit at the Brame Energy Center (BEC) located in Lena, Louisiana (Figure 1). This report summarizes a hydrogeological evaluation of the uppermost water bearing zone and its relationship with the Bottom Ash Pond unit in accordance with §257.60 of the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule.

## **2.0 FACILITY INFORMATION**

Cleco owns and operates BEC which is located at 275 Rodemacher Road, Lena, Louisiana 71447. Per “Annual CCR Inspection for Bottom Ash Pond” (January 13, 2017) the base of the Bottom Ash Pond is 85 feet Mean Sea Level (MSL). Based on this determination, the base of the two-foot thick clay liner is estimated at 83 feet MSL.

## **3.0 HYDROGEOLOGIC SETTING**

Characterization of BEC has included the geomorphologic, geologic and hydrogeologic evaluation of the soils at BEC and are presented in this section. The site layout with the CCR unit identified is shown in Figure 2.

### **Geomorphology**

BEC is located across two different geomorphologic features that consist of Intermediate Terrace deposits of Pleistocene age to the north and northwest and alluvium and natural levee deposits of Holocene age to the south and southeast. The mapped boundary of the Intermediate Terrace and the alluvium/natural levee deposits is adjacent to the northern side of the Bottom Ash Pond. The northern portion of BEC is located on the Intermediate Terrace deposits and the remainder of BEC is located on the alluvium/natural levee deposits. The Bottom Ash Pond unit is situated overlying the alluvium/natural levee deposits, with only its northern end adjacent to the Intermediate Terrace deposits. The geomorphology features are shown in Figure 2.

### **Geologic Characterization**

Geologic cross sections illustrate the difference in stratigraphy and depth to the uppermost water bearing zone for both the Intermediate Terrace deposits and the alluvium/natural levee deposits. These geologic cross sections are constructed from soil borings trending in a north-south profile across the Bottom Ash Pond unit. The profiles of these geologic cross sections are shown in Figure 2. The geologic cross sections are included in Figure 3.

The uppermost water bearing zone within the Intermediate Terrace deposits consists of an upper fine-grained sand grading downward to coarse-grained sand with gravel. Note that the Intermediate Terrace deposits are hydraulically upgradient of the Bottom Ash Pond unit. The uppermost water bearing zone within the alluvium/natural levee deposits is described as sandy silt to silty sand with some gravel in its base, often underlain by sandy clay and clay. The geologic cross sections show extensive clay deposits underlying the Bottom Ash Pond.

### **Hydrographs of Alluvium Potentiometric Surface**

Groundwater surface elevations determined from monitoring wells screened in the uppermost water bearing zone in the alluvium/natural levee deposits were used to construct a hydrograph from data measured since 1987 as shown in the hydrograph in Figure 4. The hydrograph also includes the base depth of the Bottom Ash Pond unit liner at 83 feet MSL. A 5-foot buffer distance below this liner base is shown at 78 feet MSL.

This hydrograph illustrates the fluctuations of the water table over a 31-year monitoring period and shows the groundwater surface approaching the 5-foot buffer below the base of the units only in 2009 and 2016. This coincides with record high flood stages of the Red River and its tributary Bayou Jean de Jean in 2009 and 2016. The high river stage of the Red River in 2009 and 2016 are considered anomalous and not normal fluctuations. The 2016 spring flood stage is the highest ever recorded for the nearest Red River United States Geological Survey stage gages which are named 'Red River @ Lock & Dam No. 3 Lower' and 'Red River @ Alexandria'. These two river gages are immediately upstream and downstream of BEC along the Red River. Even with these extremely high river stages in 2009 and 2016, the groundwater surface did not encounter the base liner elevation of the Bottom Ash Pond unit.

#### 4.0 PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTION DETERMINATION

The hydrogeological data presented in this evaluation indicate that the Bottom Ash Pond unit meets the criteria of the Location Restriction, Placement above the Uppermost Aquifer. The Bottom Ash Pond unit is predominantly over only the alluvium deposits with only the northern wall encountering the terrace deposits. The geologic cross sections show extensive clay deposits underlying the Bottom Ash Pond.

The hydrograph in Figure 4 illustrates the relationship of the base of the CCR unit with the groundwater surface of the uppermost water bearing zone and clearly shows significant separation (>5 ft) predominantly over the extensive 31-year period of monitoring data.

#### 5.0 CONCLUSIONS

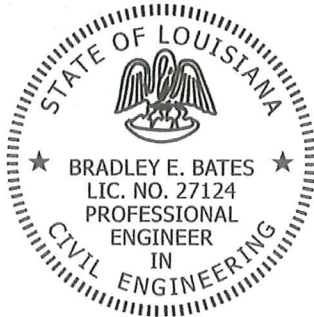
Cleco BEC has completed its evaluation of §257.60, the Placement above the Uppermost Aquifer Location Restriction. As required by the CCR Rule part §257.60, BEC hereby demonstrates that the Bottom Ash Pond unit meets the following criteria:

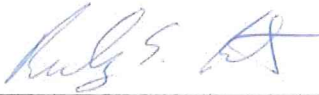
- §257.60 Placement Above the Uppermost Aquifer Location Restriction**  
§257.60 (a) The evaluation of the Bottom Ash Pond unit, indicates that the existing CCR unit, meets and exceeds the minimum requirements in this standard for separation distance of the placement of CCR waste above the uppermost aquifer.

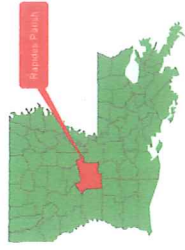
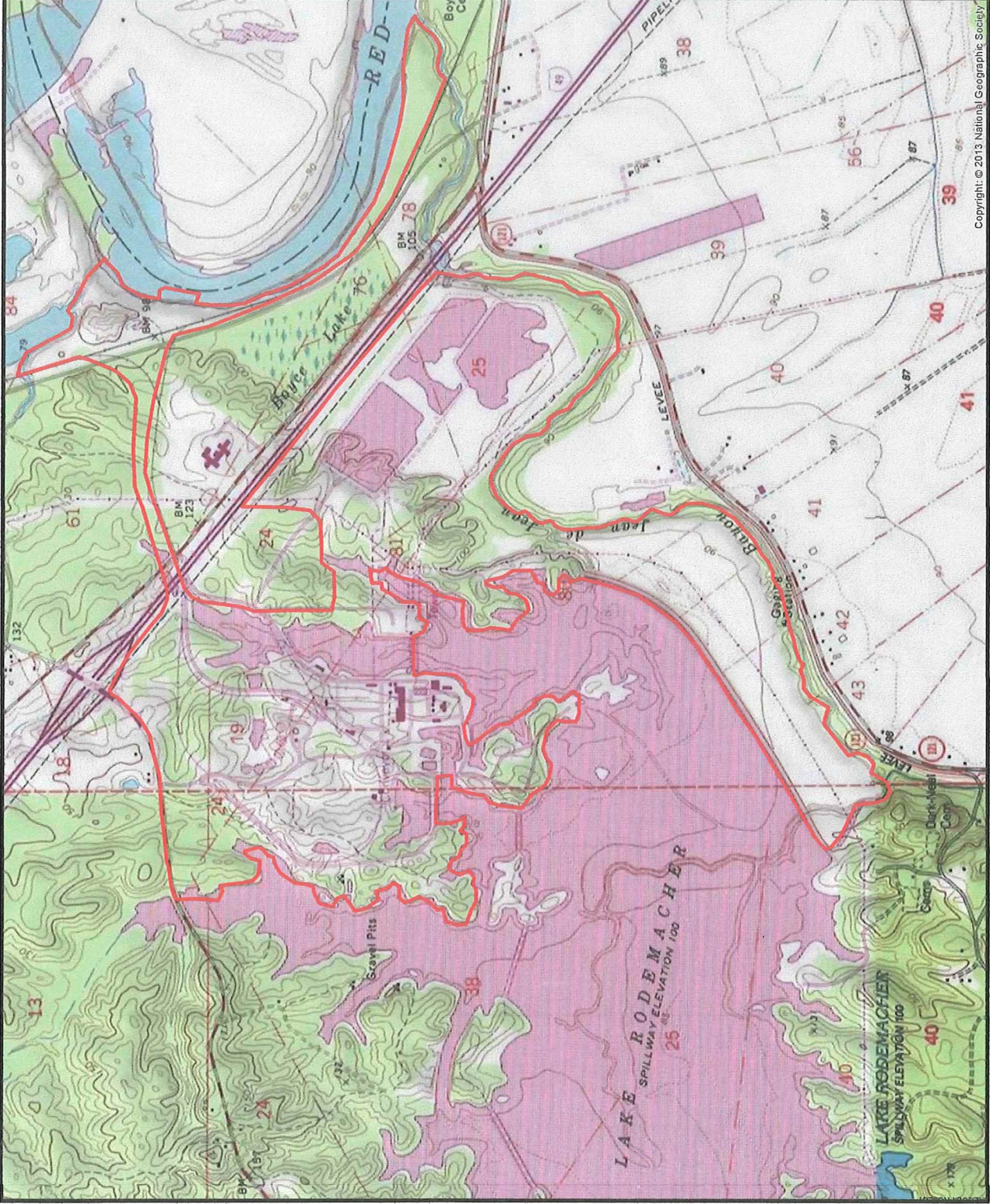
This evaluation has concluded that the Bottom Ash Pond unit meets the criteria for §257.60.

6.0 CERTIFICATION

I hereby certify this location restriction evaluation for Cleco Power LLC. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.



	27124
_____ <b>Signature</b>	_____ <b>PE Registration Number</b>
<i>Bradley E. Bates</i>	<i>Professional Engineer</i>
_____ <b>Name</b>	_____ <b>Title</b>
<i>Eagle Environmental Services, Inc.</i>	<i>10-08-2018</i>
_____ <b>Company</b>	_____ <b>Date</b>



### Legend

— Property Boundary Line



#### Reference

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



Brame Energy Center

### Site Location Map

Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	09/16
Dwg. No.:	01-16-0165-ADD5



Figure 1

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**Terraces**

- Qtp - Prairie Terrace
- Mfcb - Carnahan Bayou Member
- Qth - High Terrace
- Qti - Intermediate Terrace

**Alluvial**

- Qal - Alluvium; Qnl - Natural Levees

**Wells**

- Boring Locations (Sargent & Lundy, 1981)
- Boring Locations (Eagle, 2018)

**Cross Section Profile Location**

- Cross Section Profile Line



**Reference**

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



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Bottom Ash Pond

**Geologic Cross Section Profiles Map**

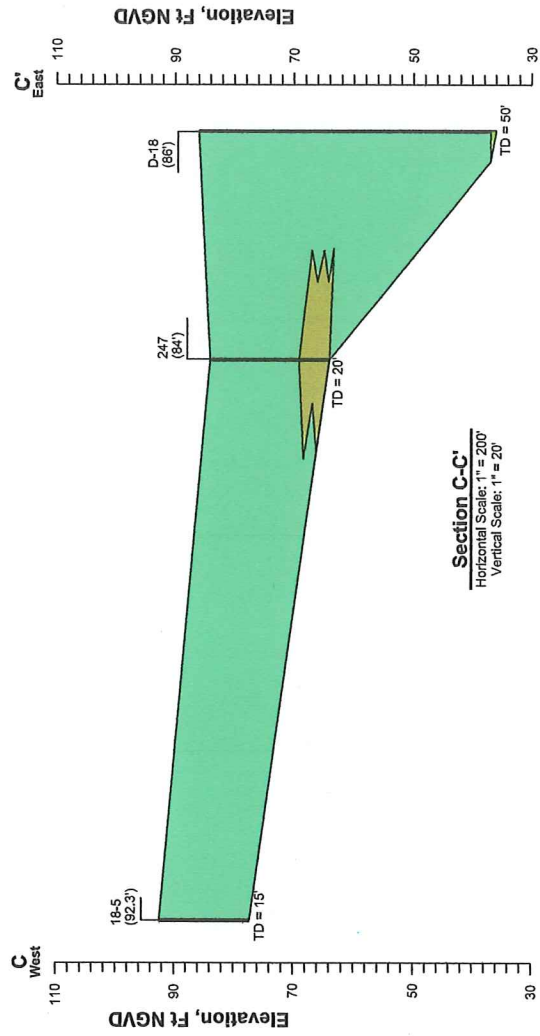
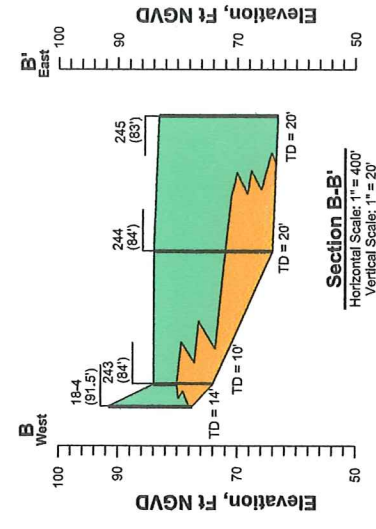
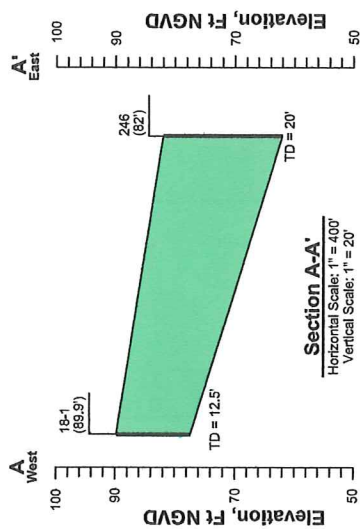
Rapides Parish, Louisiana

Drawn:	JP
Checked:	RS
Approved:	RS
Date:	8/28/18
Dwg. No.:	01-18-0185-8002A



**Figure 2**





- Legend**
- Sand
  - Silty Clay
  - Clay
  - Elevation, F.T. NGVD (84')
  - TD
  - Total Depth

**Reference**

Stratigraphy between borings are inferred. Actual conditions may vary.



**CLECO Power LLC**  
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**Bottom Ash Pond**  
**Geologic Cross Sections**  
**A-A', B-B', and C-C'**  
Rapides Parish, Louisiana

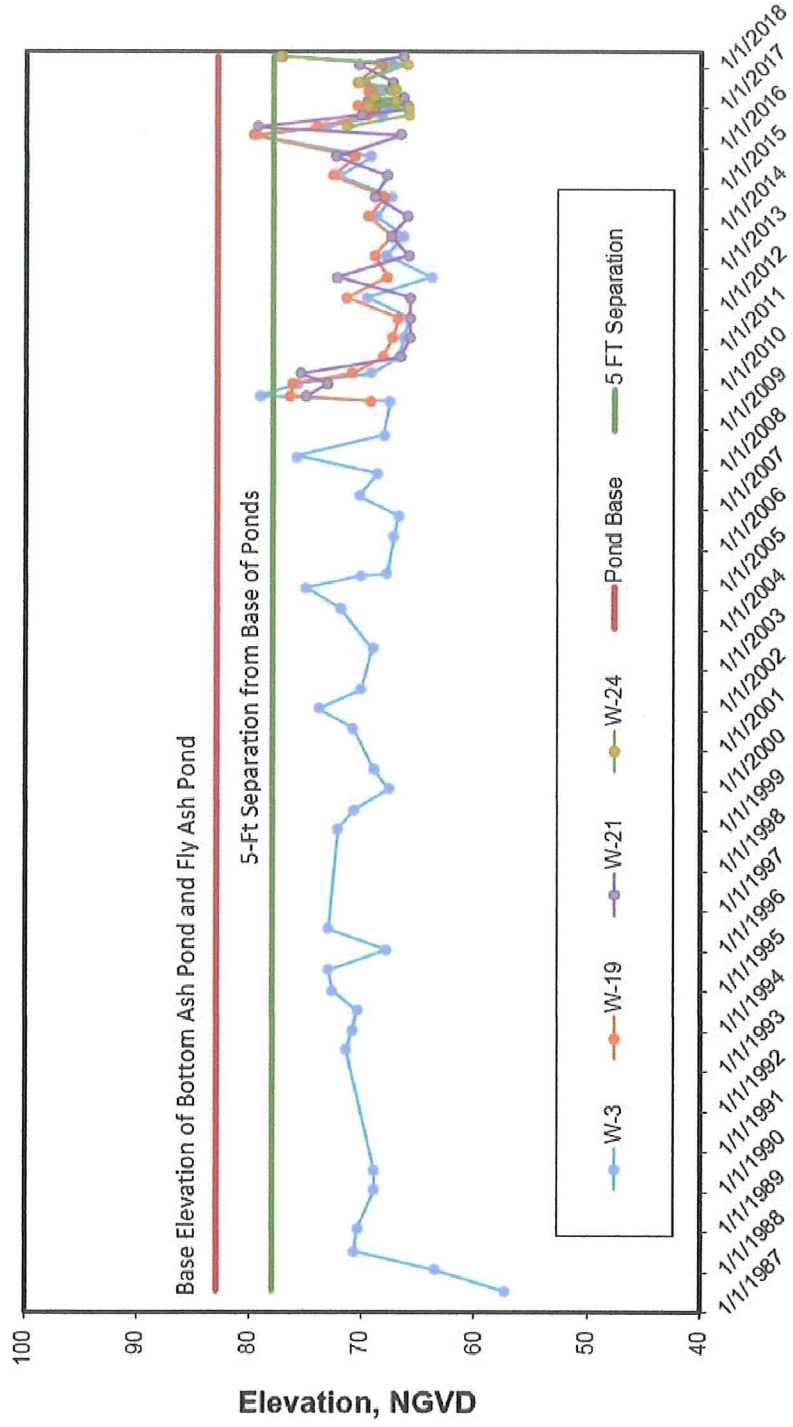
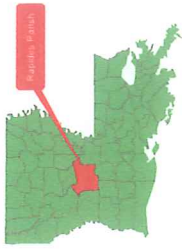


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Date:	8/14/18
Dwg. No.:	01-18-0185-5003

**Figure 3**





Date Measured

**CLCO Power LLC**  
Brame Energy Center

**Hydrograph of Alluvium Wells**

Rapides Parish, Louisiana	
Drawn: JP	
Checked: JM	
Approved: RS	
Date: 8/23/18	
Dwg. No.: 01-15-015-A007	



**Figure 4**