CLECO POWER LLC
BRAME ENERGY CENTER

BOTTOM ASH POND
AND
FLY ASH POND
LENA, LA

Application to Submit
Alternate Liner Demonstrations
Pursuant to 40 C.F.R. § 257.71(d)(1)

December 14, 2020

CLECO

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EXECUTIVE SUMMARY

In accordance with 40 C.F.R. § 257.71(d)(1)(i), Cleco Power LLC (Cleco) has prepared this application requesting the opportunity to submit Alternate Liner Demonstrations for both the Bottom Ash Pond and Fly Ash Pond at Brame Energy Center (BEC), which is located at 275 Rodemacher Road, Lena, Louisiana 71447.[1] As this application describes, "there is no reasonable probability that continued operation of [the Bottom Ash Pond and Fly Ash Pond] will result in adverse effects to human health or the environment."[2]

As required by 40 C.F.R. § 257.71(d)(1)(i), this application includes the following elements:

A. A certification signed by Cleco that the Bottom Ash Pond and Fly Ash Pond are in full compliance with this subpart except for § 257.71(a)(1).

B. Documentation supporting the certification which includes:

   1. Documentation that the groundwater monitoring network meets all the requirements of § 257.91, including documentation that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the Bottom Ash Pond and Fly Ash Pond, based on direction of flow, well location, screening depth and other relevant factors. Specifically, it includes:

      i. Maps of groundwater monitoring well locations in relation to the Bottom Ash Pond and Fly Ash Pond that depict the elevation of the potentiometric surface and the direction(s) of groundwater flow across the site;

      ii. Well construction diagrams and drilling logs for all groundwater monitoring wells;

      iii. Maps that characterize the direction of groundwater flow accounting for temporal variations; and

      iv. Other data and analyses Cleco relied upon when determining the design and location of the groundwater monitoring network.

   2. Documentation that the Bottom Ash Pond and Fly Ash Pond remain in detection monitoring pursuant to § 257.94. This includes documentation that the groundwater monitoring program meets the requirements of §§ 257.93 and 257.94, including:

[1] While Cleco is submitting an application for an Alternate Liner Demonstration for each of the ash ponds, much of the documentation for the Fly Ash Pond and Bottom Ash Pond is the same. Accordingly, Cleco has packaged them together for submittal.

[2] *See* 40 C.F.R. § 257.71(d).

i. Data of constituent concentrations, summarized in table format, at each groundwater monitoring well monitored during each sampling event; and

ii. Documentation of the most recent statistical tests conducted, analyses of the tests, and the rationale for the methods used in these comparisons. As part of this rationale, Cleco provides all data and analyses relied upon to comply with each requirement.

3. Documentation that the Bottom Ash Pond and Fly Ash Pond meet all the location restrictions under §§ 257.60 through 257.64.

4. The most recent structural stability assessments required at § 257.73(d); and

5. The most recent safety factor assessments required at § 257.73(e).

C. Documentation of the design specifications for any engineered liner components, as well as all data and analyses Cleco relied on when determining that the materials are suitable for use and that the construction of the Bottom Ash Pond and Fly Ash Pond liners are of good quality and in-line with proven and accepted engineering practices.

D. Demonstration that there is no reasonable probability that a complete and direct transport pathway (i.e., not mediated by groundwater) can exist between the Bottom Ash Pond and/or Fly Ash Pond and any nearby water body.

1.0 INTRODUCTION

1.1 Regulatory Background

The United States Environmental Protection Agency (EPA) promulgated the Coal Combustion Residuals (CCR) Rule on April 17, 2015.[3] Under the original rule, CCR surface impoundments with clay liners were considered "lined" and were permitted to continue operating.[4] On August 21, 2018, however, the United States Court of Appeals for the District of Columbia Circuit (D.C. Circuit) mandated that EPA revise the CCR Rule to classify clay-lined impoundments as unlined.[5] The D.C. Circuit's ruling also called for the closure of all unlined surface impoundments, including clay-lined impoundments.

In response to this decision, EPA recently finalized two rules. The first rule, known as "Part A," requires all unlined surface impoundments to cease receipt of CCR and/or non-CCR wastestreams and initiate closure by April 11, 2021.[6] The second rule, known as "Part B," re-classifies clay-lined surface impoundments as unlined as required by the D.C. Circuit's ruling. Part B, however, also provides owners and operators of clay-lined surface impoundments the opportunity to demonstrate "that based on the construction of the unit and surrounding site conditions, that there is no reasonable probability that continued operation of the surface impoundment will result in adverse effects to human health or the environment."[7] This is the regulatory framework under which Cleco has prepared this application requesting the opportunity to submit Alternate Liner Demonstrations for the Bottom Ash Pond and Fly Ash Pond.

The CCR Rule includes a two-step process to allow for facilities to demonstrate to EPA that based on groundwater data and the design of a particular surface impoundment, the unit(s) has and will continue to have no probability of adverse effects on human health or the environment. First, the owner or operator must submit an application requesting to submit an Alternate Liner Demonstration (ALD). If the application is approved, the owner or operator must then submit the ALD itself.

Pursuant to 40 C.F.R. § 257.71(d)(1)(i), Cleco has prepared this ALD application for the Bottom Ash Bottom and the Fly Ash Pond located at the Brame Energy Center (BEC). This application serves as notice that Cleco intends to submit an ALD under 40 C.F.R. § 257.71(d)(1)(ii) to the EPA to demonstrate that the designs of both the Bottom Ash Pond and the Fly Ash Pond liner systems perform equivalent to a composite liner as defined in 40 C.F.R. § 257.70(b). The ALD application was prepared in accordance with 40 C.F.R. § 257.71(d)(1)(i) of EPA's *Hazardous and Solid Waste Management System: Disposal of CCR; A Holistic Approach to Closure Part B: Alternate Demonstration for Unlined Surface Impoundments* (85 Federal Register 72506 (November 12, 2020).

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3 80 Fed. Reg. 21,302 (Apr. 17, 2015).
4 40 C.F.R. 257.71(a)(1)(i) (2015).
5 USWAG v. EPA, 901 F.3d at 431-432.
6 85 Fed. Reg. 53,516 (Aug. 28, 2020).
7 85 Fed. Reg. 72,506 (Nov. 12, 2020); 40 C.F.R. 257.71(d) (effective Dec. 14, 2020).

1.2 Facility Name and Location

Cleco owns and operates BEC, located at 275 Rodemacher Road, Lena, Louisiana 71447. BEC is located near Lena, Louisiana, along the west side of US Interstate Highway 49 (I49) in Rapides Parish, Louisiana.

1.3 CCR Units and Location

Currently, two CCR surface impoundments operate at BEC—the Bottom Ash Pond and Fly Ash Pond. The Bottom Ash Pond is 45.8 acres and Fly Ash Pond is 43.3 acres. These units are contiguous to one another and operate in accordance with Permit No. P-0005 issued by the Louisiana Department of Environmental Quality (LDEQ) Waste Permits Division.

The Bottom Pond and Fly Ash Pond have high quality clay liners that were constructed with suitable materials and in accordance proven and accepted engineering practices. They also share an extensive groundwater monitoring network capable of detecting any potential groundwater impacts resulting from potential releases from the Bottom Ash Pond or Fly Ash Pond. The fact that both units remain in detection monitoring pursuant to 40 C.F.R. § 257.94 demonstrates the effectiveness of the clay liners and the groundwater monitoring network. It is important to note that a LDEQ-approved groundwater monitoring program has been in place for the Bottom Ash Pond and Fly Ash Pond since 1983.

As the following sections describe in greater detail, there is no reasonable probability that continued operation of the Bottom Ash Pond and Fly Ash Pond will result in adverse effects to human health or the environment. Accordingly, Cleco respectfully requests that EPA provide Cleco the opportunity to submit an Alternate Liner Demonstration for the Bottom Ash Pond and the Fly Ash Pond, collectively or individually.

A request for approval of a site-specific alternative deadline to initiate closure pursuant to 40 C.F.R. § 257.103(f)(2)—"Permanent Cessation of a Coal-Fired Boiler(s) by a Date Certain"—for the Bottom Ash Pond was submitted to EPA on November 25, 2020. The request for approval of an alternative deadline to initiate closure would allow for the Bottom Ash Pond to continue to receive CCR wastestreams after April 11, 2021 and complete closure by no later than October 17, 2028.

The locations of these units are provided in **Appendix A**.

2.0 OWNER'S CERTIFICATION OF COMPLIANCE WITH 40 C.F.R. § 257, SUBPART D, OTHER THAN 40 C.F.R. § 257.71(A)(1)

In accordance with 40 C.F.R. § 257.71(d)(1)(i)(A), Cleco has included in **Appendix B** a signed certification that the Bottom Ash Pond and Fly Ash Pond are in full compliance with the CCR Rule, except for § 257.71(a)(1).

3.0 DOCUMENTATION SUPPORTING THE COMPLIANCE CERTIFICATION

In accordance with 40 C.F.R. § 257.71(d)(1)(i)(B), Cleco is providing the following documentation.

3.1 Documentation that the Groundwater Monitoring Network for the Bottom Ash Pond and Fly Ash Pond Meets All the Requirements of 40 C.F.R. § 257.91.

In accordance with 40 C.F.R. § 257.71(d)(1)(i)(B)(1)(i)–(iv), Cleco has included in **Appendices C–F**, the following materials documenting "that the existing network of groundwater monitoring wells is sufficient to ensure detection of any groundwater contamination resulting from the [Fly Ash Pond or Bottom Ash Pond], based on direction of flow, well location, screening depth and other relevant factors:"

- Maps of groundwater monitoring well locations in relation to the Bottom Ash Pond and Fly Ash Pond (**Appendix C**);
- Well construction diagrams and drilling logs for all groundwater monitoring wells (**Appendix D**);
- Maps that characterize the direction of groundwater flow accounting for temporal (seasonal) variations (**Appendix E**); and
- Other data and analyses to design the groundwater monitoring well network is provided as a narrative describing site characterization for the groundwater monitoring well network, as well as geologic cross sections and other supporting geologic maps (**Appendix F**).

3.2 Documentation that the Bottom Ash Pond and Fly Ash Pond Remain in Detection Monitoring Pursuant to 40 C.F.R. § 257.94

To demonstrate that the Bottom Ash Pond and Fly Ash Pond have remained in detection monitoring, 40 C.F.R. § 257.71(d)(1)(i)(B)(2) requires that Cleco submit documentation that the groundwater monitoring program meets the requirements of 40 C.F.R. §§ 257.93–.94. To fulfill this requirement, Cleco has provided the following:

- A table showing data of constituent concentrations at each groundwater monitoring well monitored during each sampling event, as well as a narrative describing this data. (**Appendix G.1.**) The narrative is presented below for the groundwater monitoring data;
- The most recent groundwater monitoring report for BEC, which was posted to Cleco's CCR website on January 31, 2019 (**Appendix G.2.** and available here);
- Annual reports that were prepared in 2017 and 2018 (**Appendix G.3.**); and
- The Monitoring Well Certification for the Bottom Ash Pond and Fly Ash Pond (**Appendix G.4);** and
- The Certification of Statistical Methodology, which was posted to Cleco's CCR website on October 17, 2017 (**Appendix G.5**).

Pursuant to 40 C.F.R. § 257.91, BEC has a multi-unit groundwater monitoring well system to evaluate the groundwater quality conditions near the Bottom Ash Pond and Fly Ash Pond. The Bottom Ash Pond and the Fly Ash Pond complies with the Groundwater Monitoring and Corrective Action requirements in 40 C.F.R. §§ 257.90–.98 as described below.

The monitoring system is a multi-unit groundwater monitoring program consists of newly installed monitoring wells and monitoring wells installed previously to conduct groundwater monitoring required by BEC's LDEQ solid waste permit. A total of nine monitoring wells have been installed per applicable portions of 40 C.F.R. § 257.91. five of these monitoring wells are background wells and four are detection monitoring wells.

BEC straddles two geomorphologic features: 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 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 northern wall of the Bottom Ash Pond abuts the terrace deposits and the remainder of the unit overlying the alluvium deposits. Locations of the monitoring wells can be found on **Figure A-2 in Appendix A** and **Appendix C**. Additional information, including a table of monitoring well construction details (**Table 1** in **Appendix C**) and well construction diagrams are provided in in the October 17, 2017 Groundwater Certification report, which is included as **Appendix C** and also available here. Drilling logs and monitoring well construction diagrams for all groundwater monitoring wells for the Bottom Ash Pond and the Fly Ash Pond are included as **Appendix D,** which is available here.

Groundwater monitoring has been performed for the Bottom Ash Pond and Fly Ash Pond since 1983 as part of the Louisiana Department of Environmental Quality (LDEQ)-permitted groundwater monitoring program. These Bottom Ash Pond and Fly Ash Pond have been permitted by the LDEQ since November 19, 1981 as part of Solid Waste Permit No. P-0005. LDEQ has renewed the permit twice. The groundwater monitoring program for the Bottom Ash Pond and Fly Ash Pond are both included in the permit, and both units remain in detection monitoring as supervised and reviewed by LDEQ.

Annual Groundwater Monitoring and Corrective Action Reports were prepared for the Bottom Ash Pond and the Fly Ash Pond for 2017, 2018, and 2019. These reports are placed in the BEC operating record and posted to the CCR Unit website. A report is forthcoming for the 2020 semi-annual groundwater monitoring events and will be posted to the Cleco CCR website in January 2021.

A summary of analytical results of the groundwater monitoring data collected since 2016 is provided in Table 1 in **Appendix G.1**. Review of the summary table indicates concentrations of the detection monitoring parameters pH, barium, calcium, fluoride, chlorides, and sulfates in the background wells and downgradient monitoring wells. Review of this data focuses on the background wells and the downgradient for statistical methods direction. There have been no alternative source demonstrations necessary to address groundwater quality for the Bottom Ash Pond and the Fly Ash Pond.

Results of the evaluations of upgradient groundwater quality at the Bottom Ash Pond and Fly Ash Pond indicate that there is significant natural spatial variation (NSV) in groundwater quality; thus, intrawell statistical evaluations are conducted for all detection monitoring parameters. This correlates with previous determinations by the LDEQ-Waste Permits Division that intrawell statistical analysis is appropriate at this site. Intrawell limit-based tests are recommended when there is evidence of NSV in groundwater quality, particularly among unimpacted upgradient wells, as it is inappropriate to pool those data across wells for the purpose of creating interwell limits for comparison with downgradient well data. Intrawell tests may be used at both new and existing facilities. Data used in intrawell limit-based tests are screened for outliers, which, if found, are removed from the background data set prior to constructing limits for each well/parameter pair. Statistical evaluations of groundwater data are performed in accordance with 40 C.F.R. § 257.93(f). A copy of the most recent statistical tests conducted in 2019 for the groundwater monitoring program is included in **Appendix G.6**.

Cleco has conducted sufficient detection monitoring sampling events in accordance with 40 C.F.R. §§ 257.93 and § 257.94. Potentiometric surface evaluation at the Bottom Ash Pond and the Fly Ash Pond indicates consistent groundwater flow to the south. Statistical evaluations of data conducted pursuant to 40 C.F.R. § 257.93 indicate that no confirmed statistically significant increases (SSIs) over background levels of appendix III constituents have been generated in downgradient wells. As a result, the Bottom Ash Pond and Fly Ash Pond have remained in detection monitoring.

Implementation of an Assessment Monitoring Program has not been required at the Bottom Ash Pond and the Fly Ash Pond based on the detection monitoring results. Additionally, an Assessment of Corrective Measures, Selection of Remedy, and/or Implementation of Corrective Action Program has not been required at the Bottom Ash Pond and the Fly Ash Pond based on the detection monitoring results.

3.3 Documentation that the Bottom Ash Pond and Fly Ash Pond Meet All the Location Restrictions under 40 C.F.R. §§ 257.60 through 257.64

A professional engineer-certified evaluation of the CCR units against the location restriction criteria for existing CCR surface impoundments described in 40 C.F.R. § 257.60 through 257.64 was completed in October 2018 and placed in the BEC operating record and posted to the facility's CCR public website. The location restriction evaluations concluded the following:

- The respective base of the Bottom Ash Pond and the Fly Ash Pond were determined to be a distance greater than 5 feet above the upper limit of the uppermost aquifer, satisfying the separation criteria in § 257.60.

- The Bottom Ash Pond and Fly Ash Pond were determined to not be in wetlands as per § 257.61.
- The Bottom Ash Pond and Fly Ash Pond were determined to not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time as per § 257.62.
- The Bottom Ash Pond and Fly Ash Pond were determined to not be located in a Seismic Impact Zone as per § 257.63.
- The Bottom Ash Pond and Fly Ash Pond were determined to not be located in an Unstable Area as per § 257.64.

The Location Restrictions Demonstration Reports for the Bottom Ash Pond and Fly Ash Pond are included in **Appendix H**.

3.4 Structural Stability Assessments

Pursuant to 40 C.F.R. § 257.73(d), the structural stability assessments for the Bottom Ash Pond and Fly Ash Pond were prepared in October 2016. In accordance with 40 C.F.R. § 257.71(d)(1)(i)(B)(4), Cleco has included the structural stability assessments in **Appendix I.** The website link for the Bottom ash Pond is provided here and the Fly Ash Pond is provided here.

3.5 Safety Factor Assessments

Pursuant to 40 C.F.R. § 257.73(e), the safety factor assessments for the Bottom Ash Pond and Fly Ash Pond were prepared in October 2016. In accordance with 40 C.F.R. § 257.71(d)(1)(i)(B)(5), Cleco has included the safety factor assessments in **Appendix J.** The website link for the Bottom Ash Pond is provided here and the Fly Ash Pond is provided here.

3.6 Other Supporting Documentation

3.6.1 Liner Design Criteria for Existing CCR Surface Impoundments—40 C.F.R . § 257.71

The Bottom Ash Pond and Fly Ash Pond are constructed with compacted clay liners measuring 3 feet thick in the base and sides that exhibits a hydraulic conductivity of no more than 1 x 10^{-7} centimeters second (cm/sec).

Liner construction documentation is discussed further in Section 4.0 below.

3.6.2 Structural Integrity Criteria for Existing CCR Surface Impoundments—40 C.F.R . § 257.73

The Bottom Ash Pond and Fly Ash Pond comply with the Structural Integrity Criteria for Existing CCR Surface Impoundments specified in 40 C.F.R. § 257.73 as described below.

3.6.2.1 Identification Marker—40 C.F.R . § 257.73(a)(1)

A permanent identification marker prepared in accordance with the requirements of 40 C.F.R. § 257.73(a)(1) has been installed at the Bottom Ash Pond and Fly Ash Pond.

3.6.2.2 Hazard Potential Classification Assessment—40 C.F.R. § 257.73(a)(2)

A Hazard Potential Classification Assessment report was completed in October 2016 for the Bottom Ash Pond and Fly Ash Pond. These are placed in the BEC operating record and posted to the facility's CCR public website. The website link for the Bottom Ash Pond is provided here and the Fly Ash Pond is provided here.

Based on the results of the Maximum and Most Probable Loss scenarios, the Bottom Ash Pond and the Fly Ash Pond at BEC are classified as a significant hazard potential CCR surface impoundments due to the potential effects on Bayou Jean de Jean and the oxbow of the Red River.

3.6.2.3 History of Construction—40 C.F.R. § 257.73(b) and (c)

The construction of the Bottom Ash Pond and the Fly Ash Pond was initiated in 1978 and completed in 1982 for both units. The History of Construction document is posted on the BEC CCR website. The website link for the Bottom Ash Pond is provided here and the website link for the Fly Ash Pond is provided here.

3.6.3 Operating Criteria—40 C.F.R. § 257.80, § 257.82, § 257.83

The Bottom Ash Pond and the Fly Ash Pond complies with the Operating Criteria specified in 40 C.F.R. § 257.80, § 257.82, and § 257.83 as described below.

3.6.3.1 Air Criteria—40 C.F.R. § 257.80

A Fugitive Dust Control Plan was prepared for BEC in accordance with 40 C.F.R. § 257.80(b) in October 2015. The plan is placed in the BEC operating record and posted to the CCR public website (here). Annual fugitive dust control reports are prepared from BEC in accordance with 40 C.F.R. § 257.80(c). These are placed in the BEC operating record and posted to the CCR public website.

3.6.3.2 Hydrologic and Hydraulic Capacity Requirements—40 C.F.R. § 257.82

An Inflow Design Flood Control System plan was prepared for the Cleco BEC facility in accordance with the requirements of 40 C.F.R. § 257.82(c) in October 2015. The plan is placed in the Cleco BEC facility's operating record and posted to the CCR public website for the Bottom Ash Pond here the Fly Ash Pond here. A periodic inflow design flood control system plans in 2021 in accordance with the requirements of 40 C.F.R. § 257.82(c)(4). These will be placed in the Cleco BEC facility's operating record and posted to the CCR public website.

3.6.3.3 Inspection of CCR Surface Impoundments—40 C.F.R. § 257.83

The Bottom Ash Pond and the Fly Ash Pond are inspected in accordance with the requirements of 40 C.F.R. § 257.83. Annual inspection reports have been completed for 2016, 2017, 2018, and 2019 are posted on the CCR website for both CCR units.

The Annual CCR Unit inspection Reports for the Bottom Ash Pond and the Fly Ash Pond conclude that no actual or potential structural weakness of the CCR units were observed and that no existing conditions are present that are disrupting or have the potential to disrupt the operation and safety of the CCR units.

3.6.4 Closure and Post-Closure Care—40 C.F.R. §§ 257.101–.104

The Bottom Ash Pond and the Fly Ash Pond are active CCR surface impoundments. Upon closure, BEC will comply with the Closure and Post-Closure Care requirements for Existing CCR Surface Impoundments specified in 40 C.F.R. §§ 257.101–.104. Closure and Post-Closure Plans were completed in October 2016 for the Bottom Ash Pond and the Fly Ash Pond in accordance with the requirements of in 40 C.F.R. § 257.101 through 257.104. These were placed in the BEC operating record and posted to the CCR website. The website link for the closure plan for the Bottom Ash Pond is included here and the post-closure plan is included here. The website link for the closure plan for the Fly Ash Pond is included here and the post-closure plan is included here.

3.6.5 Recordkeeping, Notification, and Posting of Information to the Internet—40 C.F.R. § 257.107

Cleco complies with the recordkeeping, notification, and posting of information to the internet requirements specified in 40 C.F.R. §§ 257.105–.107 for the Bottom Ash Pond and the Fly Ash Pond. Cleco maintains a publicly accessible Internet site for the Bottom Ash Pond and the Fly Ash Pond in accordance with the requirements of 40 C.F.R. § 257.107.

4.0 DOCUMENTATION OF LINER CONSTRUCTION —40 C.F.R. § 257.71(d)(1)(i)(C)

The Bottom Ash Pond and the Fly Ash Pond were constructed of compacted clay liner (CCL) measuring 3 feet on the base and sides. The CCL exhibits a hydraulic conductivity of 1×10^{-7} cm/sec. In September 2016, a summary of liner construction reports was prepared to document construction of the Bottom Ash Pond and Fly Ash Pond liners in accordance with 40 C.F.R. § 257.71(b). These documents were placed in the BEC operating record and posted on the CCR Units website. The Summary of Liner Construction Reports are included and for the Bottom Ash Pond here and for the Fly Ash Pond here.

The construction of the Bottom Ash Pond and the Fly Ash Pond was initiated in 1978 and completed in 1982. Documentation of on-site testing, field testing and laboratory testing during construction are included in the History of Construction documents posted on the Facility's CCR website. The website link for the for the Bottom Ash Pond is provided here and the Fly Ash Pond is provided here.

The conclusions from review of these documents includes the following:

- The Bottom Ash Pond and the Fly Ash Pond were constructed in accordance with the technical specifications and drawings prepared for the project.
- Material used to construct the CCL originated from on-site sources. Geotechnical testing was included in the above referenced reports. The CCL was constructed of high plasticity clay with average Plasticity Index of 41 and average Liquid Limit of 62.
- The CCL was constructed in parallel, uniform lifts not exceeding 8-10 inches, compacted with sheepsfoot compaction. Geotechnical testing was conducted in accordance with specifications in place at construction.

5.0 SURFACE IMPOUNDMENT LOCATED ADJACENT TO WATER BODY—40 C.F.R. § 257.71(d)(1)(i)(D)

The Bottom Ash Pond and the Fly Ash Pond are not located immediately adjacent to water bodies but are located near Bayou Jean de Jean as shown in **Appendix A**. A Hazard Potential Classification Assessment report was completed in October 2016 for the Bottom Ash Pond and the Fly Ash Pond. Based on the results of the Maximum and Most Probable Loss scenarios, the Bottom Ash Pond and the Fly Ash Pond at Cleco BEC are classified as Significant Hazard Potential CCR Surface Impoundments due to the potential effects on Bayou Jean de Jean and the oxbow of the Red River. A Significant Hazard Potential CCR Surface Impoundment classification involves a situation where failure or mis-operation would result in no probable loss of human life, but could cause economic loss, environmental damage, disruption of lifeline facilities, or impact on other concerns.

The Bottom Ash Pond and the Fly Ash Pond are inspected in accordance with the requirements of 40 C.F.R. § 257.83. Annual inspection reports have been completed for 2016, 2017, 2018, and 2019 are posted on the CCR website for both CCR units. The Annual CCR Unit inspection reports for the Bottom Ash Pond and the Fly Ash Pond conclude that no actual or potential structural weakness of the CCR units were observed and that no existing conditions are present that are disrupting or have the potential to disrupt the operation and safety of the CCR units.

The LDEQ Waste Permits Division oversees permitting of solid waste facilities and the LDEQ-approved solid waste permit also includes measures to construct and operate the units in a manner which safeguards against adversely impacting groundwater quality. Cleco has strategically positioned the LDEQ-approved monitoring well network to detect potential releases from the Bottom Ash Pond and Fly Ash Pond prior to impacting any potential receptors, including Bayou Jean de Jean. The measures to continue to limit any future releases to groundwater include continuation of the state and federal groundwater detection-monitoring programs in place and continued adherence to the EPA CCR Rule and LDEQ-approved solid waste permit. Additional operational actions that limit future releases beyond continued routine groundwater monitoring include application of non-recirculated, once-through water for sluicing of ash to the impoundment which minimizes concentration of solids in the impoundment water. Also there are the impoundment operational measures with integrity inspection of the physical status of the impoundment in regards to its perimeter levees, maintenance of vegetation growth on the perimeter levees, adequate freeboard protection, stormwater controls, routine removal of settled materials, facility security measures, and emergency response plan measures. Therefore, there is no reasonable probability that a complete and direct transport pathway (i.e., not mediated by groundwater) can exist between the Bottom Ash Pond and/or Fly Ash Pond and any nearby water body. If, however, any ongoing releases were to be identified, Cleco would address the releases in accordance with § 257.96(a).

6.0 ALD APPLICATION IN FACILITY OPERATING RECORD - 40 C.F.R. § 257.71(d)(1)(i)(E)

Upon submission of this application, Cleco will place this document in the facility's operating record as required by 40 C.F.R. § 257.105(f)(14).

7.0 SIGNATURE PAGE

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that the information in this document as noted in the above Report Index was assembled under my personal charge. This report is not intended or represented to be suitable for reuse by Cleco Power LLC or others without specific verification or adaptation by the Engineer. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

STATE OF LOUISIANA
BRADLEY E. BATES
LIC. NO. 27124
PROFESSIONAL
ENGINEER
IN
CIVIL ENGINEERING

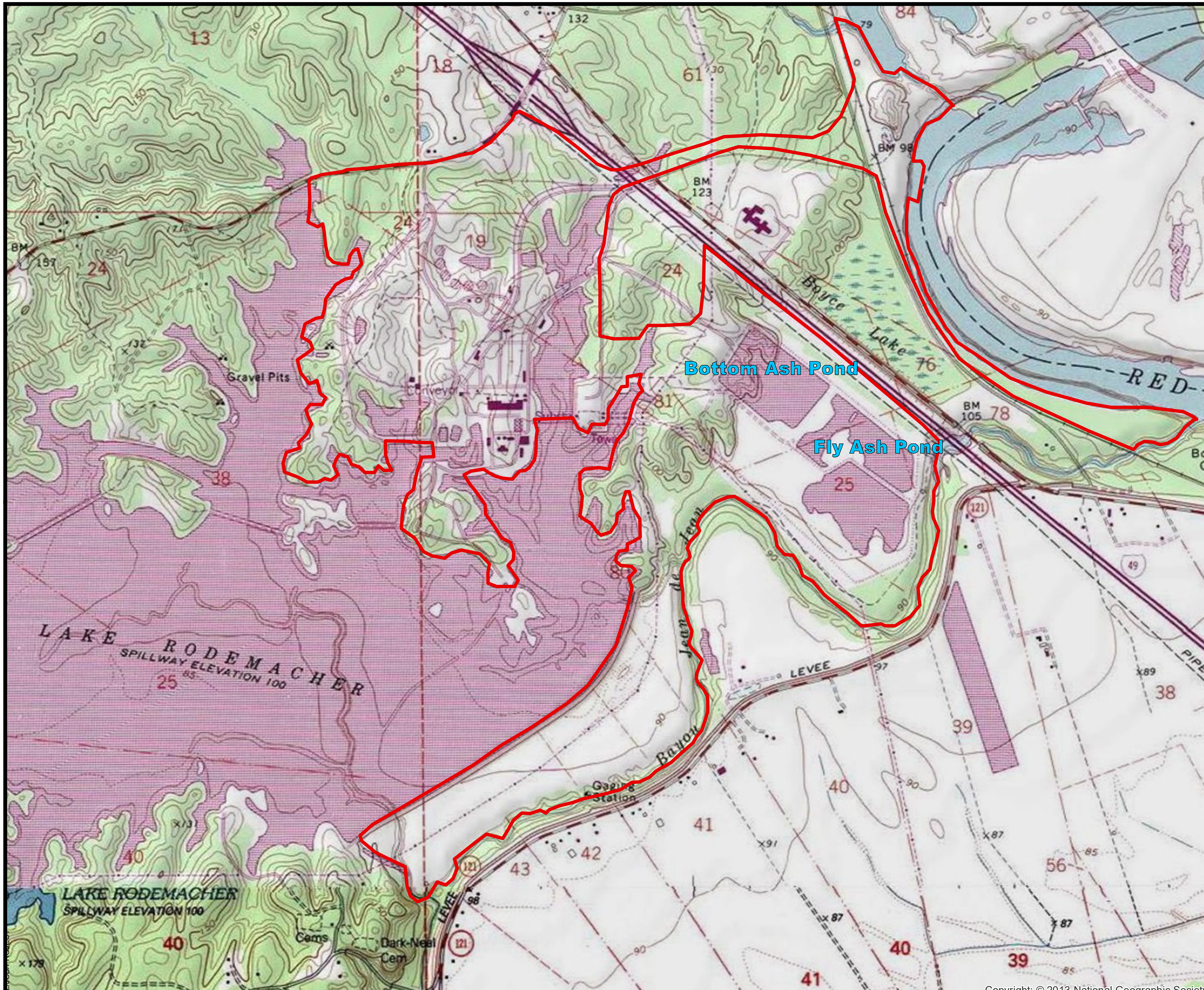
	27124
Signature	**PE Registration Number**
Bradley E. Bates	*Professional Engineer*
Name	**Title**
Eagle Environmental Services, Inc.	12/14/20
Company	**Date**

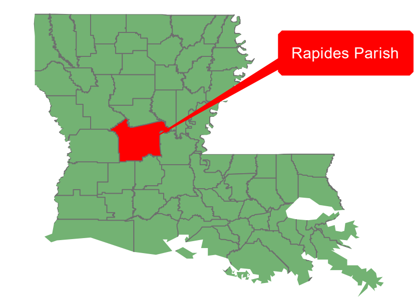
PROFESSIONAL GEOLOGIST CERTIFICATION

Raymond Sturdivant Jr	61
Signature	**PG Registration Number**
Raymond Sturdivant Jr.	*Professional Geologist*
Name	**Title**
Eagle Environmental Services, Inc.	12/14/2020
Company	**Date**

APPENDIX A

SITE LOCATION MAPS





Legend

Property Boundary Line

0 750 1,500 3,000 4,500 Feet

Reference

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

CLECO Power LLC

Brame Energy Center

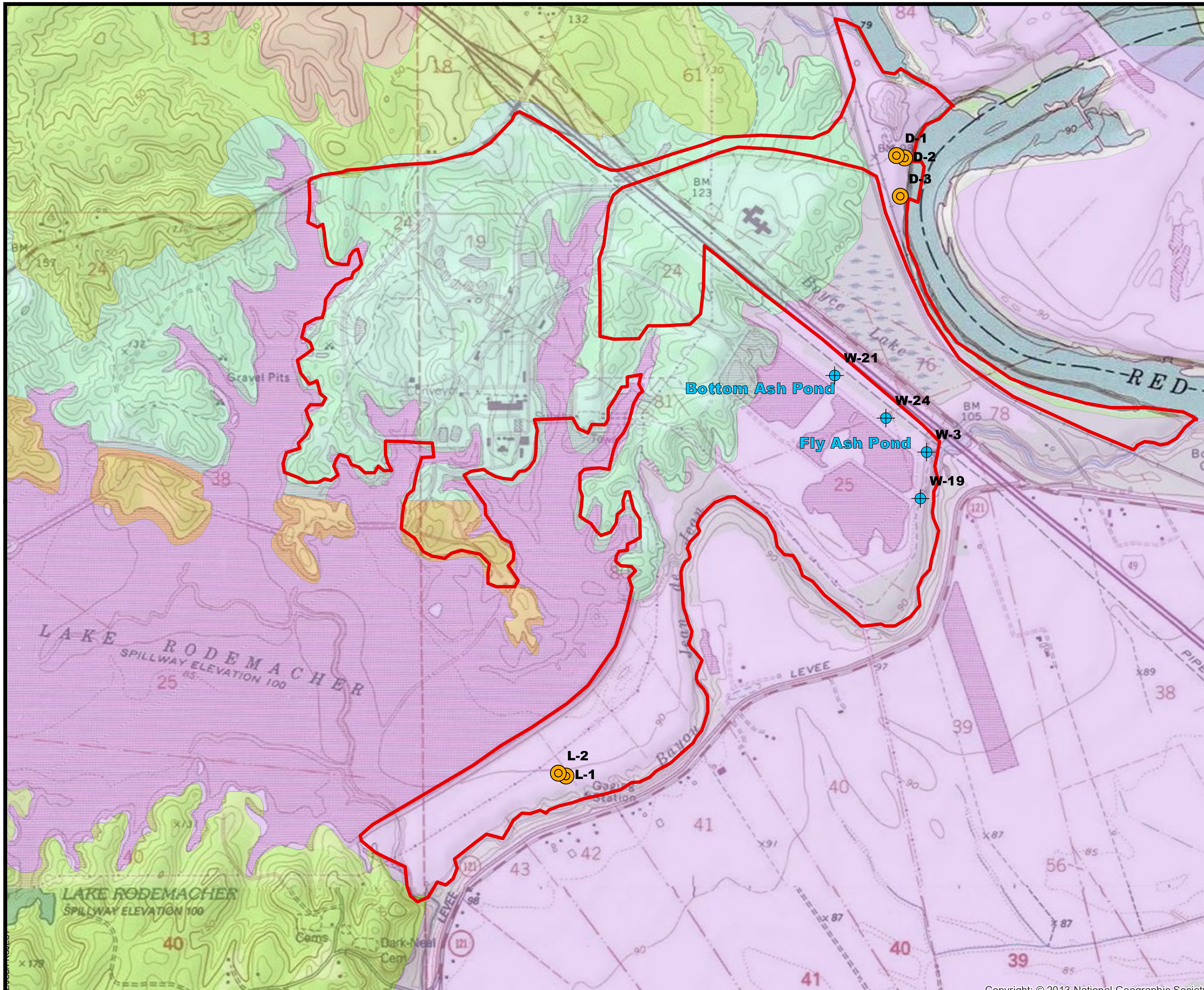
Site Location Map

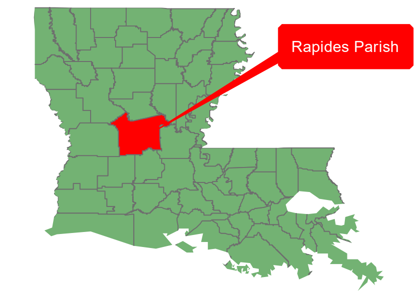
Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	12/11/20
Dwg. No.:	01-20-0220-APP-A-1

Figure A-1





Terraces

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

Alluvial

- Qal - Alluvium; Qnl - Natural Levees

Wells

- CCR Rule Compliance Wells
- CCR Rule Background Wells

Feet: 0, 750, 1,500, 3,000, 4,500

Reference

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

CLECO Power LLC

Brame Energy Center

Geomorphology Features with CCR Groundwater Monitoring Network

Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	12/11/20
Dwg. No.:	01-20-0220-APP-A-2

EAGLE ENVIRONMENTAL SERVICES, INC.

Figure A-2

APPENDIX B

OWNER'S CERTIFICATION

OWNER'S CERTIFICATION OF COMPLIANCE
40 C.F.R. § 257.71(d)(1)(i)(A)

I hereby certify that, based on the information provided to me by and inquiry of the persons immediately responsible for compliance with the CCR rule, the Brame Energy Center (BEC) facility, including the Bottom Ash Pond and Fly Ash Pond, is in compliance with 40 C.F.R. Part 257, Subpart D—Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, with the exception of 40 C.F.R. § 257.71(a)(1). Cleco's CCR Rule Compliance Website is up-to-date and contains all necessary documentation and notifications.

Shane Hilton | 12/14/20

Shane Hilton
President, Cleco Power LLC

Date

APPENDIX C

MONITORING WELL LOCATIONS / MONITORING WELL NETWORK CERTIFICATION

MONITORING WELL

NETWORK CERTIFICATION

MONITORING WELL NETWORK

1.0 Introduction

The U.S. Environmental Protection Agency (EPA) published a final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). The rule applies to the Cleco Power LLC Brame Energy Center (BEC). A site location map is provided in Figure 1. BEC has two permitted facilities that accept CCR: the Bottom Ash and Fly Ash Ponds, as shown in Figure 2.

The CCR Rule, 40 CFR Subpart D-Standards for the Disposal of CCRs, Section §257.91 requires a groundwater monitoring system that consists of sufficient number of wells at appropriate locations and depths based on site-specific technical information, to yield groundwater samples from the uppermost aquifer that:

- Accurately represent the quality of both background groundwater, and groundwater passing the boundary of the CCR unit; and
- Monitor potential contaminant pathways.

The groundwater monitoring system at BEC meets those requirements, as described below.

2.0 Site Hydrogeology Summary

The Bottom Ash and Fly Ash Ponds are situated on the aquifer recharge area for the Red River natural levee and/or Alluvial Aquifer, as well as Lake Rodemacher. Since the Bottom Ash and Fly Ash Ponds are located in the Red River Alluvium, all upgradient and downgradient monitoring wells for these CCR facilities have been installed in these deposits.

Review of geological reports indicates that Louisiana Alluvial Aquifer groundwater quality is reported by the USGS to be primarily limited to use for industrial and agricultural purposes. This is due to excessive concentrations of dissolved solids, hardness, iron, or localized salinity. The natural groundwater quality of these aquifer systems is generally considered not suitable for drinking water supply purposes without first undergoing appropriate water treatment. The Louisiana Department of Natural Resources (LDNR) issued an advisory in 2009 addressing the recommended uses of these alluvial aquifers. Furthermore, it is reported that dissolved metals, namely arsenic, have been, and are expected to be, detected in groundwater in localized areas of these aquifers (LDNR, 2009).

Louisiana Department of Natural Resources, Office of Conservation, 2009. "General Water Quality Summary, Louisiana Groundwater - Alluvial Aquifer Systems", Louisiana Department of Natural Resources, Baton Rouge, LA, 1 sheet.

3.0 Groundwater Monitoring System

Groundwater monitoring wells have been installed in the uppermost, laterally continuous water bearing zone present beneath the CCR facilities at BEC. Since the areas immediately upgradient of the Bottom Ash and Fly Ash Ponds are situated on Terrace deposits, the background monitoring wells have been installed in alternative locations, per §257.91.1. Thus, all background and compliance monitoring wells are screened in the Red River Alluvial deposits. Monitoring well information is included in Table 1, and the monitoring well locations are provided in Figure 2.

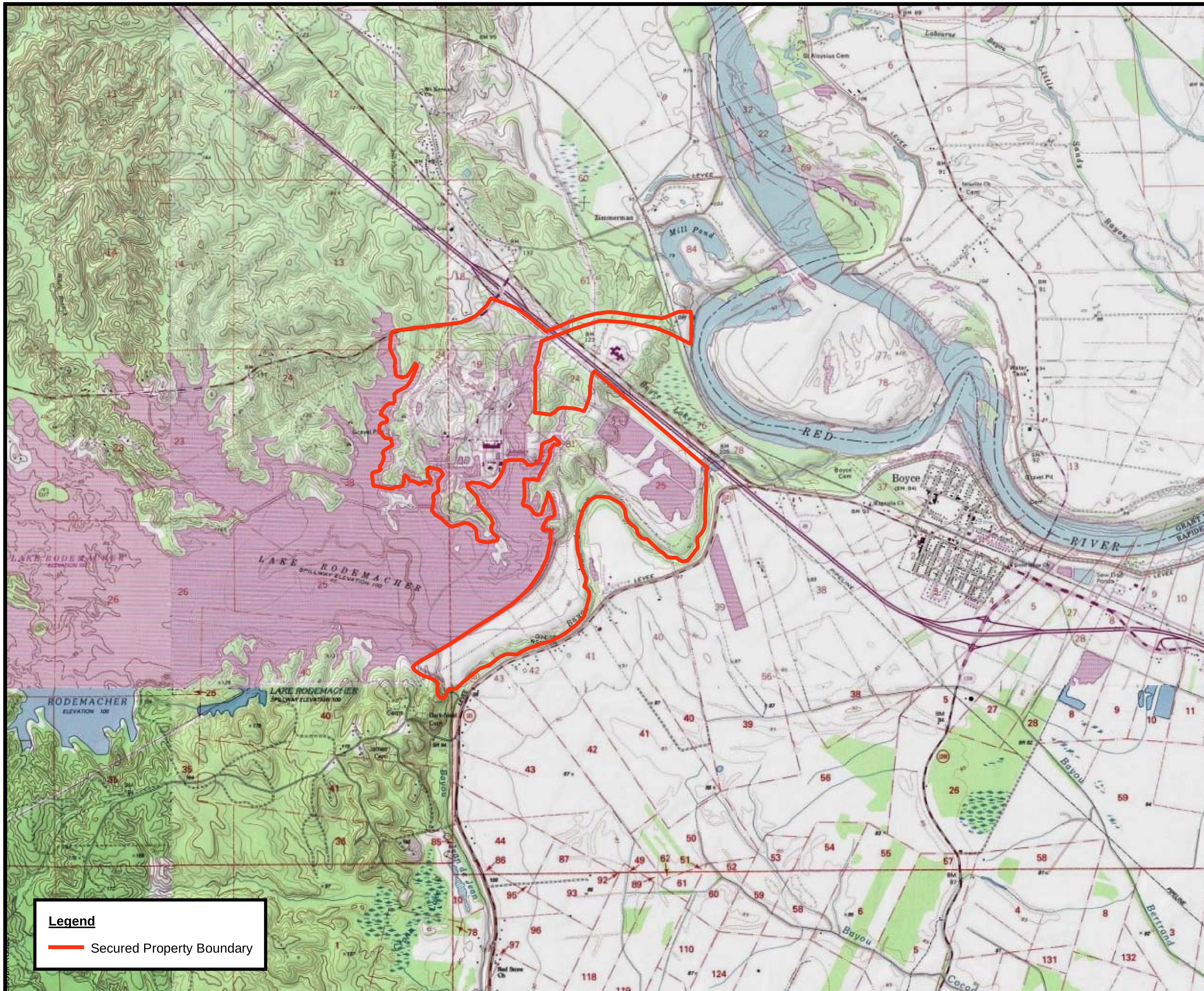
CERTIFICATION

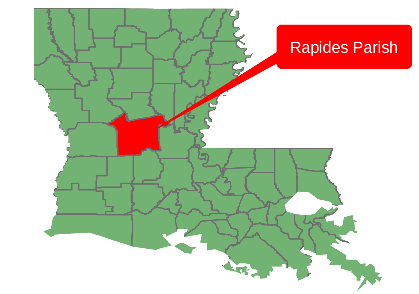
I hereby certify that the groundwater monitoring system described in this report for the Brame Energy Center, owned and operated by Cleco Power, LLC, has been designed and constructed to meet the requirements of the Coal Combustion Residual Rule 40 CFR §257.91. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

________________________________, P.E.

Date: 3/7/17

Louisiana Registration No.: 27124





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."

CLECO Power LLC

Brame Energy Center

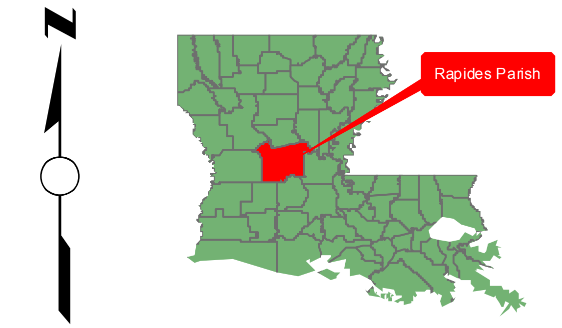
Site Location Map

Rapides Parish, Louisiana

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

EAGLE ENVIRONMENTAL SERVICES

Figure 1



Legend

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

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

CLECO Power LLC

Brame Energy Center

CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

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

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

Figure 2

Table 1
Monitoring Well Construction Data

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)	92.07	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

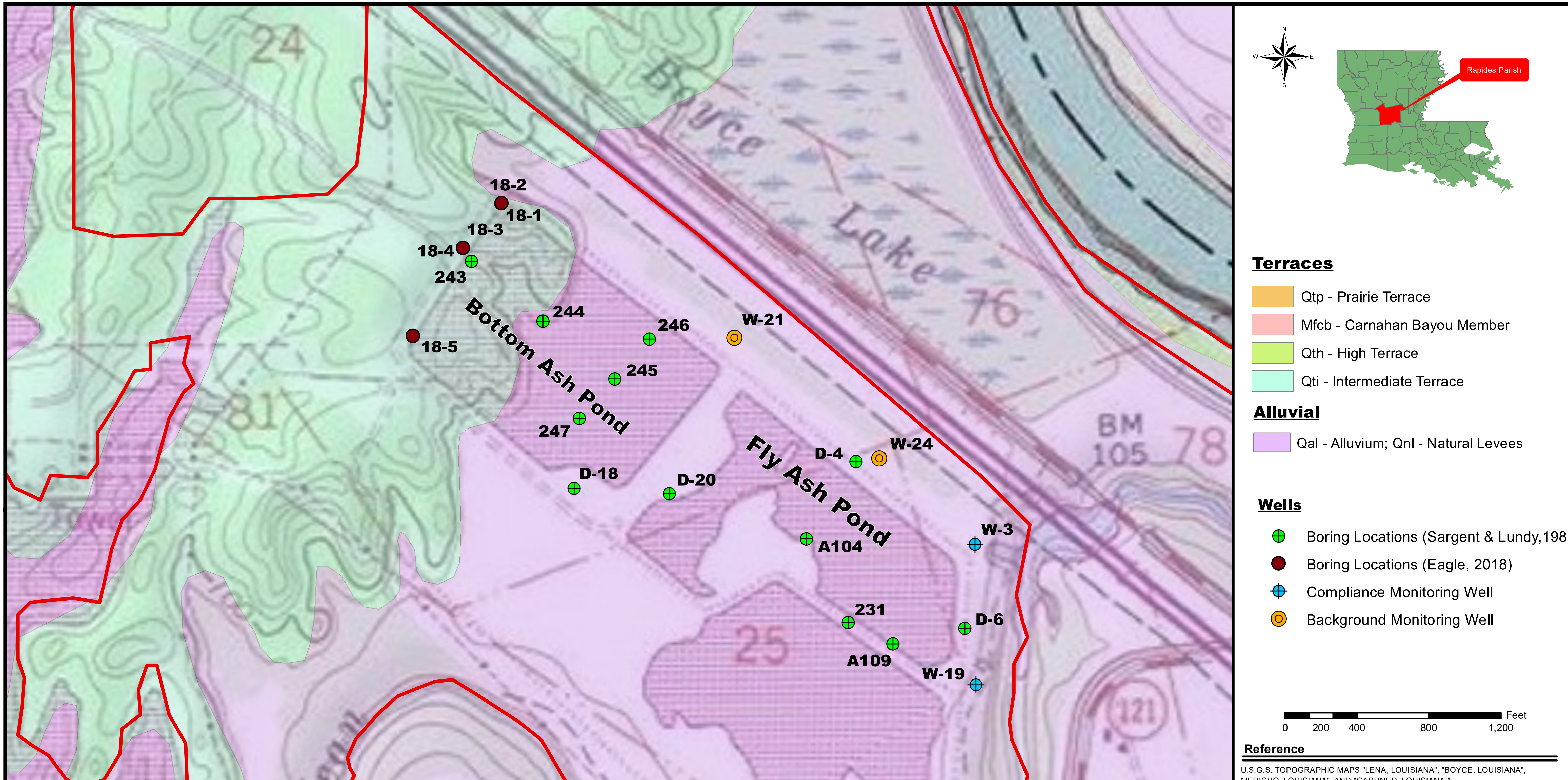
Notes:

bgs = below ground surface

PVC = polyvinyl chloride

APPENDIX D

MONITORING WELL DETAILS AND SOIL BORING LOGS



CLECO Power LLC

Brame Energy Center

Geomorphology Features with Boring Locations

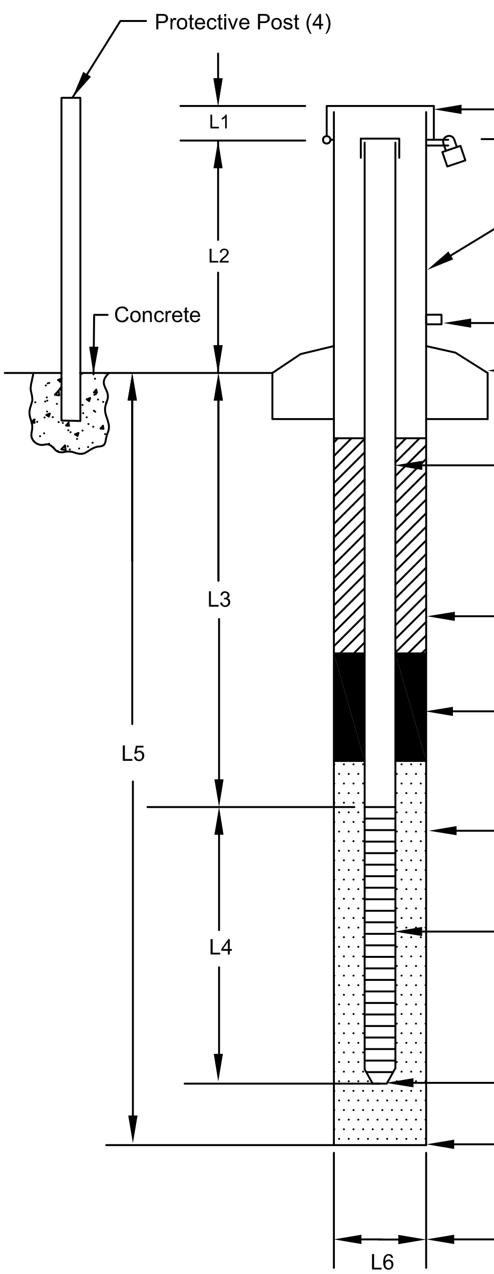
Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	RS
Date:	8/23/18
Dwg. No.:	01-20-0220-APP-D-1

Figure D-1

Monitoring Well Construction Diagram
Above Grade Well



Lockable Cap	
Casing Elevation	92.12 ft NAVD88
Protective Casing and Concrete	
Casing Material	neat cement
Casing Diameter	4"
Casing Length	3.5'
Pad Dimensions	4'x4'
Height Above Ground	3.3'
Drain with Threaded Plug	
Concrete Slab Elevation	88.97'
Well Casing	
Material	PVC
Diameter	2"
Joint Type	flush thread
Length	67'
Backfill Around Casing	
Material	neat cement
Seal	
Type Of Seal	bentonite
Filter Pack	
Type Of Filter	sand pack
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	.010"
Depth To Bottom Of Monitoring Well	77'
Depth To Bottom Of Filter Sand	77'
Diameter Of Borehole	8"

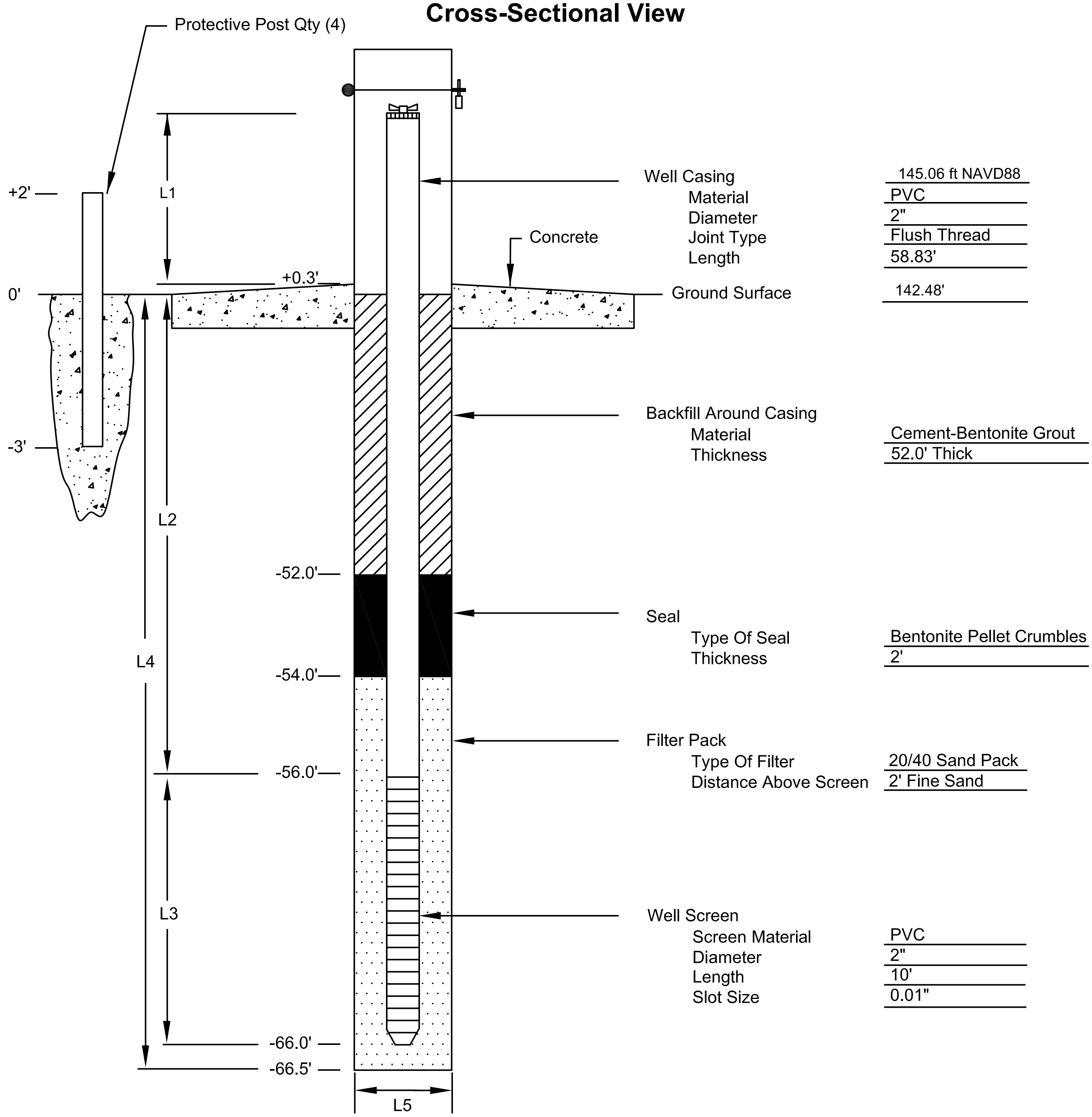
Cross-Sectional View

Project: Brame Energy Center	L1 = 0.2 Ft	CLECO
Project No: 01-14-0136	L2 = 3.3 Ft	
Monitoring Well: **W-3**	L3 = 67 Ft	
	L4 = 10 Ft	
	L5 = 77 Ft	
Diagram Not To Scale	L6 = 0.75 Ft	

File No: 01-14-0136-W3

Monitoring Well - W-14

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



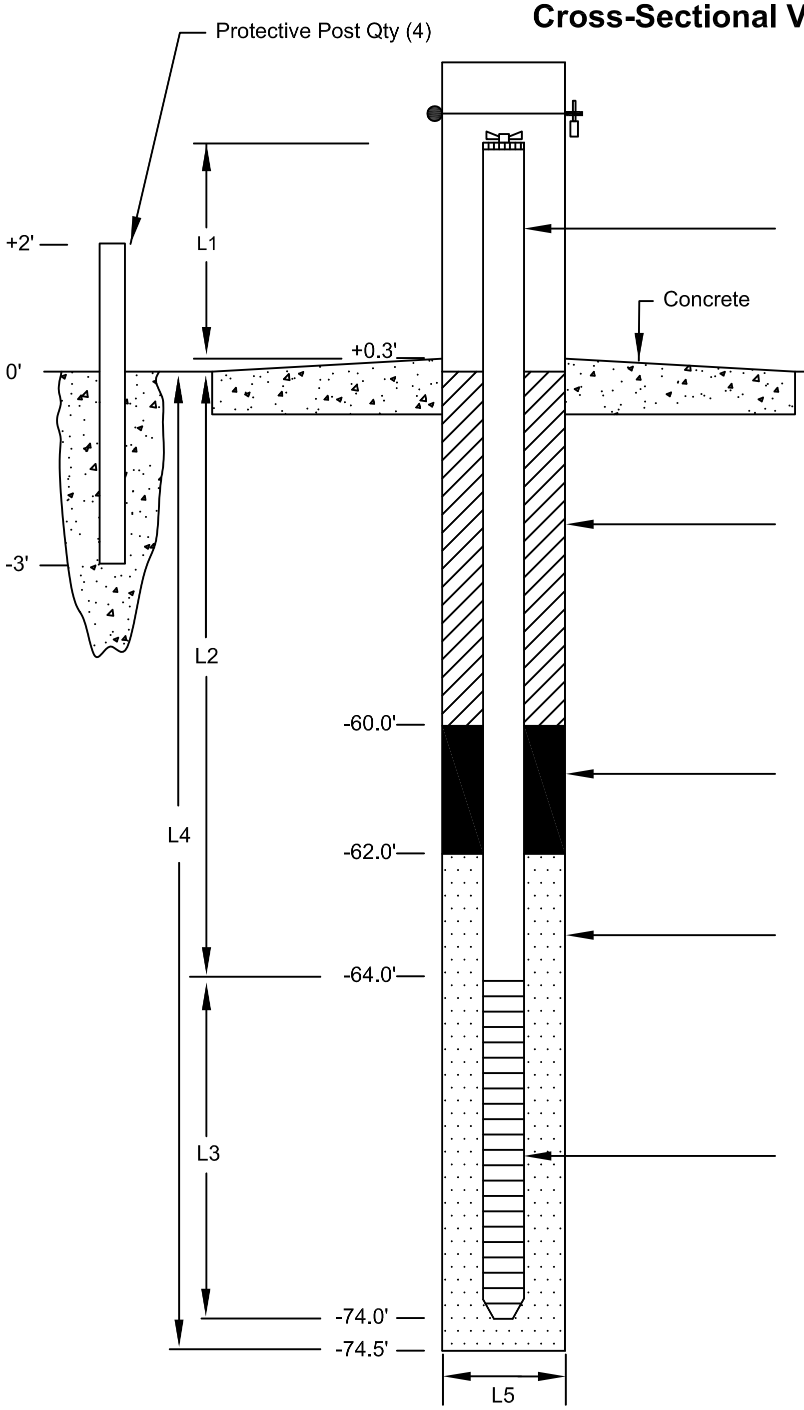
Project: Brame Energy Center	L1 = 2.53 Ft
Project No: 01-16-0162	L2 = 56.0 Ft
Monitoring Well: **W-14**	L3 = 10 Ft
	L4 = 66.5 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-W14

Monitoring Well - W-15

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



Well Casing	94.95 ft NAVD88
Material	PVC
Diameter	2"
Joint Type	Flush Thread
Length	66.88'
Ground Surface	92.36'
Backfill Around Casing	
Material	Cement-Bentonite Grout
Thickness	60.0' Thick
Seal	
Type Of Seal	Bentonite Pellet Crumbles
Thickness	2'
Filter Pack	
Type Of Filter	20/40 Sand Pack
Distance Above Screen	2' Fine Sand
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	0.01"

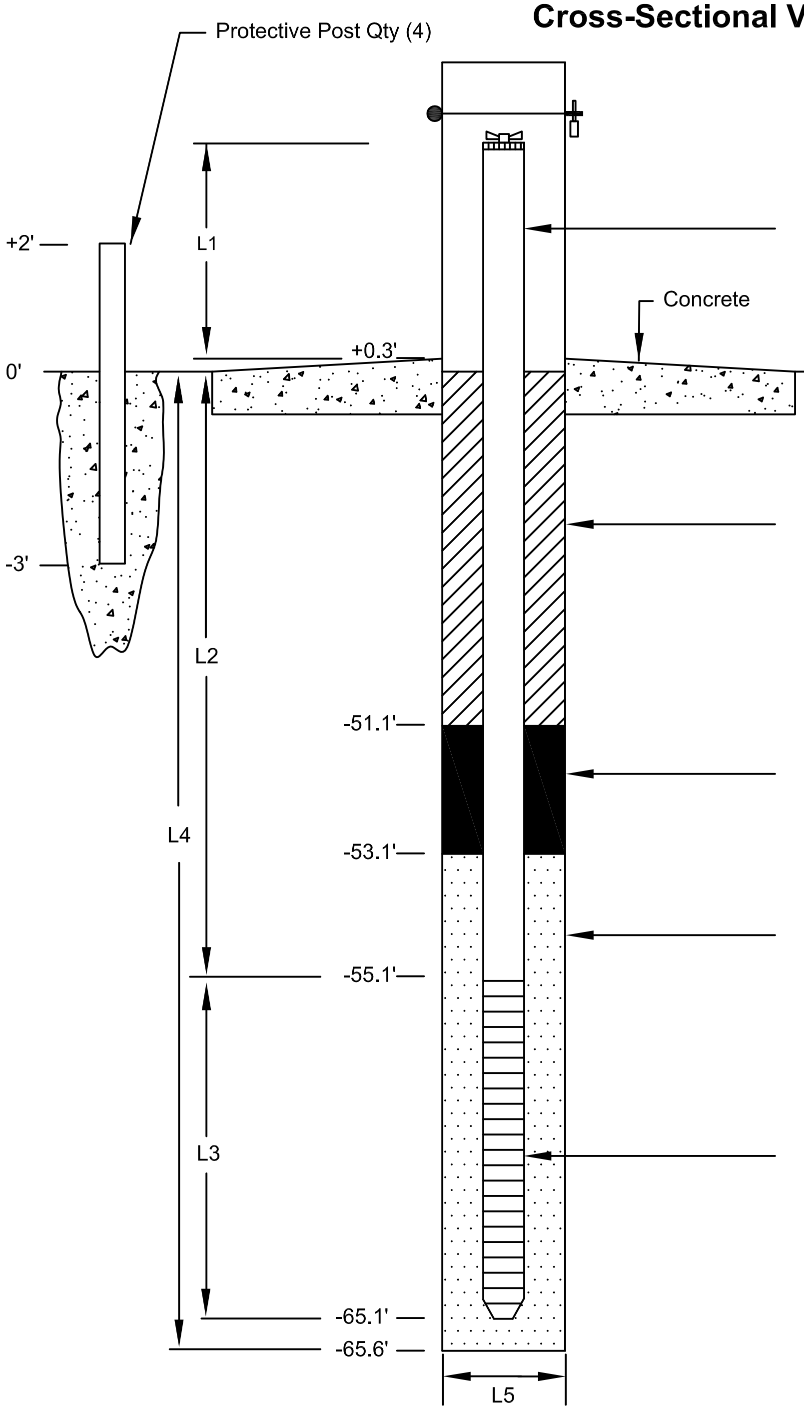
Project: Brame Energy Center	L1 = 2.58 Ft
Project No: 01-16-0162	L2 = 64.0 Ft
Monitoring Well: **W-15**	L3 = 10 Ft
	L4 = 74.5 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-W15

Monitoring Well - W-16

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



Well Casing: 98.32 ft NAVD88
- Material: PVC
- Diameter: 2"
- Joint Type: Flush Thread
- Length: 57.7'

Ground Surface: 96.04'

Backfill Around Casing
- Material: Cement-Bentonite Grout
- Thickness: 51.1' Thick

Seal
- Type Of Seal: Bentonite Pellet Crumbles
- Thickness: 2'

Filter Pack
- Type Of Filter: 20/40 Sand Pack
- Distance Above Screen: 2' Fine Sand

Well Screen
- Screen Material: PVC
- Diameter: 2"
- Length: 10'
- Slot Size: 0.01"

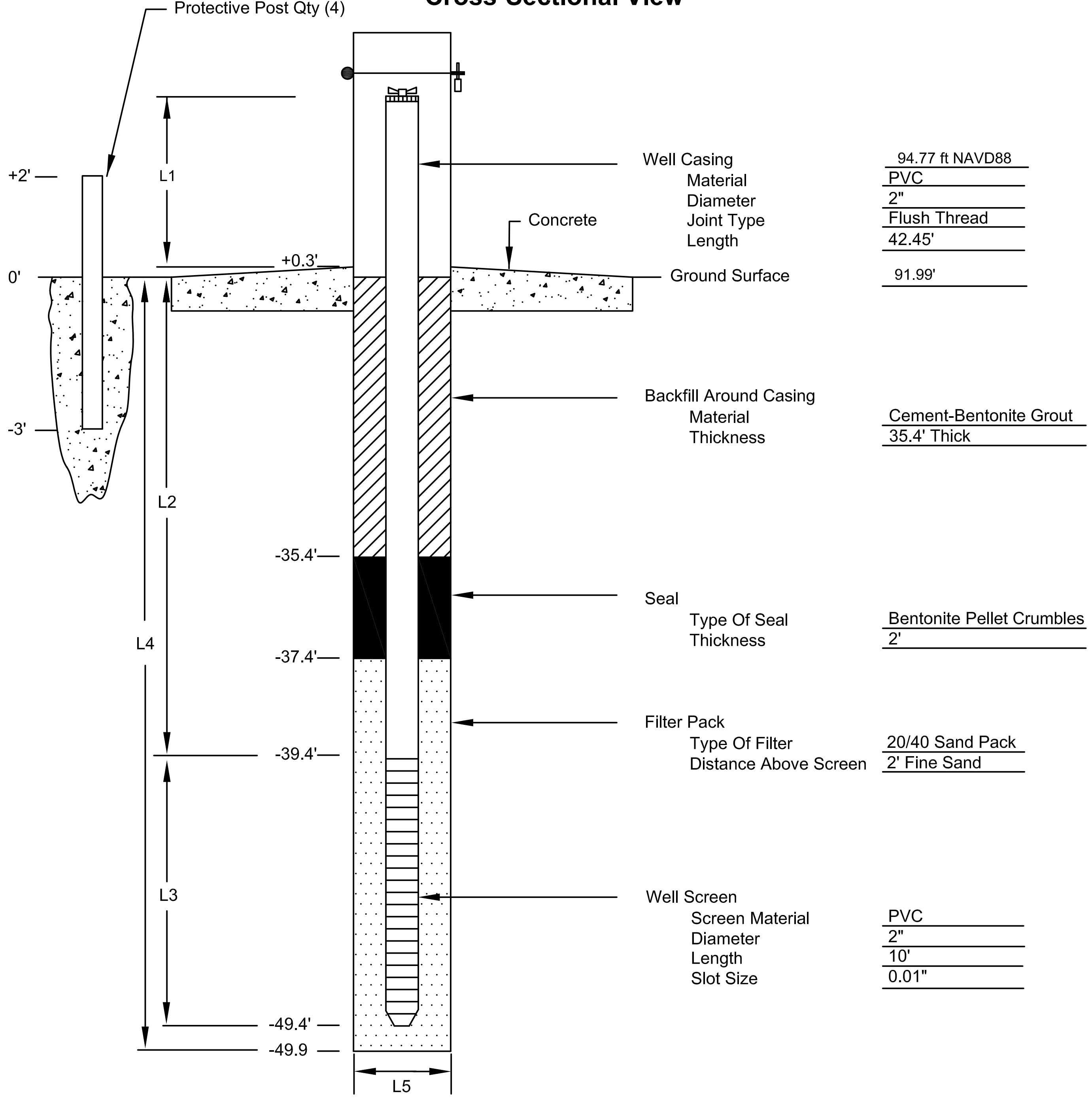
Project: Brame Energy Center	L1 = 2.30 Ft
Project No: 01-16-0162	L2 = 55.1 Ft
Monitoring Well: **W-16**	L3 = 10 Ft
	L4 = 65.6 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-W16

Monitoring Well - W-17

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



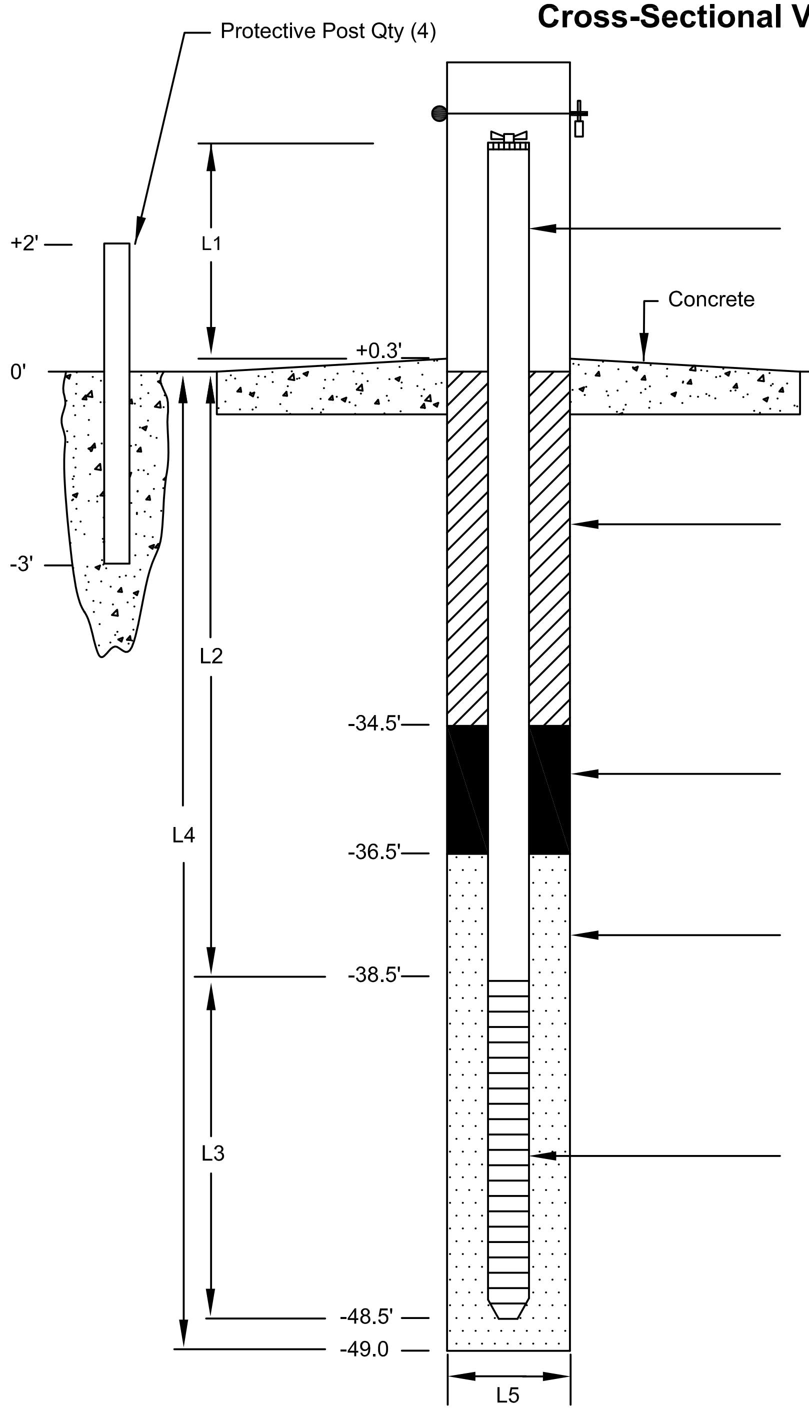
Project: Brame Energy Center	L1 = 2.75 Ft
Project No: 01-16-0162	L2 = 39.4 Ft
Monitoring Well: **W-17**	L3 = 10 Ft
	L4 = 49.9 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-W17

Monitoring Well - W-18

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



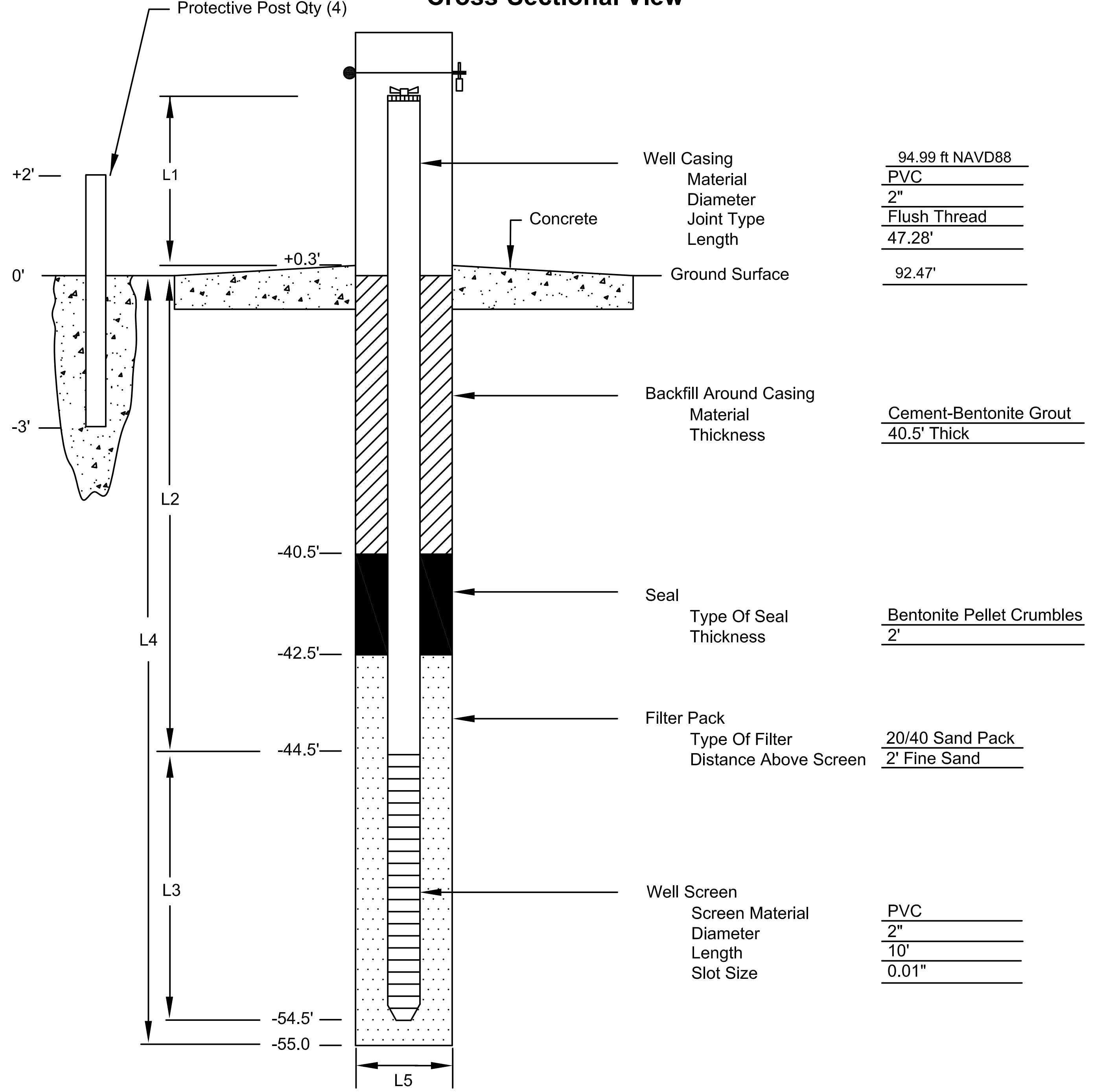
Well Casing	95.61 ft NAVD88
Material	PVC
Diameter	2"
Joint Type	Flush Thread
Length	41.56'
Ground Surface	92.9'
Backfill Around Casing	
Material	Cement-Bentonite Grout
Thickness	34.5' Thick
Seal	
Type Of Seal	Bentonite Pellet Crumbles
Thickness	2'
Filter Pack	
Type Of Filter	20/40 Sand Pack
Distance Above Screen	2' Fine Sand
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	0.01"

Project: Brame Energy Center	L1 = 2.76 Ft
Project No: 01-16-0162	L2 = 38.5 Ft
Monitoring Well: **W-18**	L3 = 10 Ft
	L4 = 49.0 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

File No: 01-16-0162-W18

Monitoring Well - W-19

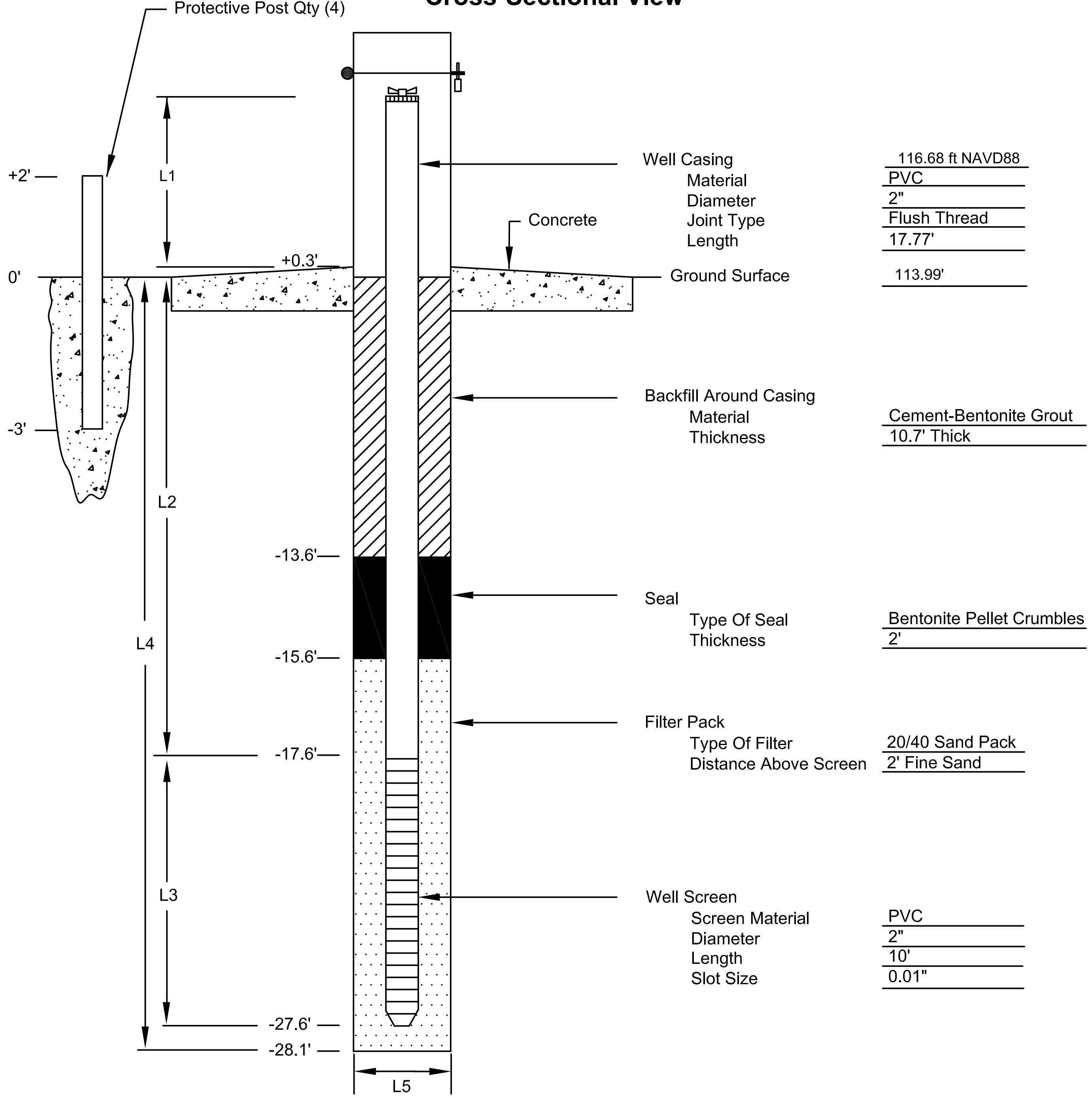
Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



Project: Brame Energy Center	L1 = 2.48 Ft	E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Project No: 01-14-0136	L2 = 44.5 Ft	
Monitoring Well: **W-19**	L3 = 10 Ft	
	L4 = 55.0 Ft	
Diagram Not To Scale	L5 = 0.75 Ft.	

Monitoring Well - W-20

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



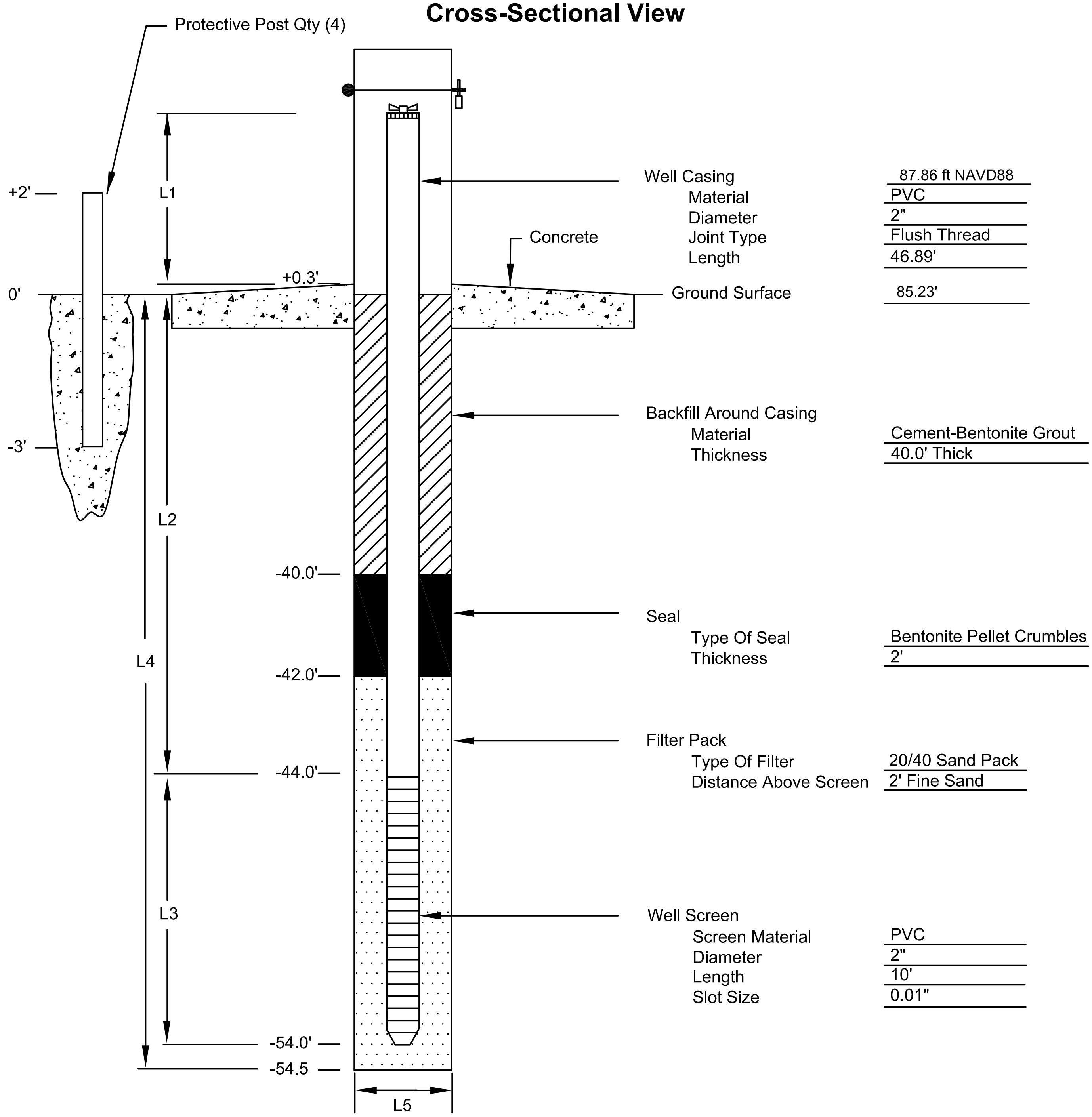
Project: Brame Energy Center	L1 = 2.67 Ft
Project No: 01-16-0162	L2 = 14.8 Ft
Monitoring Well: **W-20**	L3 = 10 Ft
	L4 = 28.1 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-W20

Monitoring Well - W-21

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View

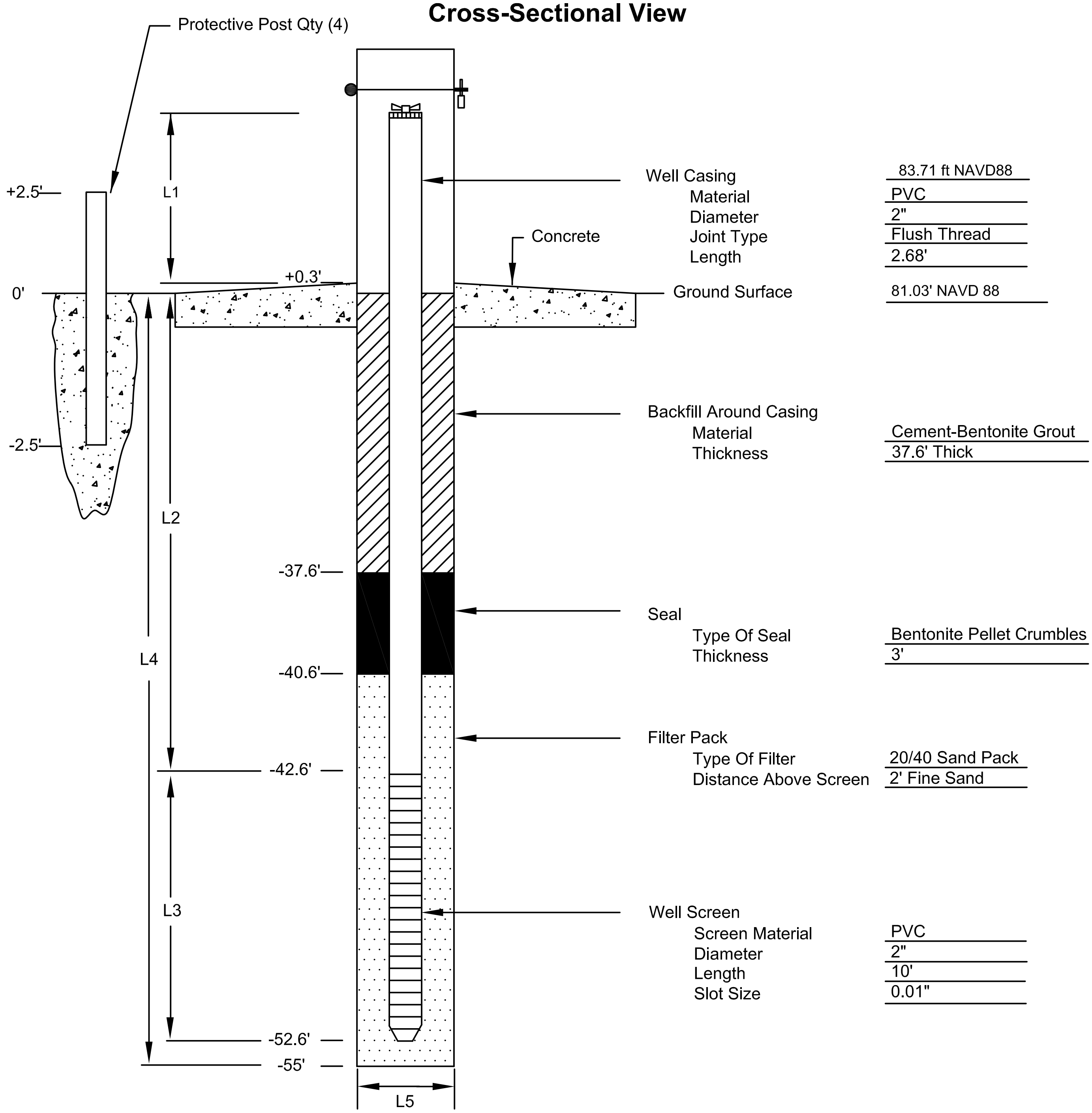


Project: Brame Energy Center	L1 = 2.59 Ft	E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Project No: 01-14-0136	L2 = 44.0 Ft	
Monitoring Well: **W-21**	L3 = 10 Ft	
	L4 = 54.5 Ft	
Diagram Not To Scale	L5 = 0.75 Ft.	

File No: 01-14-0136-W21

Monitoring Well - W-24

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View

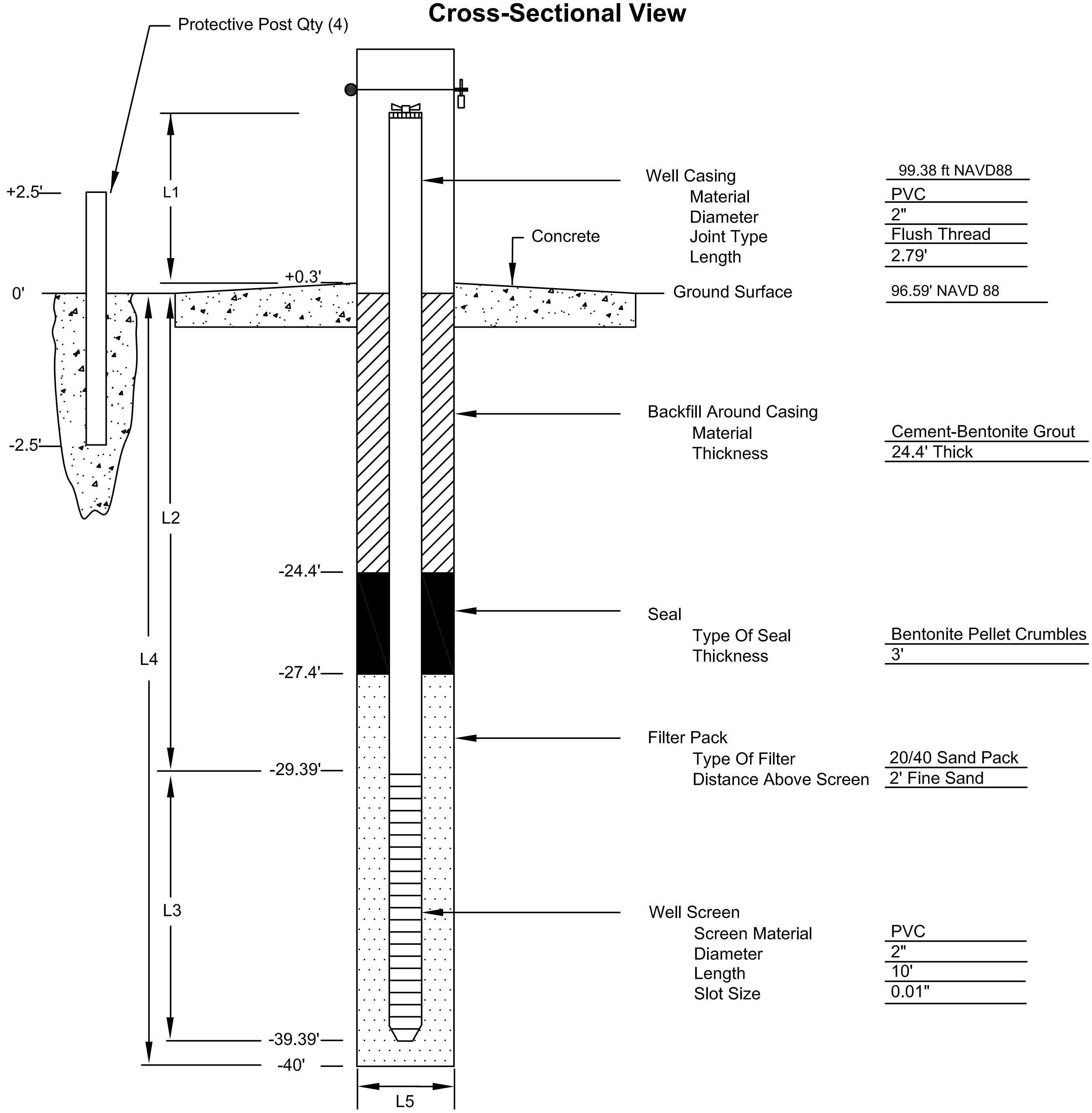


Project: Brame Energy Center	L1 = 2.68 Ft	CLECO
Project No: 01-16-0162	L2 = 42.6 Ft	
Monitoring Well: **W-24**	L3 = 10 Ft	
	L4 = 55 Ft	
Diagram Not To Scale	L5 = 0.75 Ft.	

File No: 01-16-0162-W-24

Monitoring Well - D-1

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



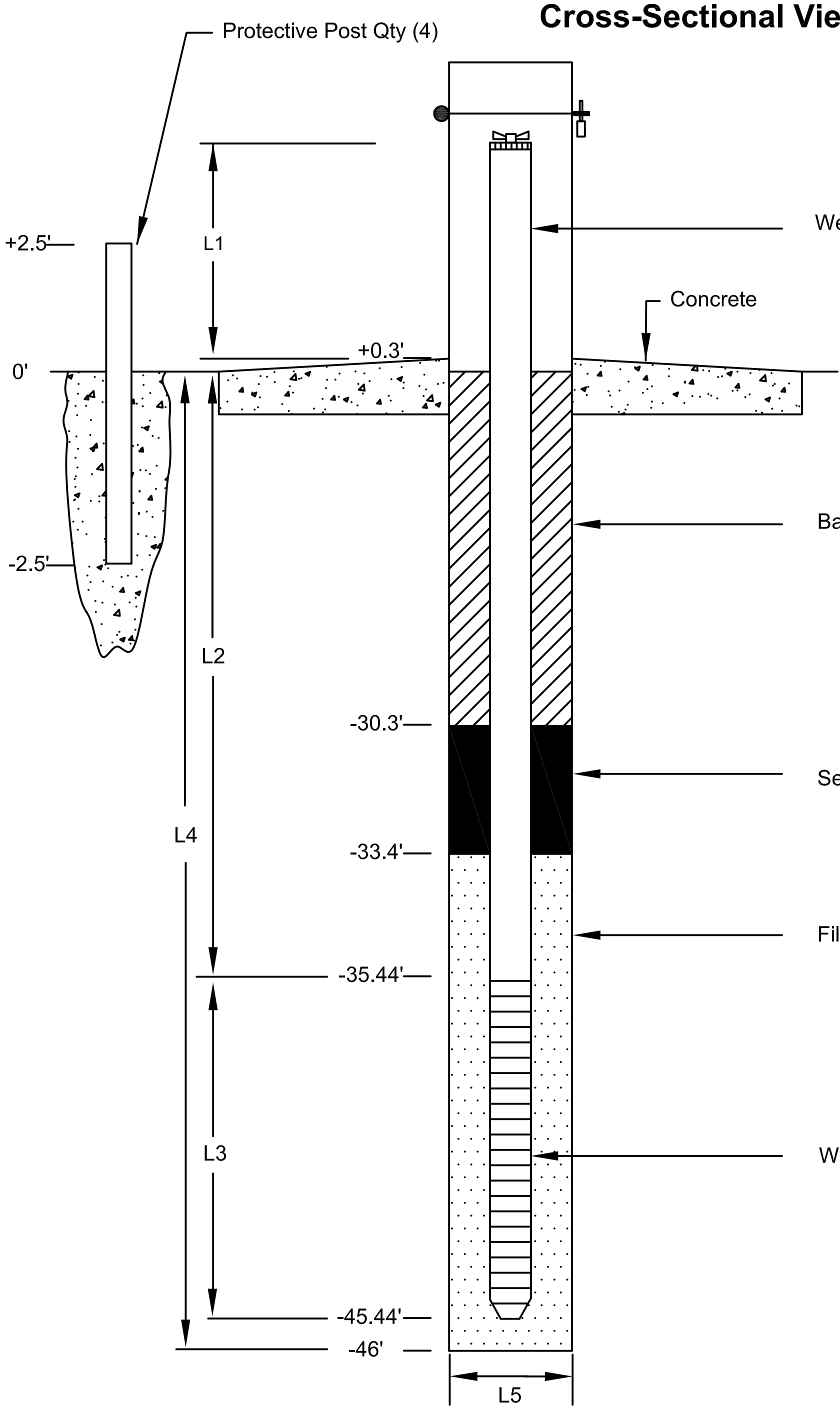
Project: Brame Energy Center	L1 = 2.79 Ft
Project No: 01-16-0162	L2 = 29.39 Ft
Monitoring Well: **D-1**	L3 = 10 Ft
	L4 = 40.0 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-D-1

Monitoring Well - D-2

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



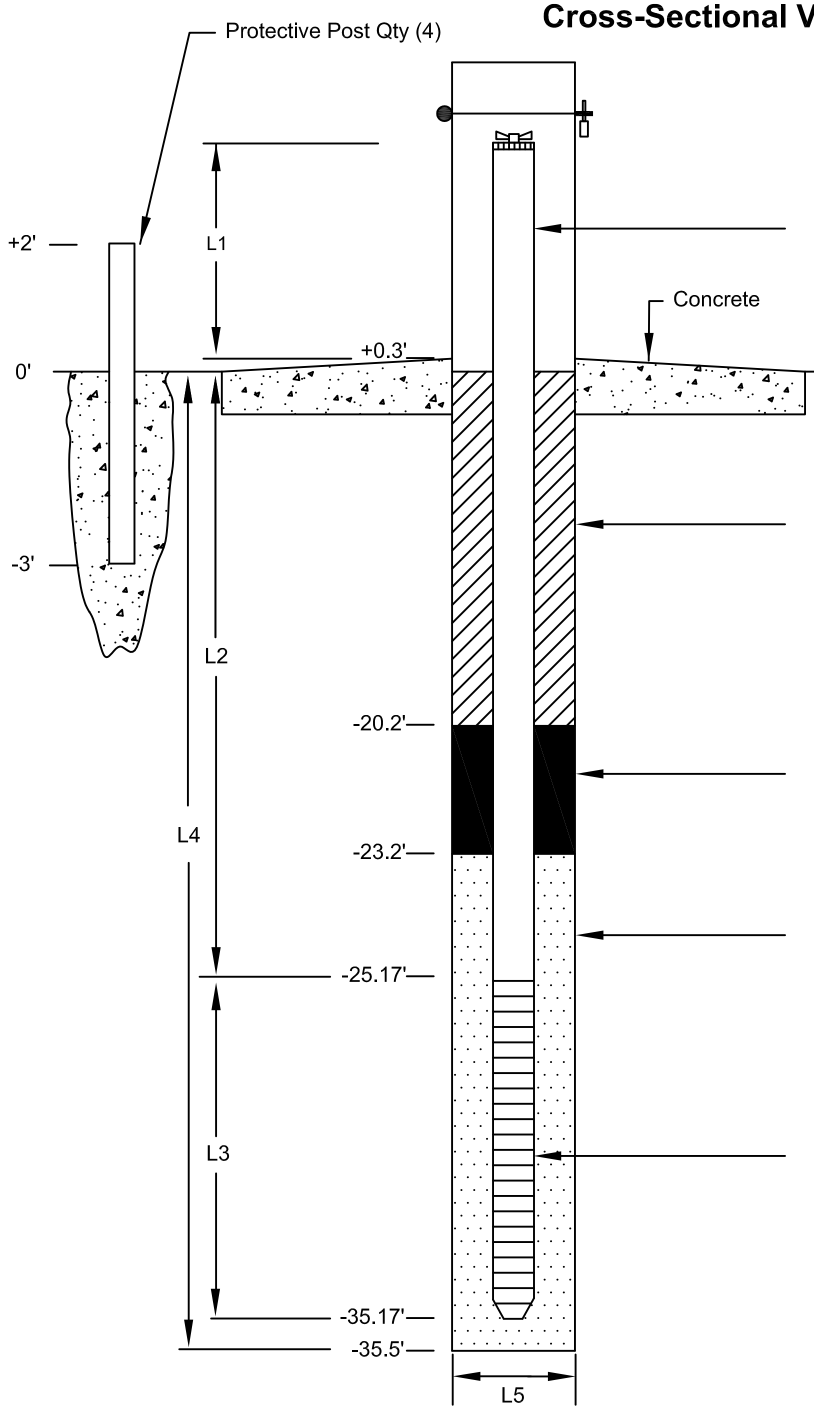
Well Casing	99.36 ft NAVD88
Material	PVC
Diameter	2"
Joint Type	Flush Thread
Length	2.26'
Ground Surface	97.10' NAVD 88
Backfill Around Casing	
Material	Cement-Bentonite Grout
Thickness	30.3' Thick
Seal	
Type Of Seal	Bentonite Pellet Crumbles
Thickness	3'
Filter Pack	
Type Of Filter	20/40 Sand Pack
Distance Above Screen	2' Fine Sand
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	0.01"

Project: Brame Energy Center	L1 = 2.77 Ft
Project No: 01-16-0162	L2 = 35.44 Ft
Monitoring Well: **D-2**	L3 = 10 Ft
	L4 = 46 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

File No: 01-16-0162-D-2

Monitoring Well - D-3

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



Well Casing 97.37 ft NAVD88
- Material: PVC
- Diameter: 2"
- Joint Type: Flush Thread
- Length: 2.87'

Ground Surface 94.50' NAVD 88

Backfill Around Casing
- Material: Cement-Bentonite Grout
- Thickness: 20.2' Thick

Seal
- Type Of Seal: Bentonite Pellet Crumbles
- Thickness: 3'

Filter Pack
- Type Of Filter: 20/40 Sand Pack
- Distance Above Screen: 2' Fine Sand

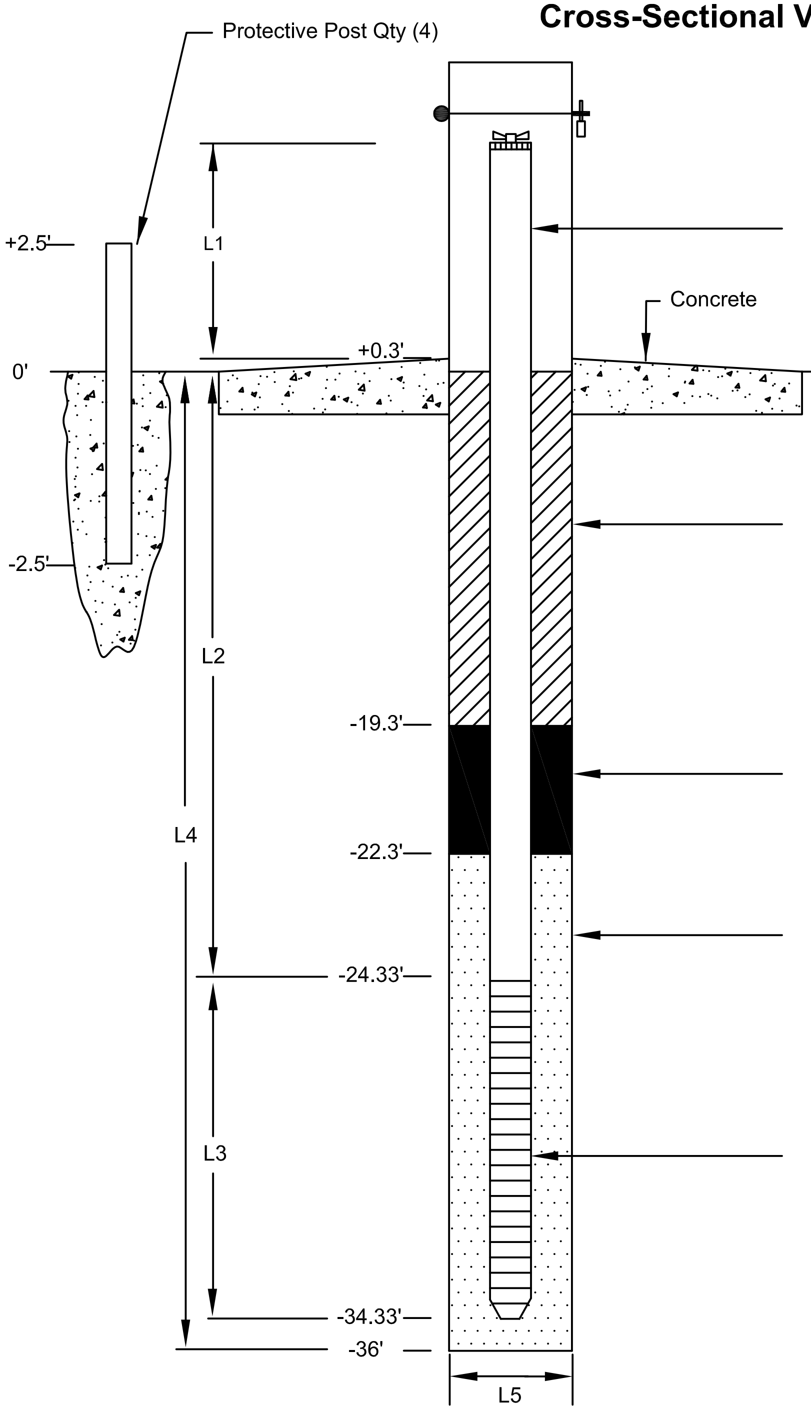
Well Screen
- Screen Material: PVC
- Diameter: 2"
- Length: 10'
- Slot Size: 0.01"

Project: Brame Energy Center	L1 = 2.87 Ft	CLECO
Project No: 01-16-0162	L2 = 25.17 Ft	
Monitoring Well: **D-3**	L3 = 10 Ft	
	L4 = 35.5 Ft	
Diagram Not To Scale	L5 = 0.75 Ft.	

File No: 01-16-0162-D-3

Monitoring Well - L-1

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View



Well Casing	86.15 ft NAVD88
Material	PVC
Diameter	2"
Joint Type	Flush Thread
Length	3.10'
Ground Surface	83.05' NAVD 88
Backfill Around Casing	
Material	Cement-Bentonite Grout
Thickness	19.3' Thick
Seal	
Type Of Seal	Bentonite Pellet Crumbles
Thickness	3'
Filter Pack	
Type Of Filter	20/40 Sand Pack
Distance Above Screen	2' Fine Sand
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	0.01"

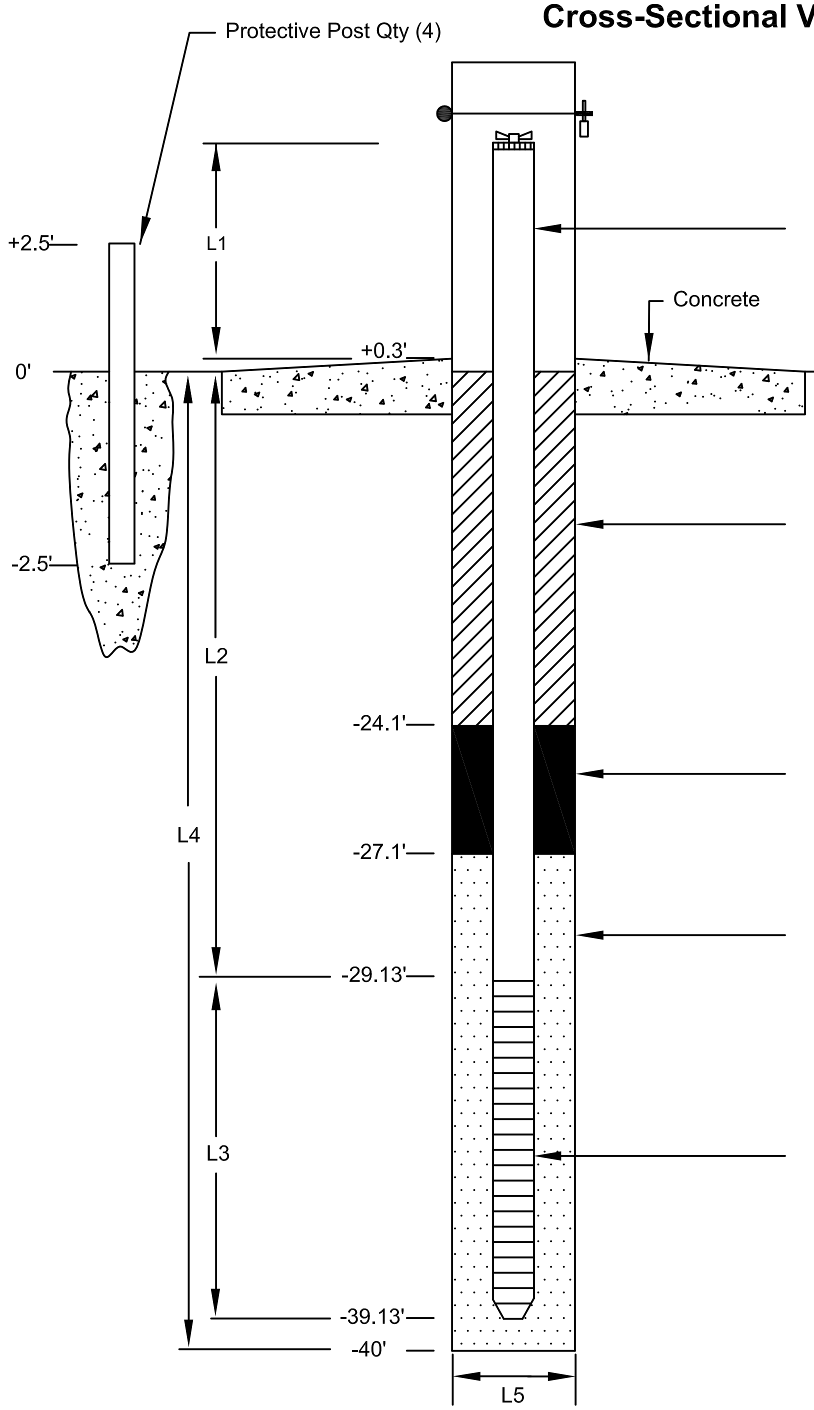
Project: Brame Energy Center	L1 = 3.1 Ft
Project No: 01-16-0162	L2 = 24.3 Ft
Monitoring Well: **L-1**	L3 = 10 Ft
	L4 = 36 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-L-1

Monitoring Well - L-2

Monitoring Well Construction Diagram
Above Grade Well
Cross-Sectional View

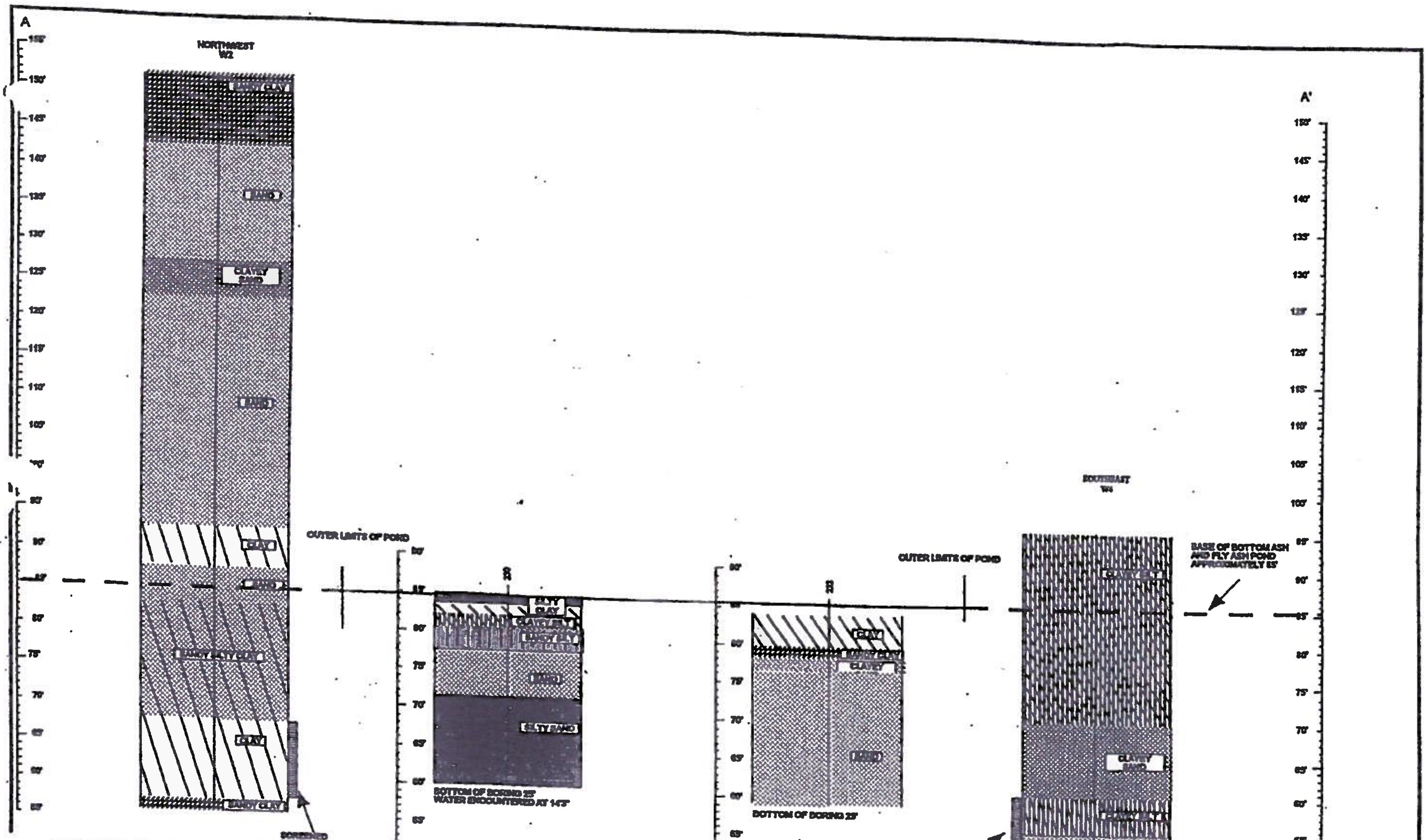


Well Casing	86.68 ft NAVD88
Material	PVC
Diameter	2"
Joint Type	Flush Thread
Length	2.95'
Ground Surface	83.73' NAVD 88
Backfill Around Casing	
Material	Cement-Bentonite Grout
Thickness	24.1' Thick
Seal	
Type Of Seal	Bentonite Pellet Crumbles
Thickness	3'
Filter Pack	
Type Of Filter	20/40 Sand Pack
Distance Above Screen	2' Fine Sand
Well Screen	
Screen Material	PVC
Diameter	2"
Length	10'
Slot Size	0.01"

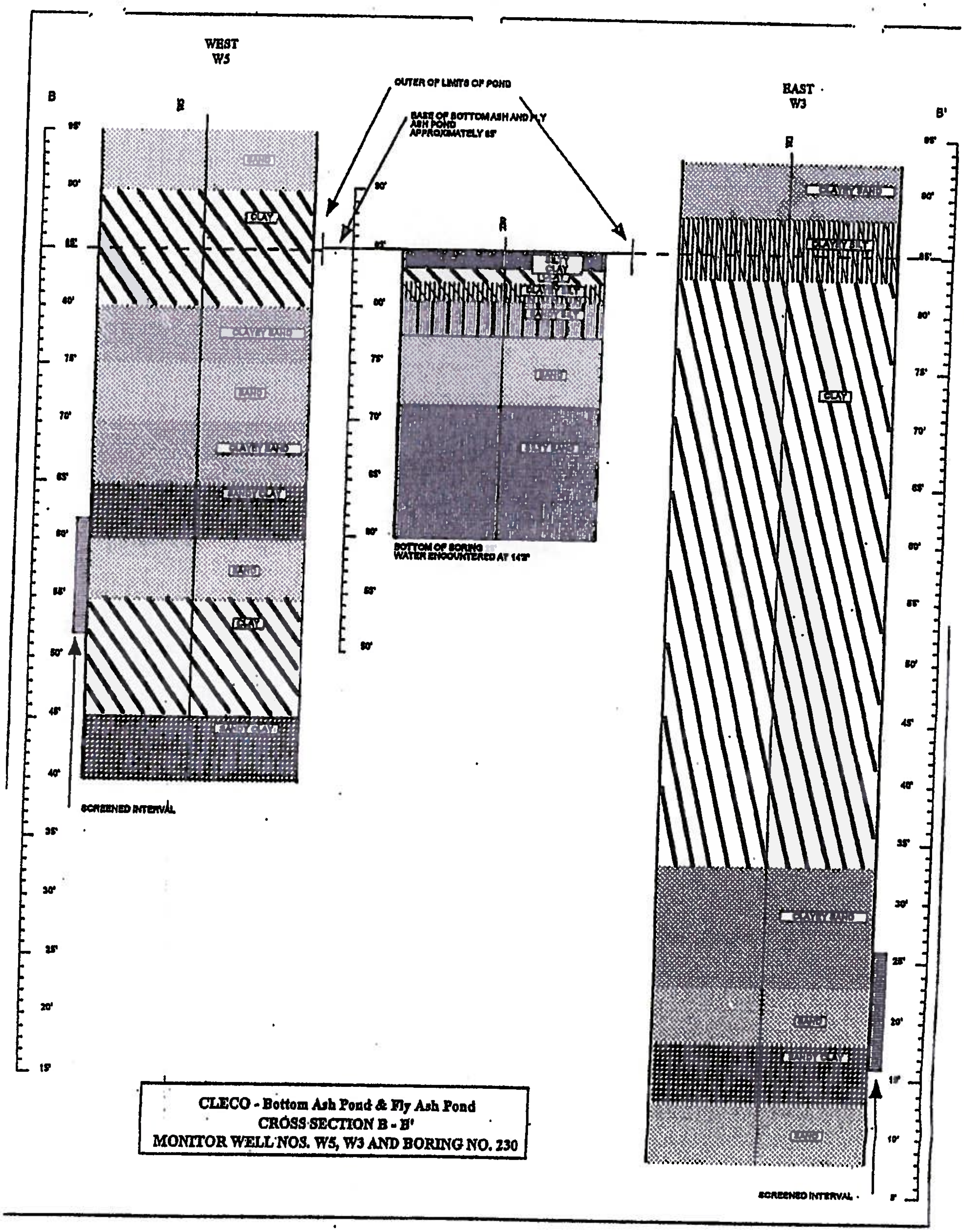
Project: Brame Energy Center	L1 = 2.95 Ft
Project No: 01-16-0162	L2 = 29.13 Ft
Monitoring Well: **L-2**	L3 = 10 Ft
	L4 = 40 Ft
Diagram Not To Scale	L5 = 0.75 Ft.

CLECO

File No: 01-16-0162-L-2



CLECO- BOTTOM ASH POND & FLY ASH POND
CROSS SECTION A - A'
MONITOR WELL NOS W2,W4 AND BORING NOS. 232, 230



CLECO - Bottom Ash Pond & Fly Ash Pond
CROSS SECTION B - B'
MONITOR WELL NOS. W5, W3 AND BORING NO. 230

LOG OF SOIL BORING:

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

File: W-19
Date: April 3, 2008
Logged By: Joseph Harrer
Driller: The Devonian Group
Rig: 6620 DT

FIELD DATA

Location: Cleco - Rodemacher

Surface Elevation:

Ground Water Level	Depth (feet)	Time	USCS	Color	Hardness	Soil Description
		14:15	CH	Red-brown	Stiff	Dry clay
B						
	5	14:30	CL	Red-brown	Firm	Wet, silty clay
			CH	Grey and Tan	Stiff	Dry, clay
	10	14:35	CH			
	15	14:40	CH			
			ML	Grey	Dense	Wet, very fine sandy silt
	20	14:45	CH	Grey	Stiff	Dry, Clay
	25	14:47	CH	Grey		
	30	15:00	CH	Grey		- - with roots
	35	15:05	CH	Grey		
			ML	Brown	Soft	Wet, clayey silt
	40					

Boring Completed at:

Ground Water Level Data	Boring Advancement Method	Notes
B-First occurrence of H_2O in soil		
E-Equilibrated level of H_2O	Boring Abandonment Method	

LOG OF SOIL BORING:

File: W-19
Date: April 1, 2008
Logged By: Joseph Harrer
Driller: The Devonian Group
Rig: 6620 DT

FIELD DATA

Location: Cleco - Rodemacher

Surface Elevation:

Ground Water Level	Depth (feet)	Time	USCS	Color	Hardness	Soil Description
		15:15	CH	Grey	Stiff	Dry, clay
	45	15:25	SC	Lt. Brown	Dense	Wet, silty, clayey very fine sand
	50	14:42	SC	Brown	Dense	
	55					
						Boring Terminated at 55 Feet - bgs
	60					
	65					
	70					
	75					
	80					

Boring Completed at:

Ground Water Level Data	Boring Advancement Method	Notes
B-First occurrence of H_2O in soil		
E-Equilibrated level of H_2O	Boring Abandonment Method	

LOG OF SOIL BORING:

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

File: W-21
Date: April 2, 2008
Logged By: Joseph Harrer
Driller: The Devonian Group
Rig: 6620 DT

FIELD DATA

Location: Cleco - Rodemacher

Surface Elevation:

Ground Water Level	Depth (feet)	Time	USCS	Color	Hardness	Soil Description
		14:15	SP	Tan	Dense	Damp, sand with very little gravel
	5	14:17	SP	Tan	Dense	Ver, sand grading to silty sand
		14:20	CH	Grey	Medium	Dry, clay with wood fragments
	10	14:25	SM	Tan	Loose	Wet, silty sand
		14:28	CL	Grey	Soft	Wet, sandy, silty clay
	15					
		14:35	CH	Red-brown	Very stiff	Dry Clay
	20	14:45	CH	Red-brown	Very stiff	
	25	14:47	CH	Red-brown	Very stiff	
	30	14:55	CH	Red-brown	Very stiff	
	35	15:05	CH	Red-brown	Very stiff	
	40					

Boring Completed at:

Ground Water Level Data	Boring Advancement Method	Notes
B-First occurrence of H_2O in soil E-Equilibrated level of H_2O	Boring Abandonment Method	

LOG OF SOIL BORING:

File: W-21
Date: April 2, 2008
Logged By: Joseph Harrer
Driller: The Devonian Group
Rig: 6620 DT

FIELD DATA

Location: Cleco - Rodemacher

Surface Elevation:

Ground Water Level	Depth (feet)	Time	USCS	Color	Hardness	Soil Description
		15:20	SM-CL	Tan and	Dense	Wet silty very find sand alternating with sandy clay
				blue/green		
	45	15:40	SM	Tan	Dense	Wet silty sand with a couple of 2" clay parts
	50	16:00	SM	Tan	Dense	- - no parts
	55					
						Boring Terminated at 55 Feet - bgs
	60					
	65					
	70					
	75					
	80					

Boring Completed at:

Ground Water Level Data	Boring Advancement Method	Notes
B-First occurrence of H_2O in soil		
E-Equilibrated level of H_2O	Boring Abandonment Method	

SOIL BORING LOG

BORING/WELL NO.:	**W-23**
TOTAL DEPTH:	**57 Feet**
TOP OF CASING ELEV.:	**136.28 Ft NGVD**
GROUND SURFACE ELEV.:	**133.58 Ft NGVD**

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

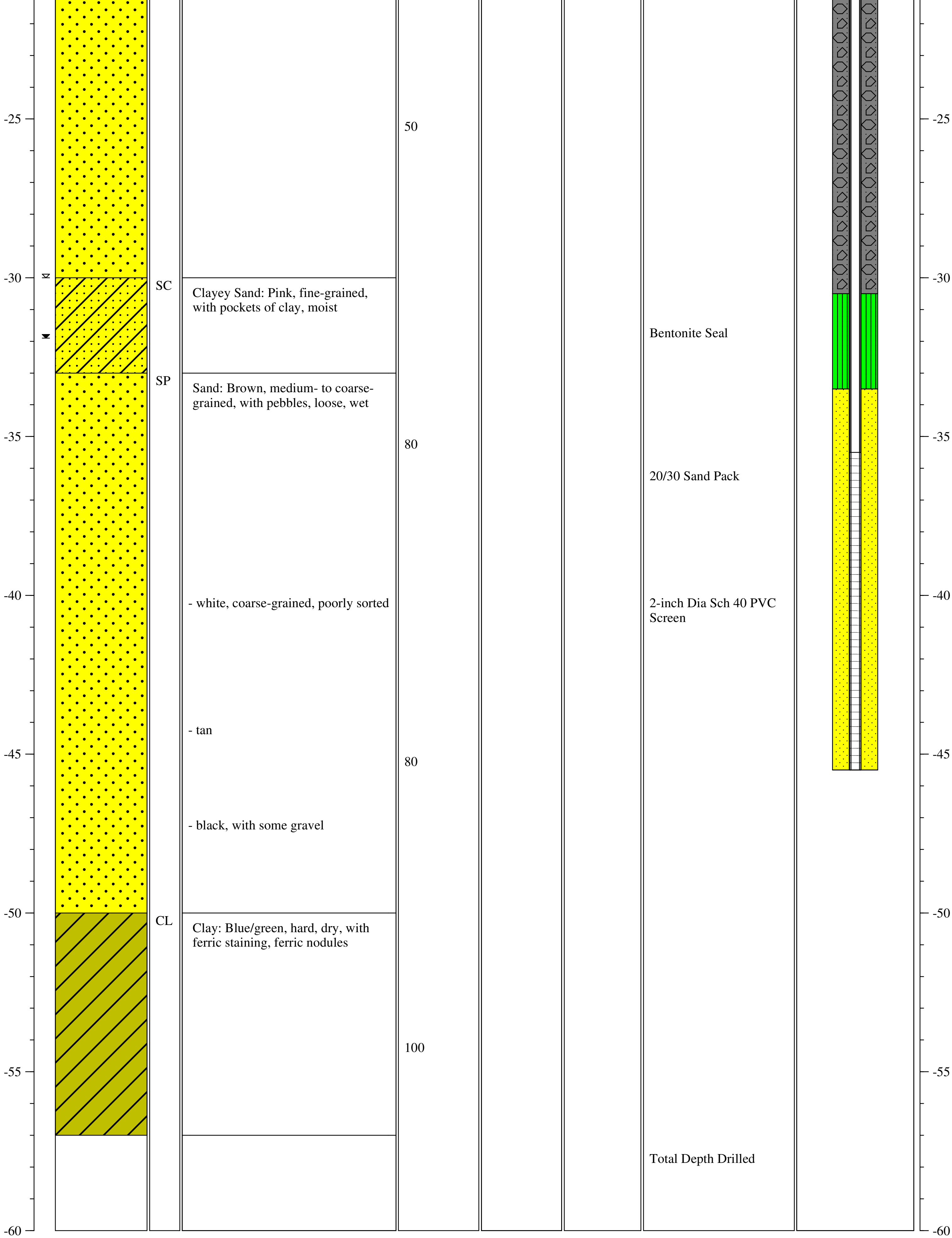
CLIENT:	**Cleco BEC**	DRILLING CO.:	**Walker Hill Environmental**
PROJECT:	**SW Permitting**	DRILLER:	**Rodney LaBrosse**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Rotosonic**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Rotosonic**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**06/15/2016**

Notes:

Water level during drilling: 30 ft bgs

Water level in completed well: 31.90 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
							Well Cap	
0			Fill: Red, brown, gravel, sand, clay				8-inch Borehole	
		CL	Clayey Sand: Light brown/tan, dry, with ferric staining					
-5				30			Grouted Annulus	
		CL	Sandy Clay: Red, hard, fine-grained, with ferric staining					
-10								
-15				30			2-inch Dia Sch 40 PVC Casing	
		SP	Sand: Red, oxidized, cohesive, dry, fine-grained					
-20								
			- fine-grained, light brown, tan, loose					


-25
-30
-35
-40
-45
-50
-55
-60
SC
Clayey Sand: Pink, fine-grained, with pockets of clay, moist
SP
Sand: Brown, medium- to coarse-grained, with pebbles, loose, wet
- white, coarse-grained, poorly sorted
- tan
- black, with some gravel
CL
Clay: Blue/green, hard, dry, with ferric staining, ferric nodules
50
80
80
100
Bentonite Seal
20/30 Sand Pack
2-inch Dia Sch 40 PVC Screen
Total Depth Drilled

SOIL BORING LOG

BORING/WELL NO.:	**W-24**
TOTAL DEPTH:	**55 Feet**
TOP OF CASING ELEV.:	**83.71 Ft NGVD**
GROUND SURFACE ELEV.:	**81.03 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Hollow Stem Auger**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**06/27/2016**

Notes:

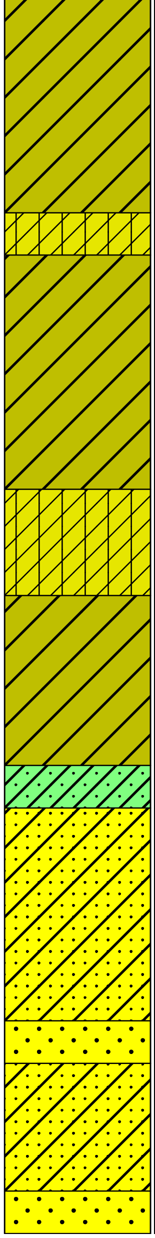
Water level during drilling: 40 ft bgs

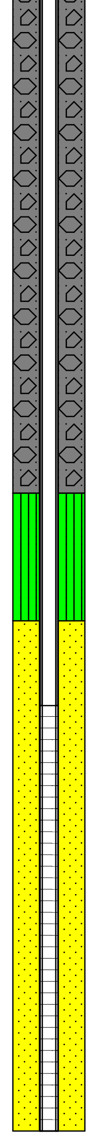
Water level in completed well: 9.60 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
							Well Cap	
0		CL	Silty Clay: Brown, dry				8-inch Borehole	
		CL	Clay: Brown, dry, with organics	100	2.00			
-5							Grouted Annulus	
		CL	Silty Clay: Brown	100	4.00			
-10		CL	Clay: Red-brown, stiff, dry	100	0.50			
-15					0.50		2-inch Dia Sch 40 PVC Casing	
				100				
-20				100				
		CL	Silty Clay: Red, brown, stiff, with ferric nodules				Bentonite Seal	
-25		CL	Clay: Red, brown, stiff, with ferric					

	staining, organics	100	
CL	Silty Clay: Red, brown, with organics, very soft		20/30 Sand Pack
CL	Clay: Blue-grey, soft	100	2-inch Dia Sch 40 PVC Screen
CL	Silty Clay: Grey, soft	100	
CL	Clay: Grey, soft, with ferric staining, organics	100	
SC	Sandy Clay: Grey, soft, wet		
SC	Clayey Sand: Grey, blue, fine-grained, wet	100	
SP	Sand: Dark grey, medium-grained, with iron staining		
SC	Clayey Sand: Dark grey, with organics, fine-grained	100	
SP	Sand: Dark grey, medium-grained, with ferric staining		

Depth scale: -30, -35, -40, -45, -50, -55





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ENVIRONMENTAL SERVICES, INC.

SOIL BORING LOG

BORING/WELL NO.:	**D-1**
TOTAL DEPTH:	**50 Feet**
TOP OF CASING ELEV.:	**99.38 Ft NGVD**
GROUND SURFACE ELEV.:	**96.59 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Walker Hill Environmental**
PROJECT:	**SW Permitting**	DRILLER:	**Rodney LaBrosse**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Rotosonic**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Rotosonic**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**06/14/2016**

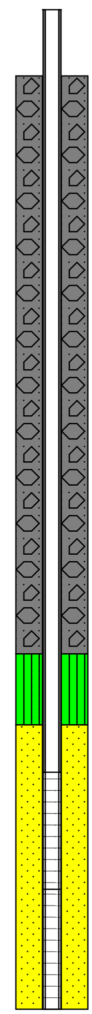
Notes:

Water level during drilling: -14.5 ft bgs

Water level in completed well: 10.04 ft bgs

DEPTH	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION
						Well Cap
0	CL	Fill: Gravel, rocks, grass, brown, moist				8-inch Borehole
-5		Clayey Silt: Red-brown, very soft at 5 feet	60	0.25		Grouted Annulus
-10	CL	Silty Clay: Light gray, soft, ferric nodules		0.25		
-15	CL	Clayey Silt: Red-gray, very soft, wet with lenses of silty clay	100	0.50		2-inch Dia Sch 40 PVC Casing
	CL	Silty Clay: Light gray, soft		0.50		
-20	SC	Clayey Sand: Grey, soft, moist, very fine-grained				
-25	SC	Sandy Clay: Grey with ferric nodules, very fine-grained, less moist, soft	100	0.50		Bentonite Seal
						20/30 Sand Pack
-30	SC	Clayey Sand: Yellow, brown, fine- to medium- grained, ferric nodules				2-inch Dia Sch 40 PVC Screen
-35	SC	Sand: Coarse-grained with pebbles	100			
-40	OH	Clay: Black, organic-rich		0.50		
	OL	Sand: Blue-green, fine-grained				
-45	SC	Clay: blue-green, stiff	100	2.00		
-50						Total Depth Drilled

WELL CONSTRUCTION



SOIL BORING LOG

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

BORING/WELL NO.:	**D-2**
TOTAL DEPTH:	**47 Feet**
TOP OF CASING ELEV.:	**99.36 Ft NGVD**
GROUND SURFACE ELEV.:	**97.10 Ft NGVD**

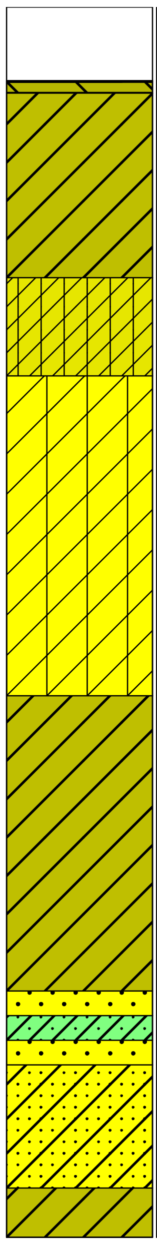
CLIENT:	**Cleco BEC**	DRILLING CO.:	**Walker Hill Environmental**
PROJECT:	**SW Permitting**	DRILLER:	**Rodney LaBrosse**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Rotosonic**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Rotosonic**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**06/14/2016**

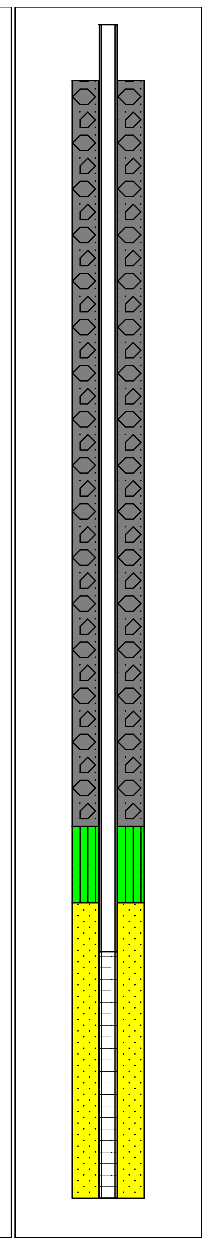
Notes:

Water level during drilling: 37 ft bgs

Water level in completed well: 17.23 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0							Well Cap	
		CL	Fill: Gravel, rocks, grass, brown, moist				8-inch Borehole	
-5			Clay: Red-brown, brick color, soft-medium, dry	60	1.00			
-10		CL	Silty Clay: Brown, soft		1.50		Grouted Annulus	
-15		CL	Clayey Silt: Brown, soft, with organics	100	0.25		2-inch Dia Sch 40 PVC Casing	
-25		CL	Clay: Grey, with ferric staining, with wood fragments, stiff	100	1.75			
-30					2.00		Bentonite Seal	
-35		SC	Sand: Yellow, brown, fine-grained, with ferric staining	100			20/30 Sand Pack	
		CL	Sandy Clay: Grey, with ferric nodules, very fine-grained, loose		0.75			
-40		SC	Sand: Yellow, brown, fine-grained, wet, loose				2-inch Dia Sch 40 PVC Screen	
		SC	Clayey Sand: Red, with ferric staining					
-45		CL	Clay: Blue-green, stiff, dry-moist	100	2.50			





SOIL BORING LOG

BORING/WELL NO.: **D-3**

TOTAL DEPTH: **50 Feet**

TOP OF CASING ELEV.: **97.37 Ft NGVD**

GROUND SURFACE ELEV.: **94.50 Ft NGVD**

CLIENT: **Cleco BEC**

PROJECT: **SW Permitting**

SITE LOCATION: **Boyce, Louisiana**

PROJECT NO.: **01-16-0162**

LOGGED BY: **R Sturdivant**

DRILLING CO.: **Walker Hill Environmental**

DRILLER: **Rodney LaBrosse**

METHOD OF DRILLING: **Rotosonic**

SAMPLING METHODS: **Rotosonic**

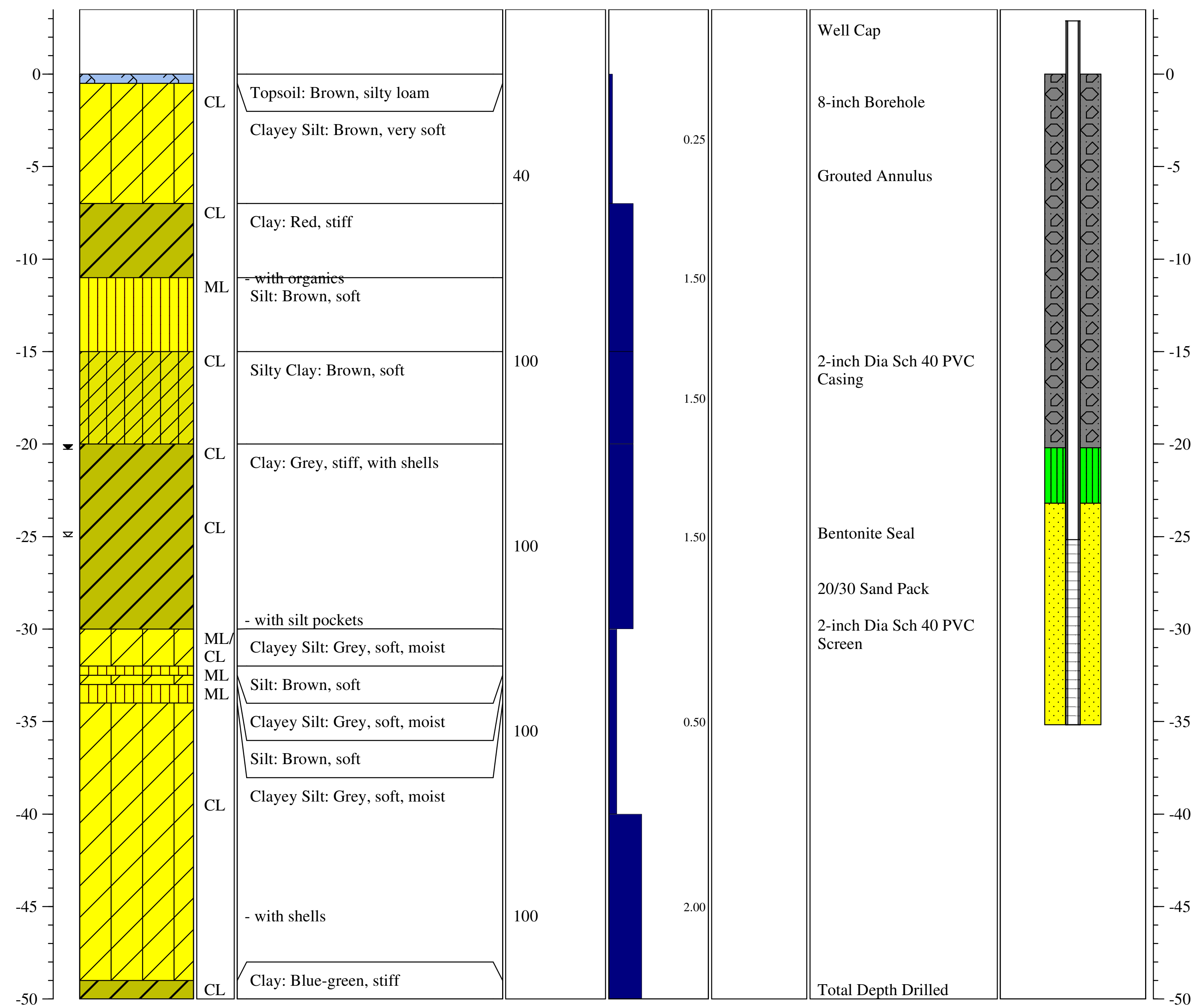
DATES DRILLED: **06/15/2016**

Notes:

Water level during drilling: 25 ft bgs

Water level in completed well: 20.28 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION



SOIL BORING LOG

BORING/WELL NO.:	L-1
TOTAL DEPTH:	36 feet
TOP OF CASING ELEV.:	86.15 Ft NGVD
GROUND SURFACE ELEV.:	83.05 Ft NGVD

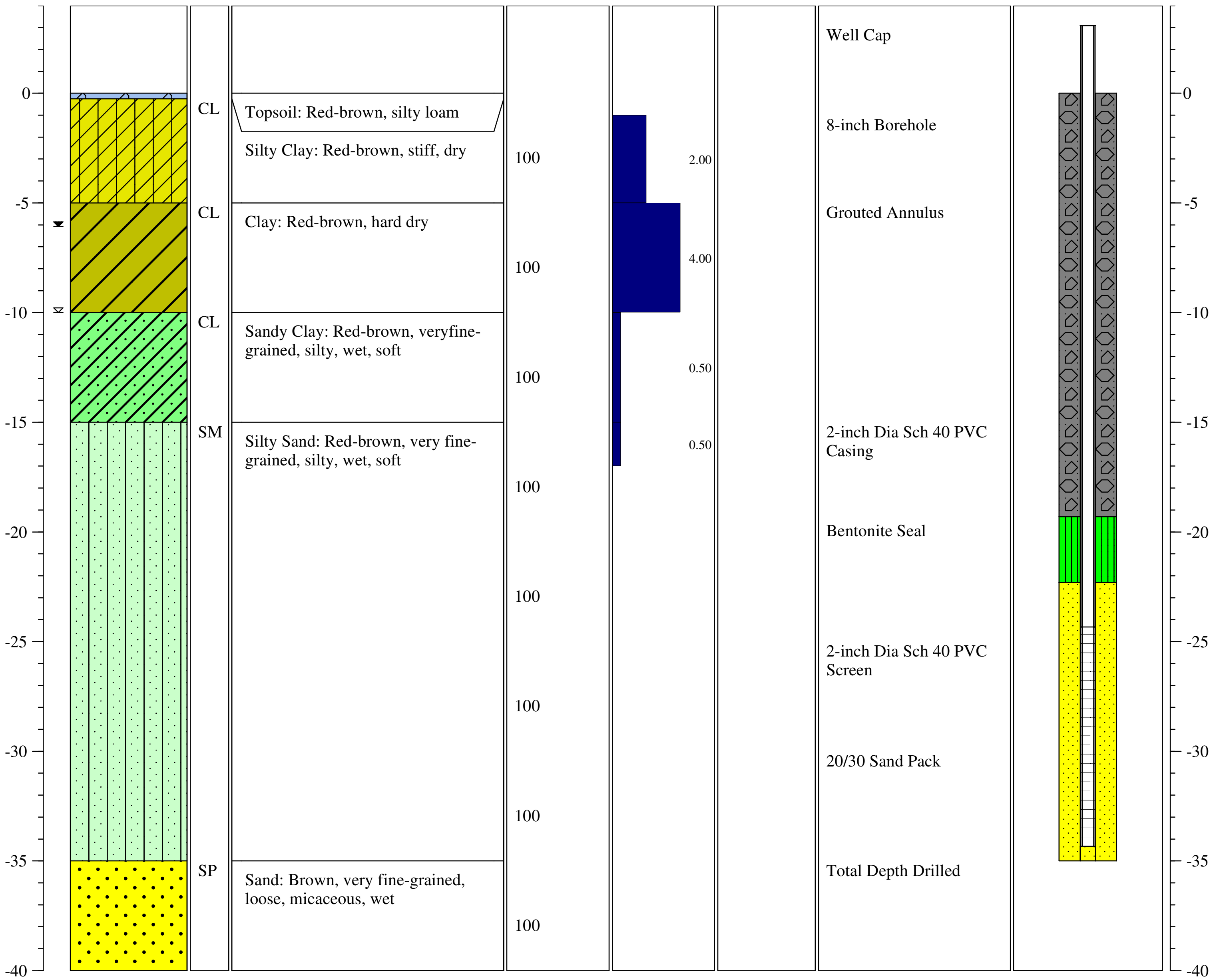
CLIENT:	Cleco BEC	DRILLING CO.:	Devonian Group
PROJECT:	SW Permitting	DRILLER:	C Hebert
SITE LOCATION:	Boyce, Louisiana	METHOD OF DRILLING:	Hollow Stem Auger
PROJECT NO.:	01-16-0162	SAMPLING METHODS:	DPT
LOGGED BY:	R Sturdivant	DATES DRILLED:	06/28/2016

Notes:

Water level during drilling: 10 ft bgs

Water level in completed well: 6.08 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION



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

SOIL BORING LOG

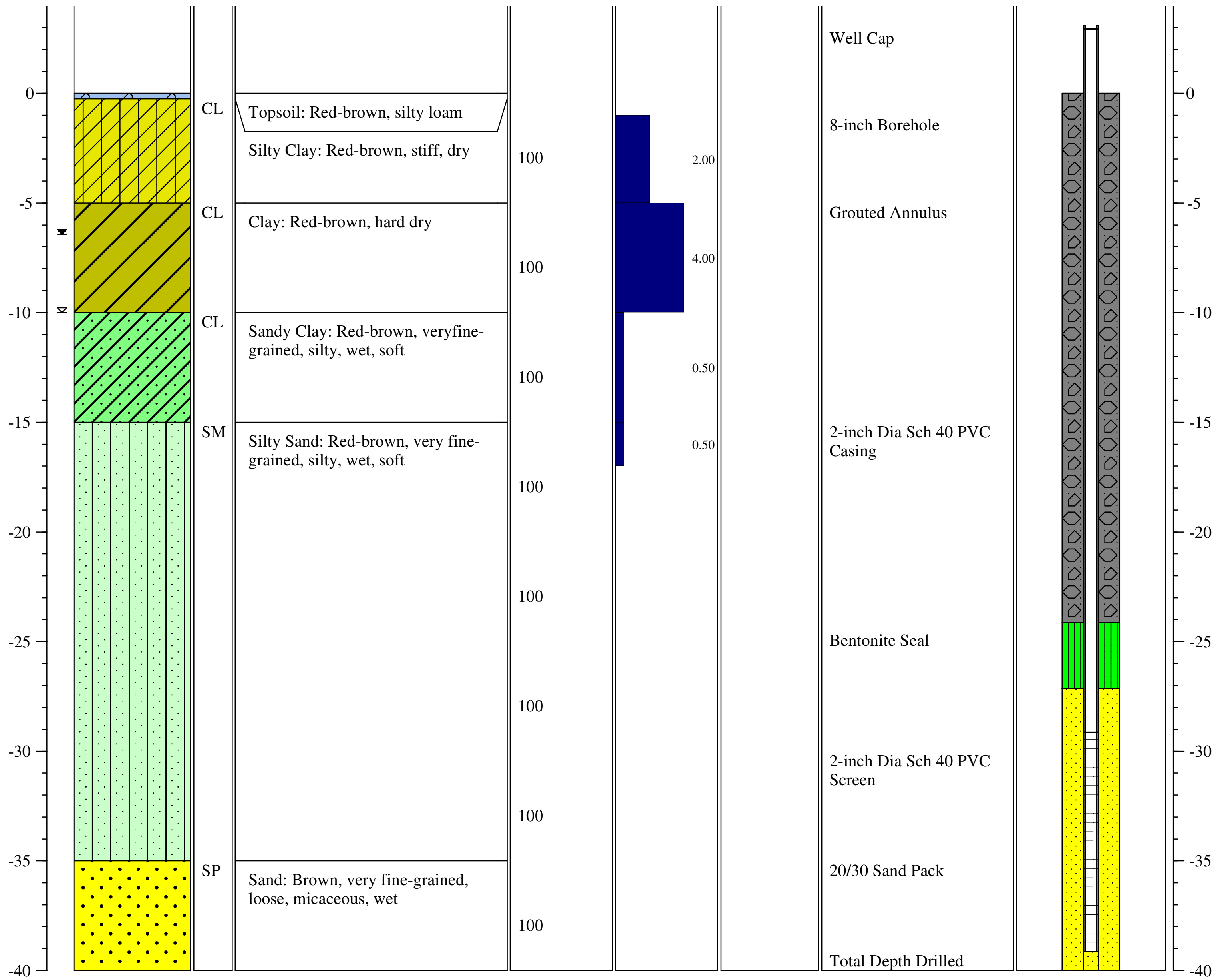
BORING/WELL NO.:	L-2
TOTAL DEPTH:	40 feet
TOP OF CASING ELEV.:	86.68 Ft NGVD
GROUND SURFACE ELEV.:	83.73 Ft NGVD

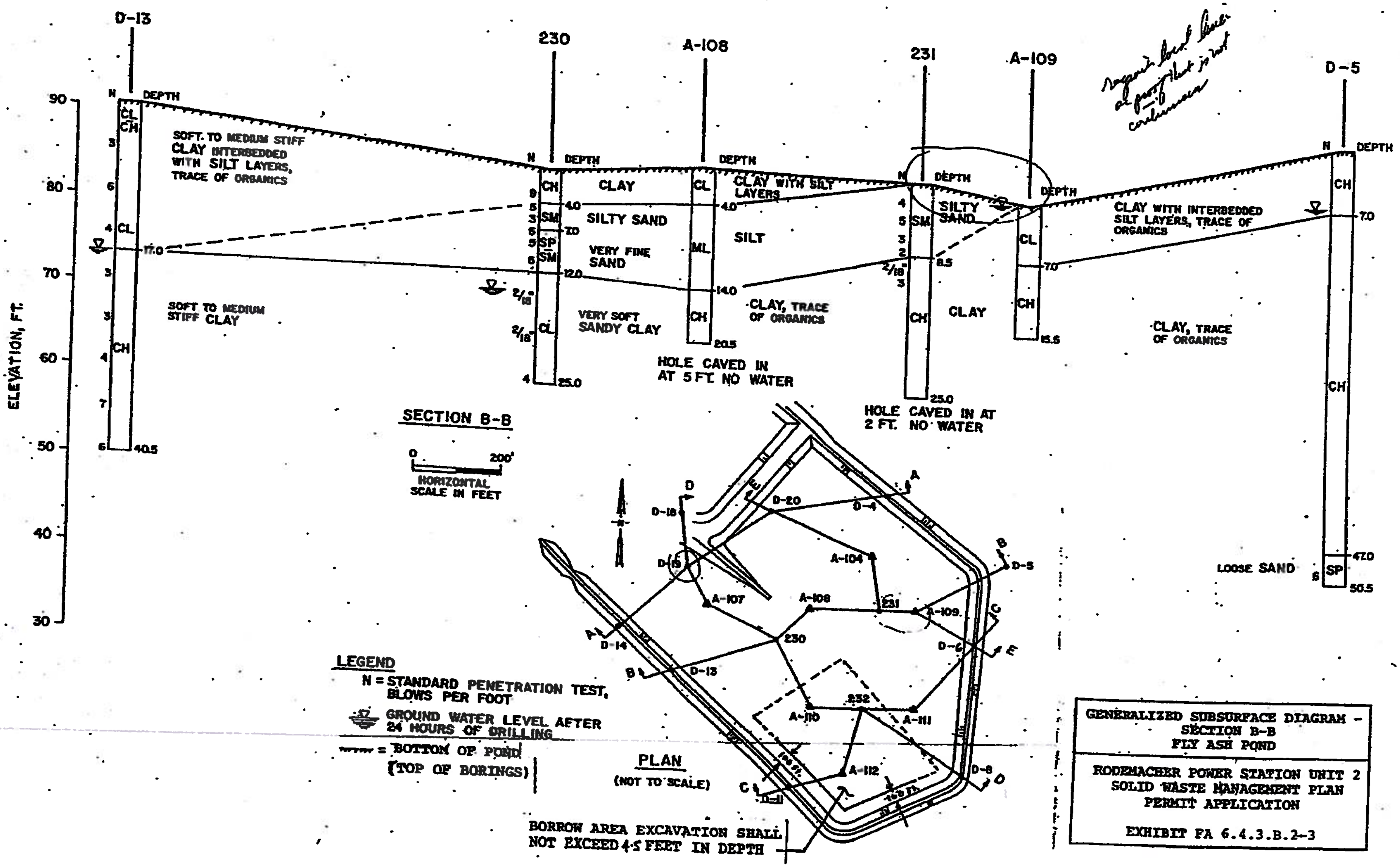
CLIENT:	Cleco BEC	DRILLING CO.:	Devonian Group
PROJECT:	SW Permitting	DRILLER:	C Hebert
SITE LOCATION:	Boyce, Louisiana	METHOD OF DRILLING:	Hollow Stem Auger
PROJECT NO.:	01-16-0162	SAMPLING METHODS:	DPT
LOGGED BY:	R Sturdivant	DATES DRILLED:	06/29/2016

Notes:

Water level during drilling: 10 ft bgs
Water level in completed well: 6.43 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION

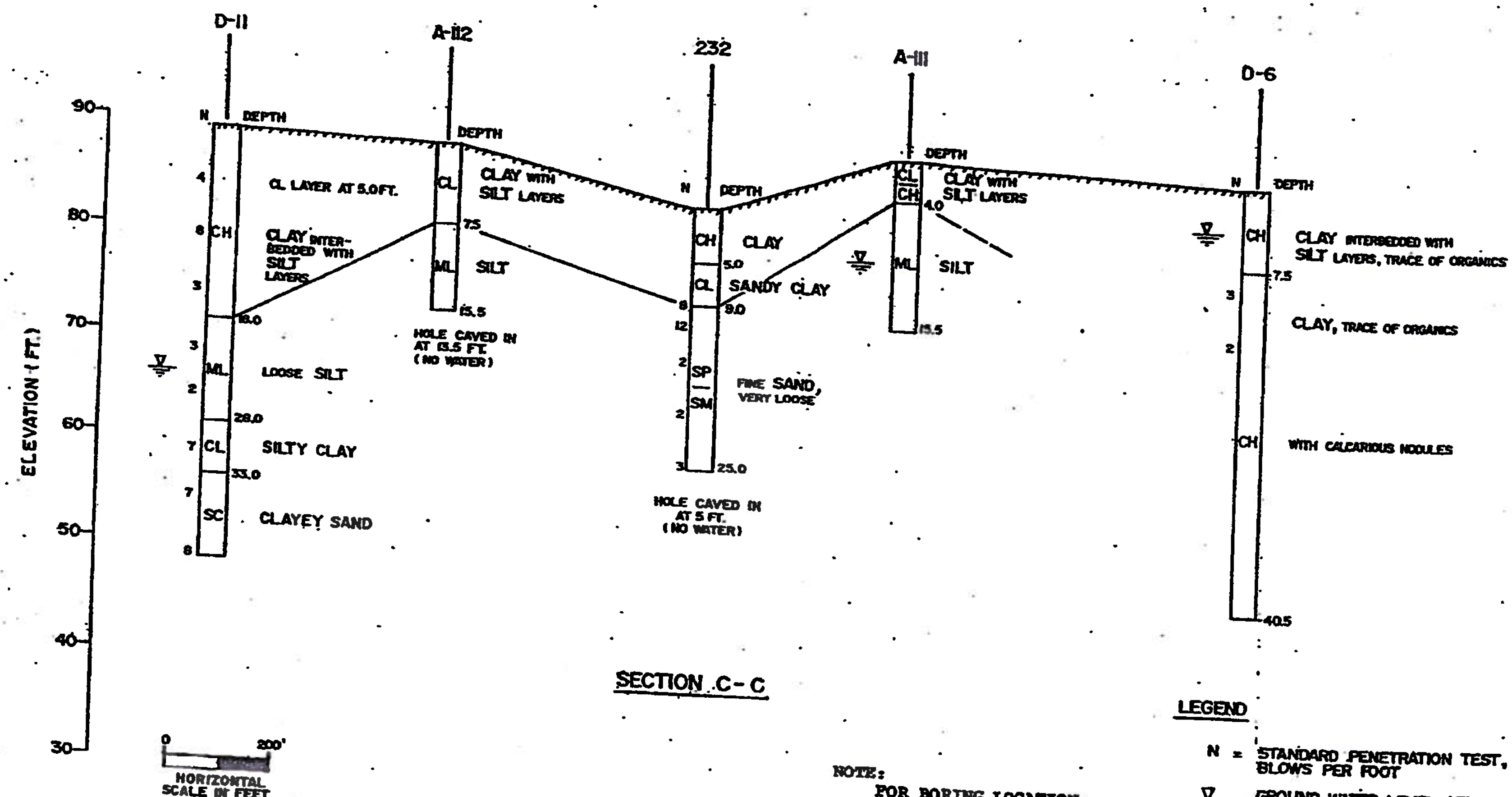




GENERALIZED SUBSURFACE DIAGRAM - SECTION B-B FLY ASH POND

RODEMACHER POWER STATION UNIT 2 SOLID WASTE MANAGEMENT PLAN PERMIT APPLICATION

EXHIBIT FA 6.4.3.B.2-3



SECTION C-C

NOTE:
FOR BORING LOCATION PLAN, SEE SECTION B-B

LEGEND

N = STANDARD PENETRATION TEST, BLOWS PER FOOT

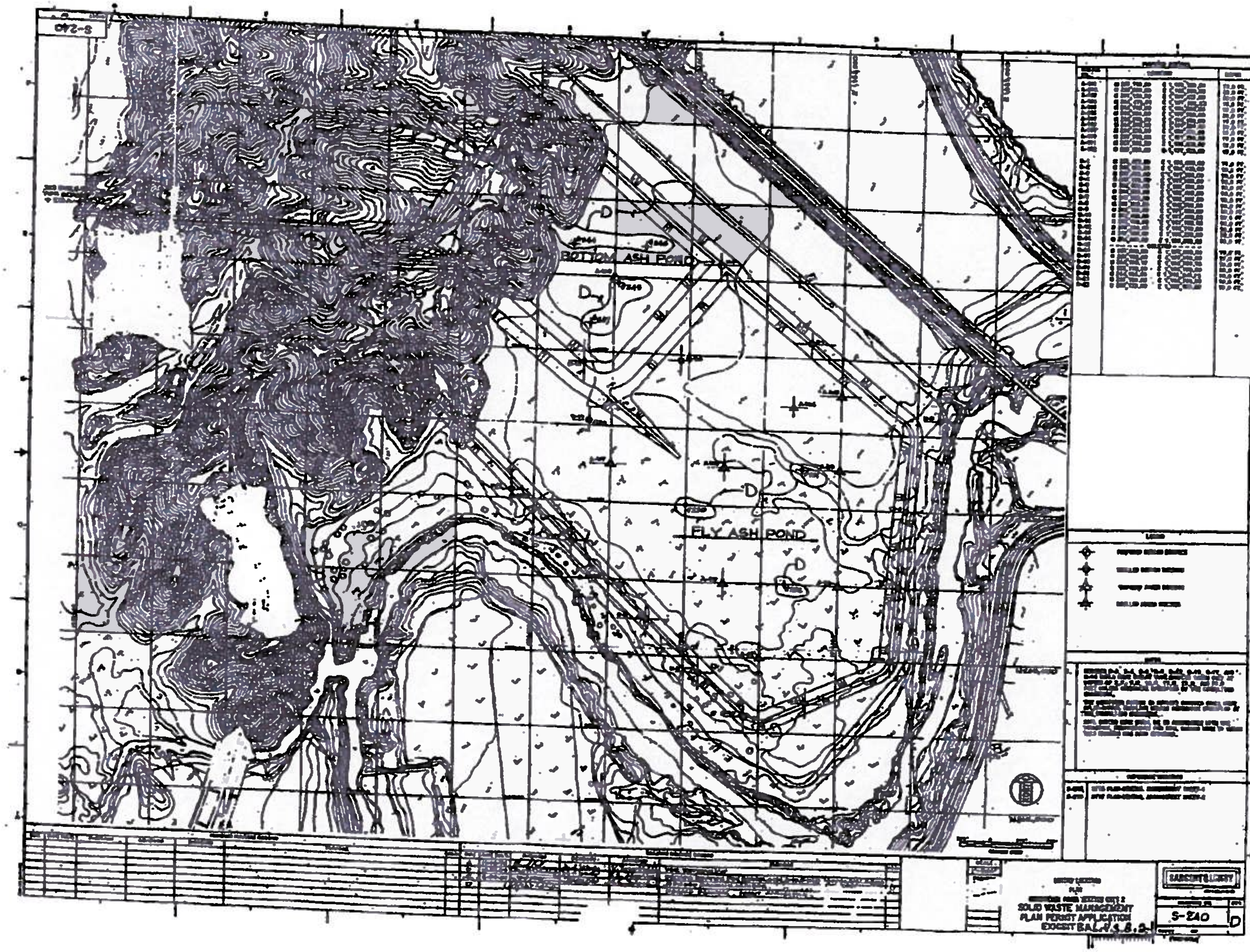
GROUND WATER LEVEL AFTER 24 HRS OF DRILLING

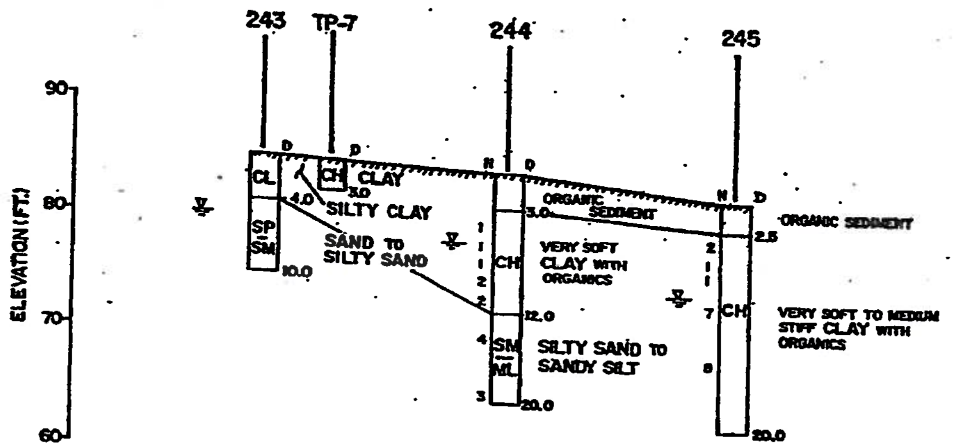
BOTTOM OF POND (TOP OF BORINGS)

GENERALIZED SUBSURFACE DIAGRAM - SECTION C-C FLY ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

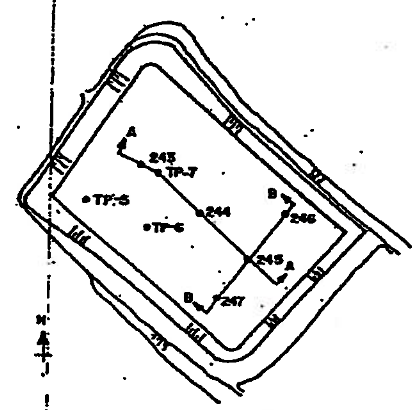
EXHIBIT FA 6.4.3.B.2-4


S-240
BOTTOM ASH POND
FLY ASH POND
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
S-240
D



SECTION A-A

0 200'
HORIZONTAL SCALE IN FEET



PLAN
N.T.S.

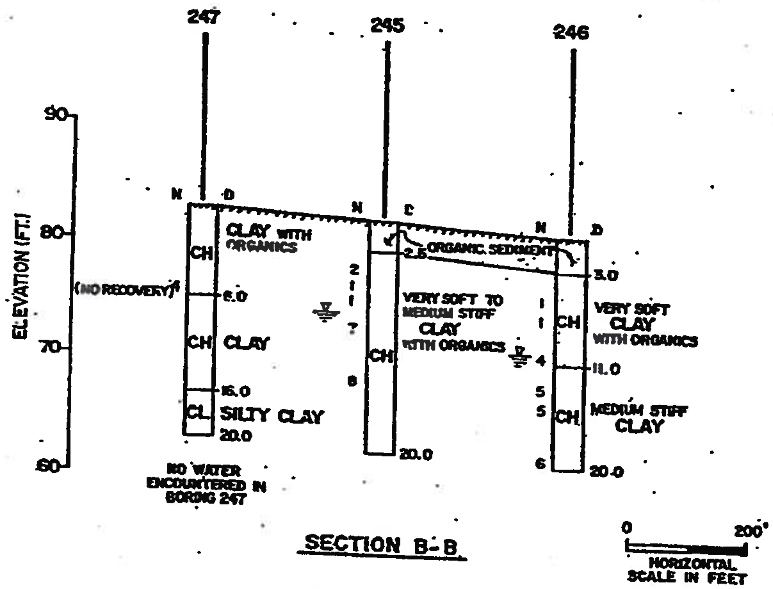
LEGEND

TP = TEST PIT
D = DEPT IN FEET
N = STANDARD PENETRATION TEST, BLOWS PER FOOT
= GROUND WATER LEVEL
= BOTTOM OF POND (TOP OF BORINGS)

GENERALIZED SUBSURFACE DIAGRAM – SECTION A-A
BOTTOM ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT BA 6.4.3.B.2-2



SECTION B-B

LEGEND

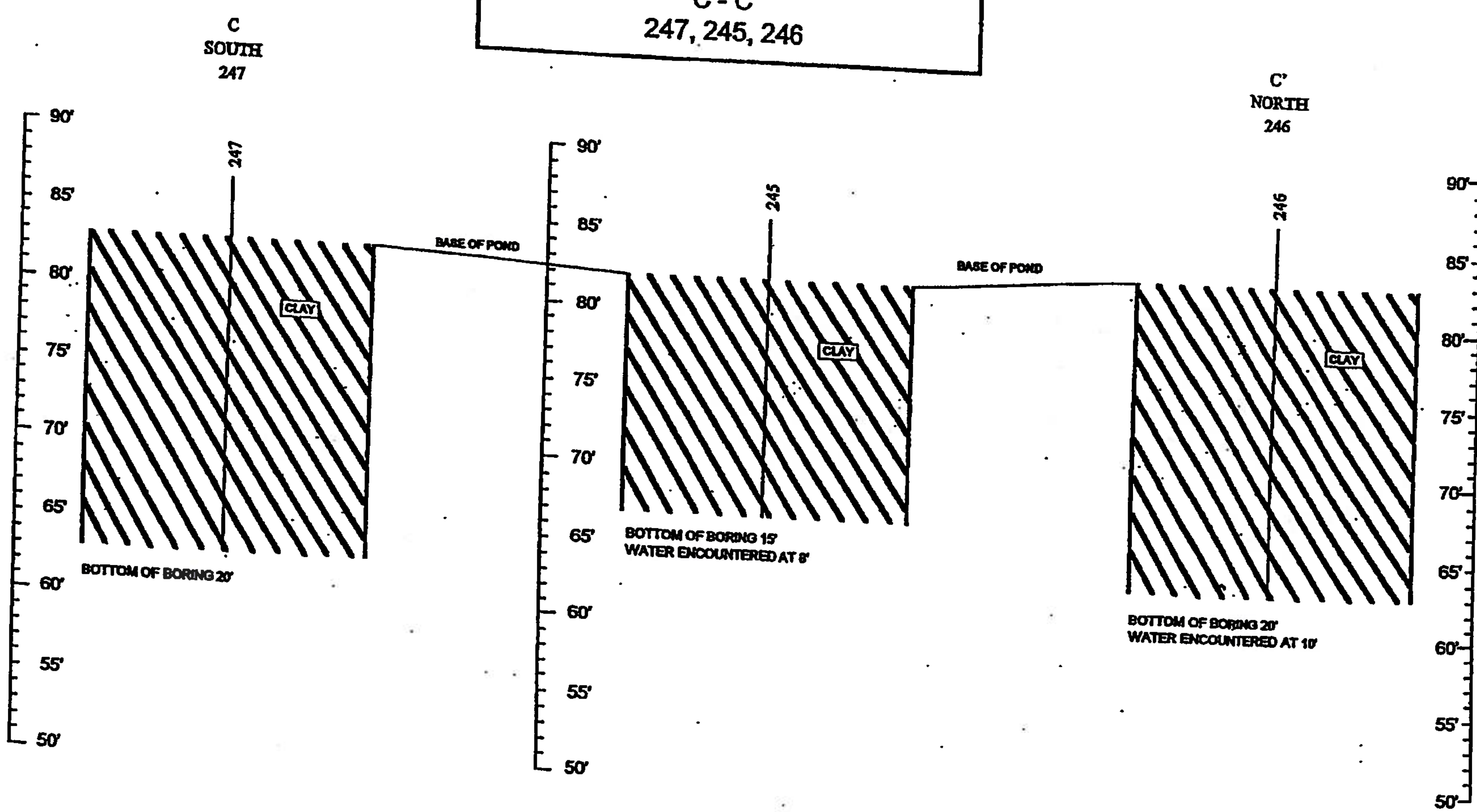
D = DEPTH IN FEET
N = STANDARD PENETRATION TEST, BLOWS PER FOOT
= GROUND WATER LEVEL
= BOTTOM OF POND (TOP OF BORINGS)

NOTE

1. FOR BORING LOCATION PLAN, SEE SECTION A-A.

GENERALIZED SUBSURFACE DIAGRAM - SECTION B-B. BOTTOM ASH POND
RODEMACHER POWER STATION UNIT 2 SOLID WASTE MANAGEMENT PLAN PERMIT APPLICATION EXHIBIT BA 6.4.3.B.2-3

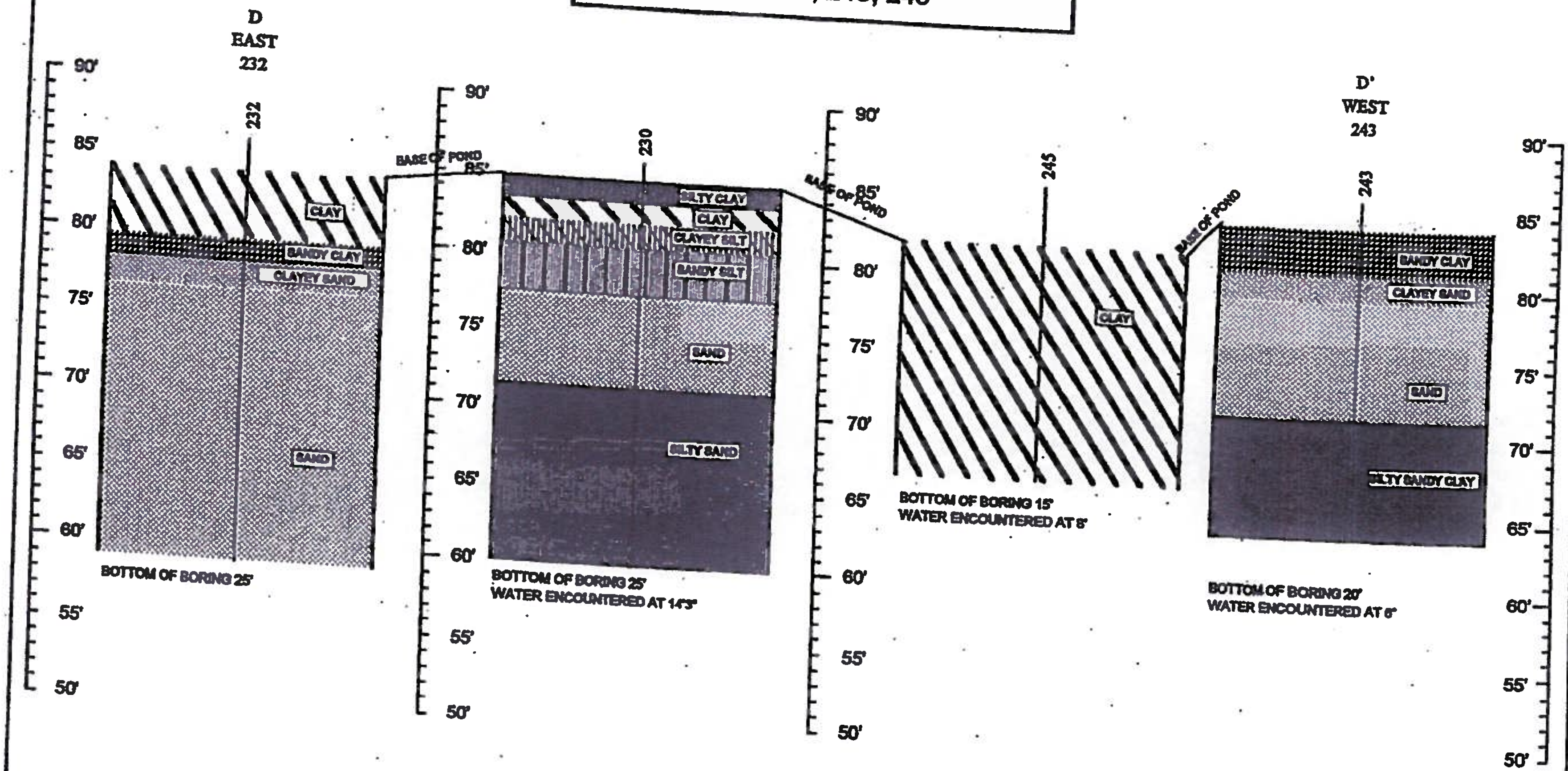
CROSS SECTION
C - C'
247, 245, 246



VERTICAL SCALE: 1" = 5'

DATE: 10/15/99	CLECO - Bottom Ash Pond CROSS SECTION C - C' BORING NOS. 247, 245, 246

CROSS SECTION
D - D'
232, 230, 245, 243



VERTICAL SCALE: 1" = 5'

	CLECO - Fly Ash Pond & Bottom Ash Pond
	CROSS SECTION D - D'
DATE: 10/15/99	BORING NOS. 232, 230, 245, 243

SOIL BORING LOG

BORING/WELL NO.:	EE-1
TOTAL DEPTH:	75 Feet
TOP OF CASING ELEV.:	NA Ft NGVD
GROUND SURFACE ELEV.:	90 Ft NGVD

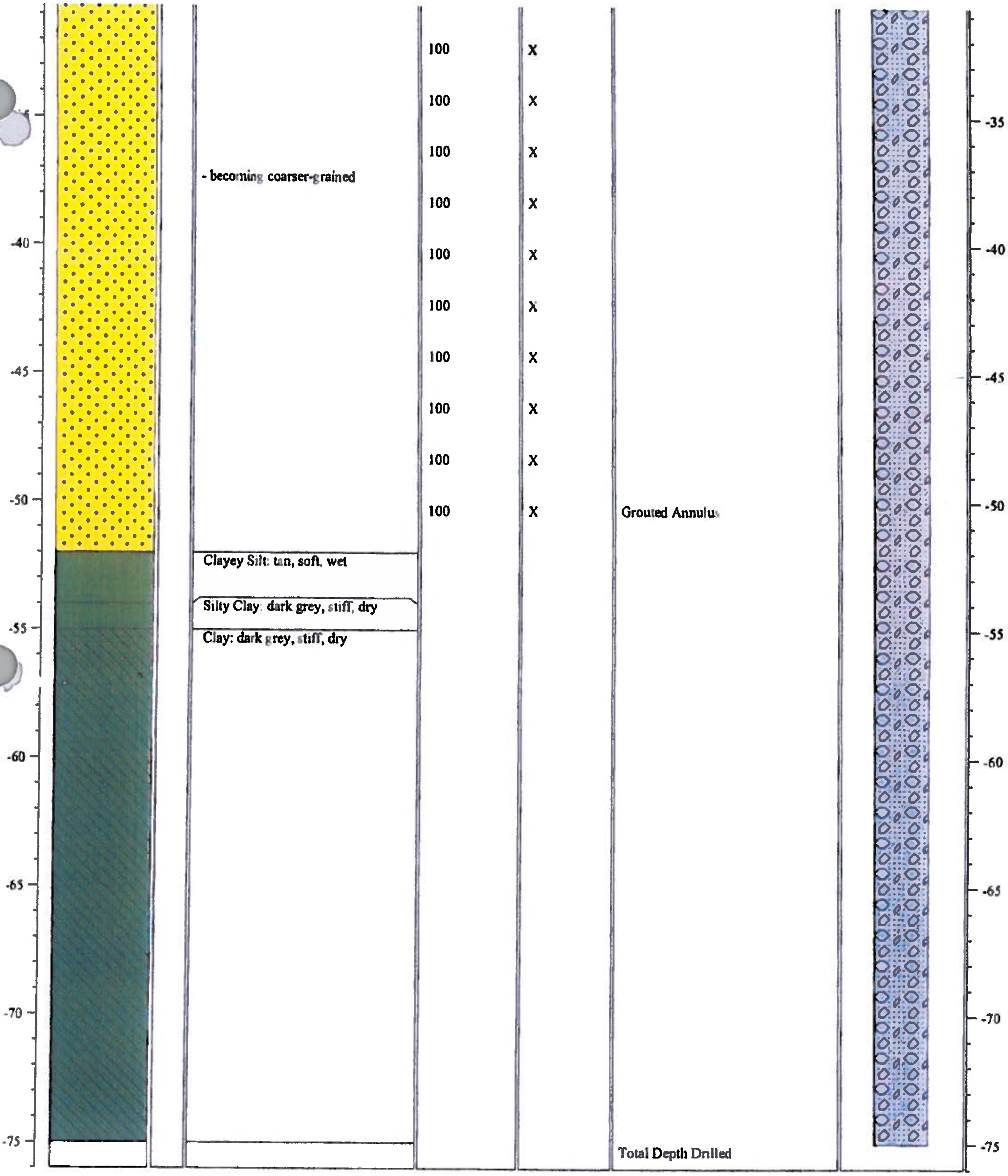
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

CLIENT:	Cleco Power, LLC	DRILLING CO.:	EDI Environmental
PROJECT:	Rodemacher Power Station	DRILLER:	D. Sandoz
SITE LOCATION:	Boyce, Louisiana	METHOD OF DRILLING:	DPT / HSA
PROJECT NO.:	01-0009	SAMPLING METHODS:	DPT / Split Spoon
LOGGED BY:	J. Mayeux	DATES DRILLED:	04/13/2005

NOTES:

- Water level during drilling: 8.0 feet bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	SAMPLE TAKEN	WELL DESCRIPTION	WELL CONSTRUCTION
0		CL	Silty Sand: tan, very fine-grained, loose				0
				100	X		
				100	X		
-5							-5
				100	X		
			- wet	100	X		
-10			Sand tan, fine- to medium-grained, loose	100	X	3-inch Diameter Borehole	-10
				100	X		
-15				100	X		-15
				100	X		
			Clay: grey, stiff, with some gravel	100	X		
-20		CL		100	X	Grouted Annulus	-20
			Sand tan, medium-grained, loose, with some gravel, wet	100	X		
-25		SC		100	X		-25
				100	X		
				100	X		
-30				100	X		-30



-40
-45
-50
-55
-60
-65
-70
-75
- becoming coarser-grained
Clayey Silt: tan, soft, wet
Silty Clay: dark grey, stiff, dry
Clay: dark grey, stiff, dry
100
100
100
100
100
100
100
100
100
100
X
X
X
X
X
X
X
X
X
X
Grouted Annulus
Total Depth Drilled
-35
-40
-45
-50
-55
-60
-65
-70
-75

SOIL BORING LOG

BORING/WELL NO.:	**W-25**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**124.74 Ft NGVD**
GROUND SURFACE ELEV.:	**121.32 Ft NGVD**

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

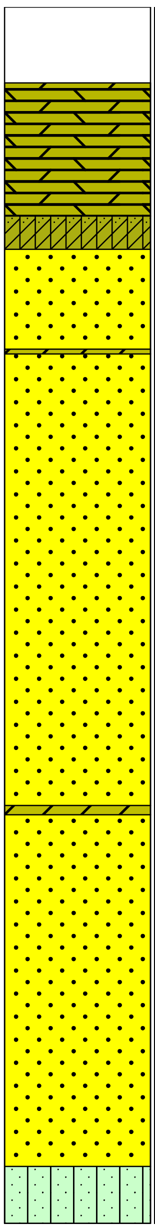
CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/06/2017**

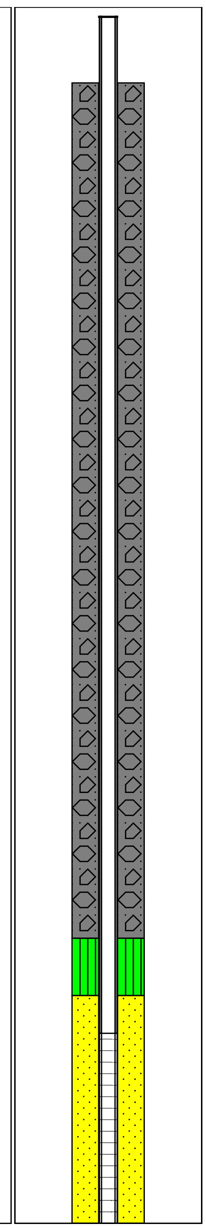
Notes:

Water level during drilling: 25 ft bgs

Water level in completed well: 23.35 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0			Fill: Orange, black, tan, rocks, sandy clay, sand, loose, loose	100			Well Cap	
-5		CL	Sandy Silty Clay: Dark brown, ligght grey, moist-dry	90			4.5-inch Borehole	
-10		SP	Sand: Tan, yellow, very fine-grained, loose, well sorted, dry	100				
-15		CL SP	Clay: Light red-brown, pink, soft Sand: Yellow-tan, very finegrained, loose, well sorted	100			Grouted Annulus	
-20			- becoming pale yellow, white - with coarse gravel	100			2-inch Dia Sch 40 PVC Casing	
-25			- fine- to coarse-grained, poorly sorted, with some pebbles, wet	100				
-30			- becoming pink to red-beige	100				
-35		CL	- with abundant pebbles Clay: Mottled red-grey, soft	100				
-40		SP	Sand: Red-orange, light brown, slightly clayey, fine- to coarse-grained, poorly sorted, with pebbles and gravel	100				
-45				100			Bentonite Seal 20/30 Sand Above Pre-pack	
-50			- coarse-grained sand, with pebbles and gravel	100			2-inch Dia Sch 40 PVC Screen 20/30 Pre-pack Sand	
-55		SW	Silty Sand: Brown, fine-grained, loose, wet	100				
-60							Total Depth Drilled	





SOIL BORING LOG

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

BORING/WELL NO.:	**W-26**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**129.42 Ft NGVD**
GROUND SURFACE ELEV.:	**125.89 Ft NGVD**

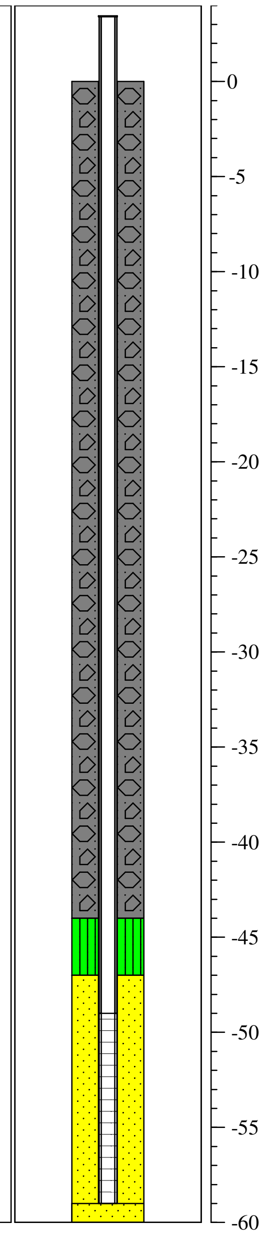
CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/07/2017**

Notes:

Water level during drilling: 30 ft bgs

Water level in completed well: 29.93 ft bgs

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
							Well Cap	
0		SP	Sand: Tan, yellow, fine- to medium-grained, loose, moist					
		CL	Silty Clay: Orange-red, stiff, with sand seams at 2.0 ft, 2.5 ft, 3.0 ft	60				
-5		SM	Sandy Silt: Orange-red, very fine-grained, loose, dry				4.5-inch Borehole	
			- with dark orange bands	90				
-10				100				
-15				100			Grouted Annulus	
-20		SP	Sand: Dark orange-red, very fine- to fine-grained, loose, dry	100			2-inch Dia Sch 40 PVC Casing	
-25			- becoming yellow					
			- becoming orange	100				
-30			- fine-grained, wet	100				
-35			- becoming tan-light yellow					
			- with thin soft orange clay pocket	100				
			- trasition to white, pale yellow sand					
-40		SW	- with random fine to coarse gravel, light brown, with some clayey sand	100				
-45			- becoming dark yellow, light brown				Bentonite Seal	
				100			20/30 Sand Above Pre-pack	
-50							2-inch Dia Sch 40 PVC Screen	
-55			- with coarse gravel	100				
			- with coarse gravel, fine- to medium-grained sand				20/30 Pre-pack Sand	
-60				100			Total Depth Drilled	



SOIL BORING LOG

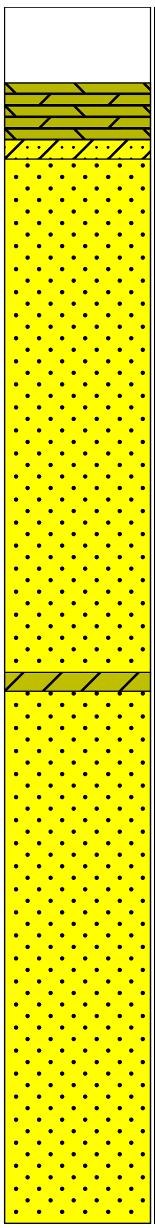
BORING/WELL NO.:	**W-27**
TOTAL DEPTH:	**60 Feet**
TOP OF CASING ELEV.:	**119.43 Ft NGVD**
GROUND SURFACE ELEV.:	**116.92 Ft NGVD**

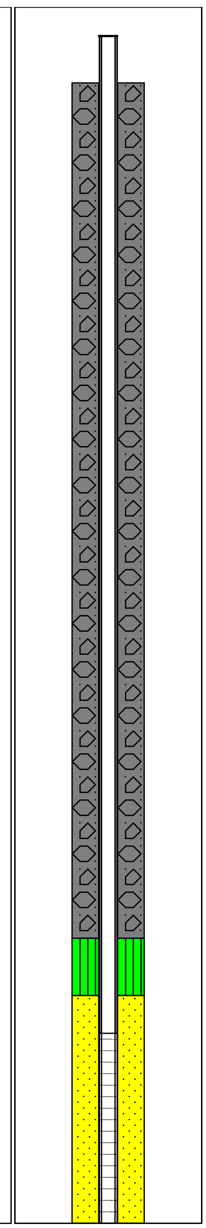
CLIENT:	**Cleco BEC**	DRILLING CO.:	**C&S Lease Service**
PROJECT:	**Ash Ponds**	DRILLER:	**Michael Dodson**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**DPT**
PROJECT NO.:	**01-17-0173**	SAMPLING METHODS:	**DPT**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**11/08/2017**

Notes:

Water level during drilling: 19 ft bgs

Water level in completed well: 19.15 ft bgs





DEPTH	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION
						Well Cap
0		Fill: Orange-red, clayey sand and sand, dry	60			
-5	SC SP	Clayey Sand: Orange, very fine- to fine-grained, dry				4.5-inch Borehole
		Sand: Orange-yellow, very fine-grained, loose, dry	75			
-10			75			
-15						Grouted Annulus
-20		- wet	75			2-inch Dia Sch 40 PVC Casing
-25			75			
		- with coarse-grained sand	100			
-30		Clay: Grey, with ferric staining, soft-very stiff				
	CL SP	Sand: Orange, medium-grained, with pebbles, loose, well sorted, wet	100			
-35		- with abundant pebbles, coarse-grained sand, some coarse gravel				
-40	SW		100			
-45		- medium- to coarse-grained, with pebbles	70			Bentonite Seal
-50		- with coarse gravel	100			20/30 Sand Above Pre-pack
						2-inch Dia Sch 40 PVC Screen
-55		- medium-grained sand, brown-yellow	100			20/30 Pre-pack Sand
-60			100			Total Depth Drilled

SOIL BORING LOG

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

BORING/WELL NO.:	**B-18-1**
TOTAL DEPTH:	**12.5 Feet**
TOP OF CASING ELEV.:	**NA**
GROUND SURFACE ELEV.:	**89.98 Ft NGVD**

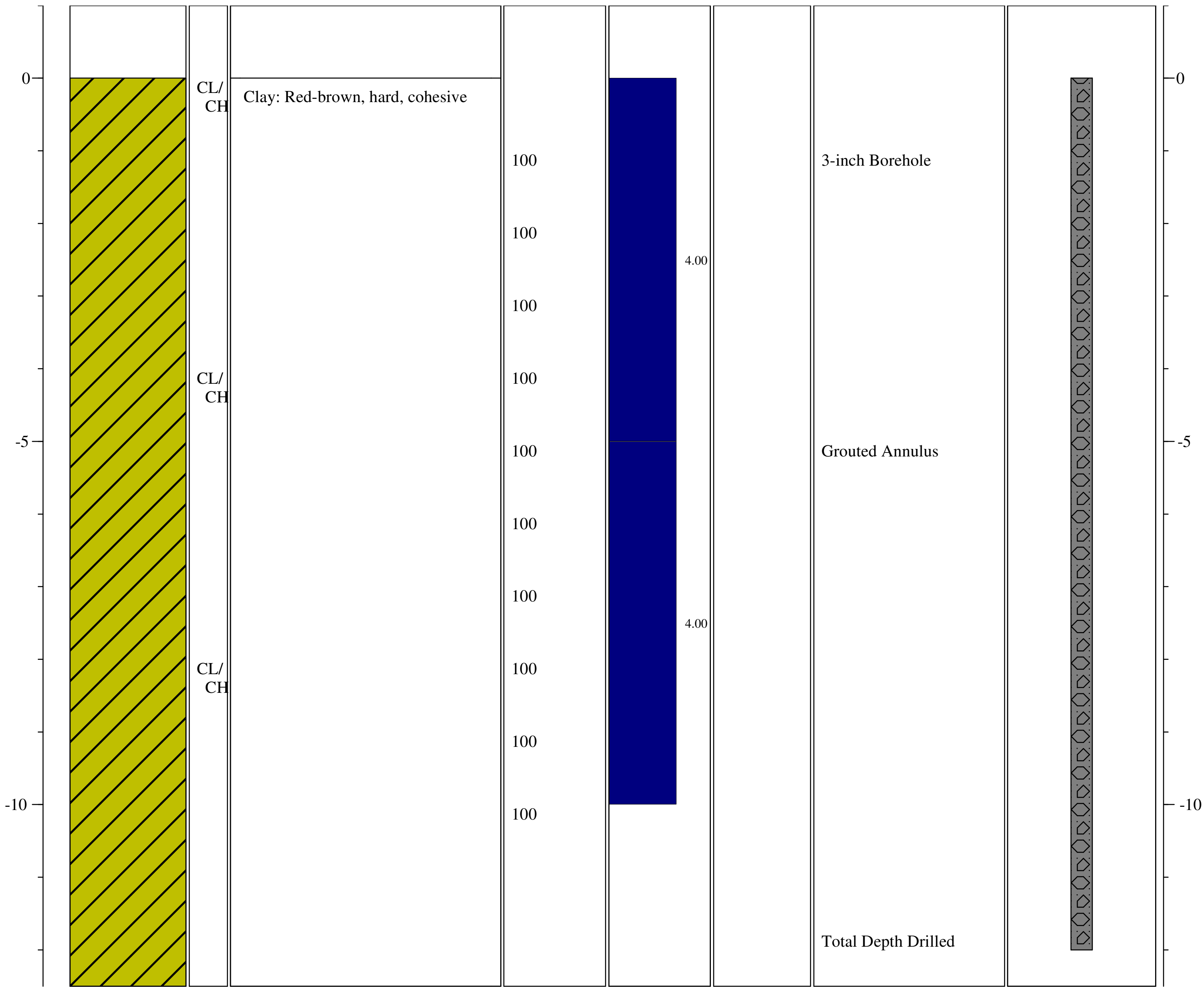
CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Hand Auger**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Hand Auger**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**12-18-2017**

Notes:

Water level during drilling: >TD

Water level in completed well: NA

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION



SOIL BORING LOG

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

BORING/WELL NO.:	**B-18-2**
TOTAL DEPTH:	**50 Feet**
TOP OF CASING ELEV.:	**NA**
GROUND SURFACE ELEV.:	**120.04 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Direct-Push Technology**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Direct-Push Technology**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**01-08-2018**

Notes:

Water level during drilling: >TD

Water level in completed well: NA

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0		CL/ CH	Clay: Grey, with heavy ferric staining	100	3.00		3-inch Borehole	
-5		SC	Sand: Yellow, coarse-grained, loose, dry	100	2.00			
		CL	Sandy Clay: Red, cohesive, fine-grained					
-10		SW	Sand: Light tan, medium-grained, loose, dry	100				
-15			- with light iron staining	100			Grouted Annulus	
-20			- coarse-grained					
			- wet	100				
-25				100				
-30			- red, with pebbles	100				
-35		CL/ CH	Clay: Grey, heavy ferric staining, hard, plastic, dry	100	3.00			
-40				100	3.00			
			- with some sand, green					
-45		SW	Sand: Grey, red, coarse-grained, with pebbles, loose	100				
-50							Total Depth Drilled	

SOIL BORING LOG

BORING/WELL NO.:	**B-18-3**
TOTAL DEPTH:	**50 Feet**
TOP OF CASING ELEV.:	**NA**
GROUND SURFACE ELEV.:	**121.14 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Direct-Push Technology**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Direct-Push Technology**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**01-09-2018**

Notes:

Water level during drilling: >TD

Water level in completed well: NA

DEPTH	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0 to -5	CL/ CH	Clay: Grey, with heavy ferric staining	100	3.00		3-inch Borehole	
-5	SC	Sand: Yellow, coarse-grained, loose, dry	100				
	CL	Sandy Clay: Red, cohesive, fine-grained		2.00			
-10	SW	Sand: Light tan, medium- to coarse- grained, some minor clay, loose, wet	100				
-15						Grouted Annulus	
		- with light iron staining	100				
-20		- coarse-grained					
		- wet	100				
-25							
			100				
-30							
		- red, with pebbles	100				
-35	CL/ CH	Clay: Mottled, brown, red, white, medium, ferric staining, plastic, dry	100	3.00			
-40	SW	Sand: White, tan, fine-grained, loose, moist					
	CL/ CH	Clay: Mottled red-white, ferric staining, stiff, plastic, dry	100	3.00			
-45							
	SW	Sand: Grey, red, coarse-grained, with pebbles, loose	100				
-50						Total Depth Drilled	

SOIL BORING LOG

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

BORING/WELL NO.:	**B-18-4**
TOTAL DEPTH:	**14 Feet**
TOP OF CASING ELEV.:	**NA**
GROUND SURFACE ELEV.:	**91.47 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Hand Auger**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Hand Auger**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**01-08-2018**

Notes:

Water level during drilling: >TD

Water level in completed well: NA

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0		CL/ CH	Clay: Red-brown, medium - stiff, high plasticity					
				100			3-inch Borehole	
				100	3.00			
				100				
		CL/ CH		100				
-5				100			Grouted Annulus	
				100				
				100	3.00			
		CL/ CH		100				
				100				
-10				100				
				100				
				100				
				100				
		SW	Sandy Gravel: Tan, pebbles, some clay					

SOIL BORING LOG

BORING/WELL NO.:	**B-18-5**
TOTAL DEPTH:	**15 Feet**
TOP OF CASING ELEV.:	**NA**
GROUND SURFACE ELEV.:	**92.32 Ft NGVD**

CLIENT:	**Cleco BEC**	DRILLING CO.:	**Devonian Group**
PROJECT:	**SW Permitting**	DRILLER:	**C Hebert**
SITE LOCATION:	**Boyce, Louisiana**	METHOD OF DRILLING:	**Hand Auger**
PROJECT NO.:	**01-16-0162**	SAMPLING METHODS:	**Hand Auger**
LOGGED BY:	**R Sturdivant**	DATES DRILLED:	**01-09-2018**

Notes:

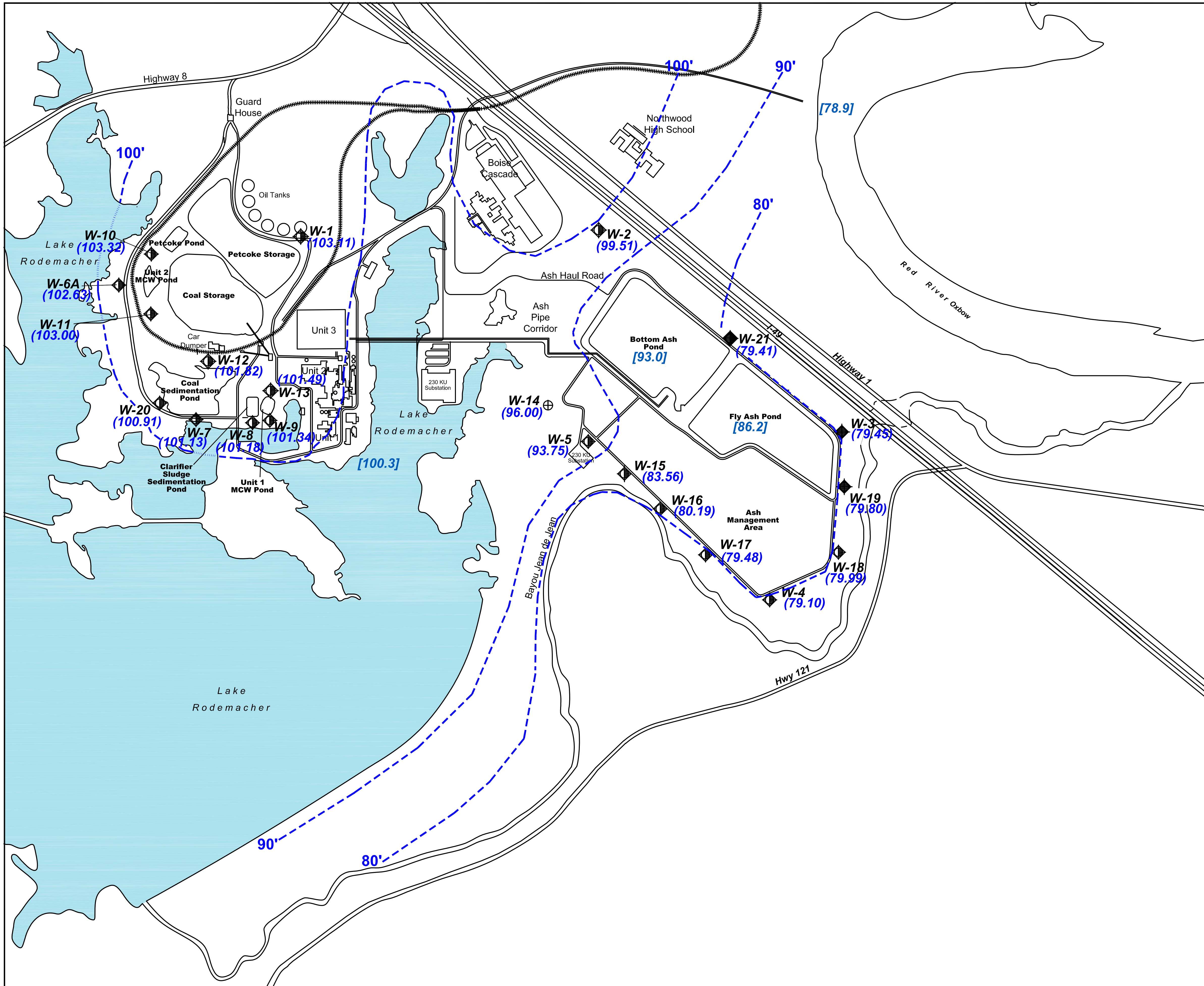
Water level during drilling: >TD

Water level in completed well: NA

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	STIFFNESS (Kg/cm^2)	SAMPLE TAKEN	BORING DESCRIPTION	WELL CONSTRUCTION
0		CL/ CH	Clay: Brown, green-grey, plastic, medium-stiff	100 100 100	3.00		3-inch Borehole	
-5		CL/ CH		100 100 100 100 100 100	3.00		Grouted Annulus	
-10		CL/ CH CL/ CH		100 100 100 100 100	3.00		Total Depth Drilled	
-15								

APPENDIX E

POTENTIOMETRIC SURFACE MAPS



Legend

Railroad Tracks

CCR Compliance Well Location

Non-CCR Piezometer Location

(79.10) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[93.0] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

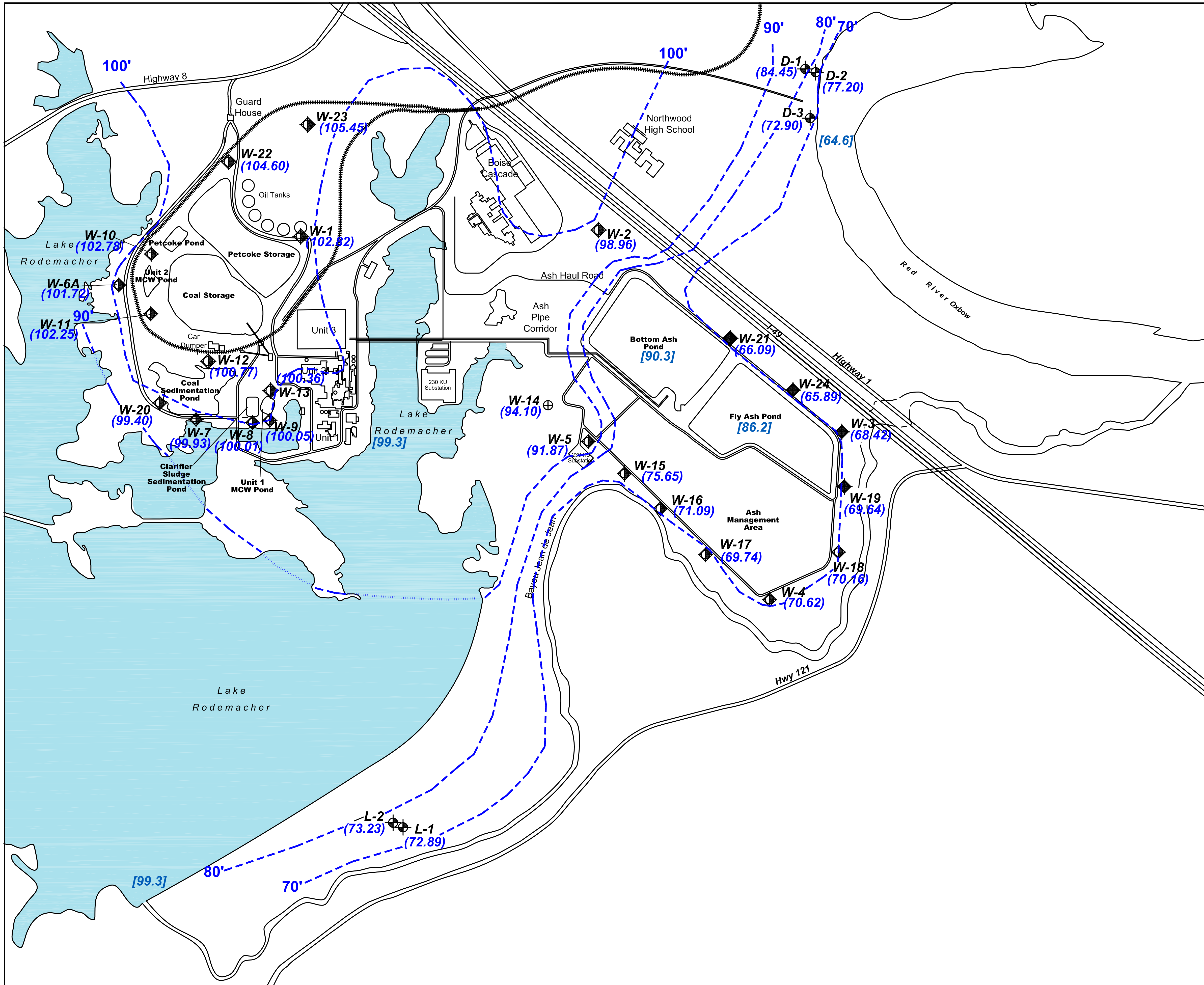
Cleco Brame
Potentiometric Surface Contour Map
April 2016

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-20-0220-APP-E-1

Figure E-1



CLECO Corporation

Brame Energy Center

Cleco Brame
Potentiometric Surface Contour Map
October 2016

Rapides Parish, Louisiana

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

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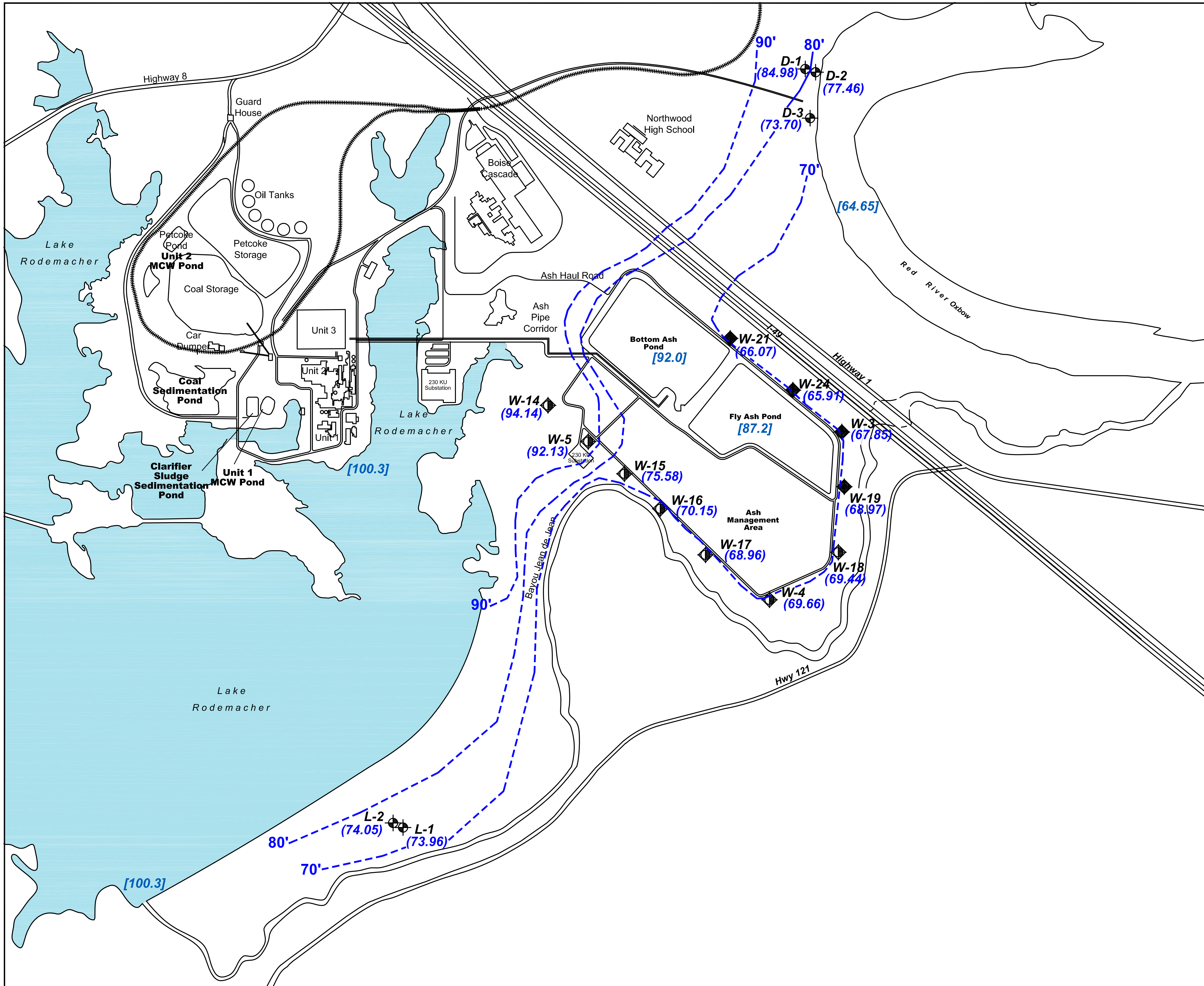
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-20-0220-APP-E-2

Figure E-2



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (68.97) Potentiometric Surface Elevation, Ft. NGVD
- 70' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [92.0] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

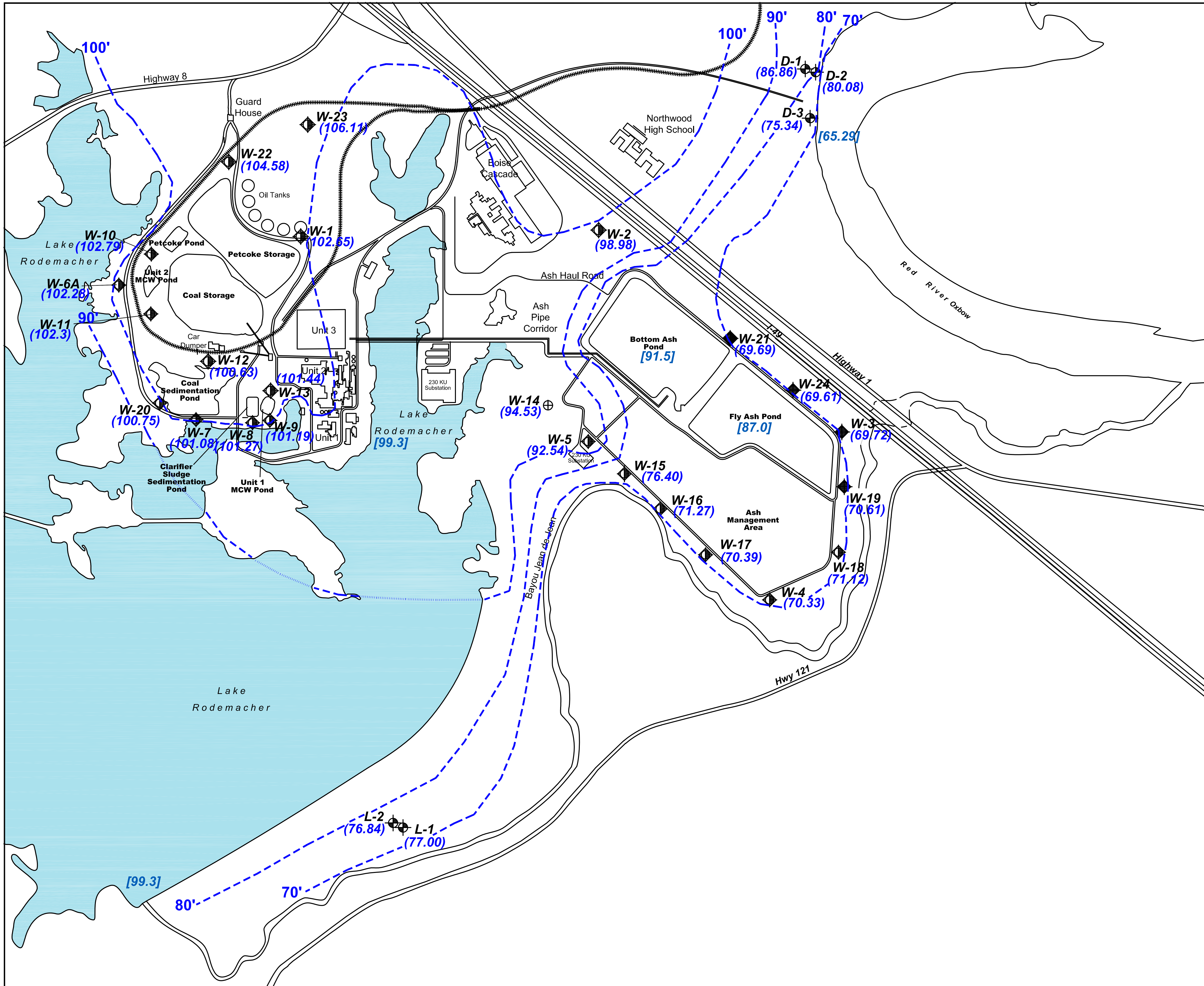
CCR Rule Wells
Potentiometric Surface Contour Map
December 2016

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	3/1/17
Dwg. No.:	01-20-0220-APP-E-3

Figure E-3



N

Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(70.33) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[91.5] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

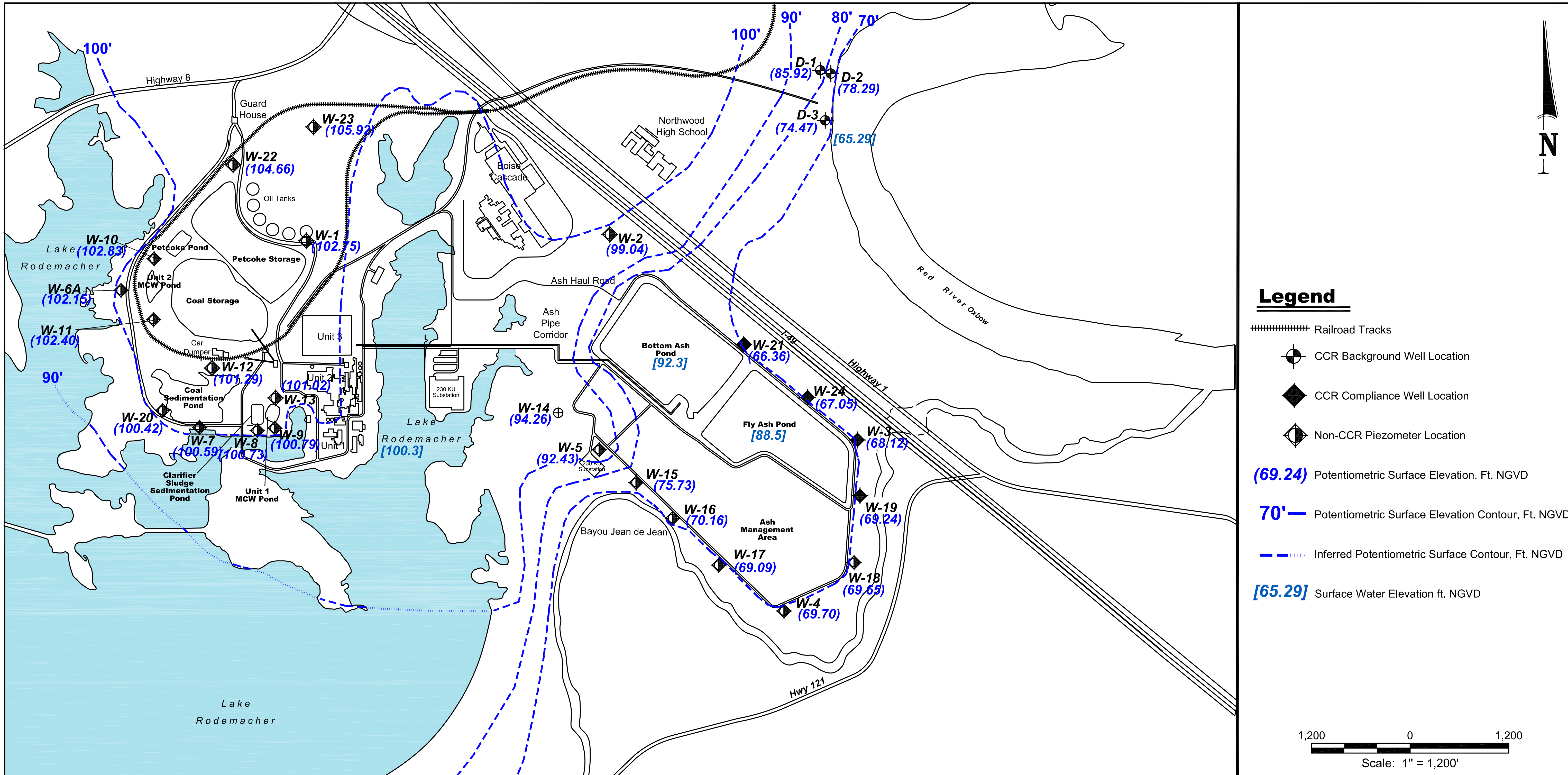
Cleco Brame
Potentiometric Surface Contour Map
January 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-20-0220-APP-E-4

Figure E-4



CLECO Corporation

Brame Energy Center

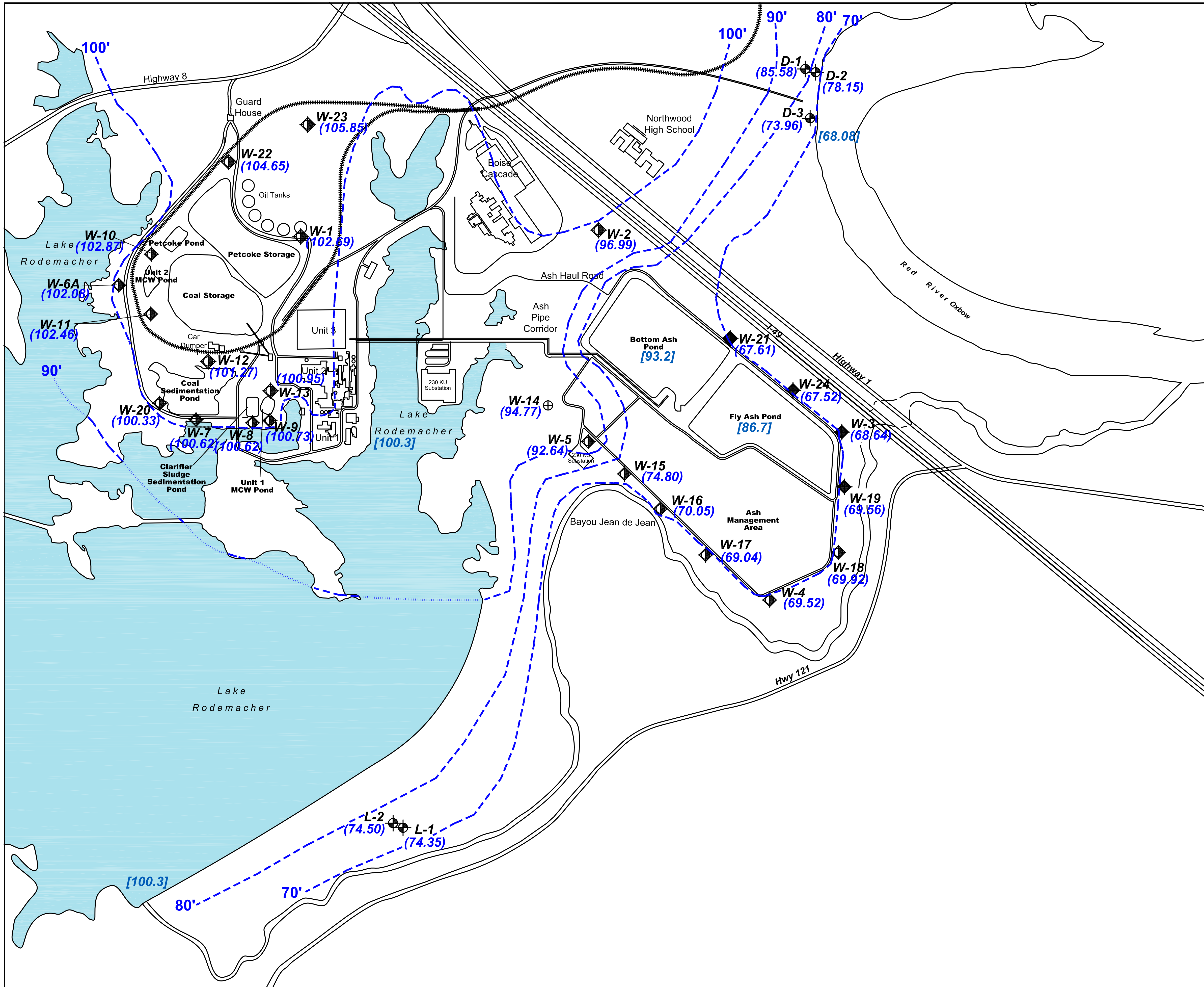
Cleco Brame
Potentiometric Surface Contour Map
February 2017

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	3/23/17
Dwg. No.:	01-20-0220-APP-E-5

Figure E-5



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(69.52) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[68.08] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

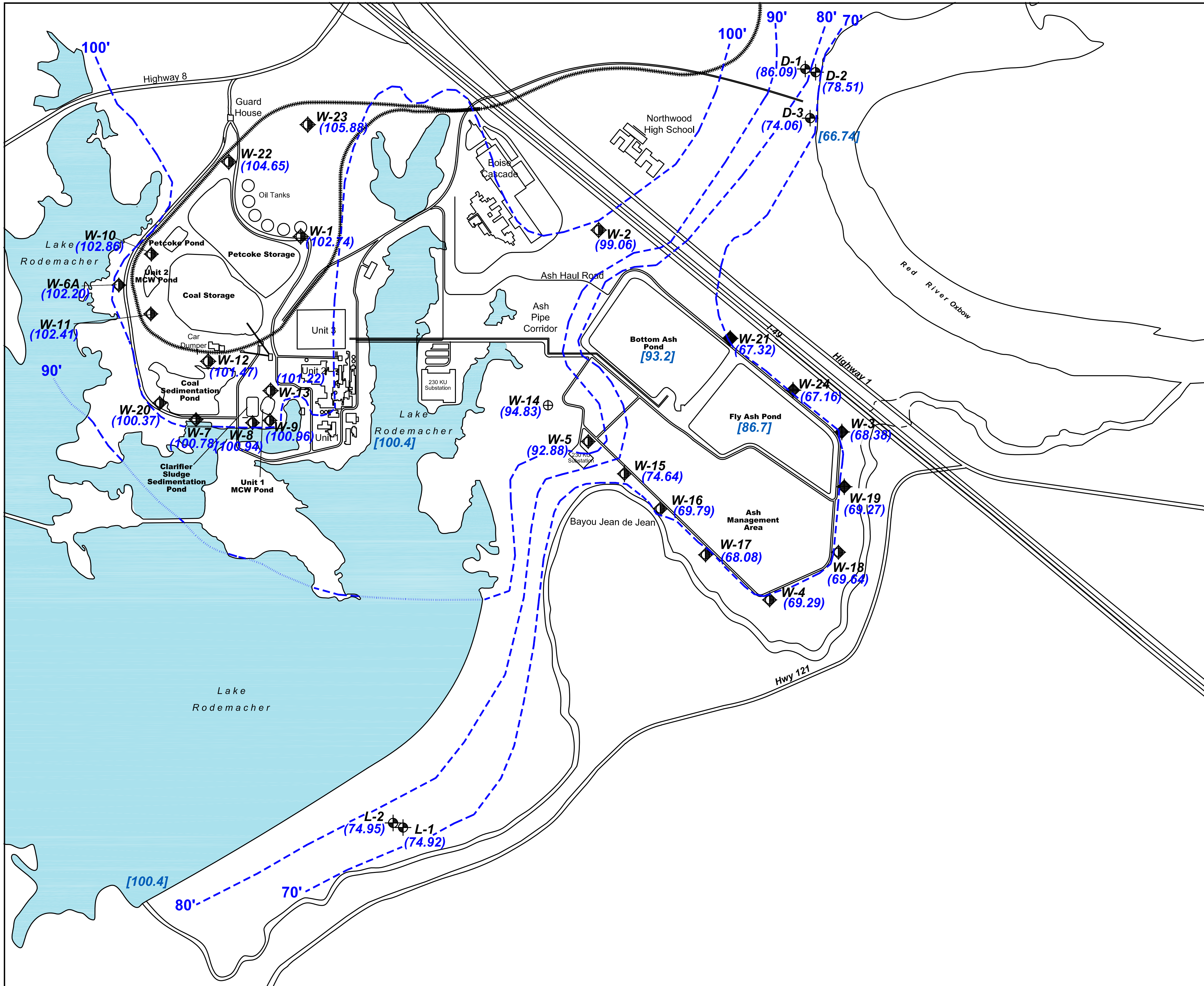
Cleco Brame
Potentiometric Surface Contour Map
May 2017

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	6/23/17
Dwg. No.:	01-20-0220-APP-E-6

Figure E-6



Legend

Railroad Tracks
CCR Background Well Location
CCR Compliance Well Location
Non-CCR Piezometer Location
(69.27) Potentiometric Surface Elevation, Ft. NGVD
70' Potentiometric Surface Elevation Contour, Ft. NGVD
Inferred Potentiometric Surface Contour, Ft. NGVD
[66.74] Surface Water Elevation ft. NGVD

1,200 0 1,200
Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

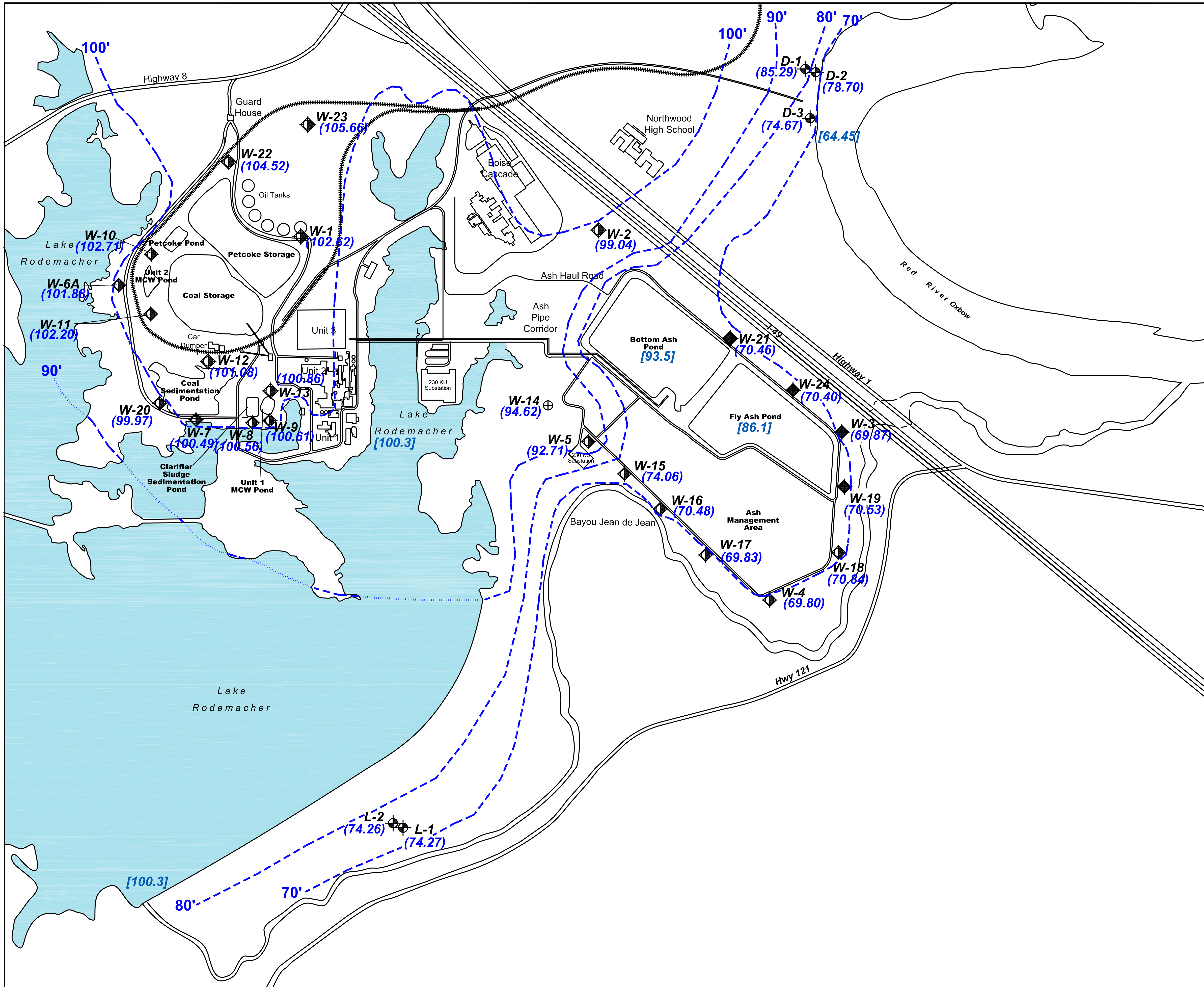
Cleco Brame
Potentiometric Surface Contour Map
June 2017

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	7/5/17
Dwg. No.:	01-20-0220-APP-E-7

Figure E-7



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(70.46) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[64.45] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

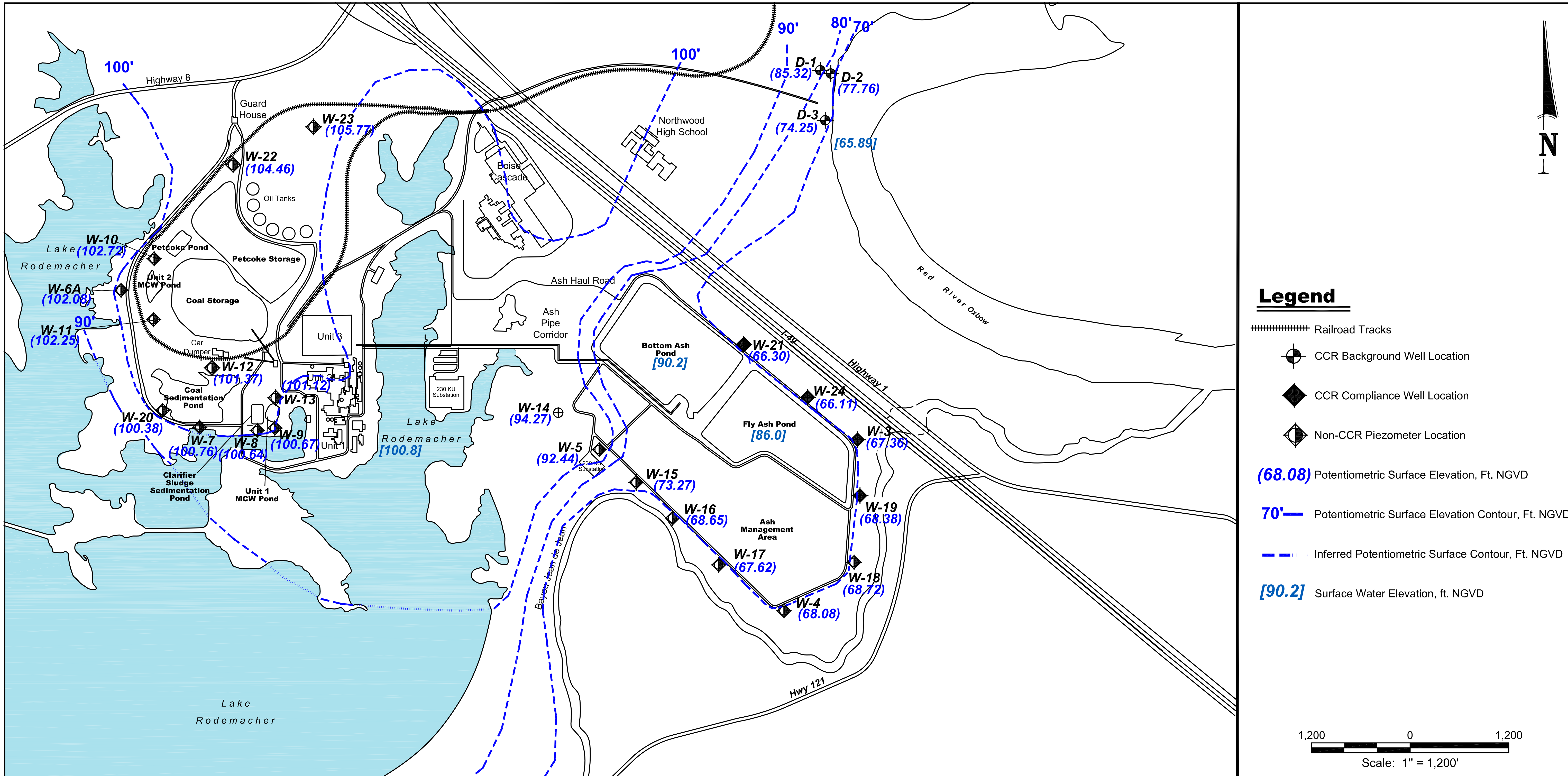
Cleco Brame
Potentiometric Surface Contour Map
August 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	8/30/17
Dwg. No.:	01-20-0220-APP-E-8

Figure E-8



CLECO Corporation

Brame Energy Center

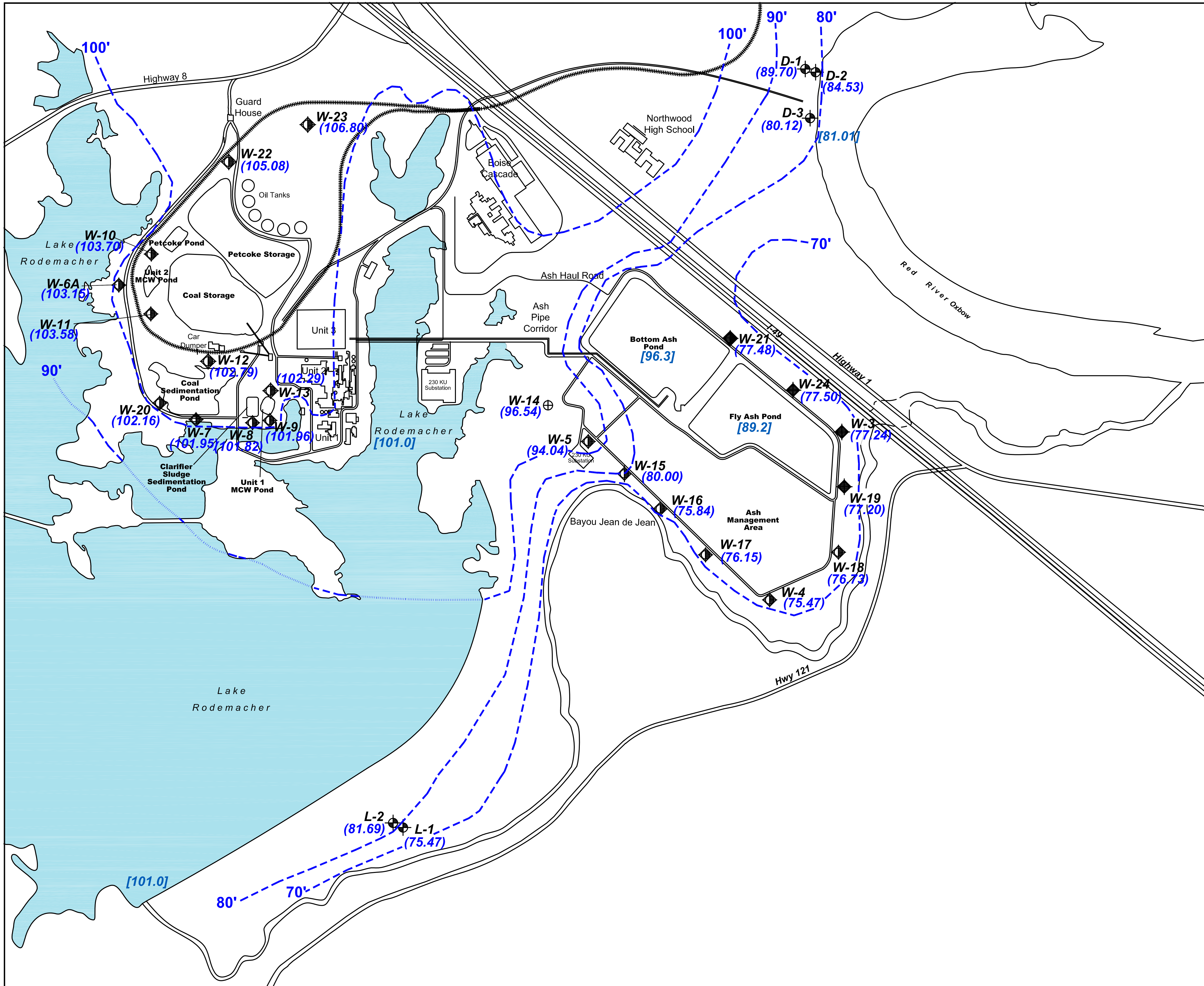
Cleco Brame
Potentiometric Surface Contour Map
January 2018

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	1/24/18
Dwg. No.:	01-20-0220-APP-E-9

Figure E-9



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(77.48) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[81.01] Surface Water Elevation ft. NGVD

CLECO Corporation

Brame Energy Center

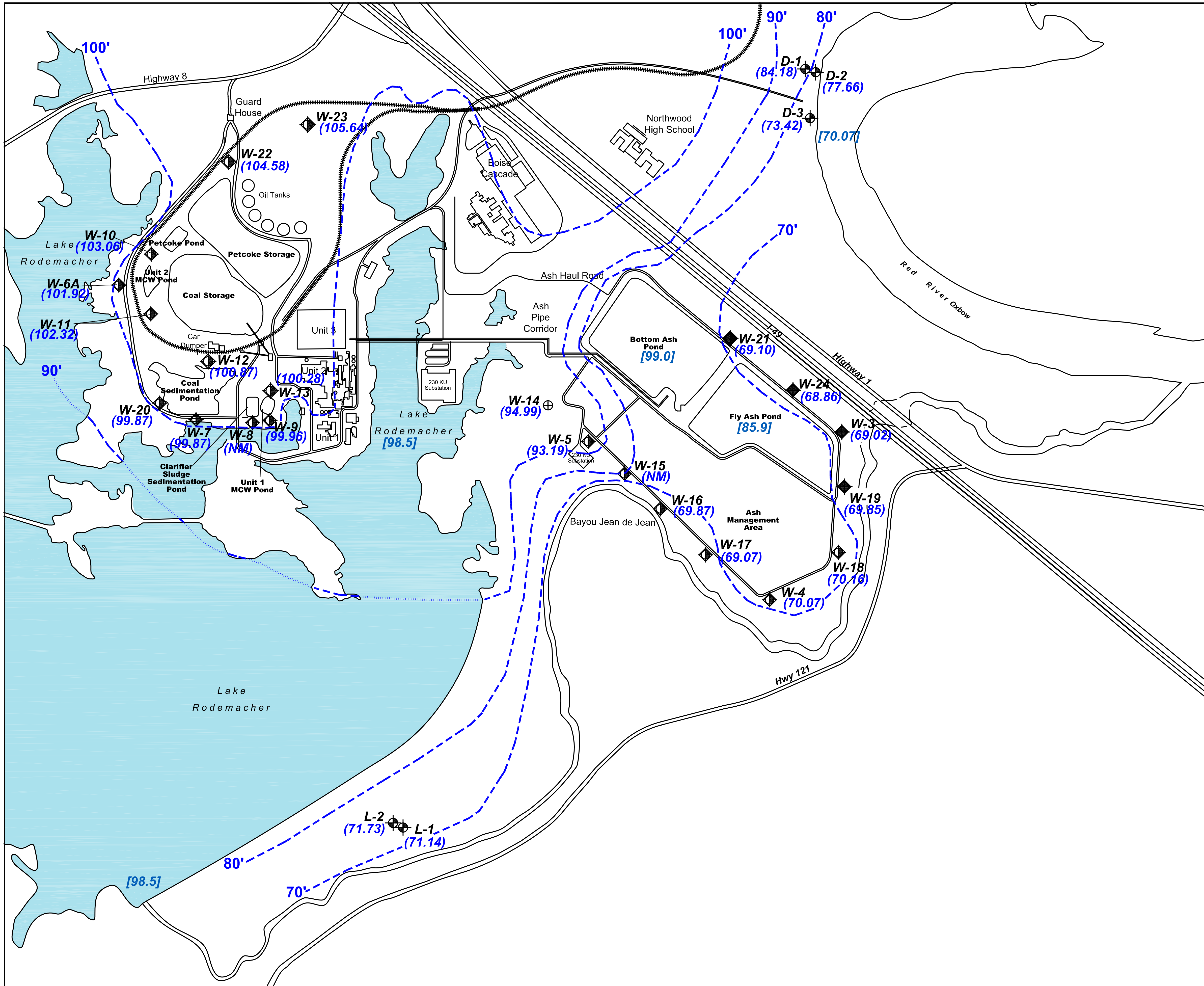
Cleco Brame
Potentiometric Surface Contour Map
April 2018

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	5/10/18
Dwg. No.:	01-20-0220-APP-E-10

Figure E-10



N

Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (73.42) Potentiometric Surface Elevation, Ft. NGVD
- 70' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [70.07] Surface Water Elevation ft. NGVD
- NM Not Measured

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

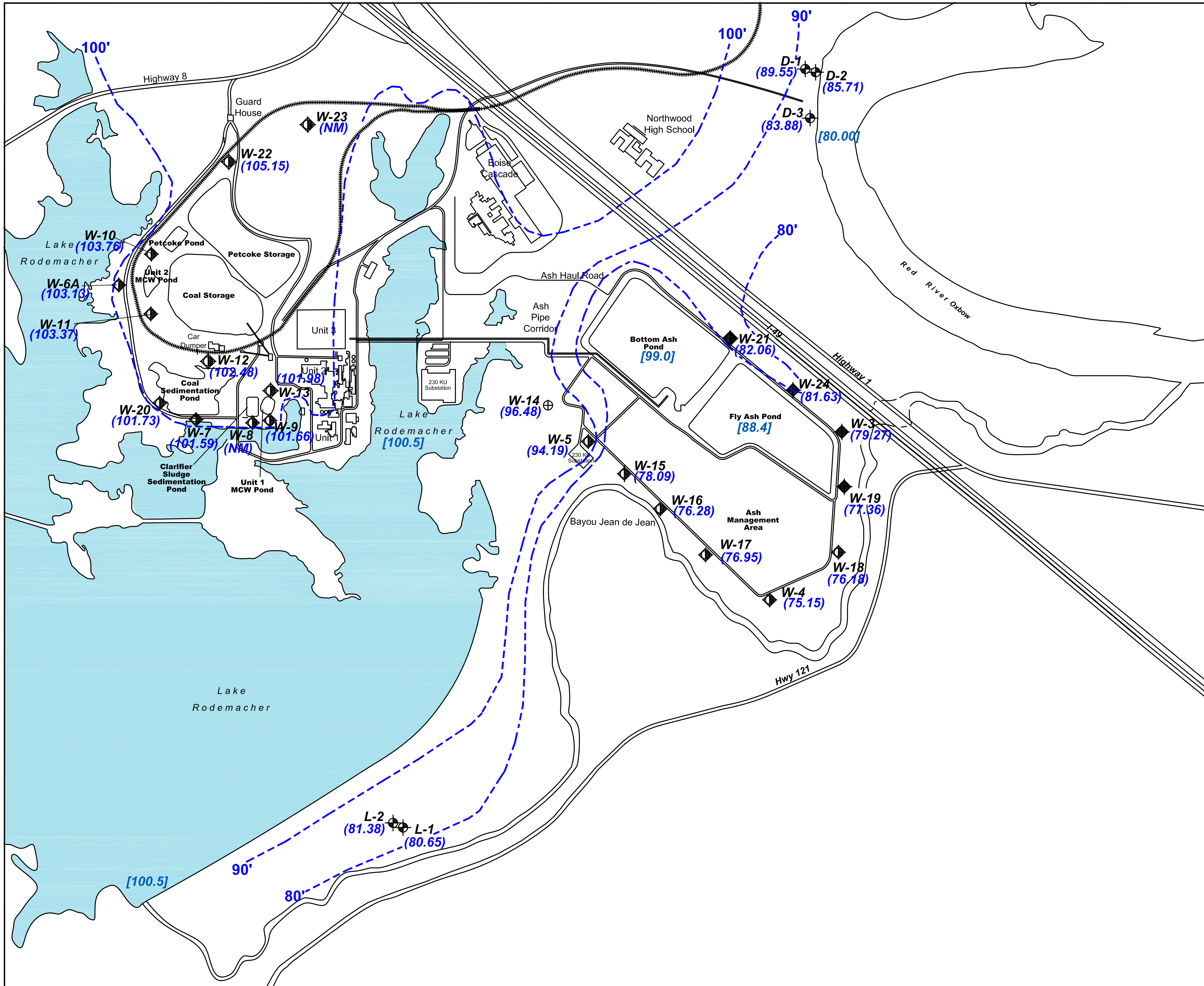
Cleco Brame
Potentiometric Surface Contour Map
October 2018

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	10/22/18
Dwg. No.:	01-20-0220-APP-E-11

Figure E-11



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (80.65) Potentiometric Surface Elevation, Ft. NGVD
- 80' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [80.00] Surface Water Elevation ft. NGVD
- NM Not Measured

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

N

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

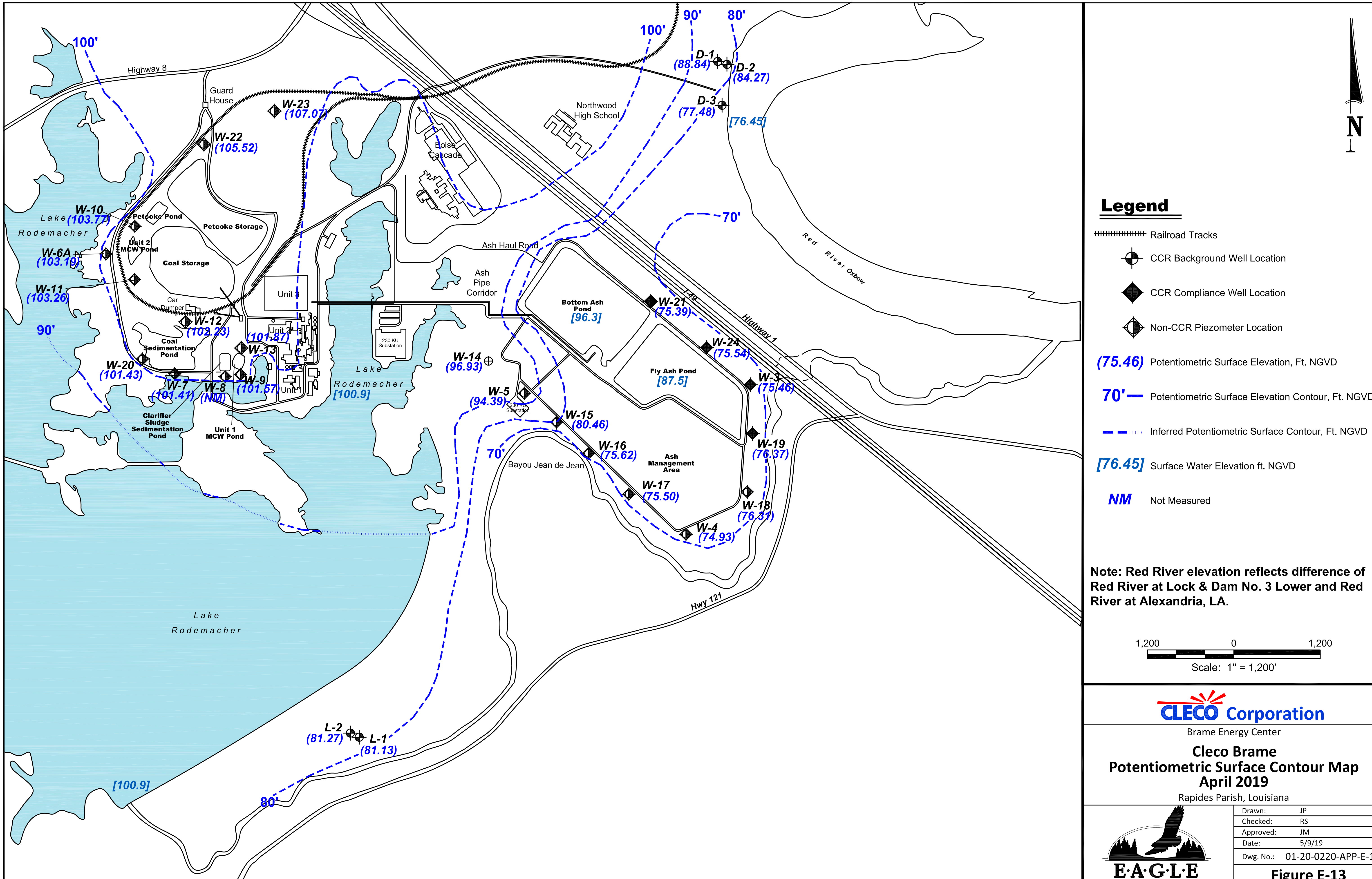
Cleco Brame
Potentiometric Surface Contour Map
January 2019

Rapides Parish, Louisiana

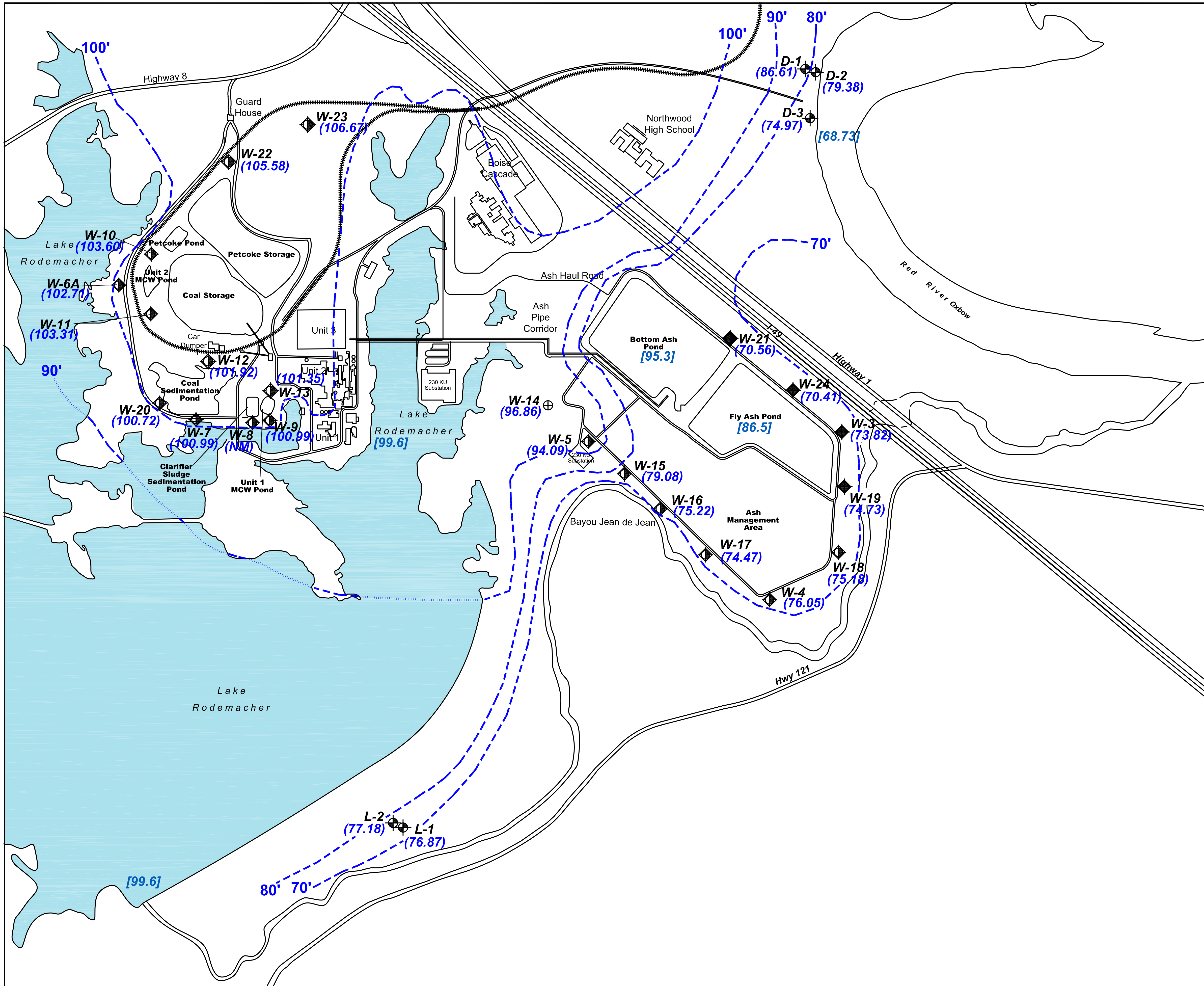
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	5/9/19
Dwg. No.:	01-20-0220-APP-E-12

Figure E-12



Legend
Railroad Tracks
CCR Background Well Location
CCR Compliance Well Location
Non-CCR Piezometer Location
(75.46) Potentiometric Surface Elevation, Ft. NGVD
70' Potentiometric Surface Elevation Contour, Ft. NGVD
Inferred Potentiometric Surface Contour, Ft. NGVD
[76.45] Surface Water Elevation ft. NGVD
NM Not Measured
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'
N
CLECO Corporation
Brame Energy Center
Cleco Brame
Potentiometric Surface Contour Map
April 2019
Rapides Parish, Louisiana
Drawn: JP
Checked: RS
Approved: JM
Date: 5/9/19
Dwg. No.: 01-20-0220-APP-E-13
Figure E-13
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Highway 8
Guard House
Northwood High School
Boise Cascade
Petcoke Pond
Petcoke Storage
Unit 2 MCW Pond
Coal Storage
Car Dumper
Unit 3
Unit 2
Unit 1
Coal Sedimentation Pond
Clarifier Sludge Sedimentation Pond
Unit 1 MCW Pond
Ash Haul Road
Ash Pipe Corridor
230 KU Substation
Bottom Ash Pond [96.3]
Fly Ash Pond [87.5]
Ash Management Area
Bayou Jean de Jean
Red River Oxbow
Highway 1
I-49
Hwy 121
Lake Rodemacher
Lake Rodemacher [100.9]
Lake Rodemacher
[100.9]
[76.45]
100'
90'
80'
70'
D-1 (88.84)
D-2 (84.27)
D-3 (77.48)
W-23 (107.07)
W-22 (105.52)
W-10 (103.77)
W-6A (103.19)
W-11 (103.26)
W-12 (102.23)
W-13 (101.87)
W-20 (101.43)
W-7 (101.41)
W-8 (NM)
W-9 (101.57)
W-14 (96.93)
W-5 (94.39)
W-15 (80.46)
W-16 (75.62)
W-17 (75.50)
W-4 (74.93)
W-18 (76.31)
W-19 (76.37)
W-3 (75.46)
W-24 (75.54)
W-21 (75.39)
L-2 (81.27)
L-1 (81.13)



N

Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(75.18) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[68.73] Surface Water Elevation ft. NGVD

NM Not Measured

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'

CLECO Corporation

Brame Energy Center

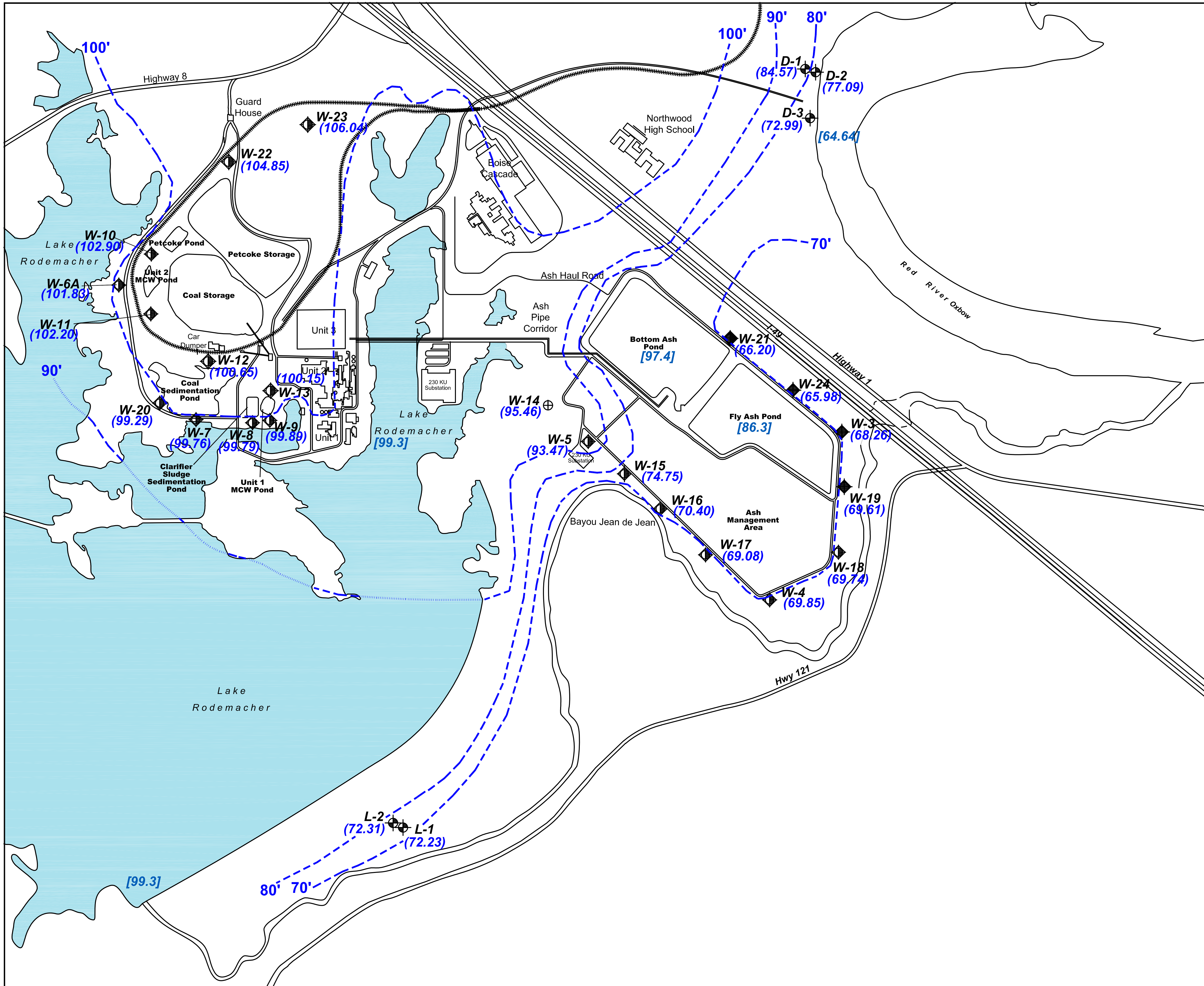
Cleco Brame
Potentiometric Surface Contour Map
July 2019

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	7/25/19
Dwg. No.:	01-20-0220-APP-E-14

Figure E-14



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- *(69.61)* Potentiometric Surface Elevation, Ft. NGVD
- **70'** Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- *[64.64]* Surface Water Elevation ft. NGVD
- *NM* Not Measured

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'

N

CLECO Corporation

Brame Energy Center

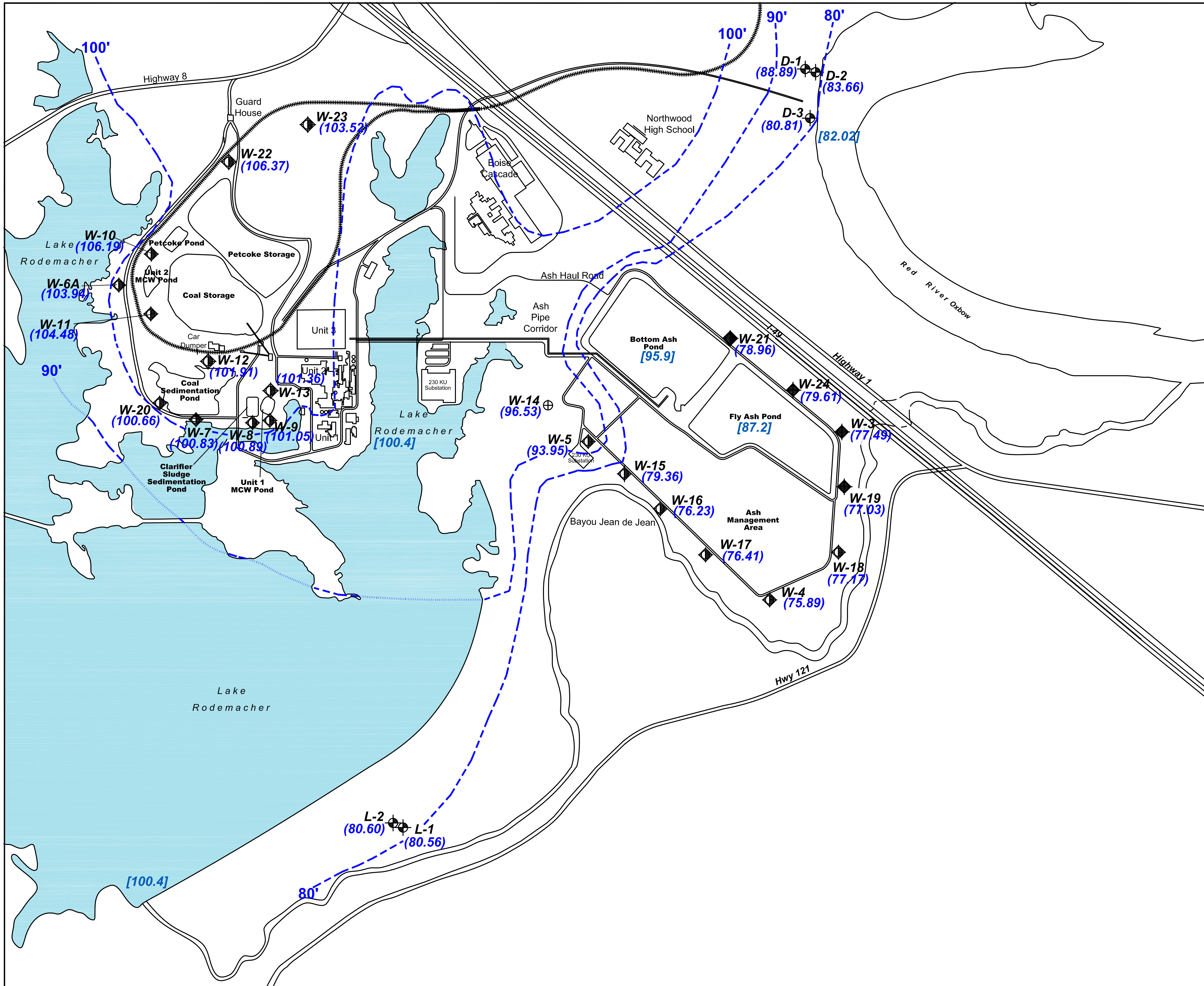
Cleco Brame
Potentiometric Surface Contour Map
October 2019

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	12/12/19
Dwg. No.:	01-20-0220-APP-E-15

Figure E-15



N

Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(78.96) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[82.02] Surface Water Elevation ft. NGVD

NM Not Measured

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'

CLECO Corporation

Brame Energy Center

Cleco Brame
Potentiometric Surface Contour Map
April 2020

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	6/2/20
Dwg. No.:	01-20-0220-APP-E-16

Figure E-16

APPENDIX F

SITE HYDROGEOLOGY AND GEOLOGIC CROSS SECTIONS

SITE HYDROGEOLOGY AND GEOLOGIC CROSS SECTIONS

HYDROGEOLOGIC SETTING

BEC straddles two different geomorphologic features: 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 Intermediate Terraces include terraces formerly designated as Montgomery, Irene, and Bentley (LGS, 1984).

The mapped boundary of the Intermediate Terrace and the alluvium/natural levee deposits follows part of the northeast edge of the Bottom Ash Pond. The northern/northwestern portion of BEC is located on the Intermediate Terrace deposits and the remainder of BEC is located on the alluvium/natural levee deposits. Most of the Bottom Ash Pond is situated on the alluvium/natural levee deposits, with only its northeastern end on the Intermediate Terrace deposits while the Fly Ash Pond is situated entirely on the alluvium deposits. The uppermost aquifer is a fining upward sequence, with fine sand grading downward to coarse sand and gravel within the Intermediate Terrace deposits, and with silt and silty sand underlain by gravel within the alluvium/natural levee deposits. The aquifer is continuous beneath the site.

SITE GEOLOGY

Geologic cross sections illustrate the difference in stratigraphy and depth to the uppermost water bearing zone between the Intermediate Terrace and alluvium/natural levee deposits. These geologic cross sections are constructed from soil borings trending in a general northwest-southeast direction across both the Bottom Ash and Fly Ash Pond units. The profiles of these geologic cross sections and the geologic cross sections are included in **Appendix F**.

The uppermost water bearing zone has some gravel at its base, overlain by silt and silty sand within the alluvium/natural levee deposits beneath the Fly Ash Pond and the southeastern half of the Bottom Ash Pond. Within the Intermediate Terrace, beneath most of the northwestern half of the Bottom Ash Pond, the uppermost water bearing sand also has gravel at its base, with coarse sand fining upward to fine sand.

GROUNDWATER FLOW EVALUATION

Horizontal groundwater flow was evaluated in the uppermost aquifer by construction of potentiometric surface maps (**Appendix E**) from data measured in monitoring wells at BEC in 2017 to 2019. An evaluation of groundwater potentiometric gradients 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.

The groundwater flow velocity is an average linear flow velocity that is calculated 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)
January 2019	0.002	0.01 to 1.0
April 2019	0.00004 to 0.0002	0.0002 to 0.1
July 2019	0.0009 to 0.002	0.045 to 1.0
October 2019	0.0007 to 0.001	0.0035 to 0.5

It is important to note that this is an advective rate and does not account for potential geological heterogeneities, causing significant variability in geochemical and hydrogeologic parameters including adsorption, biodegradation, dispersion, fraction of organic carbon, and other retarding factors affecting groundwater fate and transport in this zone. Additionally, lateral geological heterogeneities may cause variations in advective flow.

UPPERMOST AQUIFER CHARACTERIZATION

A summary of results of the uppermost aquifer characterization include the following:

- The mapped boundary of the Intermediate Terrace and the alluvium/natural levee deposits follows part of the northeast edge of the Bottom Ash Pond. The northern/northwestern portion of BEC is located on the Intermediate Terrace deposits and the remainder of BEC is located on the alluvium/natural levee deposits. Most of the Bottom Ash Pond is situated on the alluvium/natural levee deposits, with only its northeastern end on the Intermediate Terrace deposits. The Fly Ash Pond is situated entirely on the alluvium deposits.
- The uppermost aquifer is laterally continuous and consists of Holocene alluvium and Pleistocene terrace deposits. The uppermost aquifer is a fining upward sequence, with fine sand grading downward to coarse sand and gravel within the Intermediate Terrace deposits, and with silt and silty sand underlain by gravel

within the alluvium/natural levee deposits. The aquifer is continuous beneath the site.

- Water use in the vicinity of the unit is via groundwater and surface water. Groundwater is primarily used from deeper aquifers for power supply operations.
- The LDNR issued an advisory in 2009 addressing the recommended uses of these alluvial aquifers. Furthermore, it is reported that dissolved metals, including arsenic, have been, and are expected to be, detected in groundwater in localized areas of these aquifers (LDNR, 2009).

Cleco concludes that groundwater monitoring of the uppermost aquifer underlying the Fly Ash Pond and the Bottom Ash Pond is conducted per applicable portions of 40 C.F.R. § 257.93.

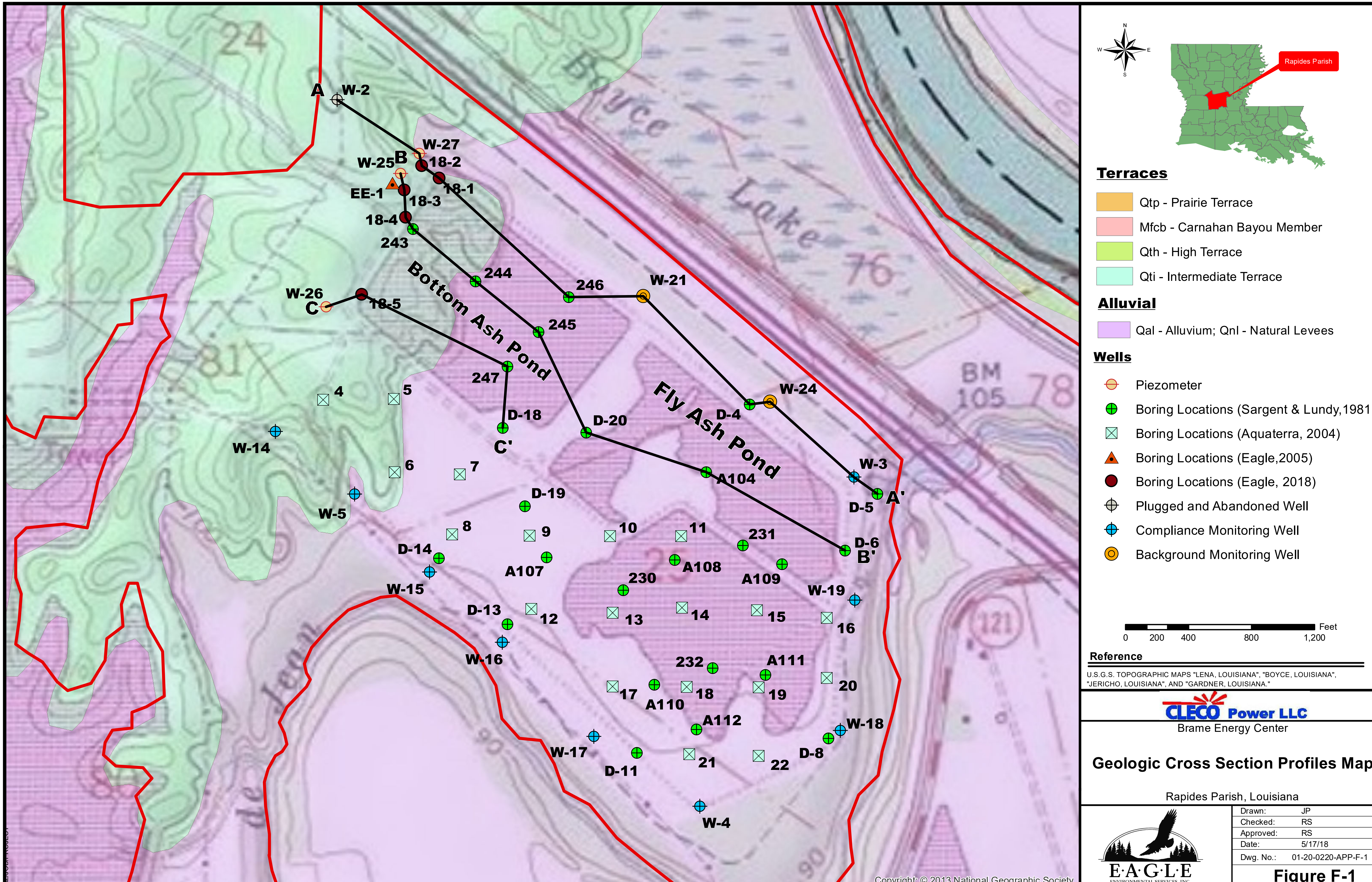
REFERENCES

Fetter, C.W., 2001. Applied Hydrogeology. 4th Edition, Prentice Hall, Upper Saddle River.

Heath, R.C., 1989, Basic Ground-water Hydrology: U.S. Geological Survey Water Supply Paper 2220, 84 p

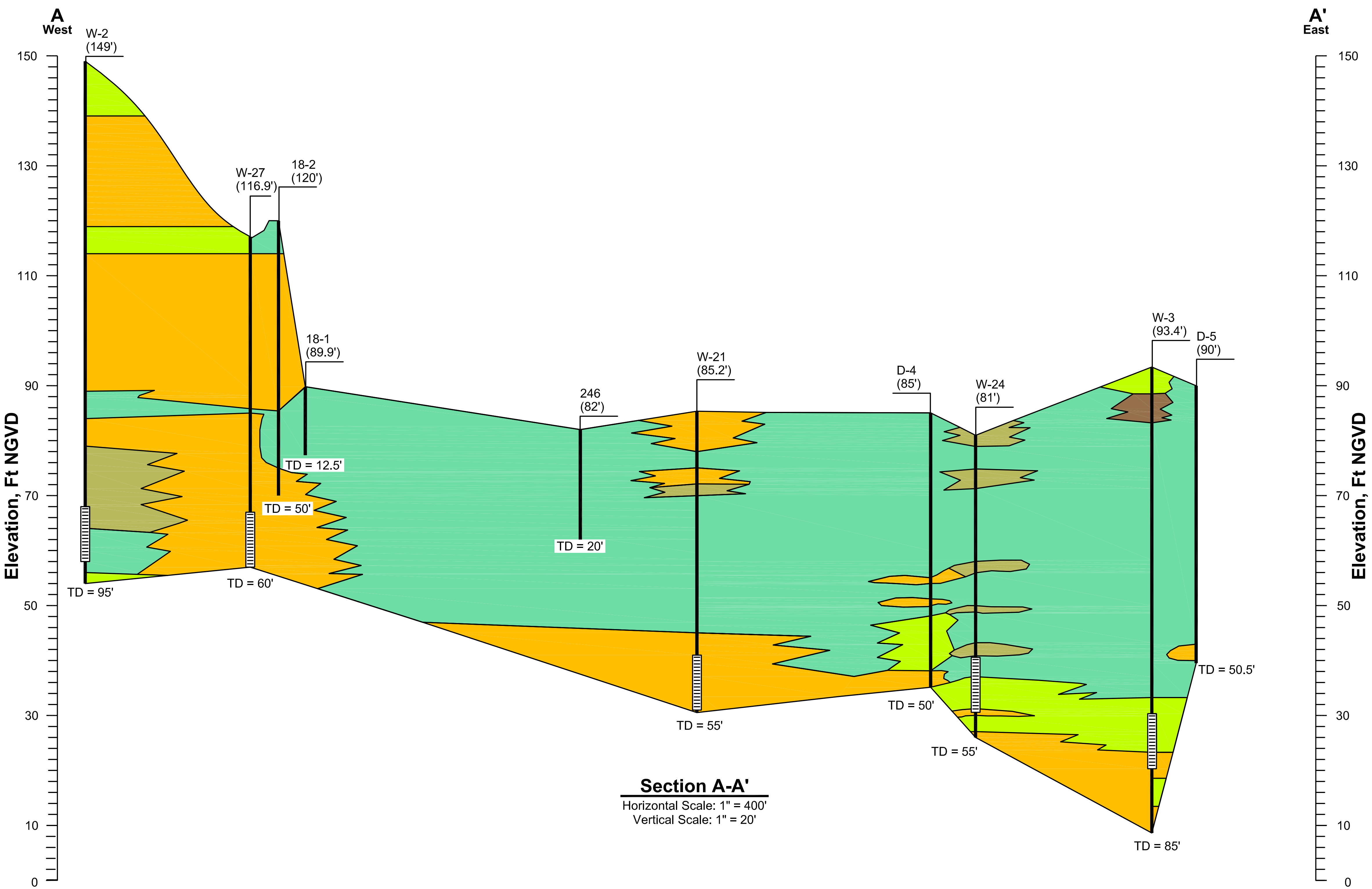
Louisiana Department of Natural Resources, Office of Conservation, 2009. "*General Water Quality Summary, Louisiana Groundwater - Alluvial Aquifer Systems*," *available at* http://www.dnr.louisiana.gov/assets/docs/conservation/documents/Alluvial-Aquifer-Water-Quality-Summary.pdf.

Louisiana Geological Survey (LGS), Snead, J.I., and McCulloh, R.P., 1984, Geologic Map of Louisiana: Louisiana Geological Survey, scale 1:500,000.



A
W-2
W-27
B
W-25
18-2
18-1
EE-1
18-3
18-4
243
244
246
W-21
W-26
C
18-5
245
Bottom Ash Pond
247
D-18
C'
D-20
Fly Ash Pond
D-4
W-24
W-3
A'
D-5
A104
W-14
4
5
6
7
W-5
D-19
8
9
10
11
231
D-6
B'
D-14
A107
A108
A109
W-15
230
W-19
D-13
12
13
14
15
16
W-16
232
A111
17
A110
18
19
20
A112
W-18
W-17
D-11
21
22
D-8
W-4
Copyright: © 2013 National Geographic Society
Terraces
Qtp - Prairie Terrace
Mfcb - Carnahan Bayou Member
Qth - High Terrace
Qti - Intermediate Terrace
Alluvial
Qal - Alluvium; Qnl - Natural Levees
Wells
Piezometer
Boring Locations (Sargent & Lundy,1981)
Boring Locations (Aquaterra, 2004)
Boring Locations (Eagle,2005)
Boring Locations (Eagle, 2018)
Plugged and Abandoned Well
Compliance Monitoring Well
Background Monitoring Well
Rapides Parish
Feet
0 200 400 800 1,200
Reference
U.S.G.S. TOPOGRAPHIC MAPS "LENA, LOUISIANA", "BOYCE, LOUISIANA", "JERICHO, LOUISIANA", AND "GARDNER, LOUISIANA."
CLECO Power LLC
Brame Energy Center
Geologic Cross Section Profiles Map
Rapides Parish, Louisiana
Drawn: JP
Checked: RS
Approved: RS
Date: 5/17/18
Dwg. No.: 01-20-0220-APP-F-1
EAGLE
ENVIRONMENTAL SERVICES, INC.

Figure F-1



Section A-A'

Horizontal Scale: 1" = 400'
Vertical Scale: 1" = 20'

Legend

- Sand
- Sandy Clay / Clayey Sand
- Silty Clay
- Clay
- Clayey Silt
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

Geologic Cross Section A-A'

Rapides Parish, Louisiana

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

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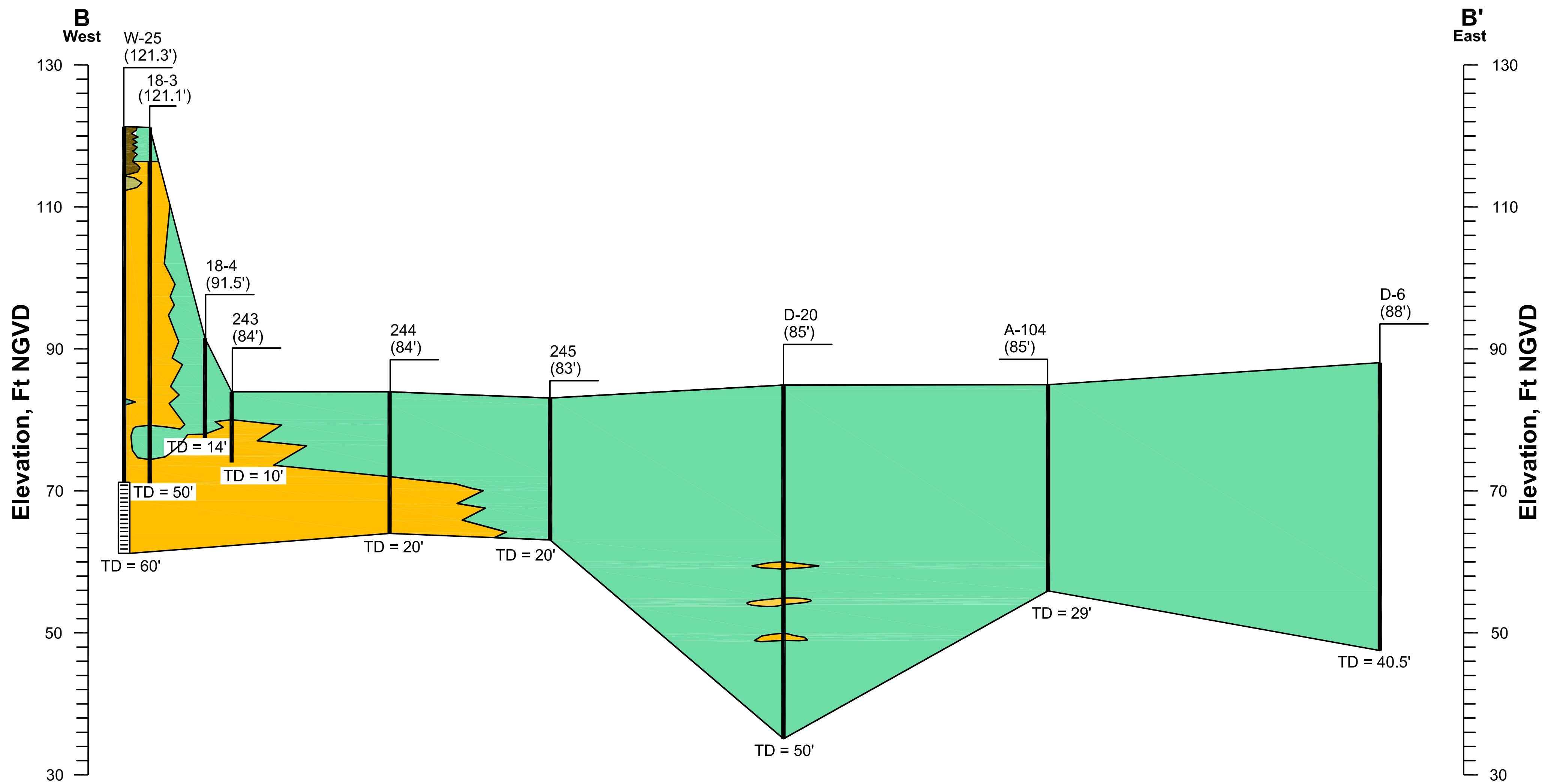
Date:	5/17/18
Dwg. No.:	01-20-0220-APP-F-2

Figure F-2



Section B-B'
Horizontal Scale: 1" = 400'
Vertical Scale: 1" = 20'

Legend

- Sand
- Sandy Clay / Clayey Sand
- Silty Clay
- Clay
- Clayey Silt
- Fill
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

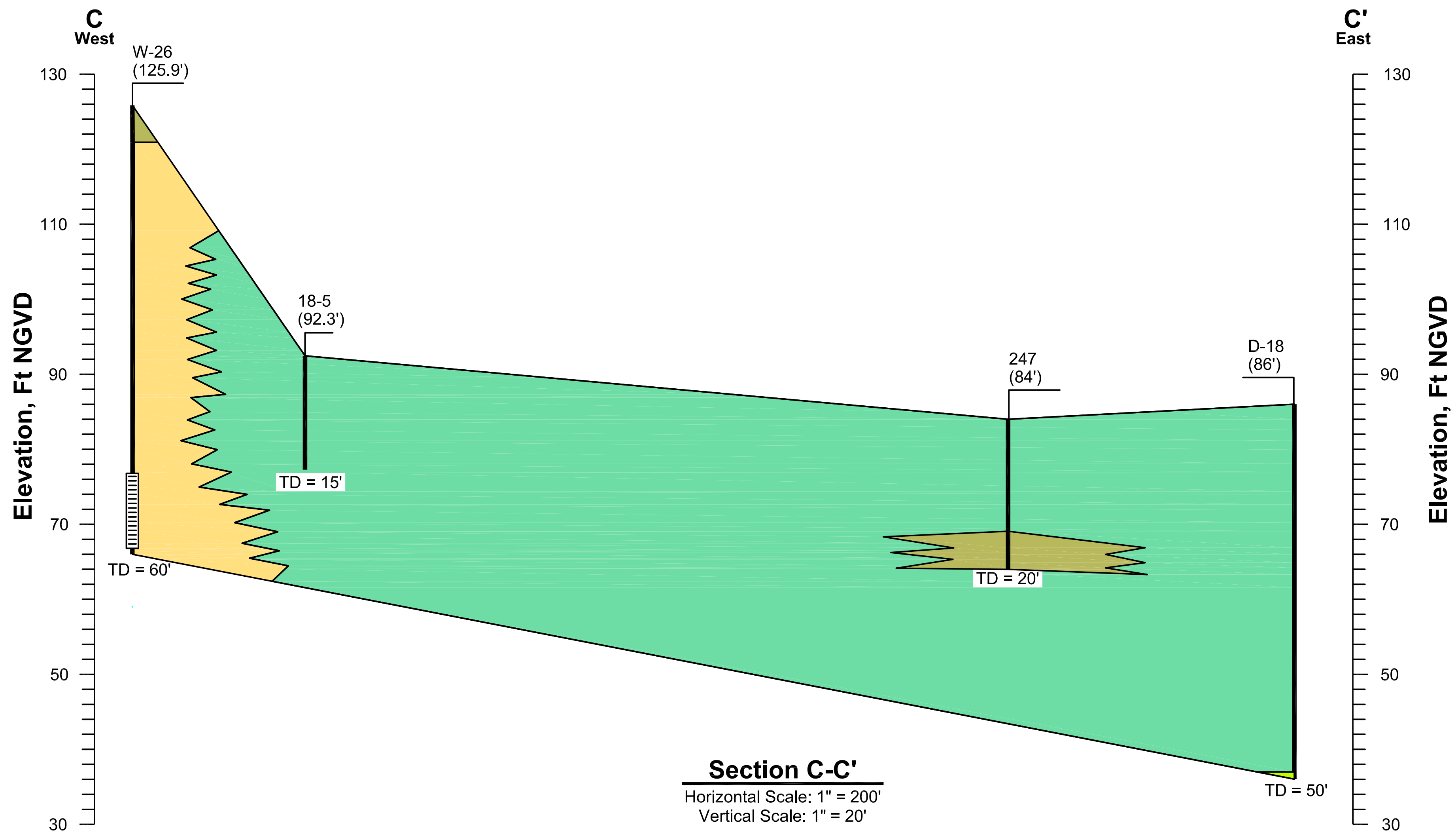
Geologic Cross Section B-B'

Rapides Parish, Louisiana

Drawn:	JP
Checked:	RS
Approved:	RS
Date:	5/17/18
Dwg. No.:	01-20-0220-APP-F-3

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

Figure F-3



Section C-C'
Horizontal Scale: 1" = 200'
Vertical Scale: 1" = 20'

Legend

- Sand
- Sandy Clay / Clayey Sand
- Silty Clay
- Clay
- Clayey Silt
- Fill
- Screen Interval
- (90') Elevation, Ft NGVD
- TD Total Depth

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

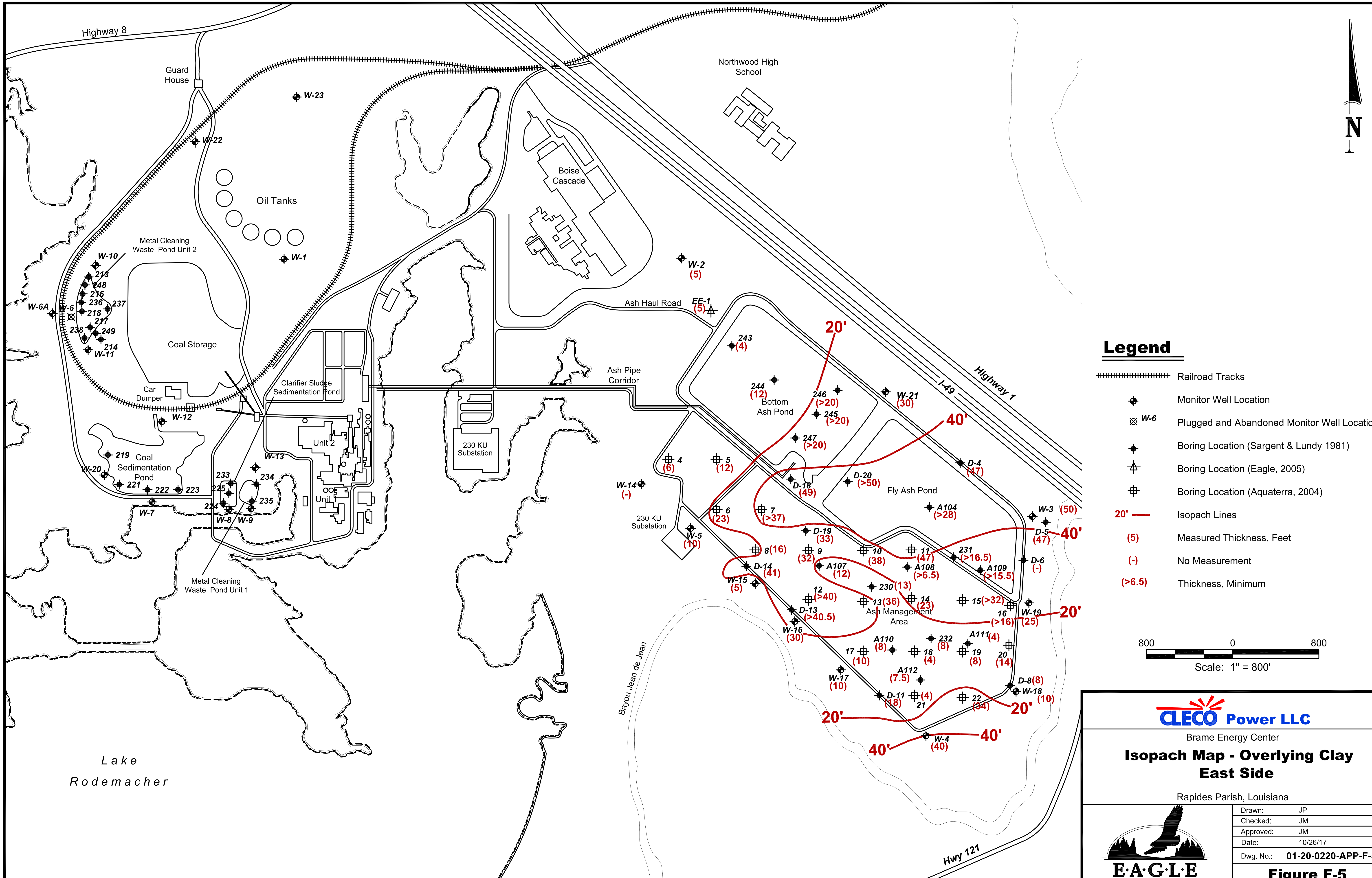
Geologic Cross Section C-C'

Rapides Parish, Louisiana

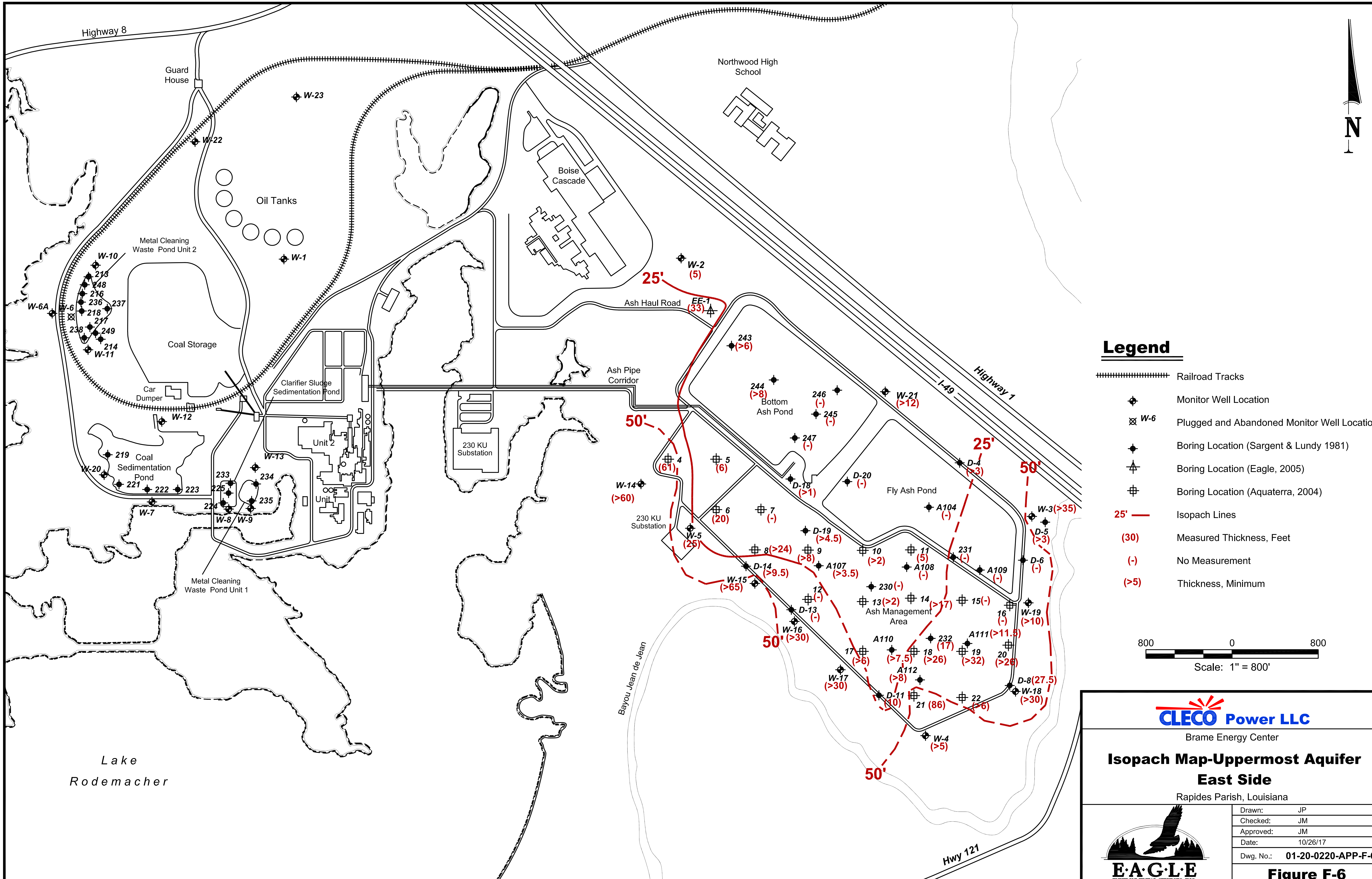
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	BS
Approved:	RS
Date:	5/17/18
Dwg. No.:	01-20-0220-APP-F-4

Figure F-4



Highway 8
Guard House
W-23
W-22
Oil Tanks
Northwood High School
Boise Cascade
Metal Cleaning Waste Pond Unit 2
W-10
W-1
W-6A
W-6
Coal Storage
Car Dumper
Clarifier Sludge Sedimentation Pond
Unit 2
Unit 1
W-12
Coal Sedimentation Pond
W-13
W-20
W-7
W-8
W-9
Metal Cleaning Waste Pond Unit 1
230 KU Substation
Ash Haul Road
Ash Pipe Corridor
EE-1 (5)
W-2 (5)
W-14 (-)
W-5 (10)
Bottom Ash Pond
Fly Ash Pond
Ash Management Area
I-49
Highway 1
Bayou Jean de Jean
Hwy 121
Lake Rodemacher
20'
40'
N
Legend
Railroad Tracks
Monitor Well Location
W-6 Plugged and Abandoned Monitor Well Location
Boring Location (Sargent & Lundy 1981)
Boring Location (Eagle, 2005)
Boring Location (Aquaterra, 2004)
20' Isopach Lines
(5) Measured Thickness, Feet
(-) No Measurement
(>6.5) Thickness, Minimum
800 0 800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Isopach Map - Overlying Clay
East Side
Rapides Parish, Louisiana
Drawn: JP
Checked: JM
Approved: JM
Date: 10/26/17
Dwg. No.: 01-20-0220-APP-F-5
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Figure F-5



CLECO Power LLC

Brame Energy Center

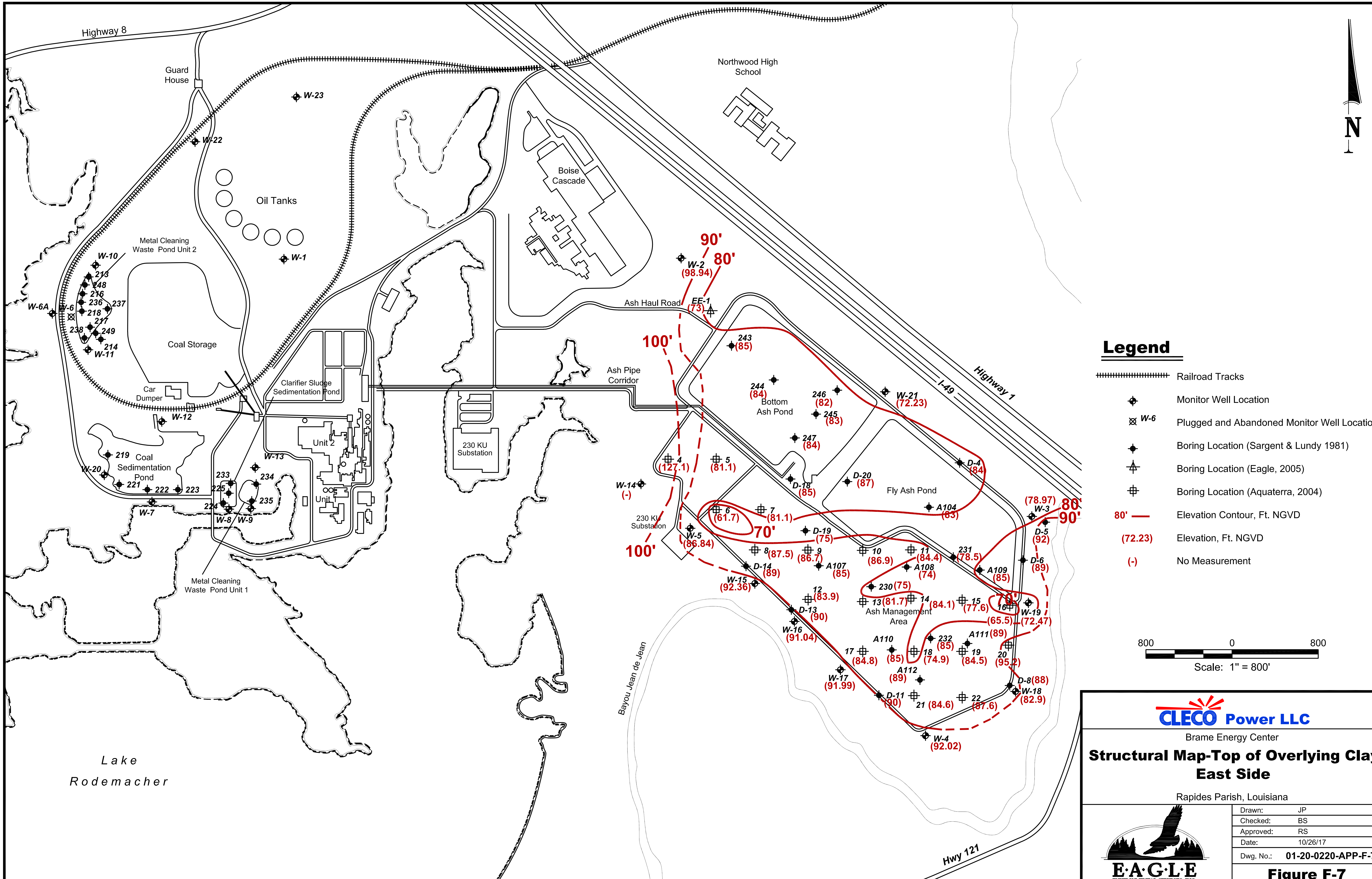
Isopach Map-Uppermost Aquifer
East Side

Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/26/17
Dwg. No.:	01-20-0220-APP-F-6

EAGLE ENVIRONMENTAL SERVICES, INC.

Figure F-6



Highway 8
Guard House
W-23
W-22
Oil Tanks
Northwood High School
Boise Cascade
Metal Cleaning Waste Pond Unit 2
W-10
W-1
W-6A
W-6
Coal Storage
W-11
Car Dumper
W-12
Clarifier Sludge Sedimentation Pond
Unit 2
Ash Haul Road
Ash Pipe Corridor
230 KU Substation
219 Coal Sedimentation Pond
W-20
W-13
W-7
W-8
W-9
Unit
Metal Cleaning Waste Pond Unit 1
Lake Rodemacher
Bayou Jean de Jean
Hwy 121
I-49
Highway 1
90'
80'
100'
70'
W-2 (98.94)
EE-1 (73)
243 (85)
244 (84)
Bottom Ash Pond
246 (82)
245 (83)
247 (84)
W-21 (72.23)
D-4 (84)
4 (127.1)
5 (81.1)
D-20 (87)
D-18 (85)
Fly Ash Pond
W-14 (-)
A104 (83)
6 (61.7)
7 (81.1)
W-3 (78.97)
230 KU Substation
W-5 (86.84)
D-19 (75)
D-5 (92)
8 (87.5)
9 (86.7)
10 (86.9)
11 (84.4)
231 (78.5)
D-6 (89)
D-14 (89)
A107 (85)
A108 (74)
A109 (85)
W-15 (92.36)
230 (75)
12 (83.9)
13 (81.7)
14 (84.1)
15 (77.6)
16
W-19 (72.47)
D-13 (90)
Ash Management Area
(65.5)
W-16 (91.04)
A110
232 (85)
A111 (89)
17 (84.8)
(85)
18 (74.9)
19 (84.5)
20 (95.2)
W-17 (91.99)
A112 (89)
D-8 (88)
W-18 (82.9)
D-11 (90)
21 (84.6)
22 (87.6)
W-4 (92.02)
N
Legend
Railroad Tracks
Monitor Well Location
W-6 Plugged and Abandoned Monitor Well Location
Boring Location (Sargent & Lundy 1981)
Boring Location (Eagle, 2005)
Boring Location (Aquaterra, 2004)
80' Elevation Contour, Ft. NGVD
(72.23) Elevation, Ft. NGVD
(-) No Measurement
800 0 800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Structural Map-Top of Overlying Clay
East Side
Rapides Parish, Louisiana
Drawn: JP
Checked: BS
Approved: RS
Date: 10/26/17
Dwg. No.: 01-20-0220-APP-F-7
E·A·G·L·E
ENVIRONMENTAL SERVICES, INC.
Figure F-7

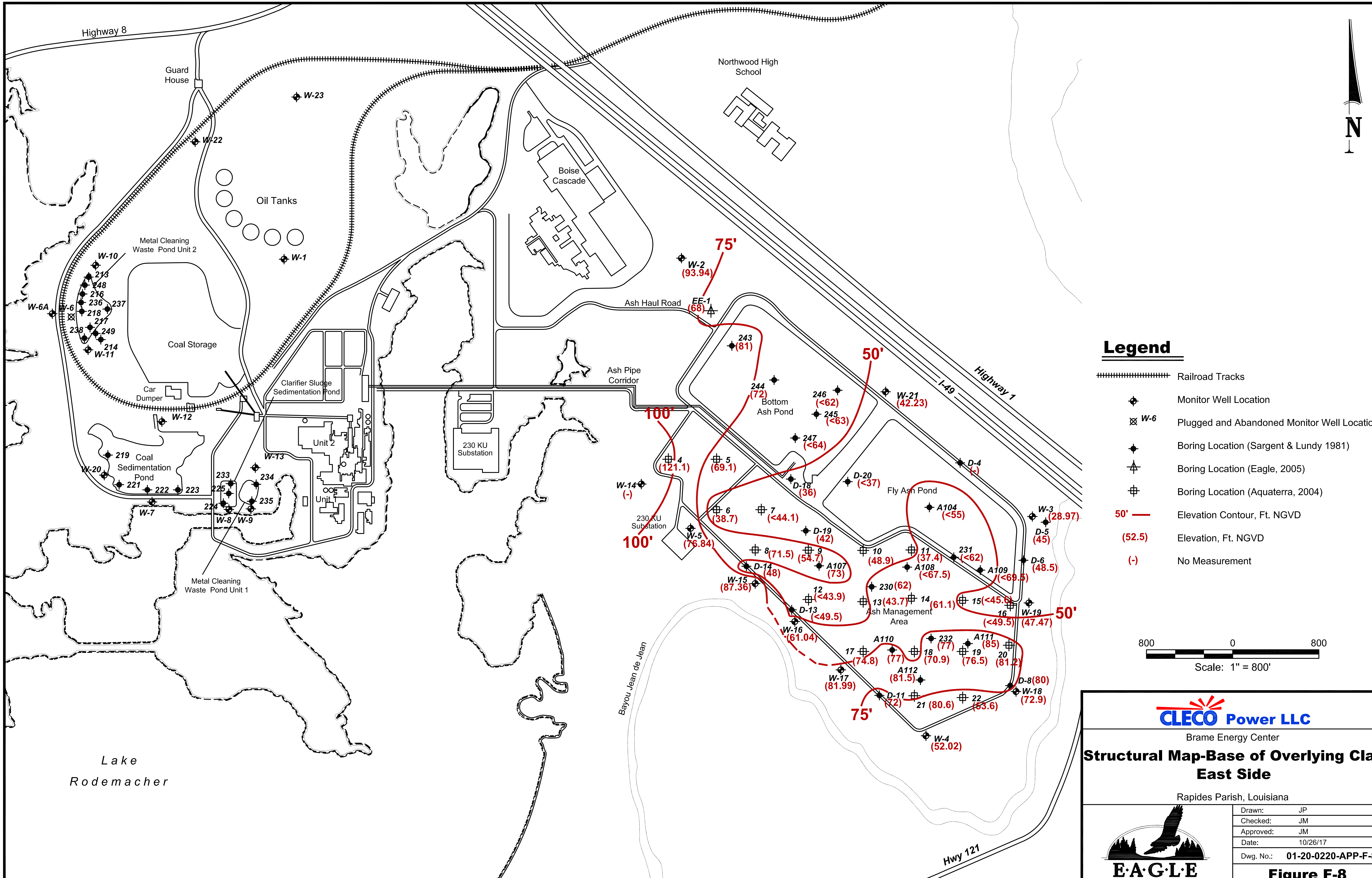

Highway 8
Guard House
W-23
W-22
Oil Tanks
Metal Cleaning Waste Pond Unit 2
W-1
W-10
213
248
216
236
237
218
217
238
249
214
W-11
W-6A
W-6
Coal Storage
Car Dumper
Clarifier Sludge Sedimentation Pond
W-12
219
Coal Sedimentation Pond
W-20
221
222
223
W-13
233
234
225
235
224
W-7
W-8
W-9
Unit 2
Unit 1
Metal Cleaning Waste Pond Unit 1
Northwood High School
Boise Cascade
230 KU Substation
Ash Pipe Corridor
Ash Haul Road
75'
W-2
(93.94)
EE-1
(68)
243
(81)
244
(72)
Bottom Ash Pond
246
(<62)
245
(<63)
247
(<64)
50'
W-21
(42.23)
I-49
Highway 1
100'
4
(121.1)
5
(69.1)
W-14
(-)
D-18
(36)
D-20
(<37)
D-4
(-)
Fly Ash Pond
A104
(<55)
6
(38.7)
7
(<44.1)
230 KU Substation
100'
W-5
(76.84)
D-19
(42)
8 (71.5)
9
(54.7)
A107
(73)
10
(48.9)
11
(37.4)
231
(<62)
A108
(<67.5)
A109
(<69.5)
W-3
(28.97)
D-5
(45)
D-6
(48.5)
D-14
(48)
W-15
(87.36)
230 (62)
12
(<43.9)
13 (43.7)
14
(61.1)
15 (<45.6)
16
(<49.5)
W-19
(47.47)
50'
D-13
(<49.5)
Ash Management Area
W-16
(61.04)
A110
232
(77)
A111
(85)
17
(74.8)
(77)
18
(70.9)
19
(76.5)
20
(81.2)
A112
(81.5)
W-17
(81.99)
D-8 (80)
W-18
(72.9)
D-11
(72)
21 (80.6)
22
(53.6)
75'
W-4
(52.02)
Bayou Jean de Jean
Lake Rodemacher
Hwy 121
N
Legend
Railroad Tracks
Monitor Well Location
W-6 Plugged and Abandoned Monitor Well Location
Boring Location (Sargent & Lundy 1981)
Boring Location (Eagle, 2005)
Boring Location (Aquaterra, 2004)
50' Elevation Contour, Ft. NGVD
(52.5) Elevation, Ft. NGVD
(-) No Measurement
800 0 800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Structural Map-Base of Overlying Clay East Side
Rapides Parish, Louisiana
Drawn: JP
Checked: JM
Approved: JM
Date: 10/26/17
Dwg. No.: 01-20-0220-APP-F-8
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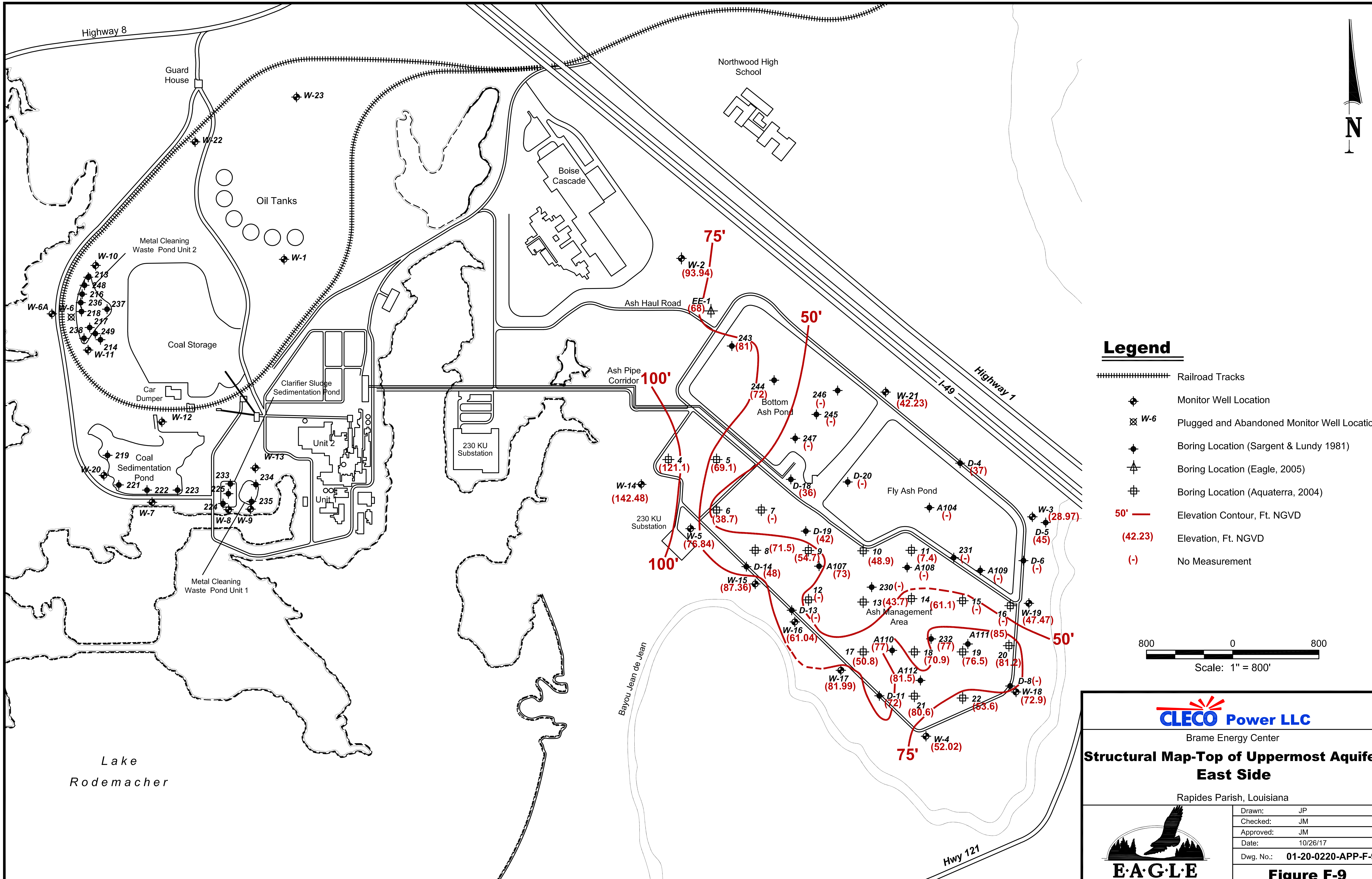
Figure F-8



Highway 8
Guard House
W-23
W-22
Oil Tanks
Metal Cleaning Waste Pond Unit 2
W-1
W-10
213
248
216
236
237
218
217
238
249
214
W-11
W-6A
W-6
Coal Storage
Car Dumper
W-12
Clarifier Sludge Sedimentation Pond
Unit 2
219
Coal Sedimentation Pond
W-20
221
222
223
W-13
233
234
225
235
224
W-7
W-8
W-9
Unit
Metal Cleaning Waste Pond Unit 1
230 KU Substation
Northwood High School
Boise Cascade
Ash Haul Road
Ash Pipe Corridor
W-2
(93.94)
75'
EE-1
(68)
243
(81)
50'
244
(72)
Bottom Ash Pond
246
(-)
245
(-)
247
(-)
W-21
(42.23)
I-49
Highway 1
100'
4
(121.1)
5
(69.1)
W-14
(142.48)
D-18
(36)
D-20
(-)
D-4
(37)
Fly Ash Pond
6
(38.7)
7
(-)
A104
(-)
W-3
(28.97)
D-5
(45)
230 KU Substation
W-5
(76.84)
D-19
(42)
8 (71.5)
9
(54.7)
10
(48.9)
11
(7.4)
231
(-)
D-6
(-)
100'
D-14
(48)
A107
(73)
A108
(-)
A109
(-)
W-15
(87.36)
230 (-)
12
(-)
13 (43.7)
14
(61.1)
15
(-)
16
(-)
W-19
(47.47)
D-13
(-)
Ash Management Area
W-16
(61.04)
A110
(77)
232
(77)
A111 (85)
50'
17
(50.8)
18
(70.9)
19
(76.5)
20
(81.2)
A112
(81.5)
W-17
(81.99)
D-8 (-)
W-18
(72.9)
D-11
(72)
21
(80.6)
22
(53.6)
W-4
(52.02)
75'
Bayou Jean de Jean
Lake Rodemacher
Hwy 121
N
Legend
Railroad Tracks
Monitor Well Location
W-6 Plugged and Abandoned Monitor Well Location
Boring Location (Sargent & Lundy 1981)
Boring Location (Eagle, 2005)
Boring Location (Aquaterra, 2004)
50' Elevation Contour, Ft. NGVD
(42.23) Elevation, Ft. NGVD
(-) No Measurement
800
0
800
Scale: 1" = 800'
CLECO Power LLC
Brame Energy Center
Structural Map-Top of Uppermost Aquifer
East Side
Rapides Parish, Louisiana
Drawn: JP
Checked: JM
Approved: JM
Date: 10/26/17
Dwg. No.: 01-20-0220-APP-F-9
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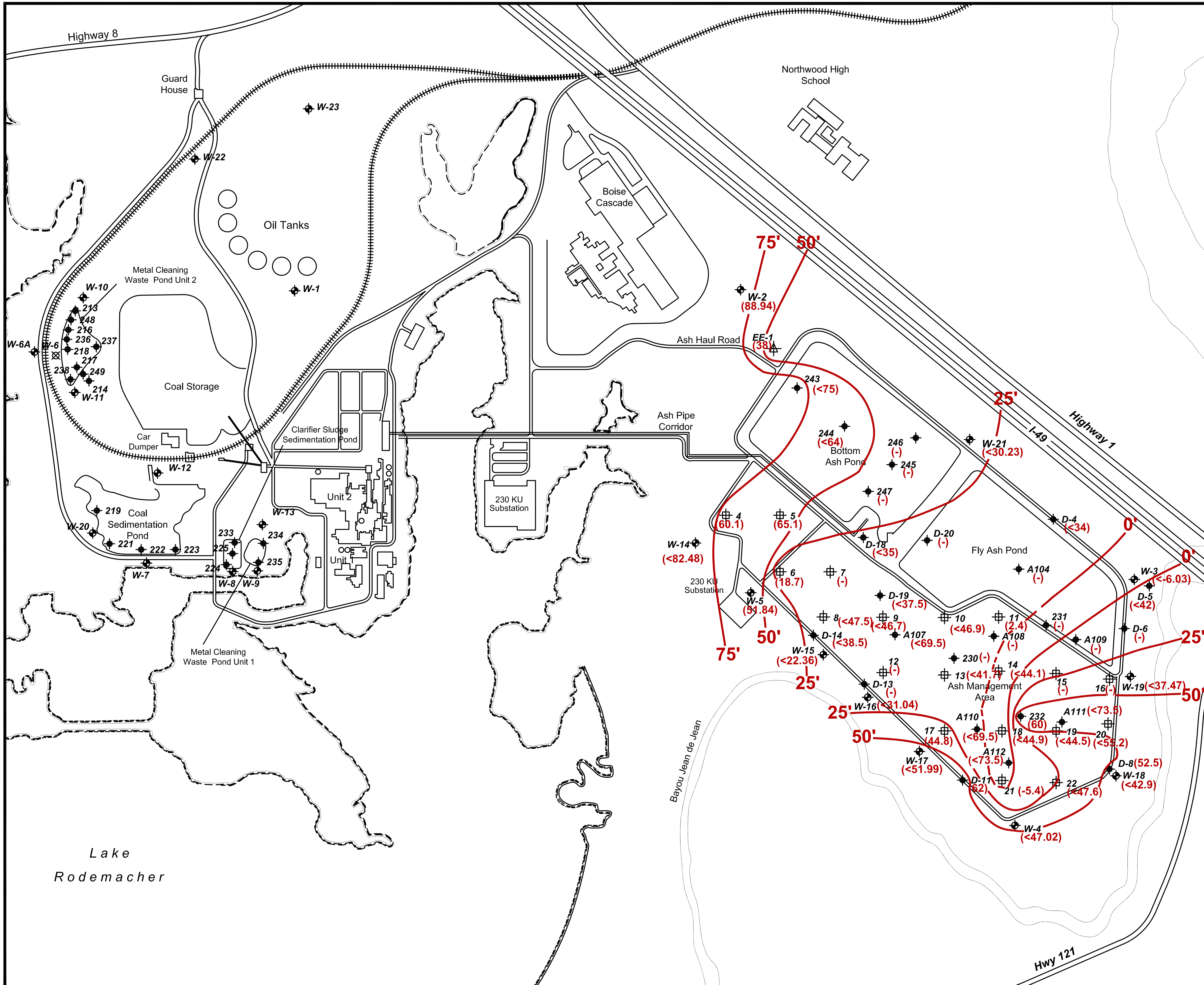
ENVIRONMENTAL SERVICES, INC.
Figure F-9



Legend

- Railroad Tracks
- Monitor Well Location
- W-6 Plugged and Abandoned Monitor Well Location
- Boring Location (Sargent & Lundy 1981)
- Boring Location (Eagle, 2005)
- Boring Location (Aquaterra, 2004)
- 25' Elevation Contour, Ft. NGVD
- (52.5) Elevation, Ft. NGVD
- (-) No Measurement

800 0 800

Scale: 1" = 800'

CLECO Power LLC

Brame Energy Center

Structural Map-Base of Upper Aquifer East Side

Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	JM
Date:	10/26/17
Dwg. No.:	01-20-0220-APP-F-10

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

Figure F-10

APPENDIX G

GROUNDWATER QUALITY DATA

APPENDIX G.1

SUMMARY TABLE OF GROUNDWATER DATA

Table 1
2016-2020 Detection Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
D-1 (BG)	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.12	16.8	20.2	0.28	8.33	11.9	260
	10/25/16	0.057	8.6	13.9	<0.5	6.7	11.6	150
	12/19/16	0.053	5.9	13.5	0.13	6.8	10.4	145
	1/24/17	0.053	6.6	13.5	<0.1	7.05	9.8	165
	2/16/17	0.052	6.2	13.3	<0.1	6.68	9.8	130
	4/6/17	0.051	5.8	13	<0.1	5.48	10.7	80
	5/13/17	0.043	5.2	13.1	0.93	6.33	10.3	125
	6/28/17	0.048	5.2	12.9	0.84	6.99	10.5	125
	8/23/17	0.046	6	13.6	<0.2	6.4	11.1	145
	1/22/18	0.047	4.9	13.4	0.1	6.84	10.8	135
	4/10/18	0.049	8.7	13.3	0.15	7.55	8.8	120
	8/8/18	0.044	5.2	12.2	<0.1	7.61	10.5	150
	10/4/18	0.046	5.8	12.3	<0.1	6.57	10.7	110
	1/16/19	0.042	5.7	13.5	<0.1	6.29	10.1	60
	4/17/19	0.045	12.6	11.9	0.48	6.32	5.9	105
	7/19/19	0.045	8.2	11.9	0.23	6.28	9.3	145
	10/30/19	0.036	5	12.7	<0.1	5.92	10.4	175
	4/1/20	0.041	9.1	11.8	0.21	7.37	6.6	<40
	9/17/20	0.037	5.8	12.7	0.17	6.47	9.8	70
D-2 (BG)	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.14	99.3	12.4	0.63	7.92	71.9	585
	10/25/16	0.13	92.2	8.8	<0.5	7.4	73.7	600
	12/19/16	0.12	91.8	9.5	0.42	7.04	75.2	715
	1/24/17	0.11	95.3	8.1	0.48	7.08	86.4	595
	2/16/17	0.12	103	8.6	0.43	7	80.7	530
	4/6/17	0.12	111	6.6	0.52	6.08	102	645
	5/13/17	1.1	101	8.1	0.43	6.74	97.8	595
	6/28/17	0.5	102	8.3	0.47	7.18	80.5	585
	8/23/17	0.11	106	7.6	0.61	7.15	95.3	615
	1/22/18	0.095	96	11.4	0.5	7.19	57.5	475
	4/10/18	0.11	109	8.3	0.35	7.35	89.1	435
	8/8/18	0.11	104	8.2	0.38	7.41	78.7	575
	10/4/18	0.11	108	6.8	0.4	6.81	88.4	525
	1/16/19	0.11	82.2	13.2	0.61	6.87	39.4	420
	4/17/19	0.25	88.3	11.4	0.91	6.68	53.2	630
	7/19/19	0.11	94.4	6.9	0.48	6.9	78.2	530
	10/30/19	0.092	93.4	9.6	0.54	6.87	69.6	405
	4/1/20	0.094	88	9.1	0.56	7.51	62	320
	9/17/20	0.1	96.7	8.9	0.41	6.81	65.6	445

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

CLECO

Table 1
2016-2020 Detection Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
D-3 (BG)	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.28	95.2	13.3	0.52	7.92	46	705
	10/25/16	0.27	87.6	11.5	0.52	7.1	45.5	745
	12/19/16	0.3	90.3	13.1	0.48	7.25	49.2	805
	1/24/17	0.29	86.2	11.8	0.52	7.35	48.3	805
	2/16/17	0.3	91.2	11.4	0.48	7.33	47.2	665
	4/6/17	0.31	88.2	12.7	0.46	5.76	53.8	740
	5/13/17	0.029	79.6	11.3	0.53	6.8	46.6	780
	6/28/17	0.47	92.2	10.5	0.53	7.39	46	805
	8/23/17	0.27	88.3	10.9	0.68	7.28	49.1	745
	1/22/18	0.31	91.5	11.2	0.49	7.28	50.2	915
	4/10/18	0.31	93.2	12.6	0.54	7.58	53.5	740
	8/8/18	0.29	86.4	10.7	1	7.4	49.1	680
	10/4/18	0.26	87	10.4	0.6	7.01	47.9	455
	1/16/19	0.35	90.9	13.6	1.1	7.16	58.6	700
	4/17/19	0.11	105	7.3	0.45	7.06	96.9	465
	7/19/19	0.27	79.7	10.9	0.98	7.13	48.7	710
	10/30/19	0.24	85.2	11.8	0.51	6.92	48.6	625
	4/1/20	0.25	86.2	9.9	0.36	7.51	47	620
	9/17/20	0.24	88.1	11.9	0.48	6.67	51.5	635
L-1 (BG)	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.12	120	10.7	0.25	8.04	21.5	425
	10/25/16	0.11	107	9.4	<0.5	7	15.4	475
	12/19/16	0.12	119	8.6	0.15	7.44	9	360
	1/24/17	0.11	109	8.3	0.27	7.18	7.9	500
	2/16/17	0.12	150	7.7	0.21	7.15	9.3	500
	4/6/17	0.12	121	6.9	0.2	6.4	10.6	510
	5/13/17	0.11	103	8.7	0.29	5.87	15.6	445
	6/28/17	0.12	117	7	0.29	7.07	5.5	535
	8/23/17	0.11	115	7	0.32	7.25	5.7	495
	1/22/18	0.12	121	5.3	0.28	7.52	13.1	475
	4/11/18	0.11	106	5.2	0.16	8.22	29.6	200
	8/8/18	0.13	117	6	0.18	7.34	11.6	500
	10/4/18	0.12	110	5.9	0.21	6	4.8	440
	1/15/19	0.088	66.9	3.7	0.2	6.89	23	600
	4/17/19	0.1	104	5.2	0.29	6.74	13.9	370
	7/19/19	0.099	84.4	4.8	0.27	7.19	10.2	445
	10/29/19	0.1	109	5.8	0.21	7.06	4.5	460
	4/1/20	0.099	112	3.9	0.14	7.57	22.5	400
	9/17/20	0.09	108	6.4	0.38	6.96	25.7	445

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

CLECO

Table 1
2016-2020 Detection Analytical Data Summary

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
L-2 (BG)	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.087	80.4	6.7	0.4	8.07	25.4	355
	10/25/16	0.085	65.7	5.9	<0.5	7.2	30.3	370
	12/19/16	0.1	79.2	6.1	0.44	7.46	29.4	400
	1/24/17	0.11	82.7	5.9	0.53	7.19	28.9	445
	2/16/17	0.093	126	6.3	0.37	7.18	35.9	490
	4/6/17	0.098	83.3	5.9	0.45	6.37	33.3	405
	5/13/17	0.11	72.7	5.8	0.52	6.22	30.8	380
	6/28/17	0.12	80.8	5.3	0.51	7.22	29	375
	8/23/17	0.095	66.4	5.2	0.64	7.28	27.9	395
	1/22/18	0.1	70.4	3.9	0.47	7.27	19.9	315
	4/11/18	0.092	74.7	3.5	0.24	7.9	20.4	235
	8/8/18	0.099	62.5	3.3	0.47	7.18	20.3	340
	10/4/18	0.093	62.8	3.2	0.48	6.87	20.4	370
	1/15/19	0.084	125	7.8	0.59	6.97	68	940
	4/17/19	0.086	150	10	0.43	6.83	98.2	565
	7/19/19	0.082	80.9	5.1	0.41	7.15	33.9	400
	10/29/19	0.082	79.4	2.4	0.52	7.06	15.9	435
	4/1/20	0.068	178	9.6	0.2	7.33	90.9	740
	9/17/20	0.085	74.1	2.2	0.61	6.84	18	280
W-3	4/29/16	0.075	25	45	<0.5	7.01	9.6	245
	7/6/16	0.14	54.1	109	0.2	7.44	3.9	565
	10/25/16	0.16	62	178	<0.5	6.9	<1.0	700
	12/19/16	0.16	64.4	174	<0.5	6.74	<1	695
	1/24/17	0.17	64.5	151	0.35	6.64	<1	710
	2/16/17	0.18	66.6	149	0.25	6.72	<1	700
	4/6/17	NA	NA	NA	NA	NA	NA	NA
	5/13/17	0.15	66.3	195	0.33	6.52	<1	715
	6/28/17	0.18	64.9	159	0.29	6.79	<1	675
	8/23/17	0.17	64	156	0.37	6.77	1.2	690
	1/23/18	0.17	67.5	161	0.43	7	<1	685
	4/11/18	0.18	69.9 / 65.2*	164	0.25	6.73	<1	595
	8/8/18	0.17	66.1	206	<1	7.31	3.9	910
	10/4/18	0.18	64	179	0.26	6.5	2.4	700
	1/15/19	0.18	58.1	144	0.28	6.67	3	900
	4/17/19	0.17	67.5	189	0.32	6.45	3.7	660
	7/19/19	0.18	59.8	154	0.31	6.57	4	640
	10/29/19	0.13	65.6	206	0.2	6.65	1.2	660
	4/1/20	0.16	64.8	178	0.26	6.8	1.5	880
	9/17/20	0.17	64.3	219 / 207**	0.4	6.74	<1	685

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

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
W-19	4/29/16	0.18	126	43.8	<0.5	7.07	14.5	695
	7/6/16	0.19	122	48	0.31	7.45	2.3	695
	10/25/16	0.18	96.4	53.6	<0.5	7.1	<1	640
	12/19/16	0.18	111	59.4	0.26	7	<1	705
	1/24/17	0.19	103	54.2	0.31	7	<1	675
	2/16/17	0.19	102	54.4	0.28	7	<1	620
	4/6/17	NA	NA	NA	NA	NA	NA	NA
	5/13/17	0.17	91.5	56.2	0.32	6.62	<1	600
	6/28/17	0.19	99.2	55.9	0.28	7.01	<1	620
	8/23/17	0.18	96.7	60.7	0.37	7.07	<1	640
	1/23/18	0.19	99.6	59.5	0.38	7.24	<1	620
	4/11/18	0.2 / 0.18*	110	58.1	0.41	7.37	1.3	495
	8/8/18	0.19	102	59.5	0.22	7.06	<1	690
	10/4/18	0.19	97.4	64.7	0.24	6.72	<1	630
	1/15/19	0.21	95.9	66.7	0.59	6.91	<1	400
	4/17/19	0.19	113	58.7	0.31	6.65	<1	640
	7/19/19	0.2	101	52.1	0.33	6.87	<1	725
	10/29/19	0.16	96.9	74.7 / 52.8*	0.38	6.83	<1	605
	4/1/20	0.17	93.1	61.6	0.39	6.87	<1	480
	9/17/20	0.18	96.6	69.8	0.25	6.57	<1	575
W-21	4/29/16	0.063	22.8	8.7	<0.5	7	32.9	215
	7/6/16	0.093	37.2	13	0.19	7.82	49.4	435
	10/25/16	0.24	81.8	43	<0.5	6.9	177	920
	12/19/16	0.35	121	52.9	0.68	7	163	1230
	1/24/17	0.36	112	52.2	0.67	7.07	168	1,220
	2/16/17	0.38	146	51.2	0.61	7.1	162	1,240
	4/6/17	NA	NA	NA	NA	NA	NA	NA
	5/13/17	0.37	111	54.8	0.79	6.86	171	1,200
	6/28/17	0.47	125	52.4	0.83	7.15	167	1,280
	8/23/17	0.35	113	54.5	0.63	7.11	166	1,190
	1/23/18	0.36	125	56.8	0.51	7.17	180	1,280
	4/11/18	0.35	124	54.3	0.41	7.51	160	1,110
	8/8/18	0.39	124	51.3	0.42	7.73	172	1,120
	10/4/18	0.35	122	54	1.1	6.91	177	1,130
	1/15/19	0.38	114	54.2	0.75	7.06	166	1,120
	4/17/19	0.3	109	54.2	0.8	6.77	158	1,020
	7/19/19	0.36	108	37.3	0.62	6.93	113	940
	10/29/19	0.32	118	67.4 / 40.5*	0.48	6.92	173	1,080
	4/1/20	0.32	114	52.9	0.42	7.07	177	1,140
	9/17/20	0.32	113	56	0.44	6.5	183	1,100

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

Table 1
2016-2020 Detection Analytical Data Summary

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
W-24	4/29/16	NA	NA	NA	NA	NA	NA	NA
	7/6/16	0.21	111	120	0.5	7.91	3.3	880
	10/25/16	0.14	13.7	65.9	<0.5	7.3	1.8	440
	12/19/16	0.19	127	156	0.46	6.9	1.8	1,100
	1/24/17	0.2	107	131	1.4	6.97	1.1	1,060
	2/16/17	0.18	158	139	0.45	7.08	6.3	1,040
	4/6/17	0.2	129	155	0.54	6.01	1.2	610
	5/13/17	0.17	125	166	0.47	6.67	<1	1,220
	6/28/17	0.19	137	175	0.5	7.2	<1	1,360
	8/23/17	0.19	115	130	0.51	7.06	<1	1,080
	1/23/18	0.19	138	175	0.34	7.21	1	1,310
	4/11/18	0.18	140	108	0.56	7.5	2.5	750
	8/8/18	0.2	117	96.2	0.27	7.51	2.4	920
	10/4/18	0.2	122	145	0.37	7.11	1	1,150
	1/15/19	0.086	62.6	27.2	0.15	7.43	11.2	540
	4/17/19	0.19	110	85.6	0.89	6.99	6.7	950
	7/19/19	0.23	95.2	89.2	0.58	7.14	3	910
	10/29/19	0.17	120	143	0.3	6.76	4.5	1,030
	4/1/20	0.043	56.7	27.7	0.12	7.85	34.3 / 6.6*	400
	9/17/20	0.15	122	98.8	0.25	6.76	2.7	895

* 5/25/18 resampling result.

<u>Notes:</u>
mg/l = milligrams per liter
S.U. = standard units

APPENDIX G.2

2019 ANNUAL GROUNDWATER MONITORING REPORT

CLECO POWER LLC
BRAME ENERGY CENTER

BOTTOM ASH POND AND
FLY ASH POND
LENA, LA

2019 Annual Groundwater Monitoring Report for the Coal Combustion Residuals Rule

January 2020

TABLE OF CONTENTS

1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the 2019 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 recently installed monitoring wells, in addition to monitoring wells installed previously to conduct groundwater monitoring required by BEC's LDEQ approved solid waste permits. 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 April and October 2019, while additional voluntary baseline sampling events were conducted in January and July 2019. It is noted that due to flooding of the Red River during the spring of 2019, flood waters saturated the ground to the east of the Bottom Ash and Fly Ash Ponds. Risers were installed to prevent inundation of flood waters into the monitoring wells.

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 Pace Analytical Services, LLC of St. Rose, Louisiana, for analysis of the CCR groundwater detection monitoring parameters by the following methods: chloride, fluoride and sulfate by 300.0; total dissolved solids by 2540C; and metals by 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 aquifer by construction of potentiometric surface maps (Figures 3 through 6) 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)
January 2019	0.002	0.01 to 1.0
April 2019	0.00004 to 0.0002	0.0002 to 0.1
July 2019	0.0009 to 0.002	0.045 to 1.0
October 2019	0.0007 to 0.001	0.0035 to 0.5

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 total dissolved solids (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.

Due to statistically significant variation found in upgradient monitoring well data, all detection monitoring parameters 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. 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.

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. Both upper and lower prediction limits were calculated for pH.

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.

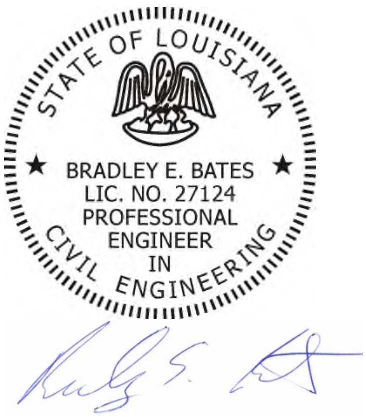
Intrawell statistical analysis of the 2019 detection monitoring groundwater data showed that SSIs were generated for chloride in downgradient/compliance wells W-19 and W-21. A verification resampling event was conducted for these well/parameter pairs in December 2019. The resampling results indicate that the referenced SSIs were not confirmed.

7.0 CONCLUSIONS AND RECOMMENDATIONS

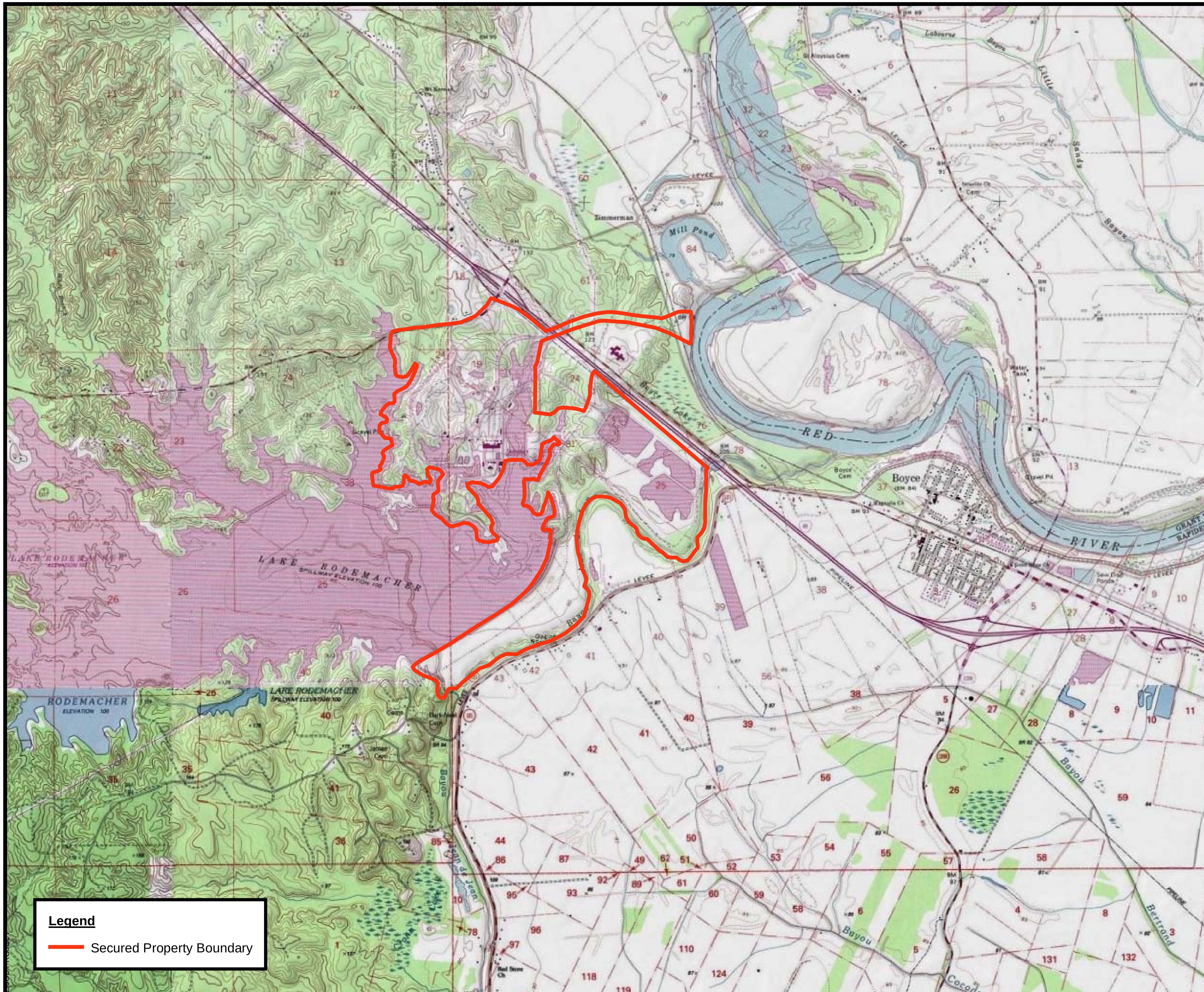
- Cleco BEC has a monitoring well system to monitor groundwater quality at the Bottom Ash and Fly Ash Ponds per applicable portions of §257.91. The network consists of five upgradient and four downgradient monitoring wells.
- Cleco conducted sufficient detection monitoring sampling events, per applicable 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 confirmed SSIs were observed in downgradient/compliance wells at BEC.
- Semi-annual detection monitoring sampling events are tentatively scheduled for March and September 2020. Data generated during these sampling events will be included in the next annual report.

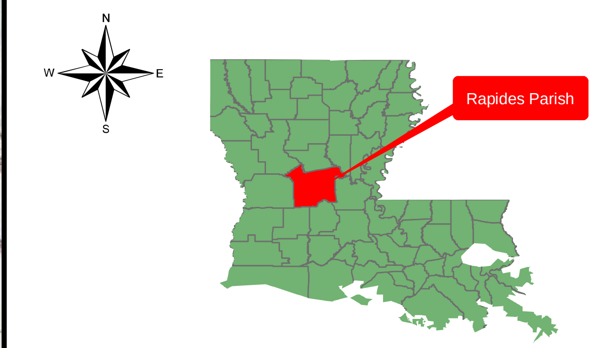
8.0 CERTIFICATION

I hereby certify this annual groundwater monitoring report for 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.	*1/9/2020*
Company	**Date**





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

Reference

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

CLECO Power LLC

Brame Energy Center

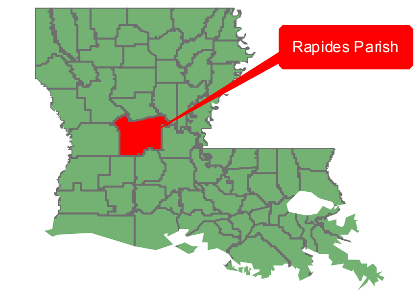
Site Location Map

Rapides Parish, Louisiana

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

EAGLE ENVIRONMENTAL SERVICES

Figure 1



Legend

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

Feet

0 500 1,000 2,000 3,000

CLECO Power LLC

Brame Energy Center

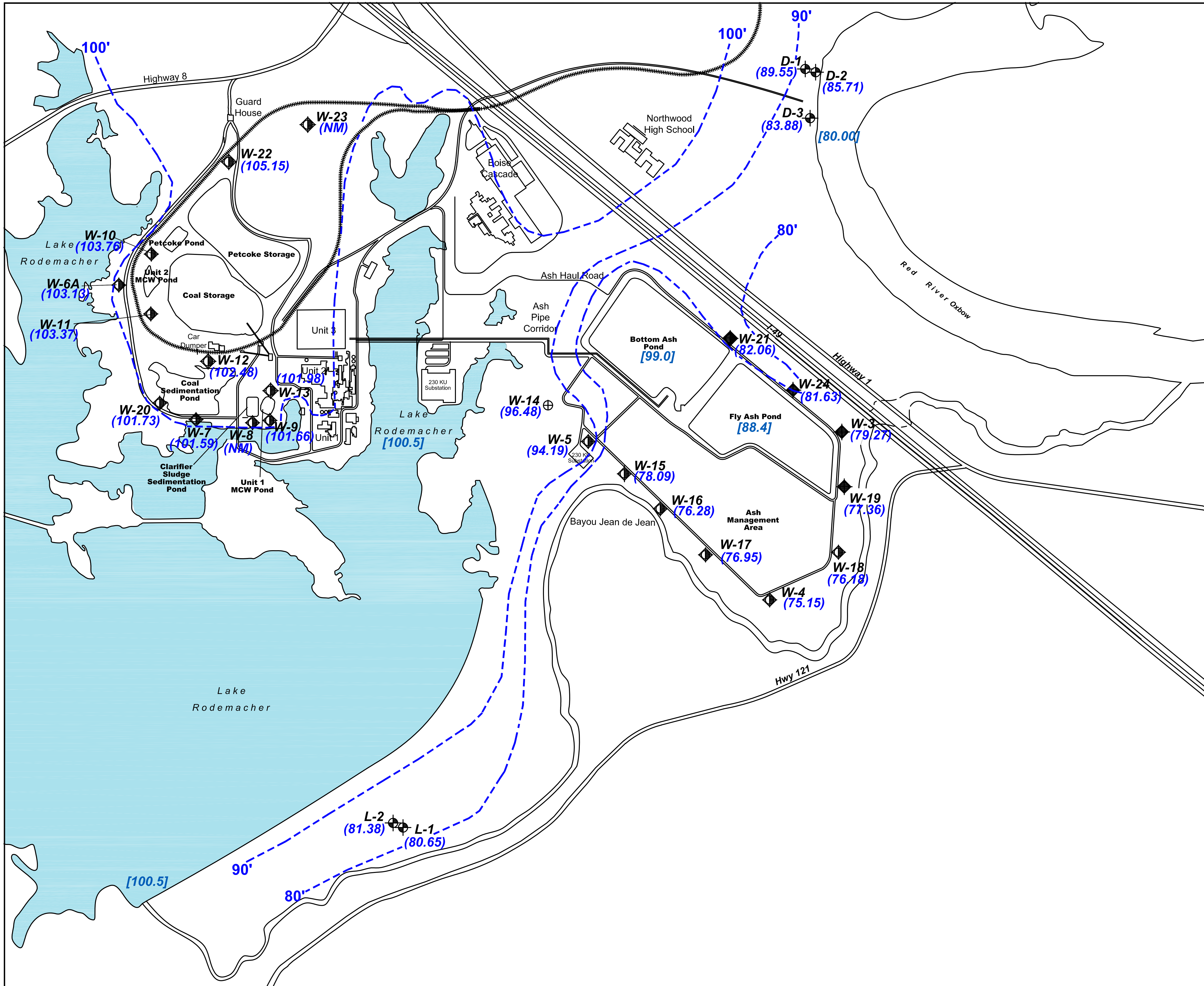
CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

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

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

Figure 2



N

Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(80.65) Potentiometric Surface Elevation, Ft. NGVD

80' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[80.00] Surface Water Elevation ft. NGVD

NM Not Measured

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'

CLECO Corporation

Brame Energy Center

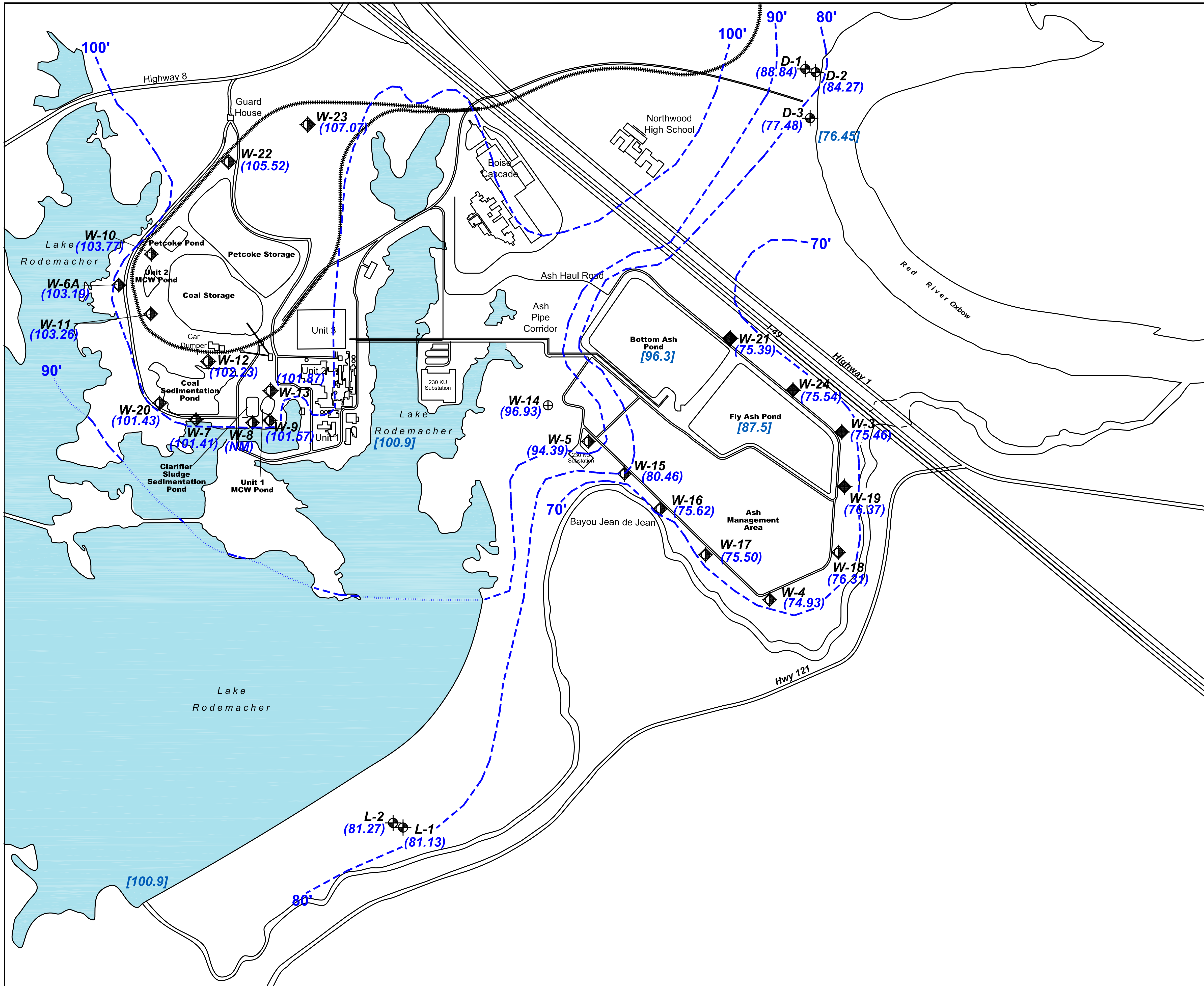
Cleco Brame
Potentiometric Surface Contour Map
January 2019

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	5/9/19
Dwg. No.:	01-19-0169-A001

Figure 3



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(75.46) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[76.45] Surface Water Elevation ft. NGVD

NM Not Measured

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'

CLECO Corporation

Brame Energy Center

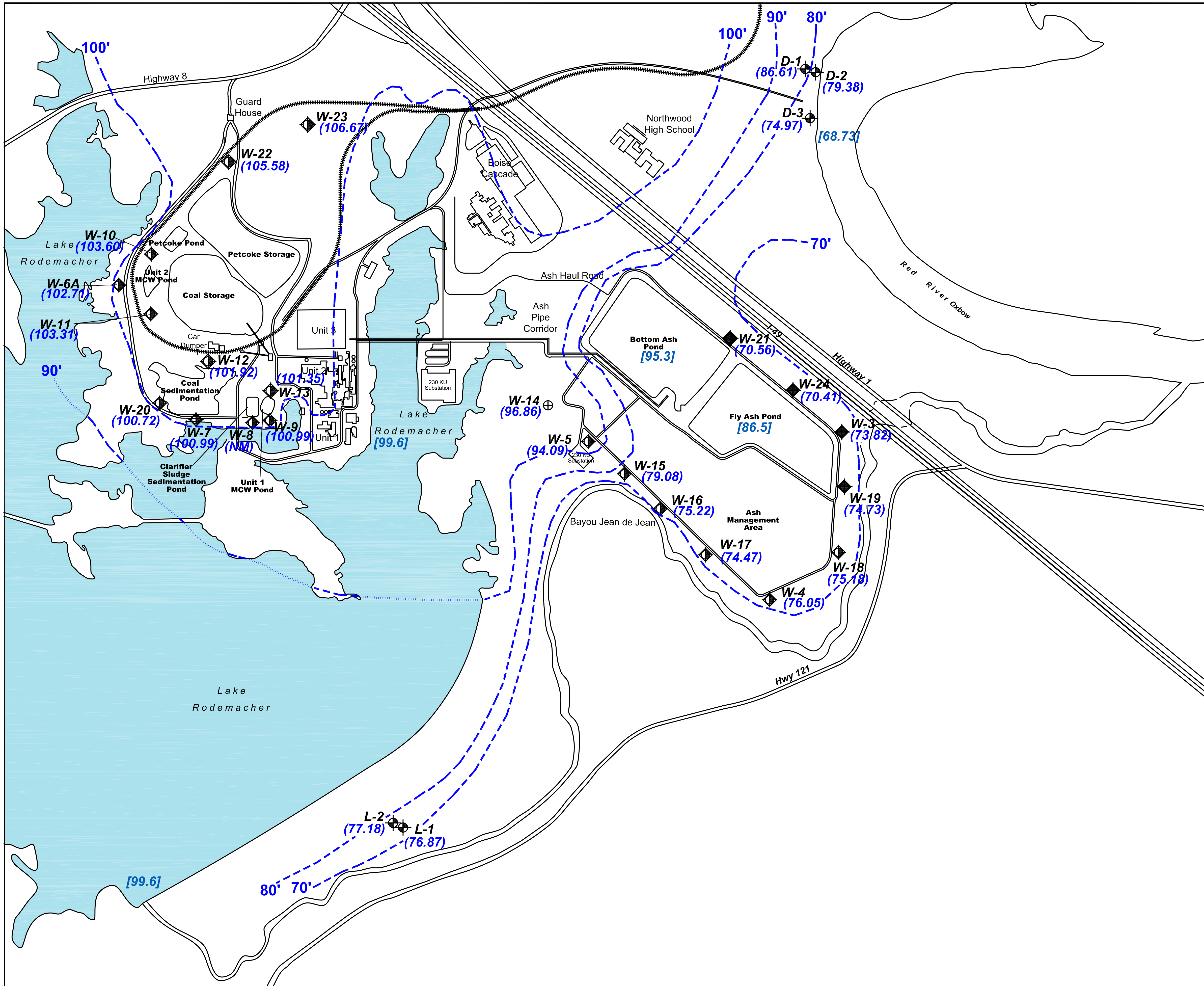
Cleco Brame
Potentiometric Surface Contour Map
April 2019

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	5/9/19
Dwg. No.:	01-19-0169-A002

Figure 4



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- *(75.18)* Potentiometric Surface Elevation, Ft. NGVD
- 70' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [68.73] Surface Water Elevation ft. NGVD
- NM Not Measured

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'

CLECO Corporation

Brame Energy Center

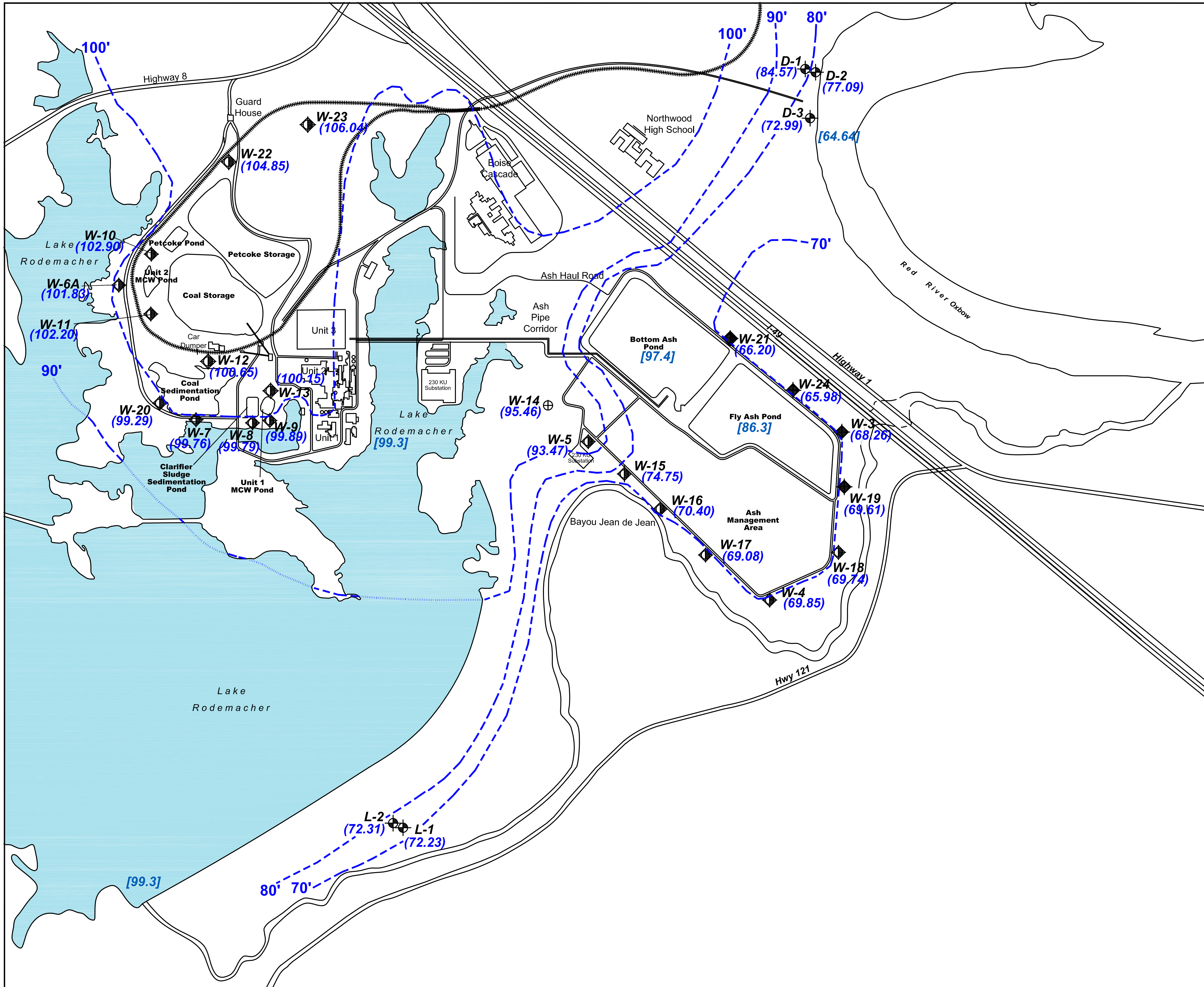
Cleco Brame
Potentiometric Surface Contour Map
July 2019

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	7/25/19
Dwg. No.:	01-19-0202-A001

Figure 5



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(69.61) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[64.64] Surface Water Elevation ft. NGVD

NM Not Measured

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'

CLECO Corporation

Brame Energy Center

Cleco Brame
Potentiometric Surface Contour Map
October 2019

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	12/12/19
Dwg. No.:	01-19-0202-A002

Figure 6

Table 1
Monitoring Well Information

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)	92.07	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
2019 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
D-1 (BG)	1/16/19	0.042	5.7	13.5	<0.1	6.29	10.1	60
	4/17/19	0.045	12.6	11.9	0.48	6.32	5.9	105
	7/19/19	0.045	8.2	11.9	0.23	6.28	9.3	145
	10/30/19	0.036	5	12.7	<0.1	5.92	10.4	175
D-2 (BG)	1/16/19	0.11	82.2	13.2	0.61	6.87	39.4	420
	4/17/19	0.25	88.3	11.4	0.91	6.68	53.2	630
	7/19/19	0.11	94.4	6.9	0.48	6.9	78.2	530
	10/30/19	0.092	93.4	9.6	0.54	6.87	69.6	405
D-3 (BG)	1/16/19	0.35	90.9	13.6	1.1	7.16	58.6	700
	4/17/19	0.11	105	7.3	0.45	7.06	96.9	465
	7/19/19	0.27	79.7	10.9	0.98	7.13	48.7	710
	10/30/19	0.24	85.2	11.8	0.51	6.92	48.6	625
L-1 (BG)	1/15/19	0.088	66.9	3.7	0.2	6.89	23	600
	4/17/19	0.1	104	5.2	0.29	6.74	13.9	370
	7/19/19	0.099	84.4	4.8	0.27	7.19	10.2	445
	10/29/19	0.1	109	5.8	0.21	7.06	4.5	460
L-2 (BG)	1/15/19	0.084	125	7.8	0.59	6.97	68	940
	4/17/19	0.086	150	10	0.43	6.83	98.2	565
	7/19/19	0.082	80.9	5.1	0.41	7.15	33.9	400
	10/29/19	0.082	79.4	2.4	0.52	7.06	15.9	435
W-3	1/15/19	0.18	58.1	144	0.28	6.67	3	900
	4/17/19	0.17	67.5	189	0.32	6.45	3.7	660
	7/19/19	0.18	59.8	154	0.31	6.57	4	640
	10/29/19	0.13	65.6	206	0.2	6.65	1.2	660
W-19	1/15/19	0.21	95.9	66.7	0.59	6.91	<1	400
	4/17/19	0.19	113	58.7	0.31	6.65	<1	640
	7/19/19	0.2	101	52.1	0.33	6.87	<1	725
	10/29/19	0.16	96.9	74.7 / 52.8*	0.38	6.83	<1	605
W-21	1/15/19	0.38	114	54.2	0.75	7.06	166	1,120
	4/17/19	0.3	109	54.2	0.8	6.77	158	1,020
	7/19/19	0.36	108	37.3	0.62	6.93	113	940
	10/29/19	0.32	118	67.4 / 40.5*	0.48	6.92	173	1,080
W-24	1/15/19	0.086	62.6	27.2	0.15	7.43	11.2	540
	4/17/19	0.19	110	85.6	0.89	6.99	6.7	950
	7/19/19	0.23	95.2	89.2	0.58	7.14	3	910
	10/29/19	0.17	120	143	0.3	6.76	4.5	1,030

* 12/17/19 Resampling event.

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

APPENDIX G.3

2017 AND 2018 ANNUAL GROUNDWATER MONITORING REPORTS

CLECO POWER LLC
BRAME ENERGY CENTER

BOTTOM ASH POND AND
FLY ASH POND
LENA, LA

2017 Annual Groundwater Monitoring Report for the Coal Combustion Residuals Rule

January 2018

CLECO

TABLE OF CONTENTS

1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the 2017 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 recently installed monitoring wells, in addition to monitoring wells installed previously to conduct groundwater monitoring required by BEC's LDEQ approved solid waste permits. 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 between April 2016 and August 2017, in accordance with applicable portions of §257.93.

Prior to purging and sampling activities, 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 Pace Analytical Services, LLC of St. Rose, Louisiana, for analysis of the CCR groundwater monitoring parameters by the following methods: chloride, fluoride and sulfate by 300.0; total dissolved solids by 2540C; metals by 6020, mercury by 7470, radium 226 by 903.1, and radium 228 by 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 aquifer by construction of potentiometric surface maps (Figures 3 through 12) 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 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 aquifer (Fetter, 2001). Using these values, the groundwater flow rate (v) is estimated to range from 0.0001 to 1.5 feet/day as listed below.

Date	Hydraulic Gradient (feet/feet)	Estimated Groundwater Flow Velocity (feet/day)
April 2016	0.00002 to 0.002	0.0001 to 1
July 2016	0.002	0.1 to 1
October 2016	0.001 to 0.002	0.05 to 1
December 2016	0.001 to 0.003	0.05 to 1.5
January 2017	0.00002 to 0.003	0.001 to 1.5
February 2017	0.001 to 0.002	0.05 to 1
May 2017	0.0006 to 0.002	0.03 to 1
June 2017	0.0006 to 0.002	0.03 to 1
August 2017	0.0003 to 0.002	0.015 to 1

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 total dissolved solids (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 summary tables are provided in Tables 2 through 11.

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.

Statistical evaluations at BEC were performed using interwell prediction limits for pH. The interwell prediction limits were performed using the Sanitas v9® software package. Prediction limits were constructed from the upgradient well data and based on the distribution of that data for each parameter. If the assumption of normality was not rejected for the upgradient data set, then a parametric prediction limit was calculated. If the assumption of normality was rejected for the upgradient data set, then a non-parametric prediction limit was calculated, in which case, the prediction limit was based on the highest value in the upgradient data set. 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 August 2017 sampling event at BEC indicated that no SSIs were generated for pH.

Due to statistically significant variation found in upgradient monitoring well data, all detection monitoring parameters except pH 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. If the assumption of normality was not rejected for the background data set, then a parametric prediction limit was calculated. If the assumption of normality was rejected for the background data set, then a non-parametric prediction limit was calculated, in which case, the prediction limit was based on the highest value in the background data set.

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 will only be 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 will be subject to verification resampling.

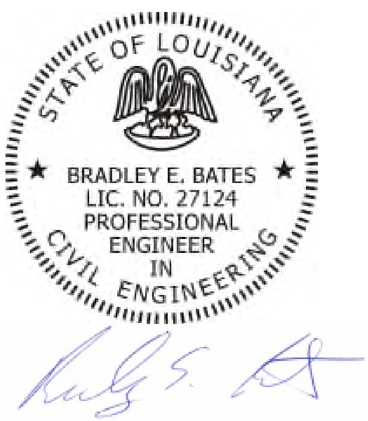
Intrawell statistical analysis of the August 2017 data showed that SSIs were generated for fluoride in upgradient wells D-3 and L-2. As stated above, verification resampling will not be conducted for intrawell SSIs generated in upgradient wells. Given the increasing concentrations of fluoride observed in upgradient locations, these conditions will be monitored in downgradient locations in future reports. No SSIs were generated in downgradient wells via intrawell statistical analysis.

7.0 CONCLUSIONS AND RECOMMENDATIONS

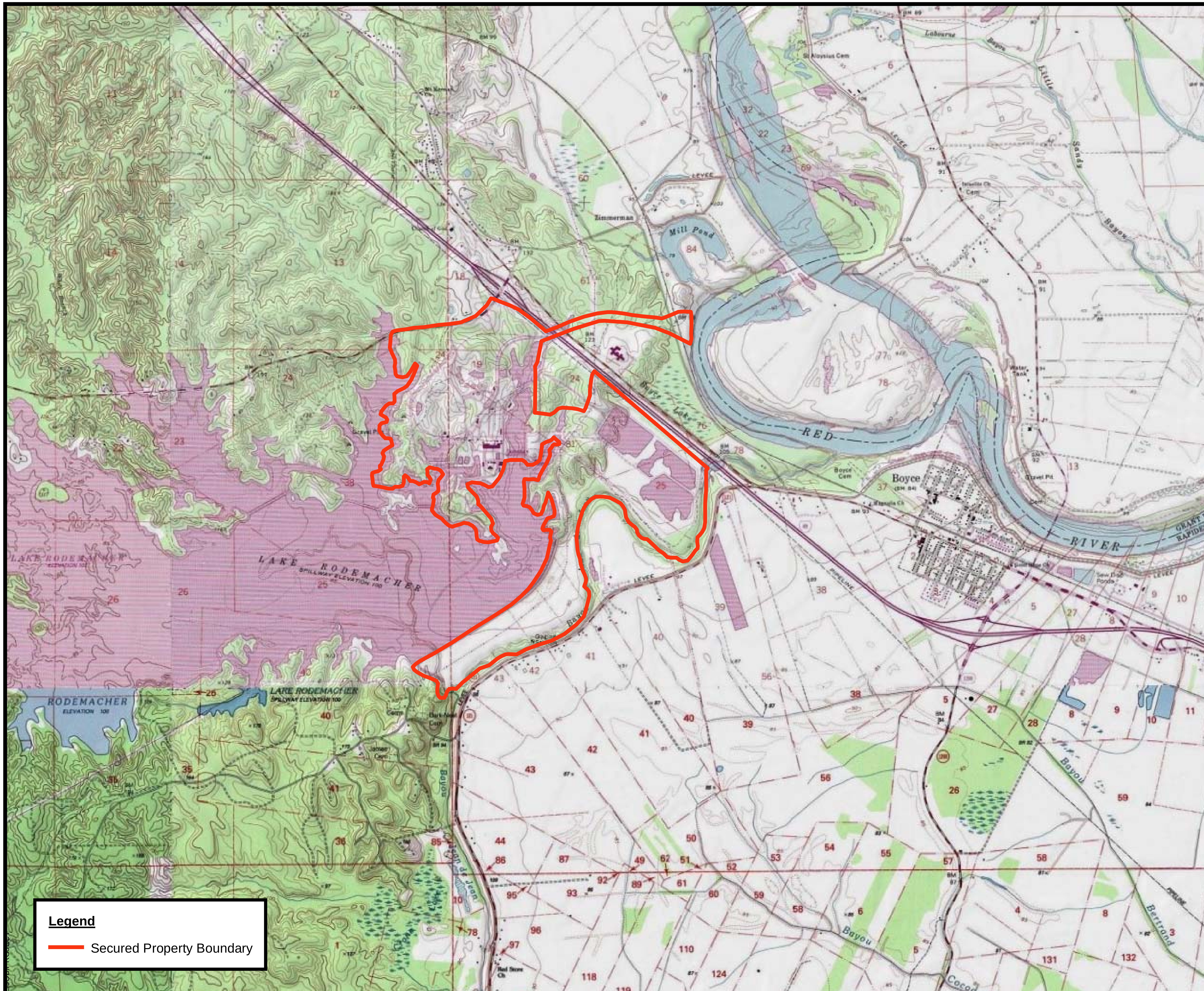
- Cleco BEC has a monitoring well system to monitor groundwater quality at the Bottom Ash and Fly Ash Ponds per applicable portions of §257.91. The network consists of five upgradient and four downgradient monitoring wells.
- Cleco conducted sufficient detection monitoring sampling events, per applicable 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 have been generated in downgradient wells.
- Semi-annual detection monitoring sampling events are tentatively scheduled for April and October of 2018. Data generated during these sampling events will be included in the next annual report.

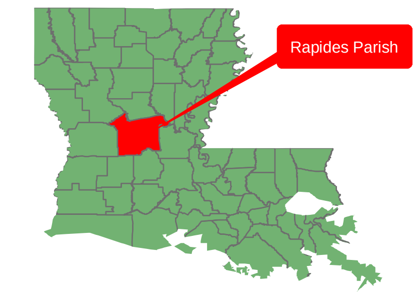
8.0 CERTIFICATION

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.	*1/10/18*
Company	**Date**





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

Reference

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

CLECO Power LLC

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

CLECO Power LLC

Brame Energy Center

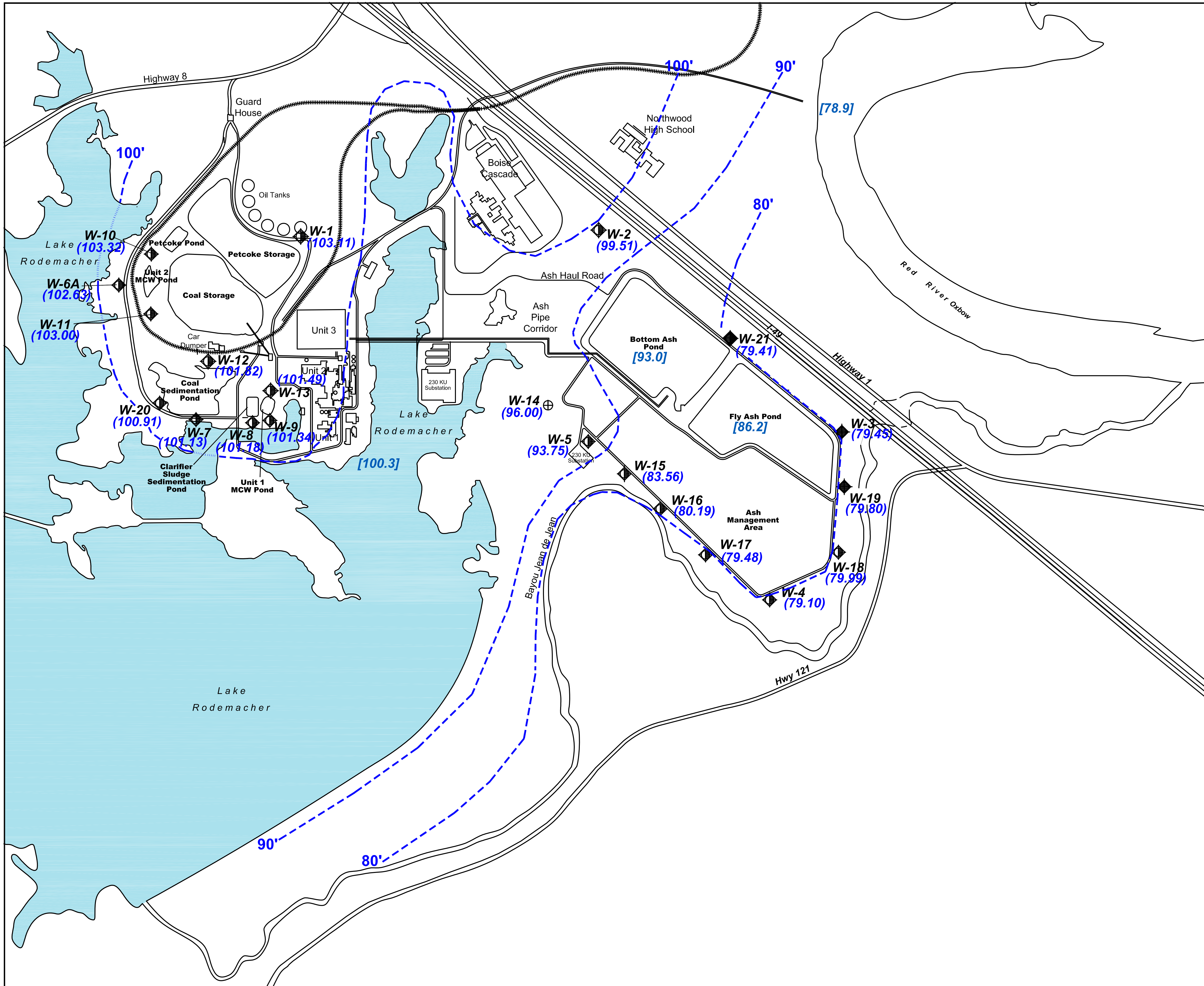
CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

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

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

Figure 2



N

Legend

Railroad Tracks

CCR Compliance Well Location

Non-CCR Piezometer Location

(79.10) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[93.0] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

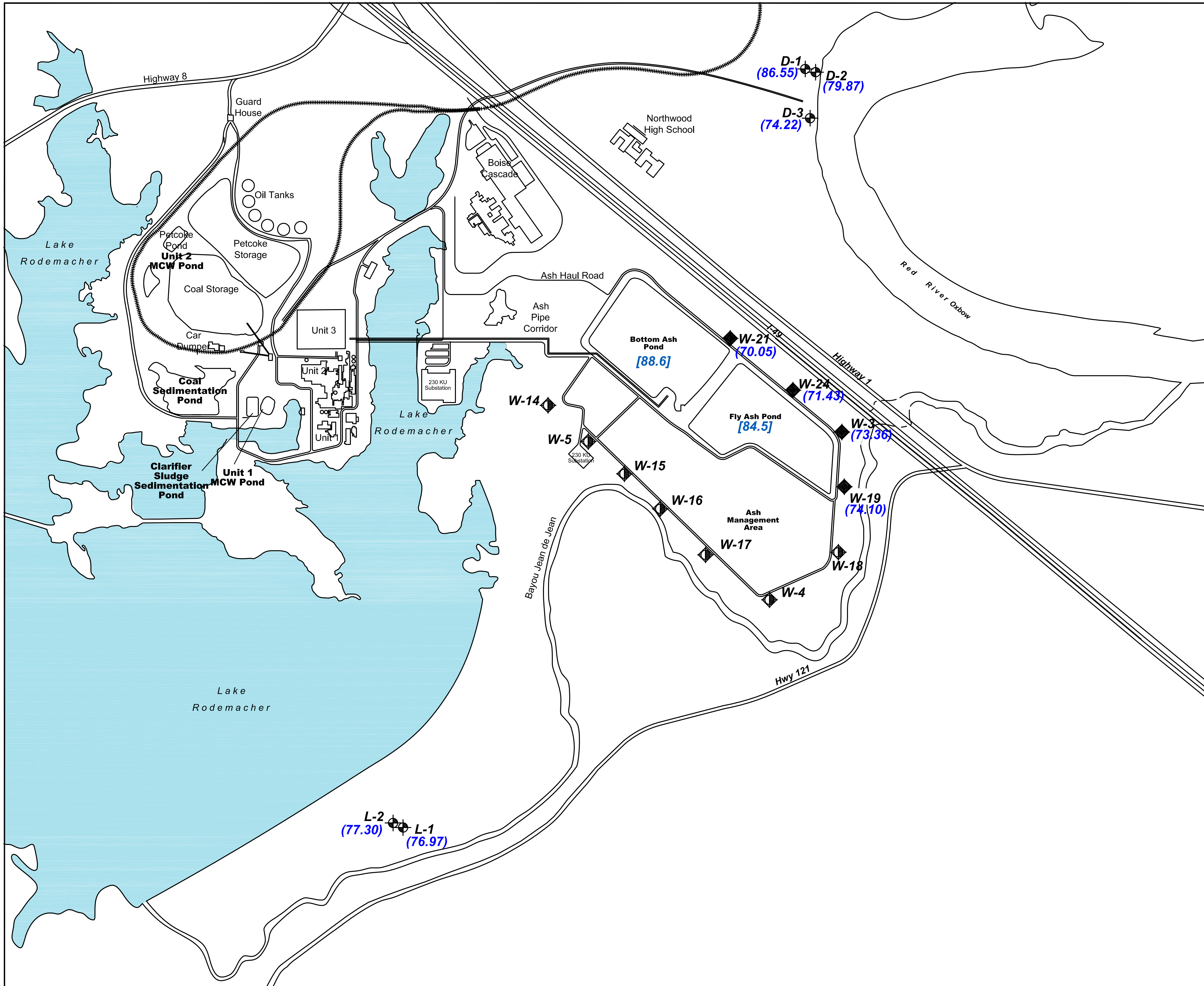
Cleco Brame
Potentiometric Surface Contour Map
April 2016

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-17-0169-A001

Figure 3



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(74.10) Potentiometric Surface Elevation, Ft. NGVD

[88.6] Surface Water Elevation, Ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

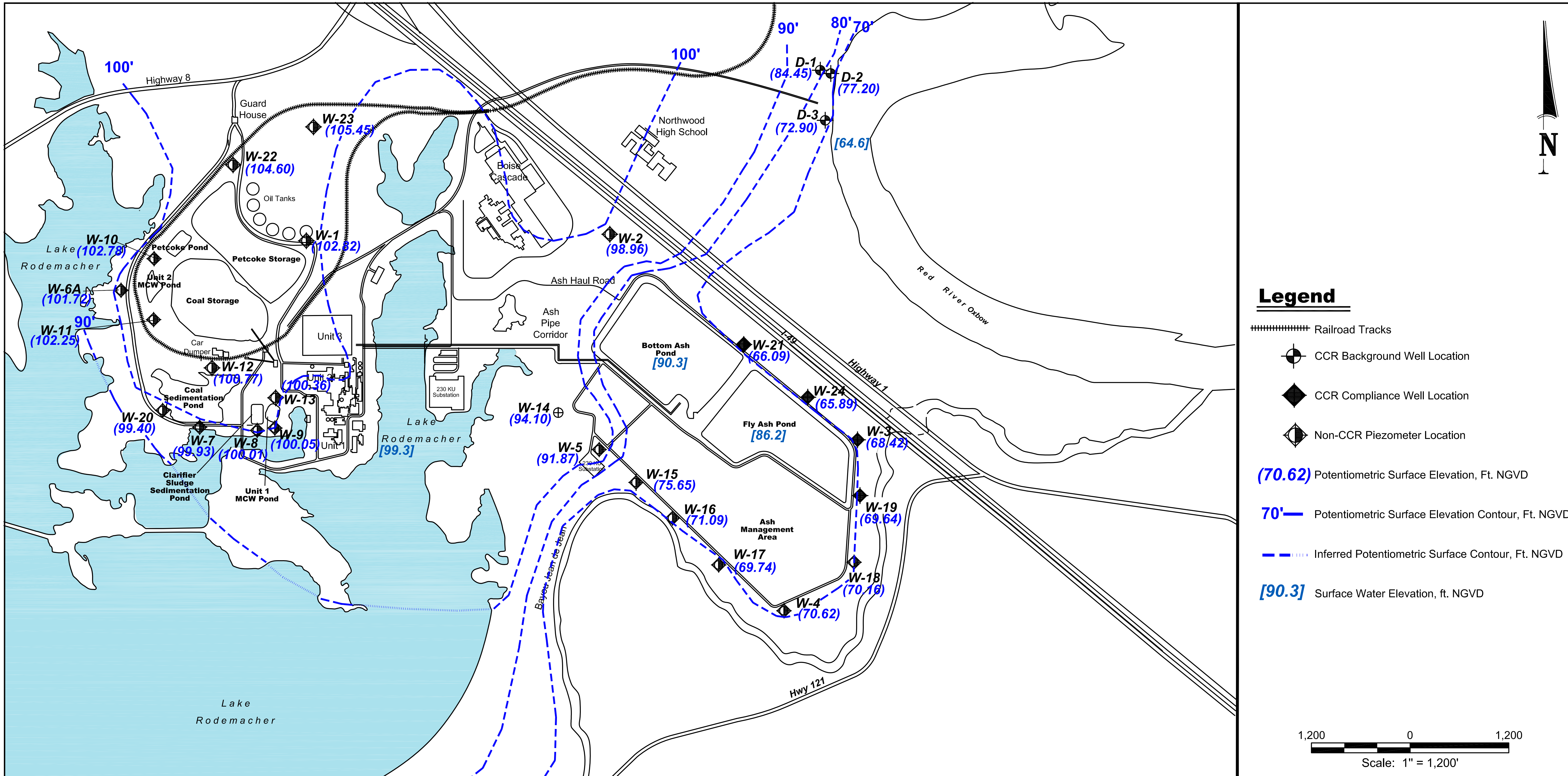
CCR Rule Wells
Potentiometric Surface Contour Map
July 2016

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	2/22/17
Dwg. No.:	01-17-0169-A002

Figure 4



CLECO Corporation

Brame Energy Center

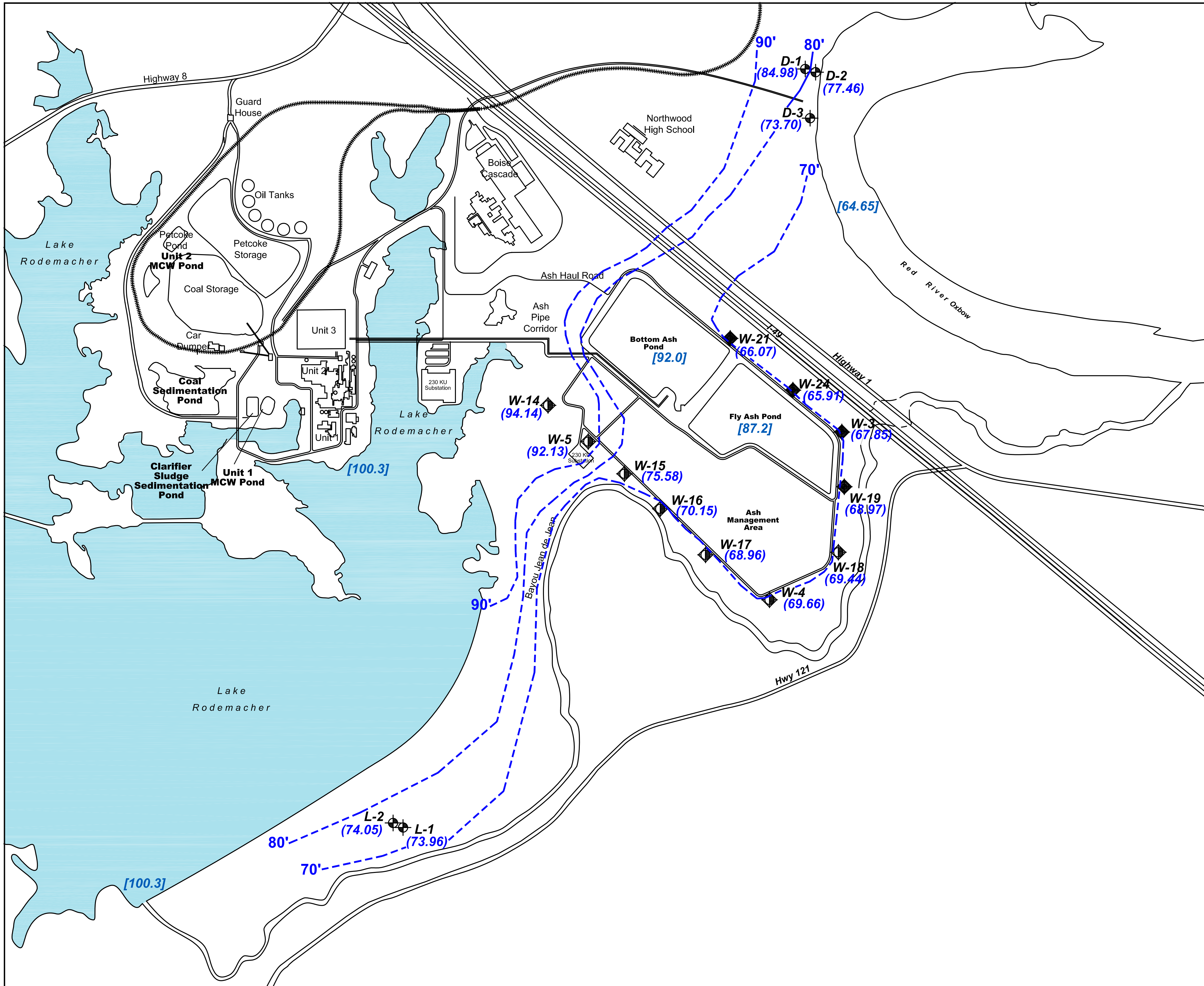
Cleco Brame
Potentiometric Surface Contour Map
October 2016

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-17-0169-A003

Figure 5



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- **(68.97)** Potentiometric Surface Elevation, Ft. NGVD
- **70'** Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- **[92.0]** Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

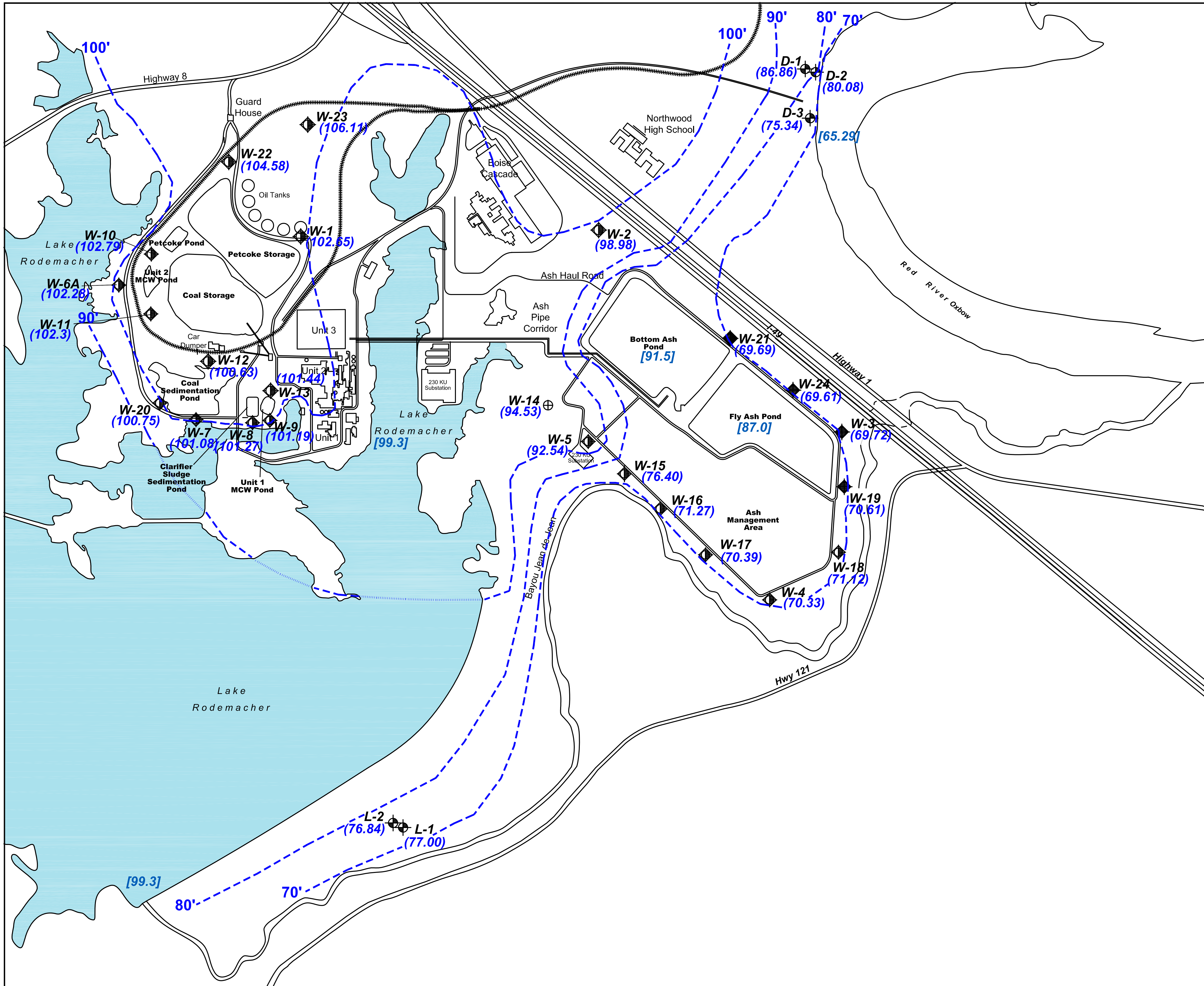
CCR Rule Wells
Potentiometric Surface Contour Map
December 2016

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	3/1/17
Dwg. No.:	01-17-0169-A004

Figure 6



N

Legend

Railroad Tracks
CCR Background Well Location
CCR Compliance Well Location
Non-CCR Piezometer Location
(70.33) Potentiometric Surface Elevation, Ft. NGVD
70' Potentiometric Surface Elevation Contour, Ft. NGVD
Inferred Potentiometric Surface Contour, Ft. NGVD
[91.5] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

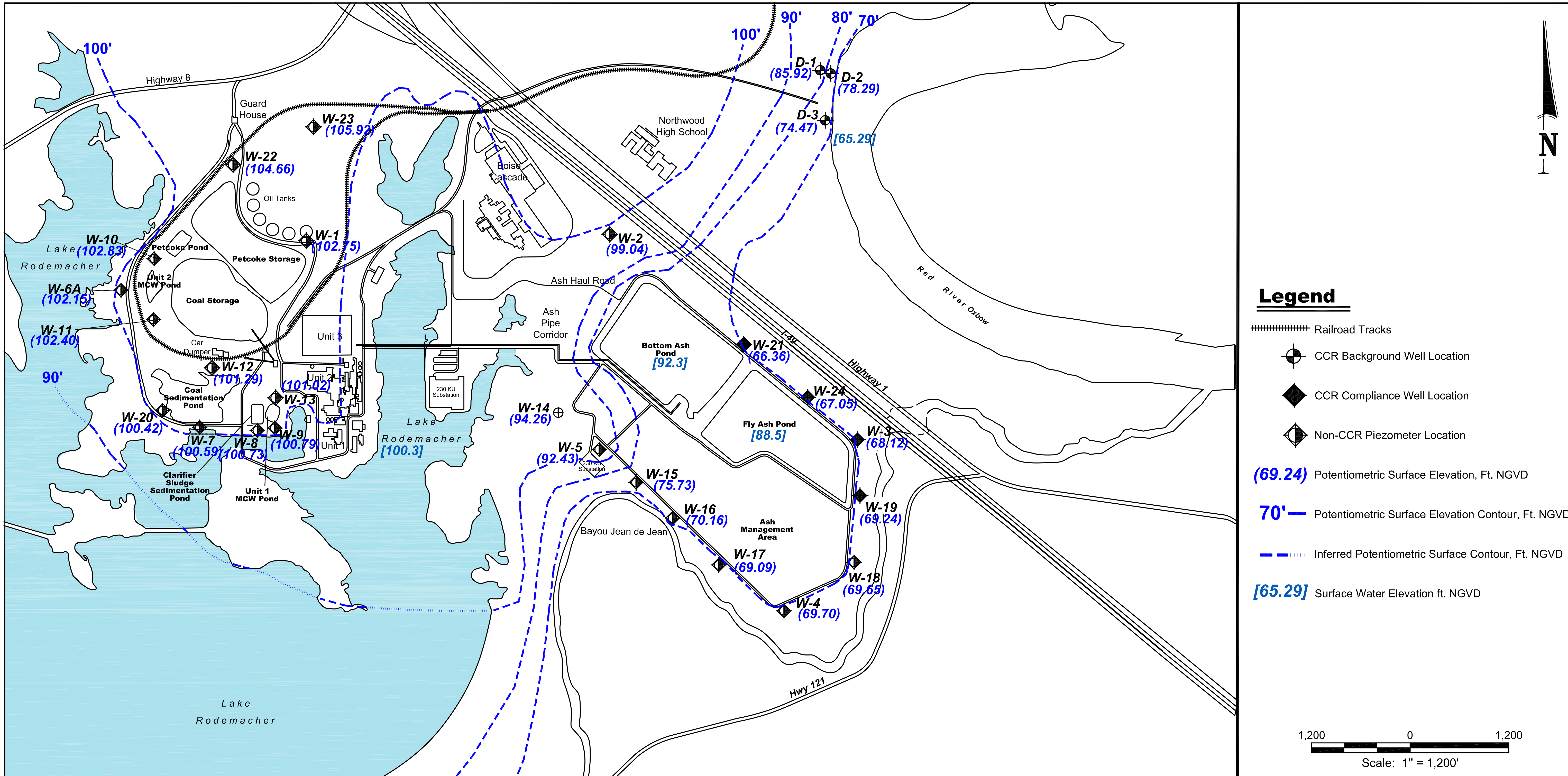
Cleco Brame
Potentiometric Surface Contour Map
January 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	2/22/17
Dwg. No.:	01-17-0169-A005

Figure 7



CLECO Corporation

Brame Energy Center

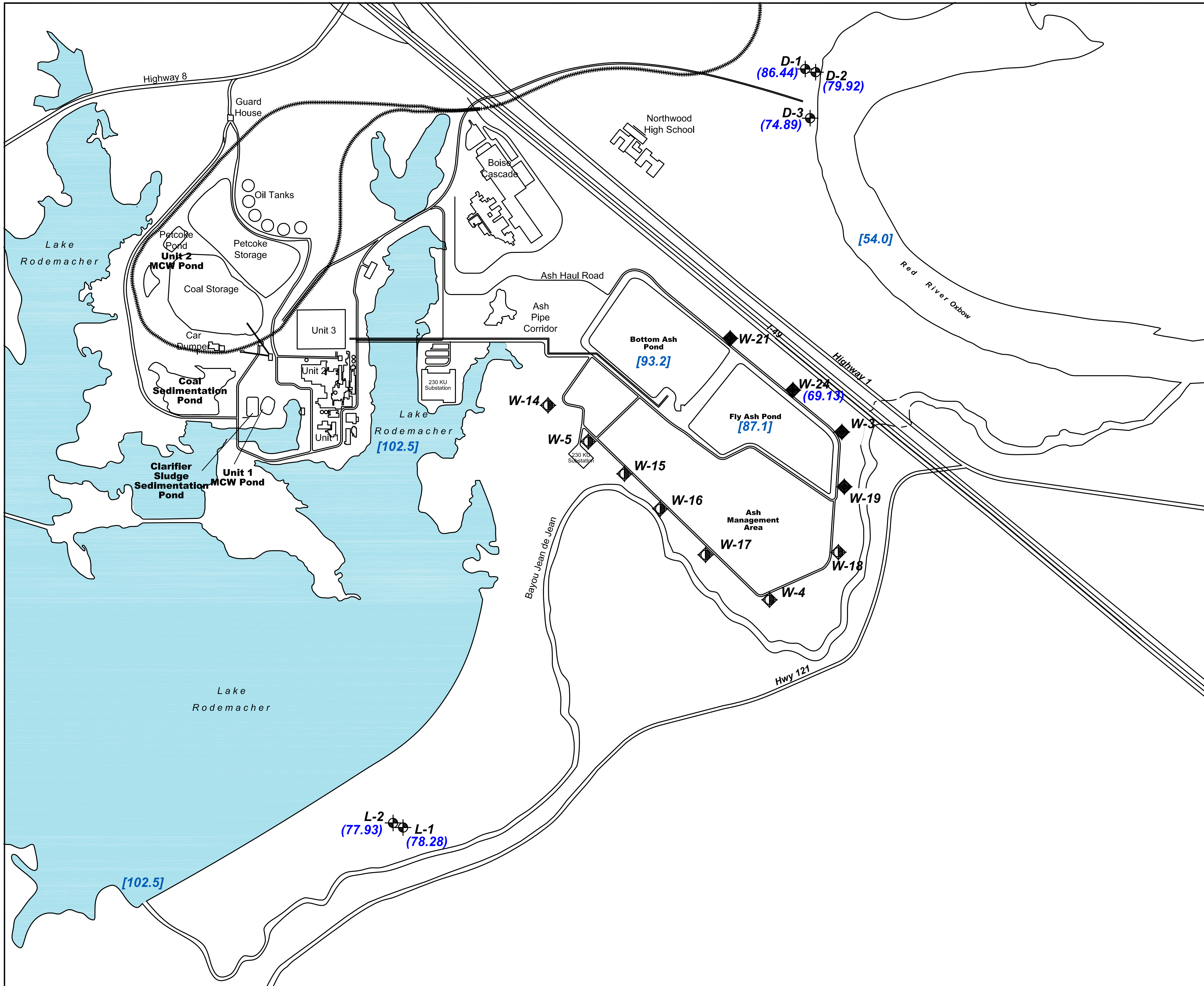
Cleco Brame
Potentiometric Surface Contour Map
February 2017

Rapides Parish, Louisiana

EAGLE ENVIRONMENTAL SERVICES, INC.

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	3/23/17
Dwg. No.:	01-17-0169-A006

Figure 8



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(69.13) Potentiometric Surface Elevation, Ft. NGVD

[87.1] Surface Water Elevation, Ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

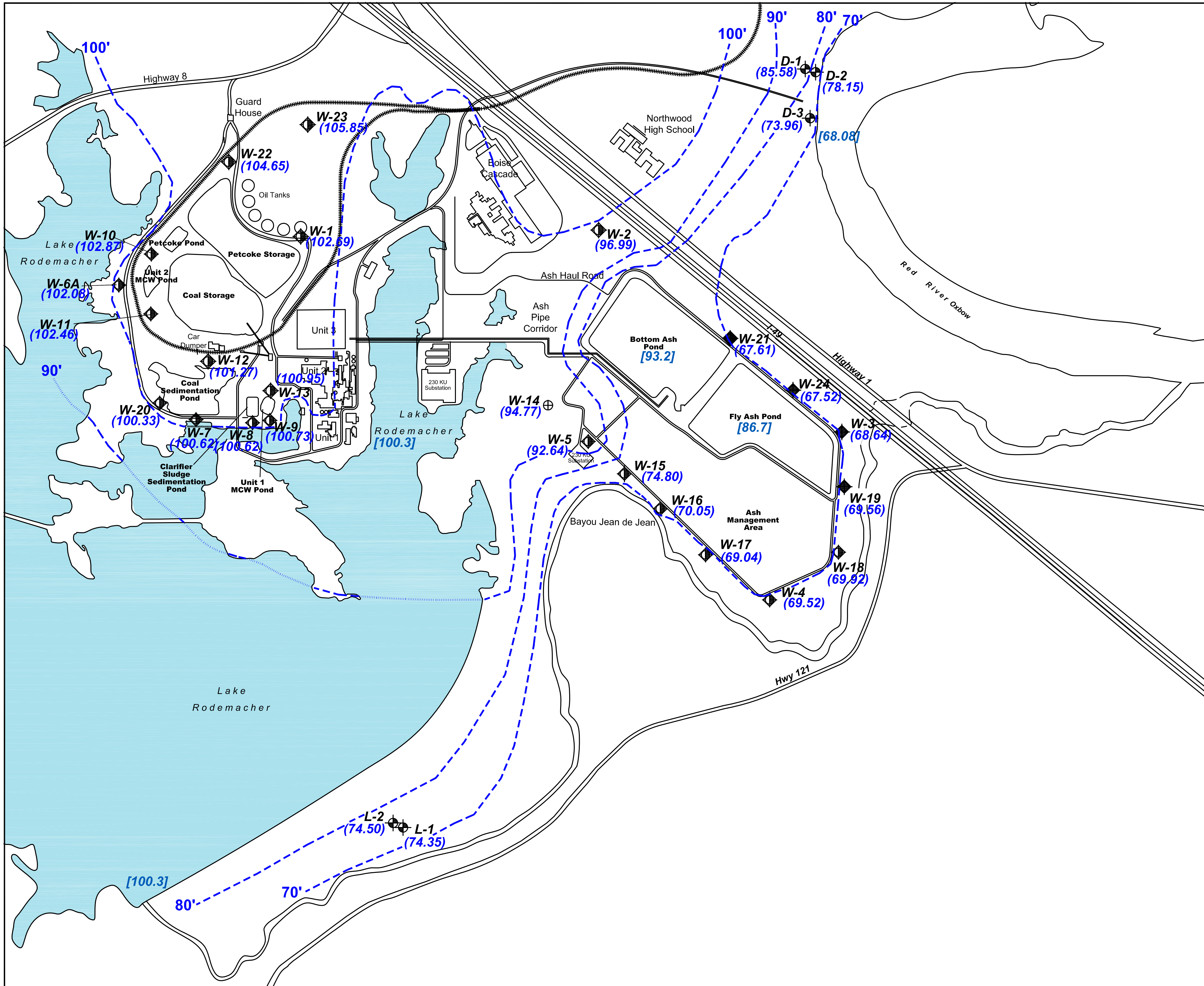
CCR Rule Wells
Potentiometric Surface Contour Map
April 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	5/9/17
Dwg. No.:	01-17-0169-A007

Figure 9



N

Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(69.52) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[68.08] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

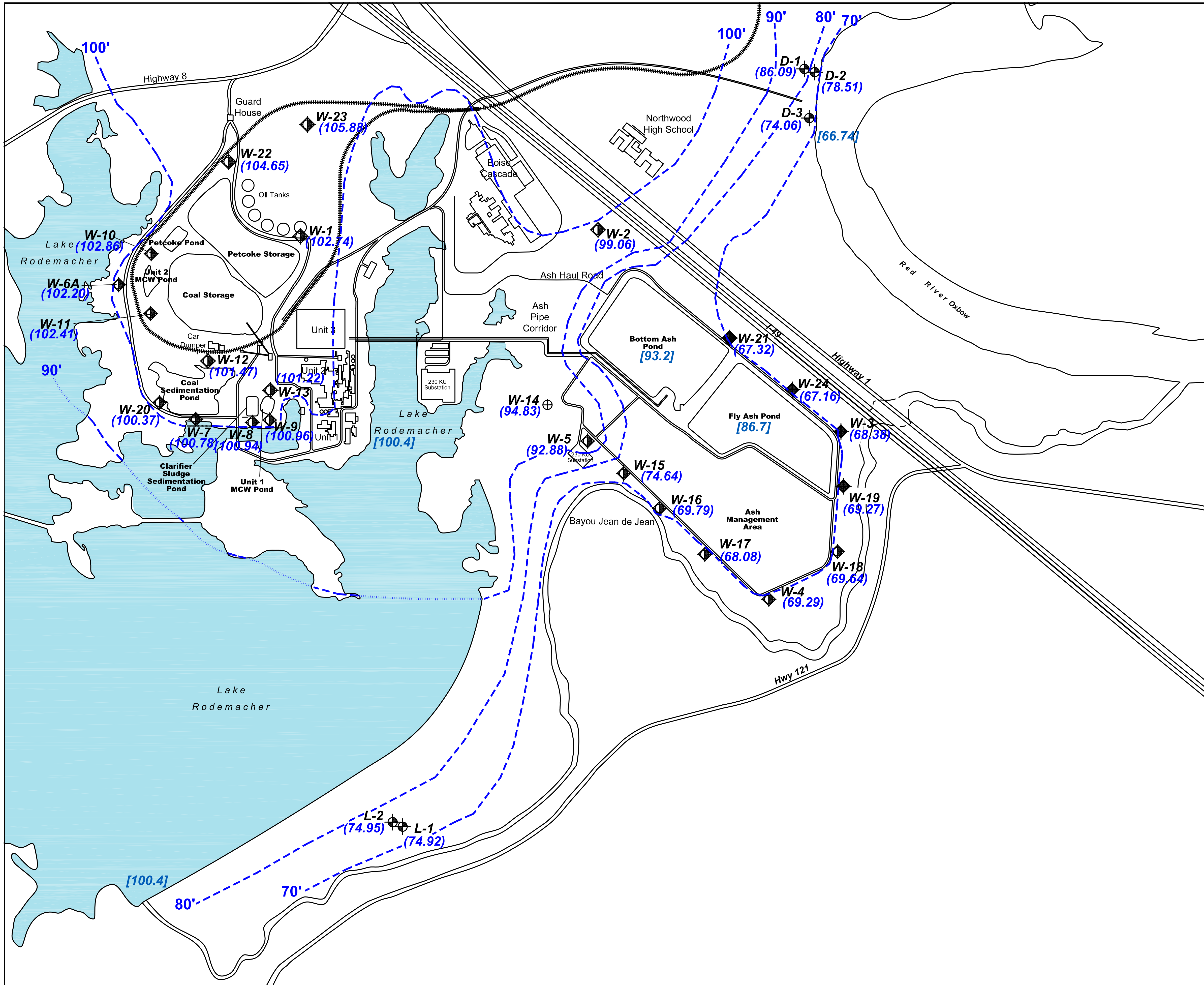
Cleco Brame
Potentiometric Surface Contour Map
May 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	6/23/17
Dwg. No.:	01-17-0169-A008

Figure 10



N

Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (69.27) Potentiometric Surface Elevation, Ft. NGVD
- 70' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [66.74] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

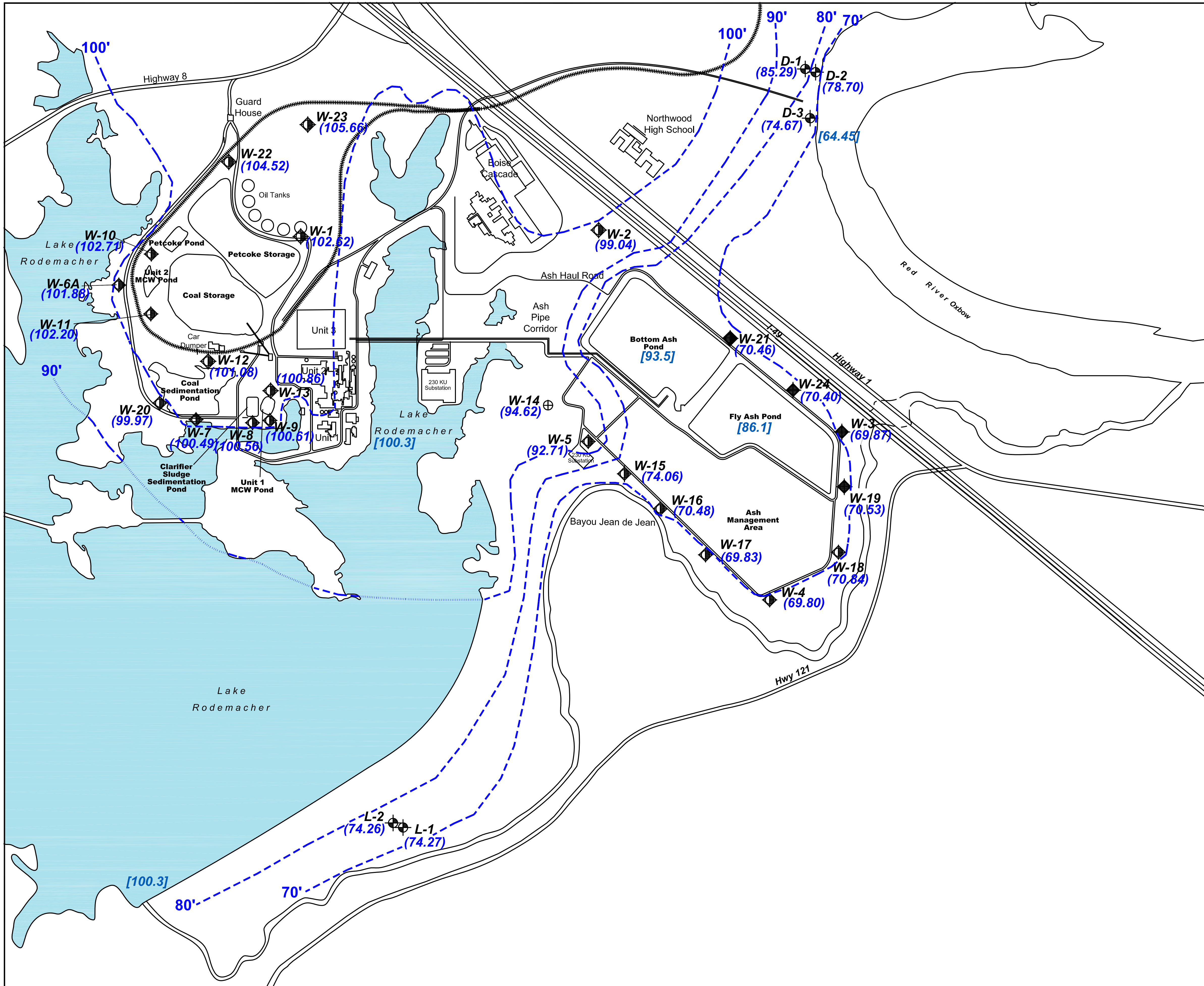
Cleco Brame
Potentiometric Surface Contour Map
June 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	7/5/17
Dwg. No.:	01-17-0169-A009

Figure 11



Legend

- Railroad Tracks
- CCR Background Well Location
- CCR Compliance Well Location
- Non-CCR Piezometer Location
- (70.46) Potentiometric Surface Elevation, Ft. NGVD
- 70' Potentiometric Surface Elevation Contour, Ft. NGVD
- Inferred Potentiometric Surface Contour, Ft. NGVD
- [64.45] Surface Water Elevation ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

Cleco Brame
Potentiometric Surface Contour Map
August 2017

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	8/30/17
Dwg. No.:	01-17-0169-A010

Figure 12

Table 1
Monitoring Well Information

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)	92.07	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
April 2016 Analytical Data Summary

Parameter/Well/ Date	MCL	W-3 4/29/16	W-19 4/29/16	W-21 4/29/16
Detection Monitoring Parameters				
Boron (mg/l)	NA	0.075	0.18	0.063
Calcium (mg/l)	NA	25	126	22.8
Chloride (mg/l)	NA	45	43.8	8.7
Fluoride (mg/l)	4	<0.5	<0.5	<0.5
pH (S.U.)	NA	7.01	7.07	7
Sulfate (mg/l)	NA	9.6	14.5	32.9
TDS (mg/l)	NA	245	695	215
Assessment Monitoring Parameters				
Antimony (mg/l)	0.006	0.0026	0.0044	<0.001
Arsenic (mg/l)	0.01	0.0034	0.022	0.0031
Barium (mg/l)	2	0.23	0.66	0.094
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	0.0017	0.0013	<0.001
Cobalt (mg/l)	NA	<0.001	<0.001	<0.001
Lead (mg/l)	0.015	0.0021	0.0026	0.0011
Lithium (mg/l)	NA	0.0056	0.008	0.0037
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.719	0.177	0.217
Radium-228 (pCi/l)	5	0.785	0.74	0.434

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

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Table 3
July 2016 Analytical Data Summary

Parameter/Well/ Date	MCL	D-1 (BG) 7/6/16	D-2 (BG) 7/6/16	D-3 (BG) 7/6/16	L-1 (BG) 7/6/16	L-2 (BG) 7/6/16	W-3 7/6/16	W-19 7/6/16	W-21 7/6/16	W-24 7/6/16
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.12	0.14	0.28	0.12	0.087	0.14	0.19	0.093	0.21
Calcium (mg/l)	NA	16.8	99.3	95.2	120	80.4	54.1	122	37.2	111
Chloride (mg/l)	NA	20.2	12.4	13.3	10.7	6.7	109	48	13	120
Fluoride (mg/l)	4	0.28	0.63	0.52	0.25	0.4	0.2	0.31	0.19	0.5
pH (S.U.)	NA	8.33	7.92	7.92	8.04	8.07	7.44	7.45	7.82	7.91
Sulfate (mg/l)	NA	11.9	71.9	46	21.5	25.4	3.9	2.3	49.4	3.3
TDS (mg/l)	NA	260	585	705	425	355	565	695	435	880
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	<0.001
Arsenic (mg/l)	0.01	0.0031	0.009	0.0022	0.0025	0.029	0.001	0.0045	0.0045	0.0049
Barium (mg/l)	2	0.15	0.25	0.21	0.4	0.2	0.38	0.45	0.13	0.56
Beryllium (mg/l)	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cadmium (mg/l)	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium (mg/l)	0.1	0.0025	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0037	<0.001
Cobalt (mg/l)	NA	0.0057	0.0025	0.0021	0.0021	<0.001	<0.001	<0.001	0.0014	0.0012
Lead (mg/l)	0.015	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Lithium (mg/l)	NA	0.012	0.016	0.023	0.013	0.0049	0.012	0.0082	0.007	0.0087
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	0.0081	0.0045	0.0045	0.0039	0.0034	<0.003	<0.003	<0.003	0.01
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.258	-0.351	0.132	0.166	0.283	0.554	0.218	0.506	0.998
Radium-228 (pCi/l)	5	0.758	0.977	1.36	0.62	1.16	0.812	0.662	0.404	1.28

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

Table 4
October 2016 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/ Date	MCL	D-1 (BG) 10/27/16	D-2 (BG) 10/27/16	D-3 (BG) 10/27/16	L-1 (BG) 10/25/16	L-2 (BG) 10/25/16	W-3 10/25/16	W-19 10/25/16	W-21 10/25/16	W-24 10/25/16
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.057	0.13	0.27	0.11	0.085	0.16	0.18	0.24	0.14
Calcium (mg/l)	NA	8.6	92.2	87.6	107	65.7	62	96.4	81.8	13.7
Chloride (mg/l)	NA	13.9	8.8	11.5	9.4	5.9	178	53.6	43	65.9
Fluoride (mg/l)	4	<0.5	<0.5	0.52	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH (S.U.)	NA	6.7	7.4	7.1	7	7.2	6.9	7.1	6.9	7.3
Sulfate (mg/l)	NA	11.6	73.7	45.5	15.4	30.3	<1.0	<1.0	177	1.8
TDS (mg/l)	NA	150	600	745	475	370	700	640	920	440
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0021	0.0014
Arsenic (mg/l)	0.01	0.0021	0.012	0.0047	0.0053	0.052	0.0026	0.0016	0.0067	0.0026
Barium (mg/l)	2	0.12	0.29	0.27	0.43	0.15	0.52	0.42	0.14	0.061
Beryllium (mg/l)	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cadmium (mg/l)	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium (mg/l)	0.1	<0.001	<0.001	0.011	<0.001	0.0011	<0.001	<0.001	<0.001	0.0013
Cobalt (mg/l)	NA	0.0077	0.0021	0.0074	0.0016	<0.001	<0.001	<0.001	0.0015	<0.001
Lead (mg/l)	0.015	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Lithium (mg/l)	NA	0.0079	0.015	0.038	0.011	0.0061	0.014	0.0084	0.013	0.022
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	0.0031	<0.003	0.0031	0.0037	0.01	<0.003	<0.003	<0.003	0.056
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.592	0.188	0.291	0.3	0.314	0.428	0.235	0	0.2
Radium-228 (pCi/l)	5	1.05	1.25	0.176	0.971	0.211	0.784	0.96	1.44	0.422

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

Table 5
December 2016 Analytical Data Summary

Parameter/Well/ Date	MCL	D-1 (BG) 12/20/16	D-2 (BG) 12/20/16	D-3 (BG) 12/20/16	L-1 (BG) 12/19/16	L-2 (BG) 12/19/16	W-3 12/19/16	W-19 12/19/16	W-21 12/19/16	W-24 12/19/16
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.053	0.12	0.3	0.12	0.1	0.16	0.18	0.35	0.19
Calcium (mg/l)	NA	5.9	91.8	90.3	119	79.2	64.4	111	121	127
Chloride (mg/l)	NA	13.5	9.5	13.1	8.6	6.1	174	59.4	52.9	156
Fluoride (mg/l)	4	0.13	0.42	0.48	0.15	0.44	<0.50	0.26	0.68	0.46
pH (S.U.)	NA	6.8	7.04	7.25	7.44	7.46	6.74	7	7	6.9
Sulfate (mg/l)	NA	10.4	75.2	49.2	9	29.4	<1	<1	163	1.8
TDS (mg/l)	NA	145	715	805	360	400	695	705	1230	1100
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Arsenic (mg/l)	0.01	<0.001	0.011	0.0069	0.0067	0.047	0.0028	0.0058	0.015	0.027
Barium (mg/l)	2	0.15	0.4	0.2	0.57	0.34	0.57	0.65	0.13	1.4
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0046
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	<0.001	0.0076	0.0048	0.0073	0.015	<0.001	0.008	<0.001	0.058
Cobalt (mg/l)	NA	0.0069	0.0073	0.0035	0.0049	0.01	<0.001	0.0036	0.0017	0.021
Lead (mg/l)	0.015	<0.001	0.0056	0.003	0.0053	0.013	<0.001	0.0096	<0.001	0.081
Lithium (mg/l)	NA	0.0082	0.015	0.025	0.022	0.025	0.014	0.014	0.017	0.056
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	0.0031	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.0769	0.637	0.482	-0.073	0.365	0.159	1.12	0.75	3.28
Radium-228 (pCi/l)	5	0.823	1.39	0.605	0.997	1.08	0.645	0.427	0.43	3.56

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

Table 6
January 2017 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/	MCL	D-1 (BG)	D-2 (BG)	D-3 (BG)	L-1 (BG)	L-2 (BG)	W-3	W-19	W-21	W-24
Date		1/25/17	1/25/17	1/25/17	1/24/17	1/24/17	1/24/17	1/24/17	1/24/17	1/24/17
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.053	0.11	0.29	0.11	0.11	0.17	0.19	0.36	0.2
Calcium (mg/l)	NA	6.6	95.3	86.2	109	82.7	64.5	103	112	107
Chloride (mg/l)	NA	13.5	8.1	11.8	8.3	5.9	151	54.2	52.2	131
Fluoride (mg/l)	4	<0.1	0.48	0.52	0.27	0.53	0.35	0.31	0.67	1.4
pH (S.U.)	NA	7.05	7.08	7.35	7.18	7.19	6.64	7	7.07	6.97
Sulfate (mg/l)	NA	9.8	86.4	48.3	7.9	28.9	<1	<1	168	1.1
TDS (mg/l)	NA	165	595	805	500	445	710	675	1,220	1,060
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	0.0023	0.014	0.005	0.0079	0.051	0.0033	0.0025	0.016	0.011
Barium (mg/l)	2	0.13	0.34	0.2	0.51	0.39	0.61	0.46	0.14	0.87
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	<0.001	0.0023	0.0083	<0.001	0.016	<0.001	0.0026	<0.001	0.0083
Cobalt (mg/l)	NA	0.0042	0.0034	0.004	0.0015	0.0092	<0.001	<0.001	0.0017	0.0038
Lead (mg/l)	0.015	<0.001	<0.001	0.0037	<0.001	0.013	<0.001	<0.001	<0.001	0.0085
Lithium (mg/l)	NA	0.0072	0.012	0.029	0.012	0.028	0.014	0.0071	0.018	0.014
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	0.0035	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.256	0.27	0.6	0	0.777	0.583	0.382	0.571	0.926
Radium-228 (pCi/l)	5	0.668	0.504	2.31	2.36	3.24	2.23	0.396	0.239	2.94

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

Table 7
February 2017 Analytical Data Summary

Parameter/Well/ Date	MCL	D-1 (BG) 2/17/17	D-2 (BG) 2/17/17	D-3 (BG) 2/17/17	L-1 (BG) 2/16/17	L-2 (BG) 2/16/17	W-3 2/16/17	W-19 2/16/17	W-21 2/16/17	W-24 2/16/17
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.052	0.12	0.3	0.12	0.093	0.18	0.19	0.38	0.18
Calcium (mg/l)	NA	6.2	103	91.2	150	126	66.6	102	146	158
Chloride (mg/l)	NA	13.3	8.6	11.4	7.7	6.3	149	54.4	51.2	139
Fluoride (mg/l)	4	<0.10	0.43	0.48	0.21	0.37	0.25	0.28	0.61	0.45
pH (S.U.)	NA	6.68	7	7.33	7.15	7.18	6.72	7	7.1	7.08
Sulfate (mg/l)	NA	9.8	80.7	47.2	9.3	35.9	<1	<1	162	6.3
TDS (mg/l)	NA	130	530	665	500	490	700	620	1,240	1,040
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	<0.001	0.013	0.0033	0.0073	0.036	0.0033	0.0021	0.015	0.036
Barium (mg/l)	2	0.12	0.34	0.19	0.63	0.33	0.59	0.44	0.13	2.7
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	<0.001	0.0013	0.0082	0.011	0.0092	<0.001	<0.001	<0.001	0.09
Cobalt (mg/l)	NA	0.0046	0.0033	0.0044	0.008	0.0074	<0.001	<0.001	0.0017	0.045
Lead (mg/l)	0.015	<0.001	<0.001	0.0049	0.0089	0.0081	<0.001	<0.001	<0.001	0.16
Lithium (mg/l)	NA	0.0077	0.0098	0.032	0.028	0.019	0.014	0.0068	0.018	0.086
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0025
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00058
Radium-226 (pCi/l)	5	0.611	0.759	-0.511	1.21	0.346	0.733	0.347	4	-0.212
Radium-228 (pCi/l)	5	-0.14	0.907	1.59	0.832	1.04	0.765	0.644	0.391	6.65

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

Table 8
April 2017 Analytical Data Summary

Parameter/Well/ Date	MCL	D-1 (BG) 4/6/17	D-2 (BG) 4/6/17	D-3 (BG) 4/6/17	L-1 (BG) 4/6/17	L-2 (BG) 4/6/17	W-24 4/6/17
Detection Monitoring Parameters							
Boron (mg/l)	NA	0.051	0.12	0.31	0.12	0.098	0.2
Calcium (mg/l)	NA	5.8	111	88.2	121	83.3	129
Chloride (mg/l)	NA	13	6.6	12.7	6.9	5.9	155
Fluoride (mg/l)	4	<0.1	0.52	0.46	0.2	0.45	0.54
pH (S.U.)	NA	5.48	6.08	5.76	6.4	6.37	6.01
Sulfate (mg/l)	NA	10.7	102	53.8	10.6	33.3	1.2
TDS (mg/l)	NA	80	645	740	510	405	610
Assessment Monitoring Parameters							
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	<0.001	0.014	0.0081	0.01	0.062	0.019
Barium (mg/l)	2	0.12	0.32	0.19	0.56	0.23	1.5
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	0.0042
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	<0.001	<0.001	0.006	0.0083	0.0034	0.057
Cobalt (mg/l)	NA	0.0051	0.0022	0.0039	0.0052	0.002	0.019
Lead (mg/l)	0.015	<0.001	<0.001	0.0052	0.0049	0.0023	0.073
Lithium (mg/l)	NA	0.0082	0.014	0.026	0.021	0.0087	0.052
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	<0.003	0.0042	0.0034	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	0.0025
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.342	0.678	0.533	0.572	0.775	2.44
Radium-228 (pCi/l)	5	0.199	0.684	0.314	0.974	0.482	2.86

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

Table 9
May 2017 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/ Date	MCL	D-1 (BG) 5/31/17	D-2 (BG) 5/31/17	D-3 (BG) 5/31/17	L-1 (BG) 5/30/17	L-2 (BG) 5/30/17	W-3 5/31/17	W-19 5/31/17	W-21 5/31/17	W-24 5/31/17
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.043	1.1	0.029	0.11	0.11	0.15	0.17	0.37	0.17
Calcium (mg/l)	NA	5.2	101	79.6	103	72.7	66.3	91.5	111	125
Chloride (mg/l)	NA	13.1	8.1	11.3	8.7	5.8	195	56.2	54.8	166
Fluoride (mg/l)	4	0.93	0.43	0.53	0.29	0.52	0.33	0.32	0.79	0.47
pH (S.U.)	NA	6.33	6.74	6.8	5.87	6.22	6.52	6.62	6.86	6.67
Sulfate (mg/l)	NA	10.3	97.8	46.6	15.6	30.8	<1	<1	171	<1
TDS (mg/l)	NA	125	595	780	445	380	715	600	1,200	1,220
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	0.0012	0.011	0.0025	0.0067	0.045	0.0018	0.0015	0.014	0.0093
Barium (mg/l)	2	0.096	0.28	0.18	0.44	0.39	0.53	0.4	0.15	0.97
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	0.0017	<0.001	<0.001	<0.001	<0.001
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	0.0015	<0.001	0.0091	0.0026	0.021	<0.001	<0.001	<0.001	0.0092
Cobalt (mg/l)	NA	0.0044	0.0017	0.0052	0.002	0.014	<0.001	<0.001	0.0018	0.0035
Lead (mg/l)	0.015	<0.001	0.0016	0.0058	0.0016	0.018	<0.001	<0.001	<0.001	0.0084
Lithium (mg/l)	NA	0.0089	0.015	0.036	0.014	0.039	0.016	0.0081	0.019	0.019
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	<0.003	0.005	<0.003	<0.003	<0.003	<0.003	0.0068
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	0.0017	<0.001	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.0793	0.495	0.876	0.693	1.61	1.06	0.683	0.727	0.835
Radium-228 (pCi/l)	5	0.6	0.584	1.29	0.86	1.44	0.376	0.726	0.892	1.99

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

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Table 10
June 2017 Analytical Data Summary

Parameter/Well/ Date	MCL	D-1 (BG) 6/28/17	D-2 (BG) 6/28/17	D-3 (BG) 6/28/17	L-1 (BG) 6/27/17	L-2 (BG) 6/27/17	W-3 6/28/17	W-19 6/27/17	W-21 6/28/17	W-24 6/27/17
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.048	0.5	0.47	0.12	0.12	0.18	0.19	0.47	0.19
Calcium (mg/l)	NA	5.2	102	92.2	117	80.8	64.9	99.2	125	137
Chloride (mg/l)	NA	12.9	8.3	10.5	7	5.3	159	55.9	52.4	175
Fluoride (mg/l)	4	0.84	0.47	0.53	0.29	0.51	0.29	0.28	0.83	0.5
pH (S.U.)	NA	6.99	7.18	7.39	7.07	7.22	6.79	7.01	7.15	7.2
Sulfate (mg/l)	NA	10.5	80.5	46	5.5	29	<1	<1	167	<1
TDS (mg/l)	NA	125	585	805	535	375	675	620	1,280	1,360
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	<0.001	0.013	0.0029	0.0081	0.041	0.0029	0.0024	0.015	0.017
Barium (mg/l)	2	0.13	0.37	0.2	0.58	0.57	0.6	0.46	0.13	1.3
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	0.0025	<0.001	<0.001	<0.001	0.0013
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	0.0016	0.0019	0.0081	0.011	0.032	<0.001	<0.001	<0.001	0.019
Cobalt (mg/l)	NA	0.004	0.0024	0.0044	0.0063	0.026	<0.001	<0.001	0.0017	0.0081
Lead (mg/l)	0.015	<0.001	<0.001	0.0054	0.0068	0.033	<0.001	<0.001	<0.001	0.023
Lithium (mg/l)	NA	0.0087	0.01	0.035	0.025	0.058	0.015	0.007	0.018	0.025
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	0.0027	<0.001	<0.001	<0.001	0.0014
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.602	0.444	1.93	0.152	0.396	0.0622	0.777	0.37	1.47
Radium-228 (pCi/l)	5	0.962	1.19	1.88	1.13	2.95	1.57	1.05	0.892	1.78

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

Table 11
August 2017 Analytical Data Summary

Cleco Brame Energy Center
Bottom Ash and Fly Ash Ponds

Parameter/Well/ Date	MCL	D-1 (BG) 8/23/17	D-2 (BG) 8/23/17	D-3 (BG) 8/23/17	L-1 (BG) 8/23/17	L-2 (BG) 8/23/17	W-3 8/23/17	W-19 8/23/17	W-21 8/23/17	W-24 8/23/17
Detection Monitoring Parameters										
Boron (mg/l)	NA	0.046	0.11	0.27	0.11	0.095	0.17	0.18	0.35	0.19
Calcium (mg/l)	NA	6	106	88.3	115	66.4	64	96.7	113	115
Chloride (mg/l)	NA	13.6	7.6	10.9	7	5.2	156	60.7	54.5	130
Fluoride (mg/l)	4	<0.2	0.61	0.68	0.32	0.64	0.37	0.37	0.63	0.51
pH (S.U.)	NA	6.4	7.15	7.28	7.25	7.28	6.77	7.07	7.11	7.06
Sulfate (mg/l)	NA	11.1	95.3	49.1	5.7	27.9	1.2	<1	166	<1
TDS (mg/l)	NA	145	615	745	495	395	690	640	1,190	1,080
Assessment Monitoring Parameters										
Antimony (mg/l)	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (mg/l)	0.01	<0.001	0.009	0.0016	0.0074	0.057	0.0025	0.0013	0.01	0.0064
Barium (mg/l)	2	0.097	0.36	0.13	0.45	0.16	0.53	0.42	0.14	0.79
Beryllium (mg/l)	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium (mg/l)	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium (mg/l)	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (mg/l)	NA	0.0049	0.0019	<0.001	0.0012	<0.001	<0.001	<0.001	0.0024	<0.001
Lead (mg/l)	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium (mg/l)	NA	0.0075	0.013	0.025	0.01	0.0051	0.014	0.0078	0.017	0.0083
Mercury (mg/l)	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (mg/l)	NA	<0.003	<0.003	0.0039	<0.003	0.0044	<0.003	<0.003	<0.003	0.0036
Selenium (mg/l)	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Thallium (mg/l)	0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Radium-226 (pCi/l)	5	0.175	0.344	0.0679	0.159	0.182	0.53	0.571	0.317	0.886
Radium-228 (pCi/l)	5	0.559	0.695	0.627	0.565	0.747	1.65	0.502	0.285	0.905

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

CLECO POWER LLC
BRAME ENERGY CENTER

BOTTOM ASH POND AND
FLY ASH POND
LENA, LA

2018 Annual Groundwater Monitoring Report for the Coal Combustion Residuals Rule

January 2019

TABLE OF CONTENTS

1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the 2018 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 recently installed monitoring wells, in addition to monitoring wells installed previously to conduct groundwater monitoring required by BEC's LDEQ approved solid waste permits. 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 April and October 2018, while additional voluntary baseline sampling events were conducted in January and August 2018.

It is noted that due to flooding of the Red River during the spring of 2018, flood waters inundated monitoring well W-24. Redevelopment activities were initiated at W-24 prior to the April 2018 sampling event to ensure that representative groundwater could be purged and sampled.

Prior to purging and sampling activities, 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 Pace Analytical Services, LLC of St. Rose, Louisiana, for analysis of the CCR groundwater detection monitoring parameters by the following methods: chloride, fluoride and sulfate by 300.0; total dissolved solids by 2540C; and metals by 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 aquifer by construction of potentiometric surface maps (Figures 3 through 6) 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)
January 2018	0.0007 to 0.001	0.01 to 0.5
April 2018	0.0002 to 0.001	0.035 to 0.5
August 2018	0.001	0.05 to 0.5
October 2018	0.0001 to 0.00005	0.0025 to 0.05

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 total dissolved solids (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.

Statistical evaluations at BEC were performed using interwell prediction limits for pH. The interwell prediction limits were performed using the Sanitas v9® software package. Prediction limits were constructed from the upgradient well data and based on the distribution of that data for each parameter. 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. 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 2018 detection monitoring sampling events at BEC indicated that no SSIs were generated for pH.

Due to statistically significant variation found in upgradient monitoring well data, all detection monitoring parameters except pH 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. 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.

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 2018 detection monitoring groundwater data showed that no confirmed SSIs were generated in downgradient wells at BEC. As stated above, verification resampling will not be conducted for intrawell SSIs generated in upgradient wells.

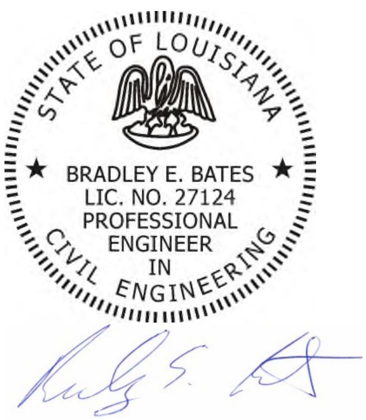
7.0 CONCLUSIONS AND RECOMMENDATIONS

- 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.

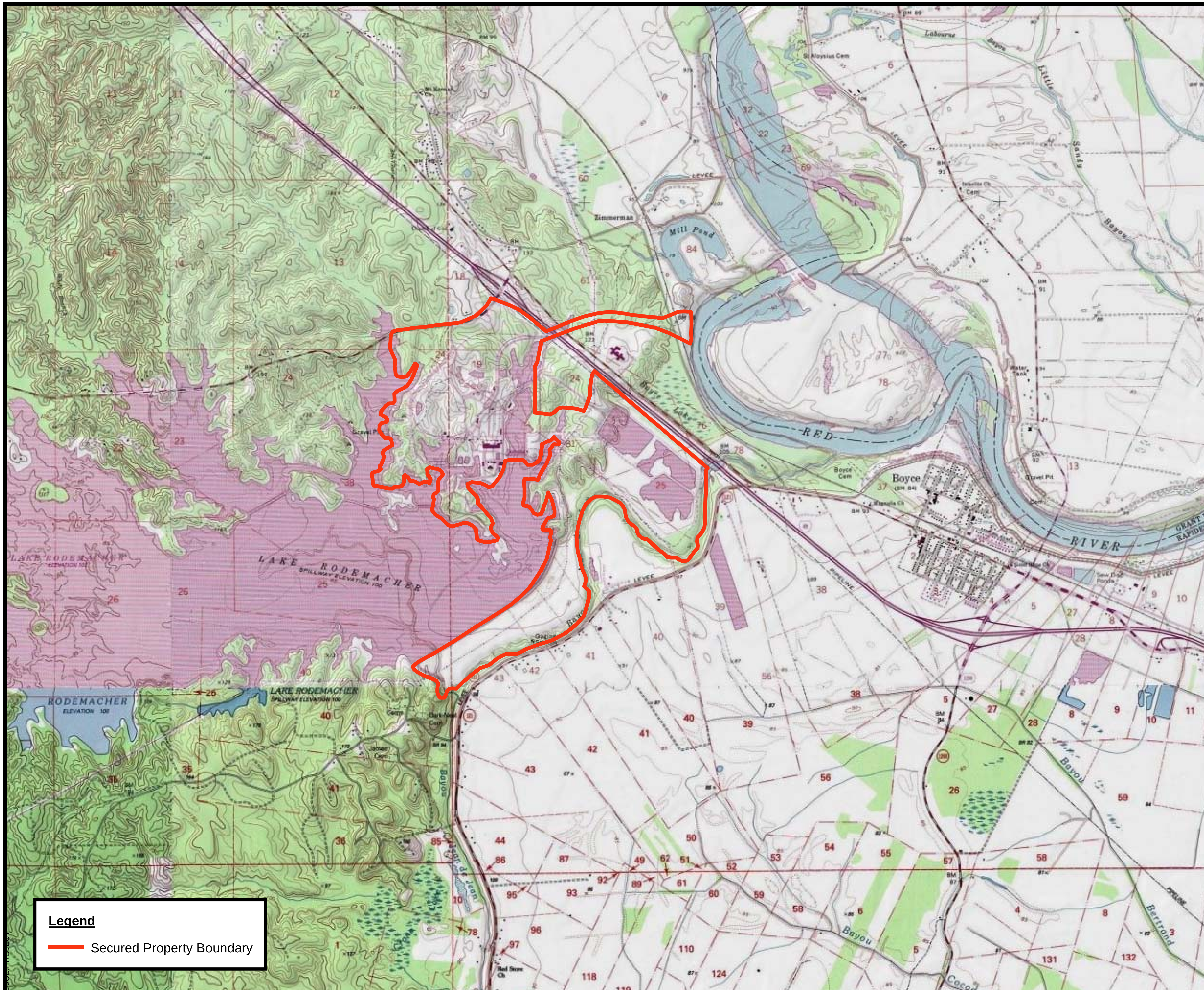
- Cleco conducted sufficient detection monitoring sampling events, per applicable portions of §257.93 and §257.94.
- Potentiometric surface evaluation at BEC indicates consistent groundwater flow towards local surface water bodies.
- Statistical evaluations of data conducted per applicable portions of §257.93 indicate that no SSIs have been generated in downgradient wells.
- Semi-annual detection monitoring sampling events are tentatively scheduled for April and October of 2019. 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.	*12/13/2018*
Company	**Date**



Legend

Secured Property Boundary

Reference

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

CLECO Power LLC

Brame Energy Center

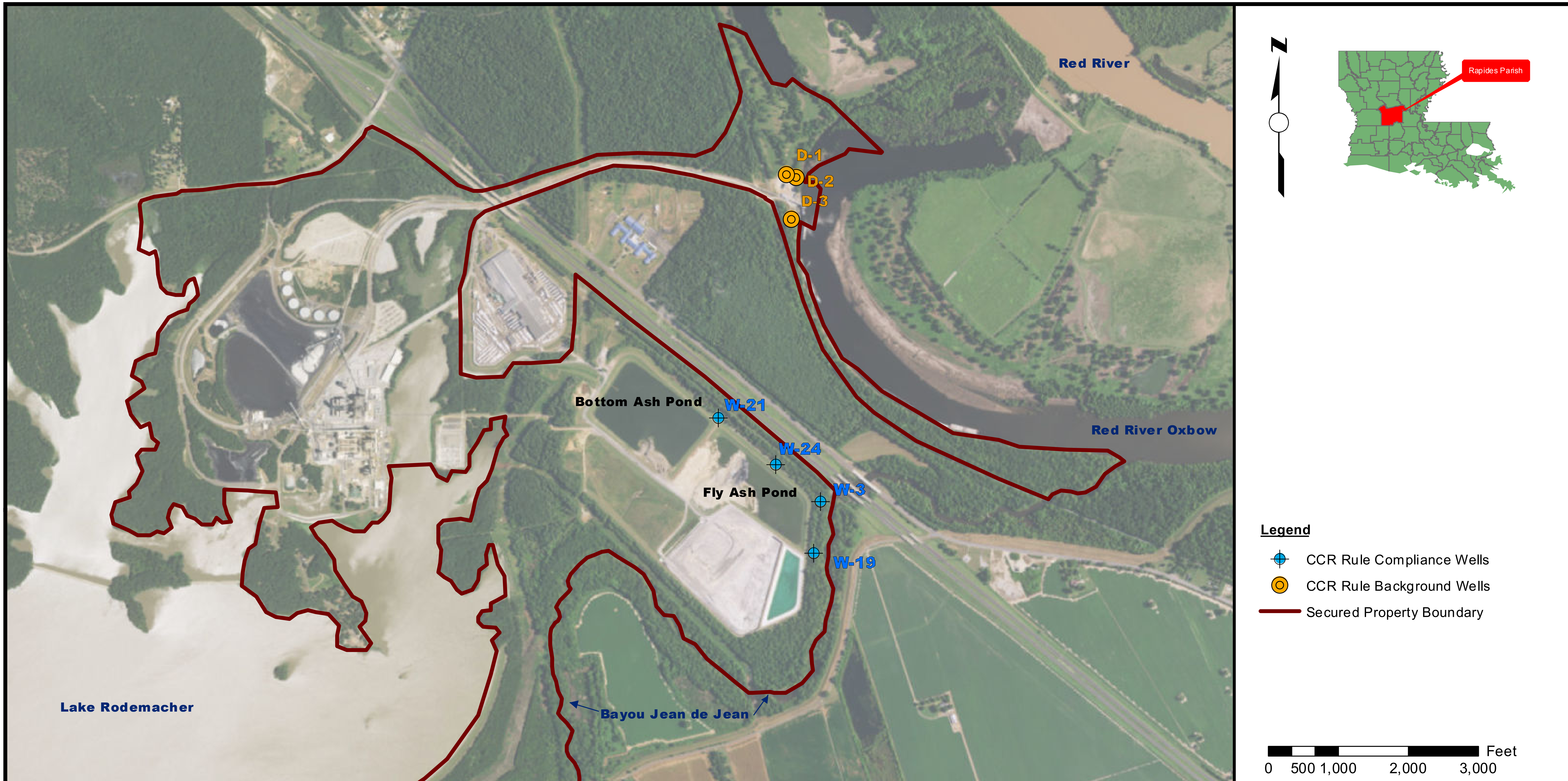
Site Location Map

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



CLECO Power LLC

Brame Energy Center

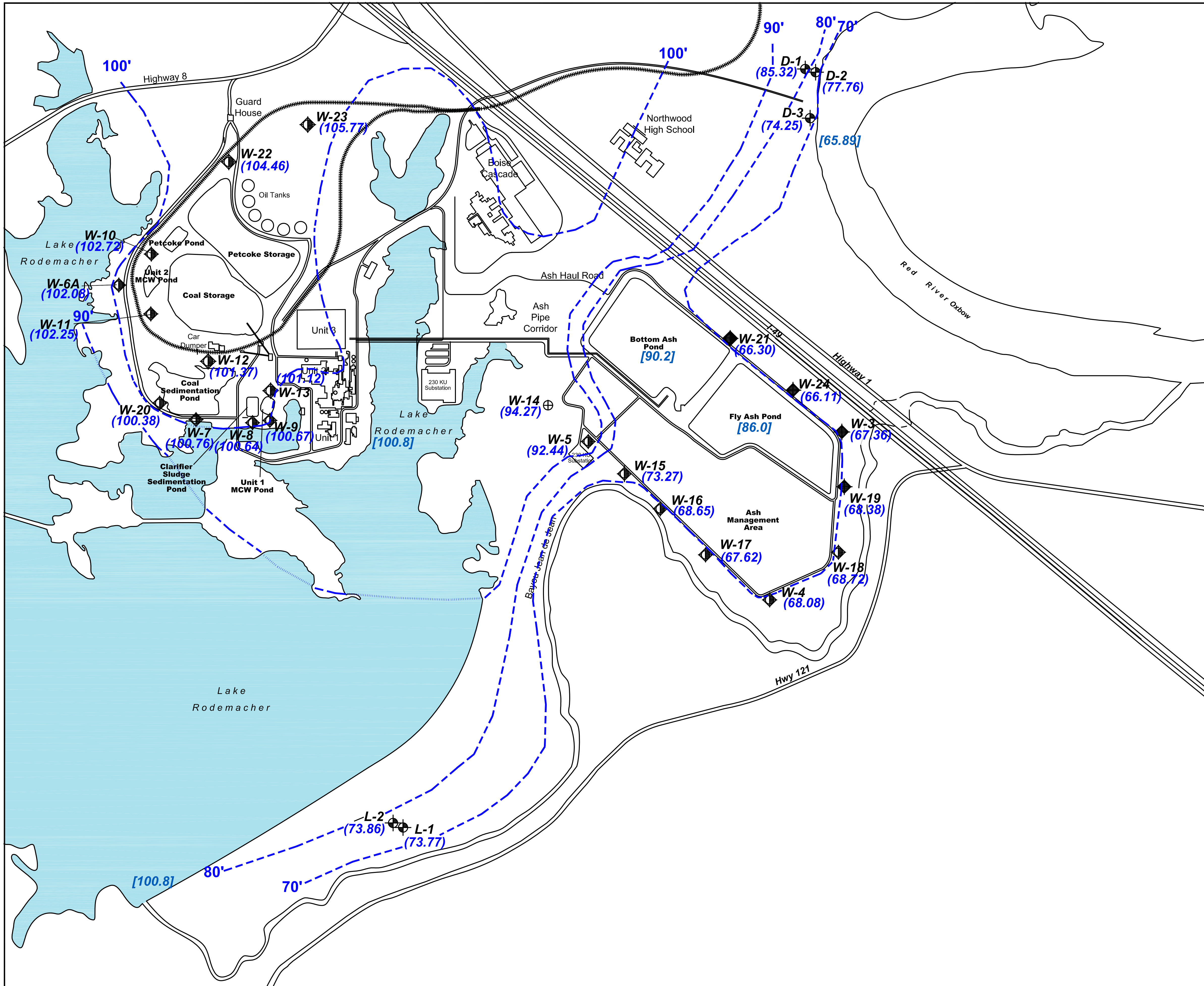
CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

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

Drawn:	JP
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

(68.08) Potentiometric Surface Elevation, Ft. NGVD

70' Potentiometric Surface Elevation Contour, Ft. NGVD

Inferred Potentiometric Surface Contour, Ft. NGVD

[90.2] Surface Water Elevation, ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

N

CLECO Corporation

Brame Energy Center

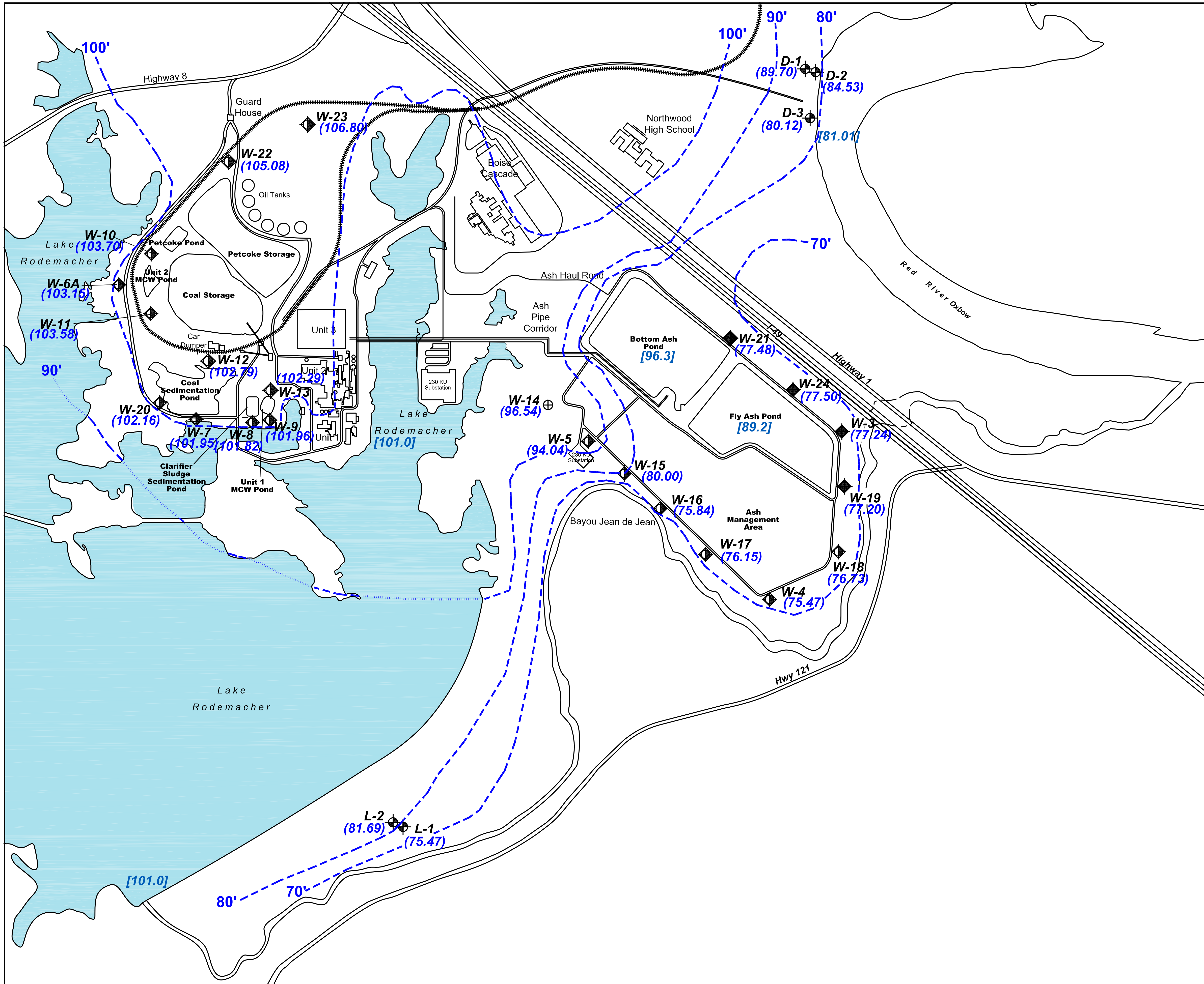
Cleco Brame
Potentiometric Surface Contour Map
January 2018

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RB
Approved:	JM
Date:	1/24/18
Dwg. No.:	01-18-0169-A001

Figure 3



CLECO Corporation

Brame Energy Center

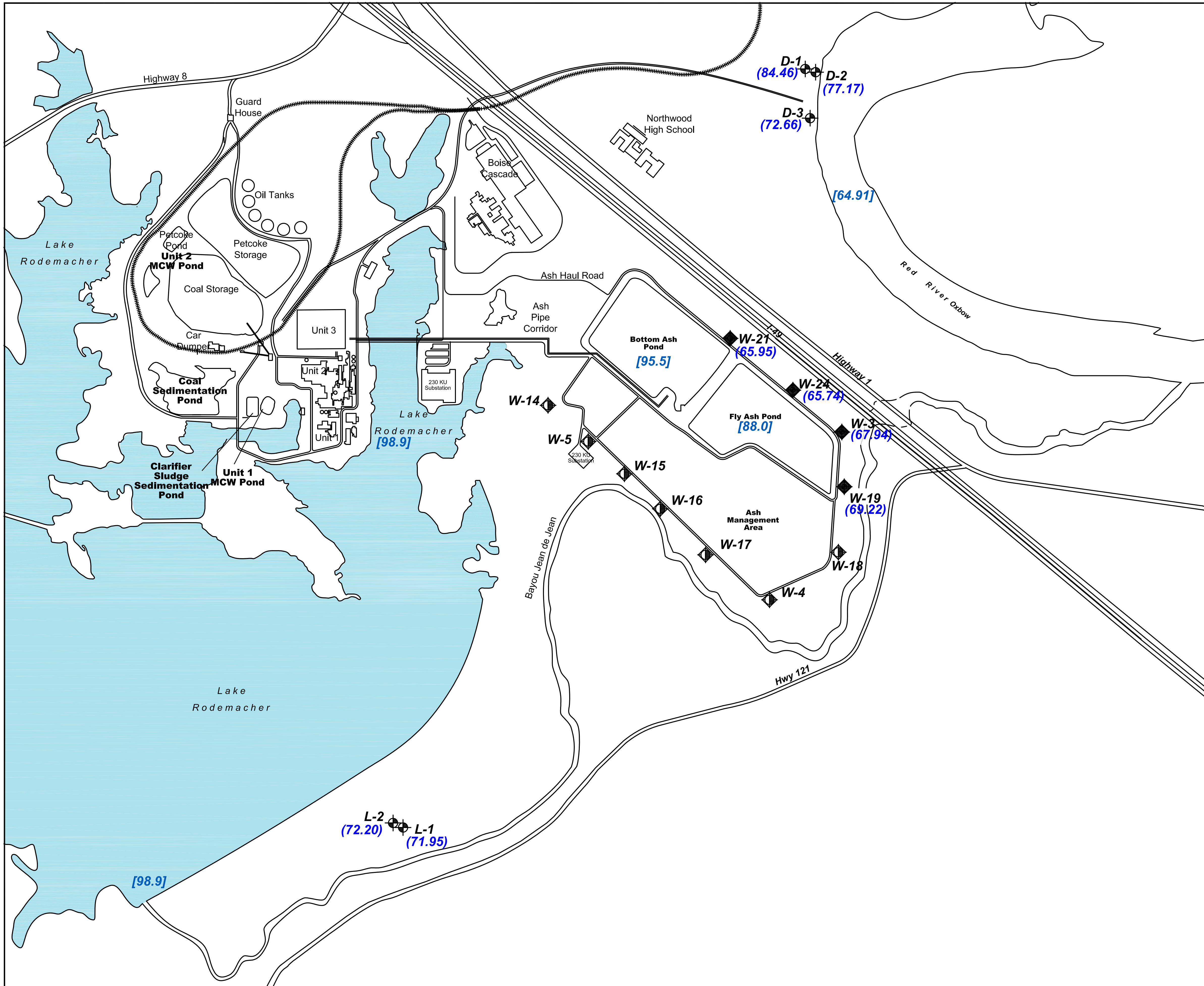
Cleco Brame
Potentiometric Surface Contour Map
April 2018

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	JM
Date:	5/10/18
Dwg. No.:	01-18-0169-A002

Figure 4



Legend

Railroad Tracks

CCR Background Well Location

CCR Compliance Well Location

Non-CCR Piezometer Location

(84.46) Potentiometric Surface Elevation, Ft. NGVD

[95.5] Surface Water Elevation, Ft. NGVD

[98.9] Lake Rodemacher Water Elevation, Ft. NGVD

1,200 0 1,200

Scale: 1" = 1,200'

CLECO Corporation

Brame Energy Center

CCR Rule Wells
Potentiometric Surface Contour Map
August 2018

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	10/22/18
Dwg. No.:	01-18-0169-A003

Figure 5

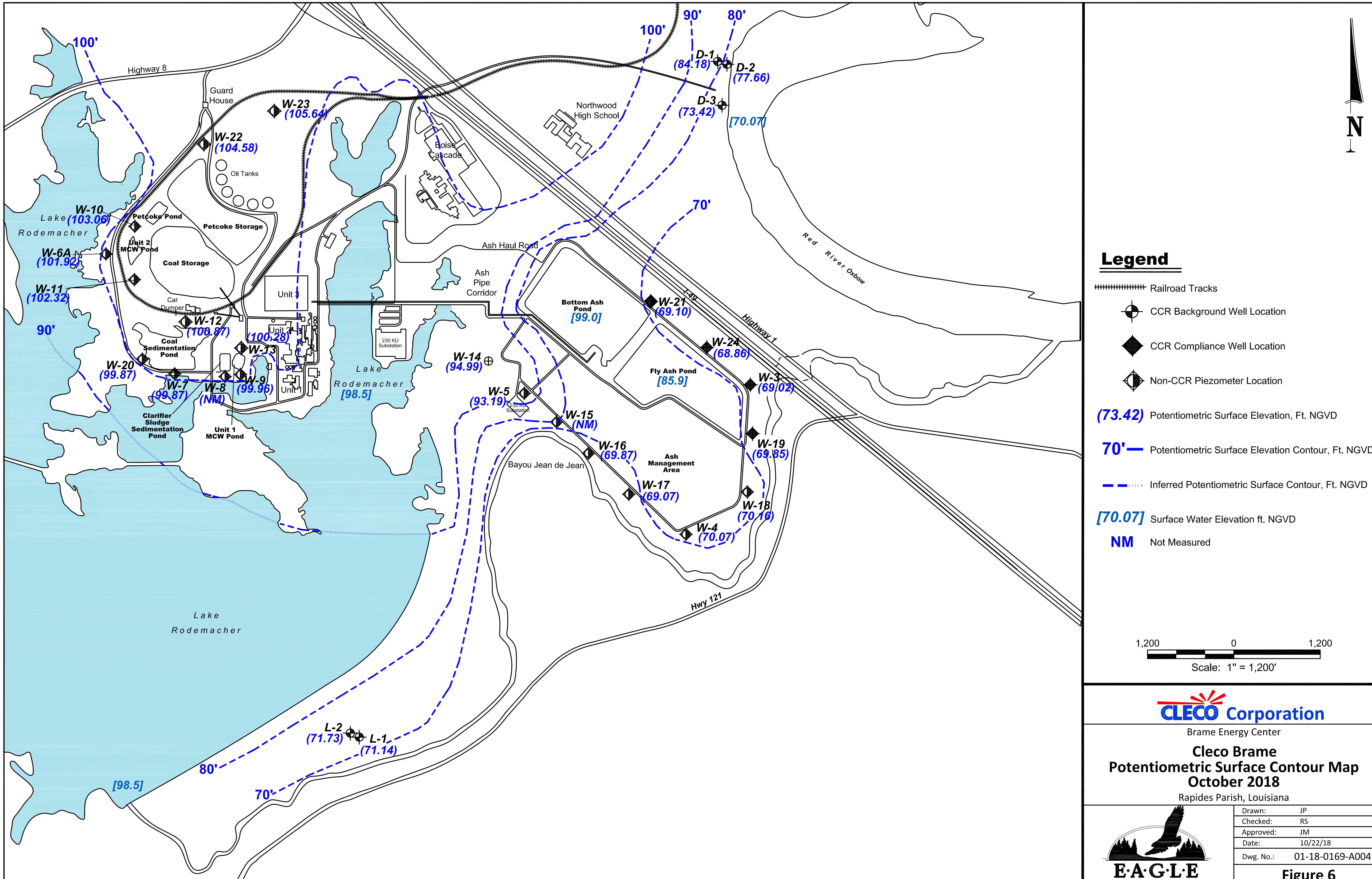

Highway 8
Guard House
W-23 (105.64)
W-22 (104.58)
Oil Tanks
Northwood High School
Boise Cascade
D-1 (84.18)
D-2 (77.66)
D-3 (73.42)
[70.07]
100'
90'
80'
70'
Lake Rodemacher
W-10 (103.06)
Petcoke Pond
Petcoke Storage
Unit 2 MCW Pond
W-6A (101.92)
Coal Storage
W-11 (102.32)
Car Dumper
Unit 3
W-12 (100.87)
(100.28)
Unit 2
W-13
Coal Sedimentation Pond
W-20 (99.87)
W-7 (99.87)
W-8 (NM)
W-9 (99.96)
Unit 1
Clarifier Sludge Sedimentation Pond
Unit 1 MCW Pond
230 KU Substation
Lake Rodemacher [98.5]
Ash Haul Road
Ash Pipe Corridor
Bottom Ash Pond [99.0]
W-14 (94.99)
W-5 (93.19)
W-21 (69.10)
W-24 (68.86)
Fly Ash Pond [85.9]
W-3 (69.02)
W-15 (NM)
W-16 (69.87)
Bayou Jean de Jean
Ash Management Area
W-19 (69.85)
W-17 (69.07)
W-18 (70.16)
W-4 (70.07)
Red River Oxbow
Highway 1
I-49
Hwy 121
Lake Rodemacher
L-2 (71.73)
L-1 (71.14)
[98.5]
N
Legend
Railroad Tracks
CCR Background Well Location
CCR Compliance Well Location
Non-CCR Piezometer Location
(73.42) Potentiometric Surface Elevation, Ft. NGVD
70' Potentiometric Surface Elevation Contour, Ft. NGVD
Inferred Potentiometric Surface Contour, Ft. NGVD
[70.07] Surface Water Elevation ft. NGVD
NM Not Measured
1,200 0 1,200
Scale: 1" = 1,200'
CLECO Corporation
Brame Energy Center
Cleco Brame
Potentiometric Surface Contour Map
October 2018
Rapides Parish, Louisiana
E·A·G·L·E ENVIRONMENTAL SERVICES, INC.
Drawn: JP
Checked: RS
Approved: JM
Date: 10/22/18
Dwg. No.: 01-18-0169-A004
Figure 6

Table 1
Monitoring Well Information

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)	92.07	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
2018 Analytical Data Summary

Parameter/Well/Date		Boron (mg/l)	Calcium (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	pH (S.U.)	Sulfate (mg/l)	TDS (mg/l)
D-1 (BG)	1/22/18	0.047	4.9	13.4	0.1	6.84	10.8	135
	4/10/18	0.049	8.7	13.3	0.15	7.55	8.8	120
	8/8/18	0.044	5.2	12.2	<0.1	7.61	10.5	150
	10/4/18	0.046	5.8	12.3	<0.1	6.57	10.7	110
D-2 (BG)	1/22/18	0.095	96	11.4	0.5	7.19	57.5	475
	4/10/18	0.11	109	8.3	0.35	7.35	89.1	435
	8/8/18	0.11	104	8.2	0.38	7.41	78.7	575
	10/4/18	0.11	108	6.8	0.4	6.81	88.4	525
D-3 (BG)	1/22/18	0.31	91.5	11.2	0.49	7.28	50.2	915
	4/10/18	0.31	93.2	12.6	0.54	7.58	53.5	740
	8/8/18	0.29	86.4	10.7	1	7.4	49.1	680
	10/4/18	0.26	87	10.4	0.6	7.01	47.9	455
L-1 (BG)	1/22/18	0.12	121	5.3	0.28	7.52	13.1	475
	4/11/18	0.11	106	5.2	0.16	8.22	29.6	200
	8/8/18	0.13	117	6	0.18	7.34	11.6	500
	10/4/18	0.12	110	5.9	0.21	6	4.8	440
L-2 (BG)	1/22/18	0.1	70.4	3.9	0.47	7.27	19.9	315
	4/11/18	0.092	74.7	3.5	0.24	7.9	20.4	235
	8/8/18	0.099	62.5	3.3	0.47	7.18	20.3	340
	10/4/18	0.093	62.8	3.2	0.48	6.87	20.4	370
W-3	1/23/18	0.17	67.5	161	0.43	7	<1	685
	4/11/18	0.18	69.9 / 65.2*	164	0.25	6.73	<1	595
	8/8/18	0.17	66.1	206	<1	7.31	3.9	910
	10/4/18	0.18	64	179	0.26	6.5	2.4	700
W-19	1/23/18	0.19	99.6	59.5	0.38	7.24	<1	620
	4/11/18	0.2 / 0.18*	110	58.1	0.41	7.37	1.3	495
	8/8/18	0.19	102	59.5	0.22	7.06	<1	690
	10/4/18	0.19	97.4	64.7	0.24	6.72	<1	630
W-21	1/23/18	0.36	125	56.8	0.51	7.17	180	1,280
	4/11/18	0.35	124	54.3	0.41	7.51	160	1,110
	8/8/18	0.39	124	51.3	0.42	7.73	172	1,120
	10/4/18	0.35	122	54	1.1	6.91	177	1,130
W-24	1/23/18	0.19	138	175	0.34	7.21	1	1,310
	4/11/18	0.18	140	108	0.56	7.5	2.5	750
	8/8/18	0.2	117	96.2	0.27	7.51	2.4	920
	10/4/18	0.2	122	145	0.37	7.11	1	1,150

* 5/25/18 resampling result.

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

APPENDIX G.4

MONITORING WELL CERTIFICATION REPORT

MONITORING WELL

NETWORK CERTIFICATION

MONITORING WELL NETWORK

1.0 Introduction

The U.S. Environmental Protection Agency (EPA) published a final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). The rule applies to the Cleco Power LLC Brame Energy Center (BEC). A site location map is provided in Figure 1. BEC has two permitted facilities that accept CCR: the Bottom Ash and Fly Ash Ponds, as shown in Figure 2.

The CCR Rule, 40 CFR Subpart D-Standards for the Disposal of CCRs, Section §257.91 requires a groundwater monitoring system that consists of sufficient number of wells at appropriate locations and depths based on site-specific technical information, to yield groundwater samples from the uppermost aquifer that:

- Accurately represent the quality of both background groundwater, and groundwater passing the boundary of the CCR unit; and
- Monitor potential contaminant pathways.

The groundwater monitoring system at BEC meets those requirements, as described below.

2.0 Site Hydrogeology Summary

The Bottom Ash and Fly Ash Ponds are situated on the aquifer recharge area for the Red River natural levee and/or Alluvial Aquifer, as well as Lake Rodemacher. Since the Bottom Ash and Fly Ash Ponds are located in the Red River Alluvium, all upgradient and downgradient monitoring wells for these CCR facilities have been installed in these deposits.

Review of geological reports indicates that Louisiana Alluvial Aquifer groundwater quality is reported by the USGS to be primarily limited to use for industrial and agricultural purposes. This is due to excessive concentrations of dissolved solids, hardness, iron, or localized salinity. The natural groundwater quality of these aquifer systems is generally considered not suitable for drinking water supply purposes without first undergoing appropriate water treatment. The Louisiana Department of Natural Resources (LDNR) issued an advisory in 2009 addressing the recommended uses of these alluvial aquifers. Furthermore, it is reported that dissolved metals, namely arsenic, have been, and are expected to be, detected in groundwater in localized areas of these aquifers (LDNR, 2009).

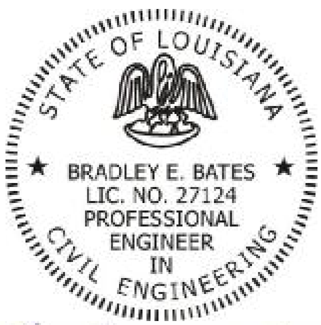
Louisiana Department of Natural Resources, Office of Conservation, 2009. “General Water Quality Summary, Louisiana Groundwater - Alluvial Aquifer Systems”, Louisiana Department of Natural Resources, Baton Rouge, LA, 1 sheet.

3.0 Groundwater Monitoring System

Groundwater monitoring wells have been installed in the uppermost, laterally continuous water bearing zone present beneath the CCR facilities at BEC. Since the areas immediately upgradient of the Bottom Ash and Fly Ash Ponds are situated on Terrace deposits, the background monitoring wells have been installed in alternative locations, per §257.91.1. Thus, all background and compliance monitoring wells are screened in the Red River Alluvial deposits. Monitoring well information is included in Table 1, and the monitoring well locations are provided in Figure 2.

CERTIFICATION

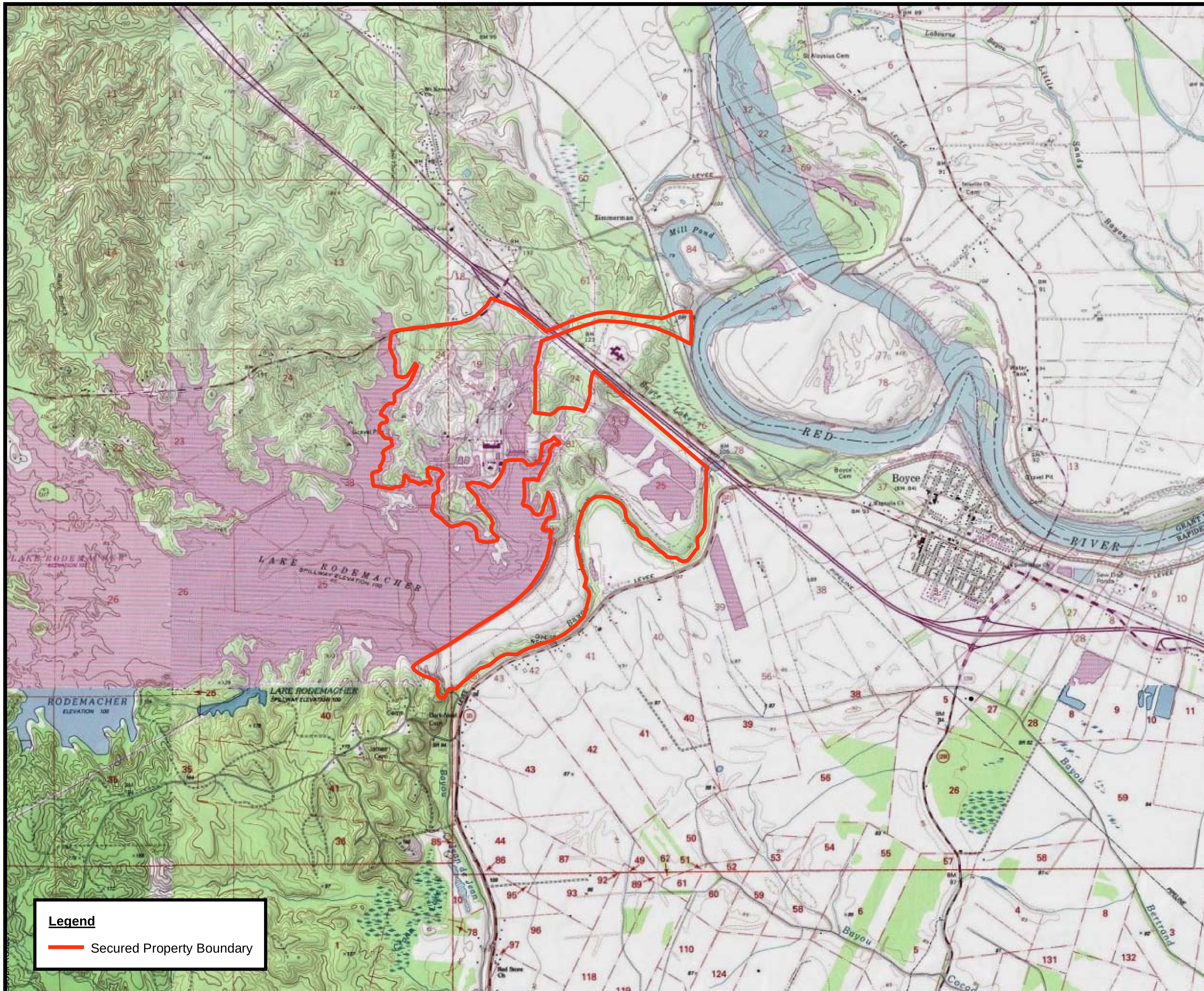
I hereby certify that the groundwater monitoring system described in this report for the Brame Energy Center, owned and operated by Cleco Power, LLC, has been designed and constructed to meet the requirements of the Coal Combustion Residual Rule 40 CFR §257.91. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

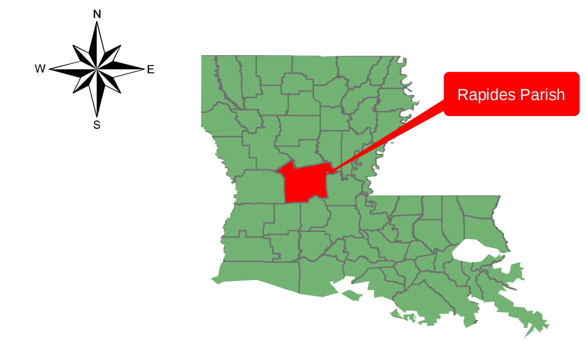


________________________________, P.E.

Date: 3/7/17

Louisiana Registration No.: 27124





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

Reference

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

CLECO Power LLC

Brame Energy Center

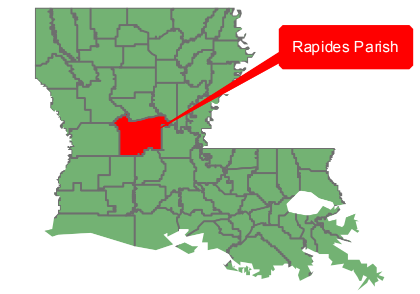
Site Location Map

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

CLECO Power LLC
Brame Energy Center

CCR Rule
Monitoring Well Location Map

Rapides Parish, Louisiana

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

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

Figure 2

Cleco Brame Energy Center
Bottom and Fly Ash Ponds

Table 1
Monitoring Well Construction Data

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)	92.07	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

APPENDIX G.5

CERTIFICATION OF STATISTICAL METHODOLOGY

CERTIFICATION OF

STATISTICAL METHODOLOGY

STATISTICAL ANALYSIS

Statistical evaluations of groundwater monitoring data for the permitted Coal Combustion Residuals (CCR) facilities will be performed using prediction limits per §257.93.F. These statistical evaluations will be conducted per performance criteria outlined in applicable portions of §275.93.G and the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (U.S. Environmental Protection Agency, March, 2009). The number of samples collected, the frequency of collection, and the management of non-detect data will be consistent with the statistical method selected. The data set to be considered in the statistical analysis will include data generated from the implementation of the CCR groundwater monitoring program.

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 CCR facility. As shown in the decision logic flowchart for detection monitoring (Figure 1), an evaluation of upgradient well data will be performed first before determining which statistical evaluation approach will be selected. If the background wells are not impacted by a release from any CCR facility and have groundwater quality statistically similar to downgradient wells (assuming no impacts from the CCR facility in the downgradient wells), then interwell statistical evaluation will be performed. If the initial sampling results indicate that background groundwater is statistically dissimilar to downgradient groundwater, then intrawell statistical evaluation will be performed. These techniques are discussed below.

- Interwell statistical evaluations involve an upgradient/downgradient comparison to determine if there are any statistically significant increases (SSIs) between groundwater quality upgradient and groundwater quality downgradient of the CCR facility. Interwell prediction limits will be constructed from the upgradient well data and based on the distribution of that data for each parameter. If the assumption of normality is not rejected for the upgradient data set, then a parametric prediction limit will be calculated. If the assumption of normality is rejected for the upgradient data set, then a non-parametric prediction limit will be calculated, in which case, the prediction limit will be based on the highest value in the upgradient data set. The most recent result for each downgradient well for each parameter will be compared to the applicable prediction limit.

- Intrawell statistical evaluations are within well comparisons. In the case of intrawell prediction limits, historical data from within a given well for a given parameter will be used to construct a limit. Compliance points will be compared to the limit to determine whether a change is occurring on a per-well/per-parameter basis. If the assumption of normality is not rejected for the background data set, then a parametric prediction limit will be calculated. If the assumption of normality is rejected for the background data set, then a non-parametric prediction limit will be calculated, in which case, the prediction limit will be based on the highest value in the background data set. (Note that both upper and lower prediction limits will be used for intrawell evaluations of pH.)

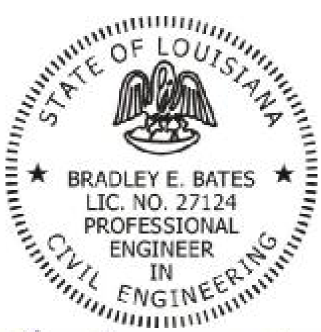
  Intrawell limit-based tests are recommended when there is evidence of natural spatial variability in groundwater quality, particularly among unimpacted upgradient wells, as it is inappropriate to pool those data across wells for the purpose of creating interwell limits for comparison with downgradient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

An integral part of using prediction limits for statistical evaluation of groundwater data is the selection of a verification resampling strategy. For the Cleco Power, LLC sites, a 1/2 verification resampling strategy will be used to lower the site-wide false positive rate (SWFPR). Verification resampling is mathematically incorporated into the prediction limit calculations, which improves statistical power while maintaining the SWFPR. Note that in the event intrawell statistical evaluations are performed that verification resampling for SSIs will only be conducted for SSIs generated in downgradient wells. Intrawell statistics will be 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 CCR facility, only downgradient wells will be subject to verification resampling.

In the event that SSIs are reported, verification resampling will be conducted for the appropriate well/parameter pairs. If SSIs are confirmed through verification resampling, the timelines listed in either §257.94.E.1 or §257.94.E.2 will be followed.

CERTIFICATION

I hereby certify that the selected statistical methodology as described above is appropriate for evaluating the groundwater monitoring data for the CCR management areas at the Cleco Power, LLC Brame Energy Center. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.

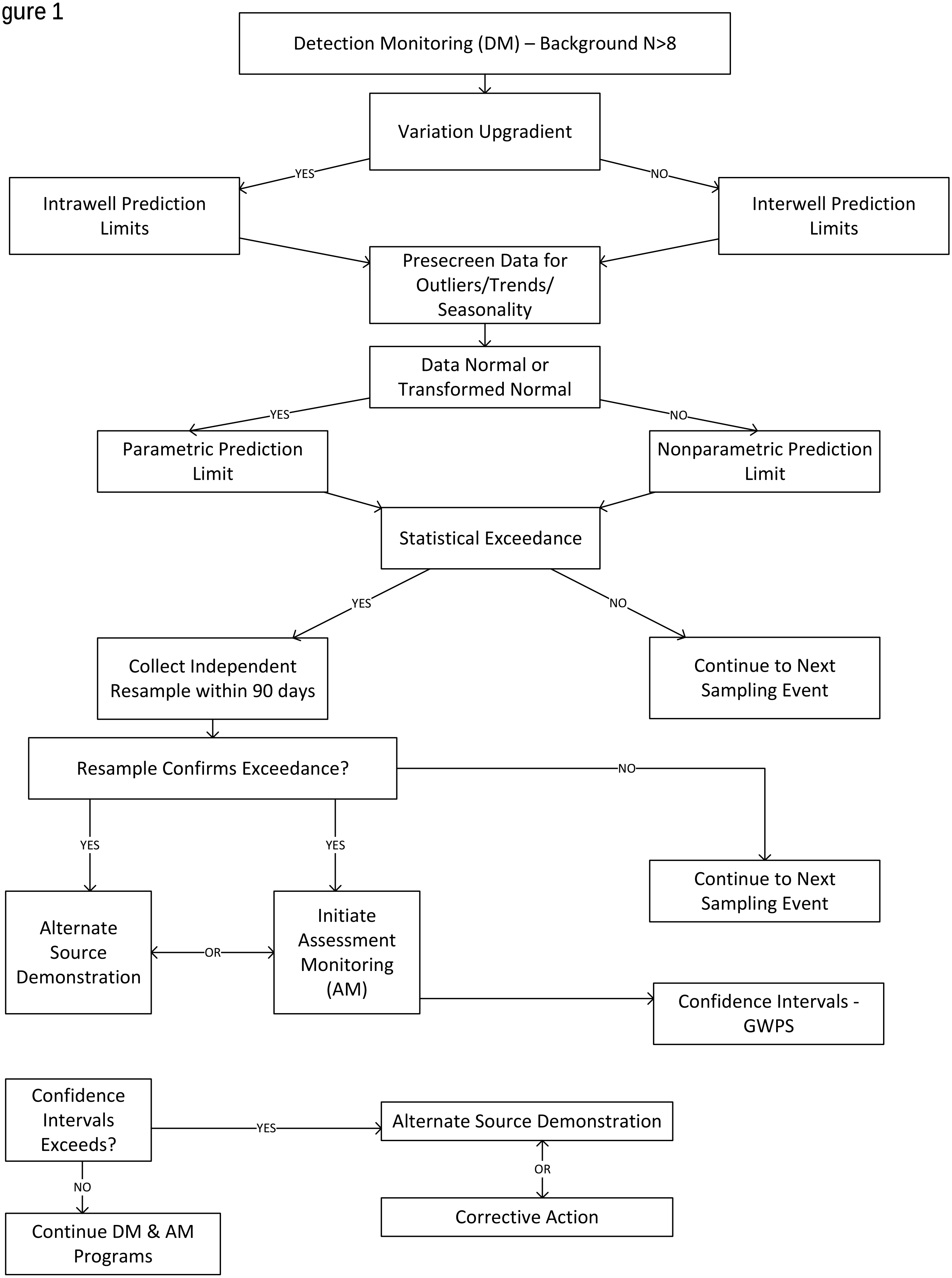


________________________________, P.E.

Date: 10/12/17

Louisiana Registration No.: 27124

Figure 1



Detection Monitoring (DM) – Background N>8
Variation Upgradient
YES
NO
Intrawell Prediction Limits
Interwell Prediction Limits
Presecreen Data for Outliers/Trends/ Seasonality
Data Normal or Transformed Normal
YES
NO
Parametric Prediction Limit
Nonparametric Prediction Limit
Statistical Exceedance
YES
NO
Collect Independent Resample within 90 days
Continue to Next Sampling Event
Resample Confirms Exceedance?
NO
YES
YES
Continue to Next Sampling Event
Alternate Source Demonstration
OR
Initiate Assessment Monitoring (AM)
Confidence Intervals - GWPS
Confidence Intervals Exceeds?
YES
Alternate Source Demonstration
OR
NO
Corrective Action
Continue DM & AM Programs

APPENDIX G.6

STATISTICAL ANALYSIS - 2019

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

MEMORANDUM

TO: Brent Croom, Jacob Hudson

FROM: Jared Mayeux

DATE: January 3, 2020

RE: BEC CCR Groundwater Statistics

Information related to the CCR groundwater monitoring program for the Bottom Ash and Fly Ash Ponds is attached. Evaluations of data distribution for the CCR parameters in upgradient wells at the CCR facilities are included.

Results of the evaluations of upgradient groundwater quality at the CCR facilities indicate that there is significant natural spatial variation (NSV) in groundwater quality; thus, intrawell statistical evaluations will be conducted for all detection monitoring parameters. This correlates with previous determinations by the Louisiana Department of Environmental Quality Waste Permits Division that intrawell statistical analysis is appropriate at this site.

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

An integral part of using prediction limits for statistical evaluation of groundwater data is the selection of a verification resampling strategy. For the Cleco Power, LLC sites, a 1/2 verification resampling strategy will be used to lower the site-wide false positive rate (SWFPR). Verification resampling is mathematically incorporated into the prediction limit calculations, which improves statistical power while maintaining the SWFPR. Note that in the event intrawell statistical evaluations are performed that verification resampling for SSIs will only be conducted for SSIs generated in downgradient wells. Intrawell statistics will be 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 CCR facilities, only downgradient wells will be subject to verification resampling.

In the event that SSIs are reported, verification resampling will be conducted for the appropriate well/parameter pairs. If SSIs are confirmed through verification resampling, the timelines listed in either §257.94.E.1 or §257.94.E.2 will be followed.

BEC Bottom Ash and Fly Ash Ponds

Background Variation

Non-Parametric ANOVA

Constituent: Boron   Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 55.2

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 16 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 54.73
Adjusted Kruskal-Wallis statistic (H') = 55.2

Non-Parametric ANOVA

Constituent: Calcium   Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 57.54

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 11 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 57.53
Adjusted Kruskal-Wallis statistic (H') = 57.54

Non-Parametric ANOVA

Constituent: Chloride   Analysis Run 1/3/2020 08:39

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 63.85

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 19 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 63.82
Adjusted Kruskal-Wallis statistic (H') = 63.85

Non-Parametric ANOVA

Constituent: Fluoride   Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 41.96

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 18 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 41.87
Adjusted Kruskal-Wallis statistic (H') = 41.96

Non-Parametric ANOVA

Constituent: pH Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 10.29

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 15 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 10.29

Adjusted Kruskal-Wallis statistic (H') = 10.29

Non-Parametric ANOVA

Constituent: Sulfate   Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 69.53

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 9 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 69.53
Adjusted Kruskal-Wallis statistic (H') = 69.53

Non-Parametric ANOVA

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:24

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

For observations made between 7/6/2016 and 10/30/2019, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 63.84

Tabulated Chi-Squared value = 9.488 with 4 degrees of freedom at the 5% significance level.

There were 17 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 63.82
Adjusted Kruskal-Wallis statistic (H') = 63.84

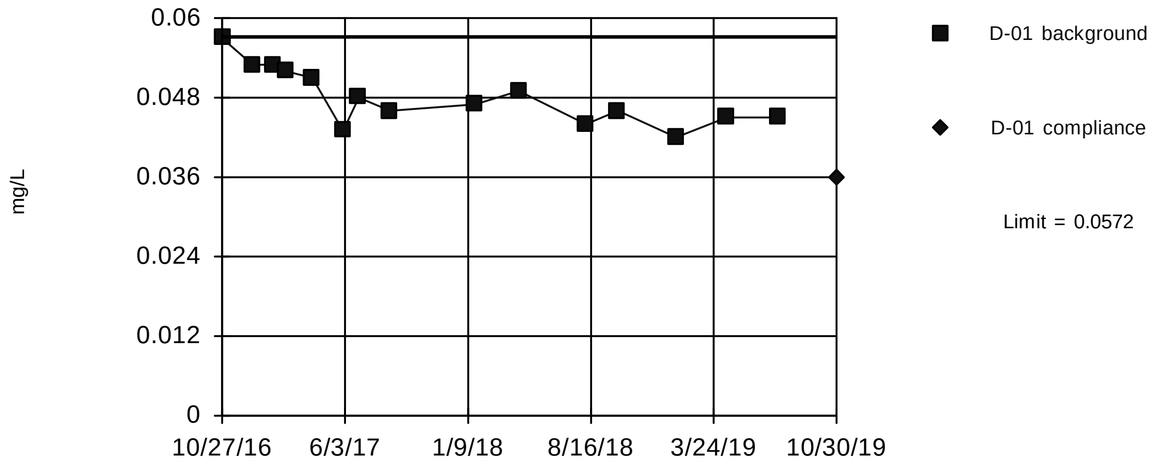
BEC BOTTOM ASH AND FLY ASH PONDS

STATISTICAL EVALUATIONS

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.04807, Std. Dev.=0.004317, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9511, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 0.12 (7/6/2016).

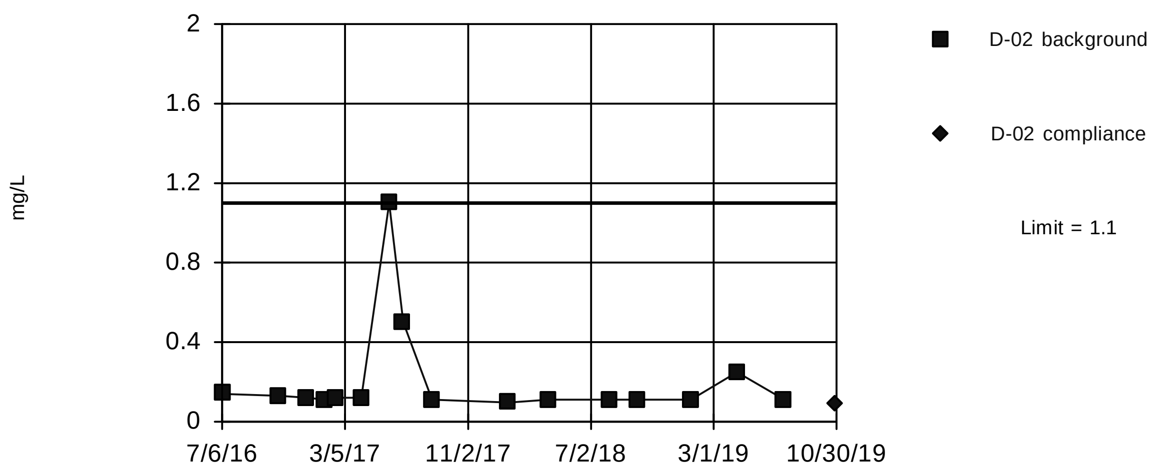
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

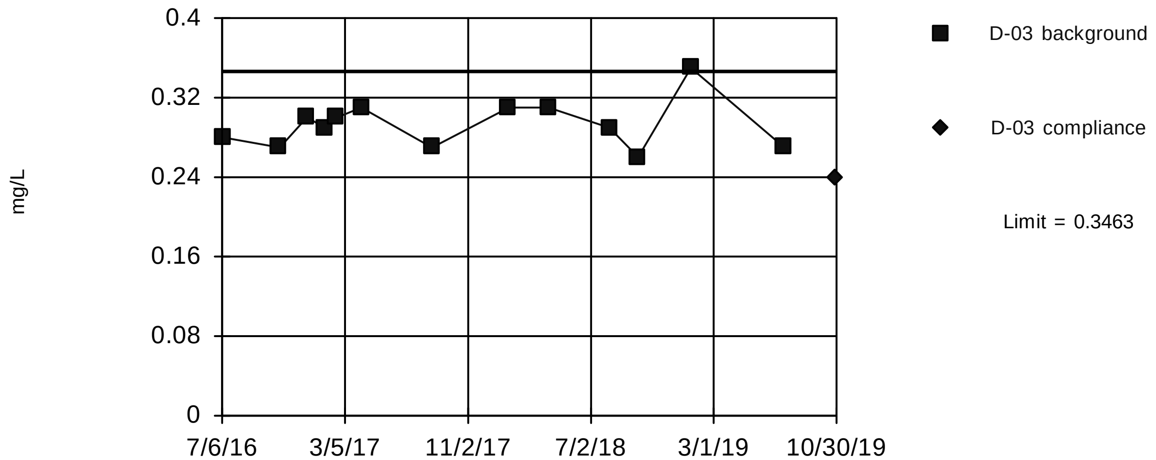
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.2931, Std. Dev.=0.02428, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9212, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Three background outliers were removed: 0.029 (5/31/2017); 0.47 (6/28/2017); 0.11 (4/17/2019).

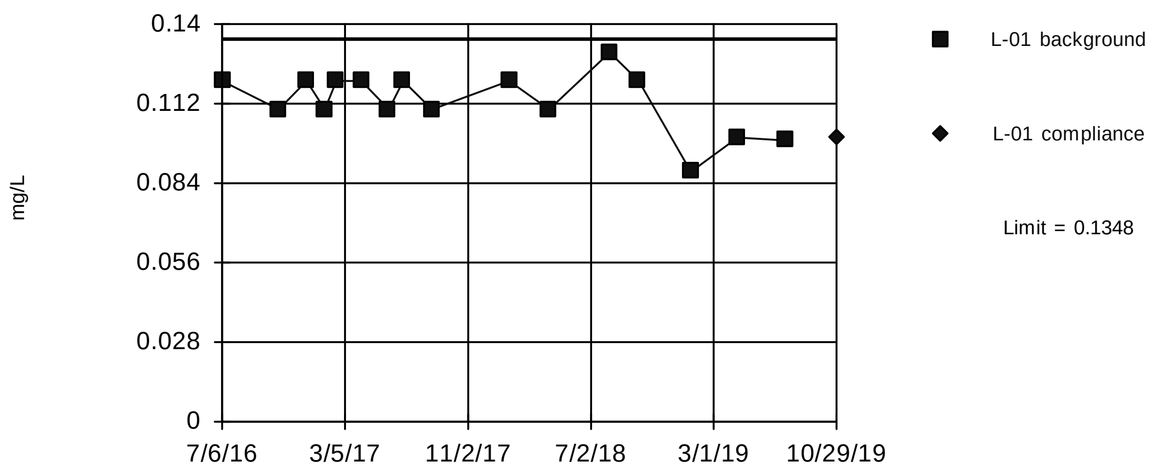
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.1129, Std. Dev.=0.01054, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.883, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. After outlier removal distribution was non-normal, so outlier results were invalidated.

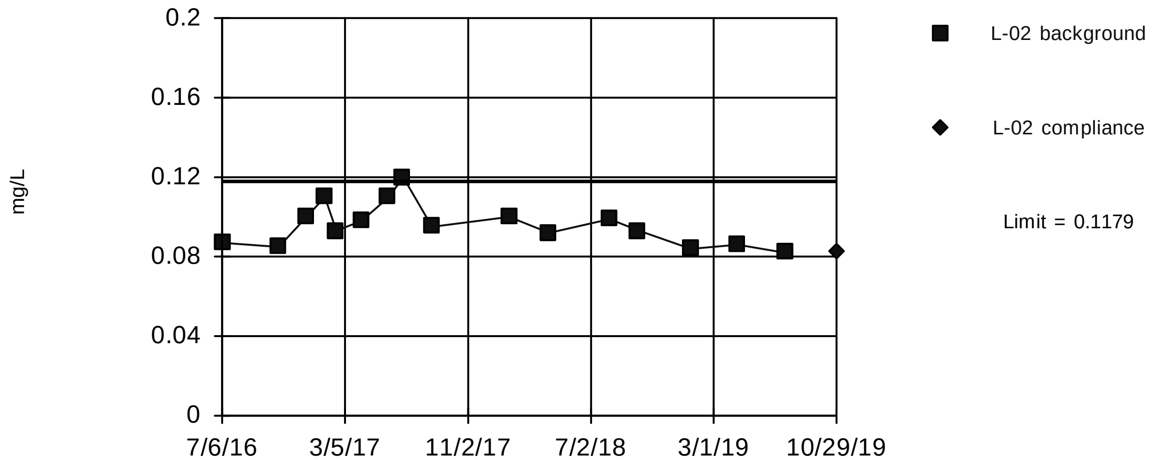
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.09588, Std. Dev.=0.01061, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9329, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

Constituent: Boron Analysis Run 12/12/2019 11:29

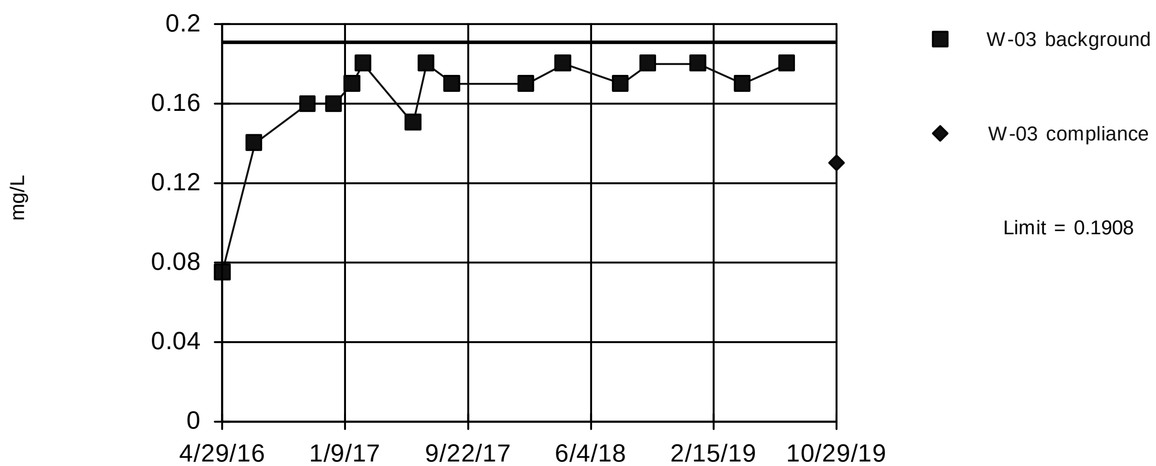
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on x^5 transformation): Mean=0.0001366, Std. Dev.=0.00005607, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8523, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. After outlier removal distribution was non-normal, so outlier results were invalidated.

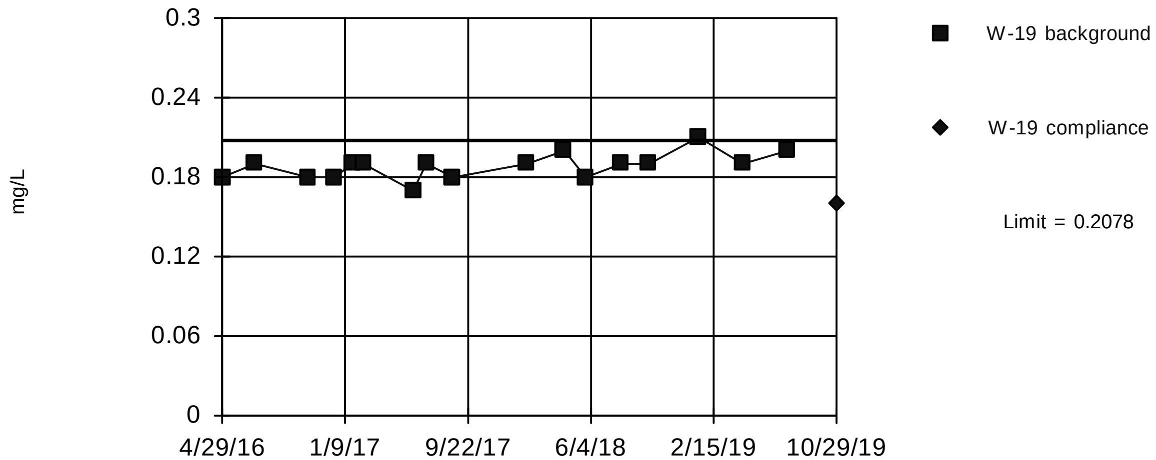
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.1882, Std. Dev.=0.00951, n=17. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9015, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

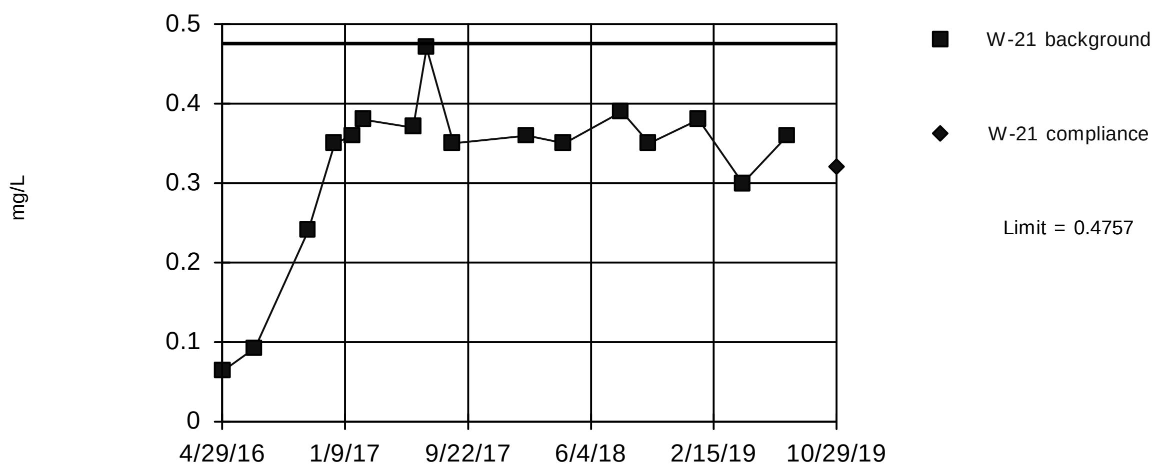
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square transformation): Mean=0.1149, Std. Dev.=0.05368, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8588, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. After outlier removal distribution was non-normal, so outlier results were invalidated.

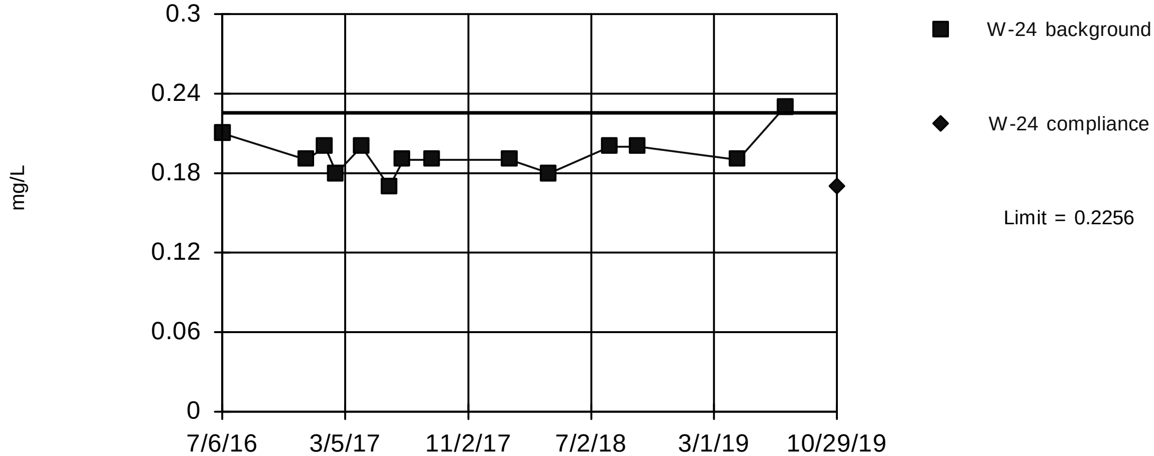
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.1943, Std. Dev.=0.01453, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9169, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 0.14 (10/25/2016); 0.086 (1/15/2019).

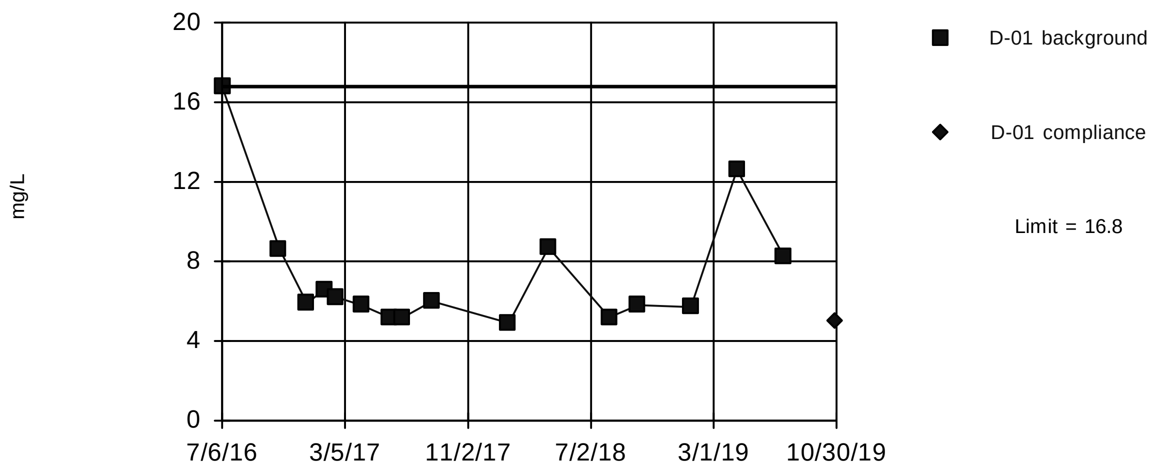
Constituent: Boron Analysis Run 12/12/2019 11:29

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

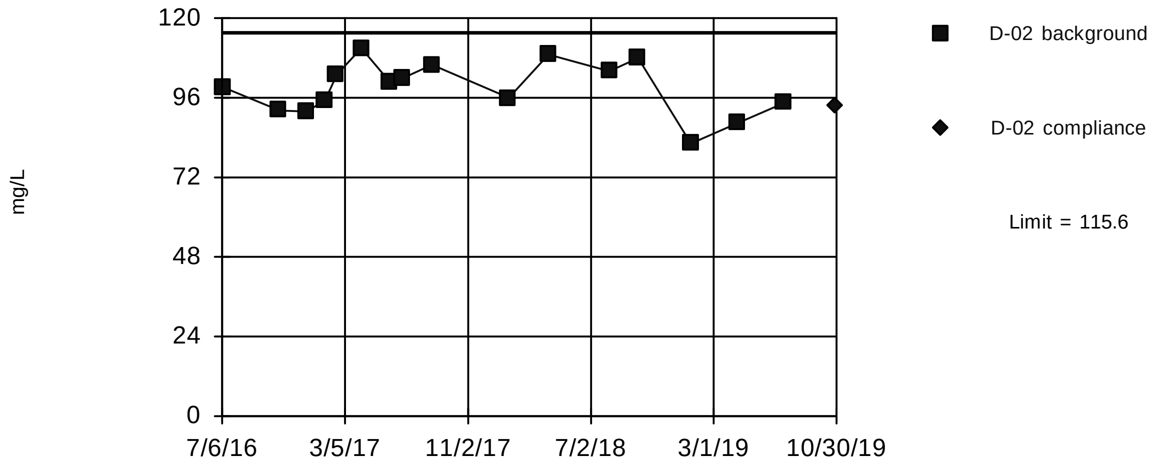
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=98.97, Std. Dev.=8.028, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9739, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

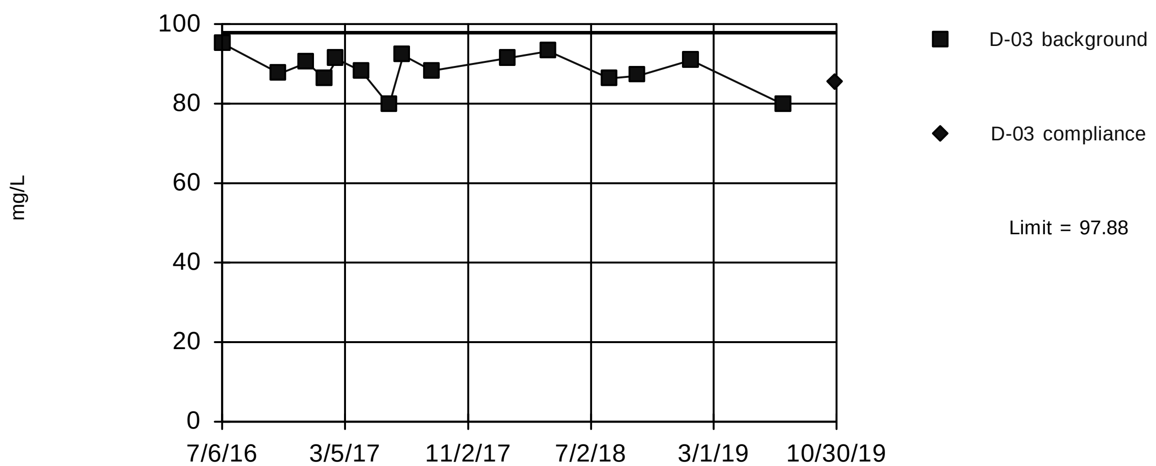
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=88.5, Std. Dev.=4.436, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9178, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 105 (4/17/2019).

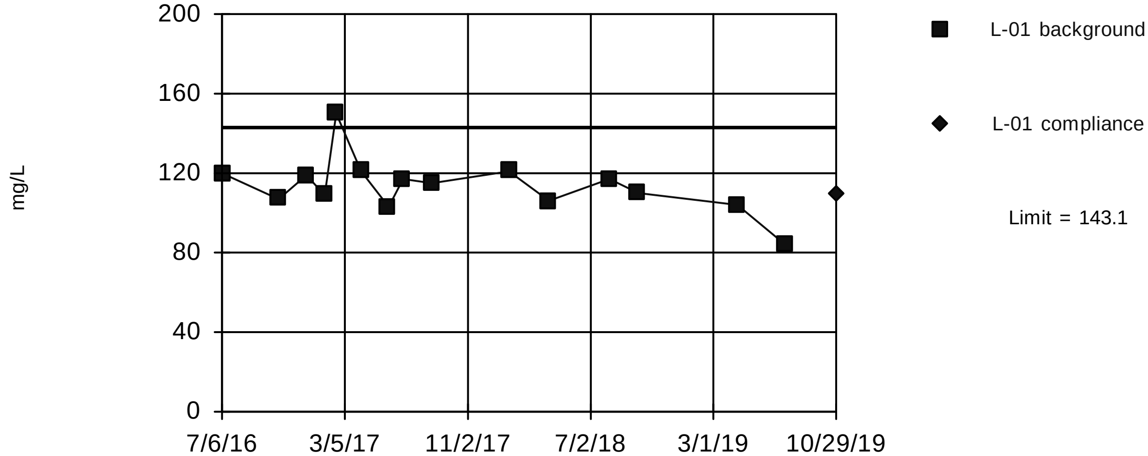
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=113.6, Std. Dev.=13.94, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8905, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 66.9 (1/15/2019).

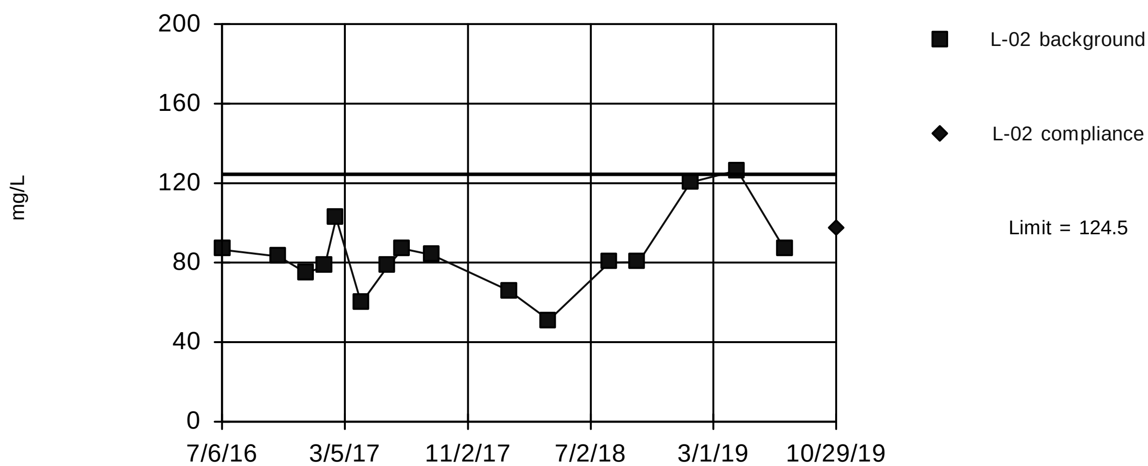
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=84.12, Std. Dev.=19.44, n=16. Seasonality was detected with 95% confidence and data were deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9141, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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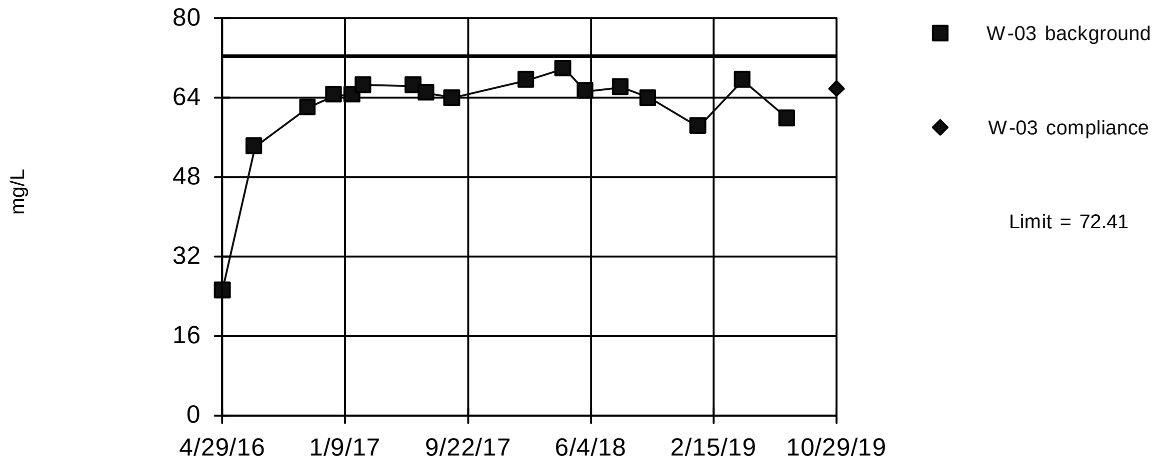
Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on x^4 transformation): Mean=1.6e7, Std. Dev.=5502058, n=17. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8648, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

Constituent: Calcium Analysis Run 12/12/2019 11:30

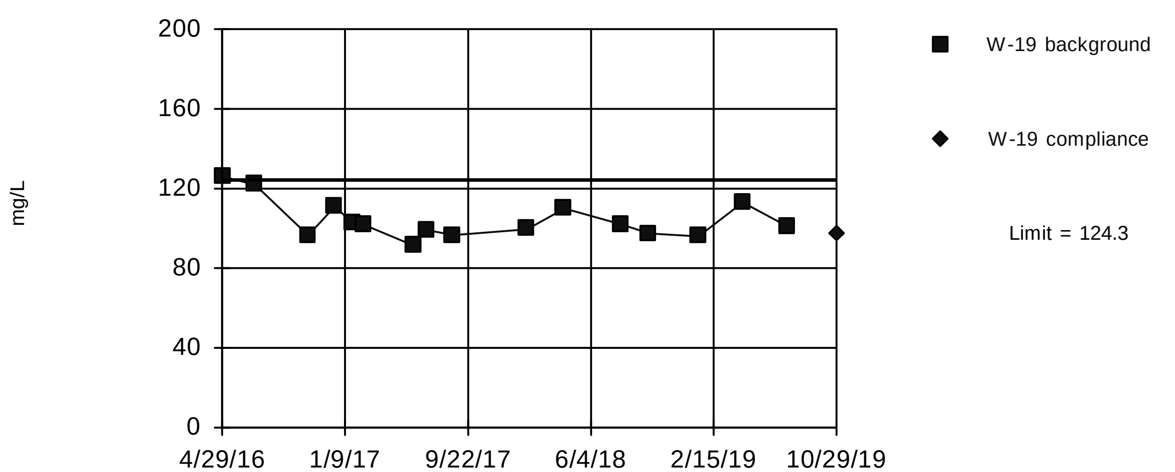
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=104.2, Std. Dev.=9.697, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8862, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

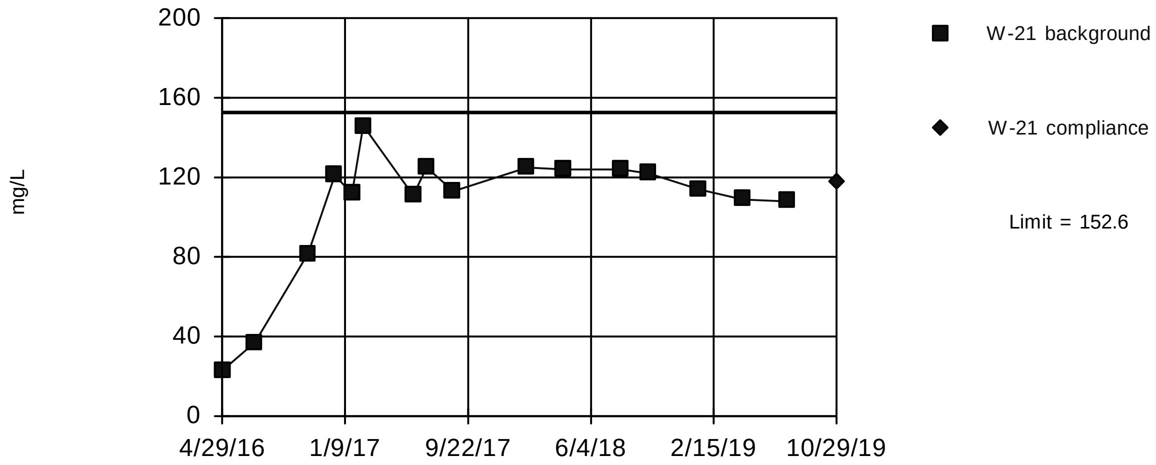
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square transformation): Mean=12226, Std. Dev.=5324, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8549, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. After outlier removal distribution was non-normal, so outlier results were invalidated.

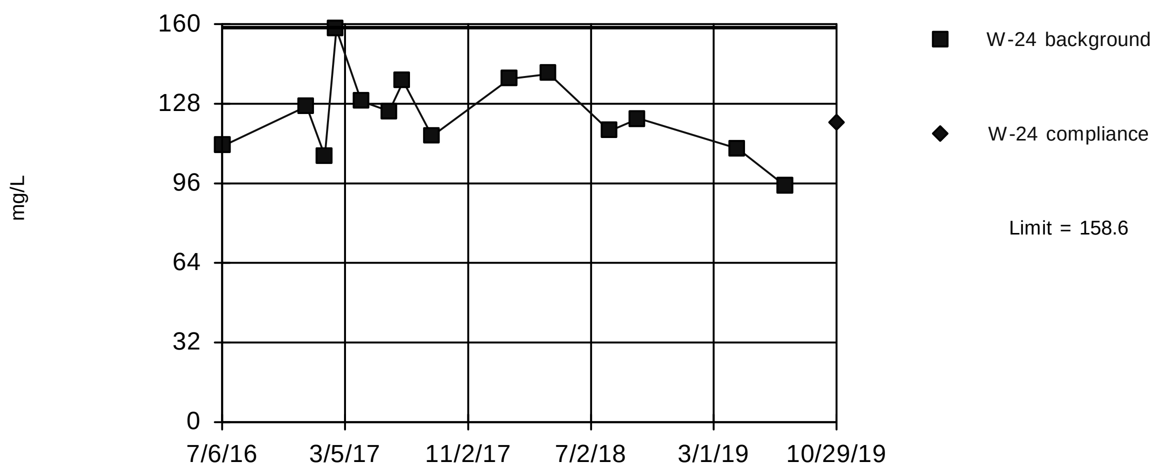
Constituent: Calcium Analysis Run 12/12/2019 11:30

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=123.7, Std. Dev.=16.24, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9825, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 13.7 (10/25/2016); 62.6 (1/15/2019).

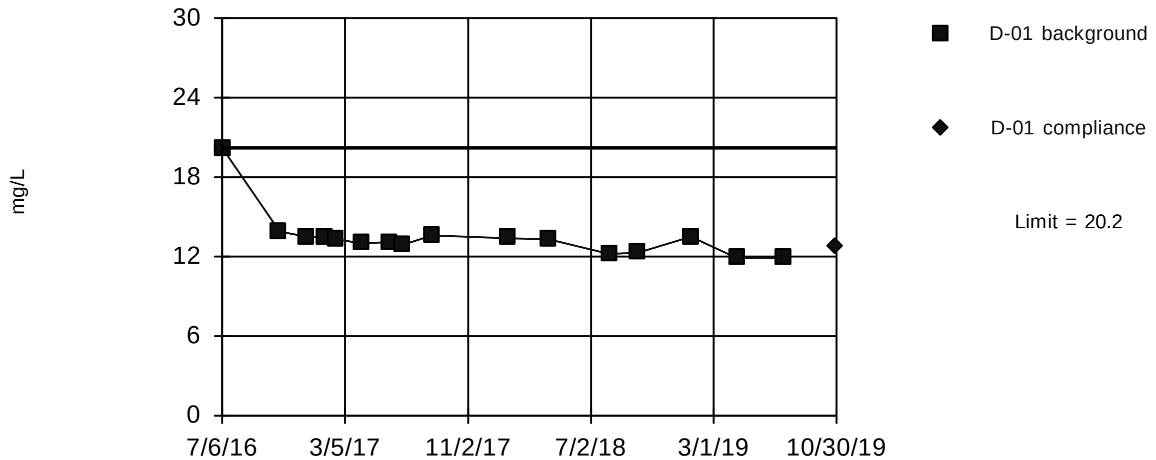
Constituent: Calcium Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

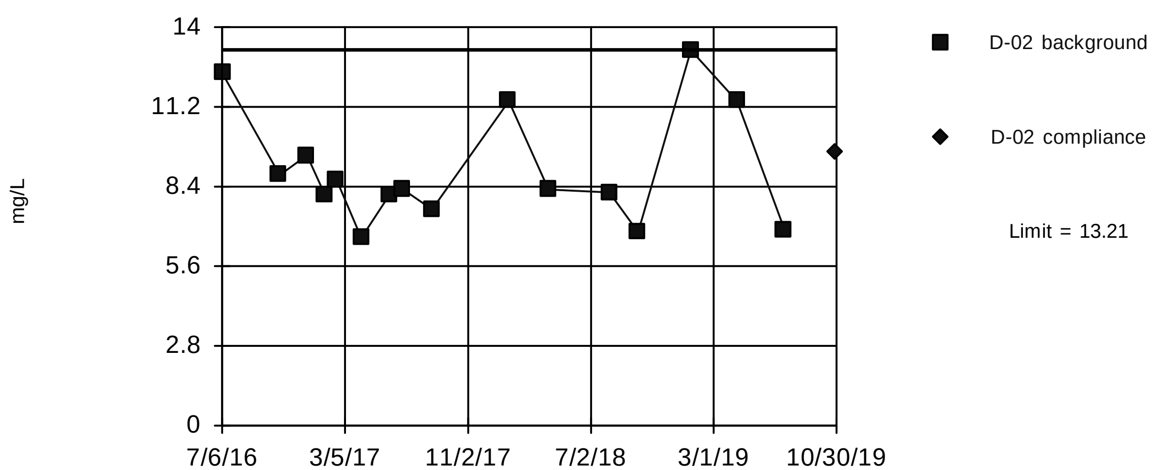
Constituent: Chloride   Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=9.013, Std. Dev.=2.023, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8795, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

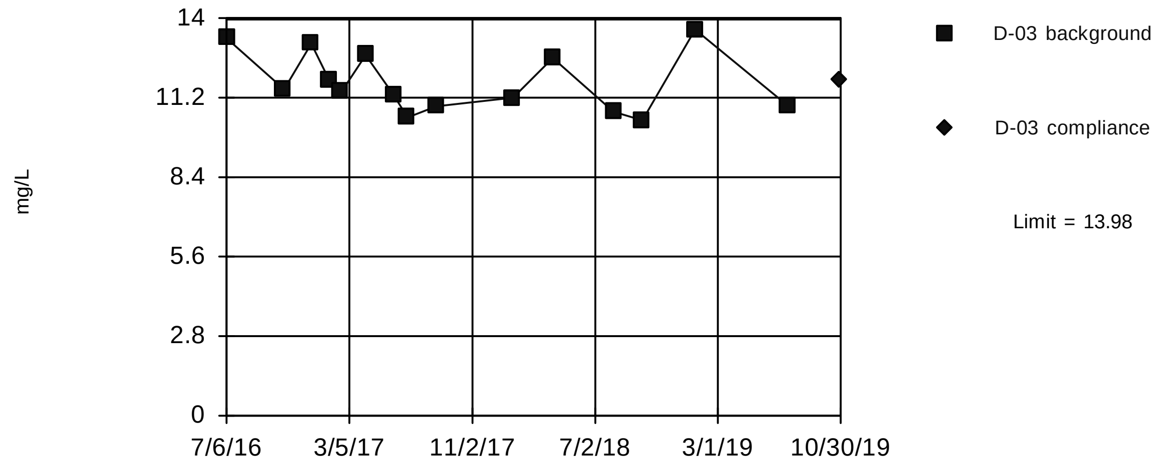
Constituent: Chloride   Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=11.73, Std. Dev.=1.065, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9097, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 7.3 (4/17/2019).

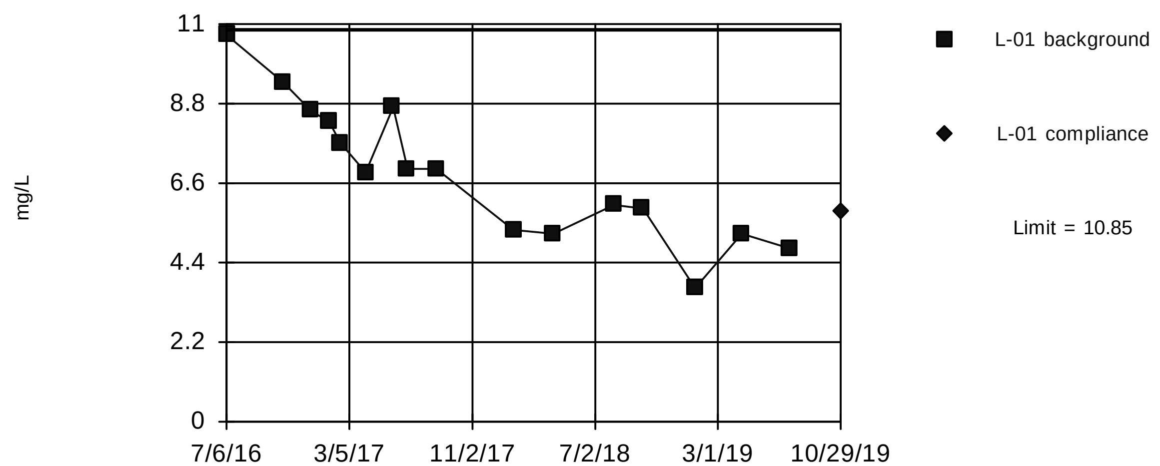
Constituent: Chloride Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=6.9, Std. Dev.=1.902, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9746, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

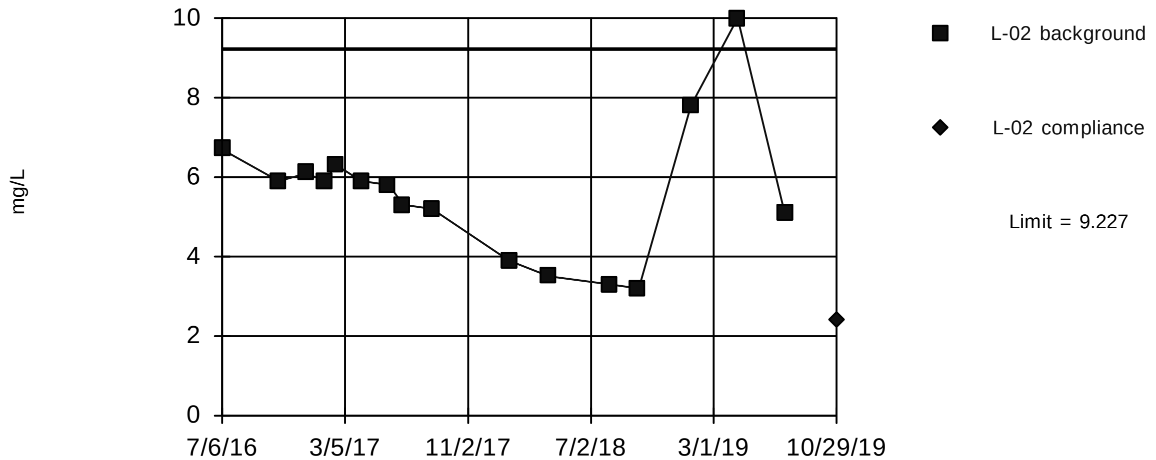
Constituent: Chloride Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=5.619, Std. Dev.=1.738, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9164, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

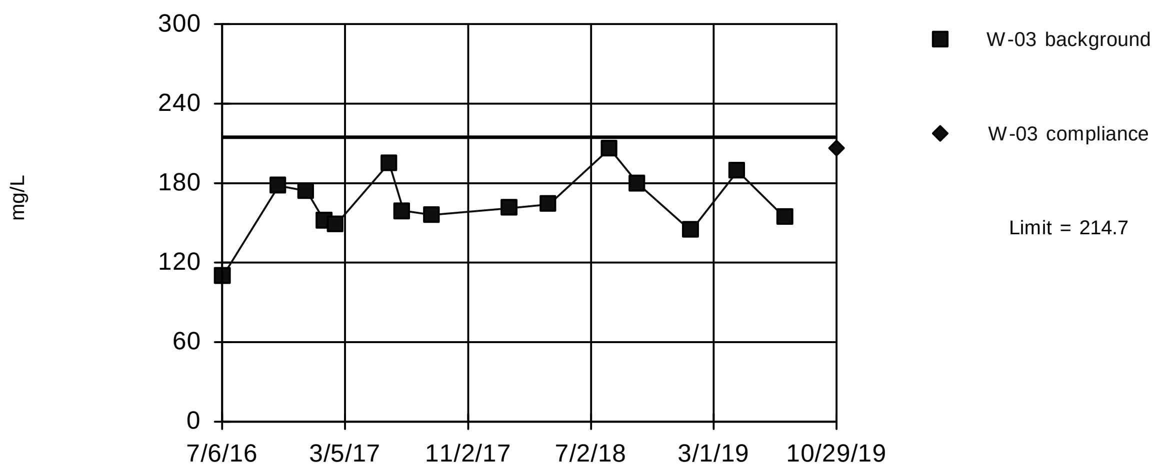
Constituent: Chloride Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=164.5, Std. Dev.=23.73, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9623, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 45 (4/29/2016).

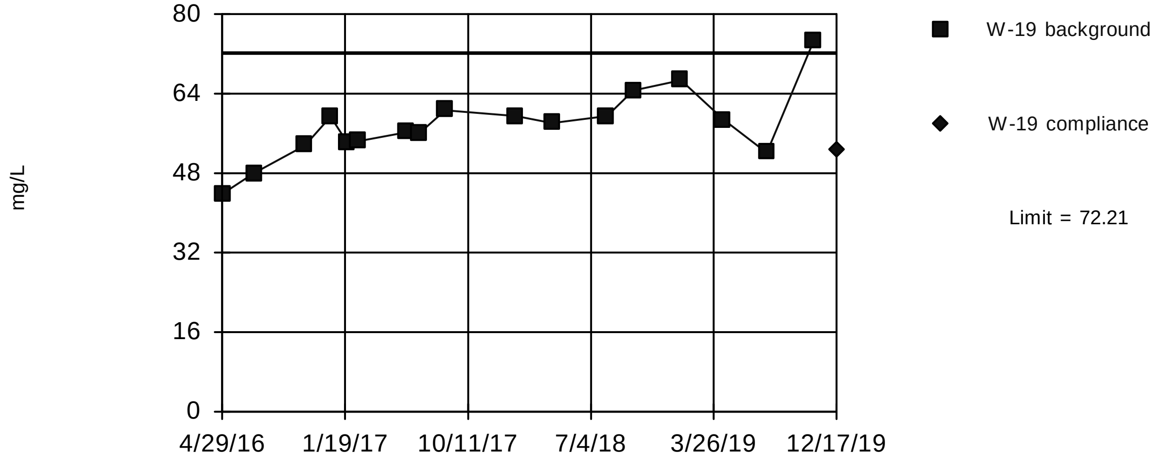
Constituent: Chloride Analysis Run 12/12/2019 11:31

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=57.66, Std. Dev.=7.083, n=17. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9629, critical = 0.851. Kappa = 2.054 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

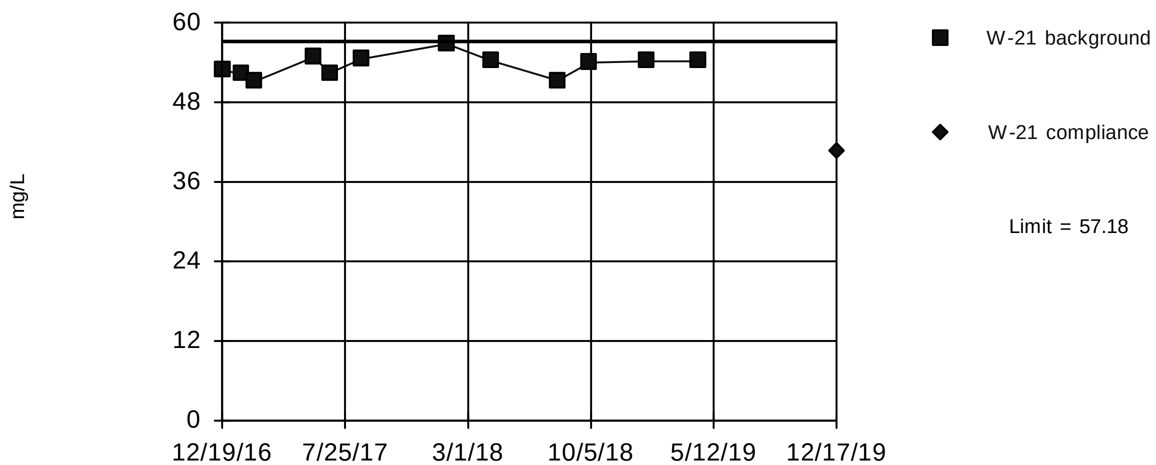
Constituent: Chloride Analysis Run 1/3/2020 08:41

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=53.57, Std. Dev.=1.618, n=12. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9382, critical = 0.805. Kappa = 2.232 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Five background outliers were removed: 8.7 (4/29/2016); 13 (7/6/2016); 43 (10/25/2016); 37.3 (7/19/2019); 67.4 (10/29/2019).

Constituent: Chloride Analysis Run 1/3/2020 08:41

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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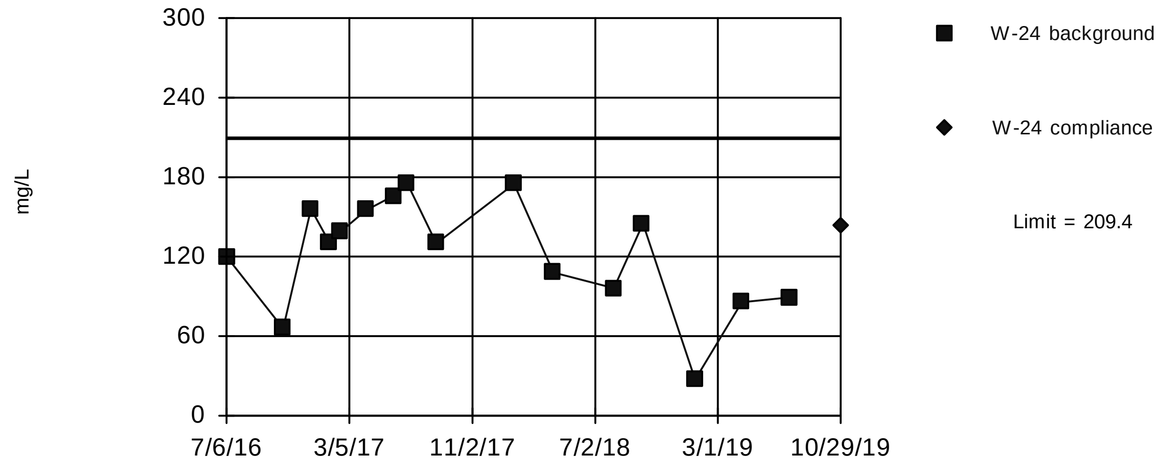
Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=122.8, Std. Dev.=41.76, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9451, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. No background outliers were found.

Constituent: Chloride Analysis Run 12/12/2019 11:31

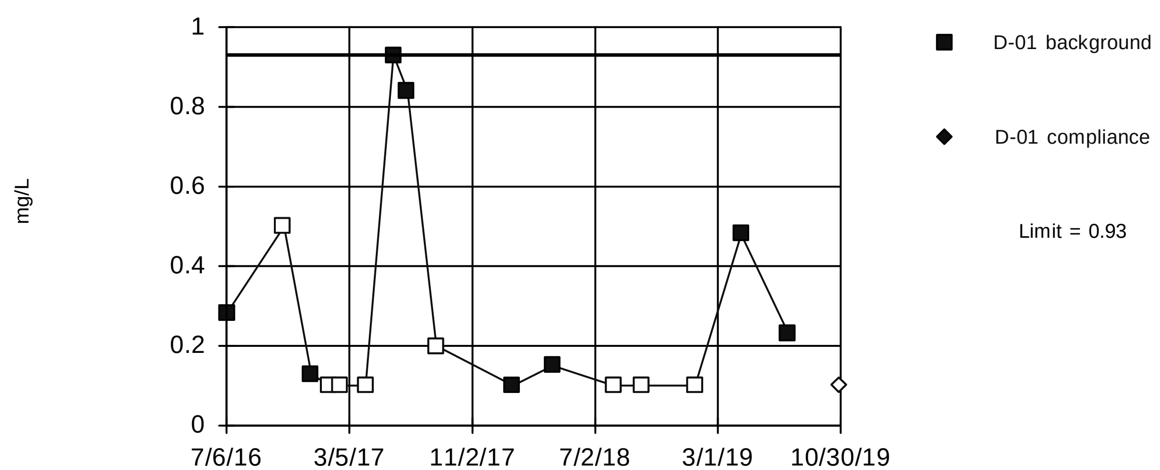
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified. Seasonality was not detected with 95% confidence.

Constituent: Fluoride Analysis Run 12/12/2019 11:31

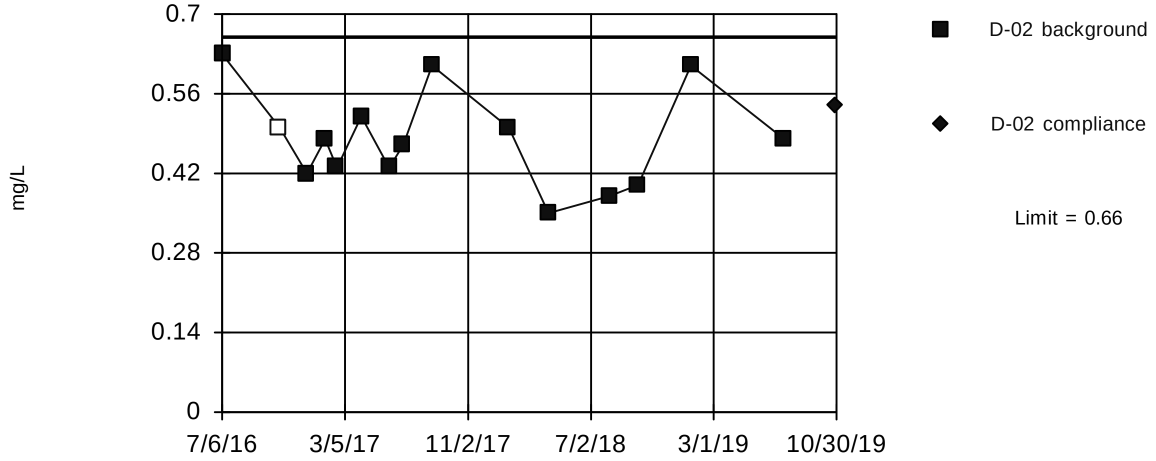
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.4807, Std. Dev.=0.08481, n=15, 6.667% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9389, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 0.91 (4/17/2019).

Constituent: Fluoride Analysis Run 12/12/2019 11:32

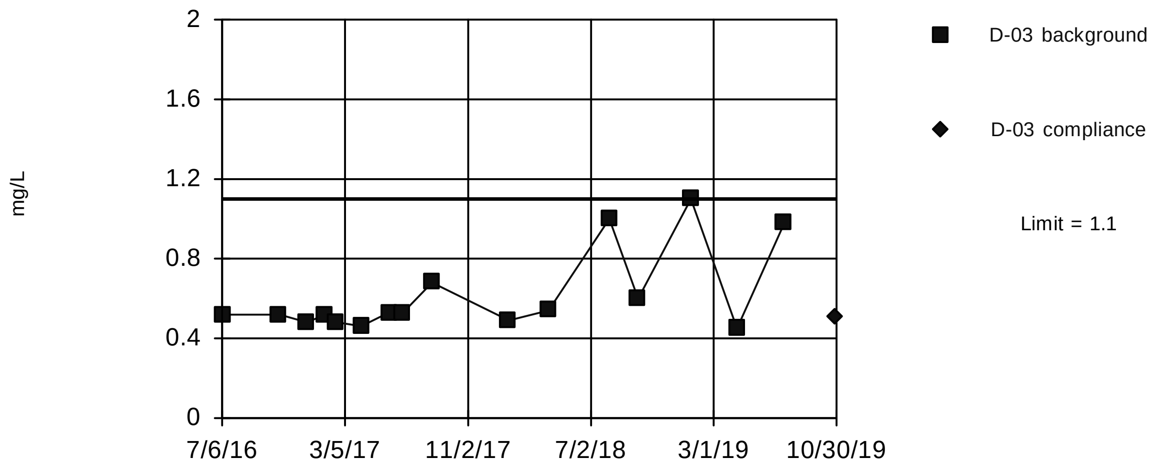
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified. Seasonality was not detected with 95% confidence.

Constituent: Fluoride Analysis Run 12/12/2019 11:32

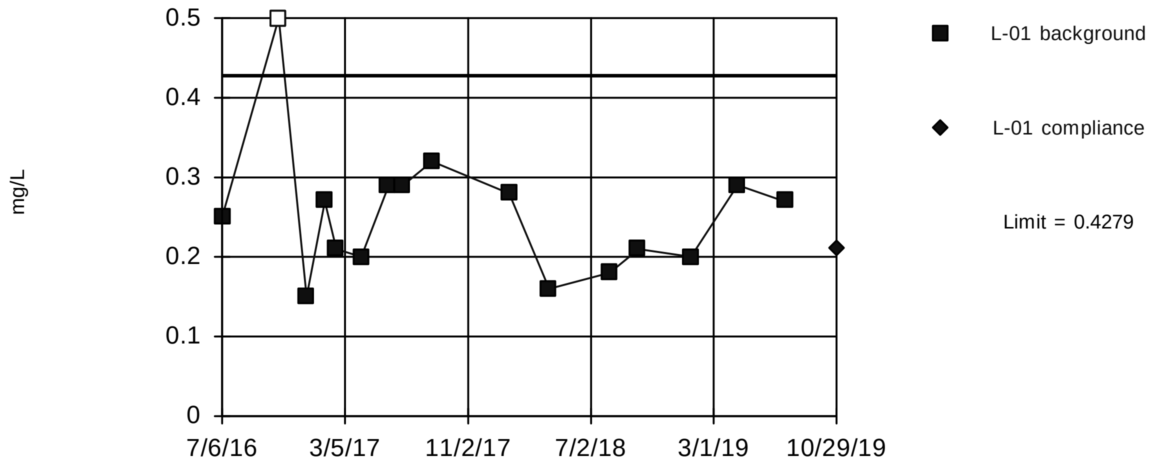
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.2544, Std. Dev.=0.08358, n=16, 6.25% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8519, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

Constituent: Fluoride Analysis Run 12/12/2019 11:32

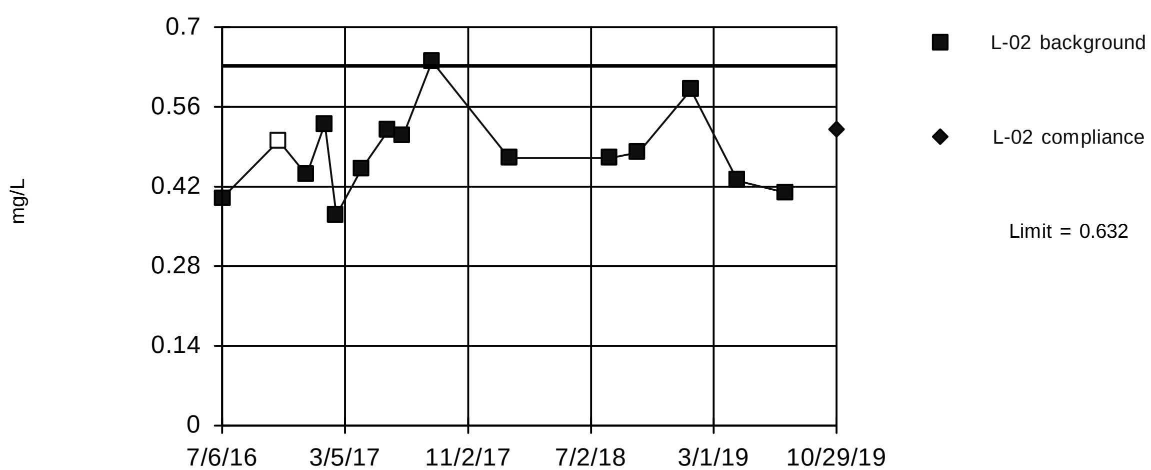
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.4807, Std. Dev.=0.07156, n=15, 6.667% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9649, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 0.24 (4/11/2018).

Constituent: Fluoride Analysis Run 12/12/2019 11:32

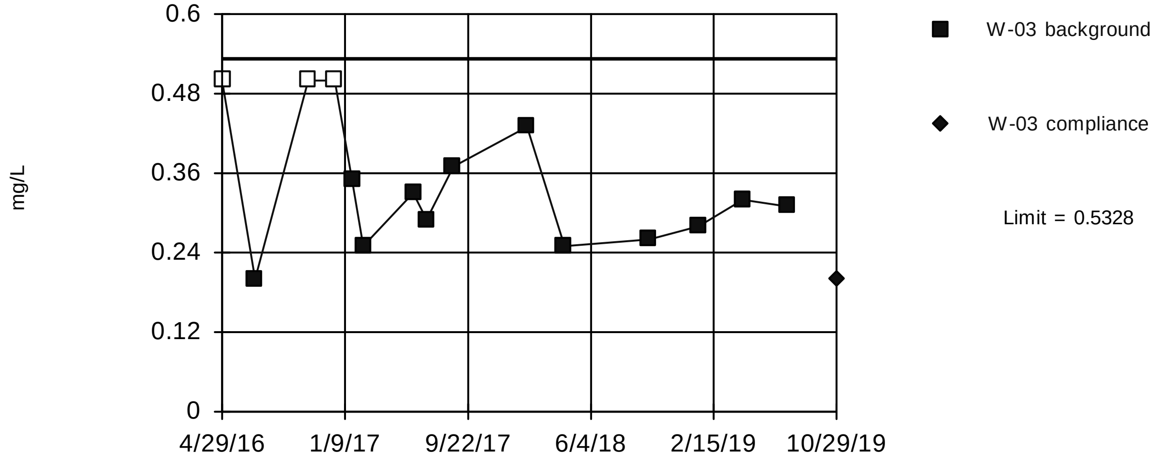
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Aitchison`s Adjustment): Mean=0.2427, Std. Dev.=0.1372, n=15, 20% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9029, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: <1 (8/8/2018).

Constituent: Fluoride Analysis Run 12/12/2019 11:32

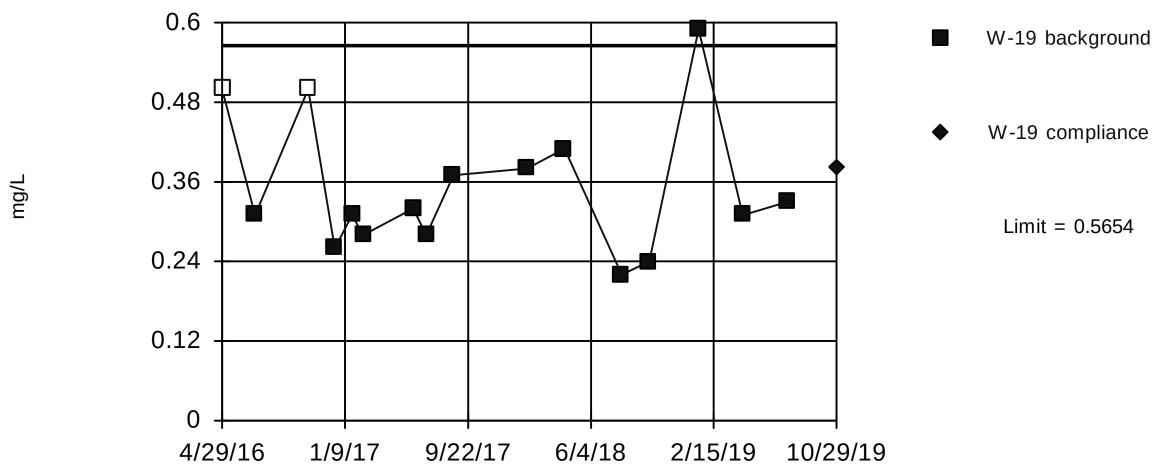
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.3506, Std. Dev.=0.1034, n=16, 12.5% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9007, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

Constituent: Fluoride Analysis Run 12/12/2019 11:32

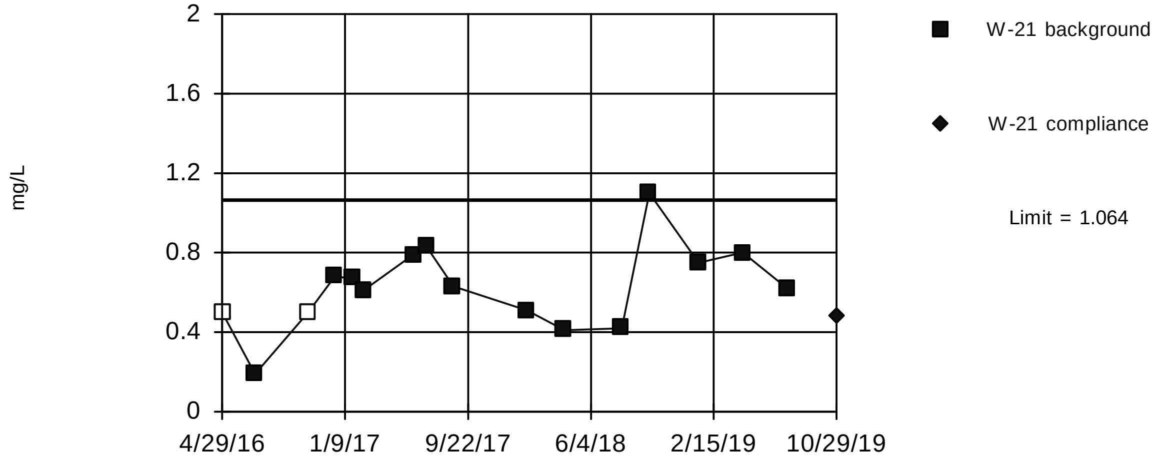
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.6256, Std. Dev.=0.2111, n=16, 12.5% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9751, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. No background outliers were found.

Constituent: Fluoride Analysis Run 12/12/2019 11:32

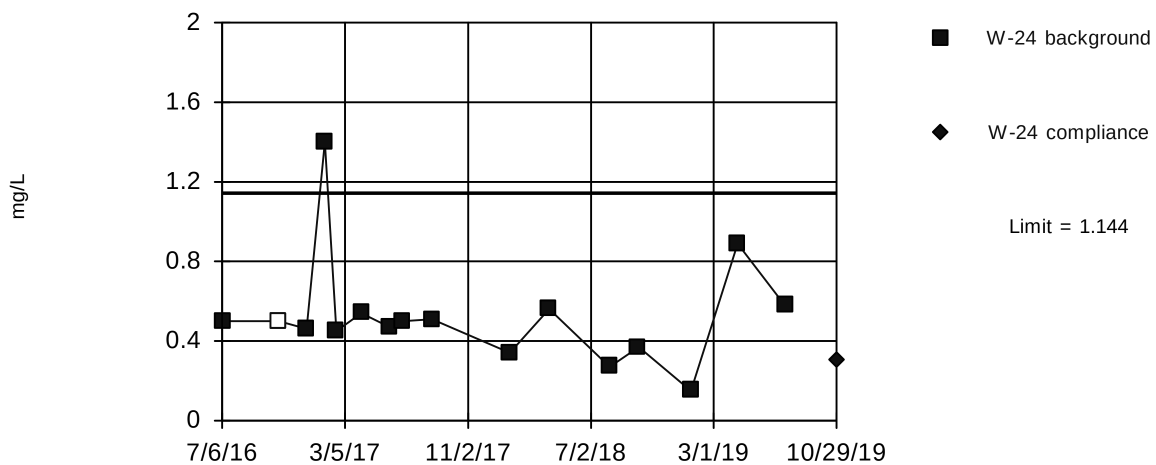
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=0.7087, Std. Dev.=0.1738, n=16, 6.25% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8707, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

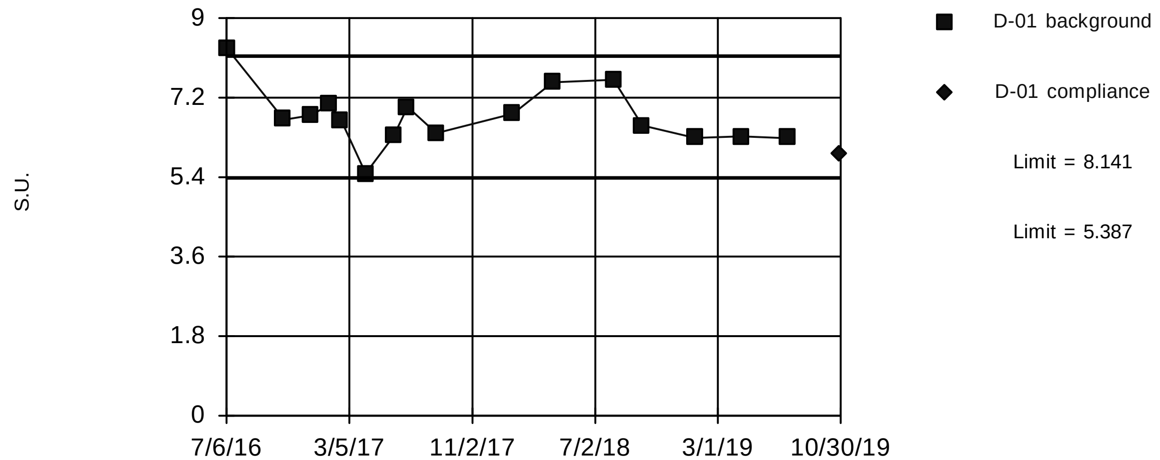
Constituent: Fluoride Analysis Run 12/12/2019 11:32

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=6.764, Std. Dev.=0.6633, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9405, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

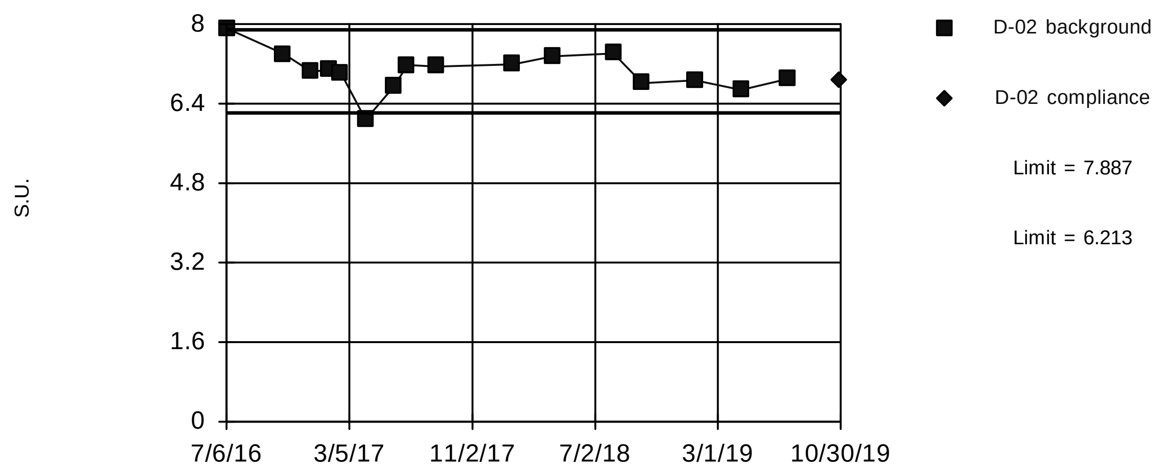
Constituent: pH Analysis Run 12/12/2019 11:32

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.05, Std. Dev.=0.4029, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9558, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. No background outliers were found.

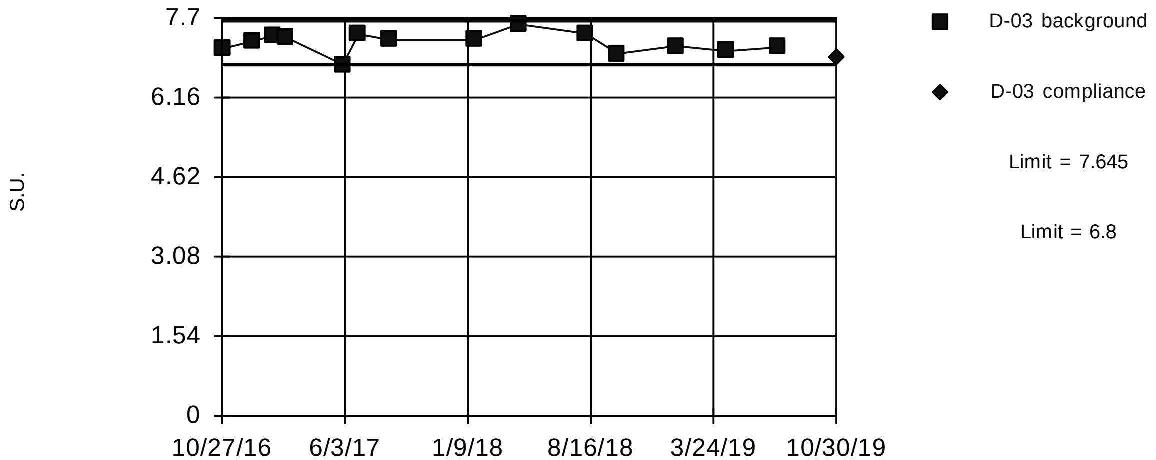
Constituent: pH Analysis Run 12/12/2019 11:32

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.223, Std. Dev.=0.1961, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9783, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 7.92 (7/6/2016); 5.76 (4/6/2017).

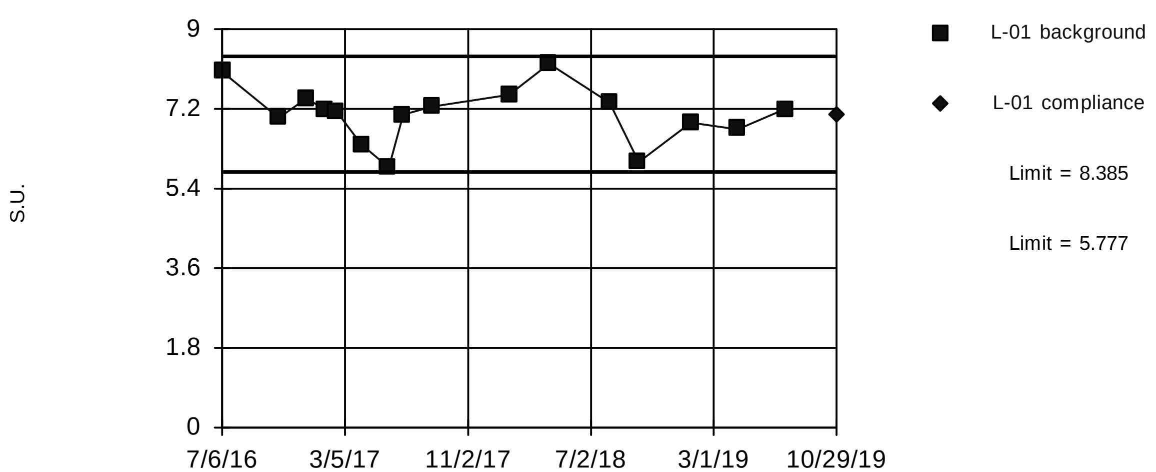
Constituent: pH Analysis Run 12/12/2019 11:32

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.081, Std. Dev.=0.6282, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9533, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

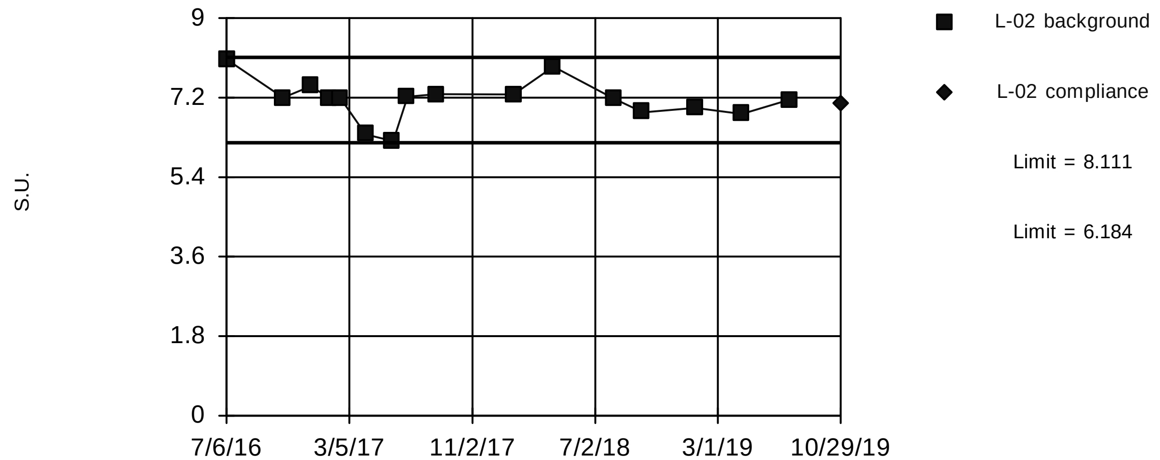
Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.148, Std. Dev.=0.4643, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9244, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

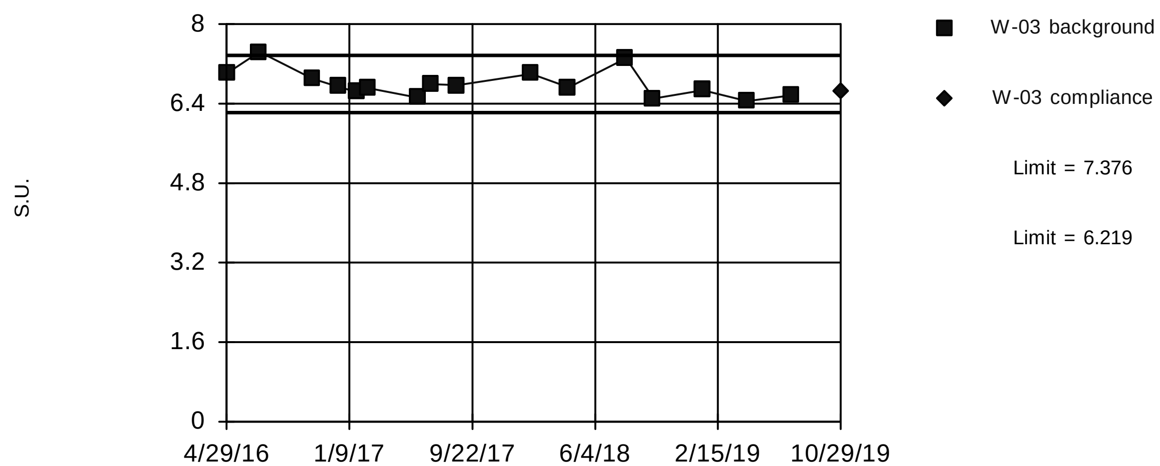
Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=6.798, Std. Dev.=0.2788, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9043, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

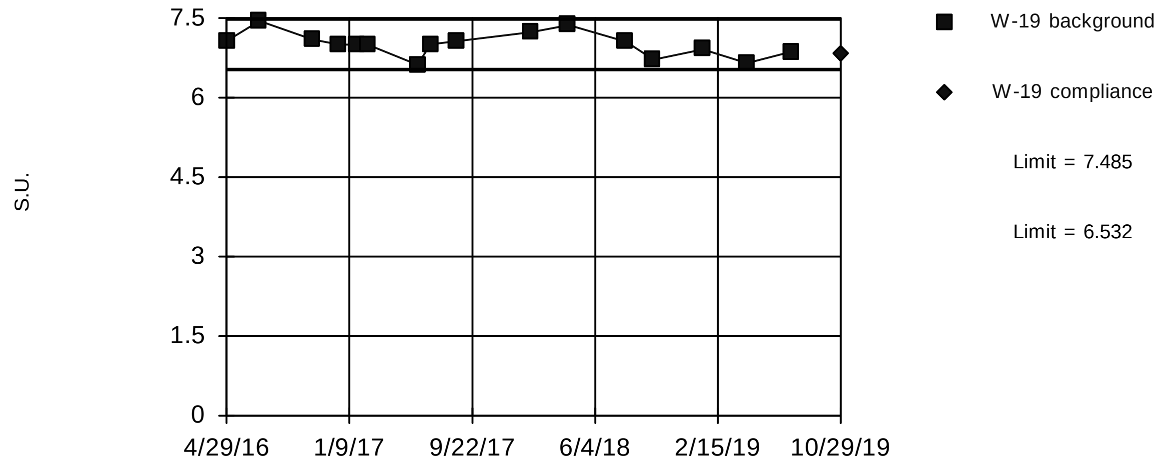
Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.009, Std. Dev.=0.2294, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9502, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

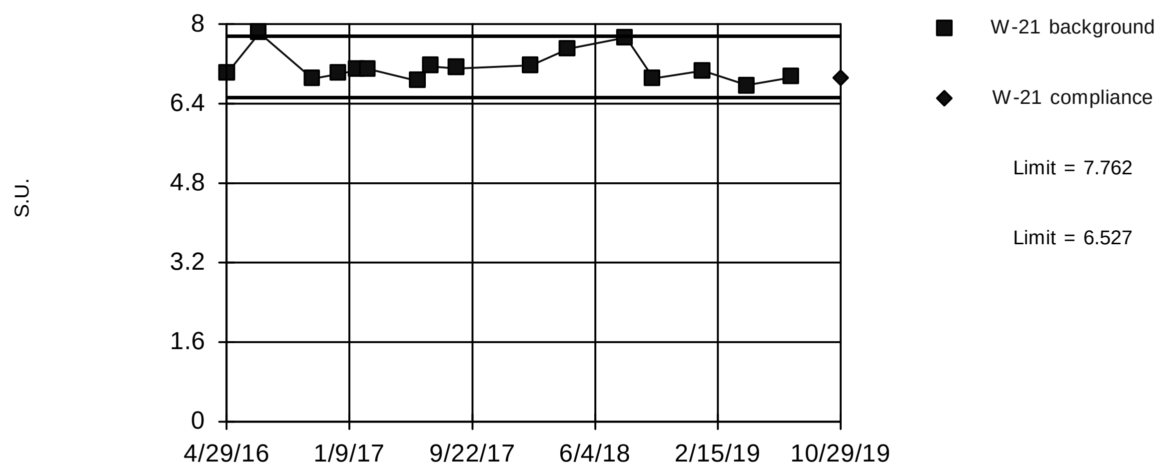
Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary (based on cube root transformation): Mean=1.924, Std. Dev.=0.02676, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8443, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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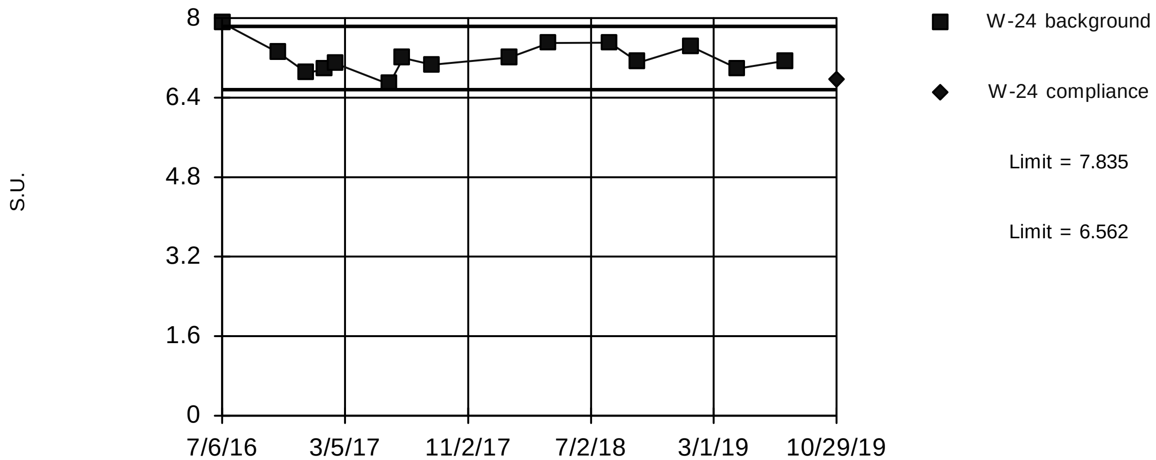
Within Limits

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=7.199, Std. Dev.=0.3008, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9603, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 6.01 (4/6/2017).

Constituent: pH Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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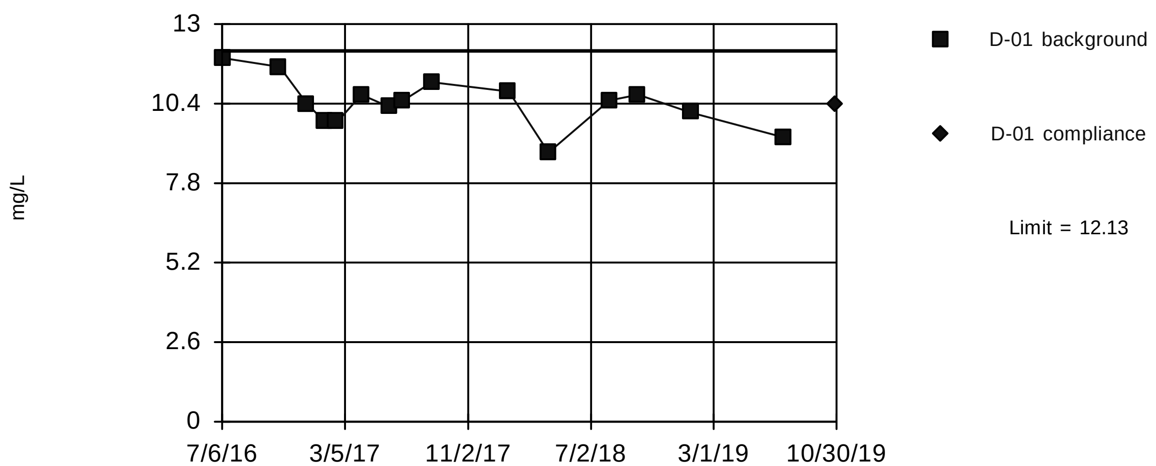
Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=10.42, Std. Dev.=0.8073, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9797, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 5.9 (4/17/2019).

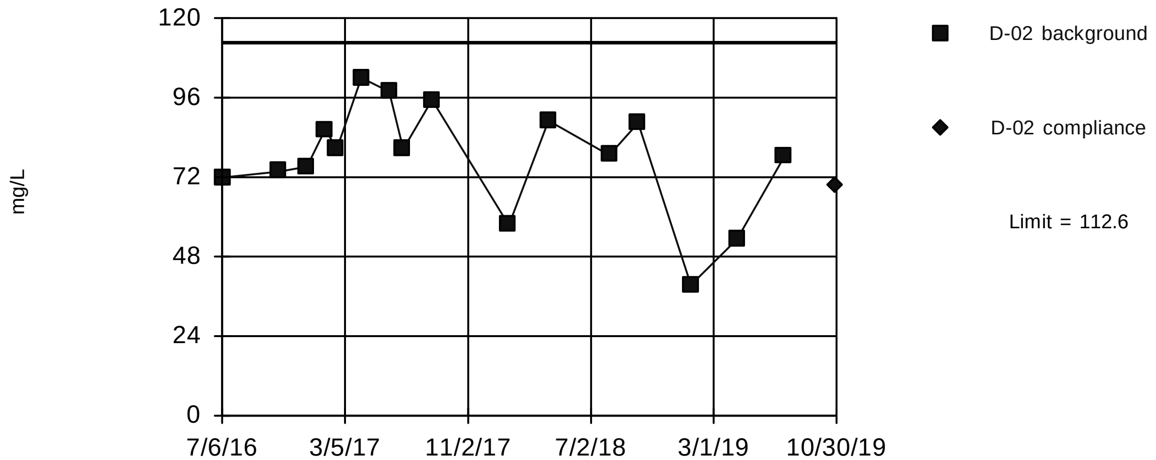
Constituent: Sulfate Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=78, Std. Dev.=16.68, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.94, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. No background outliers were found.

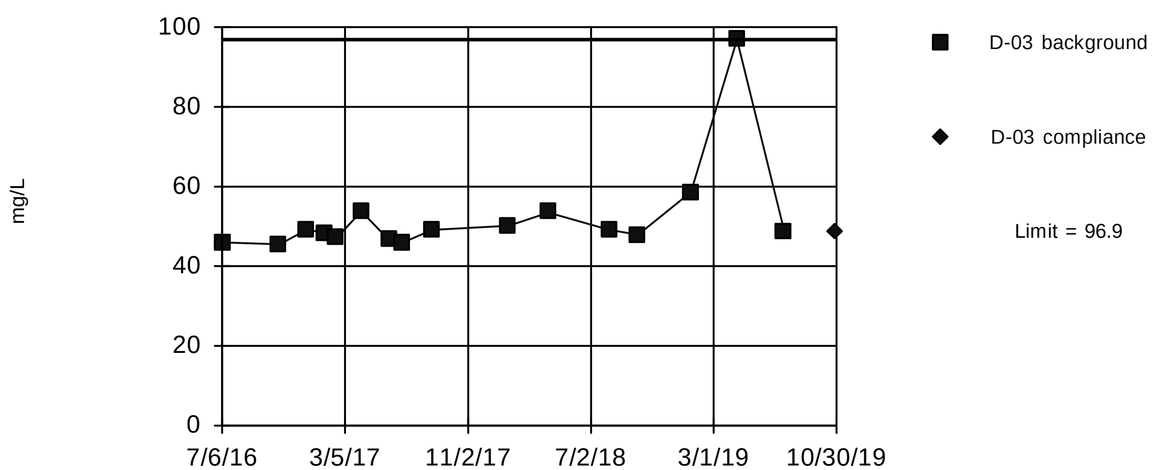
Constituent: Sulfate   Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified. Seasonality was not detected with 95% confidence.

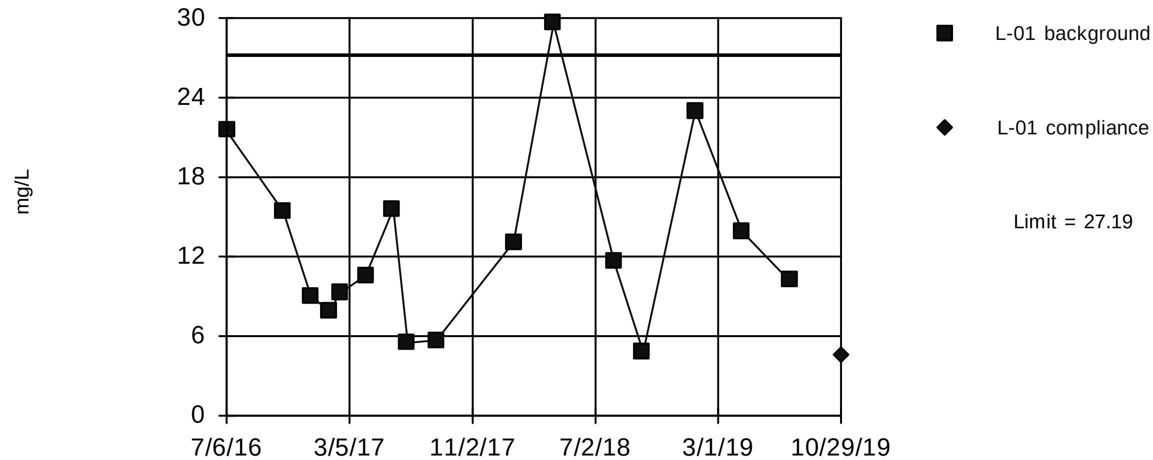
Constituent: Sulfate   Analysis Run 12/12/2019 11:33

Cleco Brame Energy Center   Client: Eagle Environmental Services, Inc.   Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=12.92, Std. Dev.=6.875, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9065, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

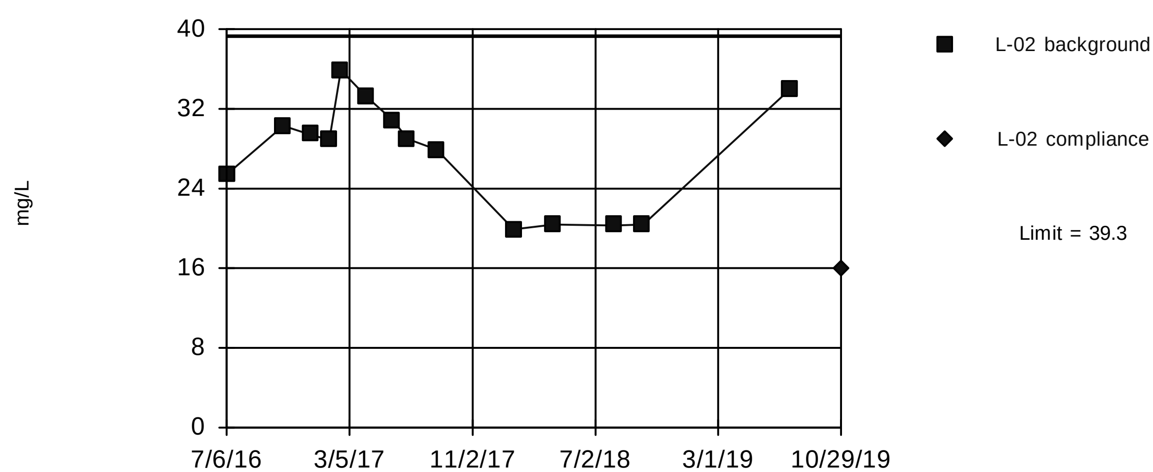
Constituent: Sulfate Analysis Run 12/12/2019 11:34

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=27.56, Std. Dev.=5.454, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9025, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 68 (1/15/2019); 98.2 (4/17/2019).

Constituent: Sulfate Analysis Run 12/12/2019 11:34

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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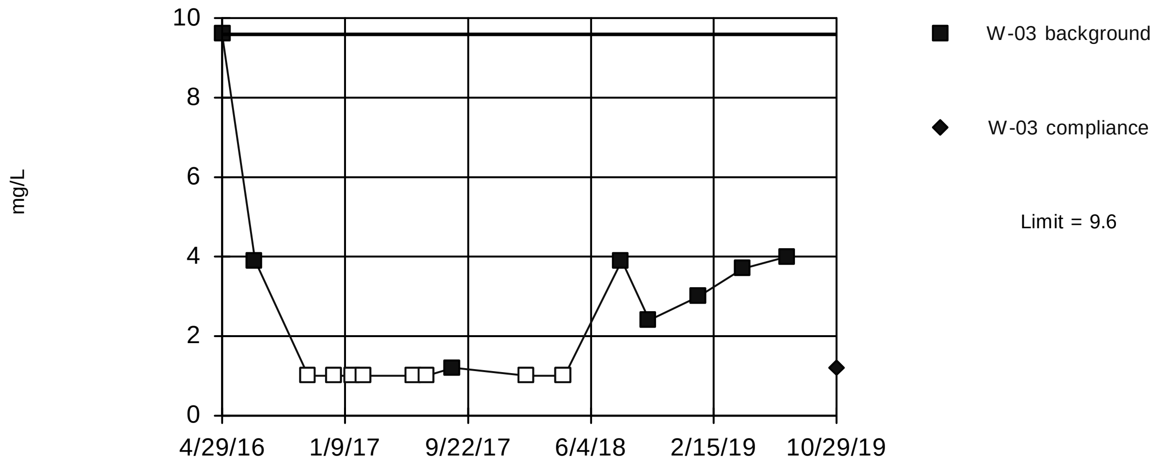
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. 50% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified. Seasonality was not detected with 95% confidence.

Constituent: Sulfate Analysis Run 12/12/2019 11:34

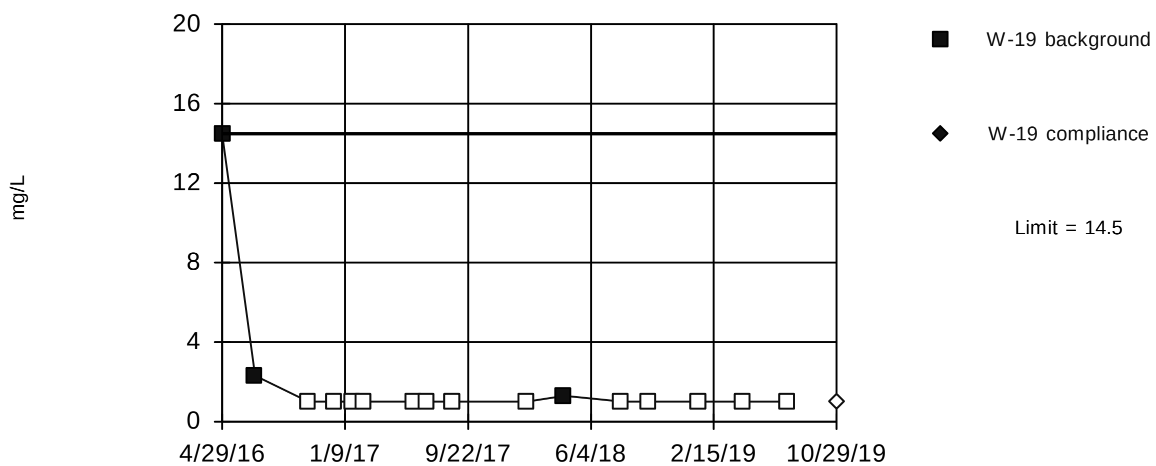
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 16 background values. 81.25% NDs. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

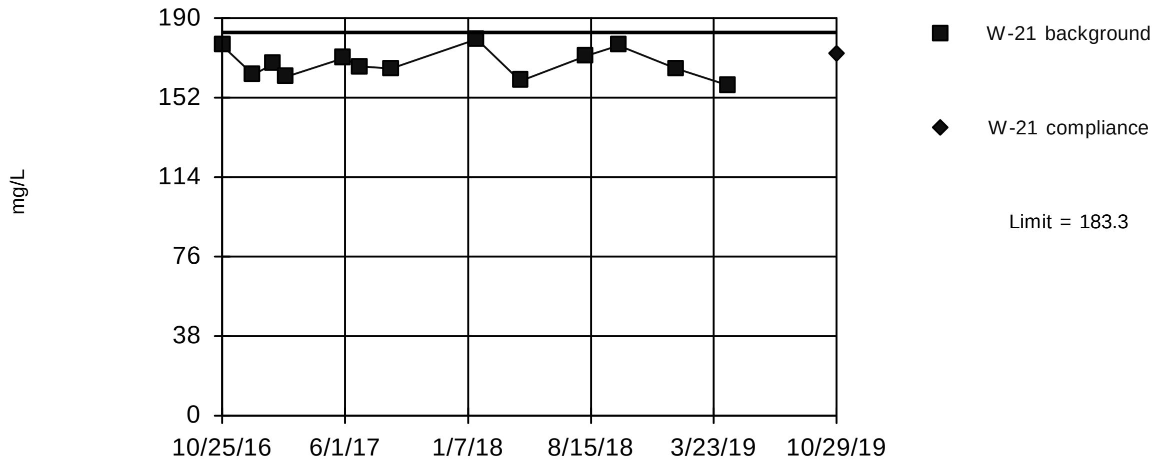
Constituent: Sulfate Analysis Run 12/12/2019 11:34

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=168.2, Std. Dev.=6.858, n=13. Insufficient data to test for seasonality: data were not deseasonalized. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9582, critical = 0.814. Kappa = 2.193 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Three background outliers were removed: 32.9 (4/29/2016); 49.4 (7/6/2016); 113 (7/19/2019).

Constituent: Sulfate Analysis Run 12/12/2019 11:34

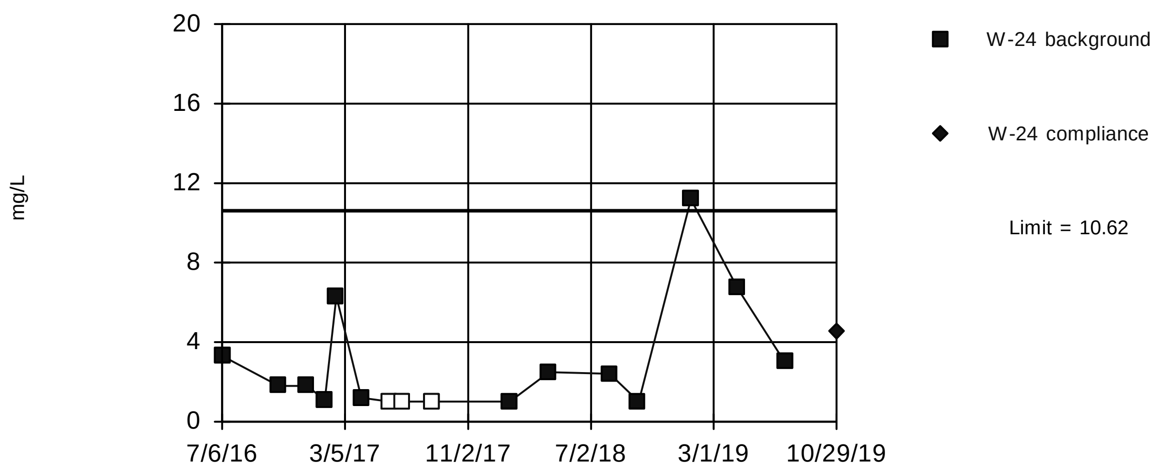
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on natural log transformation) (after Aitchison`s Adjustment): Mean=0.731, Std. Dev.=0.7859, n=16, 18.75% NDs. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8617, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

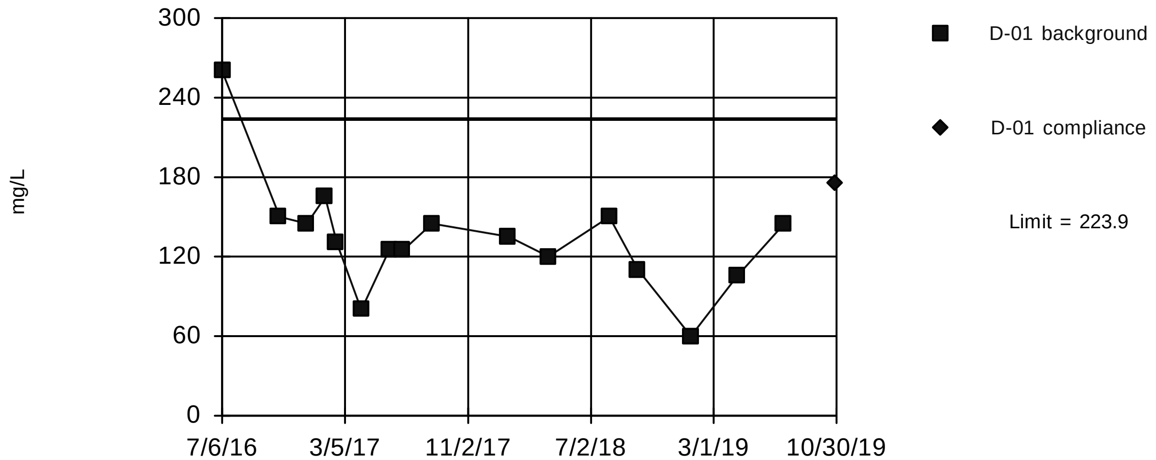
Constituent: Sulfate Analysis Run 12/12/2019 11:34

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=134.4, Std. Dev.=43.12, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8624, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

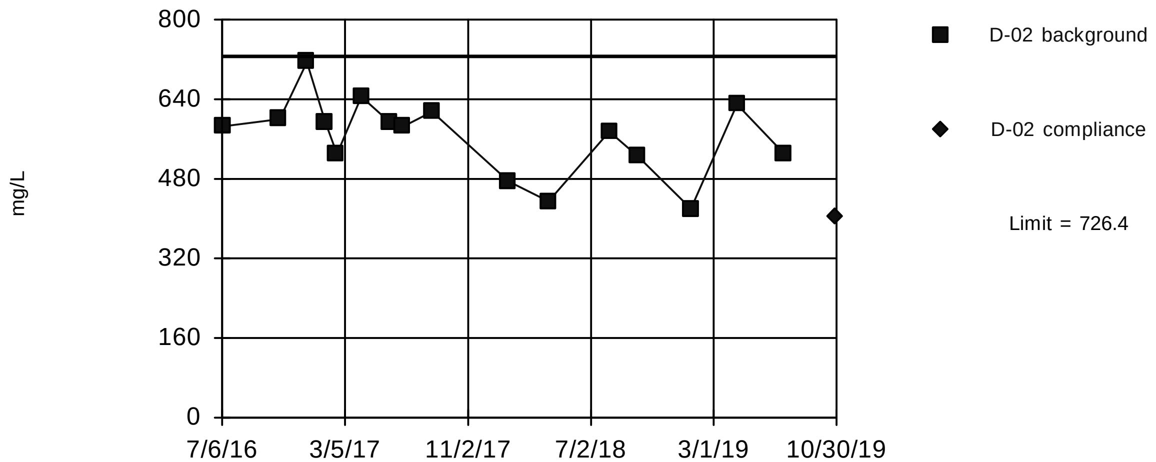
Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:34

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=565.9, Std. Dev.=77.29, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9555, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

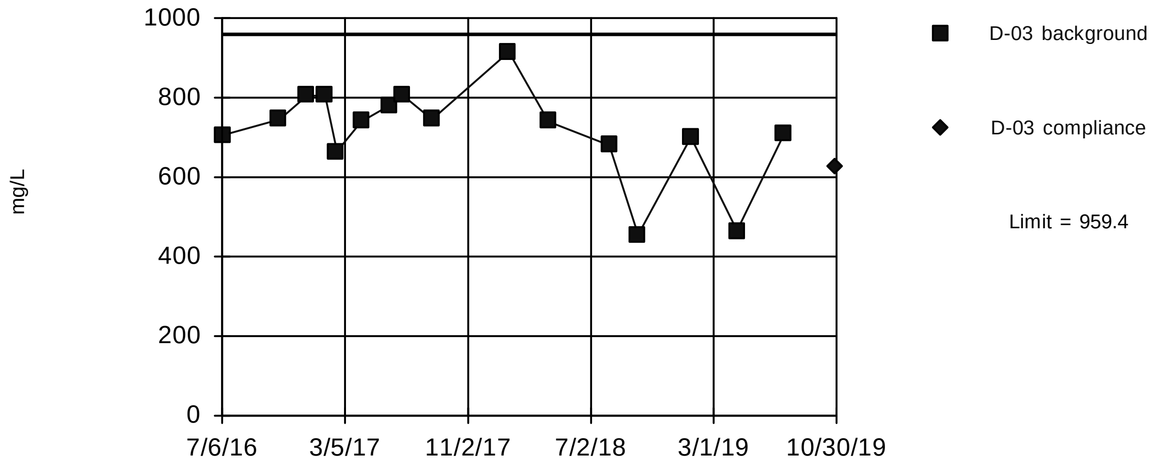
Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=716.3, Std. Dev.=117.1, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8642, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Distribution was found to be non-normal after removal of suspect values, so outliers could not be identified.

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

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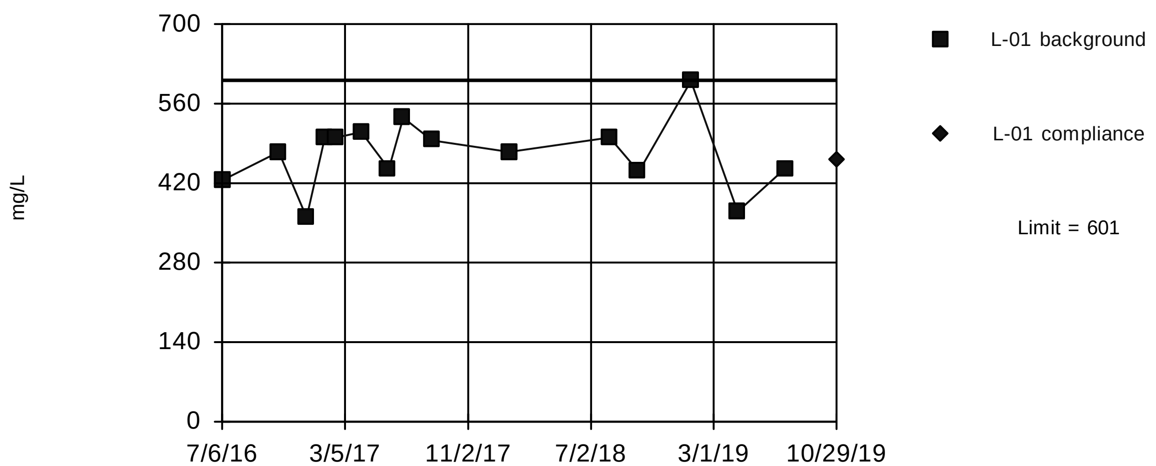
Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=471.7, Std. Dev.=61.14, n=15. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9568, critical = 0.835. Kappa = 2.115 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. One background outlier was removed: 200 (4/11/2018).

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

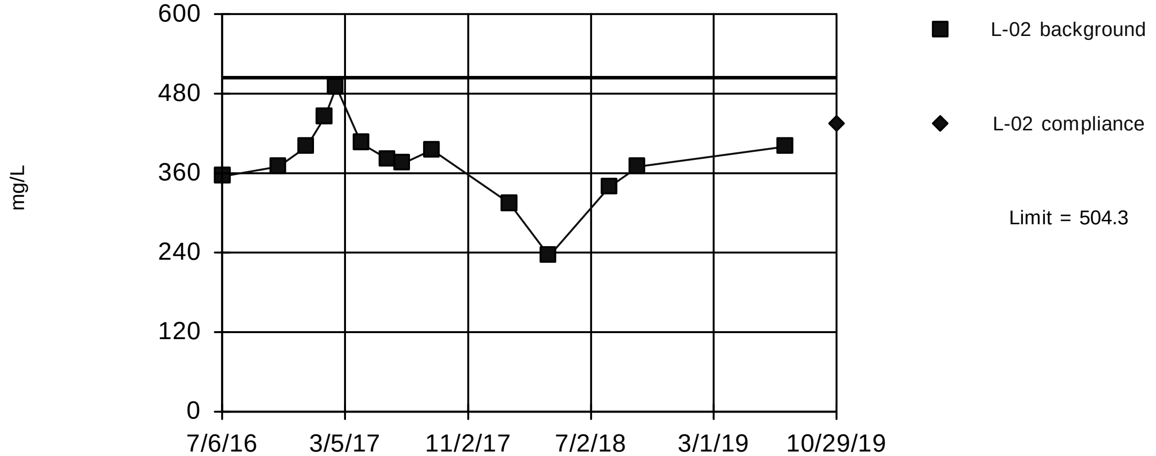
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=376.8, Std. Dev.=59.18, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9392, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 940 (1/15/2019); 565 (4/17/2019).

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

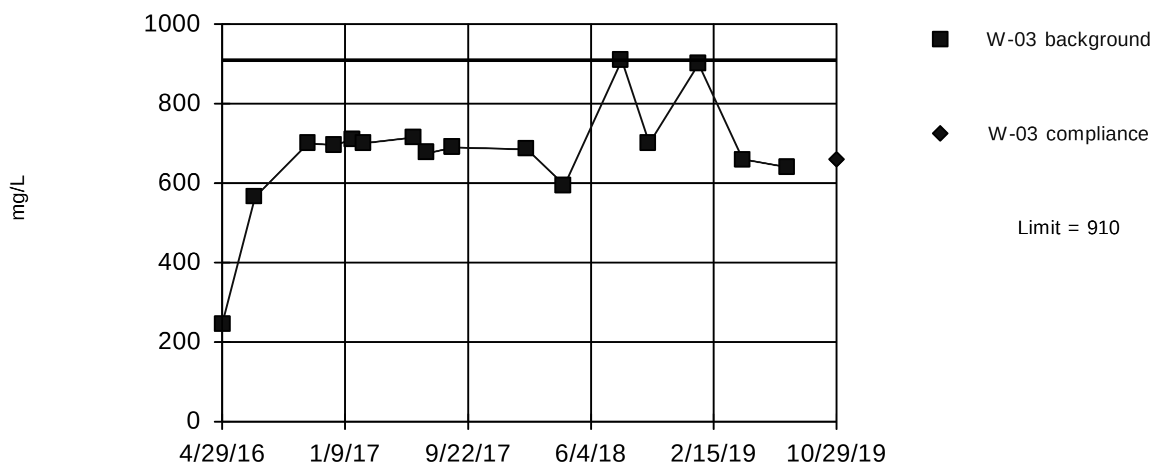
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 16 background values. Well-constituent pair annual alpha = 0.01287. Individual comparison alpha = 0.006456 (1 of 2). After outlier removal distribution was non-normal, so outlier results were invalidated. Seasonality was not detected with 95% confidence.

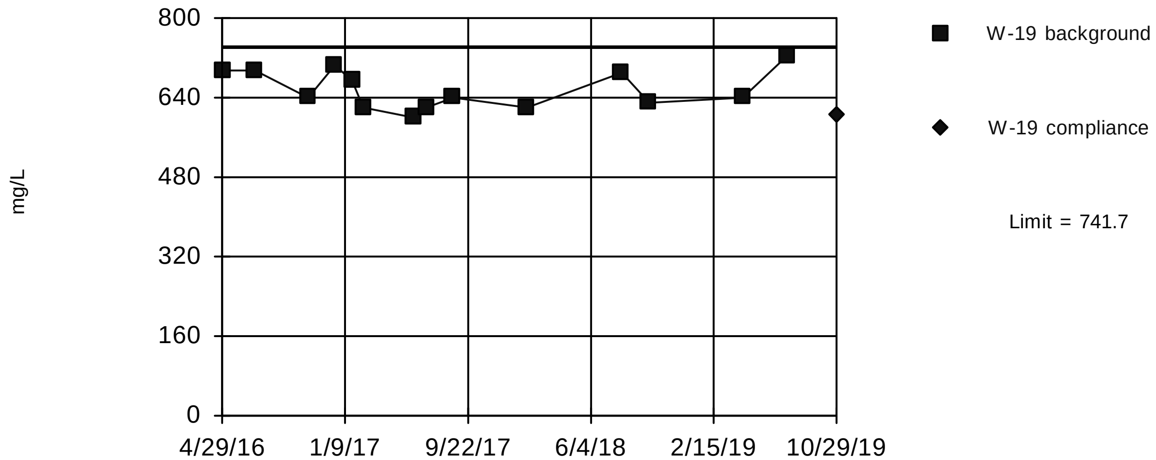
Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=656.8, Std. Dev.=39.4, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9137, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 495 (4/11/2018); 400 (1/15/2019).

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

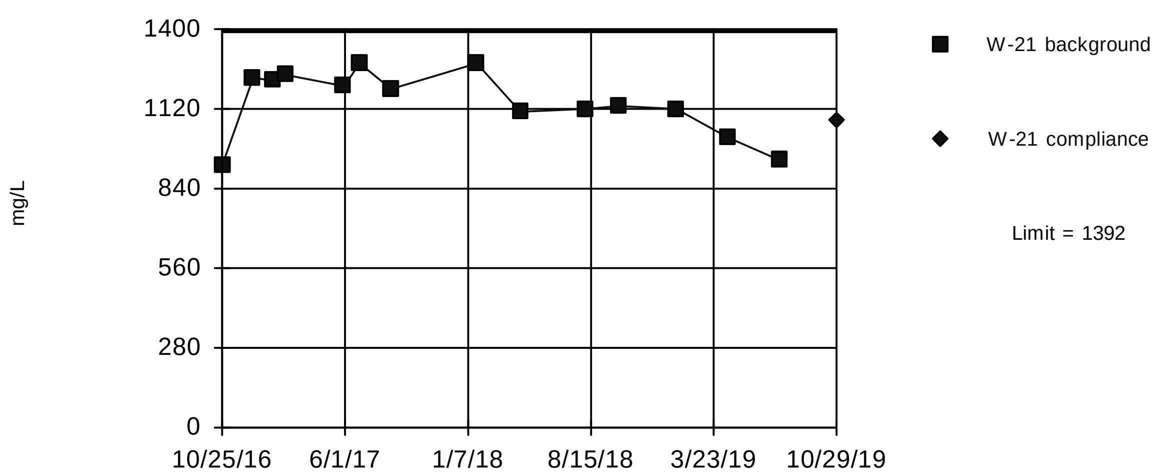
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1143, Std. Dev.=115.8, n=14. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9054, critical = 0.825. Kappa = 2.154 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. Dixon's outlier test was performed on the background data. Two background outliers were removed: 215 (4/29/2016); 435 (7/6/2016).

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:35

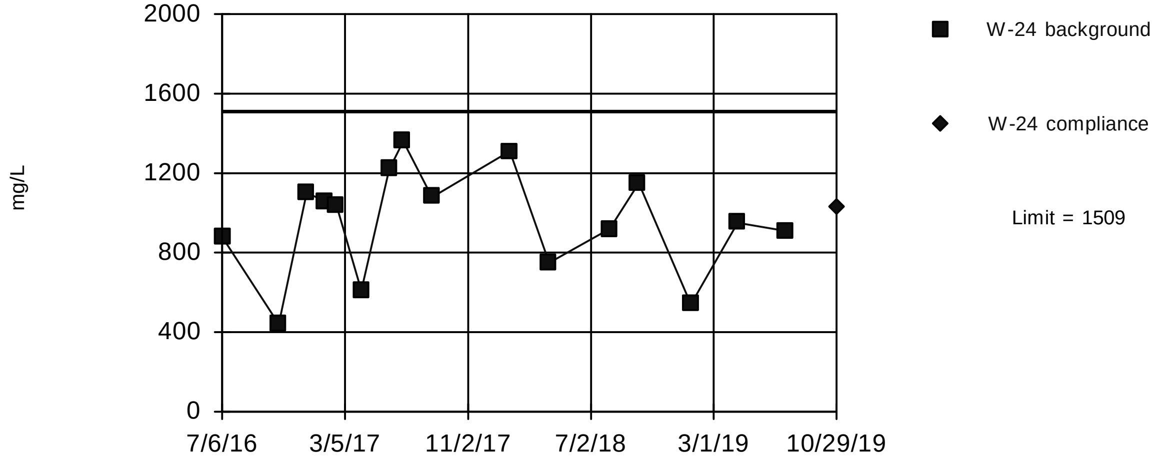
Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

Sanitas™ v.9.6.24 Sanitas software licensed to Eagle Environmental, Inc. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=957.5, Std. Dev.=265.9, n=16. Seasonality was not detected with 95% confidence. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9596, critical = 0.844. Kappa = 2.076 (c=7, w=4, 1 of 2, event alpha = 0.05132). Report alpha = 0.00188. EPA 1989 outlier screening was performed on the background data (to establish suspected outliers for Dixon's/Rosner's). No background outliers were found.

Constituent: Total Dissolved Solids Analysis Run 12/12/2019 11:36

Cleco Brame Energy Center Client: Eagle Environmental Services, Inc. Data: BEC CCR

APPENDIX H

LOCATION RESTRICTIONS DEMONSTRATIONS

BOTTOM ASH POND

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

TABLE OF CONTENTS

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:

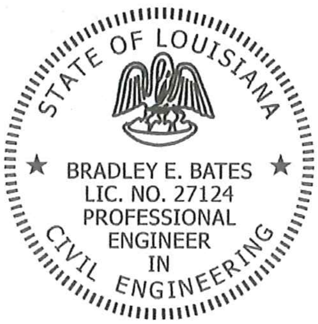
§257.60 **Placement Above the Uppermost Aquifer Location Restriction**

§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.

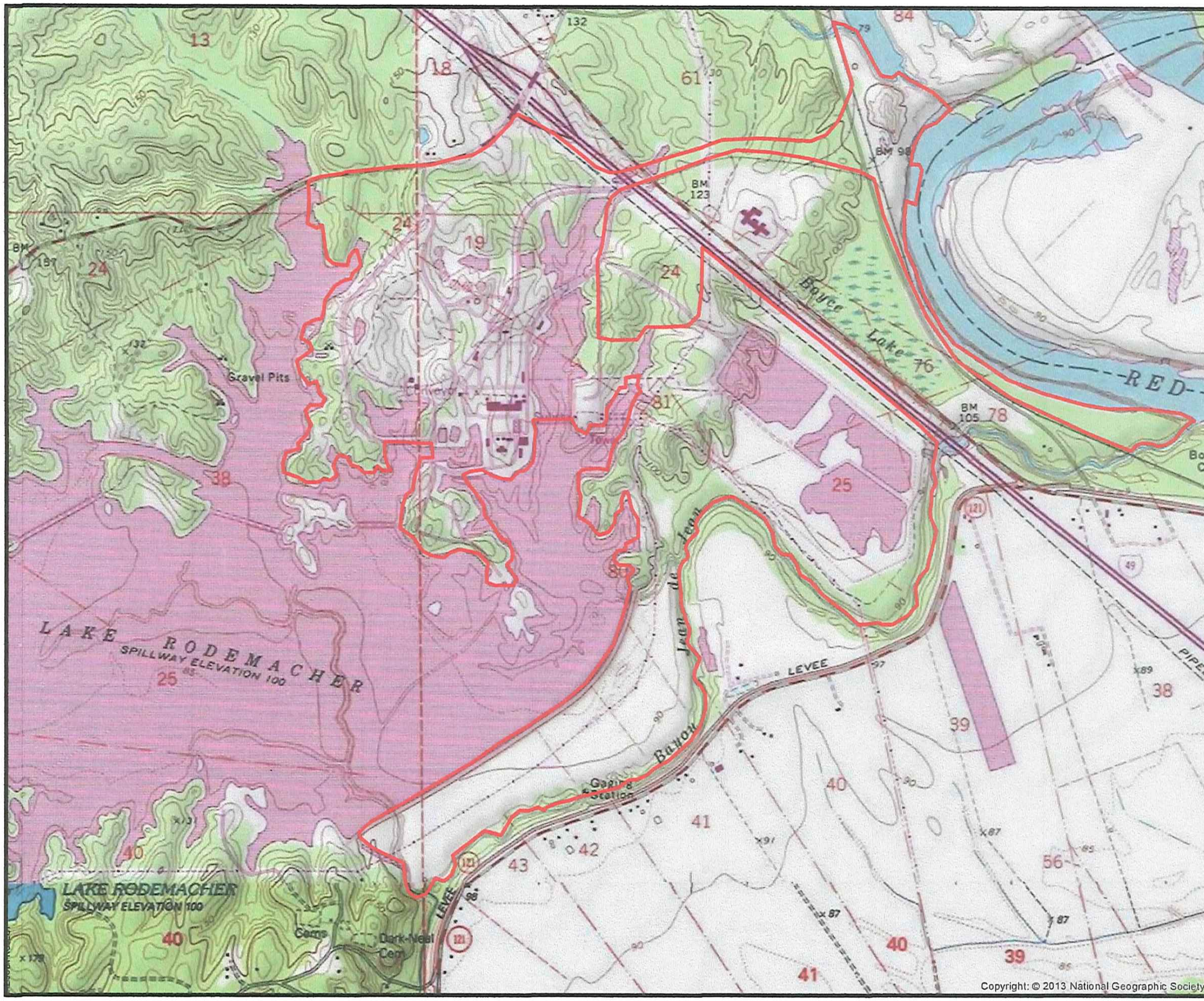
This evaluation has concluded that the Bottom Ash Pond unit meets the criteria for §257.60.

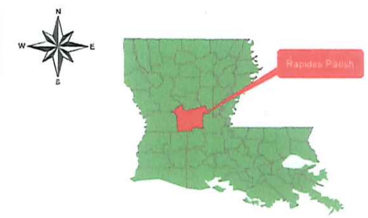
6.0 CERTIFICATION

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
Signature	**PE Registration Number**
Bradley E. Bates	*Professional Engineer*
Name	**Title**
Eagle Environmental Services, Inc.	*10-08-2018*
Company	**Date**





Legend

Property Boundary Line

0 750 1,500 3,000 4,500 Feet

Reference

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

CLECO Power LLC

Brame Energy Center

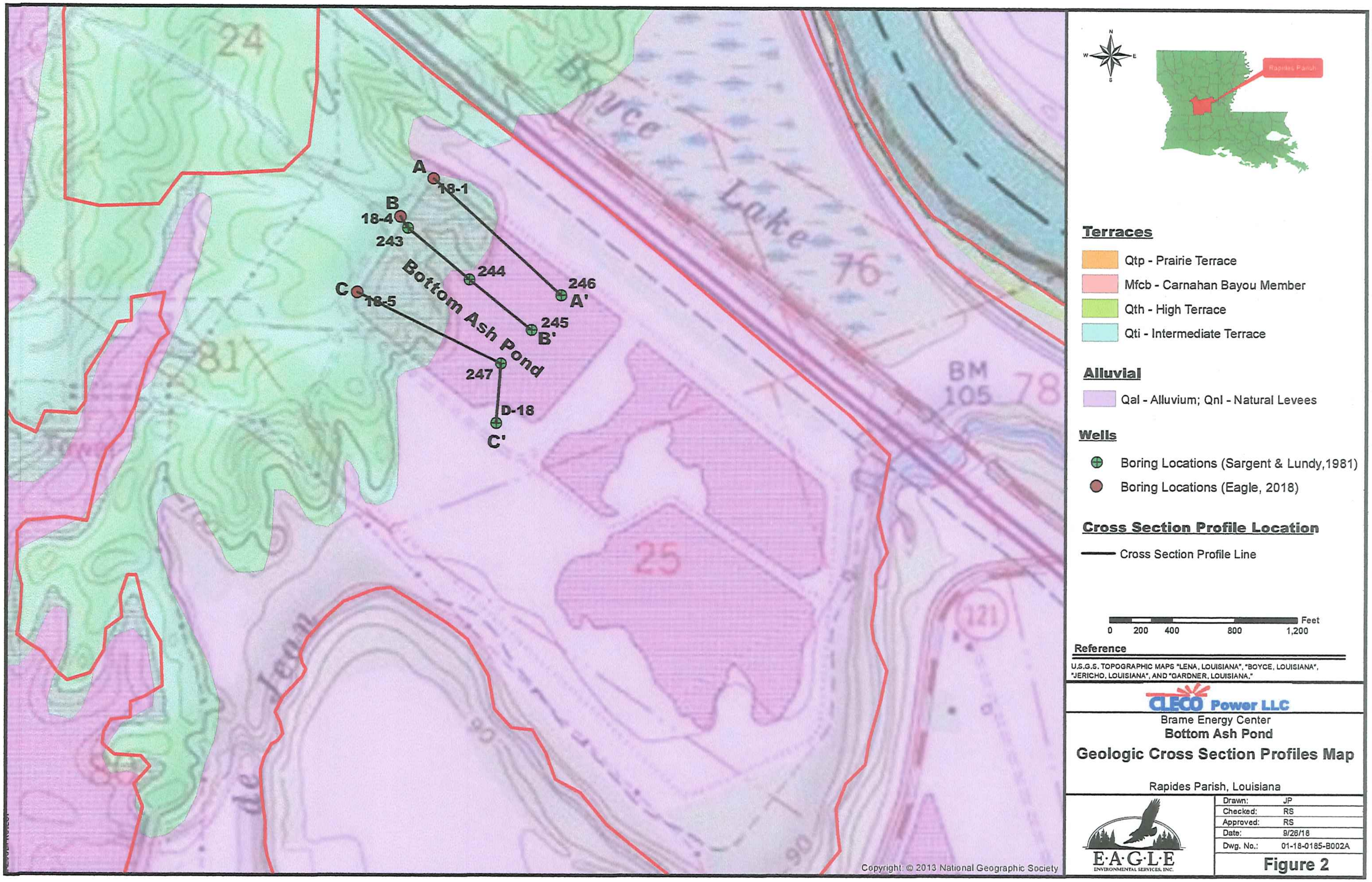
Site Location Map

Rapides Parish, Louisiana

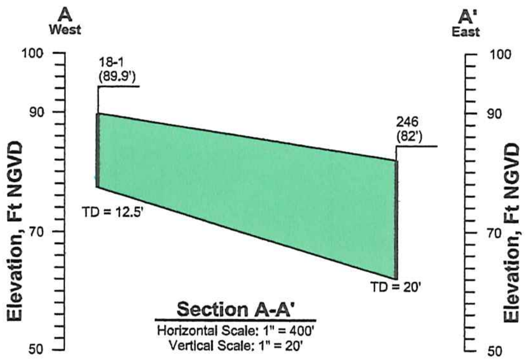
EAGLE ENVIRONMENTAL SERVICES, INC.

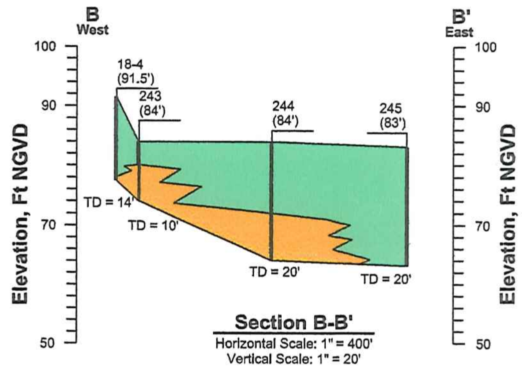
Drawn:	JP
Checked:	JM
Approved:	RS
Date:	9/9/16
Dwg. No.:	01-18-0185-A005

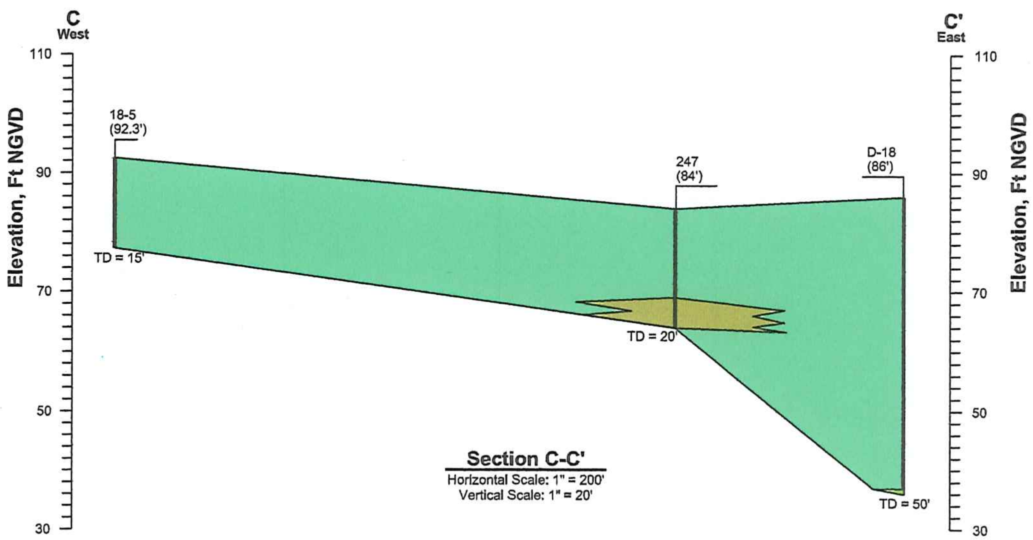
Figure 1



A
18-1
B
18-4
243
244
246
A'
C
18-5
245
B'
Bottom Ash Pond
247
D-18
C'
Boyce Lake
76
81
24
25
BM 105
78
121
90
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
0 200 400 800 1,200 Feet
Reference
U.S.G.S. TOPOGRAPHIC MAPS "LENA, LOUISIANA", "BOYCE, LOUISIANA", "JERICHO, LOUISIANA", AND "GARDNER, LOUISIANA."
Copyright: © 2013 National Geographic Society
CLECO Power LLC
Brame Energy Center
Bottom Ash Pond
Geologic Cross Section Profiles Map
Rapides Parish, Louisiana
Drawn: JP
Checked: RS
Approved: RS
Date: 9/26/18
Dwg. No.: 01-18-0185-B002A
E·A·G·L·E
ENVIRONMENTAL SERVICES, INC.
Figure 2







Legend

- Sand
- Sandy Clay / Clayey Sand
- Silty Clay
- Clay
- (84') Elevation, Ft NGVD
- TD Total Depth

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

CLECO Power LLC

Brame Energy Center

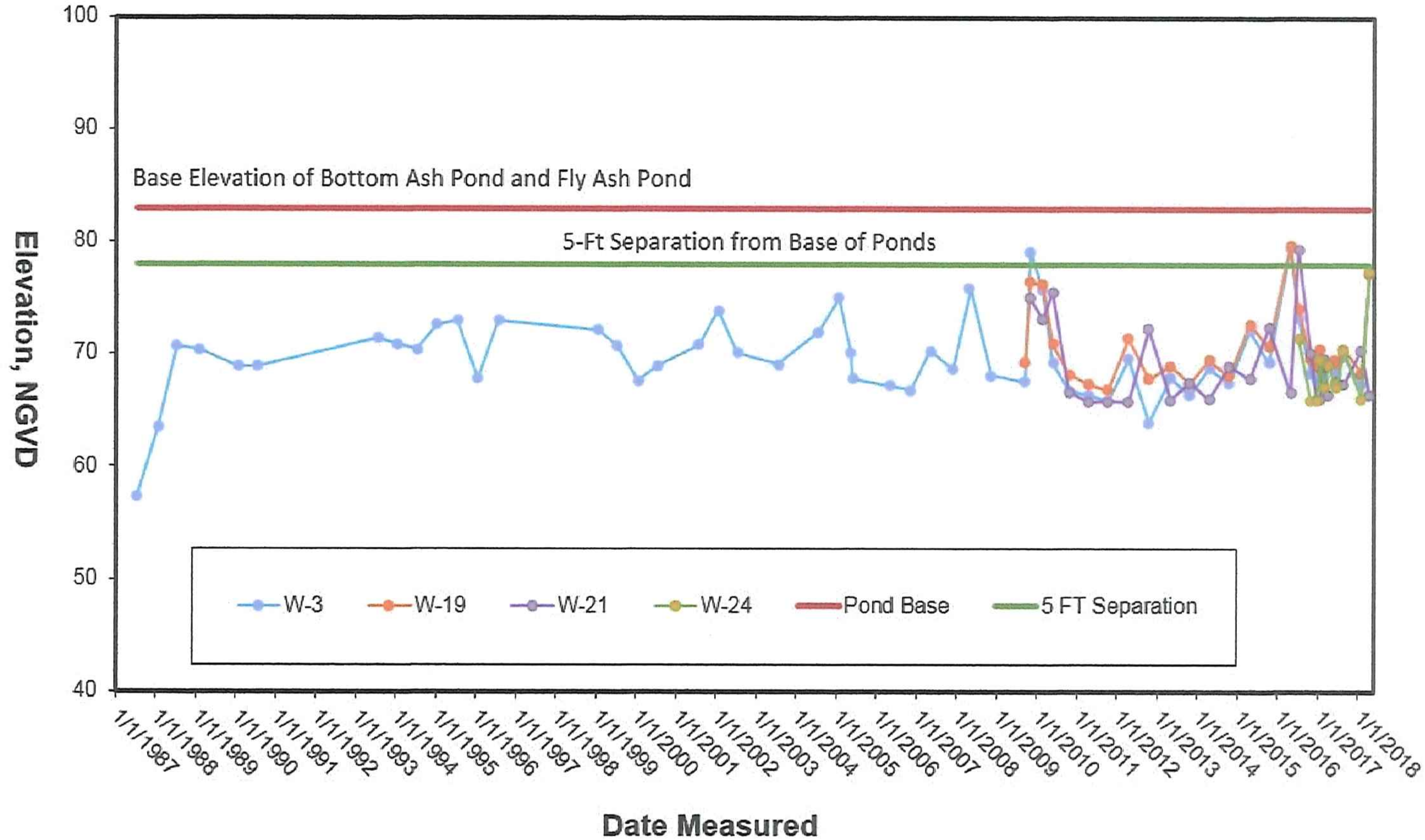
Bottom Ash Pond
Geologic Cross Sections
A-A', B-B', and C-C'

Rapides Parish, Louisiana

Drawn:	JP
Checked:	RS
Approved:	RS
Date:	9/14/18
Dwg. No.:	01-18-0185-B003

E·A·G·L·E

Figure 3



CLECO Power LLC
Brame Energy Center

Hydrograph of Alluvium Wells

Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	8/23/18
Dwg. No.:	01-18-0185-A007

Figure 4

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

CLECO

WETLANDS ASSESSMENT

BOTTOM ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
www.providenceeng.com

Project Number 002-213

PROVIDENCE

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LIST OF APPENDICES

1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a wetlands assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.61 established requirements for owners and operators to conduct a wetlands assessment by a qualified professional engineer.

40 CFR 257.61 (a) states that *new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in Section 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs below:*

- *Where applicable under Section 404 of the Clean Water Act or applicable state wetlands laws, a clear and objective rebuttal of the presumption that an alternative to the CCR unit is reasonably available that does not involve wetlands.*
- *The construction and operation of the CCR unit will not cause or contribute to any of the following:*
    - *A violation of any applicable state or federal water quality standard;*
    - *A violation of any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act;*
    - *Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and*
    - *A violation of any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of marine sanctuary.*
- *The CCR unit will not cause or contribute to significant degradation of wetlands by addressing all of the following factors:*
    - *Erosion, stability, and migration potential of native wetland soils, muds, and deposits used to support the CCR unit;*
    - *Erosion, stability, and migration potential of dredged and fill materials used to support the CCR unit;*
    - *The volume and chemical nature of the CCR;*
    - *Impacts of fish, wildlife, and other aquatic resources and their habitat from release of CCR;*
    - *The potential effects of catastrophic release of CCR to the wetland and the resulting impacts on the environment; and*
    - *Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.*
- *To the extent required under section 404 of the Clean Water Act or applicable state wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent reasonable as required by paragraphs (a)(1) through (3) of this section, then minimizing unavoidable impacts to the maximum extent reasonable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and reasonable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands); and*
- *Sufficient information is available to make a reasoned determination with respect to the demonstrations in paragraphs (a)(1) through (4) of this section.*

The Cleco Brame Energy Center is near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This wetlands and ecological assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the wetland assessment must be completed no later than October 17, 2018.

2.0 WETLANDS AND ECOLOGICAL ASSESSMENT

Wetlands

On May 29, 1977, Cleco was issued a Section 10/404 permit (Permit Number *LMNOD-SP (Bayou Jean de Jean)* by the New Orleans District of the United States Army Corps of Engineers (USACE) for dredge and fill activities for installation and maintenance of fill and a levee system for construction of a private ash pond off Bayou Jean de Jean at the current Brame Energy Center in Rapides Parish, Louisiana. The permit was specifically for dredge and fill associated with Bayou Jean de Jean and the areas within the constructed ash pond were not considered jurisdictional wetlands during the permit review process.

As part of the National Pollutant Discharge Elimination System (NPDES) permitting process, discharges from the Bottom Ash Pond were evaluated and assessed by the U.S. Environmental Protection Agency (EPA) prior to issuance of the facility's original NPDES permit which became effective on July 27, 1981. In this permit, EPA established limitations for discharges from the Bottom Ash Pond to ensure compliance with applicable water quality criteria. Compliance with the effluent limitations ensures that the discharges from the Bottom Ash Pond will not cause or contribute to an exceedance of a water quality criterion.

Furthermore, the effluent compliance history and supplemental application data on the quality of the effluent discharged from the Bottom Ash Pond has been evaluated during each permit renewal by the EPA and the Louisiana Department of Environmental Quality (LDEQ). Review of the data during every renewal term ensures that the continued discharge from the Bottom Ash Pond has not and will not cause or contribute to an exceedance of the applicable water quality criteria. In addition, the NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. There has been no violation of any applicable water quality criteria associated with the Bottom Ash Pond.

Endangered Species

Federally-listed threatened and/or endangered species in Rapides Parish include:

- Northern long-eared bat (*Myotis septentrionalis*)
- Louisiana pearlshell mussel (*Margaritifera hembeli)*
- Pallid sturgeon (*Scaphirhynchus albus)*
- Interior least tern (*Sterna antillarum athalassos)*
- Red-cockaded woodpecker (*Picoides borealis*)

Habitat requirements for listed species is described in the following sections.

Northern long-eared bat. Wintering northern long-eared bats prefer caves and mines with large passages and entrances, constant temperatures, and high humidity with no air currents. During the summer months the species prefer to roost underneath bark, in cavities, or in crevices of live and dead trees. Some males and non-reproductive females can also be found in caves and mines due

to cooler temperatures. Breeding begins in late summer or early fall. The species can be found in the eastern and north central United States.
The **Louisiana pearlshell mussel** prefers small sandy streams featuring stable sand and gravel substrates in clear-flowing shallow water within mixed pine hardwood forests. The species is currently restricted to two sub-populations on opposite sides of the Red River drainage in central Louisiana.

Pallid sturgeon adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. In Louisiana, pallid sturgeons are known to occur in the Mississippi and Atchafalaya Rivers. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May).

Preferred nesting habitat for the **interior least tern** includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats. The species prefer open habitat avoiding thick vegetation and narrow beaches. They have also been observed using sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites due to the scarceness of preferred nesting habitat. The species can be found along the shorelines of the Mississippi, Missouri, Arkansas, Ohio, Red, and Rio Grande river systems and along the rivers of Texas. Interior least tern colonies are known to occur along the Red River in northwestern and central Louisiana.

Suitable **red-cockaded woodpecker** (RCW) foraging habitat is defined as a contiguous 10-acre stand of pine or pine-hardwood forest in which 50% or more of the dominant trees are pines with a minimum age of 30 years. Suitable RCW nesting habitat was defined as foraging habitat containing any pines 60 years of age or older. The pines could be scattered or clumped within younger stands. Old age pines have thinner sapwood and a larger heartwood diameter and have a greater chance of being affected by a fungus which results in the heartwood decaying and makes excavation easier for drilling nesting and roosting cavities.

Based on habitat requirements of the listed species, adverse impacts to those species as well as impacts to critical habitats are not likely to occur.

Marine Protection, Research, and Sanctuaries Act

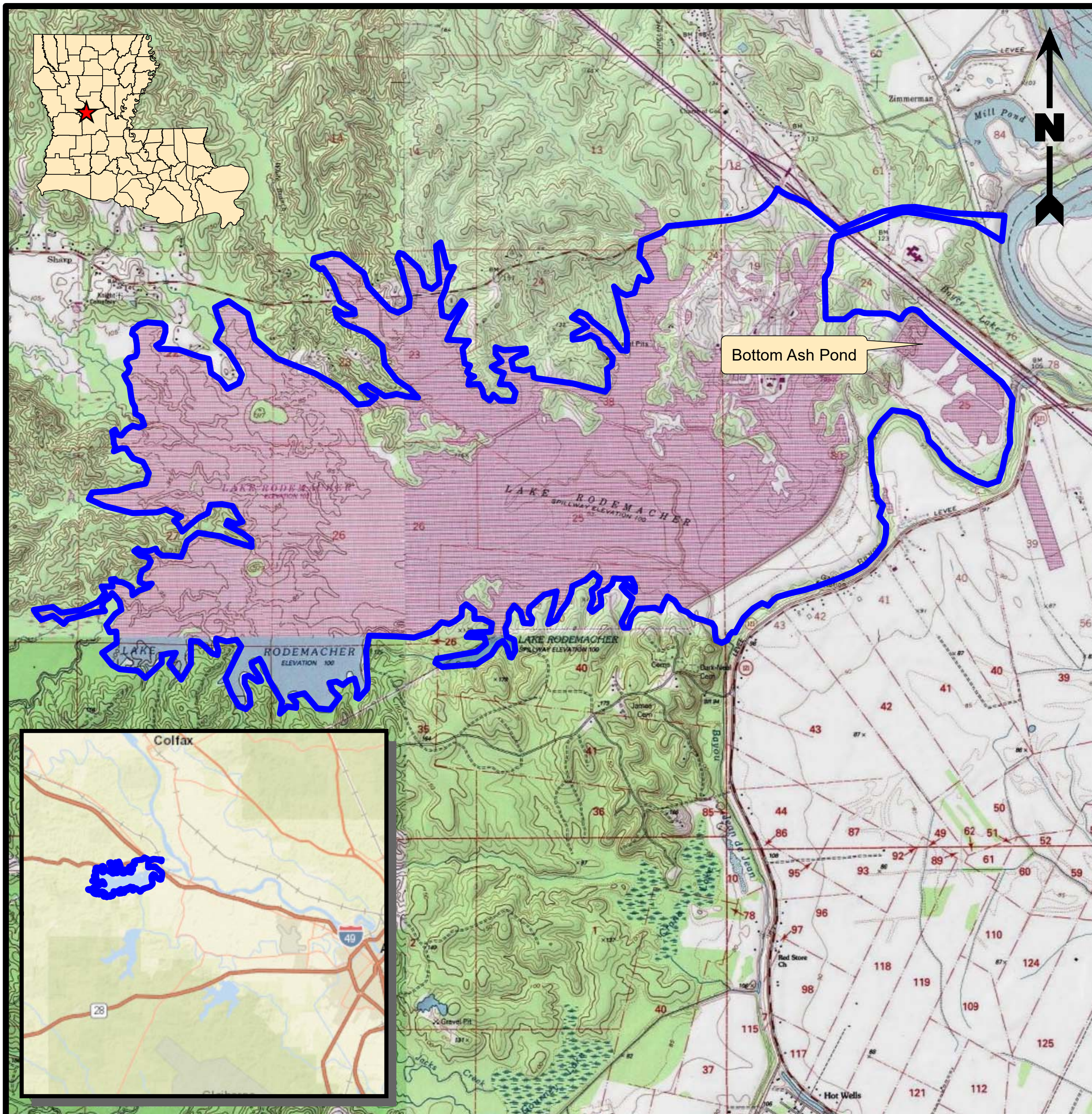
The Marine Protection, Research, and Sanctuaries Act is not applicable at this site.

3.0 CONCLUSIONS

Based on the results of the wetlands assessment, the Bottom Ash Pond was not constructed in wetlands under the jurisdiction of the USACE and that significant degradation of wetlands is not occurring. The NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. Based on the habitat requirements for the species listed as threatened and/or endangered under the Endangered Species Act of 1973, the continued existence of listed species and/or their critical habitat is not jeopardized. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Wetlands Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	07/03/17
Checked By	LMH	07/03/17
Approved By	CVH	07/03/17

Project Number 002-213	1
Drawing Number 002-213-A015	Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

N

Legend

Property Boundary

Bottom Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000
Feet

Site Map

Wetlands Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	07/03/17
Checked By	LMH	07/03/17
Approved By	CVH	07/03/17

Project Number
002-213

Drawing Number
002-213-B016

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR WETLANDS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

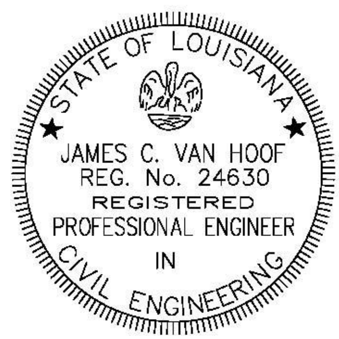
I hereby certify that I have performed a wetlands assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.61 CCR requirements. Based on the results from the wetlands assessment it appears that the Bottom Ash Pond was not constructed in wetlands under the jurisdiction of the USACE and that significant degradation of wetlands is not occurring. The NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. Based on the habitat requirements for the species listed as threatened and/or endangered under the Endangered Species Act of 1973, the continued existence of listed species and/or their critical habitat is not jeopardized.

James C. Van Hoof
Name

24630 — **LA**
Registration No. — State

James C. Van Hoof, P.E.
Signature

9/20/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

FAULT AREAS ASSESSMENT

BOTTOM ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
www.providenceeng.com

Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a fault areas assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.62 established requirements for owners and operators to conduct a fault areas assessment by a qualified professional engineer.

40 CFR 257.62 (a) states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This fault areas assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the fault areas assessment must be completed no later than October 17, 2018.

2.0 FAULT AREAS ASSESSMENT

40 CFR 257.53 states that a fault is a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side. It also states that Holocene means the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch, at 11,700 years before present, to present.

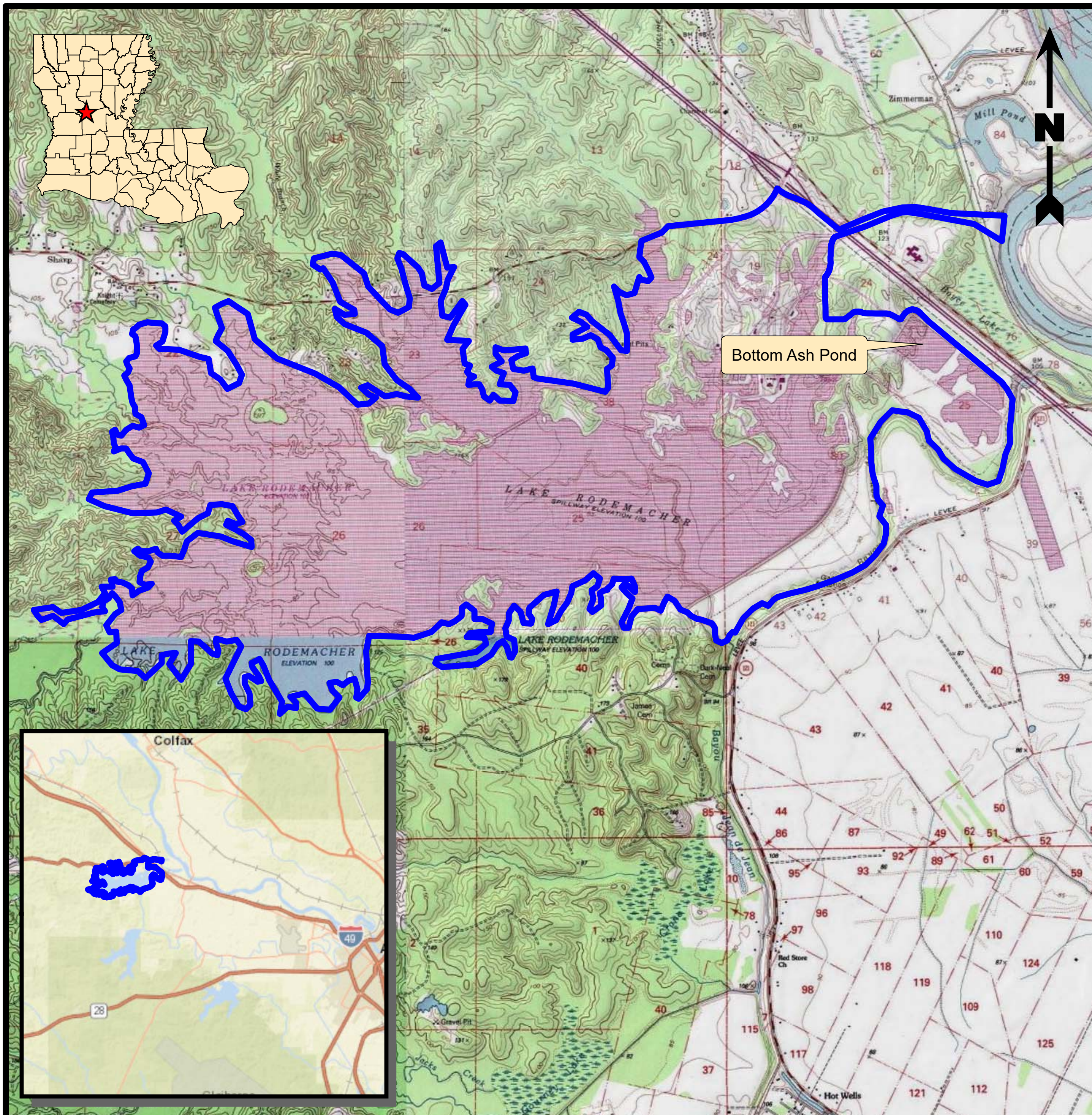
The fault locator map created on the USGS website, Mineral Resources, Online Spatial Data, By State (https://mrdata.usgs.gov/geology/state/state.php?state=LA) indicates no faults located within 60 meters (200 feet). This 200-foot buffer is shown in **Figure 3**.

3.0 CONCLUSION

Based on the results from the fault areas assessment for the Bottom Ash Pond, Providence concludes that the surface impoundment is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time. The Bottom Ash Pond meets the requirements at 257.62 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Fault Areas Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number
002-213

Drawing Number
002-213-A001

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

N

Legend

Property Boundary

Bottom Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Fault Areas Assessment - Bottom Ash Pond

Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number 002-213

Drawing Number 002-213-B002

2 Figure

FIGURE 3

FAULT LOCATION MAP

4,000 2,000 0 4,000
Feet

Legend

Property Boundary
200' Buffer
Bottom Ash Pond

Note

There are no faults located within a 200' buffer of the Bottom Ash Pond.

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2017 Microsoft Corporation and its data suppliers. Fault data obtained from the United States Geological Survey (USGS) database.

Fault Location Map

Fault Areas Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/23/17
Checked By	LMH	06/23/17
Approved By	CVH	06/23/17
Project Number 002-213		3 Figure
Drawing Number 002-213-A013		

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR FAULT AREAS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

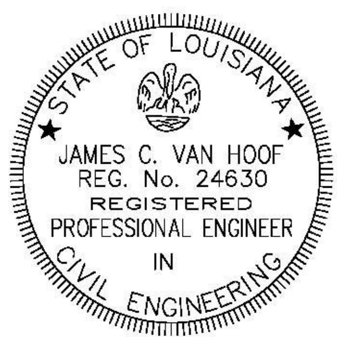
I hereby certify that I have performed a fault areas assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.62 CCR requirements. Based on the results from the fault areas assessment, the Bottom Ash Pond is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

9/19/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

SEISMIC IMPACT ZONES ASSESSMENT

BOTTOM ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802

(225) 766-7400

www.providenceeng.com

Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a seismic impact zones assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.63 established requirements for owners and operators to conduct a seismic impact zones assessment by a qualified professional engineer.

40 CFR 257.63 (a) states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site."

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This seismic impact zones assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the seismic impact zones assessment must be completed no later than October 17, 2018.

2.0 SEISMIC IMPACT ZONES ASSESSMENT

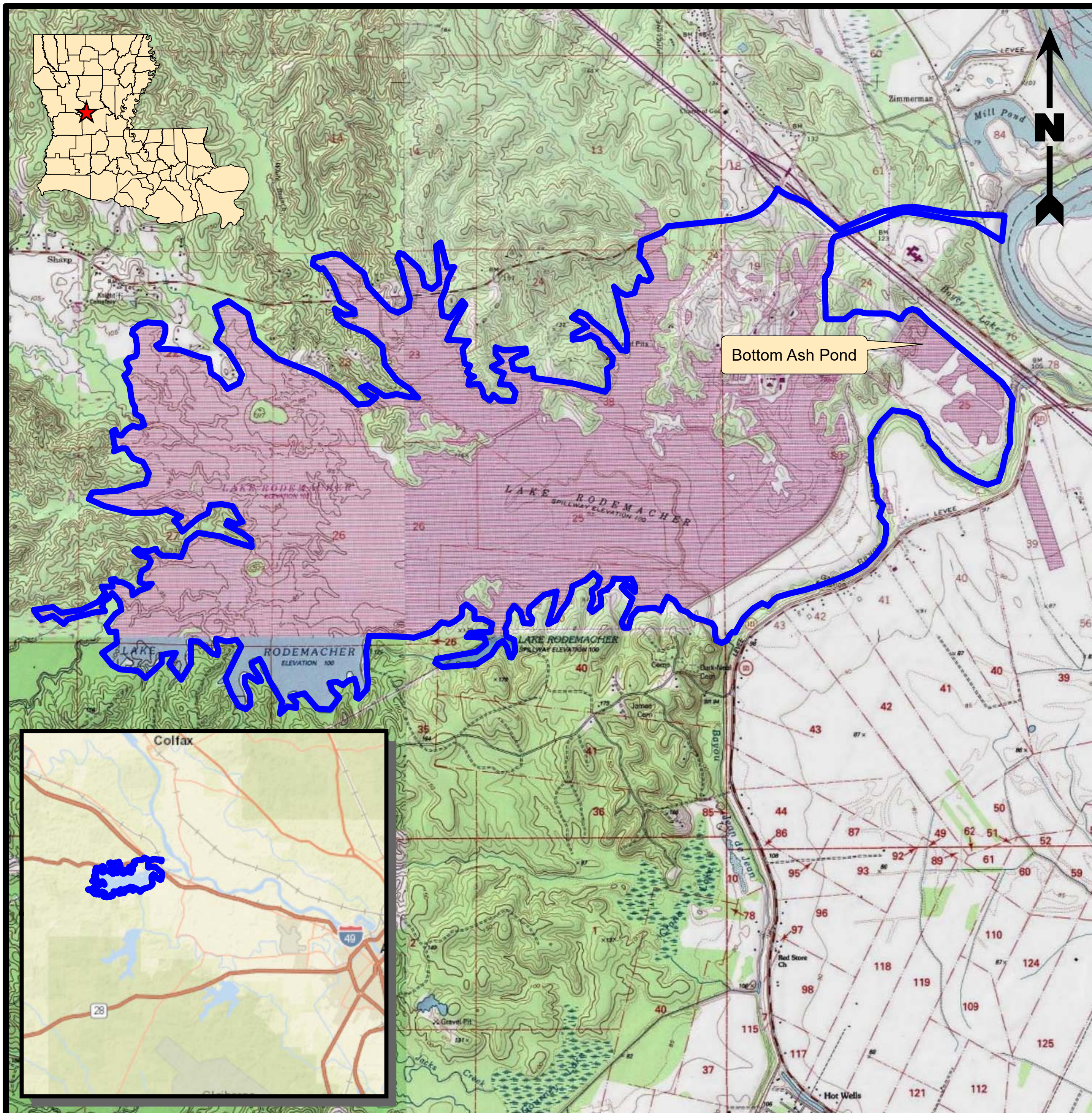
40 CFR 257.53 states that a seismic impact zone is defined as an area having 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. The 2% probability seismic map created on the USGS website, Earthquake Hazards Program, Information By Region - Louisiana, (https://earthquake.usgs.gov/earthquakes/byregion/louisiana-haz.php) indicates between 4% g (0.04 g) and 8% g (0.08 g) for the facility, which is below the specified 0.10 g noted in the regulation.

3.0 CONCLUSION

Based on the results from the seismic impact zones assessment for the Bottom Ash Pond, Providence concludes that the surface impoundment is not located in a seismic impact zone that will exceed 0.10 g in 50 years. The Bottom Ash Pond meets the requirements at 257.63 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Seismic Impact Zones Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number
002-213

Drawing Number
002-213-A005

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

N

Legend

Property Boundary

Bottom Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000
Feet

Site Map

Seismic Impact Zones Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number
002-213

Drawing Number
002-213-B006

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR SEISMIC IMPACT ZONES ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

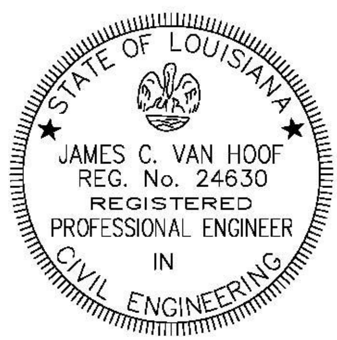
I hereby certify that I have performed a seismic impact zones assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.63 CCR requirements. Based on the results from the seismic impact zones assessment for the Bottom Ash Pond, Providence concludes that the surface impoundment is not located in a seismic impact zone that will exceed 0.10 g in 50 years. The Bottom Ash Pond meets the requirements at 257.63 of the CCR regulations.

James C. Van Hoof
Name

24630 — **LA**
Registration No. — State

James C. Van Hoof, P.E.
Signature

9/19/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

UNSTABLE AREAS ASSESSMENT

BOTTOM ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
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Baton Rouge, Louisiana 70802

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Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct an unstable areas assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.64 established requirements for owners and operators to conduct an unstable areas assessment by a qualified professional engineer.

40 CFR 257.64 (a) states:

An existing or new CCR landfill, existing or new CCR surface impoundment, or any later expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

This assessment must, at a minimum, consider the following factors when determining whether an area is unstable:

- On-site or local soil conditions that may result in significant differential settling
- On-site or local geologic or geomorphologic features
- On-site or local human-made features or events (both surface and subsurface)

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This unstable area assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the unstable areas assessment must be completed no later than October 17, 2018.

2.0 UNSTABLE AREAS ASSESSMENT

40 CFR 257.53 states that an unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including some or all of the structural components of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

On-site or Local Soil Conditions

Providence reviewed the existing soil borings that were completed for the initial design of the Bottom Ash Pond. Providence also completed soil borings in the existing levee associated with the surface impoundment. Providence reviewed the soil conditions in the boring logs and determined that the soil conditions are stable and should not cause excessive differential settlement to the extent that the stability of the CCR impoundment, or its associated features, will be compromised.

The Bottom Ash Pond is underlain with clays that extends 20 feet (terminal depth of the borings) in all of the borings except one. For that boring, the clay extends 12 feet. This provides a firm and secure foundation that maintains its integrity and will not be disrupted as a result of uneven settlement induced by hydrocompaction. Also, the clay liner provides a foundation that prevents sudden differential movement resulting from CCR placement. These areas have not been subject to mass movement in the past and are not expected to be in the future.

On-site or Local Geologic or Geomorphic Features

Providence has inspected the site, reviewed geological reports, reviewed boring logs, and reviewed topographic maps to evaluate the local geologic and geomorphic features that could cause the CCR unit to be unstable. No features were found that would cause the CCR unit to be unstable. The Bottom Ash Pond is not located in karst terrain, therefore sinkholes, vertical shafts, sinking streams, caves, seeps, large springs, and blind valleys are not expected.

On-site or Local Human-made Features or Events

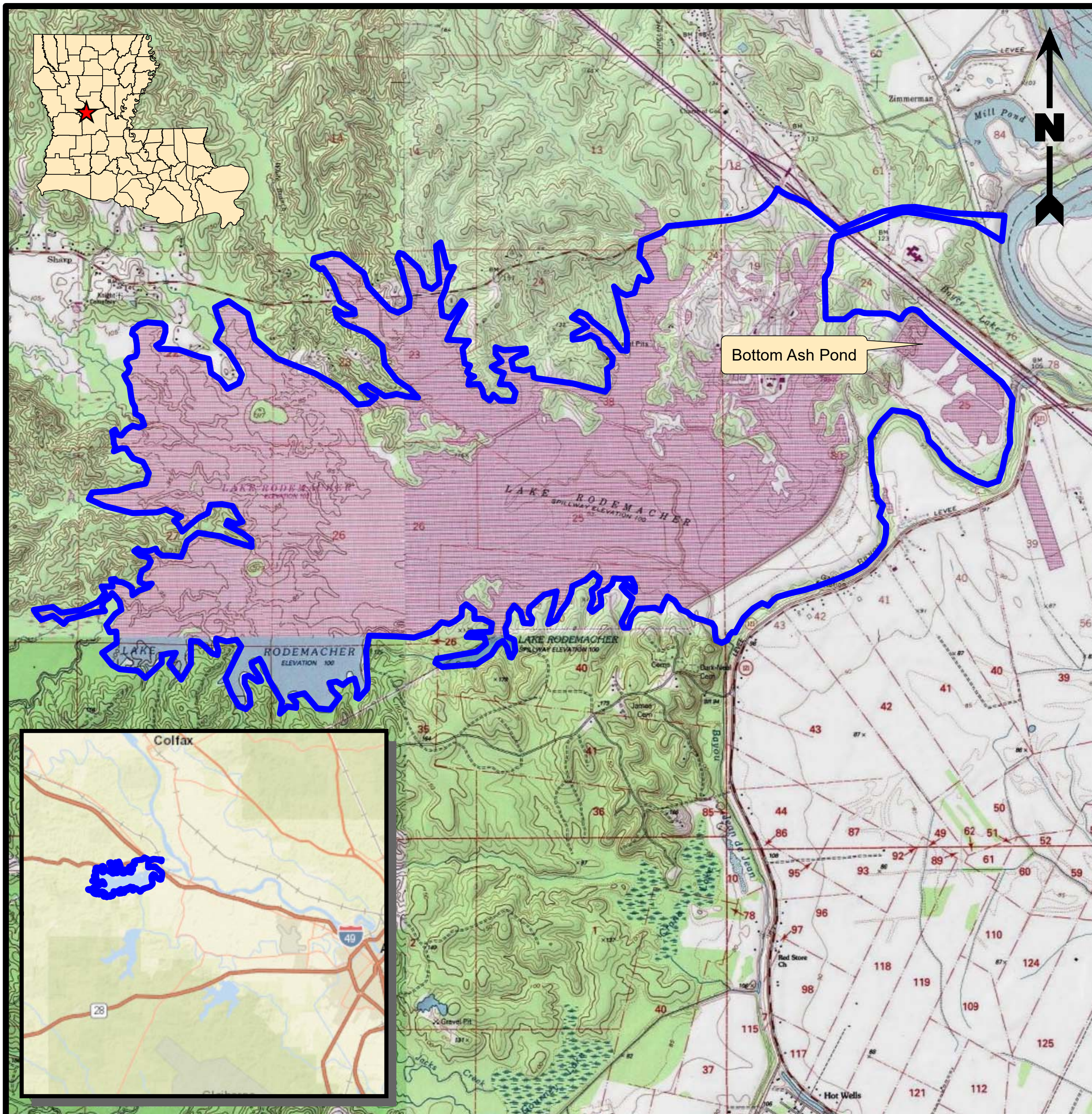
Providence reviewed the man-made features and activities associated with the CCR unit with respect to cut and fill, installation of culverts and piping, and any associated man-made features of the Bottom Ash Pond. The dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions for the daily operation of the unit. The structural stability assessment was consistent with recognized and generally accepted good engineering practices. No anthropogenic features were found that would adversely affect the stability of the CCR unit.

3.0 CONCLUSION

Based on the results from the unstable areas assessment, the Bottom Ash Pond's on-site or local soil conditions, geologic or geomorphologic features, and human-made features or events, Providence concludes that the surface impoundment is not located in unstable areas. The Bottom Ash Pond meets the requirements at 257.64 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000 Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Unstable Areas Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number 002-213

Drawing Number 002-213-A009

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

N

Legend

- Property Boundary
- Bottom Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Unstable Areas Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number 002-213

Drawing Number 002-213-B010

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR UNSTABLE AREAS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

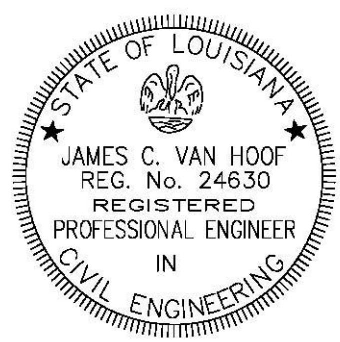
I hereby certify that I have performed an unstable areas assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.64 CCR requirements. Based on the results from the unstable areas assessment, the Bottom Ash Pond is not located in unstable areas.

James C. Van Hoof
Name

24630 — **LA**
Registration No. — State

James C. Van Hoof, P.E.
Signature

9/20/18
Date



(Seal)

FLY ASH POND

CLECO POWER LLC
BRAME ENERGY CENTER

FLY ASH POND
LENA, LA

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

October 2018

TABLE OF CONTENTS

Section Page No.

Figures

1.0 INTRODUCTION

Cleco Power LLC (Cleco) hereby presents the evaluation for the Placement above the Uppermost Aquifer Location Restriction for the Fly 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 Fly 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 located at 275 Rodemacher Road, Lena, Louisiana 71447. Per "Annual CCR Inspection for the Fly Ash Pond" (January 13, 2017) the base of the Fly Ash Pond unit 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 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 Fly Ash Pond unit is situated entirely on the alluvium 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 the alluvium/natural levee deposits. These geologic cross sections are constructed from soil borings trending in a north-south profile across the Fly 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 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 Fly Ash Pond unit. The thickness of the clay is greater than 5 feet below the base of the CCR units.

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 Fly Ash Pond units at 83 feet MSL and the 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 Fly Ash Pond unit.

4.0 PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTION DETERMINATION

The hydrogeological data presented in this evaluation indicate that the Fly Ash Pond unit meets the criteria of the Location Restriction, Placement above the Uppermost Aquifer. The Fly Ash Pond is entirely over only the alluvium deposits of which the monitoring wells included in the hydrograph (Figure 4). This hydrograph 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) over the extensive 31-year period of monitoring data. The geologic cross sections show extensive clay deposits underlying the Fly Ash Pond with a thickness of the clay greater than 5 feet below the base of the CCR unit.

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 Fly Ash Pond unit meets the following criteria:

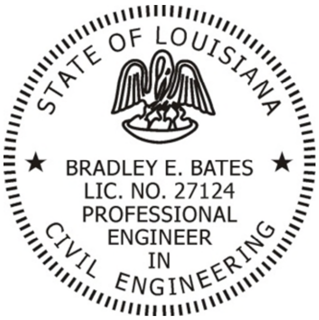
§257.60 **Placement Above the Uppermost Aquifer Location Restriction**

§257.60 (a) The evaluation of the Fly 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.

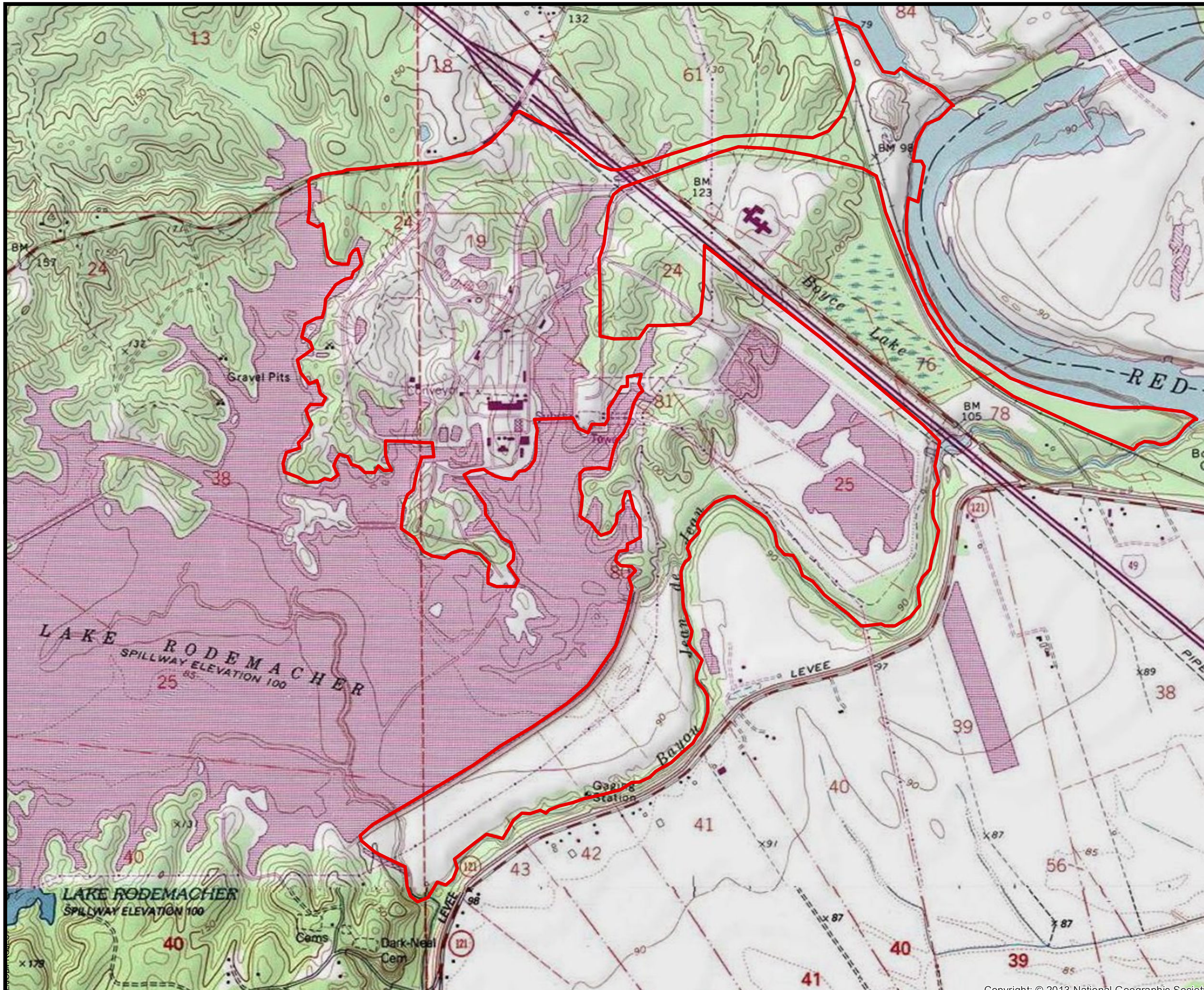
This evaluation has concluded that the Fly Ash Pond unit meets the criteria for §257.60.

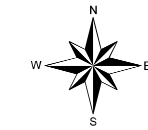
6.0 CERTIFICATION

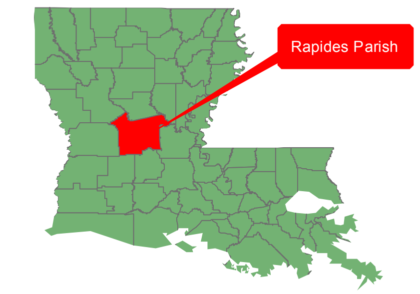
I hereby certify this location restriction evaluation for Cleco Power LLC. I am a duly licensed Professional Engineer under the laws of the State of Louisiana.



	27124
Signature	**PE Registration Number**
Bradley E. Bates	*Professional Engineer*
Name	**Title**
Eagle Environmental Services, Inc.	*10-08-2018*
Company	**Date**







Legend

Property Boundary Line

0 750 1,500 3,000 4,500 Feet

Reference

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

CLECO Power LLC

Brame Energy Center

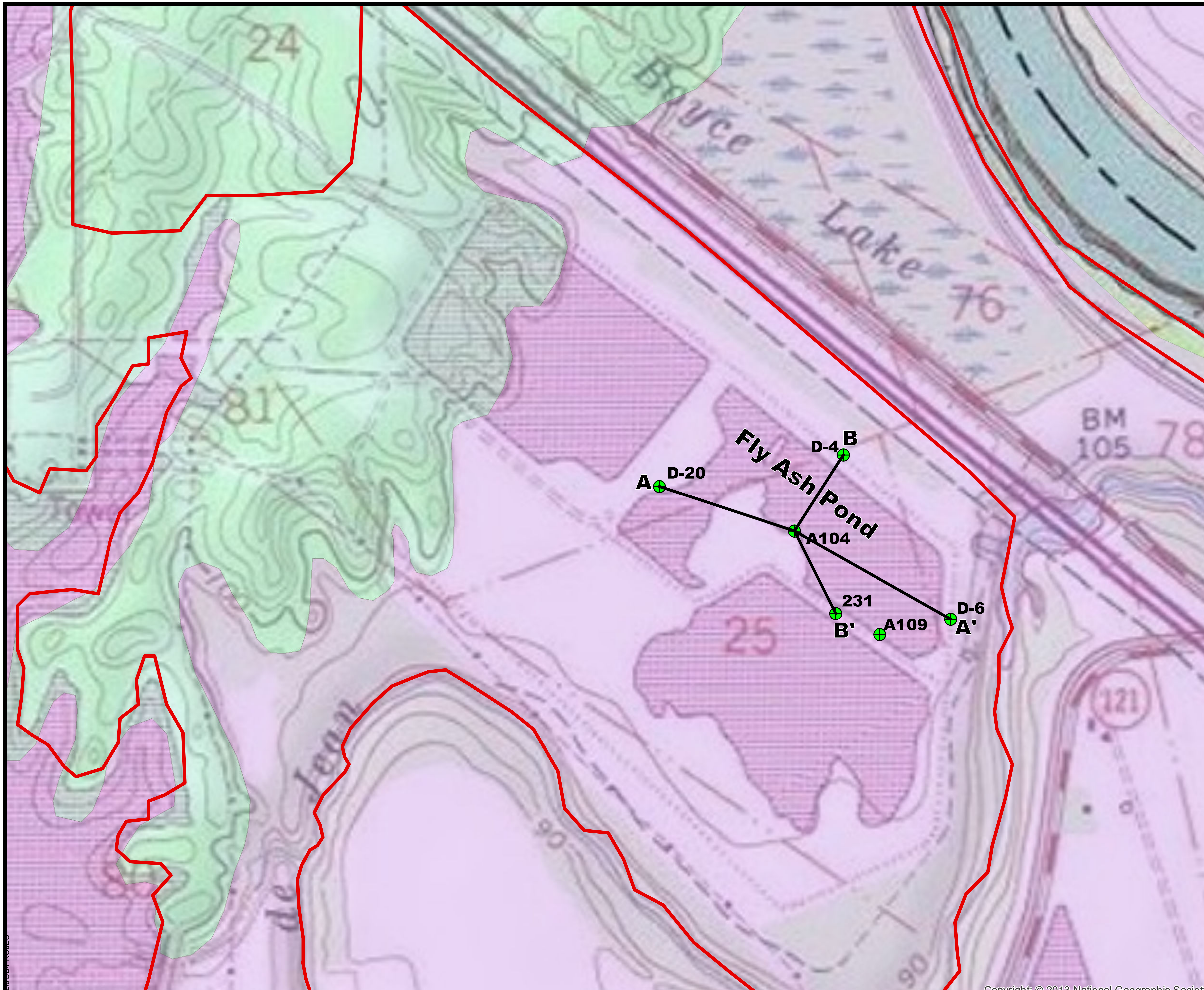
Site Location Map

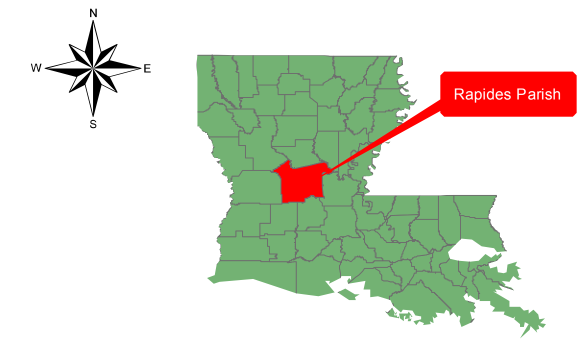
Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	9/9/16
Dwg. No.:	01-18-0185-A005

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

Figure 1





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)

Cross Section Profile Location

Cross Section Profile Line

Feet
0 200 400 800 1,200

Reference

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

CLECO Power LLC

Brame Energy Center

Fly Ash Pond

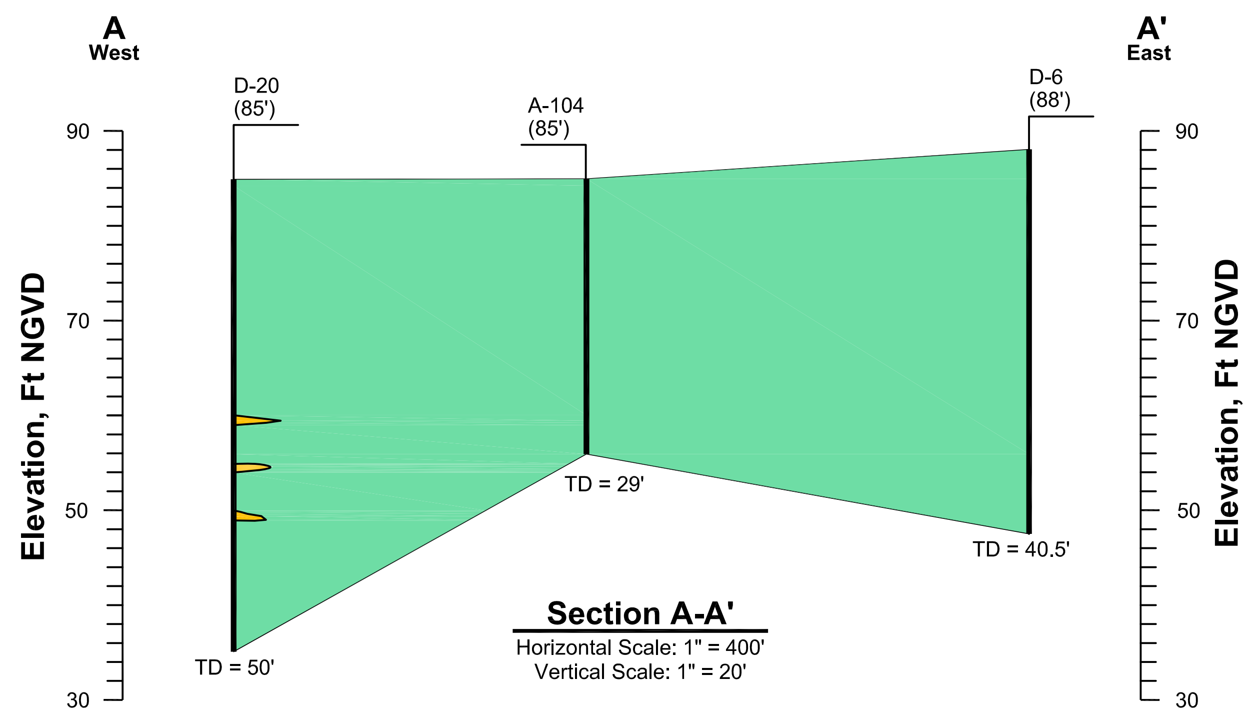
Geologic Cross Section Profiles Map

Rapides Parish, Louisiana

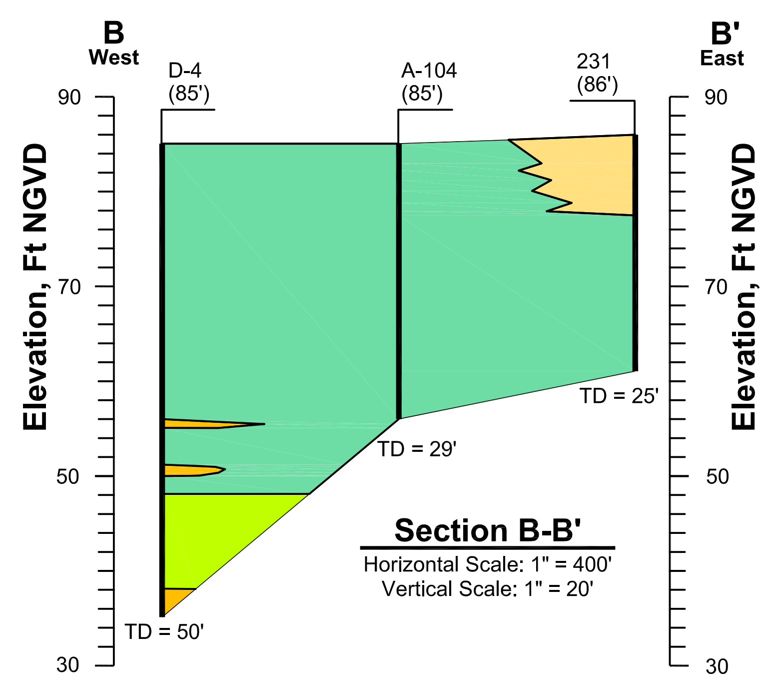
Drawn:	JP
Checked:	RS
Approved:	RS
Date:	9/26/18
Dwg. No.:	01-18-0185-B002B

EAGLE ENVIRONMENTAL SERVICES, INC.

Figure 2



Section A-A'
Horizontal Scale: 1" = 400'
Vertical Scale: 1" = 20'



Section B-B'
Horizontal Scale: 1" = 400'
Vertical Scale: 1" = 20'

Legend

- Sand
- Silty Sand
- Sandy Clay / Clayey Sand
- Silty Clay
- Clay
- (85') Elevation, Ft NGVD
- TD Total Depth

Reference

Stratigraphy between borings are inferred. Actual conditions may vary.

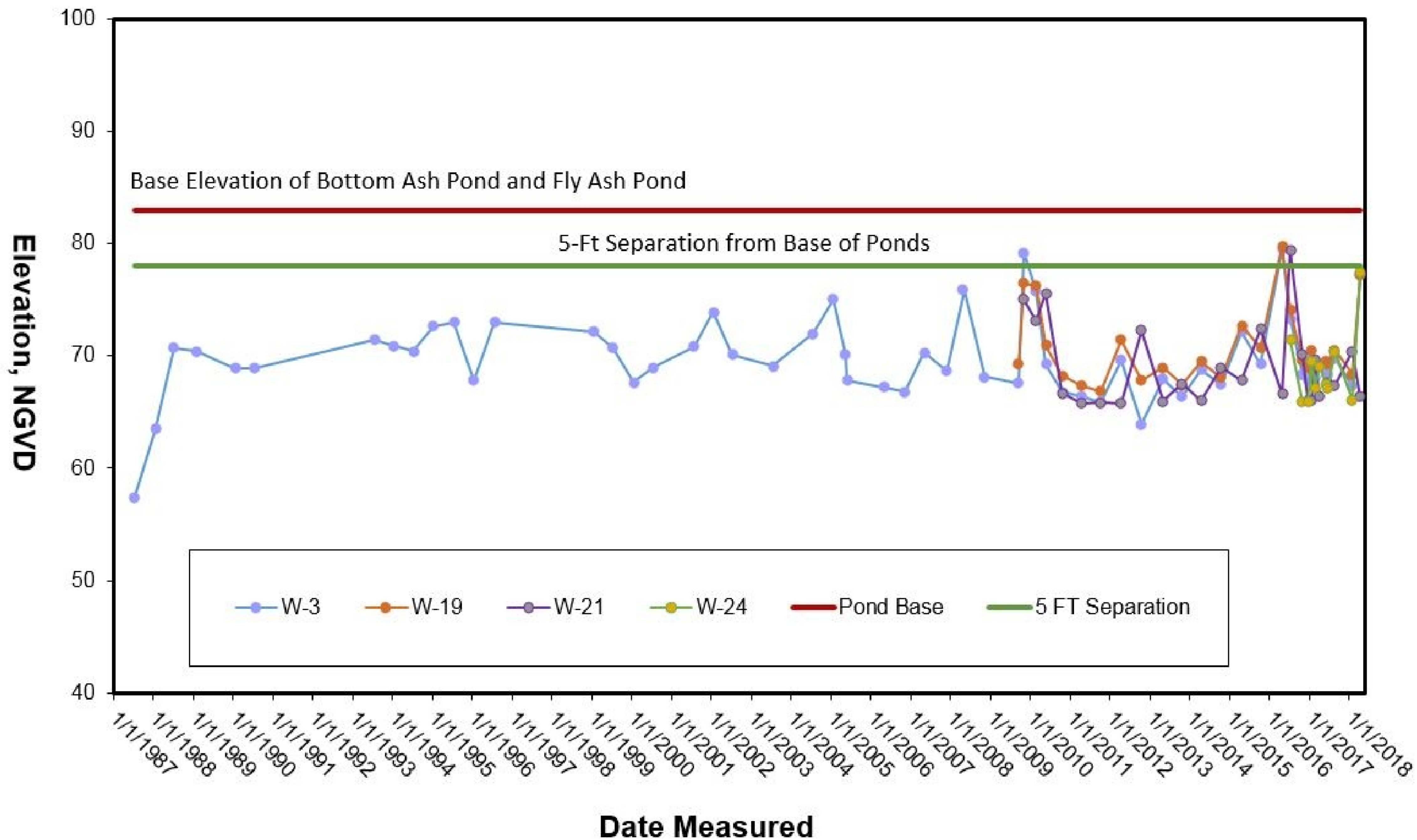
CLECO Power LLC

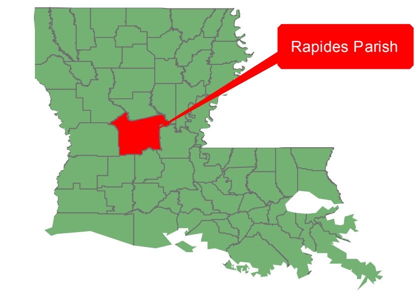
Brame Energy Center
Fly Ash Pond
Geologic Cross Sections
A-A' and B-B'
Rapides Parish, Louisiana

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

Drawn:	JP
Checked:	RS
Approved:	RS
Date:	9/7/18
Dwg. No.:	01-18-0185-B004

Figure 3





CLECO Power LLC

Brame Energy Center

Hydrograph of Alluvium Wells

Rapides Parish, Louisiana

Drawn:	JP
Checked:	JM
Approved:	RS
Date:	8/23/18
Dwg. No.:	01-18-0185-A007

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

Figure 4

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

WETLANDS ASSESSMENT

FLY ASH POND

Prepared By:

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Project Number 002-213

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LIST OF APPENDICES

1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a wetlands and ecological assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.61 established requirements for owners and operators to conduct a wetlands assessment by a qualified professional engineer.

40 CFR 257.61 (a) states that *new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in Section 232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs below:*

- *Where applicable under Section 404 of the Clean Water Act or applicable state wetlands laws, a clear and objective rebuttal of the presumption that an alternative to the CCR unit is reasonably available that does not involve wetlands.*
- *The construction and operation of the CCR unit will not cause or contribute to any of the following:*
    - *A violation of any applicable state or federal water quality standard;*
    - *A violation of any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act;*
    - *Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and*
    - *A violation of any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of marine sanctuary.*
- *The CCR unit will not cause or contribute to significant degradation of wetlands by addressing all of the following factors:*
    - *Erosion, stability, and migration potential of native wetland soils, muds, and deposits used to support the CCR unit;*
    - *Erosion, stability, and migration potential of dredged and fill materials used to support the CCR unit;*
    - *The volume and chemical nature of the CCR;*
    - *Impacts of fish, wildlife, and other aquatic resources and their habitat from release of CCR;*
    - *The potential effects of catastrophic release of CCR to the wetland and the resulting impacts on the environment; and*
    - *Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.*
- *To the extent required under section 404 of the Clean Water Act or applicable state wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent reasonable as required by paragraphs (a)(1) through (3) of this section, then minimizing unavoidable impacts to the maximum extent reasonable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and reasonable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands); and*
- *Sufficient information is available to make a reasoned determination with respect to the demonstrations in paragraphs (a)(1) through (4) of this section.*

The Cleco Brame Energy Center is near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This wetlands and ecological assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the wetland and ecological assessment must be completed no later than October 17, 2018.

2.0 WETLANDS AND ECOLOGICAL ASSESSMENT

Wetlands

On March 29, 1977, Cleco was issued a Section 10/404 permit (Permit Number *LMNOD-SP (Bayou Jean de Jean)* by the New Orleans District of the United States Army Corps of Engineers (USACE) for dredge and fill activities for installation and maintenance of fill and a levee system for construction of a private ash pond off Bayou Jean de Jean at the current Brame Energy Center in Rapides Parish, Louisiana. The permit was specifically for dredge and fill associated with Bayou Jean de Jean and the areas within the constructed ash pond were not considered jurisdictional wetlands during the permit review process.

As part of the National Pollutant Discharge Elimination System (NPDES) permitting process, discharges from the Fly Ash Pond were evaluated and assessed by the U.S. Environmental Protection Agency (EPA) prior to issuance of the facility's original NPDES permit which became effective on July 27, 1981. In this permit, EPA established limitations for discharges from the Fly Ash Pond to ensure compliance with applicable water quality criteria. Compliance with the effluent limitations ensures that the discharges from the Fly Ash Pond will not cause or contribute to an exceedance of a water quality criterion.

Furthermore, the effluent compliance history and supplemental application data on the quality of the effluent discharged from the Fly Ash Pond has been evaluated during each permit renewal by the EPA and the Louisiana Department of Environmental Quality (LDEQ). Review of the data during every renewal term ensures that the continued discharge from the Fly Ash Pond has not and will not cause or contribute to an exceedance of the applicable water quality criteria. In addition, the NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. There has been no violation of any applicable water quality criteria associated with the Fly Ash Pond.

Endangered Species

Federally-listed threatened and/or endangered species in Rapides Parish include:

- Northern long-eared bat (*Myotis septentrionalis*)
- Louisiana pearlshell mussel (*Margaritifera hembeli)*
- Pallid sturgeon (*Scaphirhynchus albus)*
- Interior least tern (*Sterna antillarum athalassos)*
- Red-cockaded woodpecker (*Picoides borealis*)

Habitat requirements for listed species is described in the following sections.

Northern long-eared bat. Wintering northern long-eared bats prefer caves and mines with large passages and entrances, constant temperatures, and high humidity with no air currents. During the summer months the species prefer to roost underneath bark, in cavities, or in crevices of live and dead trees. Some males and non-reproductive females can also be found in caves and mines due

to cooler temperatures. Breeding begins in late summer or early fall. The species can be found in the eastern and north central United States.
The **Louisiana pearlshell mussel** prefers small sandy streams featuring stable sand and gravel substrates in clear-flowing shallow water within mixed pine hardwood forests. The species is currently restricted to two sub-populations on opposite sides of the Red River drainage in central Louisiana.

Pallid sturgeon adults and sub-adults may be found in those rivers and streams until November, and in estuarine or marine waters during the remainder of the year. Sturgeon less than two years old appear to remain in riverine habitats and estuarine areas throughout the year, rather than migrate to marine waters. In Louisiana, pallid sturgeons are known to occur in the Mississippi and Atchafalaya Rivers. Spawning occurs in coastal rivers between late winter and early spring (i.e., March to May).

Preferred nesting habitat for the **interior least tern** includes bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats. The species prefer open habitat avoiding thick vegetation and narrow beaches. They have also been observed using sand and gravel pits, ash disposal areas of power plants, reservoir shorelines, and other manmade sites due to the scarceness of preferred nesting habitat. The species can be found along the shorelines of the Mississippi, Missouri, Arkansas, Ohio, Red, and Rio Grande river systems and along the rivers of Texas. Interior least tern colonies are known to occur along the Red River in northwestern and central Louisiana.

Suitable **red-cockaded woodpecker** (RCW) foraging habitat is defined as a contiguous 10-acre stand of pine or pine-hardwood forest in which 50% or more of the dominant trees are pines with a minimum age of 30 years. Suitable RCW nesting habitat was defined as foraging habitat containing any pines 60 years of age or older. The pines could be scattered or clumped within younger stands. Old age pines have thinner sapwood and a larger heartwood diameter and have a greater chance of being affected by a fungus which results in the heartwood decaying and makes excavation easier for drilling nesting and roosting cavities.

Based on habitat requirements of the listed species, adverse impacts to those species as well as impacts to critical habitats are not likely to occur.

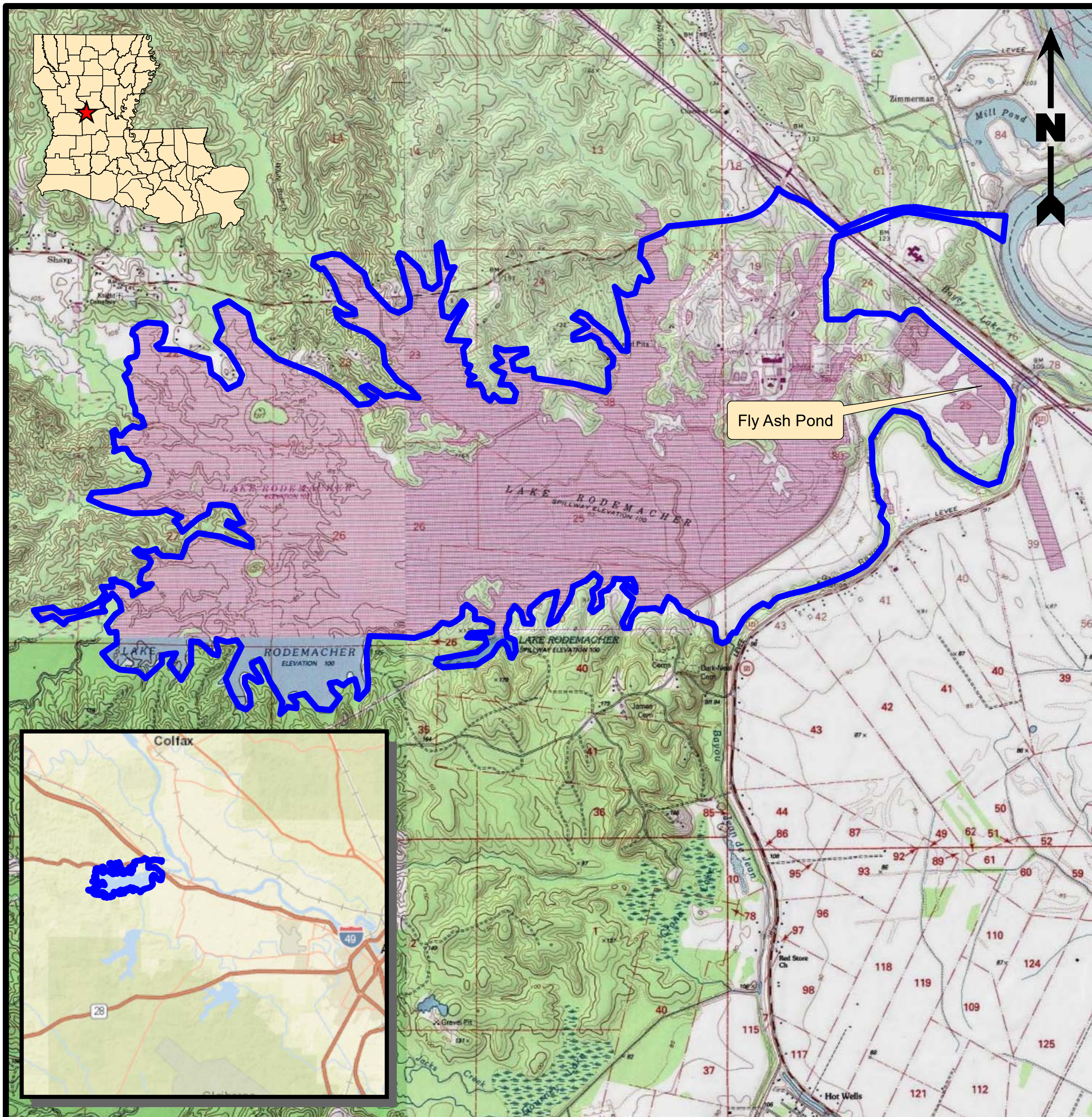
Marine Protection, Research, and Sanctuaries Act
The Marine Protection, Research, and Sanctuaries Act is not applicable at this site.

3.0 CONCLUSIONS

Based on the results of the wetlands assessment, the Fly Ash Pond was not constructed in wetlands under the jurisdiction of the USACE and that significant degradation of wetlands is not occurring. The NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. Based on the habitat requirements for the species listed as threatened and/or endangered under the Endangered Species Act of 1973, the continued existence of listed species and/or their critical habitat is not jeopardized. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Wetlands Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	07/03/17
Checked By	LMH	07/03/17
Approved By	CVH	07/03/17

Project Number 002-213

Drawing Number 002-213-A017

1
Figure

FIGURE 2

SITE MAP

Legend

Property Boundary

Fly Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Wetlands Assessment - Fly Ash Pond

Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	07/03/17
Checked By	LMH	07/03/17
Approved By	CVH	07/03/17

Project Number 002-213

Drawing Number 002-213-B018

2 Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR WETLANDS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

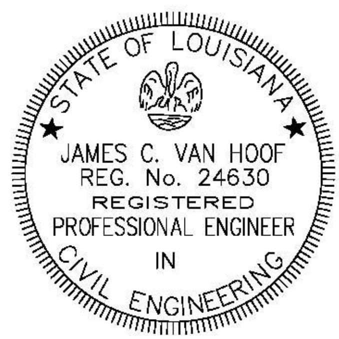
I hereby certify that I have performed a wetlands assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.61 CCR requirements. Based on the results from the wetlands assessment it appears that the Fly Ash Pond was not constructed in wetlands under the jurisdiction of the USACE and that significant degradation of wetlands is not occurring. The NPDES permit requires compliance with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants. At no time during evaluation and reissuance of each NPDES permit has LDEQ or EPA documented or demonstrated that effluent exceedances or the discharge of toxics has occurred which has resulted in the violation of any applicable water quality criteria. Based on the habitat requirements for the species listed as threatened and/or endangered under the Endangered Species Act of 1973, the continued existence of listed species and/or their critical habitat is not jeopardized.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

9/20/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

FAULT AREAS ASSESSMENT

FLY ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
www.providenceeng.com

Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a fault areas assessment of the Fly Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.62 established requirements for owners and operators to conduct a fault areas assessment by a qualified professional engineer.

40 CFR 257.62 (a) states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This fault areas assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the fault areas assessment must be completed no later than October 17, 2018.

2.0 FAULT AREAS ASSESSMENT

40 CFR 257.53 states that a fault is a fracture or a zone of fractures in any material along which strata on one side have been displaced with respect to that on the other side. It also states that Holocene means the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch, at 11,700 years before present, to present.

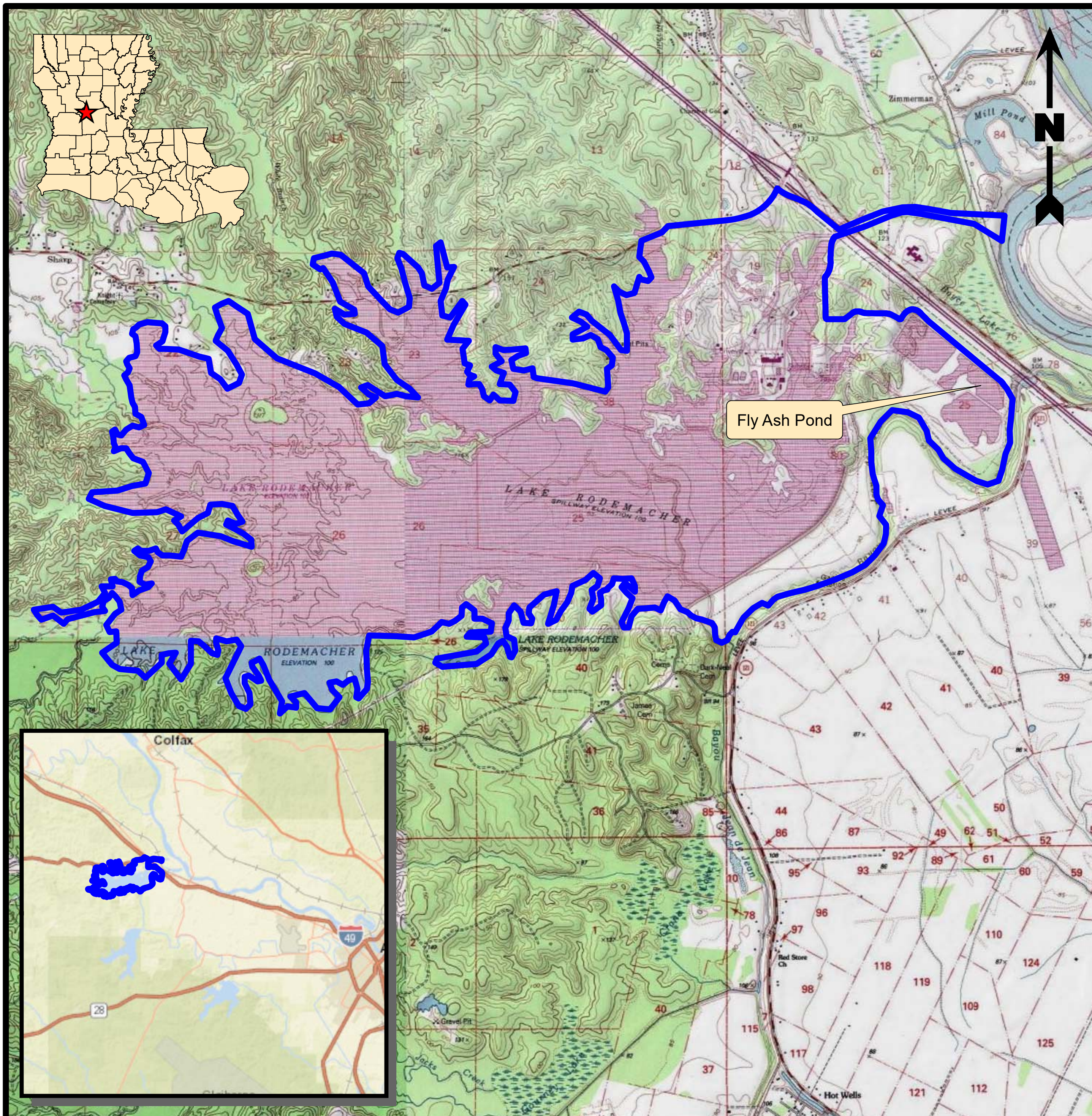
The fault locator map created on the USGS website, Mineral Resources, Online Spatial Data, By State (https://mrdata.usgs.gov/geology/state/state.php?state=LA) indicates no faults located within 60 meters (200 feet). This 200-foot buffer is shown in **Figure 3**.

3.0 CONCLUSION

Based on the results from the fault areas assessment for the Fly Ash Pond, Providence concludes that the surface impoundment is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time. The Fly Ash Pond meets the requirements at 257.62 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000 Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Fault Areas Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number 002-213
Drawing Number 002-213-A003

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

Legend

Property Boundary

Fly Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Fault Areas Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

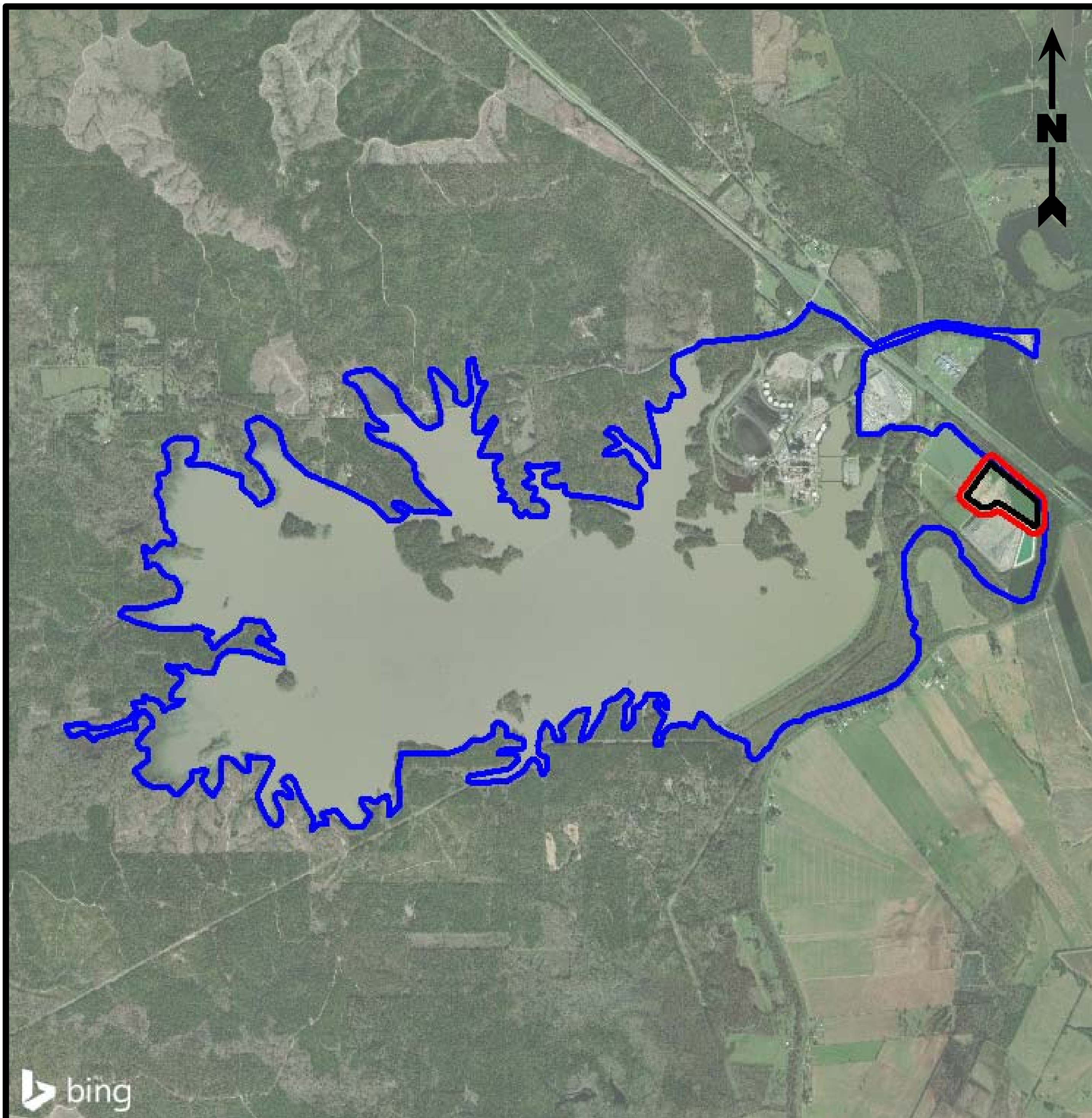
Project Number
002-213

Drawing Number
002-213-B004

2
Figure

FIGURE 3

FAULT LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary
200' Buffer
Fly Ash Pond

Note

There are no faults located within a 200' buffer of the Fly Ash Pond.

Reference

Base map comprised of Bing Maps aerial imagery from (c) 2017 Microsoft Corporation and its data suppliers. Fault data obtained from the United States Geological Survey (USGS) database.

Fault Location Map

Fault Areas Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/23/17
Checked By	LMH	06/23/17
Approved By	CVH	06/23/17

Project Number
002-213
Drawing Number
002-213-A014

3
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR FAULT AREAS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

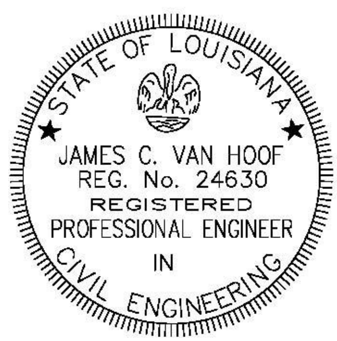
I hereby certify that I have performed a fault areas assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.62 CCR requirements. Based on the results from the fault areas assessment, the Fly Ash Pond is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time.

James C. Van Hoof
Name

24630 — Registration No.
LA — State

James C. Van Hoof, P.E.
Signature

9/19/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC

BRAME ENERGY CENTER

SEISMIC IMPACT ZONES ASSESSMENT

FLY ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
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Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a seismic impact zones assessment of the Fly Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.63 established requirements for owners and operators to conduct a seismic impact zones assessment by a qualified professional engineer.

40 CFR 257.63 (a) states:

New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site."

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This seismic impact zones assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the seismic impact zones assessment must be completed no later than October 17, 2018.

2.0 SEISMIC IMPACT ZONES ASSESSMENT

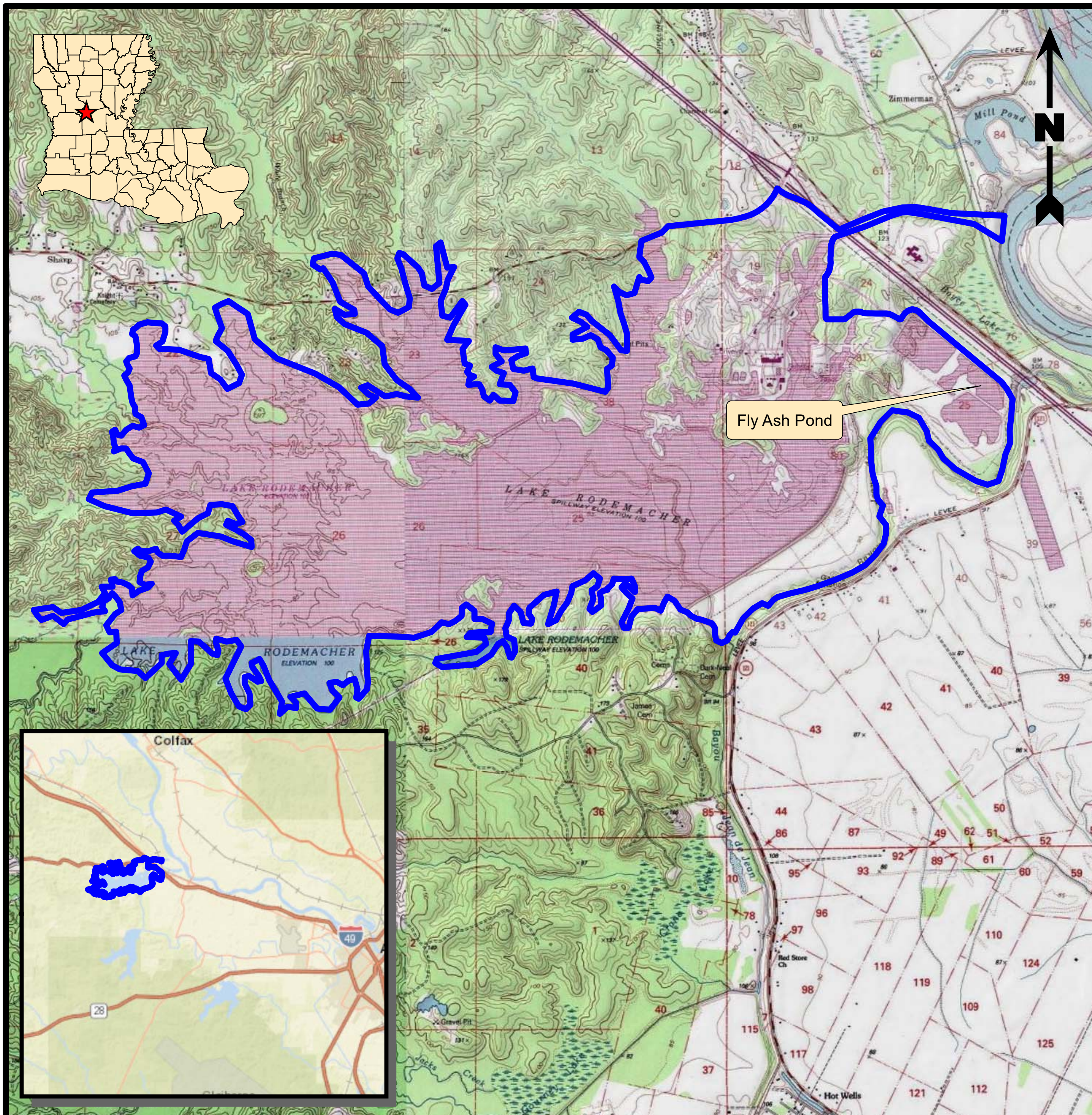
40 CFR 257.53 states that a seismic impact zone is defined as an area having 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. The 2% probability seismic map created on the USGS website, Earthquake Hazards Program, Information By Region - Louisiana, (https://earthquake.usgs.gov/earthquakes/byregion/louisiana-haz.php) indicates between 4% g (0.04 g) and 8% g (0.08 g) for the facility, which is below the specified 0.10 g noted in the regulation.

3.0 CONCLUSION

Based on the results from the seismic impact zones assessment for the Fly Ash Pond, Providence concludes that the surface impoundment is not located in a seismic impact zone that will exceed 0.10 g in 50 years. The Fly Ash Pond meets the requirements at 257.63 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Seismic Impact Zones Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number
002-213

Drawing Number
002-213-A007

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

N

Legend

- Property Boundary
- Fly Ash Pond

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Seismic Impact Zones Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number 002-213

Drawing Number 002-213-B008

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR SEISMIC IMPACT ZONES ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

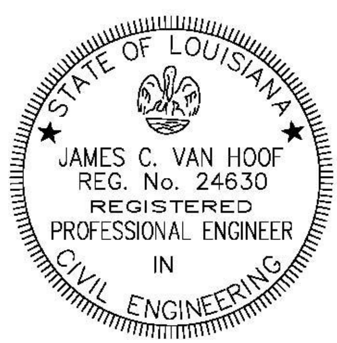
I hereby certify that I have performed a seismic impact zones assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.63 CCR requirements. Based on the results from the seismic impact zones assessment for the Fly Ash Pond, Providence concludes that the surface impoundment is not located in a seismic impact zone that will exceed 0.10 g in 50 years. The Fly Ash Pond meets the requirements at 257.63 of the CCR regulations.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

9/19/18
Date



(Seal)

SEPTEMBER 2018

CLECO POWER LLC
BRAME ENERGY CENTER

UNSTABLE AREAS ASSESSMENT

FLY ASH POND

Prepared By:

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Project Number 002-213

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct an unstable areas assessment of the Fly Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.64 established requirements for owners and operators to conduct an unstable areas assessment by a qualified professional engineer.

40 CFR 257.64 (a) states:

An existing or new CCR landfill, existing or new CCR surface impoundment, or any later expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

This assessment must, at a minimum, consider the following factors when determining whether an area is unstable:

- On-site or local soil conditions that may result in significant differential settling
- On-site or local geologic or geomorphologic features
- On-site or local human-made features or events (both surface and subsurface)

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**.

This unstable area assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**. For an existing CCR surface impoundment, the unstable areas assessment must be completed no later than October 17, 2018.

2.0 UNSTABLE AREAS ASSESSMENT

40 CFR 257.53 states that an unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including some or all of the structural components of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

On-site or Local Soil Conditions

Providence reviewed the existing soil borings that were completed for the initial design of the Fly Ash Pond. Providence also completed soil borings in the existing levee associated with the surface impoundment. Providence reviewed the soil conditions in the boring logs and determined that the soil conditions are stable and should not cause excessive differential settlement to the extent that the stability of the CCR impoundment, or its associated features, will be compromised.

The Fly Ash Pond is underlain with clays that extend from 3 to 13 feet. This provides a firm and secure foundation that maintains its integrity and will not be disrupted as a result of uneven settlement induced by hydrocompaction. Also, the clay liner provides a foundation that prevents sudden differential movement resulting from CCR placement. These areas have not been subject to mass movement in the past and are not expected to be in the future.

On-site or Local Geologic or Geomorphic Features

Providence has inspected the site, reviewed geological reports, reviewed boring logs, and reviewed topographic maps to evaluate the local geologic and geomorphic features that could cause the CCR unit to be unstable. No features were found that would cause the CCR unit to be unstable. The Fly Ash Pond is not located in karst terrain, therefore sinkholes, vertical shafts, sinking streams, caves, seeps, large springs, and blind valleys are not expected.

On-site or Local Human-made Features or Events

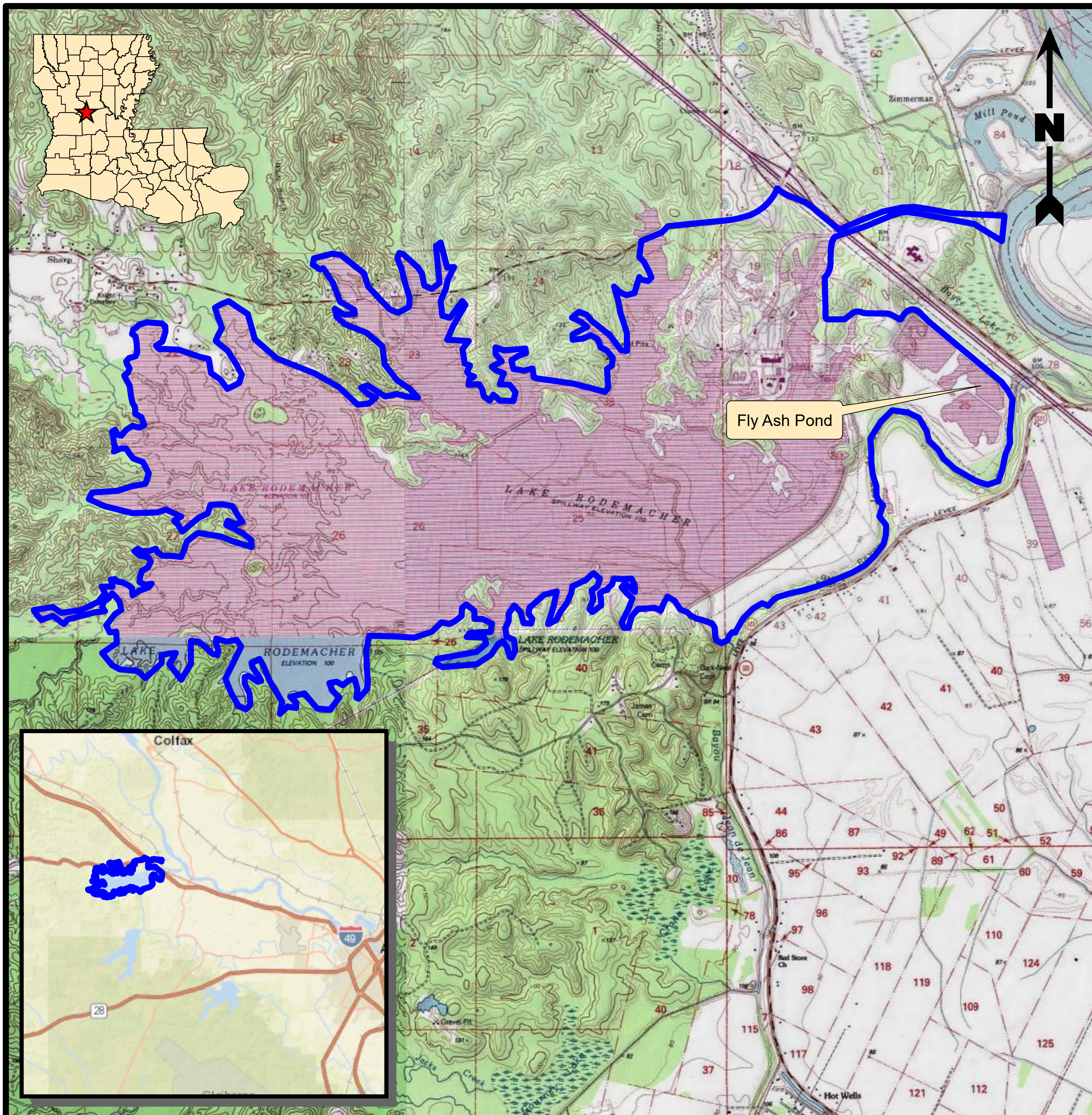
Providence reviewed the man-made features and activities associated with the CCR unit with respect to cut and fill, installation of culverts and piping, and any associated man-made features of the Fly Ash Pond. The dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions for the daily operation of the unit. The structural stability assessment was consistent with recognized and generally accepted good engineering practices. No anthropogenic features were found that would adversely affect the stability of the CCR unit.

3.0 CONCLUSION

Based on the results from the unstable areas assessment, the Fly Ash Pond's on-site or local soil conditions, geologic or geomorphologic features, and human-made features or events, Providence concludes that the surface impoundment is not located in unstable areas. The Fly Ash Pond meets the requirements at 257.64 of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Unstable Areas Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17
Project Number 002-213		1 Figure
Drawing Number 002-213-A011		

FIGURE 2

SITE MAP

Site Map

Unstable Areas Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	06/21/17
Checked By	LMH	06/21/17
Approved By	CVH	06/21/17

Project Number
002-213

Drawing Number
002-213-B012

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR UNSTABLE AREAS ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed an unstable areas assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.64 CCR requirements. Based on the results from the unstable areas assessment, the Fly Ash Pond is not located in unstable areas.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

9/20/18
Date

STATE OF LOUISIANA
JAMES C. VAN HOOF
REG. No. 24630
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

(Seal)

APPENDIX I

STRUCTURAL STABILITY ASSESSMENT

BOTTOM ASH POND

OCTOBER 2016

CLECO POWER LLC

BRAME ENERGY CENTER

STRUCTURAL STABILITY ASSESSMENT:

BOTTOM ASH POND

Prepared By:

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Project Number 002-186

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a structural stability assessment of the Bottom Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(d)(1) established requirements for owners and operators to conduct a structural stability assessment by a qualified professional engineer to document whether the design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. This assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

- Stable foundations and abutments.
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.
- Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.
- A single spillway or a combination of spillways designed, operated, and maintained to adequately manage flow during a 1,000-year flood for a significant hazard potential CCR surface impoundment.
- Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.
- For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**. This structural stability assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**. Providence reviewed the construction drawings and operational plan, and reviewed the inspection and maintenance procedures for the Bottom Ash Pond.

2.0 STRUCTURAL STABILITY

Stable Foundations and Abutments

Providence modeled a short-term slope stability analysis for the pond using a scenario where the facility allows the pond to fill to the freeboard level for the Bottom Ash surface impoundment. This scenario represents the flood/heavy rainfall conditions. The new elevation was determined using 2.5 feet of freeboard from the lowest levee crown elevation for this pond.

Based on the results of the short-term slope stability analysis, the following minimum factors of safety were obtained:

Table 1 Short-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Bottom Ash	Section 1	B-13	103.5	Spencer Method Deep Failure	1.52
Bottom Ash	Section 2	B-12	103.5	Spencer Method Deep Failure	1.52
Bottom Ash	Section 3	B-3	103.5	Spencer Method Deep Failure	1.54

The calculated short-term static factor of safety under maximum surcharge pool loading conditions is greater than 1.40, therefore these safety factors are adequate.

It must be noted that Cleco keeps the operating water levels in the Bottom Ash Pond at low levels with a pumping system. The low operating levels for this pond do not adversely affect the structural stability of the perimeter levees around the Bottom Ash Pond. The normal operating water level in the Bottom Ash Pond ranges from 90 to 96 feet NAVD 88. These levels are significantly lower than the modeled flooded/heavy rainfall conditions.

The interior and exterior slopes of the perimeter levees are on a three horizontal to one vertical and were compacted during the construction of the levees.

Adequate Slope Protection to Protect Against Surface Erosion, Wave Action, and Adverse Effects of Sudden Drawdown

The levees have adequate slope protection against surface erosion, wave action, and adverse effects of a sudden drawdown. The levees have a minimum three-foot thick layer of clay on the interior, exterior, and crest of the levee. Vegetation is adequate on the top of the levee where it may be exposed to the elements. As part of Cleco's operational plan, they inspect the levees weekly for any erosion due to weather, animals, or other elements and promptly correct any deficiencies.

Dikes Mechanically Compacted to a Density Sufficient to Withstand the Range of Loading Conditions in the CCR Unit

The dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions for the daily operation of the unit.

A Single Spillway or a Combination of Spillways Designed, Operated, and Maintained to Adequately Manage Flow During a 1,000-Year Flood for a Significant Hazard Potential CCR Surface Impoundment

Water discharges from the Bottom Ash Pond by means of a series of pumps on the northern end of the pond. An overflow control structure also exists near the pumps should the need arise. This water discharges into Lake Rodemacher, thence to Bayou Jean de Jean, thence to the Red River. This impoundment does not have an emergency spillway, but the water elevation is controlled through three floating pumps that are designed to pump approximately 5,000 gallons per minute (gpm). For normal operation, these pumps keep the water elevation below the existing control structure.

The Soil Conservation Service (SCS) Type III rain distribution for a 1,000-year, 24-hour rain event would cause a precipitation depth of 22.6 inches. Based on the operating water levels and the pumping system in the pond, the facility would adequately manage the rainfall for a 1,000-year flood event.

Hydraulic Structures Underlying the Base of the CCR Unit or Passing Through the Dike of the CCR Unit that Maintain Structural Integrity and are Free of Significant Deterioration, Deformation, Distortion, Bedding Deficiencies, Sedimentation, and Debris Which May Negatively Affect the Operation of the Hydraulic Structure

As part of the structural evaluation, Providence reviewed the presence of any culverts or pipes buried in the levees of the Bottom Ash Pond. Based on the survey of the pond levees, several site inspections, review of solid waste permit files, and discussions with Cleco personnel, Providence determined that the following culverts/pipes exist within the levees surrounding the Bottom Ash Pond:

- 24” Corrugated Metal Pipe near the southwest corner of the Bottom Ash Pond. This pipe is connected to a surface storm water ditch along the northwest perimeter of the Bottom Ash Pond.
- 24” Corrugated Metal Pipe on the west side of the Bottom Ash Pond. This pipe is the gravity overflow pipe for the Bottom Ash Pond.
- 6” HDPE pipe in the levee between the Bottom Ash Pond and Fly Ash Pond. This pipe is connected to a pump on the Fly Ash Pond side of the levee. Water is pumped from the Fly Ash Pond to the Bottom Ash Pond through this Pipe.

These drain pipes are in satisfactory condition and do not pose a threat to the levee system. These pipes have maintained their structural integrity and are free from significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris. None of the known pipes lead to offsite locations on the surface or to public drainage systems or waterways or pose any significant risks to Cleco as a result of their operation.

For CCR Units with Downstream Slopes Which Can Be Inundated By The Pool of an Adjacent Water Body, Such as a River, Stream or Lake, Downstream Slopes Must Maintain Structural Stability During Low Pool of the Adjacent Water Body or Sudden Drawdown of the Adjacent Water Body

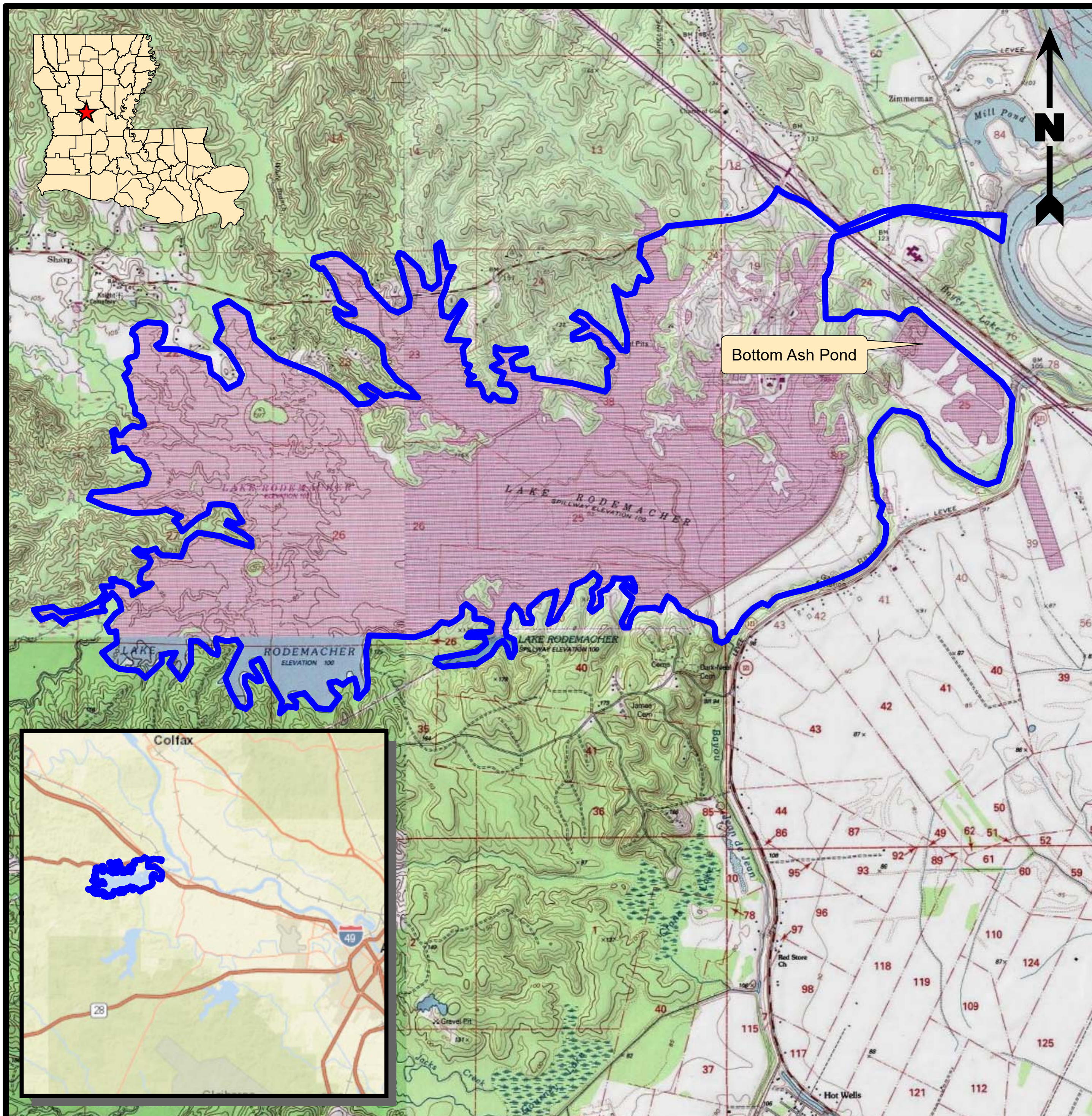
During normal operation of the Bottom Ash Pond, the levees are not inundated by surface waters from adjacent features. Occasionally, Bayou Jean de Jean will cause water to backup along the northernmost levee during high water events. However, when it does happen, the backwater levels occur as a gradual rise and/or a gradual drawdown, therefore, the levees are not negatively impacted.

3.0 CONCLUSION

Based on the results from the structural stability assessment, the Bottom Ash Pond's design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. The Bottom Ash Pond meets the requirements at 257.73(d)(1) of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Structural Stability Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number 002-186

Drawing Number 002-186-A017

1
Figure

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000
Feet

Site Map

Structural Stability Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number
002-186

Drawing Number
002-186-B018

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR STRUCTURAL STABILITY ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a structural stability assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.73(d)(1) CCR requirements. This structural stability assessment has determined that the Bottom Ash Pond's design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. It has been designed, constructed, operated, and maintained with:

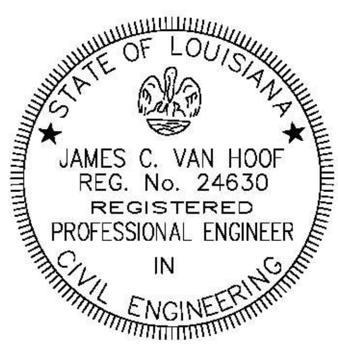
- Stable foundations and abutments.
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.
- Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.
- The discharge structures are designed, operated, and maintained to adequately manage rainfall during a 1,000-year flood for a significant hazard potential CCR surface impoundment.
- Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.
- For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes must maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

James C. Van Hoof
Name

24630 **LA**
Registration No. State

James C. Van Hoof, P.E.
Signature

10/16/2016
Date



(Seal)

FLY ASH POND

OCTOBER 2016

CLECO POWER LLC
BRAME ENERGY CENTER

CLECO

STRUCTURAL STABILTY ASSESSMENT:

FLY ASH POND

Prepared By:

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Project Number 002-186

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a structural stability assessment of the Fly Ash Pond at Cleco's Brame Energy Center. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(d)(1) established requirements for owners and operators to conduct a structural stability assessment by a qualified professional engineer to document whether the design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. This assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

- Stable foundations and abutments.
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.
- Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.
- A single spillway or a combination of spillways designed, operated, and maintained to adequately manage flow during a 1000-year flood for a significant hazard potential CCR surface impoundment.
- Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.
- For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**. This structural stability assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**. Providence reviewed the construction drawings and operational plan, and reviewed the inspection and maintenance procedures for the Fly Ash Pond.

2.0 STRUCTURAL STABILITY

Stable Foundations and Abutments

Providence modeled a short-term slope stability analysis for the pond using a scenario where the facility allows the pond to fill to the freeboard level for the Fly Ash surface impoundment. This scenario represents the flood/heavy rainfall conditions. The new elevation was determined using 2.5 feet of freeboard from the lowest levee crown elevation for this pond.

Based on the results of the short-term slope stability analysis, the following minimum factors of safety were obtained:

Table 1 Short-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Fly Ash	Section 1	B-15	102.5	Spencer Method Deep Failure	1.56
Fly Ash	Section 2	B-6	102.5	Spencer Method Deep Failure	1.80
Fly Ash	Section 3	B-8	102.5	Spencer Method Deep Failure	2.71

The calculated short-term static factor of safety under maximum surcharge pool loading conditions is greater than 1.40, therefore these safety factors are adequate.

It must be noted that Cleco keeps the operating water levels in the Fly Ash Pond at low levels with a pumping system. The low operating levels for this pond do not adversely affect the structural stability of the perimeter levees around the Fly Ash Pond. The normal operating water level in the Fly Ash Pond ranges from 86 to 92 feet NAVD 88. These levels are significantly lower than the modeled flooded/heavy rainfall conditions.

The interior and exterior slopes of the perimeter levees are on a three horizontal to one vertical and were compacted during the construction of the levees.

<u>Adequate Slope Protection to Protect Against Surface Erosion, Wave Action, and Adverse Effects of Sudden Drawdown</u>

The levees have adequate slope protection against surface erosion, wave action, and adverse effects of a sudden drawdown. The levees have a minimum three-foot thick layer of clay on the interior, exterior, and crest of the levee. Vegetation is adequate on the top of the levee where it may be exposed to the elements. As part of Cleco’s operational plan, they inspect the levees weekly for any erosion due to weather, animals, or other elements and promptly correct any deficiencies.

<u>Dikes Mechanically Compacted to a Density Sufficient to Withstand the Range of Loading Conditions in the CCR Unit</u>

The dikes were mechanically compacted to a density sufficient to withstand the range of loading conditions for the daily operation of the unit.

A Single Spillway or a Combination of Spillways Designed, Operated, and Maintained to Adequately Manage Flow During a 1,000-Year Flood for a Significant Hazard Potential CCR Surface Impoundment

Water discharges from the Fly Ash Pond by means of a pumping system (normal operating pump discharges 250 gpm and the backup pump discharges 1,600 gpm) that pumps through a pipe in the western levee to the Bottom Ash Pond with its own pumps on the northern end of the pond. This water discharges into Lake Rodemacher, thence to Bayou Jean de Jean, thence to the Red River. These impoundments do not have an emergency spillway, but the water elevation is controlled through the Fly Ash Pond pumping system. An emergency pump is also available to reduce the pond water level, if needed. For normal operation, these pumps keep the water elevation below the existing control structure.

The Soil Conservation Service (SCS) Type III rain distribution for a 1,000-year, 24-hour rain event would cause a precipitation depth of 22.6 inches. Based on the operating water levels and the pumping system in the pond, the facility would adequately manage the rainfall for a 1,000-year flood event.

Hydraulic Structures Underlying the Base of the CCR Unit or Passing Through the Dike of the CCR Unit that Maintain Structural Integrity and are Free of Significant Deterioration, Deformation, Distortion, Bedding Deficiencies, Sedimentation, and Debris Which May Negatively Affect the Operation of the Hydraulic Structure

As part of the structural evaluation, Providence reviewed the presence of any culverts or pipes buried in the levees of the Fly Ash Pond. Based on the survey of the pond levees, several site inspections, review of solid waste permit files, and discussions with Cleco personnel, Providence determined that the following culverts/pipes exist within the levees surrounding the Fly Ash Pond:

- 6” HDPE pipe in the levee between the Bottom Ash Pond and Fly Ash Pond. This pipe is connected to a pump on the Fly Ash Pond side of the levee. Water is pumped from the Fly Ash Pond to the Bottom Ash Pond through this Pipe.
- Metal Pipe in southeast corner of the Fly Ash Pond. This pipe previously drained towards the Leachate Pond/Landfill area. This pipe was capped and does not pose a risk to the Fly Ash Pond.

These drain pipes are in satisfactory condition and do not pose a threat to the levee system. These pipes have maintained their structural integrity and are free from significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris. None of the known pipes lead to offsite locations on the surface or to public drainage systems or waterways or pose any significant risks to Cleco as a result of their operation.

For CCR Units with Downstream Slopes Which Can Be Inundated by The Pool of an Adjacent Water Body, such as a River, Stream or Lake, Downstream Slopes Must Maintain Structural Stability During Low Pool of the Adjacent Water Body or Sudden Drawdown of the Adjacent Water Body

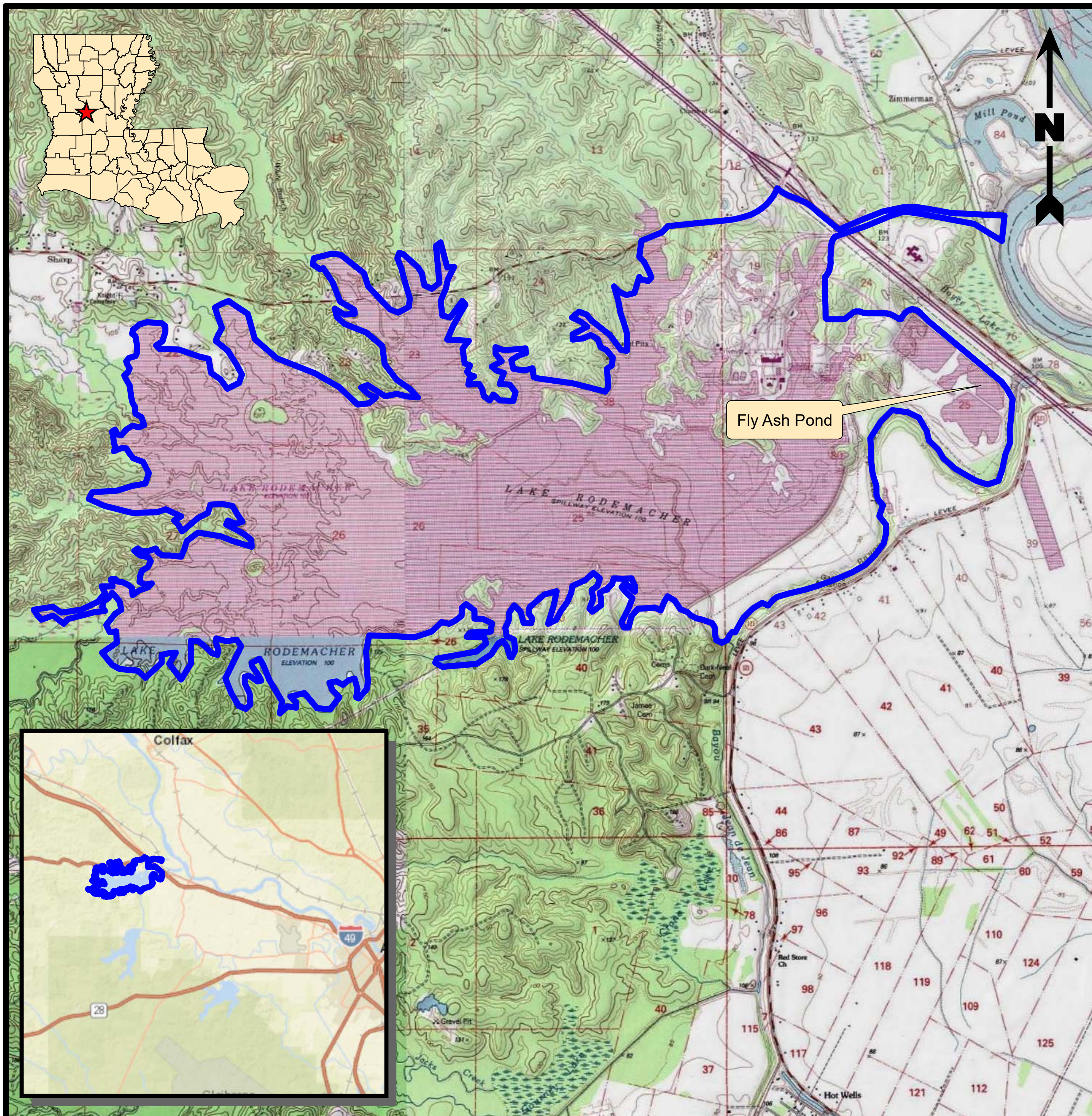
During normal operation of the Fly Ash Pond, the levees are not inundated by surface waters from adjacent features. Occasionally, Bayou Jean de Jean will cause water to backup along the northernmost levee during high water events. However, when it does happen, the backwater levels occur as a gradual rise and/or a gradual drawdown, therefore, the levees are not impacted negatively.

3.0 CONCLUSION

Based on the results from the structural stability assessment, the Fly Ash Pond's design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. The Fly Ash Pond meets the requirements at 257.73(d)(1) of the CCR regulations. **Appendix A** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000 Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Structural Stability Assessment - Fly Ash Pond

Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number 002-186

Drawing Number 002-186-A019

1 Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Structural Stability Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number
002-186

Drawing Number
002-186-B020

2
Figure

APPENDIX A

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR STRUCTURAL STABILITY ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a structural stability assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.73(d)(1) CCR requirements. This structural stability assessment has determined that the Fly Ash Pond's design, construction, operation and maintenance is consistent with recognized and generally accepted good engineering practices. It has been designed, constructed, operated, and maintained with:

- Stable foundations and abutments.
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.
- Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.
- A discharge pumping system designed, operated, and maintained to adequately manage rainfall during a 1,000-year flood for a significant hazard potential CCR surface impoundment.
- Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.
- For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes must maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

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James C. Van Hoof, P.E.
Signature

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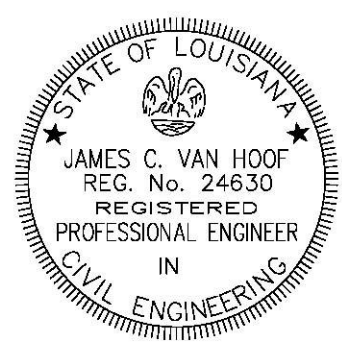

(Seal)

APPENDIX J

SAFETY FACTOR ASSESSMENT

BOTTOM ASH POND

OCTOBER 2016

CLECO POWER LLC

BRAME ENERGY CENTER

SAFETY FACTOR ASSESSMENT:

BOTTOM ASH POND

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Project Number 002-186

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct safety factor assessments of the Bottom Ash Pond at Cleco's Brame Energy Center located in Lena, Louisiana. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(e)(1) established requirements for owners and operators to conduct safety factor assessments to document whether the calculated factors of safety for the Bottom Ash Pond achieve the minimum safety factors specified below:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**. This safety factor assessment pertains to the Bottom Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Bottom Ash Pond is included as **Figure 2**.

2.0 FACTORS OF SAFETY

Providence performed a safety factor analysis (slope stability analysis) for the levees surrounding the Bottom Ash Pond. This analysis required a review of the original permit and construction drawings for the Bottom Ash Pond, a detailed topographic survey of the perimeter levees of the Bottom Ash Pond, and installation of borings in the perimeter levees to determine the soil conditions that exist within the perimeter levee system for these ponds.

Providence mobilized to the Brame Energy Center in June of 2011 and again in April of 2016 to install geotechnical borings in the perimeter levees of the Bottom Ash Pond. Geotechnical testing Laboratory, Inc. installed 4 borings spaced approximately 500 feet apart along the center line of the levee in 2011 and 3 additional borings in 2016. Soil profiles were generated for sections along the Bottom Ash Pond that shows the results of the geotechnical borings and the laboratory analysis. **Table 1** shows the soil profiles for each section and the characteristics used for the safety factor modeling.

Table 1 Subsurface Soil Classification and Parameters

	Soil	Depth (ft)	Unit Wt. (lb/ft^3)	Cohesion (lb/ft^2)	Friction Angle(Φ)
Bottom Ash Pond Section 1 B-13	**CL**	1.5	120	1,100	-
	CL-CH	2.0	120	550	-
	CH	9.5	106	250	-
	SP-SM	19.5	115	0	30
	SM	23.5	115	0	30
	CL	16.5	120	1,760	-
	SP-SM	6.5	115	0	30
Bottom Ash Pond Section 2 B-12	**Soil**	**Depth (ft)**	**Unit Wt. (lb/ft^3)**	**Cohesion (lb/ft^2)**	**Friction Angle(Φ)**
	SM	4.0	115	0	30
	CL	2.0	115	1,500	-
	SM	6.0	115	0	30
	SP-SM	11.5	115	0	30
	SP	8.5	115	0	30
	CL-CH	6.0	120	1,500	-
	SP	24.0	115	0	30
Bottom Ash Pond Section 3 B-3	**Soil**	**Depth (ft)**	**Unit Wt. (lb/ft^3)**	**Cohesion (lb/ft^2)**	**Friction Angle(Φ)**
	Cl-ML	7.5	130	375	-
	SM-SC	9.0	115	250	24
	SP-SM	15.5	115	350	20
	CH	40.0	133	850	-
	SC	11.0	130	750	-
	CL-CH	17.0	121	1,000	-

The safety factor analysis uses the strength of the soil material of which the levee is made of and subgrade to assess levee stability in accordance to the existing conditions. The Spencer Method for slope stability was used since it is the most conservative approach. The Spencer Method is a general method of slices developed on the basis of limit equilibrium. It requires satisfying equilibrium of forces and moments acting on individual blocks. The blocks are created by dividing the soil above the slip surface by dividing planes. Deep failure analysis evaluates the potential of the levees to fail through the bottom of the levees into the existing native soils. The analysis was based upon the following assumptions and input parameters.

- The subgrade stratigraphy was modeled using soil profiles from completed soil borings at the site with the soil profile condition at each section for each pond through the entire levee system.

- The height and exterior slope of the levees were determined based on actual field surveys and previously permitted design data and the bottom elevation and the interior slope of the levees below the water line was determined based on the previously permitted design provided by Cleco.
- The input parameters used in our analyses were based upon results from geotechnical investigations conducted for this safety factor analysis. **Appendix A** includes a copy of the geotechnical results as provided by the geotechnical contractor.
- The fill material in the pond was assumed to be water for the Bottom Ash Pond. Maximum water elevation in the Bottom Ash Pond is 103.5 feet NAVD 88.

The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50

Providence modeled the pond under the long-term, maximum storage to the freeboard level for the Bottom Ash surface impoundment. Based on the results of the slope stability analysis, the following minimum factors of safety were obtained:

Table 2 Long-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Bottom Ash	Section 1	B-13	103.5	Spencer Method Deep Failure	1.68
Bottom Ash	Section 2	B-12	103.5	Spencer Method Deep Failure	2.32
Bottom Ash	Section 3	B-3	103.5	Spencer Method Deep Failure	1.60

The calculated long-term static factor of safety under maximum storage pool loading conditions is greater than 1.50, therefore these safety factors are adequate.

The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40

Providence modeled the pond using a scenario where the facility allows the pond to fill to the freeboard level for the Bottom Ash surface impoundment. This scenario represents the flood/heavy rainfall conditions. The new elevation was determined using 2.5 feet of freeboard from the lowest levee crown elevation for this pond.

Based on the results of the slope stability analysis, the following minimum factors of safety were obtained:

Table 3 Short-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Bottom Ash	Section 1	B-13	103.5	Spencer Model Deep Failure	1.52
Bottom Ash	Section 2	B-12	103.5	Spencer Model Deep Failure	1.52
Bottom Ash	Section 3	B-3	103.5	Spencer Model Deep Failure	1.54

The calculated short-term static factor of safety under maximum surcharge pool loading conditions is greater than 1.40, therefore these safety factors are adequate.

The calculated seismic factor of safety must equal or exceed 1.00

The Brame Energy Center is not located in a seismic area. The Louisiana Geological Survey and the United States Geological Survey classifies the entire state of Louisiana as a low seismic risk area. This low seismic risk classification denotes that the levels of horizontal shaking that have a 2 in 100 chance of being exceed in in a 50-year period range from 0-8% g where g is the acceleration of a falling object due to gravity. The nearest published fault system to the Brame Energy Center is approximately 100 miles away. Therefore, the calculated seismic factor of safety is not applicable to the Bottom Ash Pond.

For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.2

The clayey sands and poorly graded sands in the Bottom Ash Pond levees have greater N values to resist earthquake motions and acceleration; and the relative densities are greater than 35 to 40 percent, therefore these soils are not subject to liquefaction.

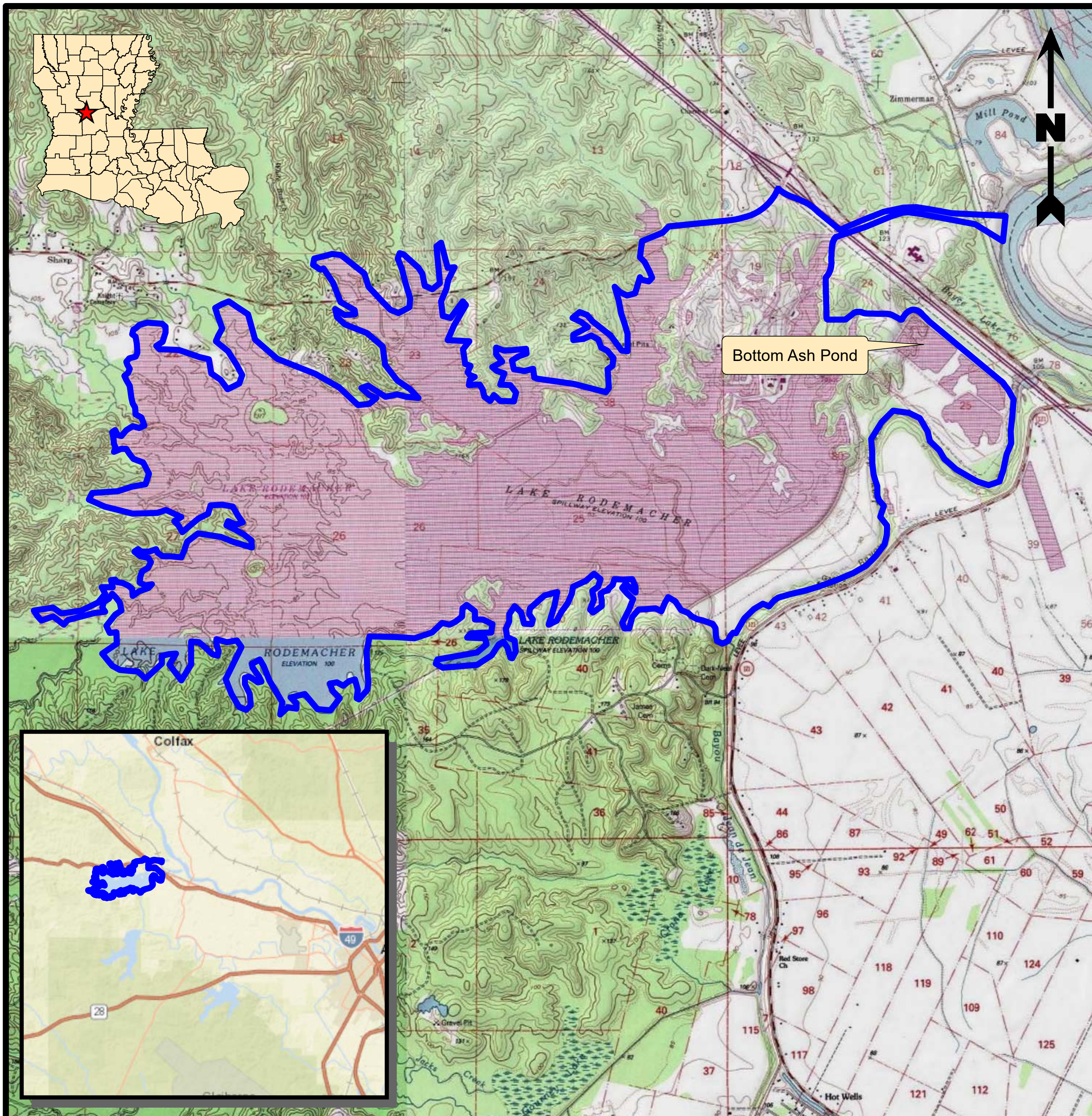
It must be noted that Cleco keeps the operating water levels in the Bottom Ash Pond at lower levels. The low operating levels for this pond will not adversely affect the structural stability of the perimeter levees around the Bottom Ash Pond. The normal operating water level in the Bottom Ash Pond ranges from 90 to 96 feet NAVD 88. These levels are significantly lower than the modeled flooded/heavy rainfall conditions.

3.0 CONCLUSIONS

Based on the results from the safety factor analysis, the existing levee design for the Bottom Ash Pond achieves the minimum safety factor requirements of the 40 CFR 257.73(e)(1) CCR regulations. Results of the safety factor analysis and model input parameters can be found in **Appendix A**. **Appendix B** contains a P.E. Certification that attests to the safety factor assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000 Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Safety Factor Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number 002-186

Drawing Number 002-186-A013

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Safety Factor Assessment - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number 002-186

Drawing Number 002-186-B014

2 Figure

APPENDIX A

SAFETY FACTOR ANALYSIS

APS Engineering and Testing

October 16, 2016

PROVIDENCE
1201 Main Street
Baton Rouge, LA 70802

Attn: Mr. Gary Leonards, P.E.

Re: Slope Stability Analysis of Bottom Ash Pond
Cleco Brame Energy Center
Lena, Louisiana

Dear Mr. Leonards:

APS Engineering and Testing, LLC has completed slope stability analysis of the Bottom Ash Pond located at Cleco Brame Energy Center in Lena, Louisiana. Authorization to proceed with this work was received from **Mr. Gary Leonards** via email on July 18, 2016. Our analysis was performed based on the soil boring log data provided by the client. Our scope of services included performing landside stability of the existing levee with maximum water elevation, as requested by the client. All sections were modeled and analyzed based on the survey data and soil boring data provided by the client. This report presents the results of Sections 1, 2 and 3 of the Bottom Ash Pond.

Background

The Bottom Ash Pond at the Brame Energy Center was initially constructed in 1981. The facility was expanded in 1982 when an additional coal fired boiler system (Unit #2) came on line. The bottom ash is sluiced to the Bottom Ash Pond. The Bottom Ash Pond is an existing unit that is essential for the management of solid residuals generated at the Brame Energy Center.

TABLE 1.0

Pond	Section #	Soil boring # (Report No.) *	Boring Depth (Feet)	Average Top of Levee Elevation (feet, NAVD88)	Pond Max. Water Elevation (feet, NAVD 88)
Bottom Ash	Section 1	B-13 (04-16-061)	80	109.8	103.5
	Section 2	B-12 (04-16-061)	80	123.3	103.5
	Section 3	B-3 (06-11-090)	80	107.9	103.5

*Boring data was obtained from Reports prepared by Geotechnical Testing Laboratory (GTL), Inc.

All three sections achieved the minimum desired factor of safety of 1.50. Please refer to *Attachments* of this report.

Assumptions and Observations:

- Soil layers are horizontal with uniform thickness.
- Soil layers encountered in Levee Centerline boring were used for the analysis.
- Cross section profiles limits were extended horizontally on the land side, whenever the failure plane passes the limits.

Slope Stability Analysis Results

Slope stability analysis was performed using Spencer method for both the short term and long term conditions as requested by the client. Changes in slopes, structural loadings, and other conditions may affect the results of slope stability analysis. Factors of safety (FoS) obtained from slope stability analysis results do meet 1.50 according to HSDRRS guidelines for Steady Water Level conditions.

TABLE 2.0

Soil Type	Phi	Cohesion (psf)
Silt (ML)	28°	0
Clay (CL/CH)	28°	0
Sand (SP / SM)	37°	0

TABLE 3.0

Pond	Section #	Condition	Flood Side Water Elevation (feet, NAVD88)	Factor of Safety Obtained	Notes
Bottom Ash Pond	1	Short Term	103.5	1.53	--
	1	Long Term	103.5	1.68	--
	2	Short Term	103.5	2.27	--
	2	Long Term	103.5	2.32	--
	3	Short Term	103.5	1.58	--
	3	Long Term	103.5	1.60	--

Based on the results presented in the above table, all three sections of the Bottom Ash Pond meet minimum required factor of safety with the projected maximum water elevation as shown in above table for both short term and long term conditions. This is based on the soil boring data provided by the client.

Liquefaction

Clayey sands and poorly graded sands present at the bottom ash project site have greater N values to resist the earthquake motions and acceleration. Also, the relative densities are more than 35 to 40 percent and therefore do not present susceptibility to liquefaction.

October 16, 2016

If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
APS ENGINEERING AND TESTING, LLC

Sairam Eddanapudi, P.E.
Project Manager

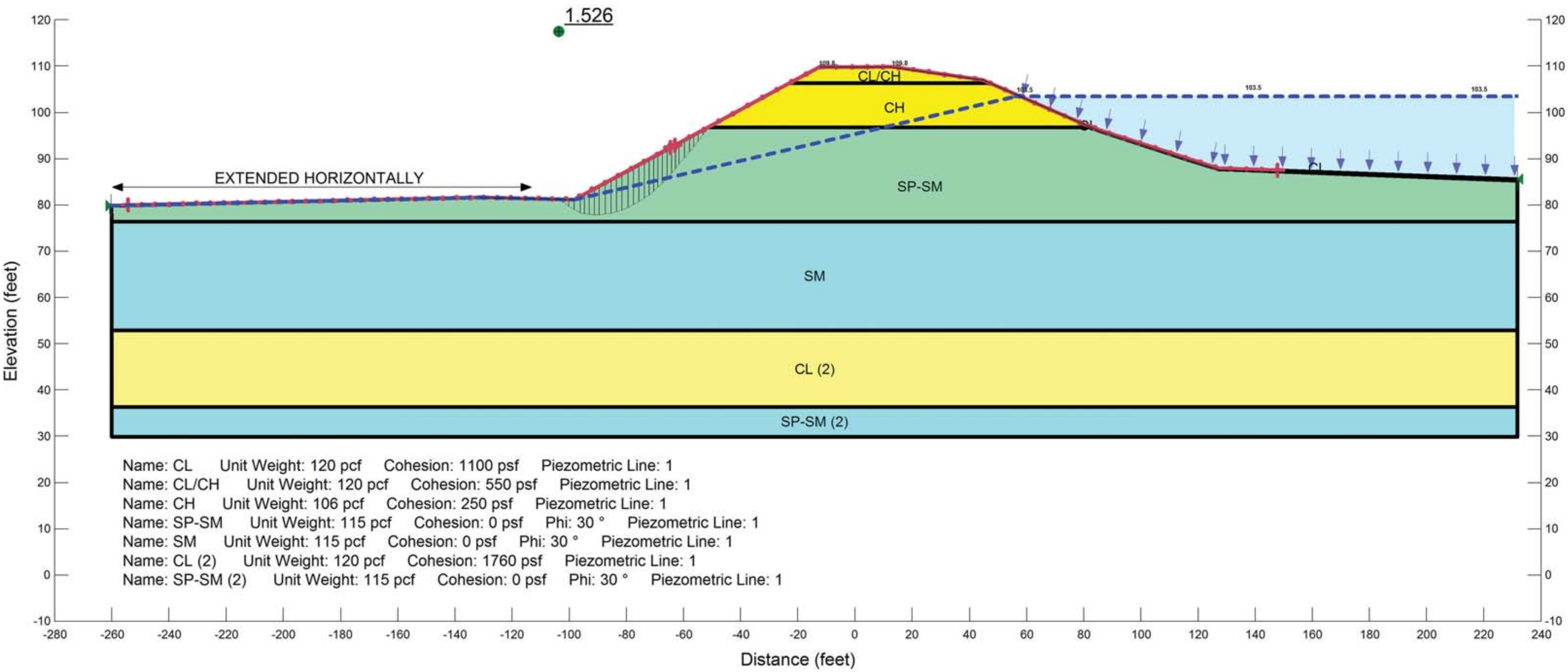
Sergio Aviles, P.E.
President

Attachments

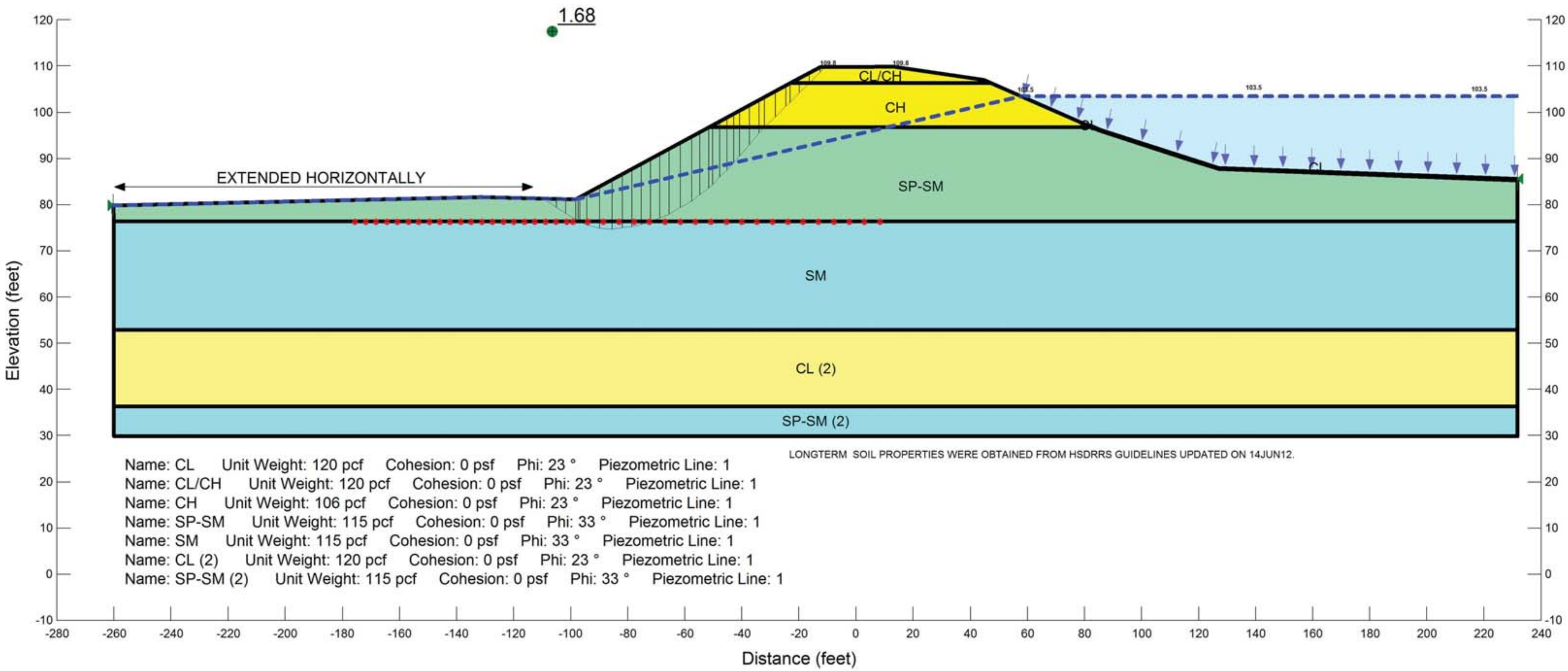
Boring Location Plan
Slope stability Analysis Results

LA Highway 1
Interstate 49
LA Highway 121
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-13
B-14
B-15
ONE
TWO
THREE
Bottom Ash Pond
Fly Ash Pond
Ash Management Area
Leachate & Contact
Sorm Water Pond
Image USDA Farm Service Agency

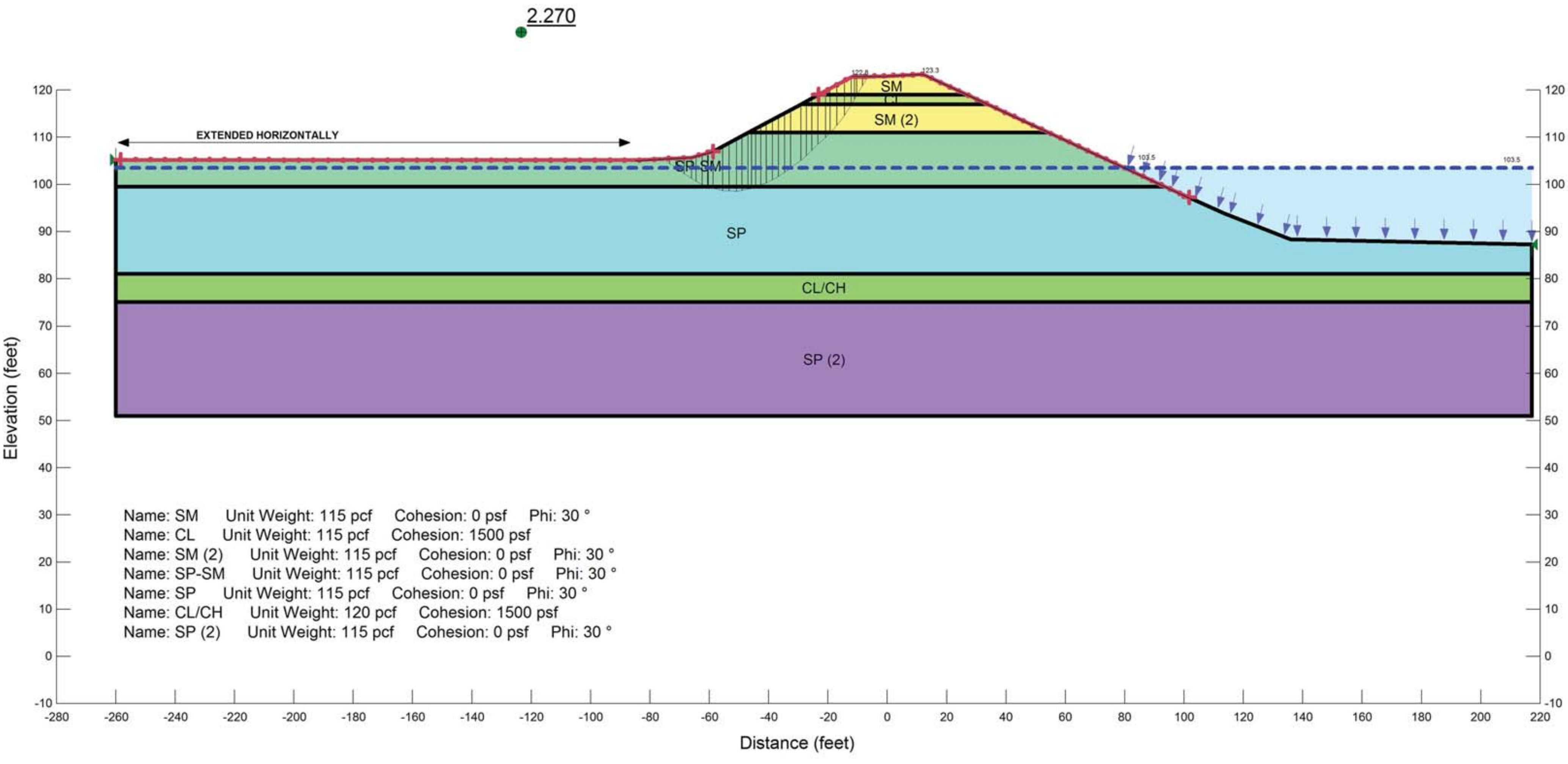
CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 1
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-13 (FROM GTL REPORT NO.: 04-16-061)



CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 1
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-13 (FROM GTL REPORT NO.: 04-16-061)

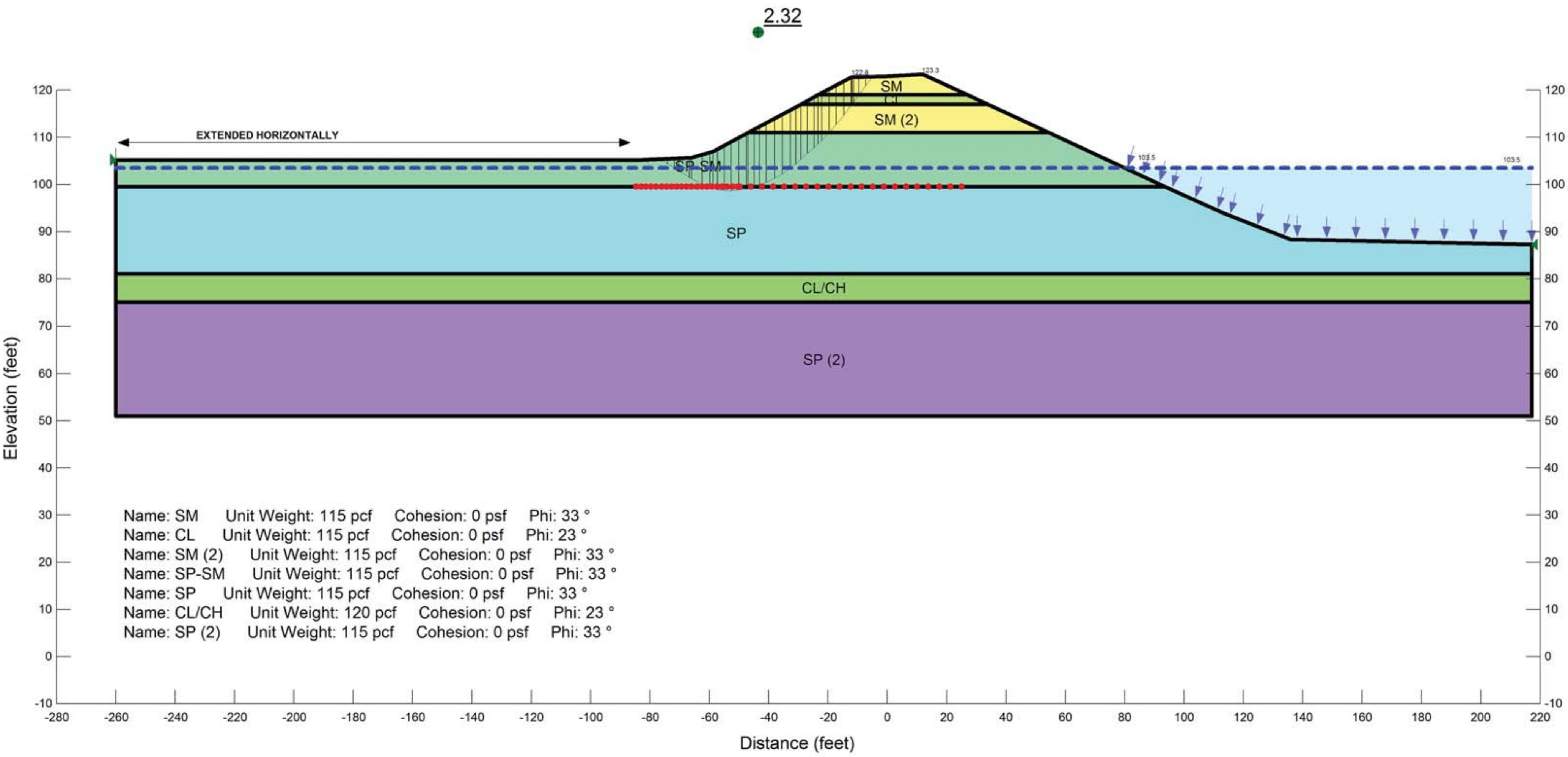


CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 2
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-12 (FROM GTL REPORT NO.: 04-16-061)

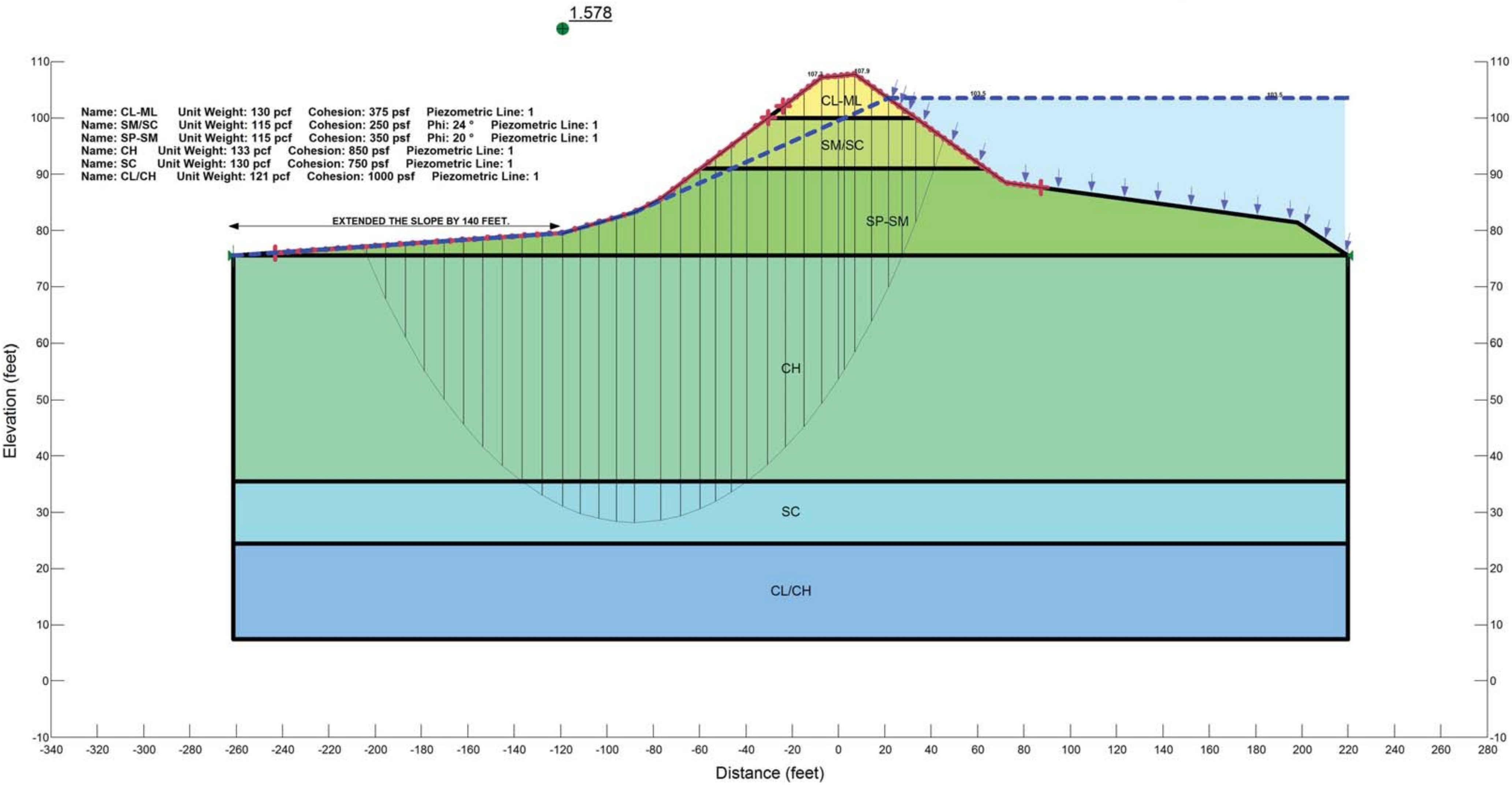


Name: SM Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: CL Unit Weight: 115 pcf Cohesion: 1500 psf
Name: SM (2) Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: SP-SM Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: SP Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °
Name: CL/CH Unit Weight: 120 pcf Cohesion: 1500 psf
Name: SP (2) Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 °

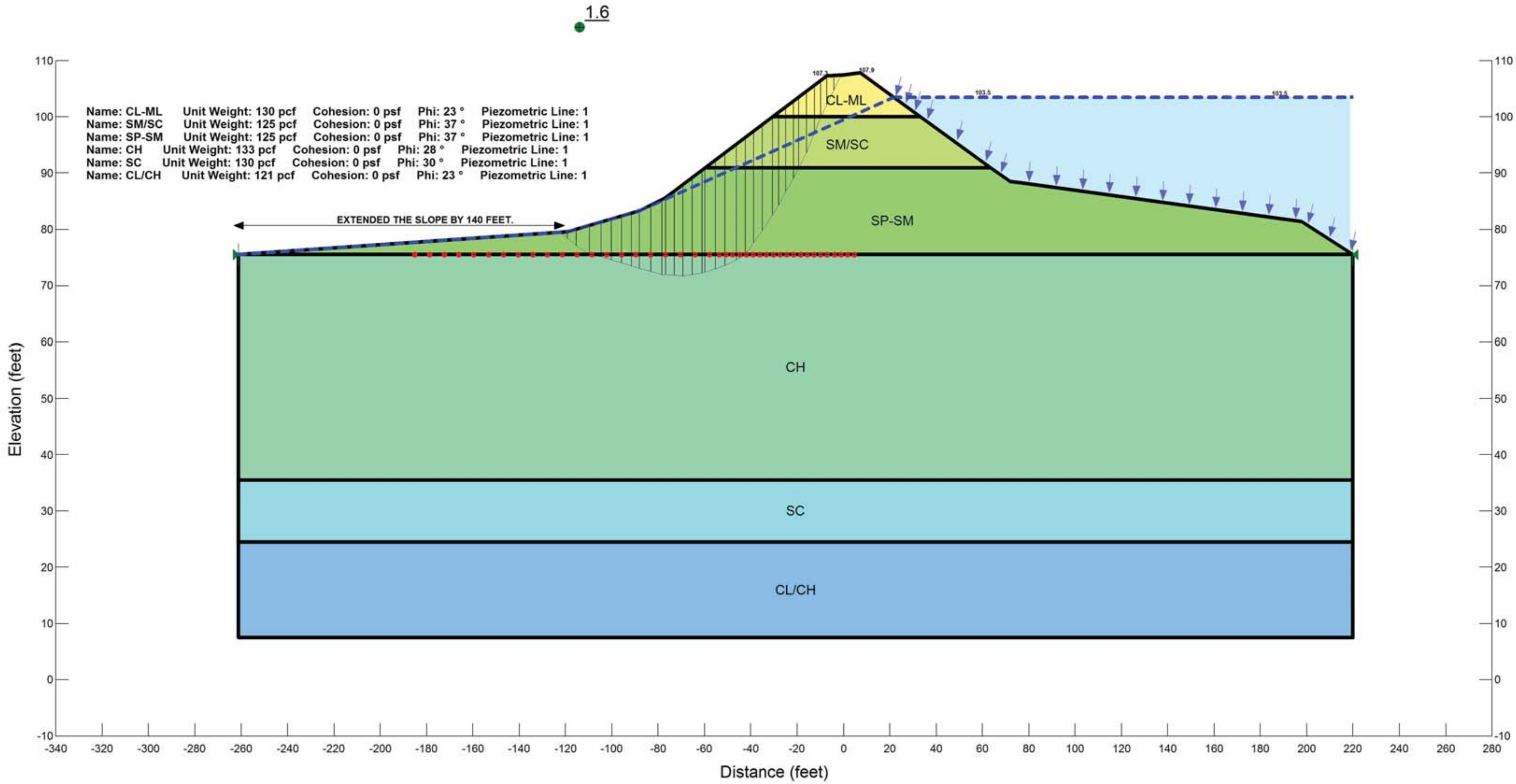
CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 2
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-12 (FROM GTL REPORT NO.: 04-16-061)



CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 3
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-3 (FROM GTL REPORT NO.: 06-11-090)



CLECO BRAME ENERGY CENTER
BOTTOM ASH POND - SECTION 3
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-3 (FROM GTL REPORT NO.: 06-11-090)



APPENDIX B

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR SAFETY FACTOR ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a safety factor assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.73(e)(1) CCR requirements. This safety factor assessment has determined that the Bottom Ash Pond has met the following requirements:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

And that these requirements were not applicable based on the findings:

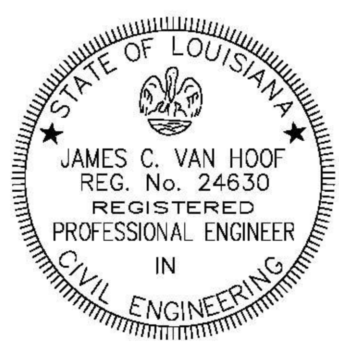
- The calculated seismic factor of safety must equal or exceed 1.00.
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

James C. Van Hoof
Name

24630 — **LA**
Registration No. — State

James C. Van Hoof, P.E.
Signature

10/17/2016
Date



(Seal)

FLY ASH POND

OCTOBER 2016

CLECO POWER LLC
BRAME ENERGY CENTER

CLECO

SAFETY FACTOR ASSESSMENT:

FLY ASH POND

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
www.providenceeng.com

Project Number 002-186

PROVIDENCE

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct safety factor assessments of the Fly Ash Pond at Cleco's Brame Energy Center located in Lena, Louisiana. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(e)(1) established requirements for owners and operators to conduct safety factor assessments to document whether the calculated factors of safety for the Fly Ash Pond achieve the minimum safety factors specified below:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

The Cleco Brame Energy Center is located near Lena in Rapides Parish, Louisiana. A site location map showing the Brame Energy Center is included as **Figure 1**. This safety factor assessment pertains to the Fly Ash surface impoundment (Pond) utilized for the Unit 2 coal-fired generation unit. A site map for the Fly Ash Pond is included as **Figure 2**.

2.0 FACTORS OF SAFETY

Providence performed a safety factor analysis (slope stability analysis) for the levees surrounding the Fly Ash Pond. This analysis required a review of the original permit and construction drawings for the Fly Ash Pond, a detailed topographic survey of the perimeter levees of the Fly Ash Pond, and installation of borings in the perimeter levees to determine the soil conditions that exist within the perimeter levee system for the pond.

Providence mobilized to the Brame Energy Center in June of 2011 and again in April of 2016 to install geotechnical borings in the perimeter levees of the Fly Ash Pond. Geotechnical Testing Laboratory, Inc. installed 6 borings spaced approximately 500 feet apart along the center line of the levee in 2011 and 1 additional boring in 2016. Soil profiles were generated for sections along the Fly Ash Pond that shows the results of the geotechnical borings and the laboratory analysis. **Table 1** shows the soil profiles for each section and the characteristics used for the safety factor modeling.

Table 1 Subsurface Soil Classification and Parameters

	Soil	Depth (ft)	Unit Wt. (lb/ft^3)	Cohesion (lb/ft^2)	Friction Angle(Φ)
Fly Ash Pond Section 1 B-15	**ML**	2.0	118	250	20
	CL-CH	6.5	120	1,000	-
	CL-ML	3.5	115	600	-
	SM	5.0	115	0	36
	CH	11.5	117	440	-
	CL	19.5	117	375	-
	SM	6.5	115	0	28
	CH	14.0	112	550	-
	SM	11.5	115	0	30
	Landfill Material	-	75	20	-
Fly Ash Pond Section 2 B-6	**Soil**	**Depth (ft)**	**Unit Wt. (lb/ft^3)**	**Cohesion (lb/ft^2)**	**Friction Angle(Φ)**
	CL	4.0	120	2,500	-
	SM-SC	21.0	115	500	30
	CH	32.0	120	950	-
	SP-SM	23.0	115	900	27
Fly Ash Pond Section 3 B-8	**Soil**	**Depth (ft)**	**Unit Wt. (lb/ft^3)**	**Cohesion (lb/ft^2)**	**Friction Angle(Φ)**
	CL	7.0	105	1,050	-
	SP-SM	15.0	115	475	31
	CH	33.0	108	800	-
	CH	25.0	97	475	-

The safety factor analysis uses the strength of the soil material of which the levee is made of and subgrade to assess levee stability in accordance to the existing conditions. The Spencer Method for slope stability was used since it is the most conservative approach. The Spencer Method is a general method of slices developed on the basis of limit equilibrium. It requires satisfying equilibrium of forces and moments acting on individual blocks. The blocks are created by dividing the soil above the slip surface by dividing planes. Deep failure analysis evaluates the potential of the levees to fail through the bottom of the levees into the existing native soils. The analysis was based upon the following assumptions and input parameters.

- The subgrade stratigraphy was modeled using soil profiles from completed soil borings at the site with the soil profile condition at each section for this pond through the entire levee system.
- The height and exterior slope of the levees were determined based on actual field surveys and previously permitted design data and the bottom

elevation and the interior slope of the levees below the water line was determined based on the previously permitted design provided by Cleco.

- The input parameters used in our analyses were based upon results from geotechnical investigations conducted for this safety factor analysis. **Appendix A** includes a copy of the geotechnical results as provided by the geotechnical contractor.
- The fill material in the pond was assumed to be water for the Fly Ash Pond. Maximum water elevation in the Fly Ash Pond is 102.5 feet NAVD 88.

<u>The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50</u>

Providence modeled the pond under the long-term, maximum storage to the freeboard level for the Fly Ash surface impoundment. Based on the results of the slope stability analysis, the following minimum factors of safety were obtained:

Table 2 Long-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Fly Ash	Section 1	B-15	102.5	Spencer Method Deep Failure	2.48
Fly Ash	Section 2	B-6	102.5	Spencer Method Deep Failure	1.53
Fly Ash	Section 3	B-8	102.5	Spencer Method Deep Failure	1.79

The calculated long-term static factor of safety under maximum storage pool loading conditions is greater than 1.50, therefore these safety factors are adequate.

<u>The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40</u>

Providence modeled the pond under the short-term scenario where the facility allows the pond to fill to the freeboard level for the Fly Ash surface impoundment. This scenario represents the flood/heavy rainfall conditions. The new elevation was determined using 2.5 feet of freeboard from the lowest levee crown elevation for each pond.

Based on the results of the slope stability analysis, the following minimum factors of safety were obtained:

Table 3 Short-Term Factors of Safety

Surface Impoundment	Section Number	Soil Boring No.	Maximum Water Elevation (feet NAVD 88)	Analysis	Factor of Safety
Fly Ash	Section 1	B-15	102.5	Spencer Method Deep Failure	1.56
Fly Ash	Section 2	B-6	102.5	Spencer Method Deep Failure	1.82
Fly Ash	Section 3	B-8	102.5	Spencer Method Deep Failure	2.75

The calculated short-term static factor of safety under maximum surcharge pool loading conditions is greater than 1.40, therefore these safety factors are adequate.

<u>The calculated seismic factor of safety must equal or exceed 1.00</u>

The Brame Energy Center is not located in a seismic area. The Louisiana Geological Survey and the United States Geological Survey classifies the entire state of Louisiana as a low seismic risk area. This low seismic risk classification denotes that the levels of horizontal shaking that have a 2 in 100 chance of being exceed in in a 50-year period range from 0-8% g where g is the acceleration of a falling object due to gravity. The nearest published fault system to the Brame Energy Center is approximately 100 miles away. Therefore, the calculated seismic factor of safety is not applicable to the Fly Ash Pond.

<u>For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.2</u>

The clayey soils encountered at the Fly Ash Pond are not susceptible to liquefaction.

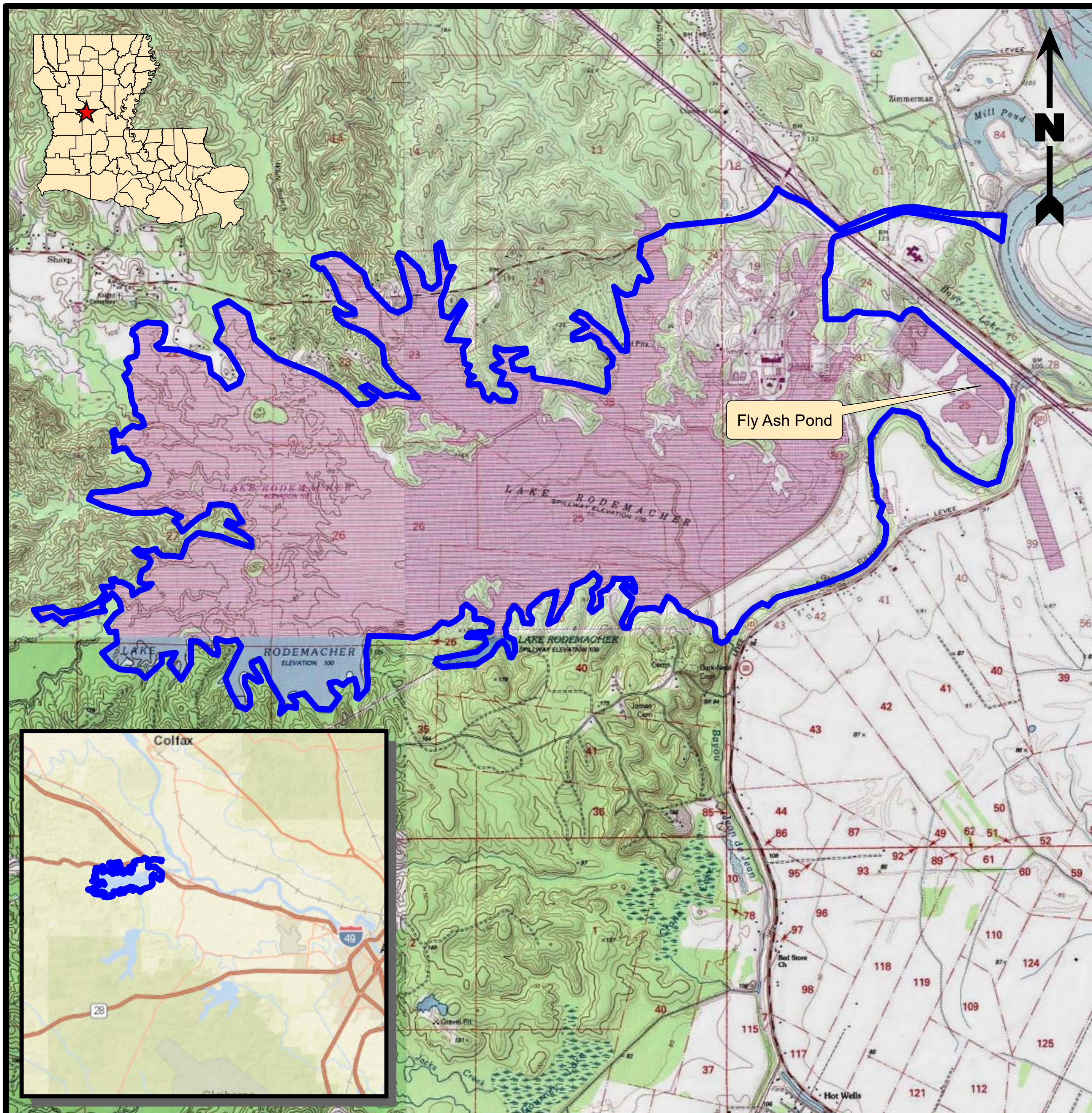
It must be noted that Cleco keeps the operating water levels in the Fly Ash Pond at lower levels. The low operating levels for this pond will not adversely affect the structural stability of the perimeter levees around the Fly Ash Pond. The normal operating water level in the Fly Ash Pond ranges from 86 to 92 feet NAVD 88. These levels are significantly lower than the modeled flooded/heavy rainfall conditions.

3.0 CONCLUSIONS

Based on the results from the safety factor analysis, the existing levee design for the Fly Ash Pond achieves the minimum safety factor requirements of the 40 CFR 257.73(e)(1) CCR regulations. Results of the safety factor analysis and model input parameters can be found in **Appendix A**. **Appendix B** contains a P.E. Certification that attests to the safety factor assessment.

FIGURE 1

SITE LOCATION MAP



Legend

Property Boundary

Site Location Map

Safety Factor Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16
Project Number 002-186		1
Drawing Number 002-186-A015		Figure

PROVIDENCE

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Safety Factor Assessment - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number
002-186

Drawing Number
002-186-B016

2
Figure

PROVIDENCE

APPENDIX A

SAFETY FACTOR ANALYSIS

October 16, 2016

PROVIDENCE
1201 Main Street
Baton Rouge, LA 70802

Attn: Mr. Gary Leonards, P.E.

Re: Slope Stability Analysis of Fly Ash Pond
Cleco Brame Energy Center
Lena, Louisiana

Dear Mr. Leonards:

APS Engineering and Testing, LLC has completed slope stability analysis of the Fly Ash Pond located at Cleco Brame Energy Center in Lena, Louisiana. Authorization to proceed with this work was received from **Mr. Gary Leonards** via email on July 18, 2016. Our analysis was performed based on the soil boring log data provided by the client. Our scope of services included performing landside stability of the existing levee with maximum water elevation, as requested by the client. All sections were modeled and analyzed based on the survey data and soil boring data provided by the client. <u>This report presents the results of Sections 1, 2 and 3 of the Fly Ash Pond.</u>

Background

The Fly Ash Pond at the Brame Energy Center was initially constructed in 1981. The facility was expanded in 1982 when an additional coal fired boiler system (Unit #2) came on line. The Fly Ash Pond levee along the southern side was added in 1984 to reduce the size of the original pond. The fly ash is trucked to the Fly Ash Pond. The Fly Ash Pond is an existing unit that is essential for the management of solid residuals generated at the Brame Energy Center.

TABLE 1.0

Pond	Section #	Soil boring # (Report No.) *	Boring Depth (Feet)	Average Top of Levee Elevation (feet, NAVD88)	Pond Max. Water Elevation (feet, NAVD88)
Fly Ash	Section 1	B-15 (04-16-061)	80	105.0	102.5
	Section 2	B-6 (06-11-090)	80	104.0	102.5
	Section 3	B-8 (06-11-090)	80	103.5	102.5

*Boring data was obtained from Reports prepared by Geotechnical Testing Laboratory (GTL), Inc.

All three sections achieved the minimum desired factor of safety of 1.50. Please refer to *Attachments* of this report.

Assumptions and Observations:

- Soil layers are horizontal with uniform thickness.
- Soil layers encountered in Levee Centerline boring were used for the analysis.
- Cross section profiles limits were extended horizontally on the land side, whenever the failure plane passes the limits.

Slope Stability Analysis Results

Slope stability analysis was performed using Spencer method for both the short term and long term conditions as requested by the client. Changes in slopes, structural loadings, and other conditions may affect the results of slope stability analysis. Factors of safety (FoS) obtained from slope stability analysis results do meet 1.50 according to HSDRRS guidelines for Steady Water Level conditions.

TABLE 2.0

Soil Type	Phi	Cohesion (psf)
Silt (ML)	28°	0
Clay (CL/CH)	28°	0
Sand (SP / SM)	37°	0

TABLE 3.0

Pond	Section #	Condition	Flood Side Water Elevation (feet, NAVD88)	Factor of Safety Obtained	Notes
Fly Ash Pond	1	Short Term	102.5	1.56	Landfill Material is required on the protected side of the levee to achieve min. FS.
	1	Long Term	102.5	2.48	--
	2	Short Term	102.5	1.80	--
	2	Long Term	102.5	1.53	--
	3	Short Term	102.5	2.71	--
	3	Long Term	102.5	1.79	--

Based on the results presented in the above table, all three sections of the Fly Ash Pond meet minimum required factor of safety with the projected maximum water elevation as shown in above table for both short term and long term conditions. This is based on the soil boring data provided by the client.

Liquefaction

Clayey soils encountered at the Fly Ash Pond site are not susceptible to liquefaction.

If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
APS ENGINEERING AND TESTING, LLC

Sairam Eddanapudi, P.E.
Project Manager

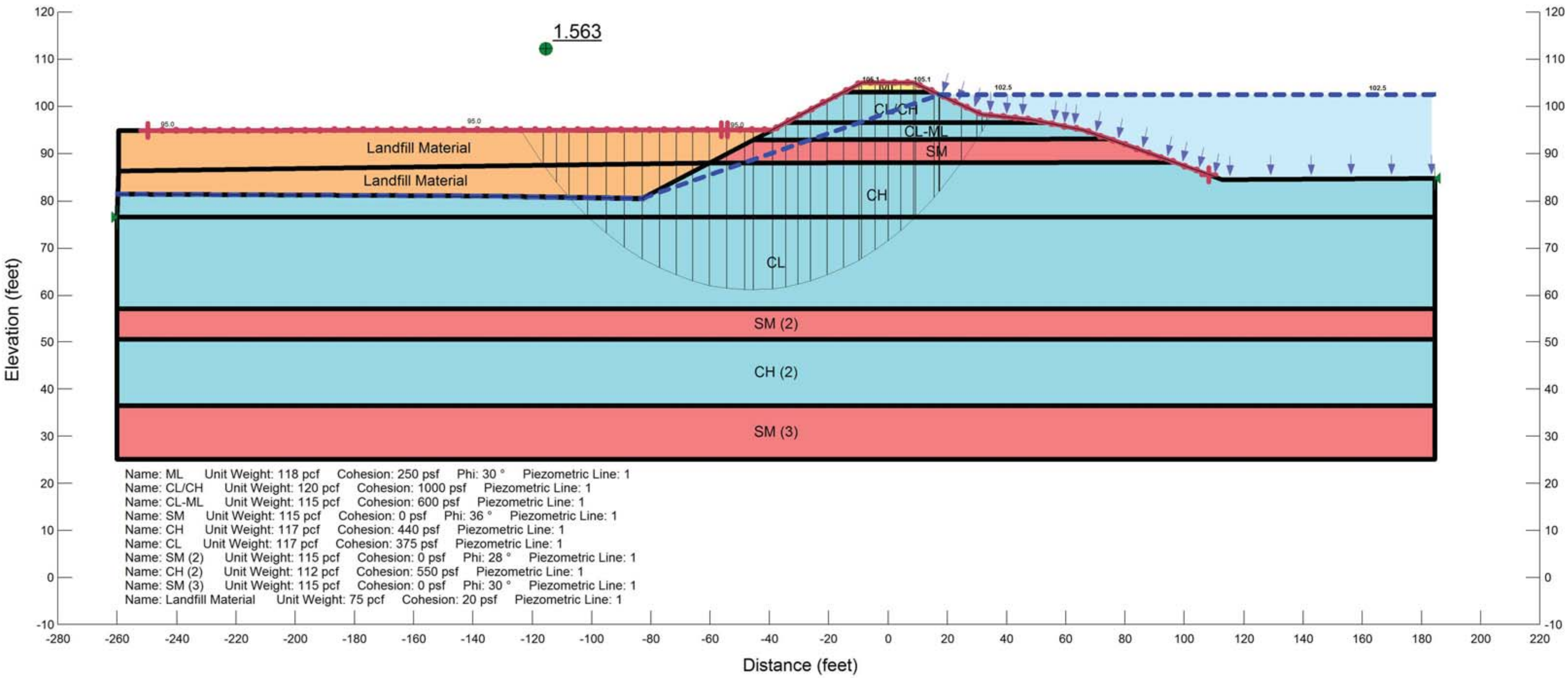
Sergio Aviles, P.E.
President

Attachments

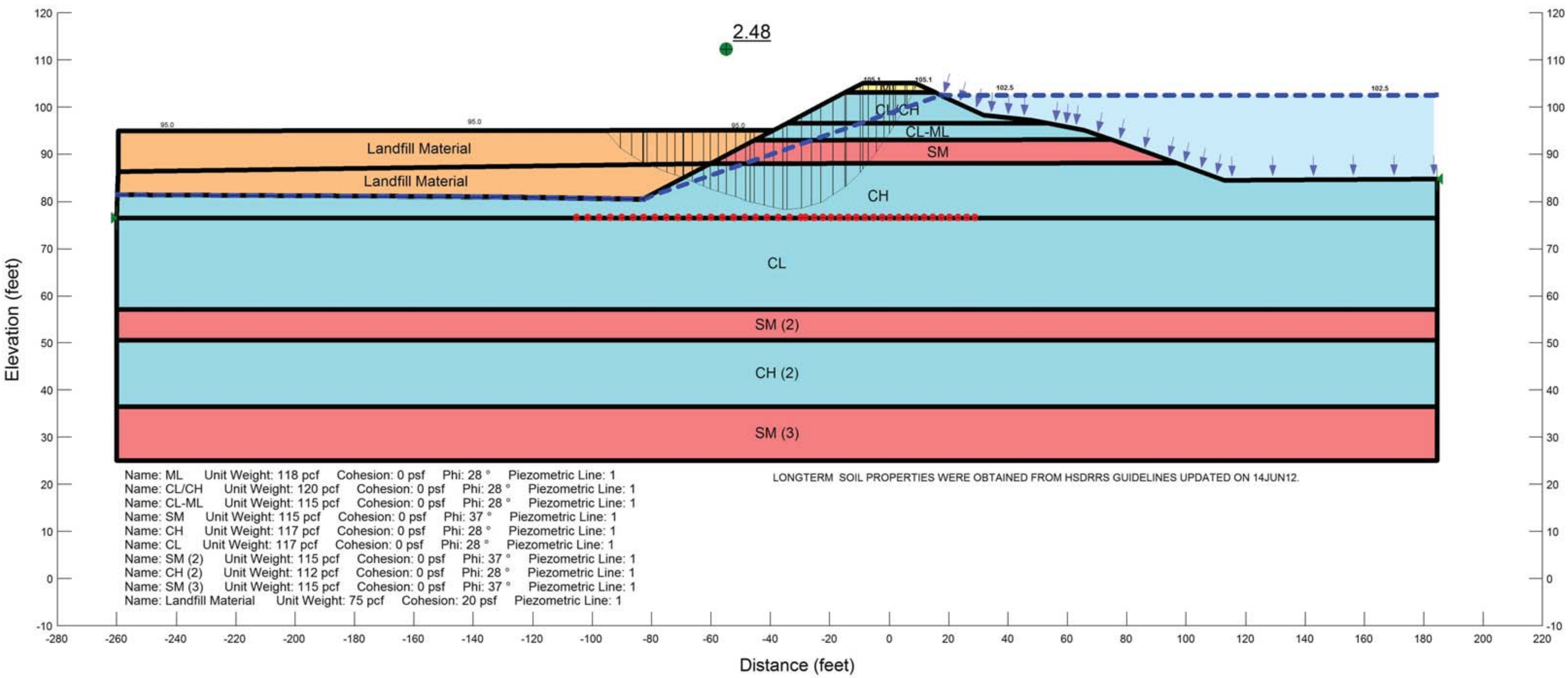
Boring Location Plan
Slope Stability Analysis Results

LA Highway 1
Interstate 49
LA Highway 121
Bottom Ash Pond
Fly Ash Pond
Ash Management Area
Leachate & Contact
Sorm Water Pond
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-14
B-15
ONE
TWO
THREE
Image USDA Farm Service Agency

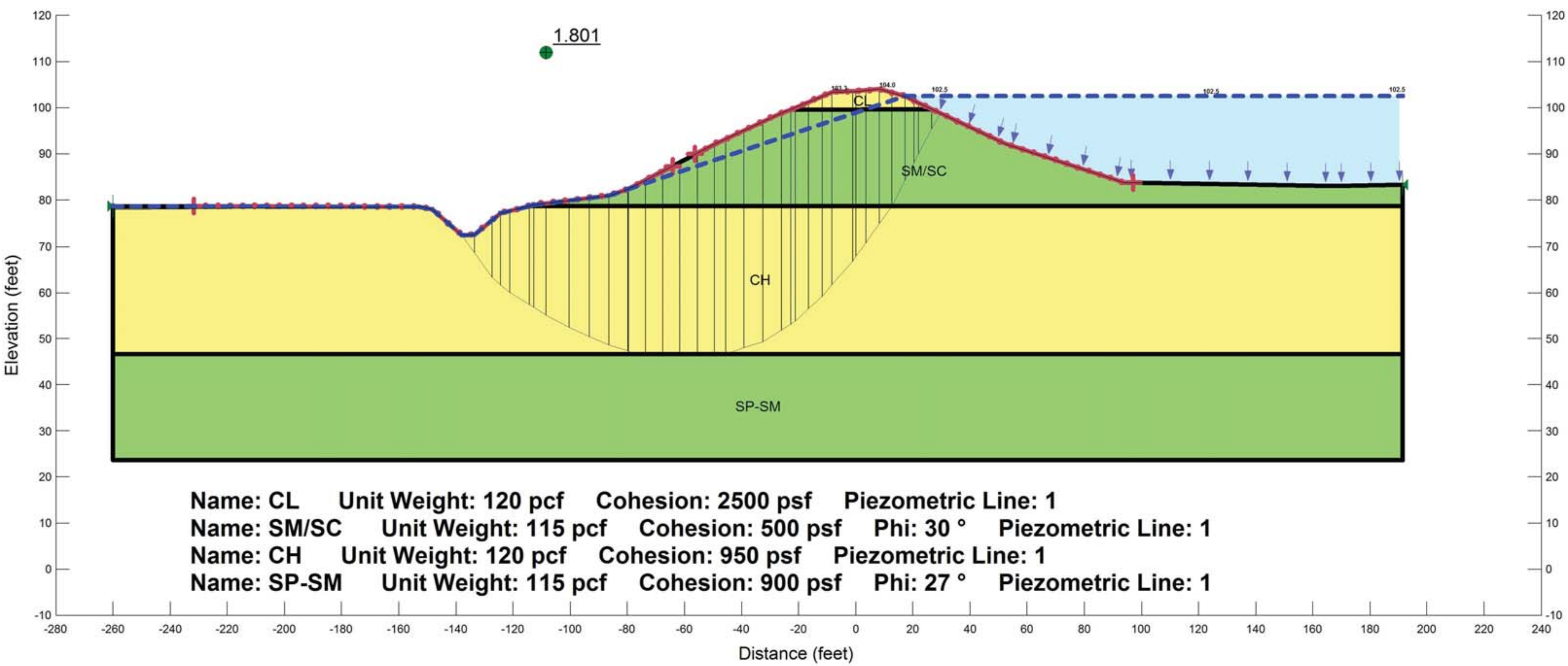
CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 1
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-15 (FROM GTL REPORT NO.: 04-16-061)



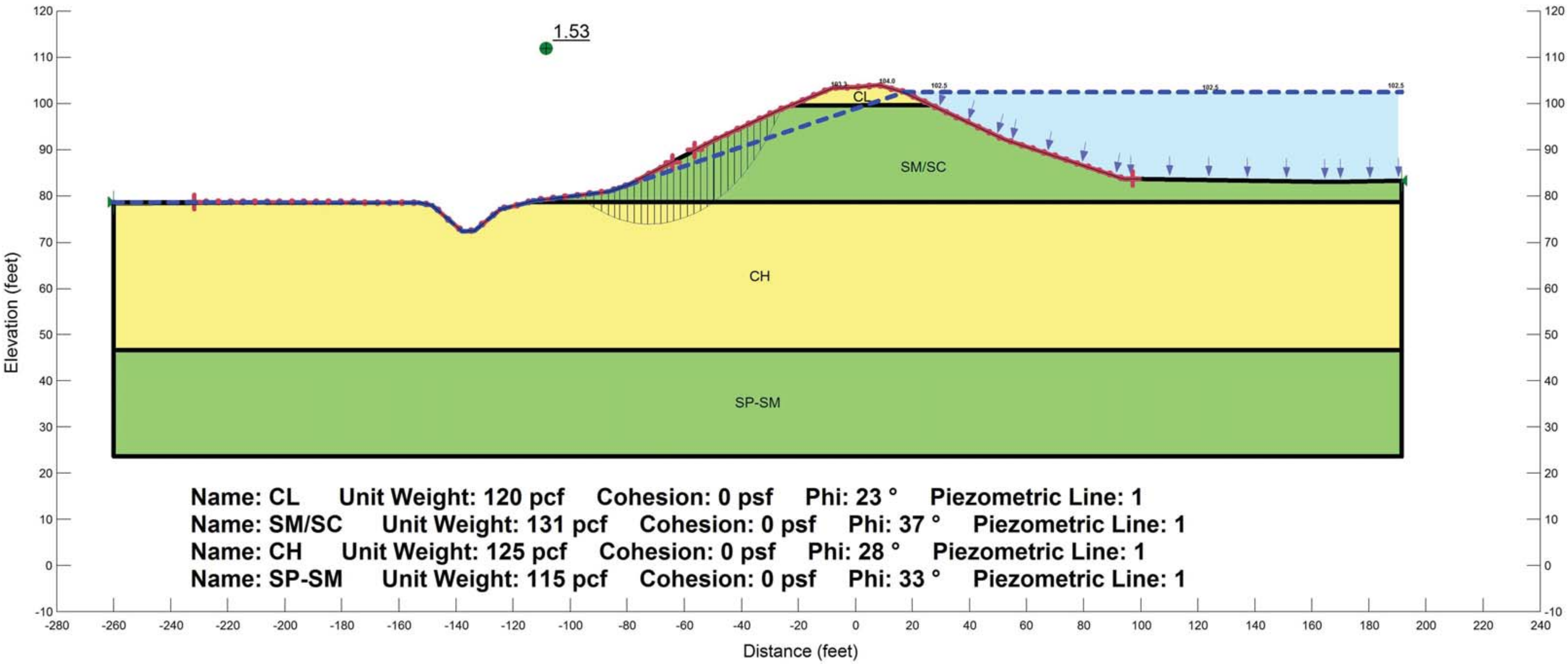
CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 1
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-15 (FROM GTL REPORT NO.: 04-16-061)



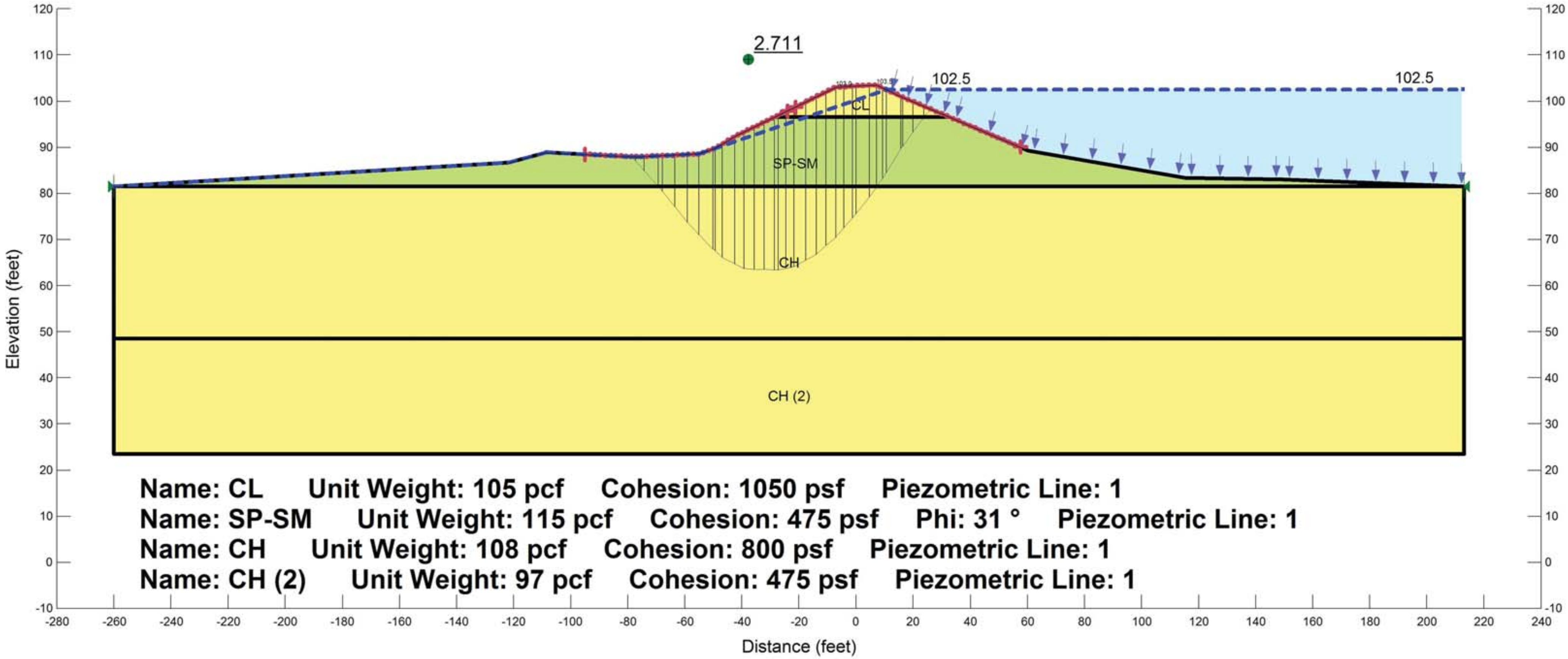
CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 2
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-6 (FROM GTL REPORT NO.: 06-11-090)



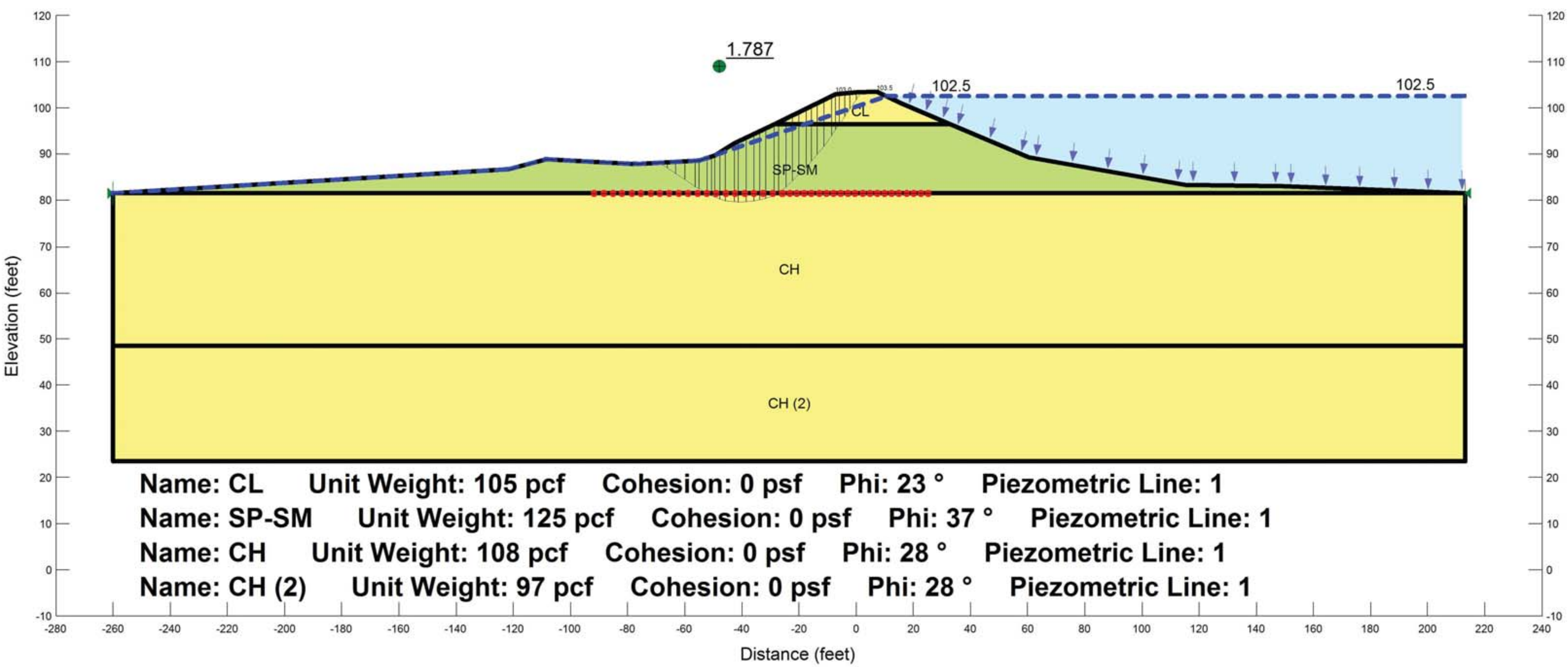
CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 2
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-6 (FROM GTL REPORT NO.: 06-11-090)



CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 3
SHORT TERM SLOPE STABILITY ANALYSIS
SOIL BORING B-8 (FROM GTL REPORT NO.: 06-11-090)



CLECO BRAME ENERGY CENTER
FLY ASH POND - SECTION 3
LONG TERM SLOPE STABILITY ANALYSIS (S-CASE)
SOIL BORING B-8 (FROM GTL REPORT NO.: 06-11-090)



APPENDIX B

P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR SAFETY FACTOR ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a safety factor assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.73(e)(1) CCR requirements. This safety factor assessment has determined that the Fly Ash Pond has met the following requirements:

- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.

And that these requirements were not applicable based on the findings:

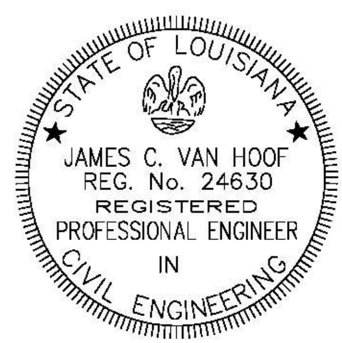
- The calculated seismic factor of safety must equal or exceed 1.00.
- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

James C. Van Hoof
Name

24630 | **LA**
Registration No. | State

James C. Van Hoof, P.E.
Signature

10/17/2016
Date



(Seal)

APPENDIX K

SUMMARY OF LINER CONSTRUCTION REPORTS

BOTTOM ASH POND

OCTOBER 2016

CLECO POWER LLC
Brame Energy Center

BOTTOM ASH POND CCR LINER VERIFICATION

Prepared By:

Providence Engineering and Environmental Group LLC
1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400
www.providenceeng.com

Project Number 002-191

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1.0 INTRODUCTION

Effective October 17, 2015, the U.S. Environmental Protection Agency (EPA) implemented final rule, 40 CFR 257, the Coal Combustion Residuals (CCR) regulations. Included in the final rule is 40 CFR 257.71, the liner requirements for CCR surface impoundments.

Cleco Power LLC (Cleco) has consulted with Providence Engineering and Environmental Group LLC (Providence) to determine if the bottom liner system in the Bottom Ash Pond CCR surface impoundment at the Brame Energy Center in Lena, Louisiana meets the liner requirements of the newly promulgated CCR regulations.

A Site Location Map and a Site Plan showing the location of the Bottom Ash surface impoundment within the facility is provided as **Figures 1** and **2**.

2.0 SUMMARY OF 40 CFR 257.71 LINER REQUIREMENTS

No later than October 17, 2016, the owner or operator of an existing CCR surface impoundment must document whether or not such unit was constructed with any one of the following:

a. A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec
b. A composite liner that meets the requirements of 257.70(b), or
c. An alternative composite liner that meets the requirements of 257.70(c)

The hydraulic conductivity of the compacted soil must be determined using recognized and generally accepted methods.

An existing CCR surface impoundment is considered to be an existing <u>unlined</u> CCR surface impoundment if either:

1. The owner or operator of the CCR unit is not constructed with a liner that meets the requirements of a, b, or c above, or
2. The owner or operator of the CCR unit fails to document whether the CCR unit was constructed with a liner that meets the requirements of a, b, or c above.

EPA defines a CCR surface impoundment in Part 257 as “a natural topographic depression, manmade excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores and disposes of CCR”.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer attesting that the documentation meets the requirements of 257.71.

3.0 BOTTOM ASH POND FACTS

As noted in the excerpts below from the 1981 solid waste permit application (**Attachment 1**) and the drawings within the application that were submitted to the Louisiana Department of Natural Resources, Solid Waste Management Division (LDNR), "the in situ clay in the upland terrace area that extended to about midway east/west of the Bottom Ash Pond met the permeability requirements".

A three-foot thick clay liner was placed over the exposed granular soils beyond the upland terrace area. The clay was placed in lifts of 8 to 10 inches and compacted with a "sheeps foot" roller. Laboratory permeability results on the recompacted samples ranged from 1.1 x 10^{-7} to 2.1 x 10^{-8} cm/sec. The liner permeability requirements as contained in the CCR rule were not met in all cases as shown with the 1.1 x 10^{-7} cm/sec data. No additional permeability verification laboratory results are available.

6.4.3.B.4) <u>Geological Characteristics</u>

a) Exhibits BA6.4.3.B.2-2 and 3 present the generalized soil conditions beneath the Bottom Ash Pond. The depth to ground water varies from 6 to 10 feet below grade. There is a very soft to medium stiff clay which extends to 20 feet (terminal depth of borings) in all of the borings except Boring 244. In that boring, the clay extended to 12 feet with a silty sand to sandy silt beneath. The laboratory coefficient of permeability for

the in situ clay varies from 1.3 x 10^{-8} to 3.5 x 10^{-8} cm/sec. As was shown in Exhibit BA6.4.3.B.1-1, the approximate limit of the insitu clay barrier is about midway of the Bottom Ash Pond. A 3 foot thick compacted clay layer was placed over the exposed granular soils on the bottom of the Bottom Ash Pond. The extent of the clay blanket was determined in the field by ensuring that the in situ clay had a minimum thickness of 3 feet. Laboratory permeability tests on recompacted samples of the clay varied from 1.1 x 10^{-7} to 2.1 x 10^{-8} cm/sec. and the Plasticity Index averaged 41 with an average liquid limit of 62 which classifies the soil as CH according to the Unified Soil Classification System. The clay liner was placed in horizontal lifts of 8 to 10 inches and was compacted with "sheeps foot" compaction equipment. The 3 foot compacted clay liner coupled with the in situ clay layer should form an effective barrier to liquid waste migration to the ground water.

However, as shown below in the responses to the DNR, (**Attachment 2**), Cleco responded that “if it cannot be shown that these permeable soils are isolated by impermeable soils, they will be replaced with an impermeable liner.” Also, it should be noted that the boring locations D-19 and 231 are actually located in the Fly Ash Pond area and this was supposed to be corrected with the second phase of the construction of the Fly Ash Pond.

Bottom Ash Pond

Section 6.4.3.B.4

Q) Where is the bottom contour of the Bottom Ash Pond in relation to the subsurface diagram?

A) Revised diagrams showing the bottom contour were distributed.

Section 6.4.3.C.3.b.i

Q) What portions of the Bottom Ash Pond would the 3-foot clay liner be placed on?

A) The lining will be placed on the portion of the Bottom Ash Pond cut into what was the original upland terrace.

Q) There are localized areas of permeable soils at boring locations D-19 and 231. Can these be excavated and replaced with liner material?

A) If it cannot be shown that these permeable soils are isolated by impermeable soils, they will be replaced with an impermeable liner.

4.0 BOTTOM ASH POND LINER PERMEABILITIES

Cleco's 1981 Bottom Ash Pond solid waste permit application (**Attachment 1**) contains the following information:

Section 6.4.3.B.4.a of permit application:

- Soft to medium stiff clay is at least 12 feet thick below the Bottom Ash Pond
- Laboratory coefficient of permeability for the in situ clay varies from 1.3 x 10^{-8} to 3.5 x 10^{-8} cm/sec
- The approximate limit of the in situ clay barrier is about midway east/west of the Bottom Ash Pond
- 3 foot-thick clay layer was placed over the exposed granular soils on the bottom of the Bottom Ash Pond
- The extent of the clay blanket was determined in the field by ensuring that the in situ clay had a minimum thickness of 3 feet
- Laboratory permeability tests on recompacted samples of the clay varied from 1.1x 10^{-7} to 2.1 x 10^{-8} cm/sec
- Soils were classified as CH according to the Unified Soil Classification System
- Clay liner was placed in horizontal lifts of 8 to 10 inches and was compacted with "sheeps foot" compaction equipment

Work was certified by the engineering firm of Sargent & Lundy and the Professional Engineer "supervised preparation of the design, plans, and specifications for the Unit 2 Bottom Ash Pond and equipment associated with such ponds". And to the best of his knowledge, "the design, plans, and specifications of the above mentioned waste disposal facilities at Rodemacher Power Station, Unit 2, meet applicable requirements of the Louisiana Solid Waste Rules and Regulations".

5.0 CLAY LINER SAMPLING ACTIVITIES

In order to verify the clay liner thickness and permeabilities in those locations that Cleco did not have enough verifiable information, seven Shelby tubes were installed in the clay liner for the collection of clay liner samples in the Bottom Ash Pond as shown on **Figure 3**.

The specific methods that were followed for the collection of the clay liner samples are summarized in the following sections.

5.1 Clay Liner Sampling

Providence contracted a Louisiana licensed driller to provide personnel and equipment, including a drilling rig mounted on a track propelled marsh buggy, to collect undisturbed samples of the clay liner in the bottom of the Bottom Ash Pond. The marsh buggy was positioned at the sample locations based on survey data points.

A temporary surface casing was used to compliment sampling and retraction grouting procedures. The materials at the mud-line were hand probed. If soft unconsolidated material was present, a 4" nominal diameter temporary surface casing was lightly pressed into place. If harder materials were present, they were broken up in order to place the temporary surface casing. For mechanical breaking of the surface material, the driller utilized Geoprobe "pre-probing tools", followed by, or in combination with, a frost auger or other solid/hollow stem auger. The express intent of this action was to only break hardened sediments (and not significantly penetrate the clay liner) such that the surface casing could be installed.

As stated above, Cleco collected seven (7) samples of the clay liner in the Bottom Ash Pond. A temporary surface casing was used at each sampling location. Undisturbed Shelby tubes were pushed to collect unconsolidated and consolidated soil matrices from the bottom of the pond, not impoundment sediments. Shelby tube samples were collected in approximately two foot intervals.

All sample locations were plugged and abandoned using CETCO 3/8 diameter coated bentonite pellets. The coated pellets are designed to "drop" through water and hydrate once they "fall" in-place. The pellets were dropped through the temporary surface casing described above. The amount placed was calculated based on the diameter of the soil boring and depth of penetration below the sediment line. Once the pellets were in-place, the surface casing was removed.

5.2 Sample Collection and Handling

Sample Handling

The Shelby tubes containing the undisturbed soil samples were capped on the tops and bottoms, and retained in as vertical position as possible and the samples were handled with care in order to minimize disturbance. The Shelby tubes were not opened in the field but were brought to the contract geotechnical laboratory where they were opened and examined for overall sample quality. A representative sample of the material in the Shelby tube was collected for the permeability testing and Atterberg limit determination.

6.0 LABORATORY ANALYSES

Providence subcontracted to APS Engineering and Testing (APS) geotechnical testing laboratory to conduct Atterberg limit determinations for the clay liner material obtained from each sample from the bottom of the pond in accordance with ASTM D 4318 and to conduct hydraulic conductivity analysis (permeability) on the samples of the clay liner material obtained from the bottom of the pond in accordance with ASTM D 5084. The results of the Atterberg limit determinations and hydraulic conductivity analysis were compared to the liner requirements for CCR facilities contained in the recently promulgated regulations.

7.0 DATA EVALUATION AND REPORTING

The geotechnical data from the original application and follow-up information to LDNR is shown in **Table 1** below for the Bottom Ash Pond.

Table 1 Bottom Ash Pond Permeabilities (Historical)

Boring ID	Unified Soil Classification	Liquid Limit	Plastic Limit	Plasticity Index	Permeability cm/sec
246	CH	69	22	47	1.3×10^{-8}
247	CH	87	24	63	2.3×10^{-8}

APS completed the Atterberg limit determinations and the permeability analysis for the samples obtained from the Bottom Ash Pond which are shown in **Attachment 3**. Photos depicting samples of the clay liner material obtained from the bottom of the Bottom Ash pond are shown in **Attachment 4.** All of the samples tested met the permeability requirements as shown in **Table 2** below. Based on the sample specimens obtained, the liner met or exceeded the two feet of compacted clay required by the CCR regulations for the Bottom Ash Pond. This data reinforces the data from the original permit application and any follow-up information provided to LDNR.

Table 2 Bottom Ash Pond Permeabilities (Additional Data)

Boring ID	Clay Type	Liquid Limit	Plastic Limit	Plasticity Index	Permeability cm/sec
AB-1	Grayish Brown Clay	64	20	44	3.4×10^{-8}
AB-2	Grayish Brown Clay	69	24	45	8.1×10^{-8}
AB-3.1	Brown Clay	71	26	45	6.5×10^{-8}
AB-4.1	Yellowish Brown Clay	51	22	29	6.6×10^{-8}
AB-5	Dark Brown Clay	81	26	55	4.5×10^{-8}
AB-6	Yellowish Brown Clay	102	37	65	8.9×10^{-8}
AB-7	Dark Brown Clay	96	36	60	8.1×10^{-8}

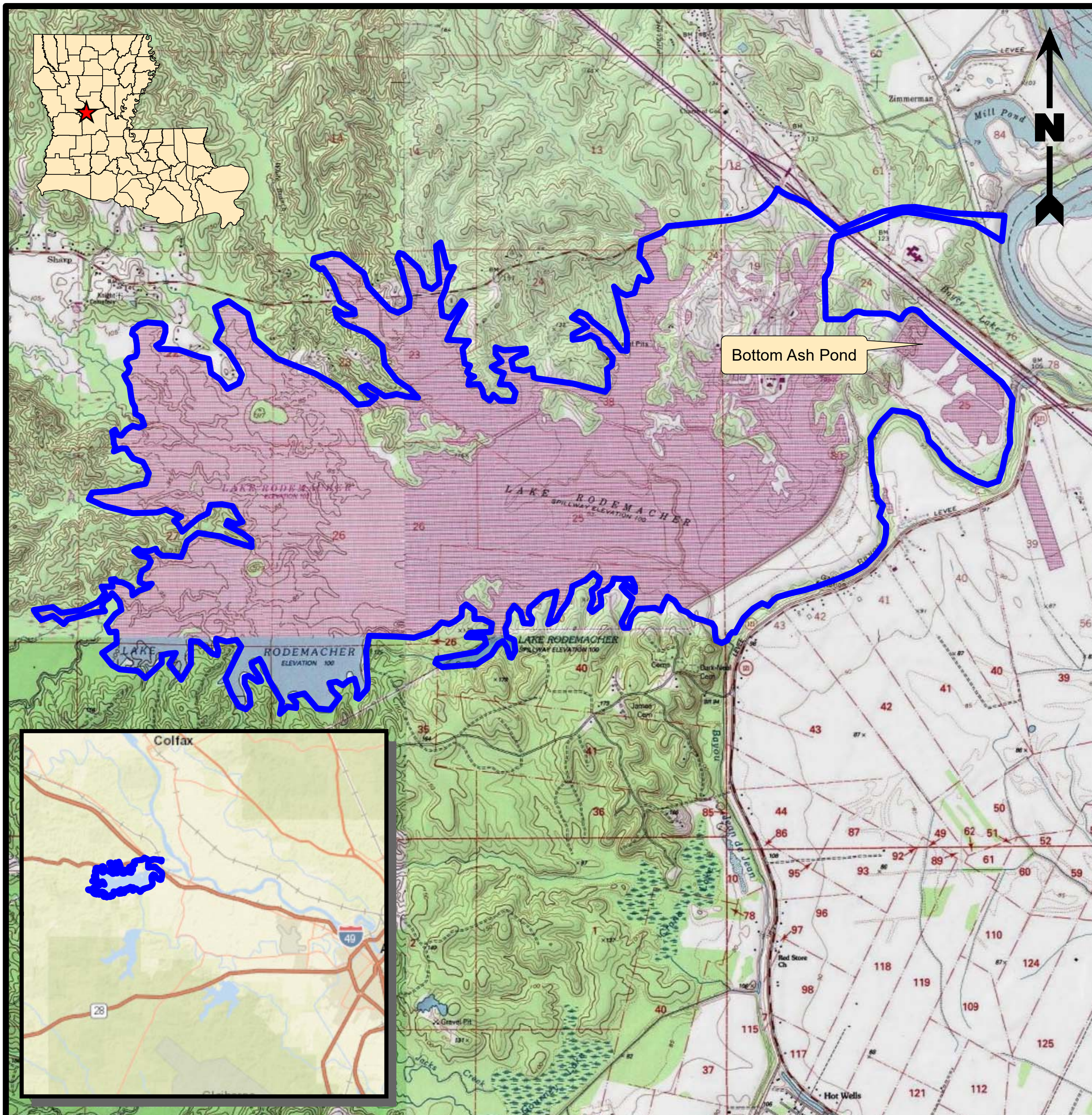
8.0 CONCLUSIONS

Providence reviewed the existing information that was completed when the Bottom Ash Pond was constructed and noted that Cleco intended to have a three-foot “compacted” clay liner in place for the Bottom Ash Pond that met the regulatory permeability requirements at the time of construction. Available information for the Bottom Ash Pond is noted in **Table 1**. Providence could not locate all of the laboratory permeability results for the liner in the Bottom Ash Pond, therefore, additional undisturbed samples of the clay liner were obtained to verify the thickness of the clay liner and to verify the permeability of the bottom liner system. Based on the information in **Table 1**, along with the additional data in **Table 2**, Providence confirms that a liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec is in-place for the Bottom Ash Pond at Brame Energy Center.

Based on the results for the liner verification, the existing clay liner for the Bottom Ash Pond meets the liner verification requirements of the CCR regulations at 40 CFR 257.71. **Attachment 5** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000
Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Liner Verification - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number
002-191
Drawing Number
002-191-A006

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000 Feet

Site Map

Liner Verification - Bottom Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

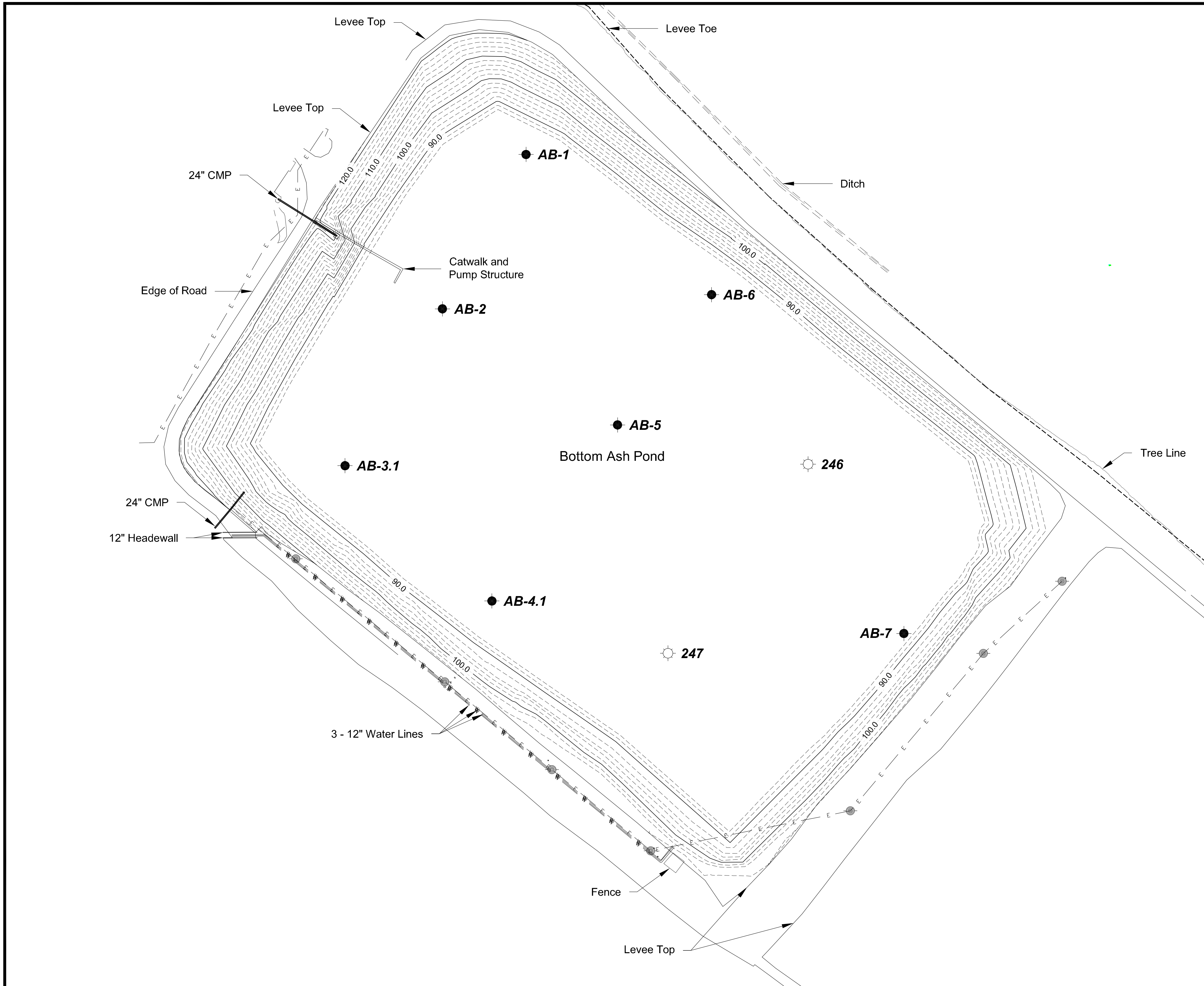
PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number 002-191	2 Figure
Drawing Number 002-191-B007	

FIGURE 3

BOTTOM ASH POND LINER VERIFICATION



Legend

Major Contour (10' Interval)

Minor Contour (2' Interval)

Overhead Electric Line

Water Line

Power Pole

Boring Location

Boring Location Taken at Time of Construction

Note

Above grade contours and features presented are comprised of survey data obtained in June of 2015. The survey contours for the ash material were removed to depict the bottom contours of the pond. The pond contours underneath the ash material and in the pond bottom are a combination of survey data collected in June of 2015 and elevation data obtained from historical figures.

200 0 200

Scale: 1" = 200'

Bottom Ash Pond Liner Verification

Clay Liner Verification

Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	09/14/16
Checked By	LMH	09/14/16
Approved By	CVH	09/14/16

Project Number 002-191

Drawing Number 002-191-B004

3 Figure

ATTACHMENT 1

1981 PERMIT APPLICATION BOTTOM ASH POND SECTION

6.4.3.B SITE MASTER PLAN FOR UNIT 2, BOTTOM ASH POND

6.4.3.B.1) Site Plan for Bottom Ash Pond

a) Exhibit BA6.4.3.B.1-1 shows the Bottom Ash Pond with original and final contours. The Bottom Ash Pond is located on both alluvial and terrace deposits. The surface area of the pond is 36 acres at elevation 106. The dikes built for the pond have a slope of 3 horizontal to 1 vertical. Four inches of seeded top soil are placed on the outward portions of the dikes for erosion control. The limits of execavation were controlled by the required design size. The ash pipe corridor is also shown in Exhibit BA6.4.3.B.1-1 along with the discharge channel to the NPDES discharge point. Cross sections of the bottom ash dikes and other details are shown in Exhibit BA6.4.3.B.1-2.

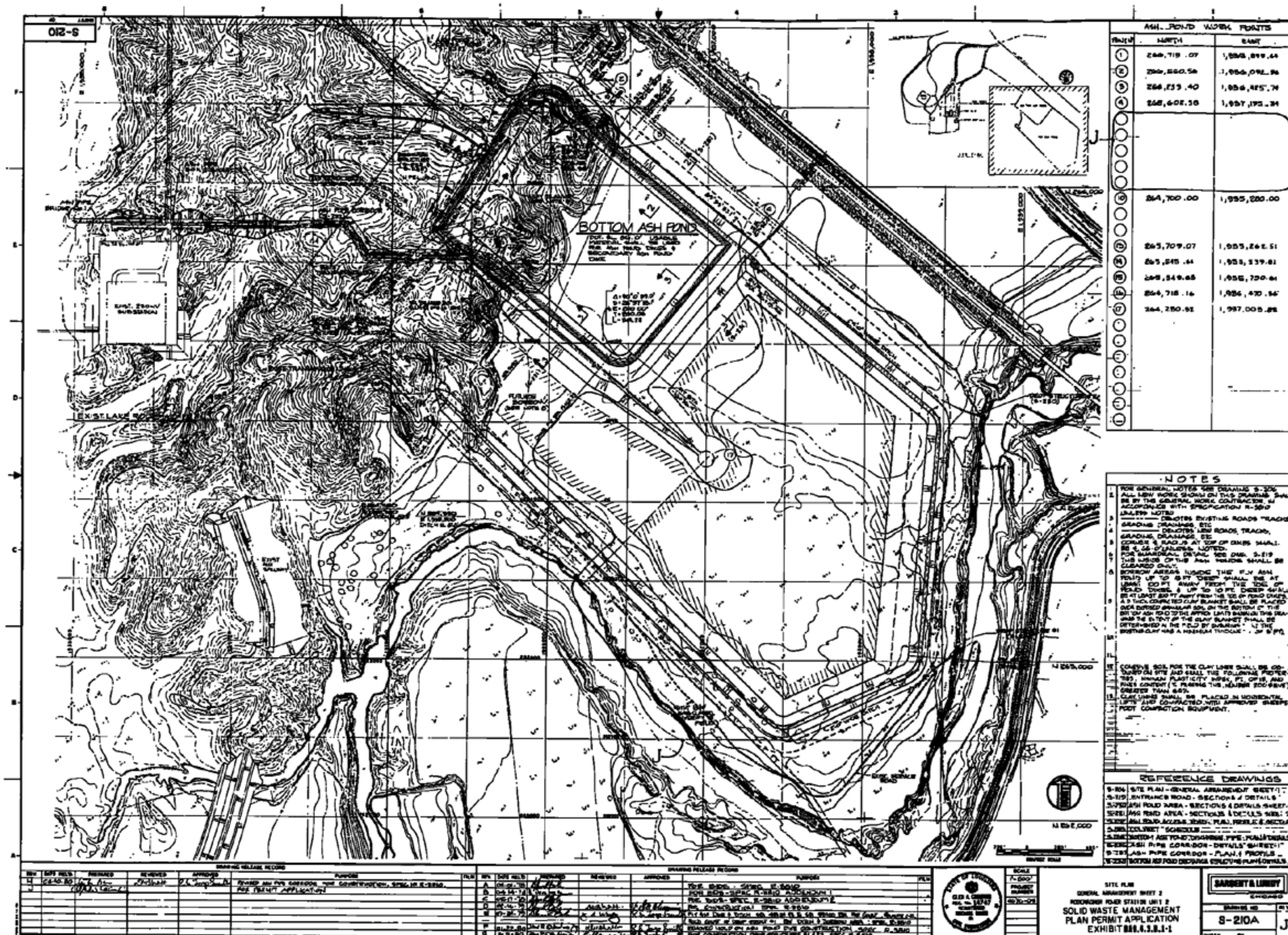
b) Peripheral fencing is not planned for the Bottom Ash Pond since the disposal facility is within the station proper and access is controlled.

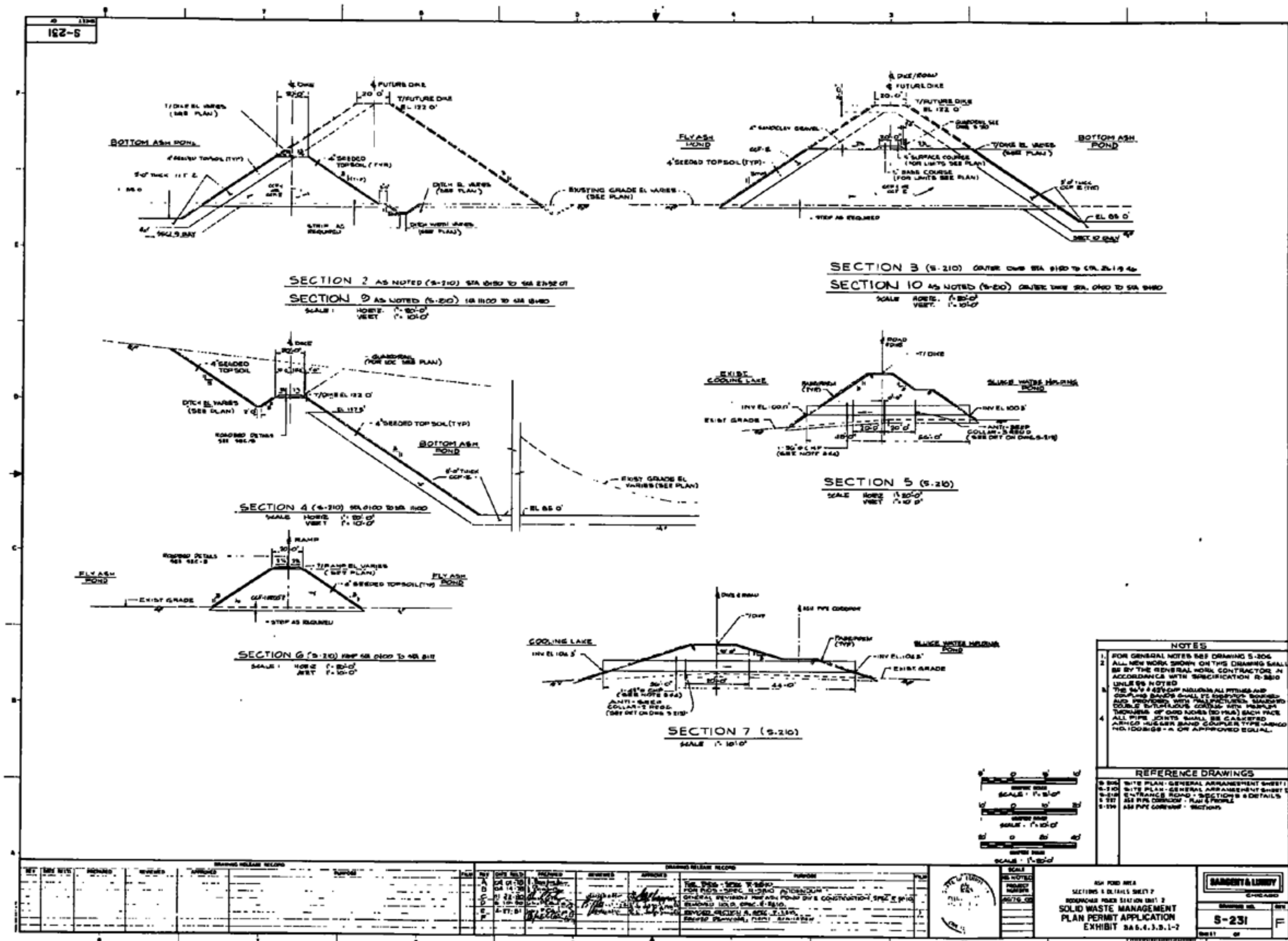
c) The size of the pond was designed to accommodate the bottom ash ~~sludge~~ expected to be generated over the lifetime of Unit 2. It is not planned to monitor the daily quantities put into the Bottom Ash Pond beyond normal plant engineering practice of every few years recording an elevation of the top of the sludge and computing the remaining volume versus projected disposal volumes.

d) The waste in the Bottom Ash Pond is non-combustible, thus no special fire protection facilities are planned.

e) The surface area of the Bottom Ash Pond is 36 acres at elevation 106 with a storage volume of 740 acre feet. The bottom ash waste will be disposed of by sluicing versus sequential filling because the facility is a pond rather than a landfill.

f) No leachate collection or treatment facilities are needed for the liquid waste pumped to the Bottom Ash Pond. The design of the facility incorporates an impermeable silty clay liner


BOTTOM ASH POND
ASH POND WORK POINTS
NORTH
EAST
264,700.00
1,955,280.00
NOTES
FOR GENERAL NOTES SEE DRAWING S-206
ALL NEW WORK SHOWN ON THIS DRAWING SHALL BE BY THE GENERAL WORK CONTRACTOR, IN ACCORDANCE WITH SPECIFICATION R-3910 UNLESS NOTED
DENOTES EXISTING ROADS, TRACKS, GRADING, DRAINAGE, ETC
DENOTES NEW ROADS, TRACKS, GRADING, DRAINAGE, ETC
FOR GUARDRAIL DETAIL SEE DWG. S-219
REFERENCE DRAWINGS
ASH PIPE CORRIDOR - PLAN & PROFILE
SITE PLAN
GENERAL ARRANGEMENT SHEET 2
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
SARGENT & LUNDY
CHICAGO
S-210A
J


S-231
BOTTOM ASH POND
FLY ASH POND
COOLING LAKE
EXISTING GRADE EL VARIES (SEE PLAN)
4" SEEDED TOPSOIL (TYP)
STRIP AS REQUIRED
EL 85.0'
SECTION 2 AS NOTED (S-210)
SECTION 9 AS NOTED (S-210)
SCALE: HORIZ 1" = 20'-0" VERT 1" = 10'-0"
SECTION 3 (S-210)
SECTION 10 AS NOTED (S-210)
SECTION 4 (S-210)
SECTION 5 (S-210)
SECTION 6 (S-210)
SECTION 7 (S-210)
NOTES
1. FOR GENERAL NOTES SEE DRAWING S-206
2. ALL NEW WORK SHOWN ON THIS DRAWING SHALL BE BY THE GENERAL WORK CONTRACTOR IN ACCORDANCE WITH SPECIFICATION R-2810 UNLESS NOTED
3.
4. ALL PIPE JOINTS SHALL BE GASKETED ARMCO HUGGER BAND COUPLER TYPE ARMCO OR APPROVED EQUAL.
REFERENCE DRAWINGS
SITE PLAN - GENERAL ARRANGEMENT SHEET 1
SITE PLAN - GENERAL ARRANGEMENT SHEET 2
ENTRANCE ROAD - SECTIONS & DETAILS
ASH PIPE CORRIDOR - PLAN & PROFILE
ASH PIPE CORRIDOR - SECTIONS
ASH POND AREA
SECTIONS & DETAILS SHEET 2
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
EXHIBIT
SARGENT & LUNDY
CHICAGO
S-231
F

within the dike and over the western portion (see Exhibit BA6.4.3.B.1-1 for limits) with a natural silty clay liner along the remaining bottom portion of the pond.

g) A wind rose applicable to the entire setting of the station is shown on Exhibit 6.4.3.A.1-1.

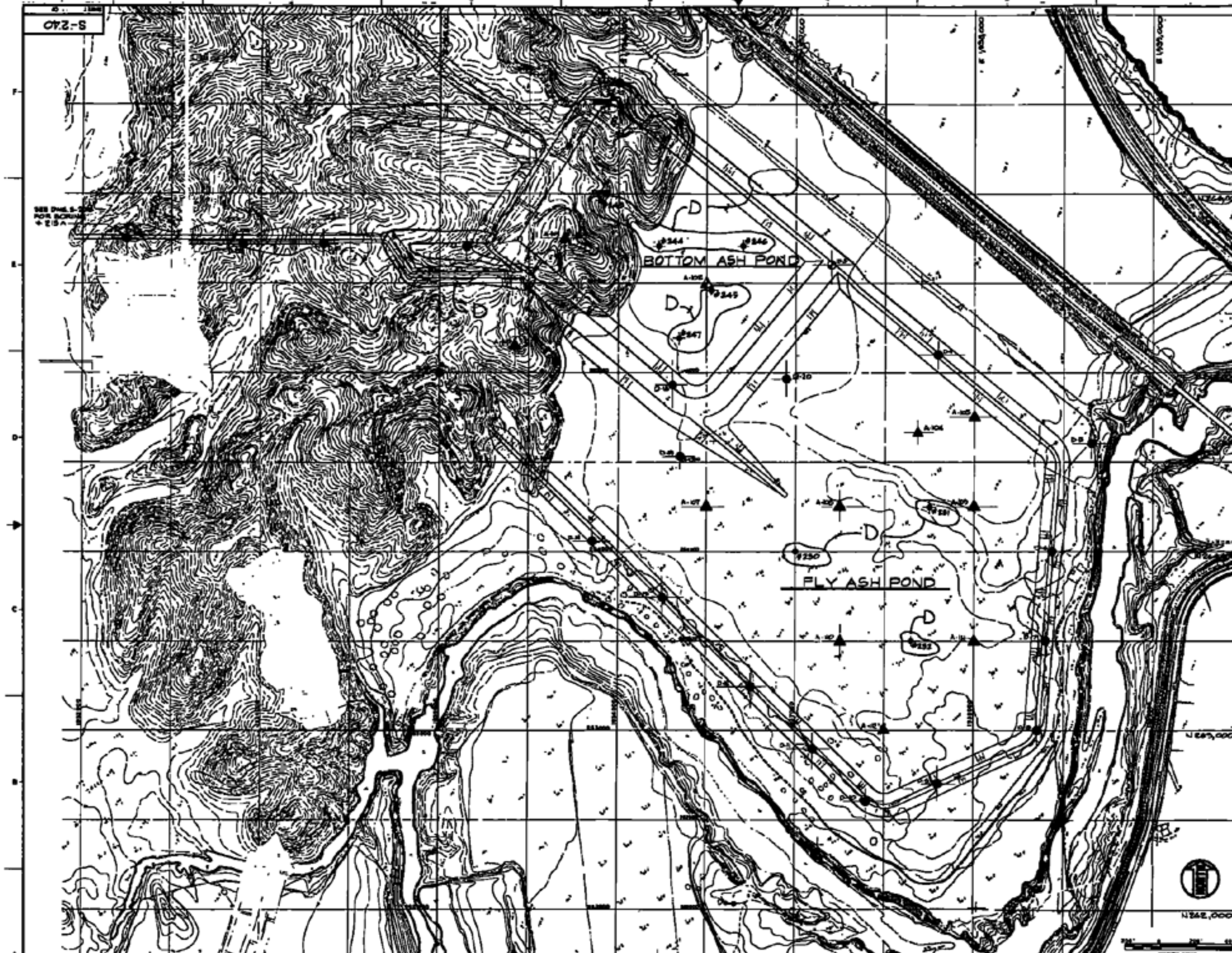
h) The waste to the Bottom Ash Pond will be a slurry so no provisions are necessary for litter control.

i) The design of the facilty is such that all trees surrounding the pond have been left not only for erosion control but also as a landscape consideration. The exterior embankments of the impoundment have been seeded. Users of LA Highways #1 and #8 and boaters on Lake Rodemacher cannot see the Bottom Ash Pond.

6.4.3.B.2) Hydrological Characteristics for Bottom Ash Pond:

a) The locations of the five borings in the Bottom Ash Pond are shown on Exhibit BA6.4.3.B.2-1. The borings, spaced between 150 and 200 feet apart, extended to 20 feet below construction grade. A northwest to southeast cross section is shown as section A-A on Exhibit BA6.4.3.B.2-2 and a southwest to northeast soil profile is shown on Exhibit BA6.4.3.B.2-3. The regional direction of ground water flow is generally to the east-southeast which is the direction of ground water flow under the Bottom Ash Pond. The borings, which were drilled to confirm the thickness of available clay liner, are within the Red River alluvial deposits and the ground water at this facility is probably hydrologically connected to the bayou. There is no evidence, however, to hydraulically connect this upper aquifer to the much deeper aquifer in the Miocene deposits which are used as a source of drinking water in the vicinity.

b) Section 6.4.3.A.2 presents further details on the ground water withdrawal rates as well as major users in the vicinity. There are irrigation wells within the vicinity of the Bottom Ash Pond but no drinking water wells.



PROPOSED BORINGS

BORING NO.	LOCATION		DEPTH
A-101	N 258,750.00	E 1,919,700.00	22.0 FT.
A-102	N 255,500.00	E 1,916,500.00	30.0 FT.
A-103	N 255,150.00	E 1,915,427.00	20.0 FT.
A-104	N 254,671.56	E 1,917,482.24	15.0 FT.
A-105	N 254,750.00	E 1,918,000.00	15.0 FT.
A-106	N 254,500.00	E 1,915,500.00	20.0 FT.
A-107	N 264,250.00	E 1,916,500.00	15.0 FT.
A-108	N 254,250.00	E 1,917,250.00	20.0 FT.
A-109	N 254,250.00	E 1,918,000.00	15.0 FT.
A-110	N 253,750.00	E 1,917,250.00	15.0 FT.
A-111	N 253,500.00	E 1,918,000.00	15.0 FT.
A-112	N 260,000.00	E 1,917,500.00	15.0 FT.
D-1	N 256,450.00	E 1,916,000.00	75.0 FT.
D-2	N 256,100.00	E 1,914,930.00	50.0 FT.
D-3	N 255,600.00	E 1,917,200.00	50.0 FT.
D-4	N 255,100.00	E 1,917,807.00	50.0 FT.
D-5	N 254,600.00	E 1,918,690.00	50.0 FT.
D-6	N 254,000.00	E 1,918,437.00	50.0 FT.
D-7	N 253,900.00	E 1,918,995.00	50.0 FT.
D-8	N 253,000.00	E 1,918,250.00	50.0 FT.
D-9	N 252,500.00	E 1,917,800.00	50.0 FT.
D-10	N 252,600.00	E 1,917,400.00	50.0 FT.
D-11	N 252,900.00	E 1,917,100.00	50.0 FT.
D-12	N 255,250.00	E 1,916,750.00	50.0 FT.
D-13	N 250,750.00	E 1,915,250.00	50.0 FT.
D-14	N 254,060.00	E 1,915,850.00	50.0 FT.
D-15	- - - - - - DELETED - - - - - -		
D-16	N 255,000.00	E 1,919,000.00	75.0 FT.
D-17	N 255,720.00	E 1,919,750.00	75.0 FT.
D-18	N 254,950.15	E 1,916,905.78	50.0 FT.
D-19	N 258,370.00	E 1,916,350.00	50.0 FT.
D-20	N 254,941.85	E 1,916,946.15	50.0 FT.
D-21	N 257,700.00	E 1,914,750.00	50.0 FT.
D-22	N 261,720.00	E 1,911,900.00	50.0 FT.

LEGEND

- PROPOSED DESIGN BORINGS
- DRILLED DESIGN BORINGS
- PROPOSED AUGER BORINGS
- DRILLED AUGER BORINGS

NOTES

1. BORINGS D-3, D-4, D-8, D-9, D-12, D-13, D-17, AND D-18 SHALL HAVE SHELBY TUBE SAMPLES TAKEN ONLY AT DEPTHS OF 2.5, 5.0, 10.0, 15.0, 25.0, AND 35.0 FEET UNLESS OTHERWISE SPECIFIED BY THE CONSULTING ENGINEERS.
2. THE REMAINING DESIGN (D SERIES) BORINGS SHALL HAVE SPLIT-BARREL SAMPLING UNLESS OTHERWISE SPECIFIED BY THE CONSULTING ENGINEERS.
3. SOIL BORING WORK SHALL BE IN ACCORDANCE WITH THE TECHNICAL REQUIREMENTS FOR SOIL BORING WORK TO WHICH THIS DRAWING HAS BEEN ATTACHED.

REFERENCE DRAWINGS

S-206	SITE PLAN-GENERAL ARRANGEMENT SHEET-1
S-210	SITE PLAN-GENERAL ARRANGEMENT SHEET-2

DRAWING RELEASE RECORD

REV	DATE	PURPOSE
A	11-15-78	FOR REFERENCE
B	10-25-79	RECORD REVISION FOR BORINGS
C		REVISED DRAWING NUMBER
D		RECORD DRAWING PERMIT APPLICATION

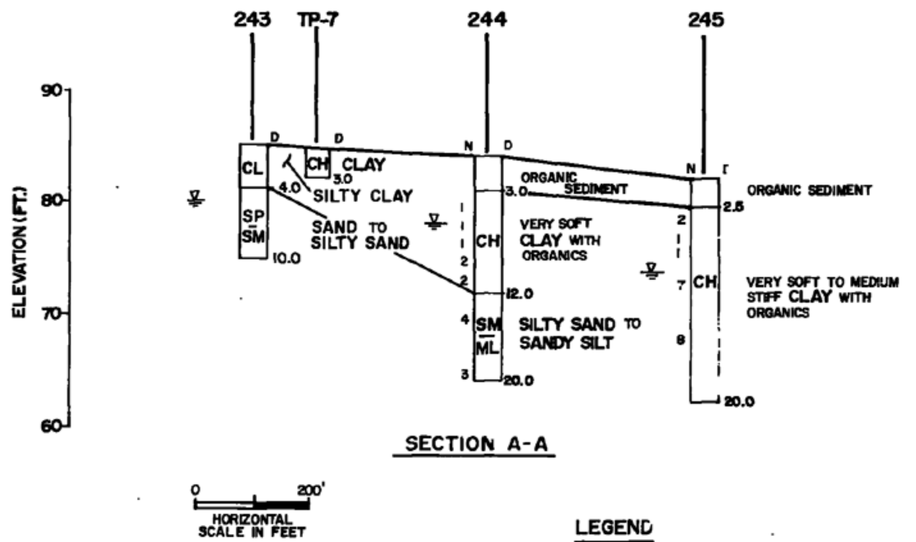
SCALE 1"=200'

BORING LOCATION
PLAN
ROCKPORT POWER STATION UNIT 2
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
EXHIBIT 800.4.3.8.2-1

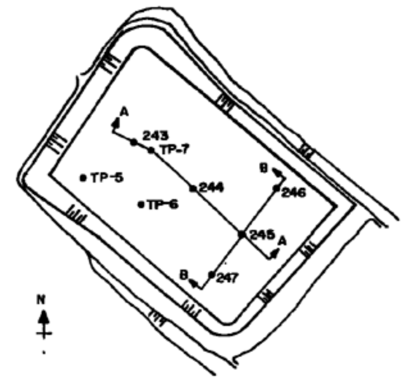
SARGENT & LUNDY
CHICAGO

DRAWING NO. S-240 REV D

FORMERLY S-235



SECTION A-A



PLAN
N.T.S.

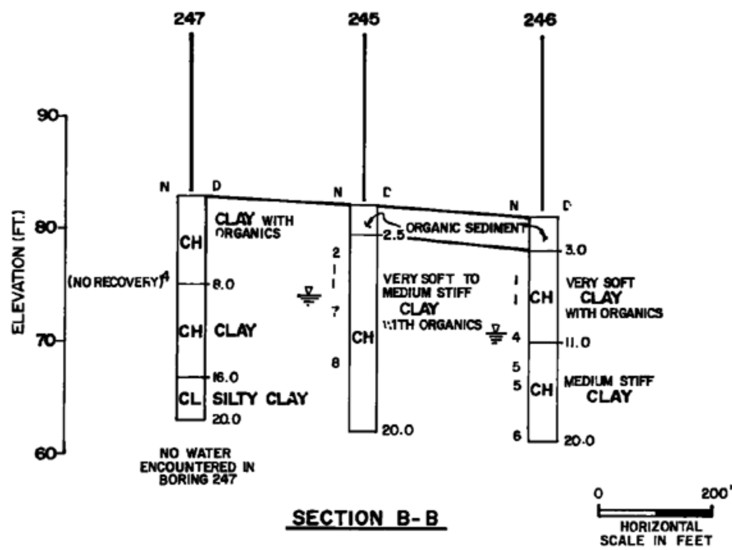
LEGEND

TP = TEST PIT
D = DEPT IN FEET
N = STANDARD PENETRATION TEST, BLOWS PER FOOT
= GROUND WATER LEVEL

GENERALIZED SUBSURFACE DIAGRAM - SECTION A-A
BOTTOM ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT BA 6.4.3.B.2-2



SECTION B-B

LEGEND

D = DEPTH IN FEET

N = STANDARD PENETRATION TEST, BLOWS PER FOOT

▽ = GROUND WATER LEVEL

NOTE

1. FOR BORING LOCATION PLAN, SEE SECTION A-A.

GENERALIZED SUBSURFACE DIAGRAM - SECTION B-B BOTTOM ASH POND
RODEMACHER POWER STATION UNIT 2 SOLID WASTE MANAGEMENT PLAN PERMIT APPLICATION EXHIBIT BA 6.4.3.B.2-3

c) The uppermost freshwater aquifer beneath the Bottom Ash Pond, as recorded in the boring logs, is between 6 feet and 9 feet below grade. The depth to the nearest aquifer used for drinking water should be between 50 and 200 feet below grade.

6.4.3.B.3) Surface Drainage Information

a) There will be no surface streams directed through the Bottom Ash Pond. The pond is a completely diked facility except on the northwestern portion where excavation into a hillside was necessary. There is a perimeter interceptor ditch on the northwestern portion of the pond which should divert surface water run on.

b) Above-ground pipes carry the bottom ash sluice to the Bottom Ash Pond. The decanted water will overflow via the discharge channel to the NPDES permitted discharge point number 004. (For further details on NPDES permit conditions and discharge points, see the attachment to Part I of this application.)

c) The 25-year, 24-hour maximum rainfall for the Bottom Ash Pond is 9 inches according to U.S. Weather Bureau data. Any rainfall event up to or exceeding the 25-year, 24-hour maximum will flow out of the pond at its outfall.

d) Discharge water from the Bottom Ash Pond will be handled by a weir box pipe structure and channel located on the northwest side. There is no need for a dewatering plan beyond the normal operating procedures.

6.4.3.B.4) Geological Characteristics

a) Exhibits BA6.4.3.B.2-2 and 3 present the generalized soil conditions beneath the Bottom Ash Pond. The depth to ground water varies from 6 to 10 feet below grade. There is a very soft to medium stiff clay which extends to 20 feet (terminal depth of borings) in all of the borings except Boring 244. In that boring, the clay extended to 12 feet with a silty sand to sandy silt beneath. The laboratory coefficient of permeability for the in situ clay varies from 1.3×10^{-8} to 3.5×10^{-8} cm/sec. As was shown in Exhibit BA6.4.3.B.1-1, the approximate limit of the insitu clay barrier is about midway of the Bottom Ash Pond. A 3 foot thick compacted clay layer was placed over the exposed granular soils on the bottom of the Bottom Ash Pond. The extent of the clay blanket was determined in the field by ensuring that the in situ clay had a minimum thickness of 3 feet. Laboratory permeability tests on recompacted samples of the clay varied from 1.1×10^{-7} to 2.1×10^{-8} cm/sec. and the Plasticity Index averaged 41 with an average liquid limit of 62 which classifies the soil as CH according to the Unified Soil Classification System. The clay liner was placed in horizontal lifts of 8 to 10 inches and was compacted with "sheeps foot" compaction equipment. The 3 foot compacted clay liner coupled with the in situ clay layer should form an effective barrier to liquid waste migration to the ground water.

A summary of the laboratory test results is presented in Table BA6.4.3.B.4-1.

6.4.3.B.5) Environmental Characteristics for Bottom Ash Pond:

a) There are no known historical or archaeological sites within 1000 feet of the Bottom Ash Pond. No habitats for endangered species or other sensitive ecological species are within 1000 feet of the Bottom Ash Pond.

The basis for the statements is the 1972-1973 ecological studies of the environment at the Rodemacher Station. The survey addressed in detail the terrestrial wildlife, the aquatic life, and vegetation in the area. Since that time the station and lake have been constructed and the immediate area of the station, including the Bottom Ash Pond, is one of an industrial setting.

TABLE BA 6.4.3.B.4-1

SUMMARY OF LABORATORY TESTS
BOTTOM ASH POND

Feature	Boring No. Sample No.	Bottom of Sample Depth, Ft.	Particle Size Analysis (% Passing) (2) No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Atterberg Limits (3) Liquid Limit (°/o)	Plastic Limit (°/o)	Plasticity Index	Unified Soil Classification Symbol	Natural Water Content (°/o) (4)	Dry Density lbs/ft³	Laboratory Permeability (5) cm/sec
Bottom Ash Pond	243	1.5				91	47	20	27	CL	21.8		
		3.0				89	47	19	28	CL	21.7		
		7.5				9	21	N.P.	N.P.	SP-SM	24.6		
	244, 2	4.5				96	69	22	47	CH	97.8		
	3	6.0				97	81	23	58	CH	78.1		
	4	7.5				94	77	23	54	CH	79.2		
	5	9.0				98	69	22	47	CH	63.5		
	6	10.5				97	71	23	48	CH	65.6		
	8	15.0				50	20	17	3	SM-ML	18.2		
	9	20.0				50	19	N.P.(6)	N.P.	SM-ML	18.0		
	245, 2	4.0				93	81	22	59	CH			
	3	5.5				94	74	22	52	CH			
	4	7.0				100	65	21	44	CH			
	6	10.0				98	82	23	59	CH	63.3		
	7	15.0				98	-	-	-				
	246, 2	6.5				95	70	23	47	CH	82.3		
	3	8.0				97	60	21	39	CH	98.2		
	4	9.5				95	85	23	62	CH	40.9		
	5	11.0				7	69	22	47	CH	37.6	78.0	1.3×10^{-8}
	7	15.0				99	64	22	42	CH	32.5		
	8	20.0				100	69	22	47	CH	33.6		
	247, 2	4.0				100	78	21	57	CH	45.0		2.3×10^{-8}
	3	6.0				100	87	24	63	CH	66.0		3.5×10^{-8}
	5	10.0				98	54	20	34	CH	60.8		
	6	15.0				87	70	23	47	CH	30.6		
	7	20.0				98	40	20	20	CH	61.8		

TABLE BA 6.4.3.B.4-1 (Continued)

SUMMARY OF LABORATORY TESTS
BOTTOM ASH POND

Feature	Boring No. Sample No.	Bottom of Sample Depth, Ft.	Particle Size Analysis (% Passing) (2) No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Atterberg Limits (3) Liquid Limit (°/o)	Plastic Limit (°/o)	Plasticity Index	Unified Soil Classification Symbol	Natural Water Content (°/o) (4)	Dry Density lbs/ft³	Laboratory Permeability (5) cm/sec
Bottom Ash Pond (CONTD.)	TP-5, 1	1.0	-	-	-	96	60	20	40	CH	28.4		
	2	2.0	-	-	-	96	64	21	43	CH	28.0		
	3	3.0	-	-	-	99	60	21	39	CH	27.6		
	TP-6, 1	1.0	-	-	-	99	65	20	45	CH	24.8		
	2	2.0	-	-	-	99	61	22	39	CH	25.1		
	3	3.0	-	-	-	99	60	21	39	CH	22.4		
	TP-7, 1	1.0	-	-	-	93	58	21	37	CH	26.1		
	2	2.0	-	-	-	99	70	24	46	CH	33.4		
	3	3.0	-	-	-	93	65	22	43	CH	32.8		
													2.1×10^{-8} (A) 1.1×10^{-7} (A)
	230, 2	3.0	100	100	100	100	58	20	38	CH	25.6		
	4	6.0											
	6	9.0											
	8	15.0	-	-	100	66	27	19	8	CL	27.4		
	231, 2	3.0	-	-	-	37	N.P.(6)	N.P.	N.P.	SM	17.7	-	
	4	6.0	-	-	-	15	N.P.	N.P.	N.P.	SC	25.1		
	9	20.0	-	-	-	99	61	20	41	CH	38.9	-	
	232, 1	1.5	-	-	-	100	62	20	42	CH	35.3	-	
	3	4.5	100	100	100	98	58	19	39	CH	36	83	1.1×10^{-8}
	5	7.5	-	-	-	89	29	18	11	CL	24.1	-	

NOTE: A) Two Permeability Tests performed on composite material of all samples from TP-5, TP-6, and TP-7.

GENERAL NOTES:

(1) Laboratory testing performed by Southwestern Laboratories, Inc., Shreveport, Louisiana
(2) Laboratory Particle Size Analysis Tests performed in accordance with ASTM D422 and ASTM D1140
(3) Laboratory Atterberg Limit Tests performed in accordance with ASTM D423 and ASTM D424.
(4) Laboratory Water Content Tests of Soils performed in accordance with ASTM D2216. Most of Water Content Tests performed on split-spoon samples.
(5) Laboratory Vertical Permeability Test performed on undisturbed Shelby tube samples unless otherwise noted. Samples tested using Falling Head Test procedure in accordance with EM 1110-2-1906.
(6) N.P. = Non Plastic

b) The operation of the Bottom Ash Pond will have no adverse impact upon the use of the lake the quality of the lake environment.

6.4.3.C FACILITY PLANS AND SPECIFICATIONS - BOTTOM ASH POND

1) Design, Plans, and Specifications: The plans submitted herein for the Bottom Ash Pond were prepared and sealed by Professional Engineers with the required expertise in processing or disposing of solid waste as defined by the Solid Waste Management Plan.

2) Certification: Exhibit BA 6.4.3.C.2-1 is a certification that the facility meets the requirements outlined in the state regulations.

3) Special Requirements:

a) Incineration. Incineration is not planned as a disposal option in the operation of the Bottom Ash Pond.

b) Sanitary Landfills.

b.i) Typical cross sections of the above ground structures for the Bottom Ash Pond are shown in Exhibits BA 6.4.3.B.1-1, 2 and 3. No daily fill or cover is necessary for the liquid waste to be placed in the pond. The ground water table is at least 6 feet below construction grade and the 6 feet of soil between the ground water and the bottom of the pond is a CH material. In the northwestern part of the Bottom Ash Pond and in the surrounding dikes, the minimum thickness of compacted clay is 3 feet. The natural impermeability of the in situ soils and the compacted clay liner form a suitable protective barrier to the ground water.

b.ii) The soil types underlying the Bottom Ash Pond comprised a minimum of 3 feet of compacted clay over silty to clayey sands or very plastic in situ clay (CH). Cross sections of the subsurface conditions are shown in Exhibits BA 6.4.3.B.2-2 and 3.

<u>CERTIFICATE OF SARGENT & LUNDY ENGINEERS</u>

I, Richard I. Gavin, make this certification as a registered Professional Engineer on behalf of Sargent & Lundy Engineers for the benefit of all persons interested in the application of Central Louisiana Electric Company, Inc. for a Solid Waste Disposal Permit from the Louisiana Department of Natural Resources, Office of Environmental Affairs.

I do hereby certify as follows:

1. I am a registered Professional Engineer in the State of Louisiana.

2. I have supervised preparation of the design, plans, and specifications for the Unit 2 Boiler Cleaning Waste Pond, Bottom Ash Pond, Fly Ash Pond, Clarifier Sludge Pond, and equipment associated with such waste ponds.

3. To the best of my knowledge, the design, plans, and specifications for the above mentioned waste disposal facilities at Rodemacher Power Station, Unit 2, meet applicable requirements of the Louisiana Solid Waste Rules and Regulations.

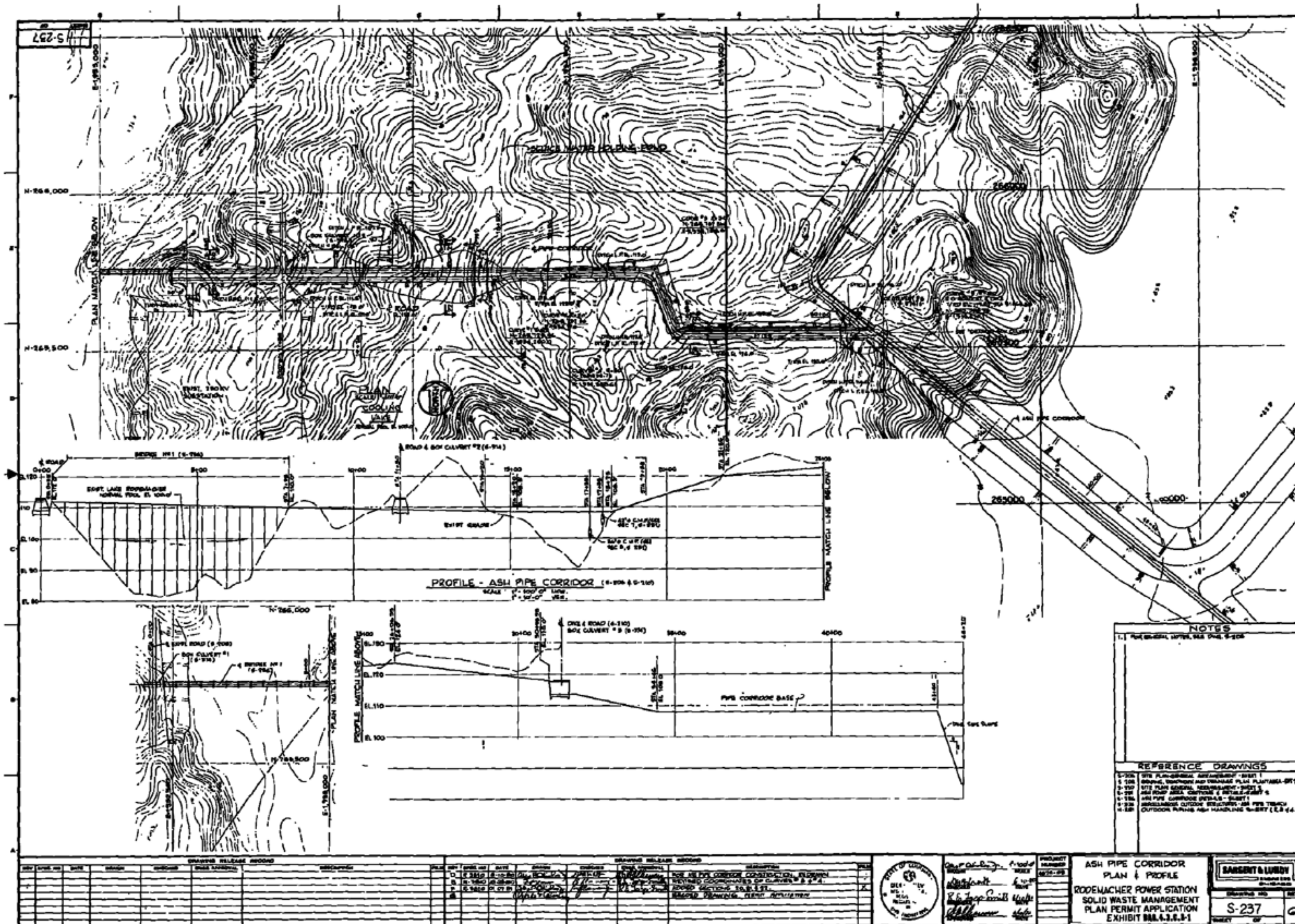
4. To the extent that this certification is based upon information and data prepared and analyzed by Sargent & Lundy personnel other than myself, I have reviewed this certification with such personnel to confirm its completeness and accuracy.

IN WITNESS WHEREOF, I have hereunto set my hand this 2 day of October, 1981.

STATE OF LOUISIANA
R. I. GAVIN
REG. No. 11283
REGISTERED PROFESSIONAL ENGINEER
IN
MECHANICAL ENGINEERING

Richard I. Gavin
Richard I. Gavin, Partner
Sargent & Lundy Engineers

EXHIBIT BA 6.4.3.C.2-1



ASH PIPE CORRIDOR
PLAN & PROFILE
RODEMACHER POWER STATION
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
SARGENT & LUNDY
S-237
G
PROFILE - ASH PIPE CORRIDOR
NOTES
REFERENCE DRAWINGS
PLAN MATCH LINE BELOW
PROFILE MATCH LINE BELOW
PLAN MATCH LINE ABOVE
PROFILE MATCH LINE ABOVE
PIPE CORRIDOR BASE
ASH PIPE CORRIDOR
N-266,000
N-265,500
265000
EL.120
EL.110
EL.100
EL.90
EL.80
EL.130
0+00
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00

b.iii) Section 6.4.3.D.2 discusses the characteristics of the wastes to be placed in the Bottom Ash Pond. Given the relatively harmless nature of the waste and the clay barrier in the pond, ground water quality should not be affected by operation of the Bottom Ash Pond.

b.iv) No cover material will be needed in the daily operation of the Bottom Ash Pond since the waste is in a liquid form.

b.v) A detailed description of the equipment to be used in the overall operation of the Bottom Ash Pond is presented in Section 6.4.3.D.2.

b.vi) No leachate collection and/or treatment system is planned for the Bottom Ash Pond since it is designed to contain liquids.

b.vii) The ground water monitoring strategy for the Bottom Ash Pond is tied to the down gradient monitoring wells for the Fly Ash Pond. The proximity of these two ponds as shown on Exhibit BA 6.4.3.B.2-1 is such that the two monitoring wells shown on Exhibit 6.4.3.A.2-2 should serve as indicators if contamination should occur. This decision also considers the relatively clean characteristics of the bottom ash waste and its relatively harmless influence on the environment. The two wells shown for the Bottom Ash and Fly Ash ponds are keyed to the network of monitoring wells for the Rodemacher Station. There are two background wells proposed in the northern portion of the station and at least two downgradient from each of waste disposal facilities. facilities. A typical cross section of a monitoring well is shown in Exhibit BA 6.4.3.C.3-1. The two monitoring wells for the Bottom Ash and Fly Ash ponds would extend below the protective clay liner into the more sandy soils or at least 10 to 15 feet into the CH soils of the area.

As a contingency plan to the above minimum monitoring program, if a significant increase (or pH decrease) shows up in the chemical parameters being monitored (see Section 7.3.3.G.3) then additional ground water samples from the affected wells would be immediately obtained following the same sampling procedure outlined in Section 7.3.3.G.3. The samples would be split and tested to first determine if the change was the result of laboratory error. If no laboratory error was found then at least two additional borings would be drilled and soil samples obtained on continuous intervals to a depth corresponding to the level where contamination was recorded. Depths to the ground water surface would be recorded.

Field permeability tests (packer tests) would be performed, at least one per boring, at a depth determined by the geologist/geohydrologist responsible for the field program. The locations would depend upon the log of boring and depth from which the contaminated samples had been obtained. At least three laboratory permeability tests would be performed upon samples from the new borings.

Leachate tests on at least three soil samples, at different depths, should be conducted and laboratory tests (parameters to be determined based on parameters that increased) performed. As a part of the laboratory testing, moisture and density tests on undisturbed samples, Atterburg Limits and grain size analysis would be conducted (the number to be determined).

Statistical evaluation of the new laboratory data would be made and compared to previously reported data for trends. Detailed cross sections with all data would be prepared showing both physical and chemical parameters.

A simple "first estimate" model of the subsurface conditions would be evaluated using EPA or state approved modeling programs. The data would be evaluated and

ATTACHMENT 2

BA RESPONSE TO DNR 1981

copy to Laf.

CENTRAL LOUISIANA ELECTRIC COMPANY INC.

RECEIVED
NOV 9 1981
DNR - OEA
ACADIAN REGION
LAFAYETTE, LOUISIANA

RODEMACHER POWER STATION
(Near Boyce, Louisiana)
CONSTRUCTION DEPARTMENT

Area Code: 318
Telephone: 793-2126

Please Reply to:
Rt. 1, Lena, La. 71447

November 2, 1981

RECEIVED
NOV 3 1981
DEPARTMENT OF NATURAL RESOURCES
SOLID WASTE MANAGEMENT

Mr. John Koury, Administrator
Solid Waste Management Division
Department of Natural Resources
P. O. Box 44066
Baton Rouge, LA 70804

Re: Responses to DNR Questions on Solid Waste Disposal Permit Application for Rodemacher Power Station Surface Impoundments

Dear Mr. Koury:

In accordance with instructions from Ms. Barbara Delatte, Solid Waste Specialist, we are hereby submitting responses to comments and questions presented by your staff during the October 29, 1981, review meeting for the Solid Waste Disposal Permit Application for the Rodemacher Power Station. We understand that this letter will be appended to our application filing in lieu of actually changing the application in response to DNR comments and questions.

The responses are organized below according to their respective subsection of the Louisiana Solid Waste Management Program Rules and Regulations.

Boiler Cleaning Waste Pond

Section 6.4.3.B.4

Q) The Plasticity Index is low for the materials on the slopes of the Unit 2 Boiler Cleaning Waste Pond. Will it be adequate for a liner?

A) The specification for the liner requires a Plasticity Index of 15 or more. The specification will be adhered to.

Q) Where is the bottom contour of the Unit 2 Boiler Cleaning Waste Pond in relation to the subsurface diagram?

A) Revised diagrams showing the bottom contour were distributed.

Q) Is there a need for an additional liner on the upper slopes of the Unit 2 Boiler Cleaning Waste Pond in the areas lacking natural clay?

A) S&L indicated that an adequate liner was being provided on the upper slopes as shown in the plans.

Bottom Ash Pond

Section 6.4.3.B.4

Q) Where is the bottom contour of the Bottom Ash Pond in relation to the subsurface diagram?

A) Revised diagrams showing the bottom contour were distributed.

Section 6.4.3.C.3.b.i

Q) What portions of the Bottom Ash Pond would the 3-foot clay liner be placed on?

A) The lining will be placed on the portion of the Bottom Ash Pond cut into what was the original upland terrace.

Q) There are localized areas of permeable soils at boring locations D-19 and 231. Can these be excavated and replaced with liner material?

A) If it cannot be shown that these permeable soils are isolated by impermeable soils, they will be replaced with an impermeable liner.

Fly Ash Pond

Section 6.4.3.C.3.b.i

Q) Exhibit FA6.4.3.B.1-2 is missing.

A) The reference should be to Exhibit BA6.4.3.B.1-2 presented in the Bottom Ash Pond subsection.

Section 6.4.3.C.3.b.vii

Q) Due to groundwater flow, a monitoring well should be placed on the eastern dike between the Fly Ash Pond and Bayou Jean de Jean.

A) A monitoring well will be placed as requested.

Clarifier Sludge Pond

Section 6.4.3.B.4

Q) Will the 1.5-foot bentonite/soil mixture be equivalent to a 3-foot natural clay liner?

A) The permeability tests on the bentonite/soil mixtures have indicated that the permeability of a 7% bentonite mixture is low enough to assure that 1.5 feet of the mixture is more than equivalent to 3 feet of natural clay. A set of calculations demonstrating the adequacy of the bentonite/soil mixture was distributed.

Mr. John Koury
Department of Natural Resources
November 2, 1981
Page 3

Clarifier Sludge Pond (Cont'd)

Section 6.4.3.B.4 (Cont'd)

Q) Can it be shown that the bentonite/soil mixture will be adequate after placement?

A) Tests will be taken after liner placement and compaction to demonstrate compliance with the permeability and thickness requirements.

We trust that the above responses will adequately address any concerns expressed by your staff during their review of the Solid Waste Disposal Permit Application. We look forward to your written confirmation of the adequacy of these responses and the eventual issuance of a permit to operate the new surface impoundments at Rodemacher Power Station.

Very truly yours,

J. T. Simms

J. T. Simms, Jr.
Manager Power Plant Engineering
& Construction

RECEIVED

JTSJR:kej
cc: Mr. W. Buchanan
Mr. R. E. Torp-Smith
Mr. P. J. Turregano
Mr. M. Hess

ATTACHMENT 3

BOTTOM ASH POND PERMEABILITY TESTS

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	AB-1
Sample Length (inches):	30.0"
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	6/7
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =27.4 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL: 64 PL:20 PI: 44

Parameter	Initial	Final
Height, in	2.85	2.80
Diameter, in	3.00	2.97
Area, in^2	7.07	6.93
Volume, in^3	20.1	19.4
Mass, g	618	618
Bulk Density, pcf	117	121
Moisture Content, %	25.7	25.7
Dry Density, pcf	92.8	96.4
Degree of Saturation, %	87.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 97.04 **Cell Pressure Increment, psi : 4.95** **Increased Cell Pressure, psi : 101.99**

Sample Pressure, psi: 87.03 **Corresponding Sample Pressure, psi: 91.56** **B Coefficient: 0.91**

Sample Pressure Increment, psi: 4.53 **(β value did not increase with increase in pressure. Final degree of saturation > 95%)**

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/30	1	97.0	87.0	16.5	16.3	0.2	132	29.2	3.7E-08	20.2	0.995	3.6E-08
8/30	2	97.0	87.0	16.5	16.3	0.2	139	29.2	3.5E-08	20.2	0.995	3.5E-08
8/30	3	97.0	87.0	16.3	16.3	0.2	144	29.2	3.4E-08	20.2	0.995	3.3E-08
8/30	4	97.0	87.0	16.3	16.3	0.2	149	29.2	3.2E-08	20.2	0.995	3.2E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 3.4 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Very Dark Grayish Brown Clay
Boring No.:	-----
Sample:	AB-2
Sample Length (inches):	24.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	12/2
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =36.4 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL: 69 PL:24 PI:45

Parameter	Initial	Final
Height, in	3.16	3.07
Diameter, in	2.90	2.86
Area, in^2	6.61	6.42
Volume, in^3	20.9	19.7
Mass, g	598	596
Bulk Density, pcf	109	115
Moisture Content, %	33.5	33.0
Dry Density, pcf	81.6	86.4
Degree of Saturation, %	86.0	96.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 94.96 **Cell Pressure Increment, psi : 5.18** **Increased Cell Pressure, psi : 100.14**

Sample Pressure, psi: 85.02 **Corresponding Sample Pressure, psi: 90.03** **B Coefficient: 0.97**

Sample Pressure Increment, psi: 5.01

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/30	1	95.0	85.0	18.0	17.8	0.2	60	29.1	8.7E-08	20.2	0.995	8.7E-08
8/30	2	95.0	85.0	18.0	17.8	0.2	62	29.1	8.5E-08	20.2	0.995	8.4E-08
8/30	3	95.0	85.0	18.0	17.8	0.2	67	29.1	7.8E-08	20.2	0.995	7.8E-08
8/30	4	95.0	85.0	18.0	17.8	0.2	70	29.1	7.5E-08	20.2	0.995	7.5E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 8.1 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Brown Clay
Boring No.:	-----
Sample:	AB-3.1
Sample Length (inches):	33.0"
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	11/1
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =34.9 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL:71 PL:26 PI: 45

Parameter	Initial	Final
Height, in	3.00	2.94
Diameter, in	2.88	2.87
Area, in^2	6.51	6.47
Volume, in^3	19.5	19.0
Mass, g	579	580
Bulk Density, pcf	113	116
Moisture Content, %	31.9	32.1
Dry Density, pcf	85.4	87.7
Degree of Saturation, %	90.0	96.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 97.03 **Cell Pressure Increment, psi : 4.91** **Increased Cell Pressure, psi : 101.94**

Sample Pressure, psi: 87.03 **Corresponding Sample Pressure, psi: 91.51** **B Coefficient: 0.91**

Sample Pressure Increment, psi: 4.48 **(β value did not increase with increase in pressure. Final degree of saturation > 95%)**

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/30	1	97.0	87.0	17.0	16.8	0.2	71	28.7	7.4E-08	20.2	0.995	7.4E-08
8/30	2	97.0	87.0	17.0	16.8	0.2	80	28.7	6.6E-08	20.2	0.995	6.6E-08
8/30	3	97.0	87.0	17.0	16.8	0.2	86	28.7	6.1E-08	20.2	0.995	6.1E-08
8/30	4	97.0	87.0	17.0	16.8	0.2	92	28.7	5.7E-08	20.2	0.995	5.7E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 6.5 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Light Yellowish Brown Clay
Boring No.:	-----
Sample:	AB-4.1
Sample Length (inches):	37.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	1/6
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =21.4%
Assumed Specific Gravity:	2.65
Atterbergs:	LL: 51 PL: 22 PI: 29

Parameter	Initial	Final
Height, in	3.01	3.22
Diameter, in	2.86	2.91
Area, in^2	6.42	6.65
Volume, in^3	19.3	21.4
Mass, g	600	699
Bulk Density, pcf	118	124
Moisture Content, %	6.2	23.9
Dry Density, pcf	111.0	100.2
Degree of Saturation, %	33.0	97.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 94.98 **Cell Pressure Increment, psi : 4.96** **Increased Cell Pressure, psi : 99.94**

Sample Pressure, psi: 84.98 **Corresponding Sample Pressure, psi: 89.76** **B Coefficient: 0.96**

Sample Pressure Increment, psi: 4.78

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/22	1	95.0	85.0	17.5	17.3	0.2	73	27.0	7.5E-08	20.1	0.998	7.5E-08
8/22	2	95.0	85.0	17.5	17.3	0.2	81	27.0	6.7E-08	20.1	0.998	6.7E-08
8/22	3	95.0	85.0	17.5	17.3	0.2	88	27.0	6.2E-08	20.1	0.998	6.2E-08
8/22	4	95.0	85.0	17.5	17.3	0.2	94	27.0	5.8E-08	20.1	0.998	5.8E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 6.6 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Brown Clay
Boring No.:	-----
Sample:	AB-5
Sample Length (inches):	33.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	7/3
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =47.2%
Assumed Specific Gravity:	2.70
Atterbergs:	LL:81 PL: 26 PI: 55

Parameter	Initial	Final
Height, in	2.75	2.73
Diameter, in	2.97	2.89
Area, in^2	6.93	6.56
Volume, in^3	19.1	17.9
Mass, g	533	533
Bulk Density, pcf	106	113
Moisture Content, %	36.2	36.1
Dry Density, pcf	78.1	83.1
Degree of Saturation, %	84.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 97.01 **Cell Pressure Increment, psi : 4.93** **Increased Cell Pressure, psi : 101.94**

Sample Pressure, psi: 87.01 **Corresponding Sample Pressure, psi: 91.54** **B Coefficient: 0.92**

Sample Pressure Increment, psi: 4.53 **(β value did not increase with increase in pressure. Final degree of saturation > 95%)**

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/22	1	97.0	87.0	16.0	15.8	0.2	103	29.1	5.0E-08	20.1	0.998	5.0E-08
8/22	2	97.0	87.0	16.0	15.8	0.2	111	29.1	4.6E-08	20.1	0.998	4.6E-08
8/22	3	97.0	87.0	16.0	15.8	0.2	117	29.1	4.4E-08	20.1	0.998	4.4E-08
8/22	4	97.0	87.0	16.0	15.8	0.2	124	29.1	4.1E-08	20.1	0.998	4.1E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 4.5 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Yellowish Brown Clay
Boring No.:	-----
Sample:	AB-6
Depth:	30.0'
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	7/3
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =78.0%
Assumed Specific Gravity:	2.65
Atterbergs:	LL: 102 PL:37 PI: 65

Parameter	Initial	Final
Height, in	3.07	3.01
Diameter, in	2.83	2.80
Area, in^2	6.29	6.16
Volume, in^3	19.3	18.5
Mass, g	465	460
Bulk Density, pcf	91	94
Moisture Content, %	74.8	73.2
Dry Density, pcf	52.3	54.5
Degree of Saturation, %	92.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 95.01 **Cell Pressure Increment, psi : 5.11** **Increased Cell Pressure, psi : 100.12**

Sample Pressure, psi: 85.01 **Corresponding Sample Pressure, psi: 90.05** **B Coefficient: 0.99**

Sample Pressure Increment, psi: 5.04

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/31	1	95.0	85.0	14.0	13.8	0.2	71	23.1	9.7E-08	19.7	1.008	9.8E-08
8/31	2	95.0	85.0	14.0	13.8	0.2	77	23.1	9.0E-08	19.7	1.008	9.0E-08
8/31	3	95.0	85.0	14.0	13.8	0.2	80	23.1	8.6E-08	19.7	1.008	8.7E-08
8/31	4	95.0	85.0	14.0	13.8	0.2	85	23.1	8.1E-08	19.7	1.008	8.2E-08

TEST RESULTS: **PERMEABILITY AT 20 °C: 8.9 x10^{-8} cm/sec (@ 10 psi effective stress)**

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Bottom Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Brown Clay
Boring No.:	-----
Sample:	AB-7
Sample Length (inches):	39.0′
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	19/2
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =56.2%
Assumed Specific Gravity:	2.65
Atterbergs:	LL:96 PL:36 PI: 60

Parameter	Initial	Final
Height, in	2.90	2.82
Diameter, in	2.90	2.87
Area, in^2	6.61	6.47
Volume, in^3	19.2	18.2
Mass, g	482	476
Bulk Density, pcf	96	99
Moisture Content, %	61.1	59.1
Dry Density, pcf	59.3	62.3
Degree of Saturation, %	91.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 95.02 **Cell Pressure Increment, psi : 4.92** **Increased Cell Pressure, psi : 99.94**

Sample Pressure, psi: 85.01 **Corresponding Sample Pressure, psi: 89.35** **B Coefficient: 0.88**

Sample Pressure Increment, psi: 4.34 **(β value did not increase with increase in pressure. Final degree of saturation > 95%)**

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/31	1	95.0	85.0	14.0	13.8	0.2	72	24.6	8.6E-08	19.7	1.008	8.6E-08
8/31	2	95.0	85.0	14.0	13.8	0.2	74	24.6	8.3E-08	19.7	1.008	8.4E-08
8/31	3	95.0	85.0	14.0	13.8	0.2	78	24.6	7.9E-08	19.7	1.008	8.0E-08
8/31	4	95.0	85.0	14.0	13.8	0.2	82	24.6	7.5E-08	19.7	1.008	7.6E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 8.1 x10^{-8} cm/sec (@ 10 psi effective stress)

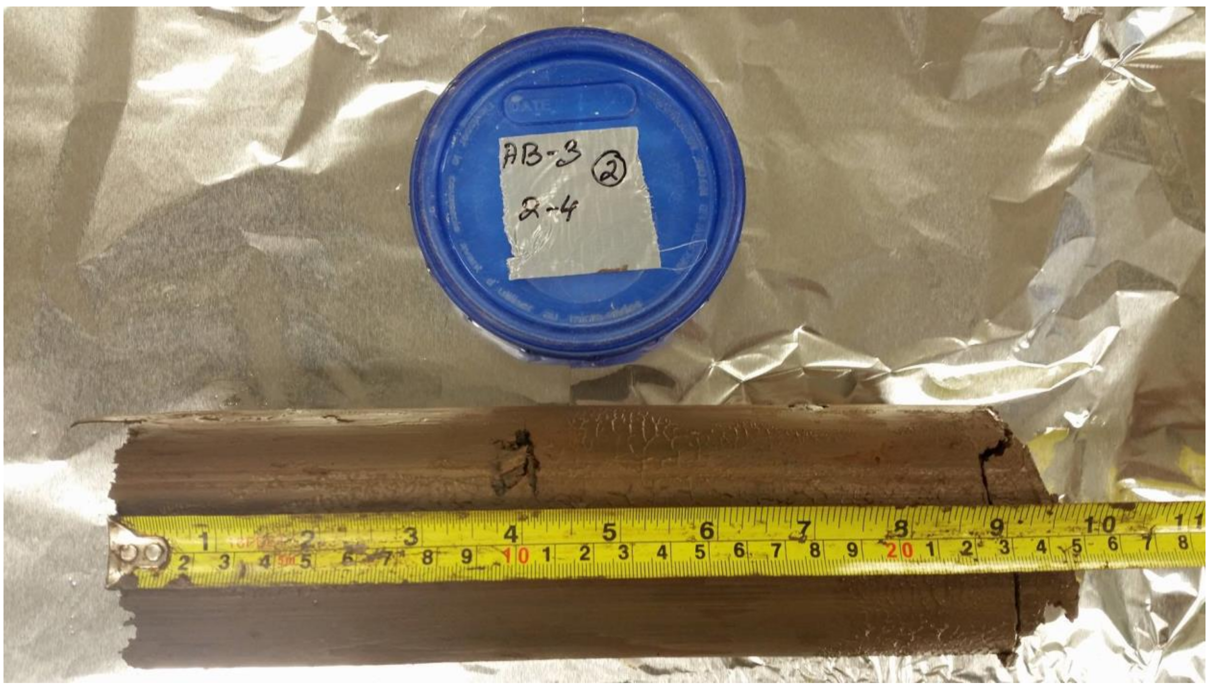
ATTACHMENT 4

BOTTOM ASH POND BORING PHOTOS

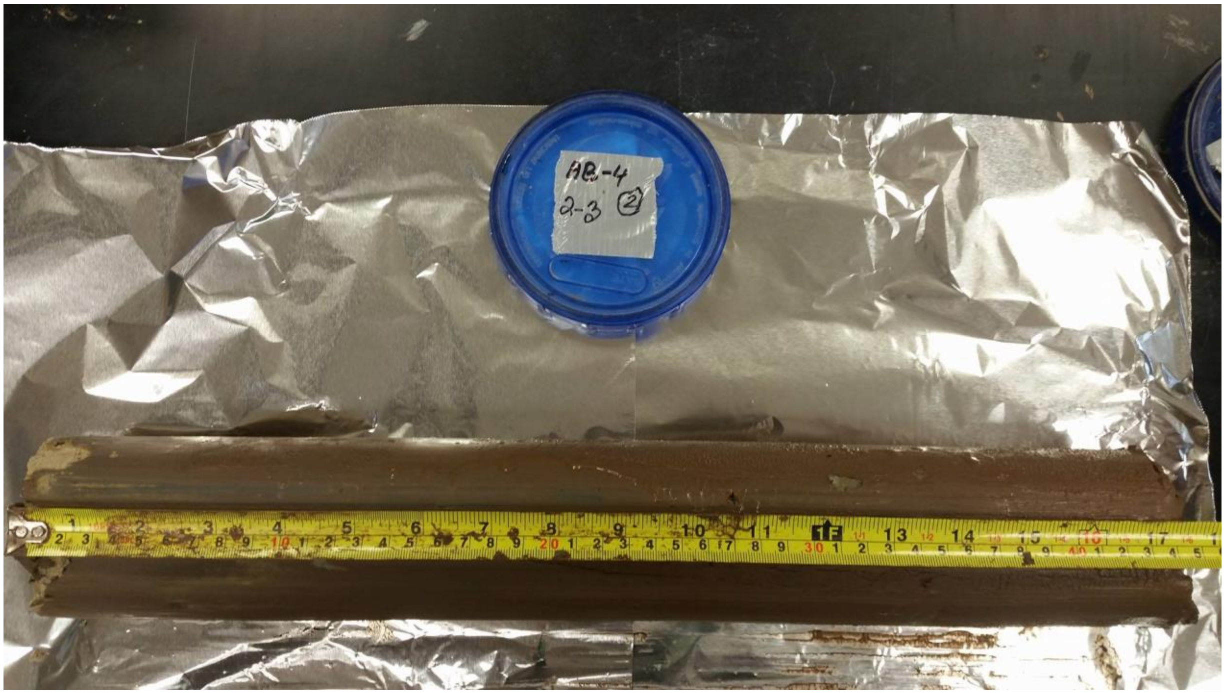
PHOTOGRAPH 1
Bottom Ash Pond - Typical Geotechnical Drilling Rig Setup.

PHOTOGRAPH 2
Bottom Ash Pond Undisturbed Soil Sample AB-1.

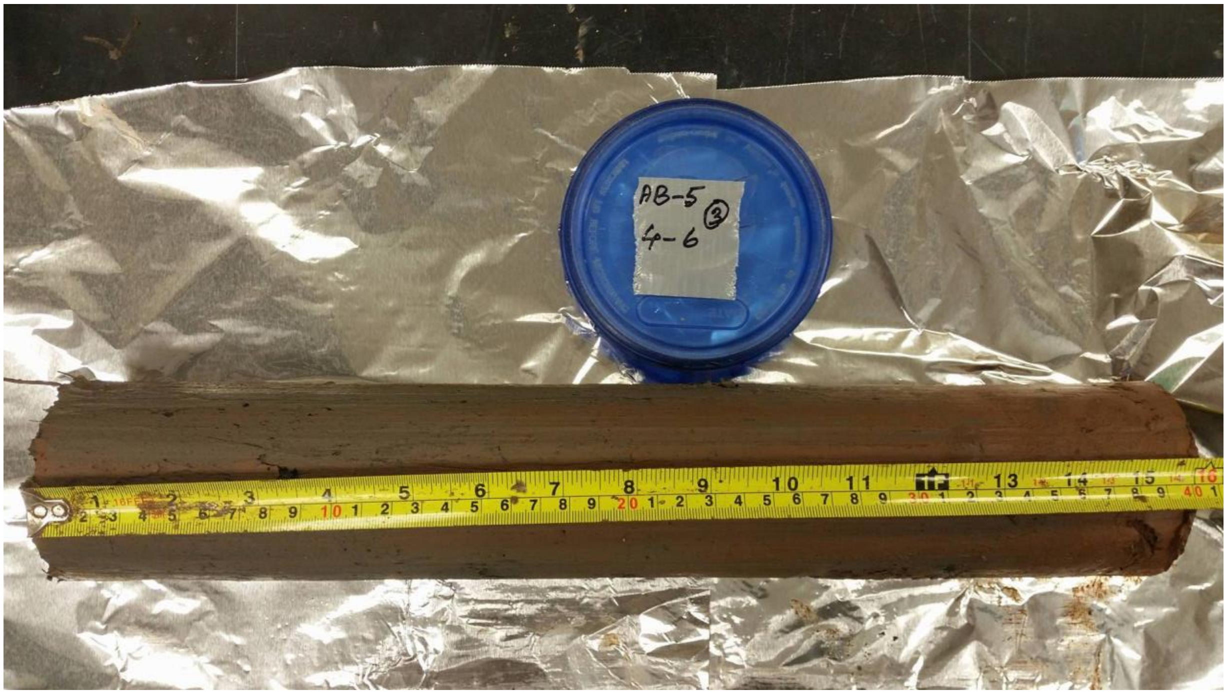
PHOTOGRAPH 3
Bottom Ash Pond Undisturbed Soil Sample AB–2.



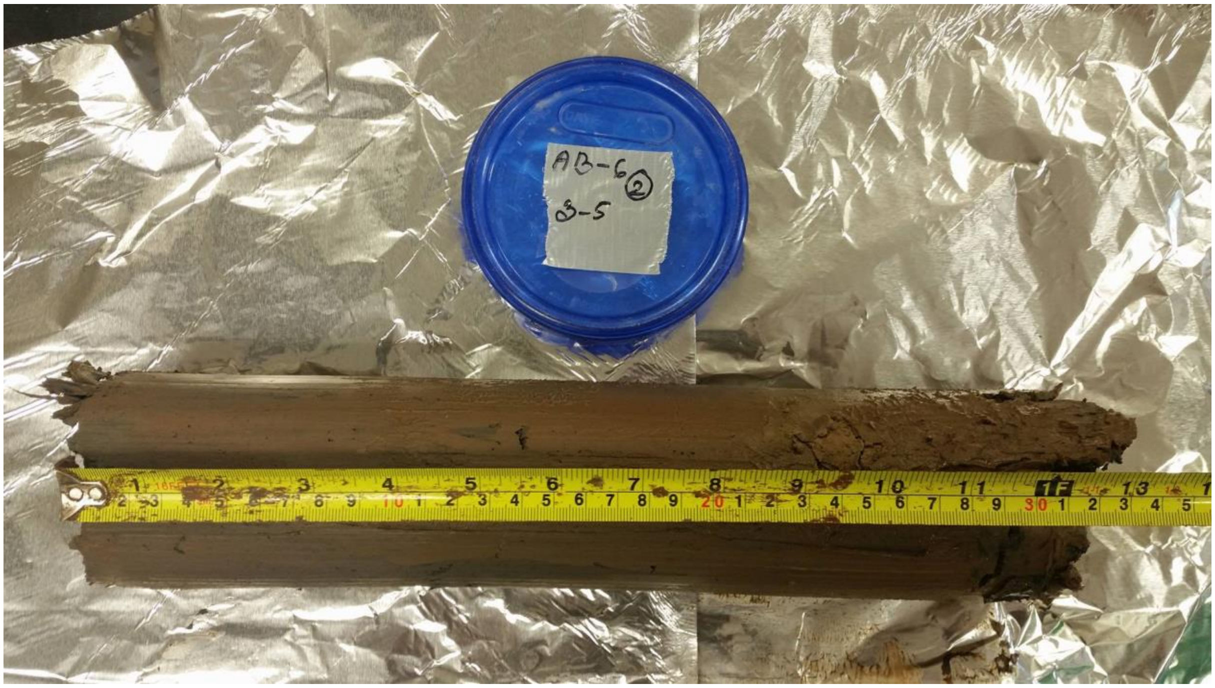
PHOTOGRAPH 4
Bottom Ash Pond Undisturbed Soil Sample AB–3.



PHOTOGRAPH 5
Bottom Ash Pond Undisturbed Soil Sample AB–4.



PHOTOGRAPH 6
Bottom Ash Pond Undisturbed Soil Sample AB–5.



PHOTOGRAPH 7
Bottom Ash Pond Undisturbed Soil Sample AB–6.

PHOTOGRAPH 8
Bottom Ash Pond Undisturbed Soil Sample AB–7.

ATTACHMENT 5

BOTTOM ASH POND P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
BOTTOM ASH POND
CCR LINER VERIFICATION ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a liner verification assessment for Cleco's Brame Energy Center Bottom Ash Pond in accordance with the 40 CFR 257.71 CCR requirements. This liner verification assessment has determined that the Bottom Ash Pond has met the following requirement:

- A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec

James C. Van Hoof
Name

24630 | **LA**
Registration No. | State

James C. Van Hoof, P.E.
Signature

10/12/2016
Date

STATE OF LOUISIANA
JAMES C. VAN HOOF
REG. No. 24630
REGISTERED
PROFESSIONAL ENGINEER
IN
CIVIL ENGINEERING

(Seal)

FLY ASH POND

OCTOBER 2016

CLECO POWER LLC
Brame Energy Center

FLY ASH POND CCR LINER VERIFICATION

Prepared By:

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1201 Main Street
Baton Rouge, Louisiana 70802
(225) 766-7400

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Project Number 002-191

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LIST OF ATTACHMENTS

1.0 INTRODUCTION

Effective October 17, 2015, the U.S. Environmental Protection Agency (EPA) implemented final rule, 40 CFR 257, the Coal Combustion Residuals (CCR) regulations. Included in the final rule is 40 CFR 257.71, the liner requirements for CCR surface impoundments.

Cleco Power LLC (Cleco) has consulted with Providence Engineering and Environmental Group LLC (Providence) to determine if the bottom liner system in the Fly Ash Pond CCR surface impoundment at the Brame Energy Center in Lena, Louisiana meets the liner requirements of the newly promulgated CCR regulations.

A Site Location Map and a Site Plan showing the location of the Fly Ash surface impoundment within the facility is provided as **Figures 1** and **2**.

2.0 SUMMARY OF 40 CFR 257.71 LINER REQUIREMENTS

No later than October 17, 2016, the owner or operator of an existing CCR surface impoundment must document whether or not such unit was constructed with any one of the following:

a. A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec
b. A composite liner that meets the requirements of 257.70(b), or
c. An alternative composite liner that meets the requirements of 257.70(c)

The hydraulic conductivity of the compacted soil must be determined using recognized and generally accepted methods.

An existing CCR surface impoundment is considered to be an existing <u>unlined</u> CCR surface impoundment if either:

1. The owner or operator of the CCR unit is not constructed with a liner that meets the requirements of a, b, or c above, or
2. The owner or operator of the CCR unit fails to document whether the CCR unit was constructed with a liner that meets the requirements of a, b, or c above.

EPA defines a CCR surface impoundment in Part 257 as “a natural topographic depression, manmade excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores and disposes of CCR”.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer attesting that the documentation meets the requirements of 257.71.

3.0 FLY ASH POND FACTS

Historical documents relating to Cleco's Fly Ash Pond includes the following information:

- Per attached letter (**Attachment 1**) dated August 1, 1983, from J.T. Simms (Cleco) to Mr. John Koury (LDNR Solid Waste Division) the Fly Ash Pond permit issued under Louisiana Solid Waste Division on November 19, 1981, it was discovered by Cleco personnel that there appeared to be insufficient clay in certain areas of the Fly Ash Pond to meet the liner requirements of the Solid Waste Rules and Regulations. This was subsequently verified in the field and the cause was determined to be over-borrowing of the in-situ clay.
- The problem was explained to Mr. Koury in a meeting in his office on April 22, 1982 (noted in **Attachment 1**). A proposal was made to use a small area (ABIH) of the Fly Ash Pond (Drawing AP-13 in **Attachment 1**) which did have sufficient liner until a permanent solution could be formulated. Mr. Koury approved the temporary use of the small area in a letter dated May 11, 1982 (noted in **Attachment 1**).
- Alternative liner substances for the area not having sufficient liner were determined to be economically or administratively unacceptable.
- In a letter dated December 13, 1982, (noted in **Attachment 1**) Cleco proposed an alternative to enclose 30 acres of the original 104 acres with the construction of a new dike within the original perimeter dikes. Most of the 30 acres already contained an acceptable liner. Those that did not would be repaired to meet the liner specifications of the Solid Waste Rules and Regulations.
- Three feet of clay liner was added to the interior slope of the levee as well as areas of the bottom liner that needed repair.
- Drawings AP-10 and AP-11 (**Attachment 1**) shows the extension of the dike (approximately 1,685 ft.).

Below is from a letter from Cleco to LDNR Solid Waste Management Division dated December 22, 1983 referencing the Fly Ash Pond (**Attachment 2 Fly Ash Pond Modification Soil Borings**).

The new interior dike has been placed as close as possible to the existing in situ clay which allows use of the maximum area for disposal and required the least amount of construction effort. The three-foot layer of clay on the interior slope of the new dike was made continuous with the clay already on the bottom of the new active disposal area.

After the clay was placed on the slope of the new dike, soil borings were made to verify the continuity of the clay liner along the bottom of the new active area. The borings were made along the edge of the new dike near suspected silty areas. The borings were located from 100 to 300 feet apart which is sufficient to predict accurately the continuous clay liner. The latest soil borings, together with those taken in the Fly Ash Pond where it was first constructed, establish the fact that there is clay of sufficient thickness and premeability over the entire bottom of the new active disposal area.

4.0 FLY ASH POND LINER PERMEABILITIES

Cleco's 1981 Fly Ash Pond solid waste permit application states the following:

Section 6.4.3.C.3.bii of the solid waste permit application **(Attachment 3**)

- Beneath most of the Fly Ash Pond and underlying the top clay stratum is approximately 25 to 40 feet of clay
- Laboratory coefficient of permeability for the in situ clay at boring 232 is 1.1×10^{-8} cm/sec
- 3-foot-thick clay layer was placed over the bottom of the Fly Ash Pond
- The extent of the clay blanket was determined in the field by ensuring that the in situ clay had a minimum thickness of 3 feet
- Laboratory permeability tests on recompacted samples of the clay along the dike extension varied from 1.4×10^{-8} to 8.9×10^{-9} cm/sec
- Soils were classified as CH according to the Unified Soil Classification System, except for boring 231 which was SM (silty sand)
- Clay liner was placed in horizontal lifts of 8 to 10 inches and was compacted with "sheeps foot" compaction equipment

No additional permeability verification laboratory results are available for the general area of the Fly Ash Pond.

5.0 CLAY LINER SAMPLING ACTIVITIES

In order to verify the clay liner thickness and permeabilities in those locations that Cleco did not have enough verifiable information, six (6) Shelby tubes were installed in the Fly Ash Pond as shown in **Figure 3**.

The specific methods that were followed for the collection of the clay liner samples are summarized in the following sections.

5.1 Clay Liner Sampling

Providence contracted a Louisiana licensed driller to provide personnel and equipment, including a drilling rig mounted on a track propelled marsh buggy, to collect undisturbed samples of the clay liner in the bottom of the Fly Ash Pond. The marsh buggy was positioned at the sample locations based on survey data points.

A temporary surface casing was used to compliment sampling and retraction grouting procedures. The materials at the mud-line were hand probed. If soft unconsolidated material was present, a 4" nominal diameter temporary surface casing was lightly pressed into place. If harder materials were present, they were broken up in order to place the temporary surface casing. For mechanical breaking of the surface material, the driller utilized Geoprobe "pre-probing tools", followed by, or in combination with, a frost auger or other solid/hollow stem auger. The express intent of this action was to only break hardened sediments (and not significantly penetrate the clay liner) such that the surface casing could be installed.

As stated above, Cleco collected six (6) samples of the clay liner in the Fly Ash Pond. A temporary surface casing was used at each sampling location. Undisturbed Shelby tubes were pushed to collect unconsolidated and consolidated soil matrices from the bottom of the pond, not impoundment sediments. Shelby tube samples were collected in approximately two foot intervals.

All sample locations were plugged and abandoned using CETCO 3/8 diameter coated bentonite pellets. The coated pellets are designed to "drop" through water and hydrate once they "fall" in-place. The pellets were dropped through the temporary surface casing described above. The amount placed was calculated based on the diameter of the soil boring and depth of penetration below the sediment line. Once the pellets were in-place, the surface casing was removed.

5.2 Sample Collection and Handling

Sample Handling

The Shelby tubes containing the undisturbed soil samples were capped on the tops and bottoms, and retained in as vertical position as possible and the samples were handled with care in order to minimize disturbance. The Shelby tubes were not opened in the field but were brought to the contract geotechnical laboratory where they were opened and examined for overall sample quality. A representative sample of the material in the Shelby tube was collected for the permeability testing and Atterberg limit determination.

6.0 LABORATORY ANALYSES

Providence subcontracted to APS Engineering and Testing (APS) geotechnical testing laboratory to conduct Atterberg limit determinations for the clay liner material obtained from each sample from the bottom of the pond in accordance with ASTM D 4318 and to conduct hydraulic conductivity analysis (permeability) on the samples of the clay liner material obtained from the bottom of the pond in accordance with ASTM D 5084. The results of the Atterberg limit determinations and hydraulic conductivity analysis were compared to the liner requirements for CCR facilities contained in the recently promulgated regulations.

7.0 DATA EVALUATION AND REPORTING

The geotechnical data from the original application and follow-up information to LDNR is shown in **Table 1** below for the Fly Ash Pond.

Table 1 Fly Ash Pond Permeabilities (Historical)

Boring ID	Clay Type	Liquid Limit	Plastic Limit	Plasticity Index	Permeability cm/sec
SA-1	Brown Clay	71	25	46	3.3×10^{-9}
SA-2	Brown Clay	60	21	39	5.5×10^{-9}
SA-3	Brown Clay	42	16	26	7.8×10^{-9}
SA-4	Brown Clay	40	16	24	1.7×10^{-8}
SA-5	Brown Clay	39	16	23	6.6×10^{-9}
SA-7	Brown Clay	39	19	20	1.4×10^{-8}

These Boring ID locations are shown in **Attachment 3**.

APS completed the Atterberg limit determinations and the permeability analysis for the samples obtained from the Fly Ash Pond which is shown in **Attachment 4**. Photos depicting samples of the clay liner material obtained from the bottom of the Fly Ash pond are shown in **Attachment 5**. All of the samples tested met the permeability requirements as shown in **Table 2** below. Based on the sample specimens obtained, the liner met or exceeded the two feet of compacted clay required by the CCR regulations for the Fly Ash Pond. This data reinforces the data from the original permit application and any follow-up information provided to LDNR.

Table 2 Fly Ash Pond Permeabilities (Additional Data)

Boring ID	Clay Type	Liquid Limit	Plastic Limit	Plasticity Index	Permeability cm/sec
FA-1	Grayish Brown Clay	91	40	51	2.4×10^{-8}
FA-2	Grayish Brown Clay	118	28	90	4.9×10^{-8}
FA-3	Grayish Brown Clay	73	31	42	5.2×10^{-8}
FA-4	Grayish Brown Clay	117	38	79	8.9×10^{-8}
FA-5	Grayish Brown Clay	91	33	58	5.2×10^{-8}
FA-6	Grayish Brown Clay	87	30	57	3.5×10^{-8}

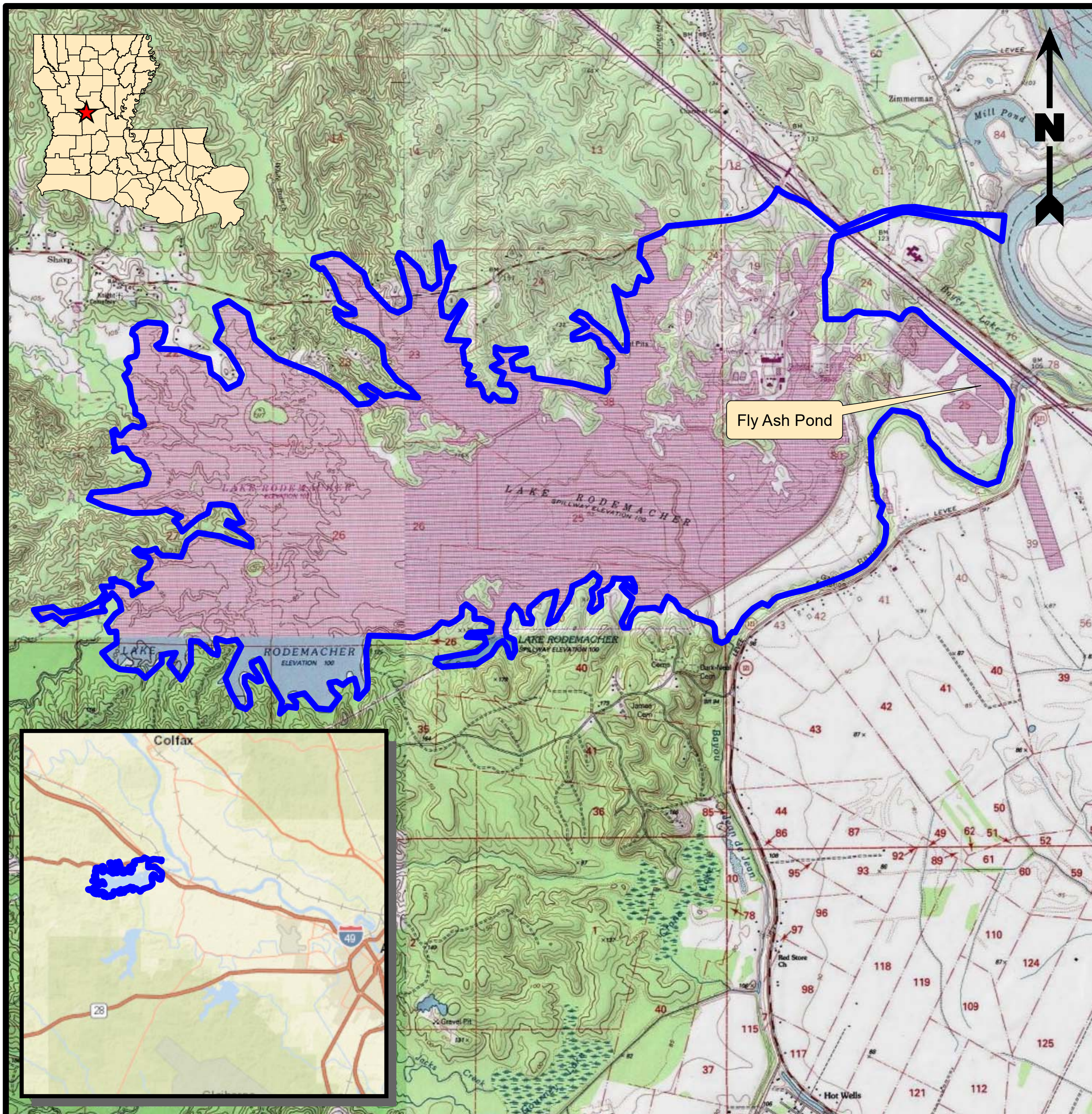
8.0 CONCLUSIONS

Providence reviewed the existing information that was completed when the Fly Ash Pond was constructed and noted that Cleco intended to have a three-foot “compacted” clay liner in place for the Fly Ash Pond that met the regulatory permeability requirements at the time of construction. Available information for the pond is noted in **Table 1**. Providence could not locate all of the laboratory permeability results for the liner in the Fly Ash Pond, therefore, additional undisturbed samples of the clay liner were obtained to verify the thickness of the clay liner and to verify the permeability of the bottom liner system. Based on the information in **Table 1**, along with the additional data in **Table 2**, Providence confirms that a liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} cm/sec is in-place for the Fly Ash Pond at Brame Energy Center.

Based on the results for the liner verification, the existing clay liner for the Fly Ash Pond meets the liner verification requirements of the CCR regulations at 40 CFR 257.71. **Attachment 6** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



4,000 2,000 0 4,000 Feet

Legend

Property Boundary

Reference

Base map comprised of U.S.G.S. 7.5 minute topographic maps, "Lena, LA", "Boyce, LA", "Jericho, LA", and "Gardner, LA".

Site Location Map

Liner Verification - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

Project Number
002-191

Drawing Number
002-191-A008

1
Figure

Providence Engineering and Environmental Group LLC

FIGURE 2

SITE MAP

Legend

Property Boundary

Reference

Base map comprised of Google Earth aerial imagery from 10/03/14.

1,000 500 0 1,000
Feet

Site Map

Liner Verification - Fly Ash Pond
Boyce, Rapides Parish, Louisiana

Cleco Power LLC
Brame Energy Center

PROVIDENCE

Drawn By	LMM	10/04/16
Checked By	LMH	10/04/16
Approved By	CVH	10/04/16

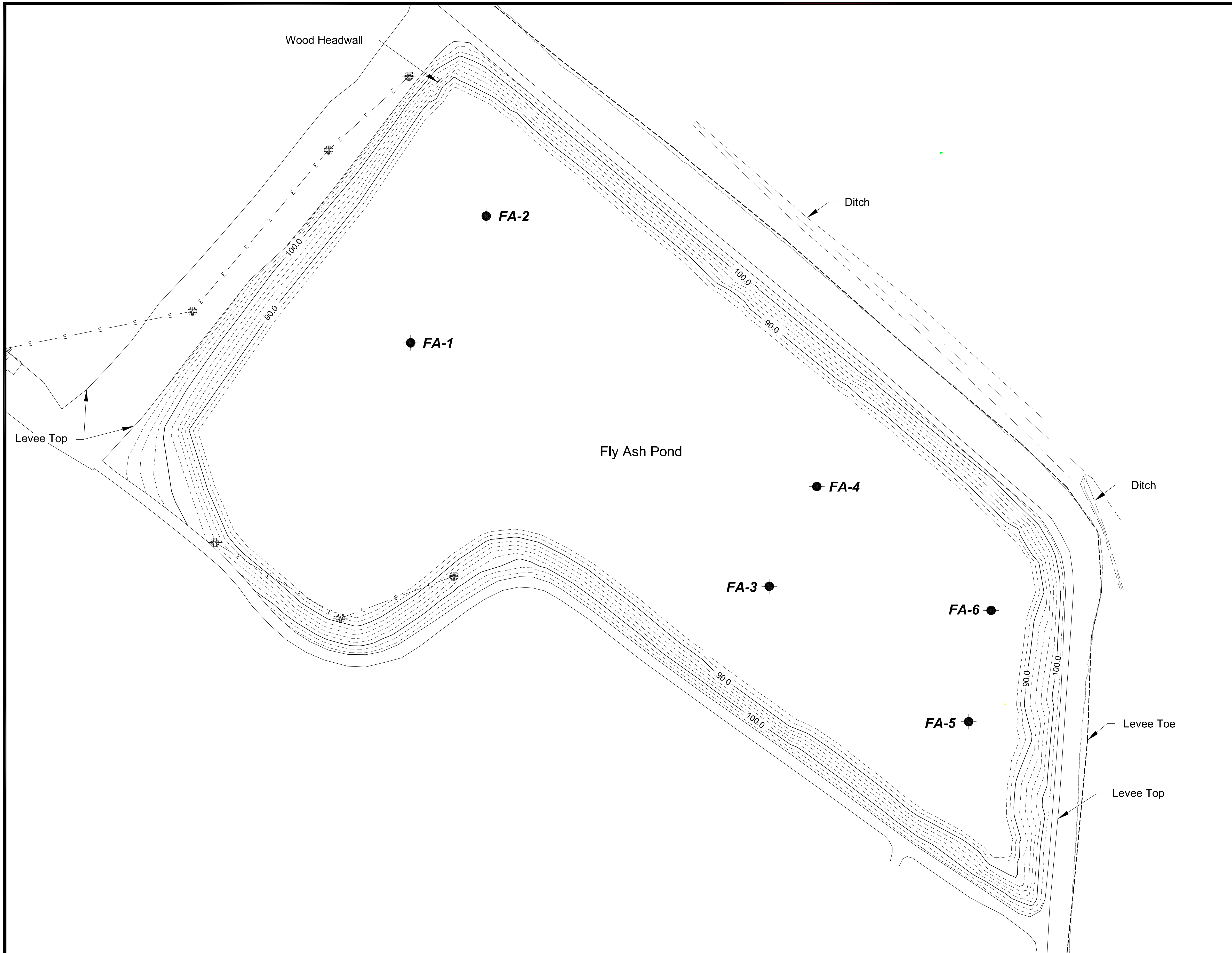
Project Number
002-191

Drawing Number
002-191-B009

2
Figure

FIGURE 3

FLY ASH POND LINER VERIFICATION



Legend

- Major Contour (10' Interval)
- Minor Contour (2' Interval)
- Water Line
- Power Pole
- Boring Location

Note

Above grade contours and features presented are comprised of survey data obtained in June of 2015. The survey contours for the ash material were removed to depict the bottom contours of the pond. The pond contours underneath the ash material and in the pond bottom are a combination of survey data collected in June of 2015 and elevation data obtained from historical figures.

200 0 200

Scale: 1" = 200'

Fly Ash Pond Liner Verification

Clay Liner Verification

Boyce, Rapides Parish, Louisiana

Cleco Power LLC

Brame Energy Center

PROVIDENCE

Drawn By	LMM	09/14/16
Checked By	LMH	09/14/16
Approved By	CVH	09/14/16

Project Number 002-191

Drawing Number 002-191-B005

3 Figure

ATTACHMENT 1

FLY ASH POND MODIFICATION FROM ORIGINAL CONSTRUCTION

CLECO

CENTRAL LOUISIANA ELECTRIC COMPANY, INC.

August 1, 1983

Mr. John Koury, Administrator
Solid Waste Division
P. O. Box 44066
Baton Rouge, LA 70804

Dear Mr. Koury:

Enclosed please find three copies of a proposal which CLECO is submitting for the repair and rearrangement of the Fly Ash Pond at Rodemacher Power Station Unit 2. This is a request that you modify permit number P-0005 to reflect the information contained in the proposal. We trust that the information and drawings supplied are sufficient for a complete review by your staff.

It is important that construction of this project begin well in advance of the wet winter months. For this reason, we would appreciate an expeditious reply to this request.

Very truly yours,

J. T. Simms Jr.

J. T. Simms, Jr., Manager
Resource Development Division

JTSjr/PJT:aw
Enclosures

cc: Messrs. B. J. Guillory
L. G. Fontenot
K. B. Dickerson
T. G. Bonner
G. E. DeSoto
C. A. Strong

Pg1

A PROPOSAL FOR FLY ASH POND REPAIR
RODEMACHER POWER STATION UNIT 2
CENTRAL LOUISIANA ELECTRIC COMPANY, INC.
AUGUST 1983

I. BACKGROUND

The Fly Ash Pond at Rodemacher Station is a 104-acre facility which is permitted under Louisiana Solid Waste Permit number P-0005. This permit was issued by the Solid Waste Division on November 19, 1981, for solid waste disposal facilities associated with Rodemacher Power Station Unit 2, including the Fly Ash Pond, Bottom Ash Pond, Clarifier Sludge Pond, and Unit 2 Boiler Cleaning Waste Pond.

Prior to the final inspection by Solid Waste Division staff, it was discovered by CLECO personnel that there appeared to be insufficient clay in certain areas of the Fly Ash Pond to meet the liner requirements of the Solid Waste Rules and Regulations. This was subsequently verified in the field and the cause was determined to be over borrowing of the in-situ clay.

The problem was explained to Mr. John Koury in a meeting in his office on April 22, 1982, and a proposal was made to use a small area of the Fly Ash Pond which did have sufficient liner until a permanent solution could be formulated. Mr. Koury approved the temporary use of the small area in a letter dated May 11, 1982, provided that periodic progress reports of our plans for a permanent solution were made to him. The substance of this meeting was confirmed in a letter to Mr. Koury dated April 16, 1982, and signed by J. T. Simms, Jr. Since this initial meeting and explanation, CLECO has used only the small area which was approved for the disposal of fly ash, and has made the required progress reports.

II. PROGRESS

Since the problem with the liner was discovered, CLECO has been actively seeking a solution to the problem. We have sought administrative relief from the requirement to have a complete liner; we have investigated the use of alternative liner substances including fly ash and soil bentonite combinations. These alternatives were found to be economically or administratively unacceptable. This left one alternative as the most practical approach to the problem. This alternative was explained to Mr. Koury in a letter dated December 13, 1982, and basically provides for the construction of a new dike within the original perimeter dikes. The new disposal area would enclose approximately 30 acres of the original Fly Ash Pond. Most of these 30 acres contain an acceptable liner. Those portions which do not have an acceptable liner will be repaired to meet the liner specifications of the Solid Waste Rules and Regulations.

Before this plan could be implemented, the weather began to cause a serious problem in the pond. Heavy rains during the winter of 1982 caused extensive flooding in the Fly Ash Pond. We were allowed to pump this water from the pond per the terms of an Administrative Order issued by EPA in January of 1983. Spring rains have caused another large volume of water to accumulate in the pond. The water in the Fly Ash Pond has delayed the implementation of our plans and continues to trouble us as evaporation may not give sufficient relief before another wet season is upon us. The disposition of the water in the Fly Ash Pond has become a part of our overall plan, as explained below.

PROPOSED SOLUTION

CLECO's proposal to solve the problem in the Fly Ash Pond consists of two phases. Reference will be made to the following enclosed drawings to assist in understanding the proposal:

M-1	Property Plat of Rodemacher Station
M-2-1	Property Plat Showing Location of Monitor Wells
AP-10	Fly Ash Pond General Arrangement
AP-11 Sheet 1	Plan of Fly Ash Pond Disposal Enlargement
AP-11 Sheet 2	Fly Ash Pond Dike Section
AP-12 Sheet 1	Plan of Fly Ash Pond Discharge Pipe
AP-12 Sheet 2	Fly Ash Pond Discharge Pipe Section
AP-13	New Fly Ash Pond Arrangement

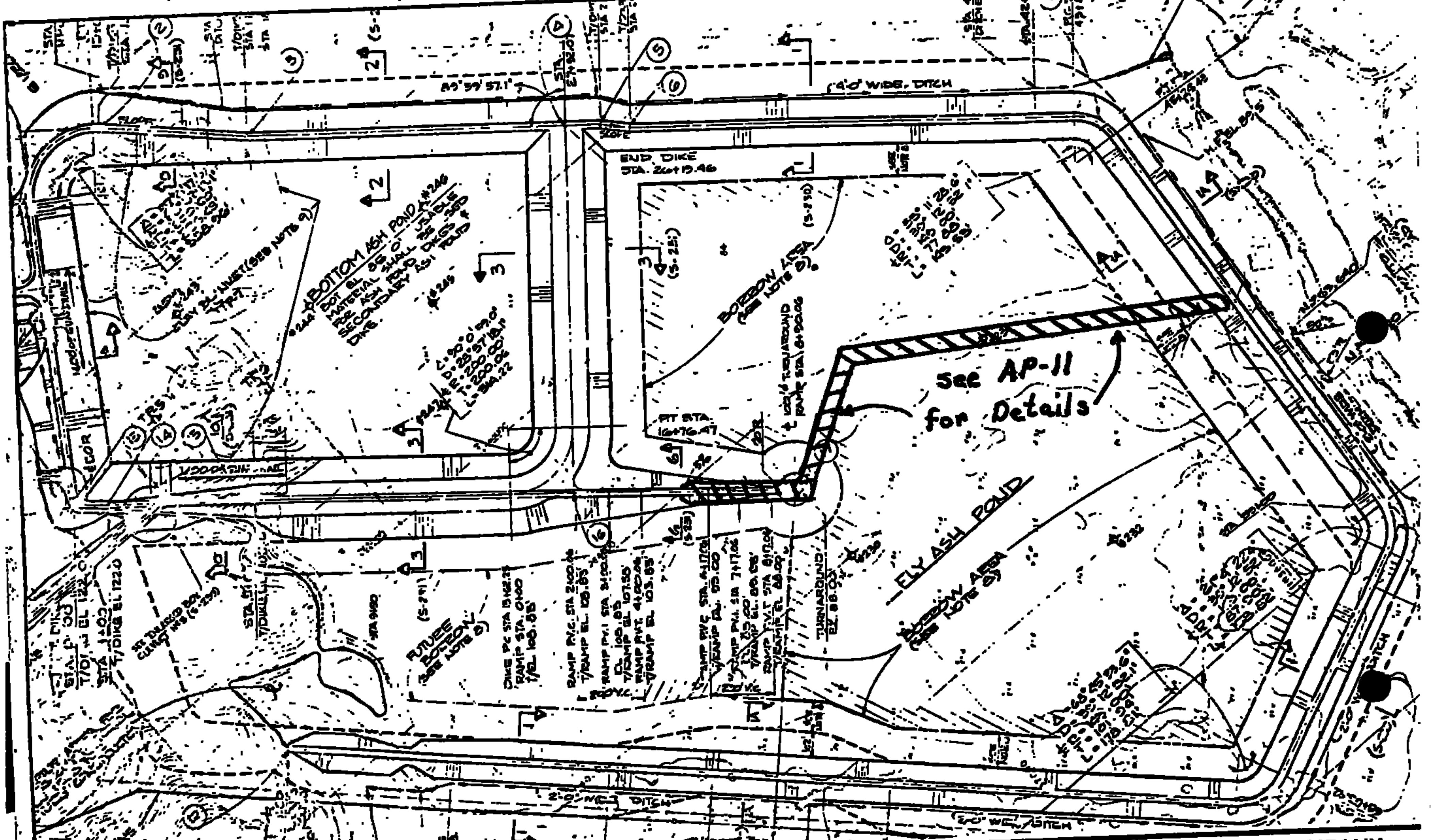
Drawing M-1 shows the relationship of the Fly Ash Pond to the area at Rodemacher Station. At present, fly ash is disposed of in the area ABIH as shown on drawing AP-13. There is a temporary dike which also serves as a road along line BDE. Phase 1 of the plan is to construct a new permanent dike along line GEDC. This new dike would enclose an area of approximately 30 acres. The general arrangement of the new disposal area is shown on drawing AP-10. The soil will be studied in this new area and any part of the bottom which is deficient in clay liner will be repaired to conform to the Solid Waste Rules and Regulations. Construction details are shown on AP-11, sheets 1 and 2.

There is a substantial amount of water standing in the Fly Ash Pond except in the active disposal area (ABIH). In order for construction of the new dike to proceed, this water will be moved in the following manner. A temporary dike will be constructed from the present temporary dike at point D to a point C on the perimeter dike. Once completed, any remaining water within the area BCDI will be pumped to the inactive area. This water has never been in contact with fly ash and is essentially collected rainwater. Once this water is removed, soil samples will be taken to determine which areas within BCDI will require additional clay liner. Those areas requiring additional clay will be repaired and construction will begin on the new permanent dike (GEDC). The temporary dike from EDC will become part of the fill for the permanent dike (GEDC). The relationship of the temporary dike and the permanent dike is shown in cross section on drawing AP-11, sheet 2. Some water has collected near the present active disposal area (ABIH). At some point during or after the construction of the new permanent dike GEDC, this water will be released to the entire new disposal area (ABCDEFH). This will be accomplished by breaching the present temporary dike at some point along DIB. This action will not be taken until GEDC is sufficiently complete to prevent this water from getting to the inactive area. When the new dike (GEDC) is completed, fly ash will be disposed of only within area ABCDEFH. Runoff which falls in this area will be totally contained therein.

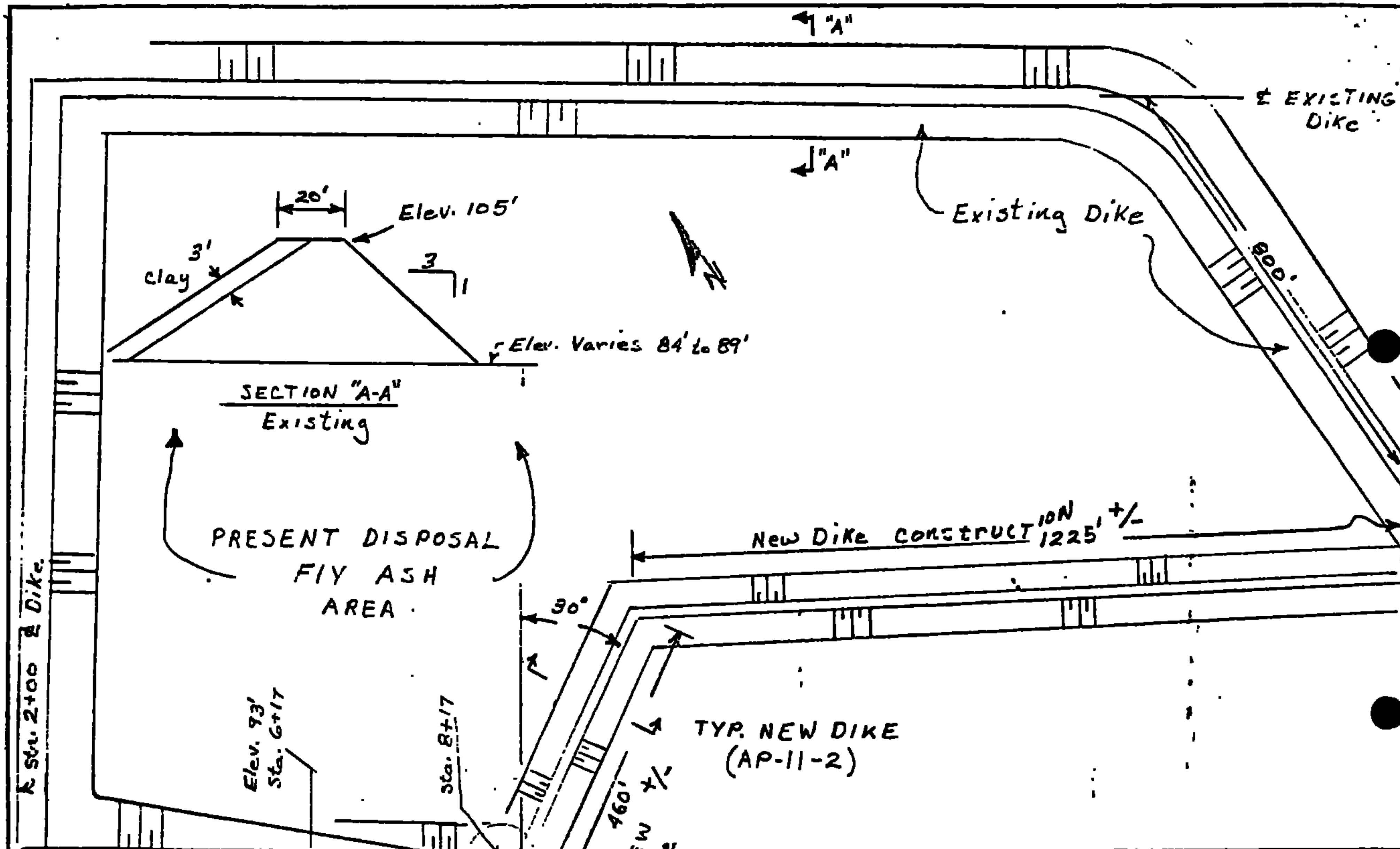
During the construction of the new permanent dike, GEDC, or shortly after its completion, Phase 2 will begin and will provide for the disposal of the water in the inactive area. Water which is presently in the inactive area has not been in contact with the disposed fly ash. A 12" steel discharge pipe will be pushed through the perimeter dike to allow rainwater which has collected in the inactive area to drain to Bayou Jean de Jean. If this work is completed before the new temporary dike (DC) is finished, water in area BCDI will drain naturally toward the inactive area, and will not have to be pumped. As mentioned earlier, the water which is presently in BCDI is merely rainwater runoff. The proposed location of the discharge pipe is shown on drawing AP-13. The arrangement of the discharge pipe in the perimeter dike is shown on AP-12, sheet 1. A cross section of the perimeter dike showing the discharge pipe is shown on drawing AP-12, sheet 2.

CLECO believes that this proposal is environmentally sound and will cause no adverse impacts. The provisions outlined in the original permit application are still applicable and no changes are required since this modification involves only a change in size of the disposal facility. The substantive provisions which demonstrate compliance with Section 6.4.3. of the Solid Waste Rules and Regulations are unchanged. Drawing M-2-1 shows the location of the groundwater monitoring wells at Rodemacher Station. The location of wells W-3, W-4 and W-5 is such that they will detect any groundwater contamination of the new proposed arrangement of the Fly Ash Pond.

CLECO wishes to reserve the right to use the inactive area for fly ash disposal at some future date. Should it become necessary in the future to use the inactive area, CLECO will make all repairs necessary so that the area complies fully with the applicable provisions of the Louisiana Solid Waste Rules and Regulations. Any plans to repair and use the inactive area for fly ash disposal will not begin without first obtaining the permission of the Solid Waste Division.



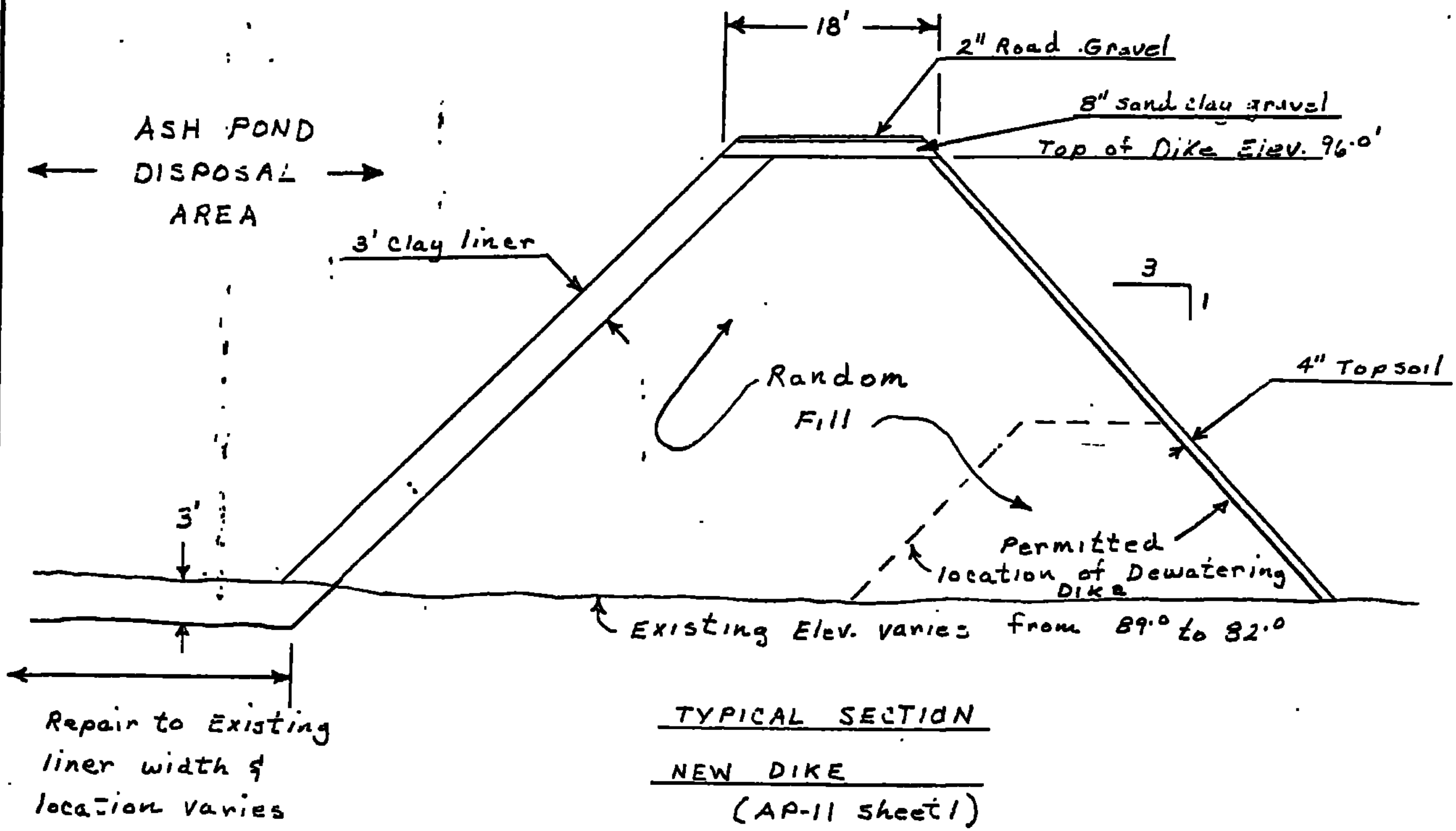
CENTRAL LOUISIANA ELECTRIC COMPANY POWER PLANT CONSTRUCTION DEPARTMENT					
RODEMACHER STATION FLY ASH POND GENERAL ARRANGEMENT					
DRAWN BY GED	DATE 5-10-83	SCALE None	APPROVED BY GED	DRAWING NO. AP-10	SHEET 1



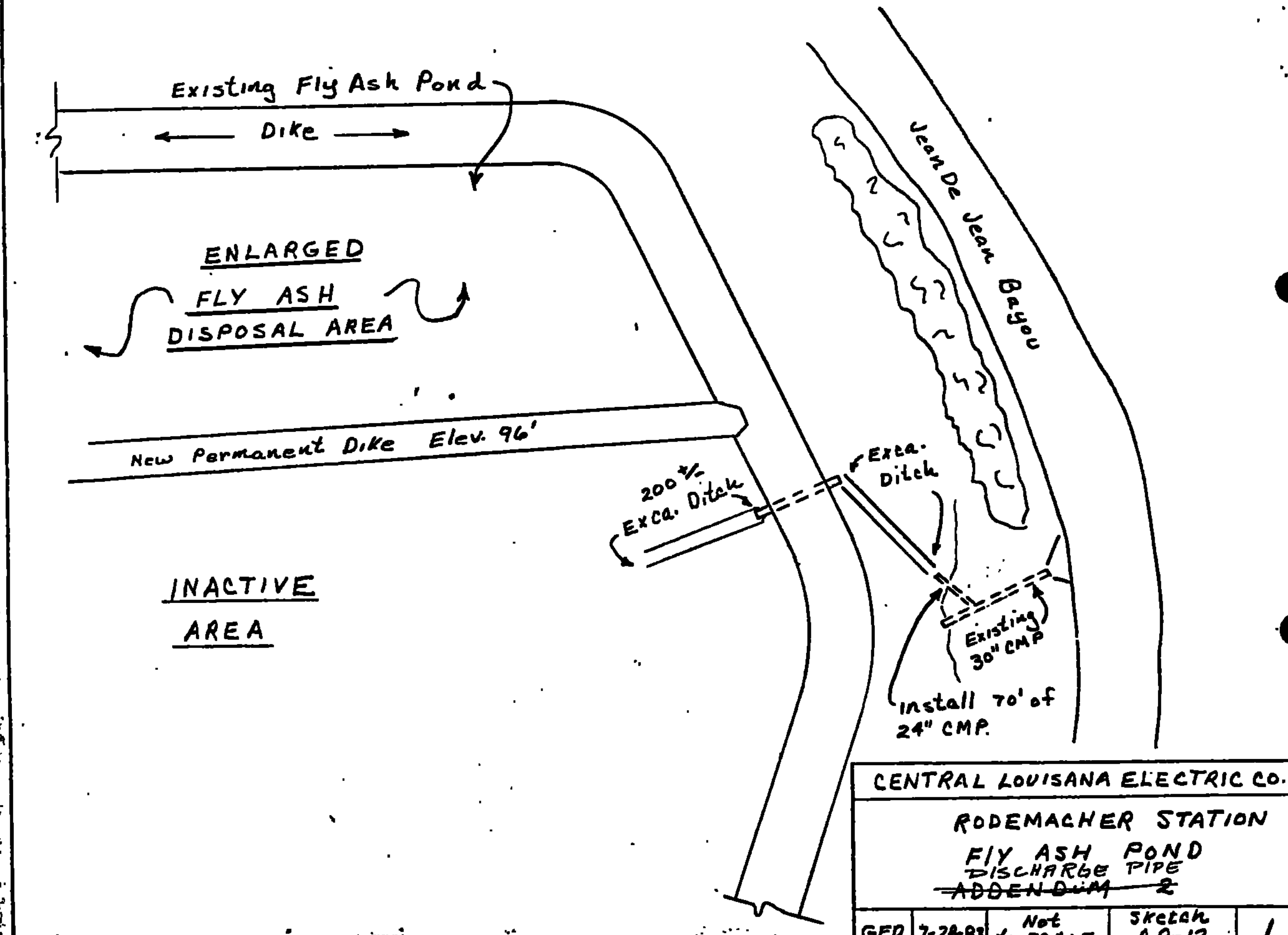
CENTRAL LOUISIANA ELECTRIC COMPANY
POWER PLANT CONSTRUCTION DEPARTMENT

PLAN OF
FLY ASH POND
DISPOSAL ENLARGEMENT

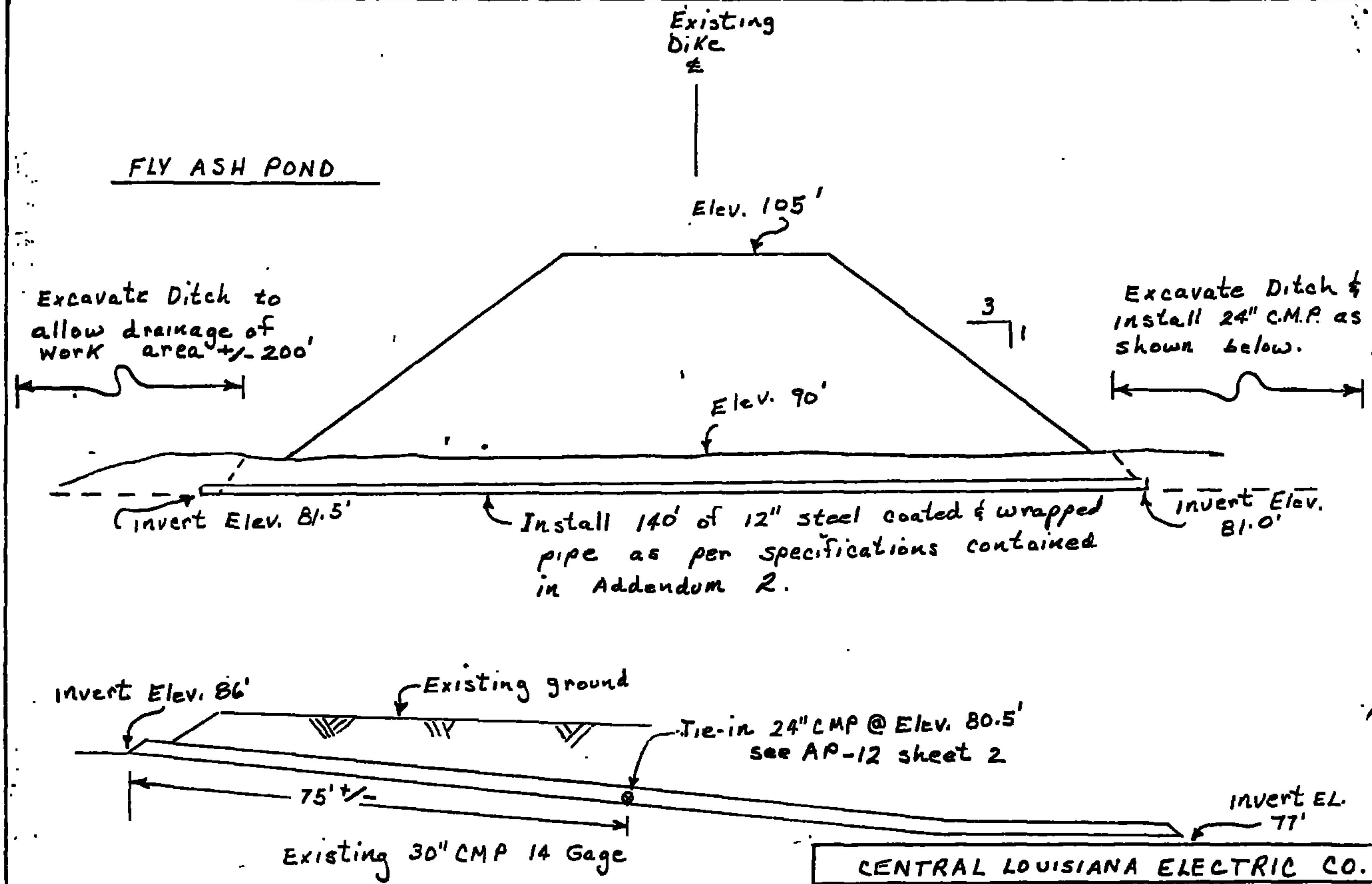
DRAWN BY	DATE	SCALE	APPROVED BY	DRAWING NO.	SHEET
GEO	5-10-83	None	GEO	AP-11	1



CENTRAL LOUISIANA ELECTRIC COMPANY POWER PLANT CONSTRUCTION DEPARTMENT					
Dike Section					
DRAWN BY	DATE	SCALE	APPROVED BY	DRAWING NO.	SHEET
GEO	5-10-83	None	GEO	AP-11	2



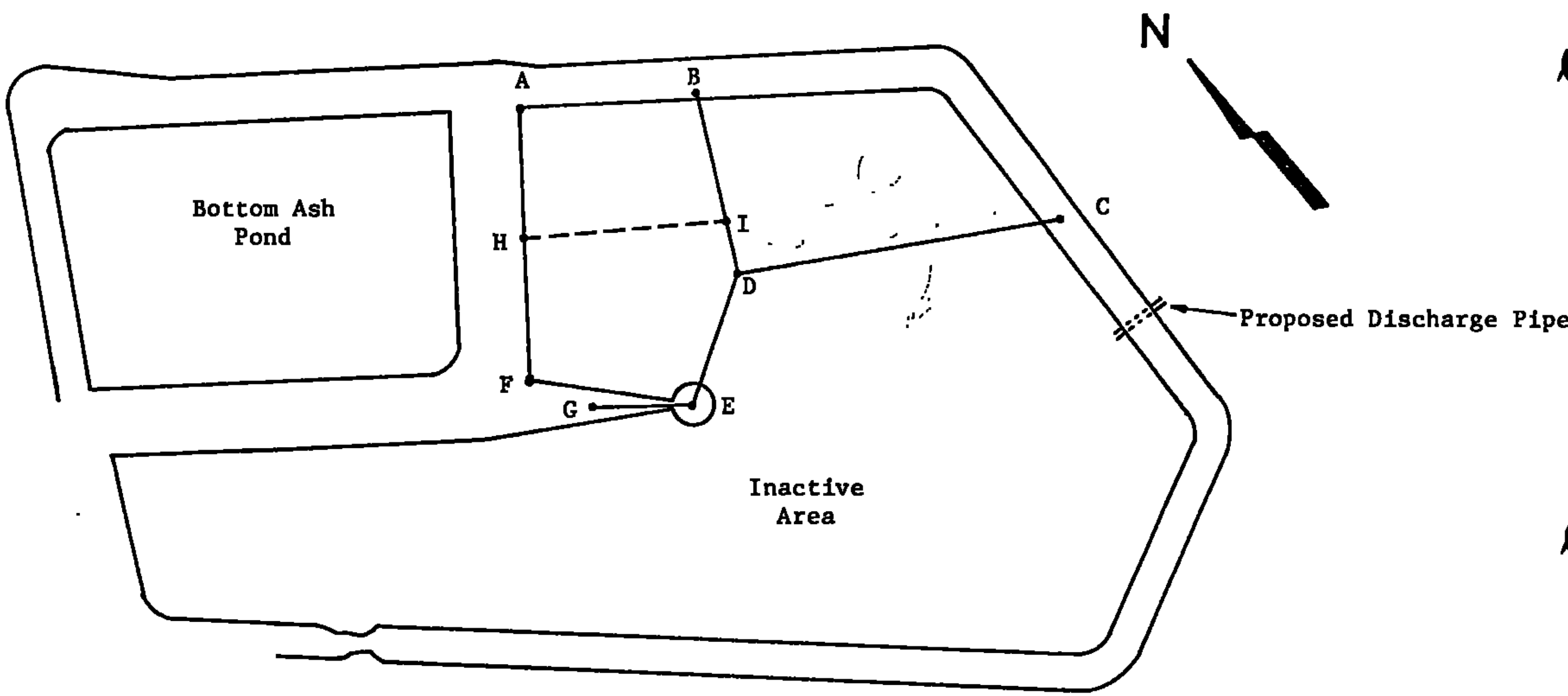
CENTRAL LOUISANA ELECTRIC CO.				
RODEMACHER STATION FLY ASH POND DISCHARGE PIPE ~~ADDENDUM~~ 2				
GED	7-28-83	Not to SCALE	Sketch AP-12	1



CENTRAL LOUISIANA ELECTRIC CO.				
RODEMACHER STATION FLY ASH POND DISCHARGE PIPE SECTION ~~ADDENDUM~~ 2				
GED	7-28-83	Not to SCALE	Sketch AP-12	1

LEGEND:

- ABIH - Present Disposal Area
- EDB - Present Temporary Dike and Road
- DC - Proposed New Temporary Dike
- GEDC - Proposed New Permanent Dike
- ABCDEFH - Proposed New Permanent Disposal Area



CENTRAL LOUISIANA ELECTRIC COMPANY, INC.				
NEW FLY ASH POND ARRANGEMENT				
PJT	7/29/83	NTS	AP-13	1

ATTACHMENT 2

FLY ASH POND MODIFICATION SOIL BORINGS

PJ1

CENTRAL LOUISIANA ELECTRIC COMPANY, INC.

December 22, 1983

Mr. John Koury, Administrator
Solid Waste Management Division
P. O. Box 44066
Baton Rouge, LA 70804-4066

Dear Mr. Koury:

Rodemacher Power Station Unit 2
Fly Ash Pond Rearrangement

Central Louisiana Electric Company, Inc. is in the process of rearranging the Fly Ash Pond at Rodemacher Power Station in Rapides Parish. As you are aware, the need for this rearrangement came about when it was discovered that there was insufficient acceptable clay liner in certain parts of the original Fly Ash Pond. The problem was first brought to your attention in a letter dated April 16, 1982. In that letter, we requested that we be allowed to use a small corner of the original pond which met the criteria of the Solid Waste Rules and Regulations until a permanent solution could be implemented. Permission was given to use that corner and to this date, all fly ash has been disposed of in that area.

In a December 13, 1982 letter to you, a preliminary plan for solving the problem was outlined. This letter made the first mention of rearranging the Fly Ash Pond and using only that area with sufficient acceptable clay liner for fly ash disposal. A final, more detailed plan for the rearrangement was submitted to your office on August 1, 1983. Your acceptance of the final plan dated August 22, 1983, obliged us to advise your office prior to placing any fly ash in the reworked areas of the pond and to keep you advised of our progress. This letter is intended to advise you of our progress and to request permission to begin using the rearranged area for fly ash disposal.

Construction work began in the Fly Ash Pond on September 9, 1983, to rearrange the disposal area according to the August 1, 1983 proposal. Progress has been satisfactory, but it soon became apparent that the entire project could not be completed before wet weather caused all construction activity to stop. The following has been accomplished to date:

1. Installation of a 12-inch drain pipe through the perimeter dike in order to drain the inactive area of the Fly Ash Pond.

2. Began construction of the new interior dike which defines the new active disposal area. Placed random fill to a height of 4 - 5 feet for the dike. Placed three feet of acceptable clay liner on interior slope of the new dike.

3. Made soil borings from new active disposal area at the edge of the new interior dike.

The new interior dike has been placed as close as possible to the existing in situ clay which allows use of the maximum area for disposal and required the least amount of construction effort. The three-foot layer of clay on the interior slope of the new dike was made continuous with the clay already on the bottom of the new active disposal area.

After the clay was placed on the slope of the new dike, soil borings were made to verify the continuity of the clay liner along the bottom of the new active area. The borings were made along the edge of the new dike near suspected silty areas. The borings were located from 100 to 300 feet apart which is sufficient to predict accurately the continuous clay liner. The latest soil borings, together with those taken in the Fly Ash Pond where it was first constructed, establish the fact that there is clay of sufficient thickness and premeability over the entire bottom of the new active disposal area.

The new dike has been constructed to a height of approximately five feet. We will not be able to complete construction on this dike until the spring. When completed, the new dike will be approximately eleven feet above existing ground level.

After the borings were made and soil from them sent for analysis, we requested an inspection of this completed work by a member of your staff. The inspection was requested at that time in order to obtain approval to use the new active area for disposal as soon as the soil boring analysis verified the permeability of the clay liner. Also, it was important that the reworked areas of the Fly Ash Pond be inspected prior to the onset of wet weather. Once covered by rain water, some of the newly constructed areas might not be as accessible again. On November 29, 1983, Mr. Claude Chachere toured the Fly Ash Pond and inspected the completed facilities mentioned above. After his inspection, Mr. Chachere indicated to us that he was satisfied with the construction which had been completed and that we should make a progress report to you once we received the soil boring data.

We have recently received the last of the soil data from the laboratory and include the following for your review:

Attachment 1 - Plan of Fly Ash Pond Showing Soil Boring Locations
Attachment 2 - Dike Section Showing Proximity of Soil Borings
Attachment 3 - Summary of Laboratory Data
Attachment 4 - Lab Results of Clay Placed on Slope of New Dike
Attachment 5 - Lab Results from Soil Borings SA-1, SA-2, SA-3, SA-4, SA-4-1, SA-4-2, SA-5, SA-6, SA-7, SA-8, CB-1

As the laboratory data demonstrates, the permeabilities of the in situ clay from all borings meet or exceed the 1 x 10-7 cm/sec required. The Atterburg limits also show that the clay which was placed on the interior slope of the new dike meets the permeability requirements of the Solid Waste Rules and Regulations.

As mentioned earlier, the wet weather has caused a cessation of construction activity. However, the only remaining item to be completed is to build up the dike to its final height of approximately eleven feet. We expect to be able to complete this task in early spring. Since the top of the new dike will have no effect on disposal in the new active disposal area, and the liner in the new disposal area has been shown to meet the requirements of the Solid Waste Rules and Regulations, we are requesting that we be allowed to begin disposal of fly ash in the new area. Your concurrence will be appreciated.

Should you require additional information in this matter, do not hesitate to contact us. An expeditious reply would be appreciated.

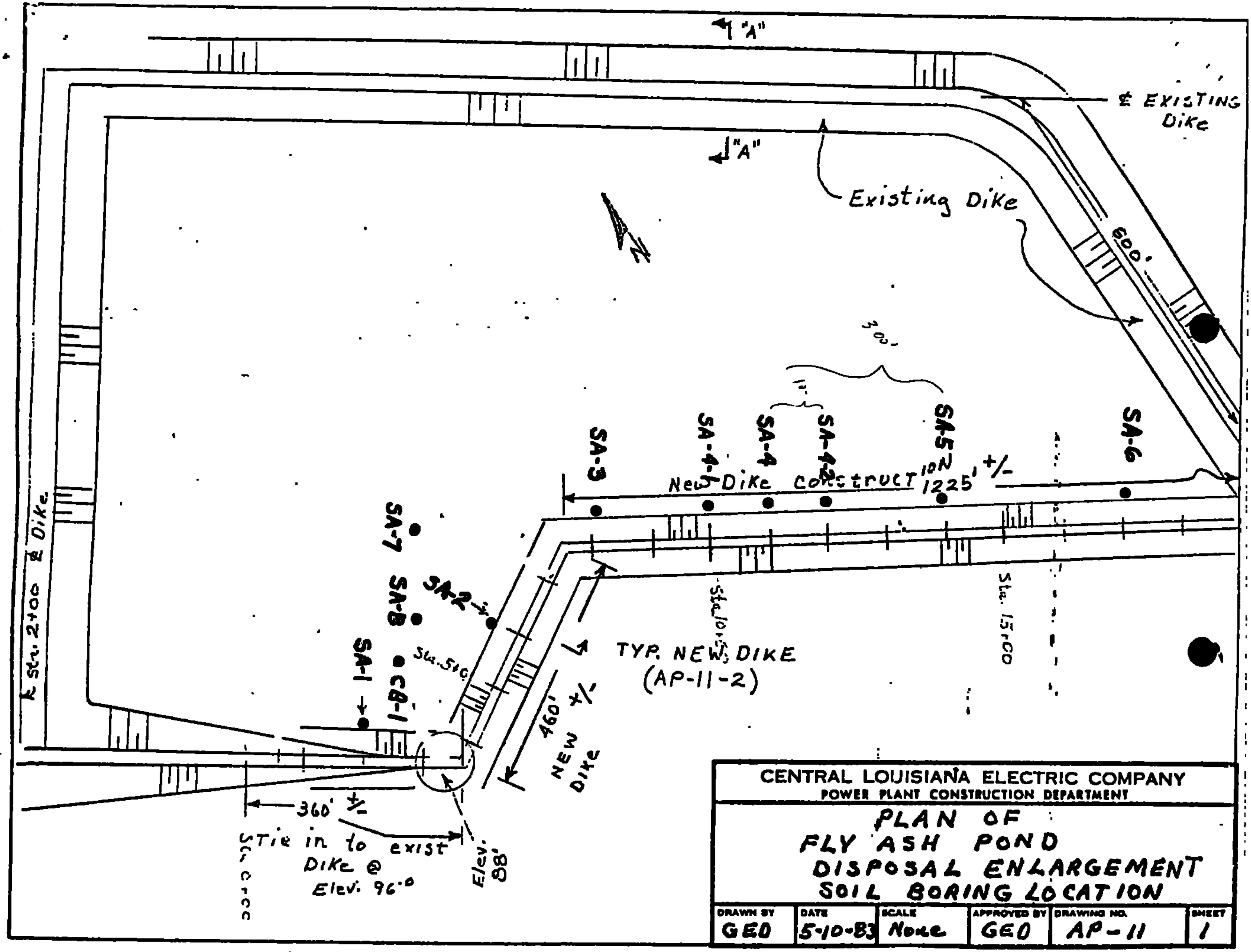
Very truly yours,

J. T. Simms Jr

J. T. Simms, Jr., Manager
Resource Development Division

JTSjr/PJT:aw
Enclosures

cc: Messrs. B. J. Guillory
L. G. Fontenot
K. B. Dickerson
G. E. DeSoto
C. A. Strong



"A"
"A"
℄ EXISTING Dike
Existing Dike
600'
300'
10'
SA-6
SA-5
SA-4-2
SA-4
SA-4-1
SA-3
SA-2
SA-7
SA-8
CB-1
SA-1
New Dike Construction 1225' +/-
Sta. 15+00
Sta 10+0
Sta. 5+0
TYP. NEW DIKE (AP-11-2)
460' +/- NEW DIKE
360' +/-
Tie in to exist Dike @ Elev. 96.0
Elev. 88'
Sta. 0+00
℄ Sta. 2+00 ℄ Dike
N
CENTRAL LOUISIANA ELECTRIC COMPANY
POWER PLANT CONSTRUCTION DEPARTMENT
PLAN OF FLY ASH POND DISPOSAL ENLARGEMENT SOIL BORING LOCATION
DRAWN BY GEO
DATE 5-10-83
SCALE None
APPROVED BY GEO
DRAWING NO. AP-11
SHEET 1

ATTACHMENT 3: SUMMARY OF LABORATORY DATA

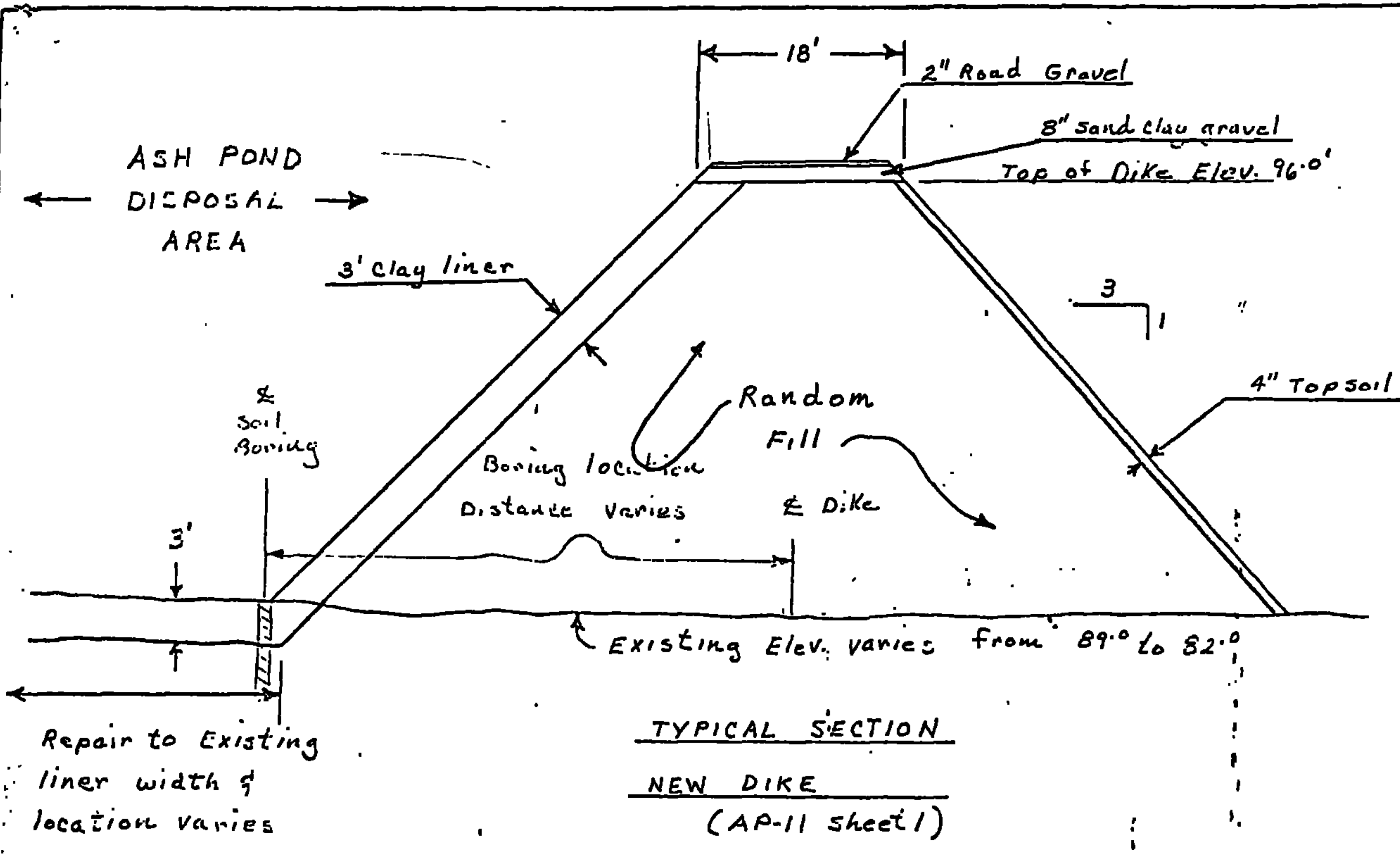
SUMMARY OF LABORATORY TEST DATA

PROJECT 83-2844

DATE November 29, 1983

BORING NO	DEPTH IN FEET	TYPE OF MATERIAL	MOISTURE CONTENT %	DRY DENSITY pcf	ATTERBERG LIMITS LL	PL	PI	COMPRESSION TEST: COMPRESSION psf	STRAIN %	LATERAL PRESSURE psi	TYPE FAILURE	Coefficient of Permeability Cm/sec.
SA-1	0-2	Brown Clay	35	85	71	25	46					3.3×10^{-9}
SA-2	2-4	Brown Clay	18	104	60	21	39					5.5×10^{-9}
SA-3	2-4	Brown Clay	49	76	42	16	26					7.8×10^{-9}
SA-4	2-4	Brown Clay	22	102	40	16	24					1.7×10^{-8}
SA-5	0-2	Brown Clay	24	101	39	16	23					6.6×10^{-9}
SA-7	4-6	Brown Clay	24	101	39	19	20					1.4×10^{-8}
CB-6	0-2	Brown Sandy Clay	33	90								8.9×10^{-9}

SOUTHWESTERN LABORATORIES



CENTRAL LOUISIANA ELECTRIC COMPANY POWER PLANT CONSTRUCTION DEPARTMENT					
Dike Section					
DRAWN BY GED	DATE 5-10-83	SCALE None	APPROVED BY GED	DRAWING NO. AP-11	SHEET 2

ATTACHMENT 2: DIKE SECTION SHOWING PROXIMITY OF SOIL BORINGS

ATTACHMENT 4 [redacted] AB RESULTS OF CLAY PLACED ON [redacted] E OF NEW DIKE

[illegible] LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3753

LOCATION Sta 4 + 00

Date 11-18-83

Boring No. ______ Sample Depth ______

Tested by R.L.

Contractor Cleco

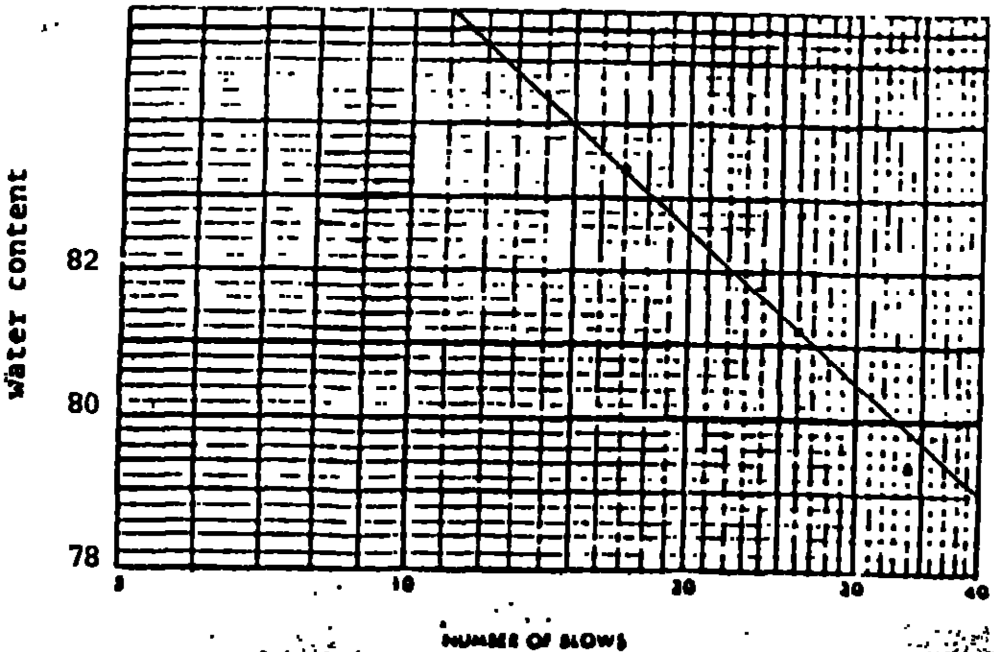
PLASTIC LIMIT

Can No.	A-15		
Wet Wt.	8.58		
Dry Wt.	7.0		
Wt. Water	1.58		
T.W.	1.54		
Wt. Dry Soil	5.46		
% Water	28.9		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	34	26	17		
Can No.	AL	A-7	A-5		
Wet Wt.	13.01	15.61	14.49		
Dry Wt.	7.97	9.35	8.64		
Wt. Water	5.04	6.26	5.85		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	6.43	7.81	7.1		
% Water	78.4	80.2	82.4		



LL 81

PL 29

PI 52

Symbol from plasticity chart ______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3753

LOCATION Sta 6 + 00 Date 11-18-83

Boring No. ________ Sample Depth ________ Tested by R.L.

Contractor Cleco

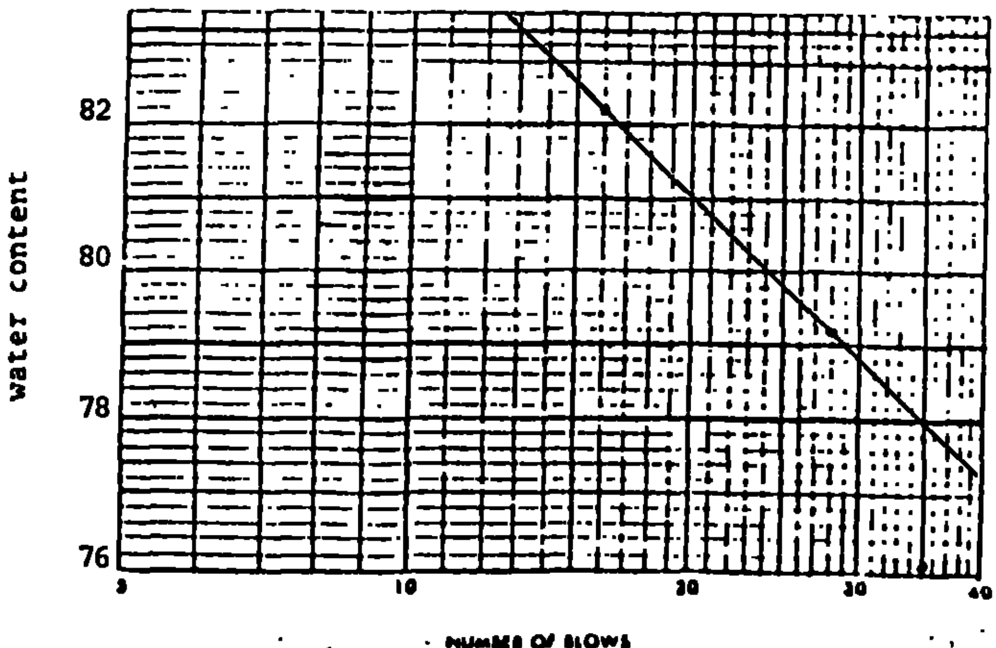
PLASTIC LIMIT

Can No.	AV		
Wet Wt.	10.09		
Dry Wt.	8.37		
Wt. Water	1.72		
T.W.	1.54		
Wt. Dry Soil	6.83		
% Water	25.2		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	28	16		
Can No.	A-21	AA	A-12		
Wet Wt.	15.03	16.02	15.26		
Dry Wt.	9.2	9.62	9.07		
Wt. Water	5.83	6.4	6.19		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	7.66	8.08	7.53		
% Water	76.1	79.2	82.2		



LL 80

PL 25

PI 55

Symbol from plasticity chart

SOUTHWESTERN LABORATORIES

CONSTRUCTION MATERIALS TESTING DIVISION

FILE NUMBER 9101550

DATE: 12-02-83

TO: Cleco

REPORT OF: LABORATORY SIEVE ANALYSIS OF Material finer than #200
(AND) PLASTICITY INDEX

FOR: Cleco

IDENTIFICATION MARKS
(PROJECT TITLE & LOCATION) Fly Ash Pond Enlargement Sta #8 + 50

A (REPRESENTATIVE) SAMPLE OF Brown Clay

XXXXXXXXXXXXXXXX WAS DELIVERED TO THE LABORATORY) BY XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXX Contractor in Alexandria, LA ON December 2, 1983

TO DETERMINE THE GRADATION AND PLASTICITY INDEX. THE TEST RESULTS ARE AS FOLLOWS:

U. S. SIEVE SIZE		% RETAINED/PASSING	SPEC. REQUIREMENTS
#10	0	0/100	
#40	4.8	4.9/95.1	
#200	12.6	12.9/82.2	
-200	80.5	82.2	

WT. OF TOTAL
SAMPLE 97.9

ATTERBERG LIMITS DETERMINATION
(ASTM D-424)

REMARKS:

		REQUIREMENTS
TECHNICIAN: Roxanne Lawson	LIQUID LIMIT: 67	%
	PLASTICITY INDEX: 47	%

LAB. NO. 13-3760

SOUTHWESTERN LABORATORIES

Bob Adair

BOB ADAIR, Manager

SOUTHWESTERN LABORATORIES

CONSTRUCTION MATERIALS TESTING DIVISION

FILE NUMBER 9101550

DATE 12-02-83

TO: Cleco

REPORT OF: LABORATORY SIEVE ANALYSIS OF Material Finer than #200
(AND) PLASTICITY INDEX

FOR: Cleco

IDENTIFICATION MARKS
(PROJECT TITLE & LOCATION) Fly Ash Pond Enlargment Sta # 6 + 25

A (REPRESENTATIVE) SAMPLE OF Brown Clay

(WAS SECURED FROM, WAS DELIVERED TO THE LABORATORY) BY ~~(A REPRESENTATIVE OF SOUTH-WESTERN LABORATORIES)~~ contractor in Alexandria, LA ON December 2, 1983

TO DETERMINE THE GRADATION AND PLASTICITY INDEX. THE TEST RESULTS ARE AS FOLLOWS:

U. S. SIEVE SIZE		% RETAINED/PASSING	SPEC. REQUIREMENTS
#10	0	0/100	
#40	7.6	6.2/93.8	
#200	16.8	13.6/80.2	
-200	98.7	80.2	

WT. OF TOTAL
SAMPLE 123.1

ATTERBERG LIMITS DETERMINATION
(ASTM D-424)

REMARKS:

REQUIREMENTS

TECHNICIAN: Roxanne Lawson

LIQUID LIMIT: 63 ______ %

PLASTICITY INDEX: 43 ______ %

LAB. NO. 13-3760

SOUTHWESTERN LABORATORIES

Bob Adair

BOB ADAIR, Manager

SOUTHWESTERN LABORATORIES

CONSTRUCTION MATERIALS TESTING DIVISION

FILE NUMBER 9101550

DATE 12-02-83

TO: CLECO

REPORT OF: LABORATORY SIEVE ANALYSIS OF Material Finer than #200
(AND) PLASTICITY INDEX

FOR: CLECO

IDENTIFICATION MARKS
(PROJECT TITLE & LOCATION) Fly Ash Pond Enlargement Sta 12 + 50

A (REPRESENTATIVE) SAMPLE OF Brown Clay

(~~WAS SECURED FROM~~ WAS DELIVERED TO THE LABORATORY) BY (~~REPRESENTATIVE OF SOUTHWESTERN LABORATORIES~~) Contractor in Alexandria, LA. ON 12-02-83

TO DETERMINE THE GRADATION AND PLASTICITY INDEX. THE TEST RESULTS ARE AS FOLLOWS:

U. S. SIEVE SIZE	% RETAINED/PASSING	SPEC. REQUIREMENTS
#10 0	0/100	
#40 3.6	3.5/96.5	
#200 10.9	10.5/86.0	
-200 89.8	86.0	

WT. OF TOTAL
SAMPLE 104.3

ATTERBERG LIMITS DETERMINATION
(ASTM D-424)

REMARKS:

		REQUIREMENTS
TECHNICIAN: Roxanne Lawson	LIQUID LIMIT: 74	%
	PLASTICITY INDEX: 49	%

LAB. NO. 13-3760

SOUTHWESTERN LABORATORIES

Bob Adair

BOB ADAIR, Manager

ATTACHMENT 5: LAB RESULTS FROM SOIL BORINGS SA-1, SA-2, SA-3, SA-4, SA-4-1, SA-4-2, SA-5, SA-6, SA-7, SA-8, CB-1

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-1
LOCATION: Rodemacher Power Sta.

Date: 10-25-83 Type: Auger Ground Elevation: 86.0

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
0–2		■	Brown Clay.
2–4		■	Brown Clay.
4–6		■	Brown Clay.
6–10		X	1-2-2 (4 B/F) Tan and Brown Silty Sand.

BOTTOM OF HOLE - 10'

WATER = 8'

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-1

Date 10-26-83

Boring No. ____ Sample Depth 0-2

Tested by R.L.

Contractor Cleco

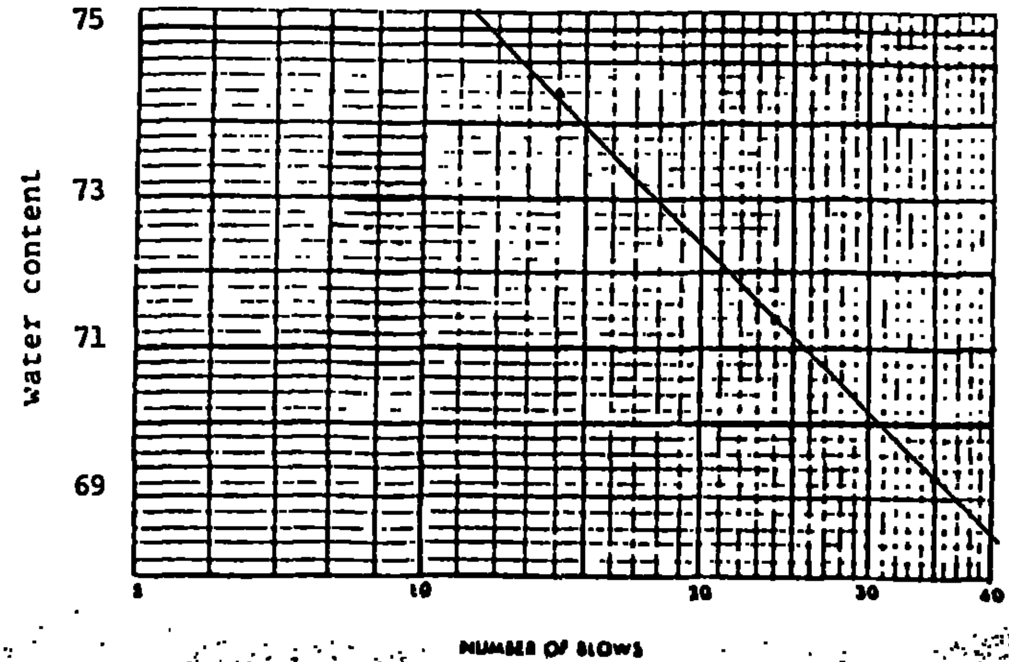
PLASTIC LIMIT

Can No.	A-14		
Wet Wt.	8.28		
Dry Wt.	6.94		
Wt. Water	1.34		
T.W.	1.54		
Wt. Dry Soil	5.4		
% Water	24.8		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	24	14		
Can No.	A-1	A-3	AK		
Wet Wt.	17.35	17.93	18.3		
Dry Wt.	10.88	11.1	11.15		
Wt. Water	6.47	6.83	7.15		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.34	9.56	9.61		
% Water	69.3	71.4	74.4		



LL 71

PL 25

PI 46

Symbol from plasticity chart ____

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-1

Date 10-26-83

Boring No. ______ Sample Depth 2-4

Tested by R.L.

Contractor Cleco

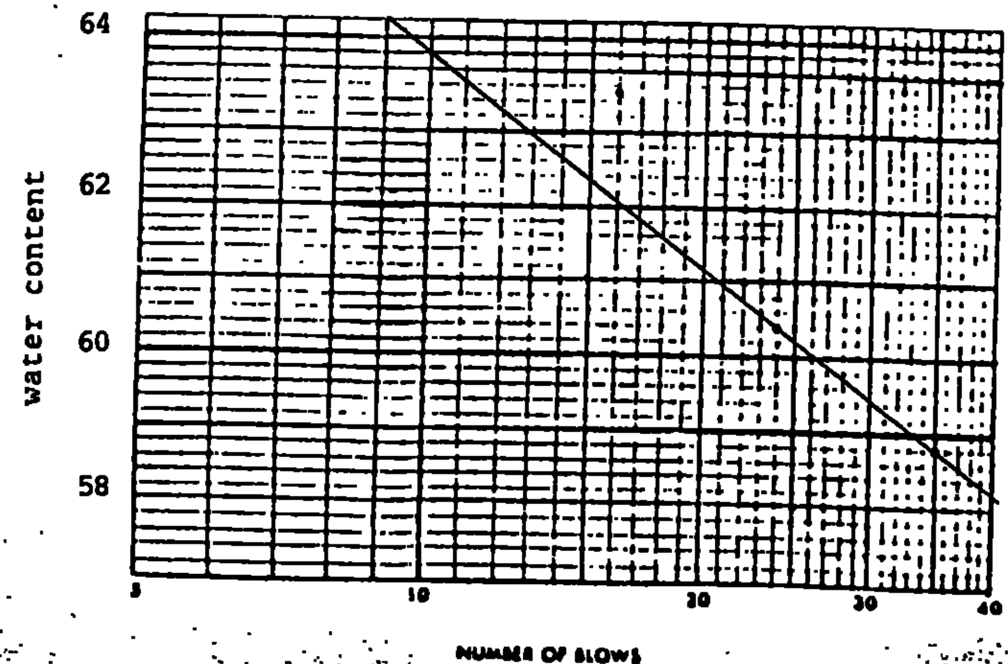
PLASTIC LIMIT

Can No.	A-16		
Wet Wt.	9.52		
Dry Wt.	8.25		
Wt. Water	1.27		
T.W.	1.54		
Wt. Dry Soil	6.71		
% Water	18.9		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	24	16		
Can No.	AX	AE	A-15		
Wet Wt.	17.4	18.11	18.29		
Dry Wt.	11.53	11.87	11.78		
Wt. Water	5.87	6.24	6.51		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.99	10.33	10.24		
% Water	58.8	60.4	63.5		



LL 60

PL 19

PI 41

Symbol from plasticity chart

______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 17-3713

LOCATION SA-1

Date 10-26-83

Boring No. ______ Sample Depth 4-6

Tested by R.L.

Contractor Cleco

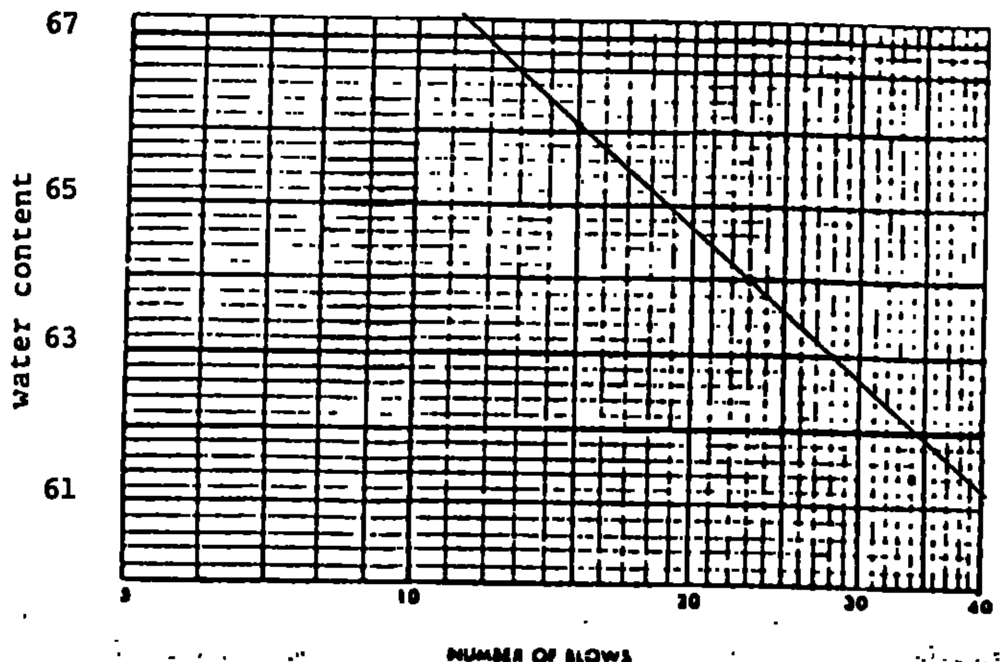
PLASTIC LIMIT

Can No.	A-5		
Wet Wt.	9.23		
Dry Wt.	7.98		
Wt. Water	1.25		
T.W.	1.54		
Wt. Dry Soil	6.44		
% Water	19.4		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	34	23	15		
Can No.	A-19	AW	A-4		
Wet Wt.	17.15	18.56	18.42		
Dry Wt.	11.21	11.92	11.7		
Wt. Water	5.94	6.64	6.72		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.67	10.38	10.16		
% Water	61.4	64.0	66.1		



LL 64

PL 19

PI 45

Symbol from plasticity chart ______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-2
LOCATION: Rodemacher Power Sta.

Date: 10-25-83 Type: Auger Ground Elevation: 87.0

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
		■	Brown Clay
		■	Brown Clay.
5		■	Brown Clay.
		X	4-4-3-7 B/F Brown Clay.
10		X	3-4-5-9 B/F Brown Clay.

Bottom of Hole - 10'

Free Water - 6'

15
20
25
30
35
40
45
50

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-2

Date 10-26-83

Boring No. ______ Sample Depth 0-2

Tested by ______

Contractor Cleco

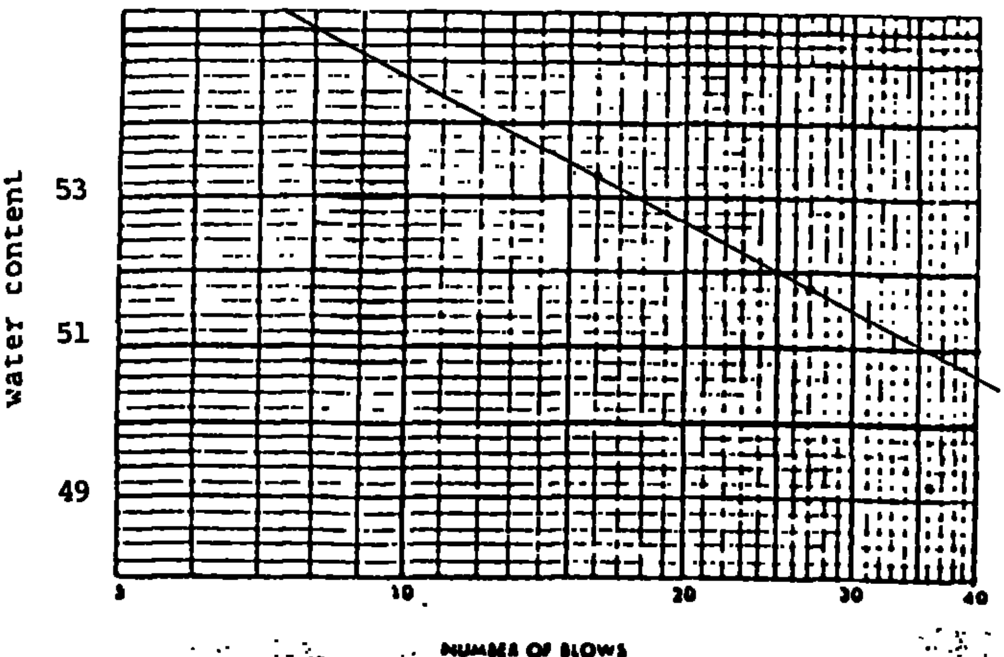
PLASTIC LIMIT

Can No.	AL		
Wet Wt.	10.02		
Dry Wt.	8.74		
Wt. Water	1.28		
T.W.	1.54		
Wt. Dry Soil	7.2		
% Water	17.8		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	27	16		
Can No.	A-2	AV	A-18		
Wet Wt.	19.04	19.64	20.08		
Dry Wt.	13.27	13.46	13.63		
Wt. Water	5.77	6.18	6.45		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	11.73	11.92	12.09		
% Water	49.2	51.8	53.3		



LL 52

PL 18

PI 34

Symbol from plasticity chart

______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION Sa-2

Date 10-26-83

Boring No. ______ Sample Depth 2-4

Tested by R.L.

Contractor Cleco

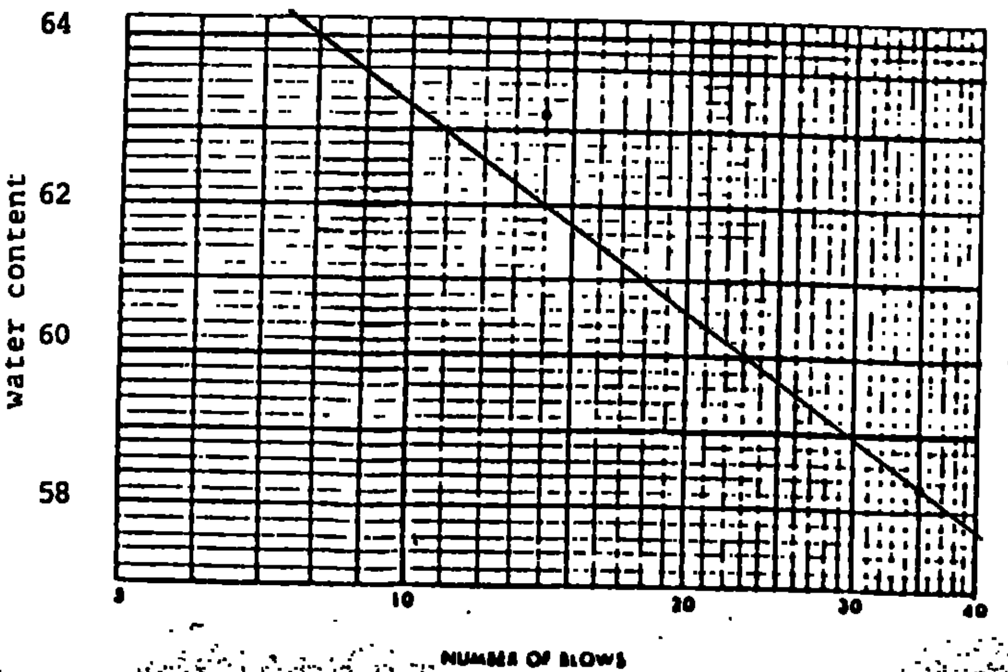
PLASTIC LIMIT

Can No.	A-12		
Wet Wt.	7.34		
Dry Wt.	6.33		
Wt. Water	1.01		
T.W.	1.54		
Wt. Dry Soil	4.79		
% Water	21.1		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	23	14		
Can No.	AE	AH	AI		
Wet Wt.	15.28	15.73	16.21		
Dry Wt.	10.22	10.41	10.53		
Wt. Water	5.06	5.32	5.68		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	8.68	8.87	8.99		
% Water	58.3	60.0	63.2		



LL 60

PL 21

PI 39

Symbol from plasticity chart ______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-3
LOCATION: Rodemacher Power Sta.

Date: 10-25-83 Type: Auger Ground Elevation: 85.0

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
		■	Dark Brown Clay.
		■	Brown Clay.
5		■	Brown Clayey Silt.
		■	Brown Clayey Silt.
10		■	Brown Clay.
			Bottom of Hole = 10'
			Free Water - 6'
15			
20			
25			
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Dark Brown Clay

Lab No. 13-3713

LOCATION SA-3

Date 10-26-83

Boring No. ________ Sample Depth 0-2

Tested by R.L.

Contractor Cleco

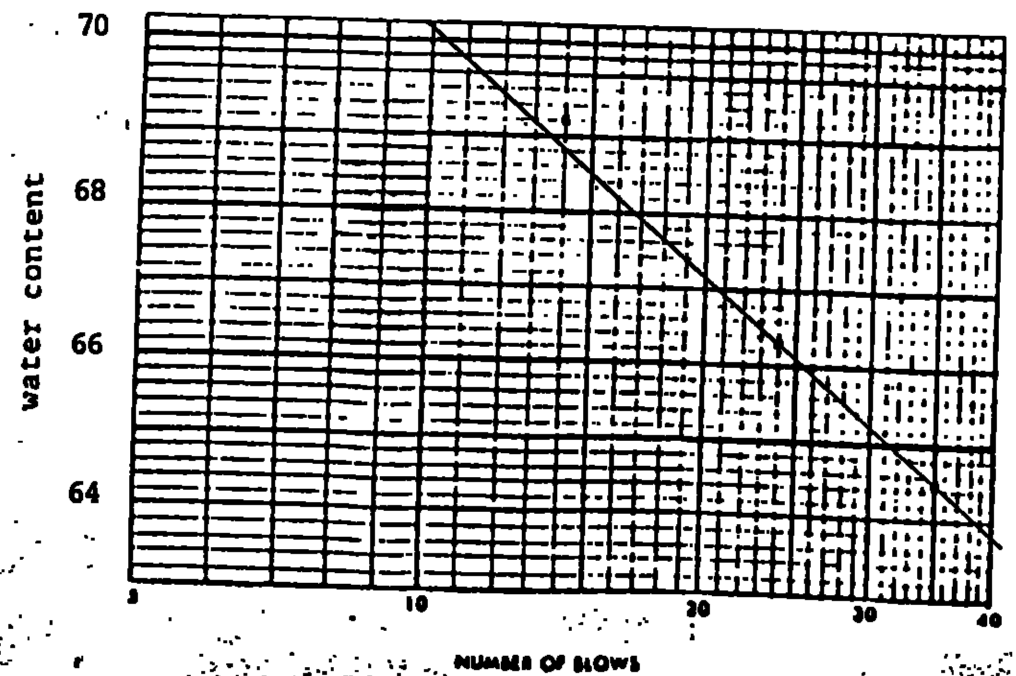
PLASTIC LIMIT

Can No.	AX		
Wet Wt.	9.01		
Dry Wt.	7.55		
Wt. Water	1.46		
T.W.	1.54		
Wt. Dry Soil	6.01		
% Water	24.3		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	24	14		
Can No.	A-1	AA	A-14		
Wet Wt.	13.53	14.13	14.7		
Dry Wt.	8.83	9.11	9.32		
Wt. Water	4.7	5.02	5.38		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	7.29	7.57	7.78		
% Water	64.5	66.3	69.2		



LL 66

PL 24

PI 42

Symbol from plasticity chart ________

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-3

Date 10-26-83

Boring No. ______ Sample Depth 2-4

Tested by R.L.

Contractor Cleco

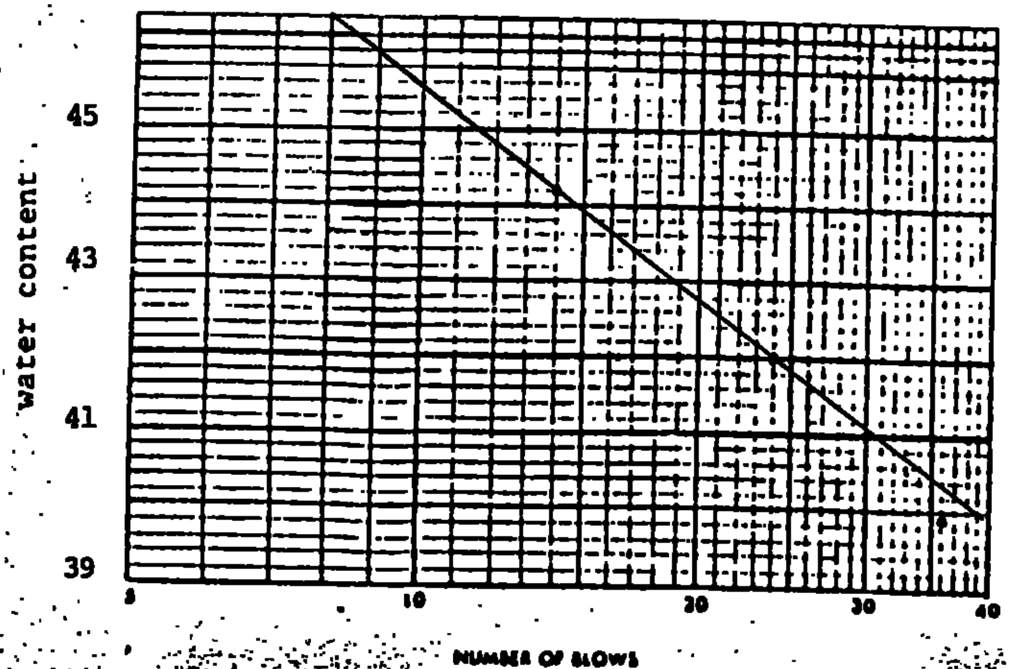
PLASTIC LIMIT

Can No.	A-1		
Wet Wt.	9.17		
Dry Wt.	8.12		
Wt. Water	1.05		
T.W.	1.54		
Wt. Dry Soil	6.58		
% Water	16.0		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	24	14		
Can No.	A-16	A-3	A-7		
Wet Wt.	15.54	15.94	16.35		
Dry Wt.	11.55	11.68	11.81		
Wt. Water	3.99	4.26	4.54		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	10.01	10.14	10.27		
% Water	39.9	42.0	44.2		



LL 42

PL 16

PI 26

Symbol from plasticity chart ______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clayey Silt

Lab No. 13-3713

LOCATION SA-3 **Date** 10-26-83

Boring No. ______ **Sample Depth** 4-6 **Tested by** R.L.

Contractor Cleco

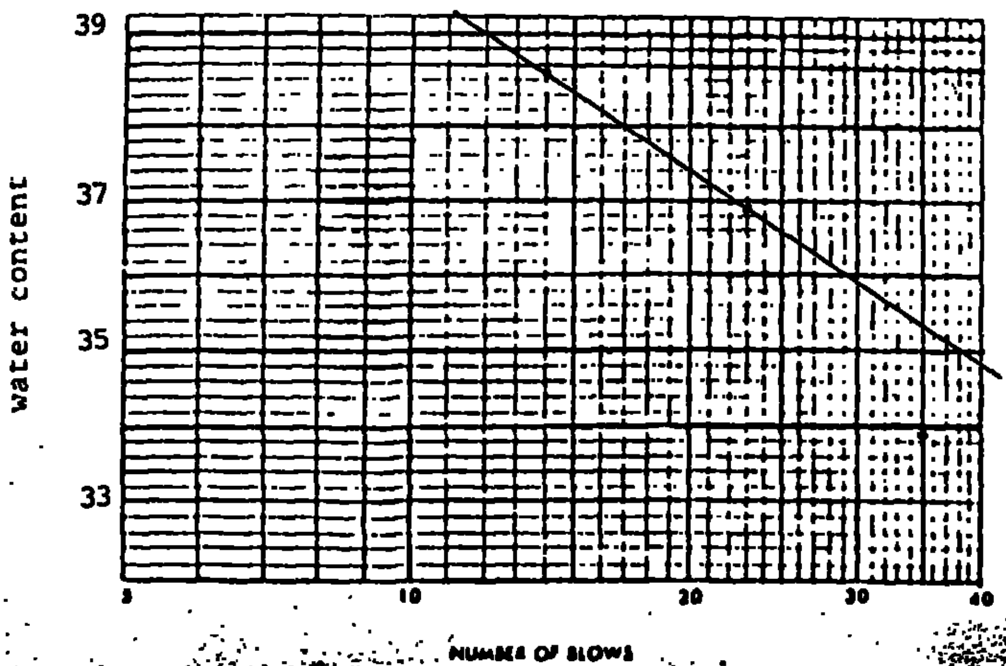
PLASTIC LIMIT

Can No.	AL		
Wet Wt.	10.22		
Dry Wt.	9.11		
Wt. Water	1.11		
T.W.	1.54		
Wt. Dry Soil	7.57		
% Water	14.7		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	23	14		
Can No.	AP	AI	A-26		
Wet Wt.	19.37	19.53	20.06		
Dry Wt.	14.86	14.68	14.89		
Wt. Water	4.51	4.85	5.17		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	13.32	13.14	13.35		
% Water	33.9	36.9	38.7		



LL 37

PL 15

PI 22

Symbol from plasticity chart

______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-4
LOCATION: Rodemacher Power Sta.

Date: 10-25-83 Type: Auger Ground Elevation: 85.0

Legend: ■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
		■	Brown Clay.
		■	Brown Clay.
5		X	5-9-9-18 B/F Brown and Tan Sand.
		X	4-4-4-8 B/F Brown and Tan Silty Sand.
10		X	1-2-2-4 B/F Brown and Gray Clay.

BOTTOM OF HOLE = 10'

WATER = 8'

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-4

Date 10-26-83

Boring No. ______ Sample Depth 2'-4'

Tested by R.L.

Contractor Cleco

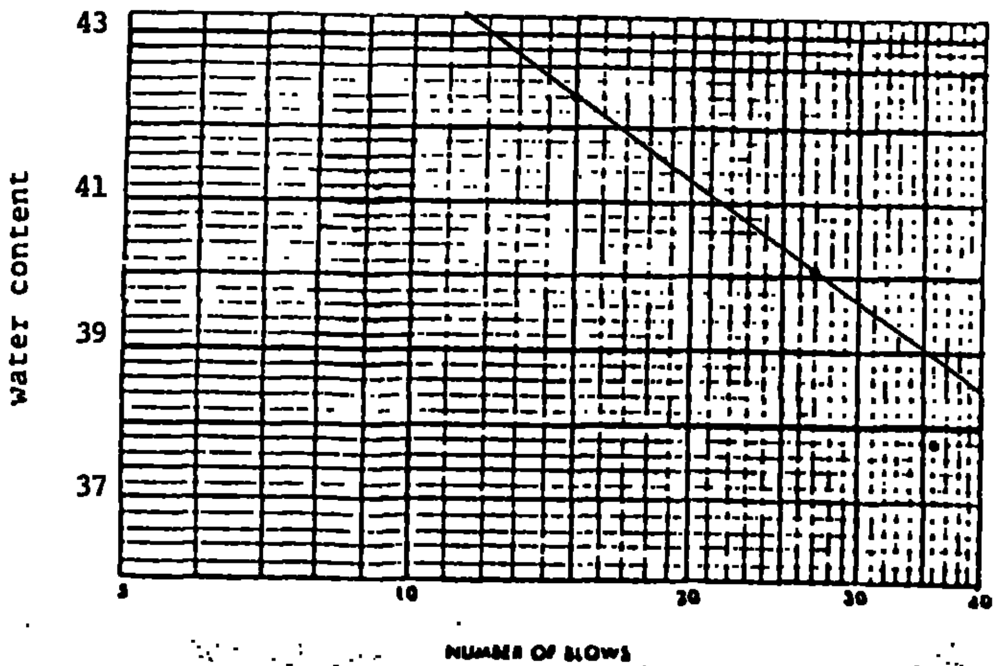
PLASTIC LIMIT

Can No.	AX		
Wet Wt.	9.79		
Dry Wt.	8.66		
Wt. Water	1.13		
T.W.	1.54		
Wt. Dry Soil	7.12		
% Water	15.9		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	27	15		
Can No.	A-24	AD	AF		
Wet Wt.	17.46	18.46	19.04		
Dry Wt.	13.09	13.67	13.83		
Wt. Water	4.37	4.84	5.21		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	11.55	12.08	12.29		
% Water	37.8	40.1	42.4		



LL 40

PL 16

PI 24

Symbol from plasticity chart ______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-4-1
LOCATION: Rodemacher Power Sta.

Date: 10-25-83 Type: Auger Ground Elevation: 85.0

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
			Brown Clay.
			Brown Clayey Sand.
5			Brown Clay.
			Brown Silty Clay.
10		X	1-2-2-4- B/F Brown and Tan Sandy Clay.

BOTTOM OF HOLE = 10'

WATER = 9'

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

36

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-4-1

Date 10-26-83

Boring No. ______ Sample Depth 0-2

Tested by R.L.

Contractor Cleco

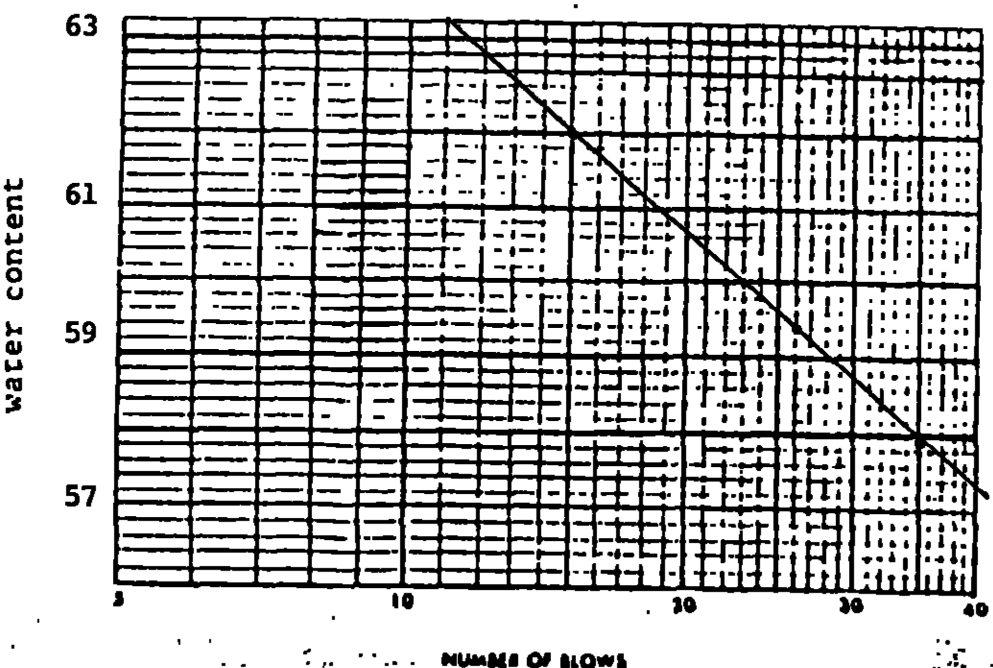
PLASTIC LIMIT

Can No.	A-1		
Wet Wt.	9.64		
Dry Wt.	8.31		
Wt. Water	1.33		
T.W.	1.54		
Wt. Dry Soil	6.77		
% Water	19.6		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	26	15		
Can No.	A-19	A-23	AC		
Wet Wt.	16.35	17.19	17.46		
Dry Wt.	10.93	11.36	11.37		
Wt. Water	5.42	5.83	6.09		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.36	9.82	9.83		
% Water	57.9	59.4	62.0		



LL 60

PL 20

PI 40

Symbol from plasticity chart ______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clayey Sand

Lab No. 13-3713

LOCATION SA-4-1

Date 10-26-83

Boring No. ______ Sample Depth 2' - 4'

Tested by R.L.

Contractor Cleco

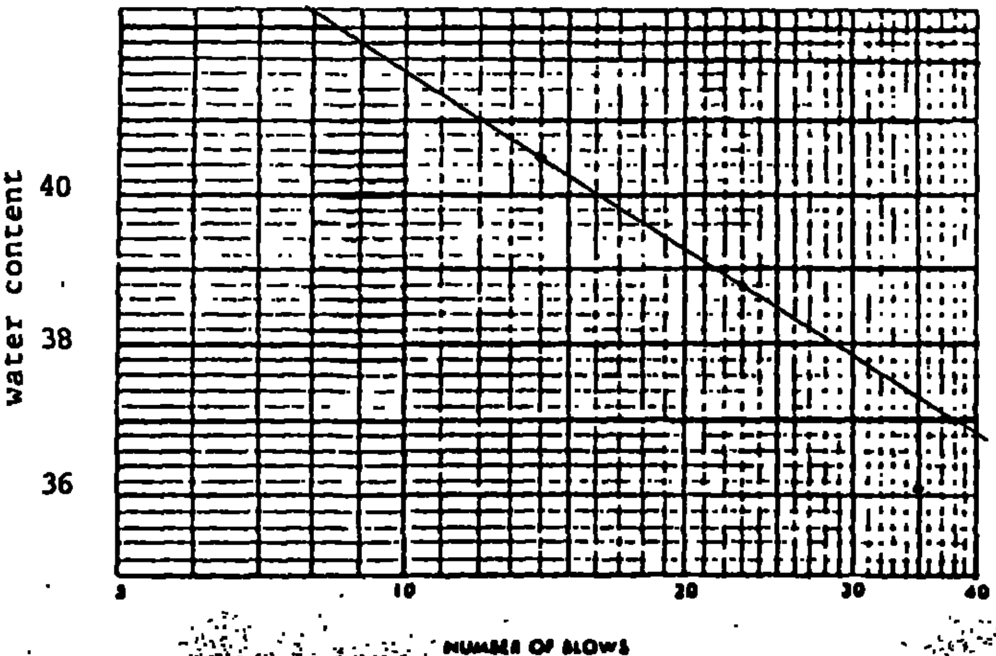
PLASTIC LIMIT

Can No.	AC		
Wet Wt.	10.74		
Dry Wt.	9.34		
Wt. Water	1.4		
T.W.	1.54		
Wt. Dry Soil	7.8		
% Water	17.9		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	23	14		
Can No.	A-16	AH	AX		
Wet Wt.	23.09	24.03	22.8		
Dry Wt.	17.37	17.74	16.67		
Wt. Water	5.72	6.29	6.13		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	15.83	16.2	15.13		
% Water	36.1	38.8	40.5		



LL 39

PL 18

PI 21

Symbol from plasticity chart

______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-4-1

Date 10-26-83

Boring No. ______ Sample Depth 4-6

Tested by R.L.

Contractor Cleco

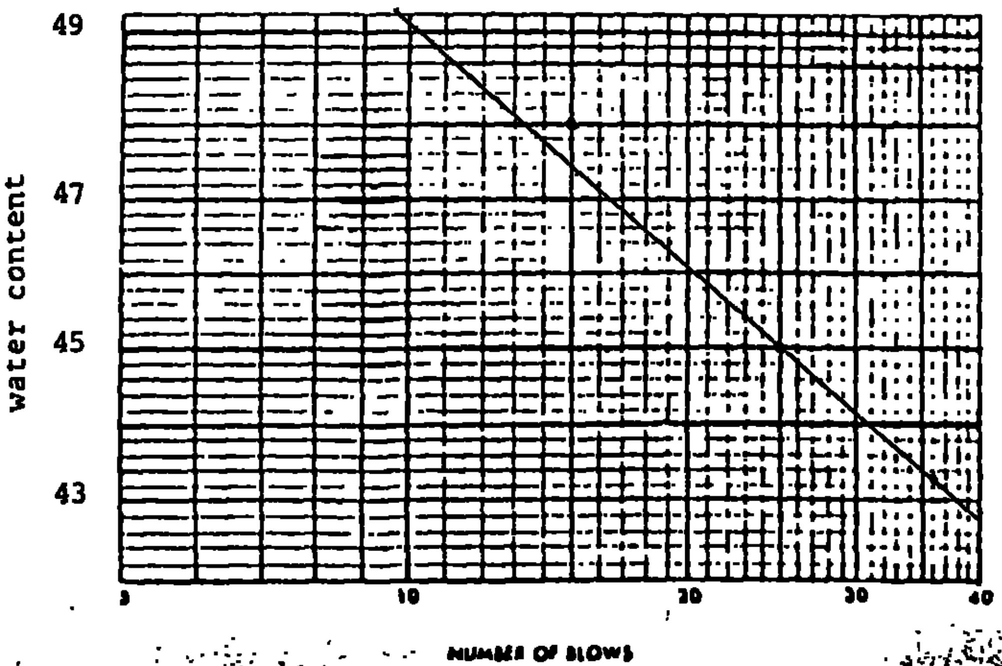
PLASTIC LIMIT

Can No.	A-7		
Wet Wt.	10.53		
Dry Wt.	9.39		
Wt. Water	1.14		
T.W.	1.54		
Wt. Dry Soil	7.85		
% Water	14.5		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	25	15		
Can No.	AM	A-26	A-5		
Wet Wt.	20.22	20.84	21.5		
Dry Wt.	14.58	14.85	15.03		
Wt. Water	5.64	5.99	6.47		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	13.04	13.31	13.49		
% Water	43.3	45.0	48.0		



LL 45

PL 15

PI 30

Symbol from plasticity chart

______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-4-2
LOCATION: Rodemacher Power Sta.

Date: 10-26-83 Type: Auger Ground Elevation: 84.5

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
		■	Brown Clay.
		■	Brown Clay.
5		■	Brown Clay.
		X	4-4-5-9 B/F Brown Silty Sand.
10		X	3-3-3-6 B/F Brown Silty Sand.

BOTTOM OF HOLE - 10'

WATER = 4'

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-4-2

Date 10-26-83

Boring No. ________ Sample Depth 0-2

Tested by R.L.

Contractor Cleco

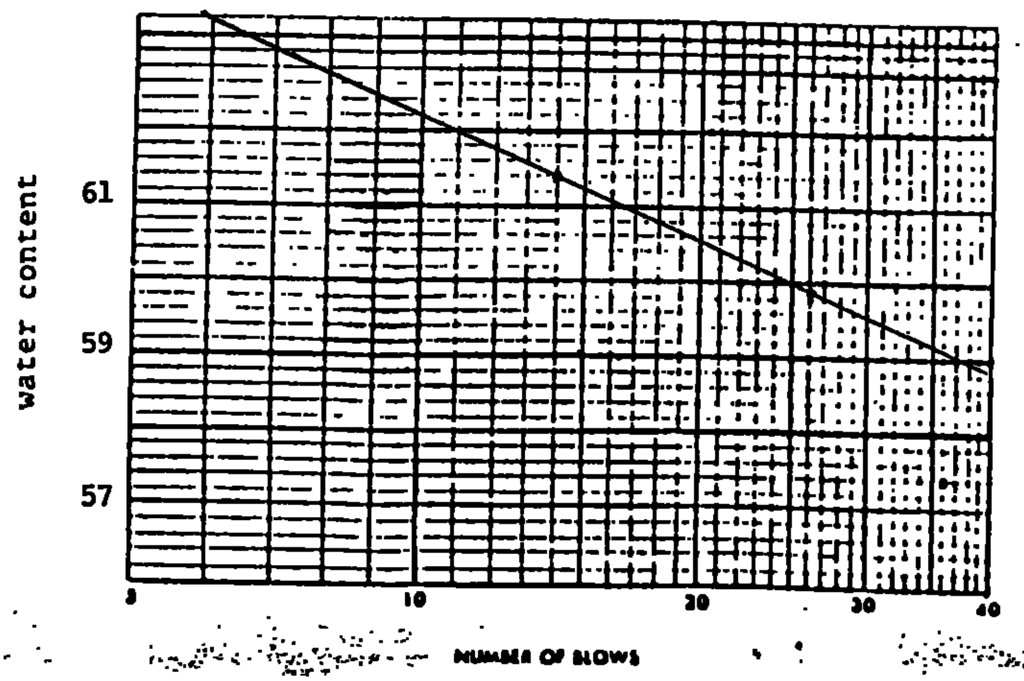
PLASTIC LIMIT

Can No.	AW		
Wet Wt.	9.1		
Dry Wt.	7.61		
Wt. Water	1.49		
T.W.	1.54		
Wt. Dry Soil	6.07		
% Water	24.5		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	26	14		
Can No.	A-26	A-11	A-32		
Wet Wt.	15.77	16.2	16.07		
Dry Wt.	10.58	10.71	10.54		
Wt. Water	5.19	5.49	5.53		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.04	9.17	9.0		
% Water	57.4	59.9	61.4		



LL 60

PL 25

PI 35

Symbol from plasticity chart ________

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-5
LOCATION: Rodemacher Power Sta.

Date: 10-26-83 Type: Auger Ground Elevation: 84.0

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
			Brown Clay.
			Brown Clayey Silt.
5		X	4-8-12-20 B/F Brown Sand.
		X	2-8-14-22 B/F Brown Silty Sand.
10		X	2-7-12-19 B/F Brown Silty Sand.
15			
20			
25			
30			
35			
40			
45			
50			

BOTTOM OF HOLE = 10'

WATER = 8'

SOUTHWESTERN LABORATORIES
SOIL MECHANICS LABORATORY
ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-5

Date 10-26-83

Boring No. ______ Sample Depth 0-2

Tested by R.L.

Contractor Cleco

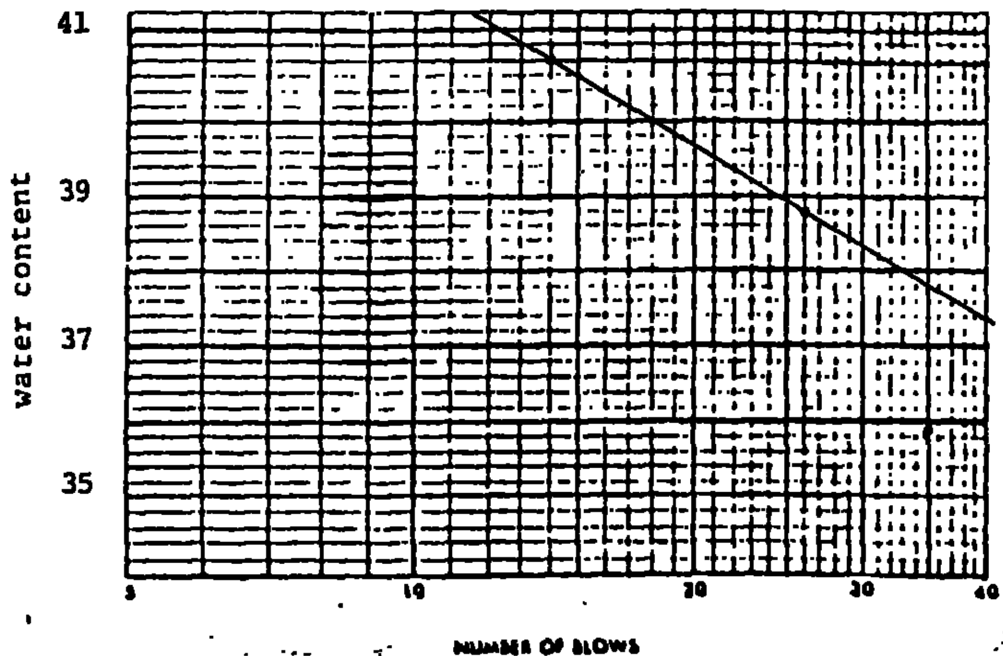
PLASTIC LIMIT

Can No.	AG		
Wet Wt.	8.39		
Dry Wt.	7.43		
Wt. Water	.96		
T.W.	1.54		
Wt. Dry Soil	5.89		
% Water	16.3		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	26	14		
Can No.	AX	AY	A-3		
Wet Wt.	21.22	19.47	19.1		
Dry Wt.	16.29	14.46	14.01		
Wt. Water	4.93	5.01	5.09		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	14.75	12.92	12.47		
% Water	35.9	38.8	40.8		



LL 39

PL 16

PI 23

Symbol from plasticity chart ______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clayey Silt

Lab No. 13-3713

LOCATION SA-5

Date 10-26-83

Boring No. ______ Sample Depth 2-4

Tested by R.L.

Contractor Cleco

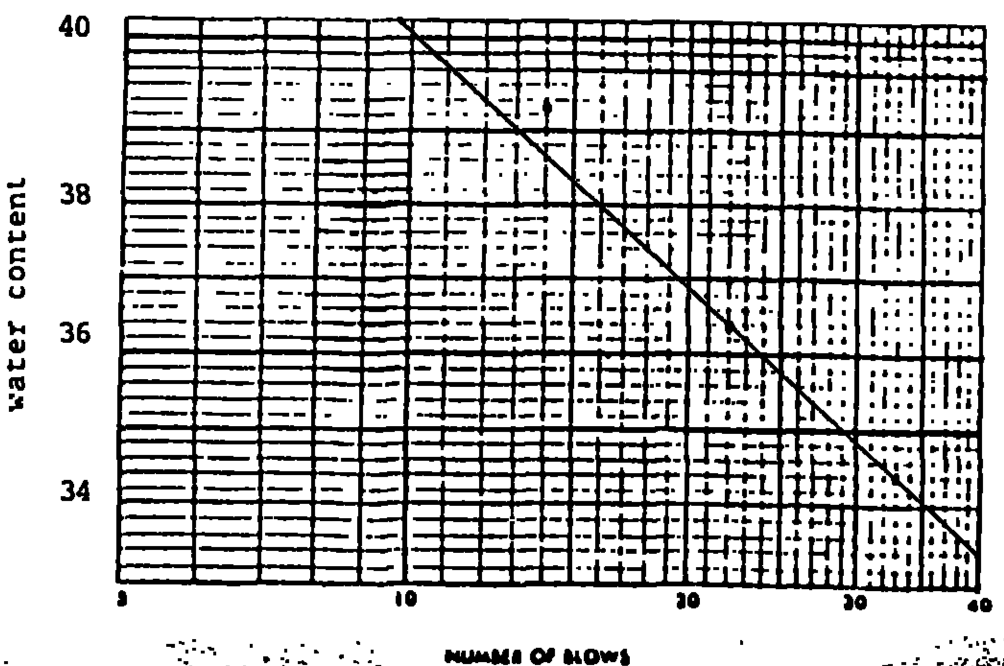
PLASTIC LIMIT

Can No.	A-24		
Wet Wt.	10.48		
Dry Wt.	9.33		
Wt. Water	1.15		
T.W.	1.54		
Wt. Dry Soil	7.79		
% Water	14.8		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	33	22	14		
Can No.	A-10	A-2	AS		
Wet Wt.	14.99	15.37	15.43		
Dry Wt.	11.55	11.68	11.51		
Wt. Water	3.44	3.69	3.92		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	10.01	10.14	9.97		
% Water	34.4	36.4	39.3		



LL 36

PL 15

PI 21

Symbol from plasticity chart

______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-6
LOCATION: Rodemacher Power Sta.

Date: 10-26-83   Type: Auger   Ground Elevation: 82.0

Legend: ■ Sample   X Penetration   ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
0–3		■	Brown Clay.
3–6		■	Brown Sand.
6–10		■	Brown Clay.

BOTTOM OF HOLE - 10'

NO WATER

Depth scale: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE : Brown Clay

Lab No. 13-3713

LOCATION SA-6

Date 10-26-83

Boring No. ________ Sample Depth 0-3

Tested by R.L.

Contractor Cleco

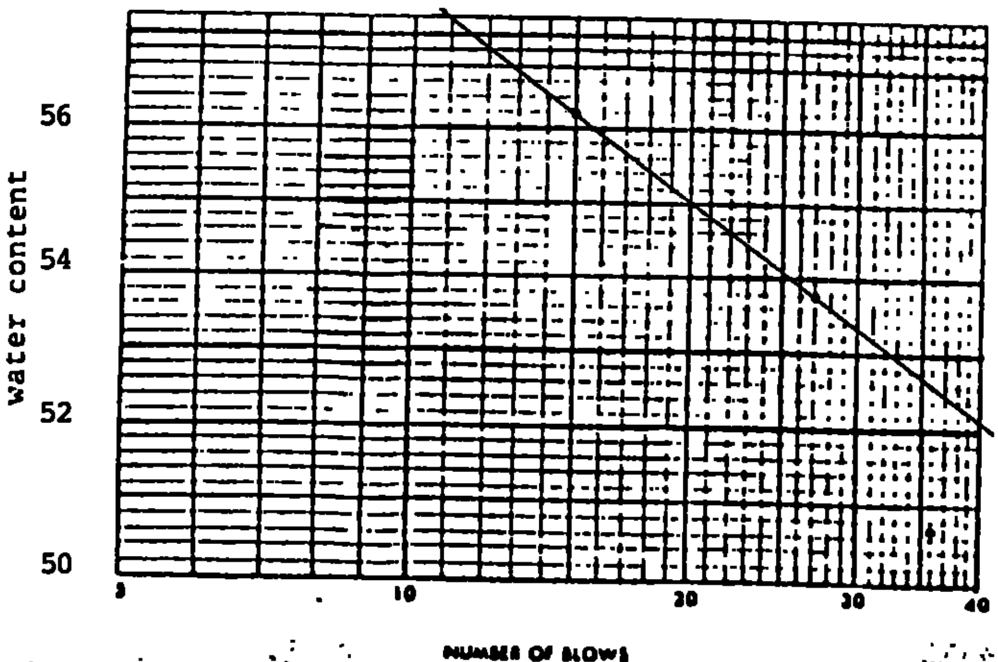
PLASTIC LIMIT

Can No.	AJ		
Wet Wt.	8.06		
Dry Wt.	6.79		
Wt. Water	1.27		
T.W.	1.54		
Wt. Dry Soil	5.25		
% Water	24.2		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	27	15		
Can No.	AB	A-3	A-9		
Wet Wt.	16.78	16.87	17.83		
Dry Wt.	11.65	11.51	11.97		
Wt. Water	5.13	5.36	5.86		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	10.11	9.97	10.43		
% Water	50.7	53.8	56.2		



LL 54

PL 24

PI 30

Symbol from plasticity chart ____________

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-6

Date 10-26-83

Boring No. ______ Sample Depth 6-10

Tested by R.L.

Contractor Cleco

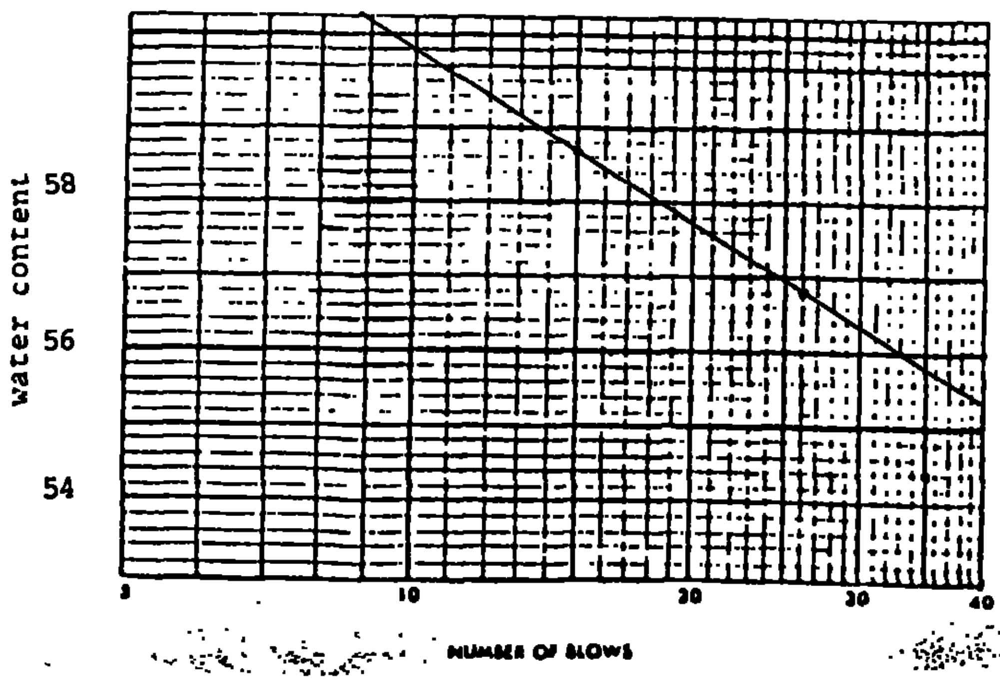
PLASTIC LIMIT

Can No.	AW		
Wet Wt.	8.85		
Dry Wt.	7.65		
Wt. Water	1.2		
T.W.	1.54		
Wt. Dry Soil	6.11		
% Water	19.6		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	26	15		
Can No.	AF	AE	AT		
Wet Wt.	14.96	15.56	16.11		
Dry Wt.	10.23	10.48	10.72		
Wt. Water	4.73	5.08	5.39		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	8.69	8.94	9.18		
% Water	54.4	56.8	58.7		



LL 57

PL 20

PI 37

Symbol from plasticity chart ______

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-7
LOCATION: Rodemacher Power Sta.

Date: 10-26-83 Type: Auger Ground Elevation: 84.0

Legend:

■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
		■	Tan Sandy Ash.
		■	Brown Clay.
5		■	Brown Clay.
		■	Brown Clay.
10		■	Brown Clay.
		■	Brown Clay.

BOTTOM OF HOLE = 12'

NO WATER

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-7

Date 10-26-83

Boring No. ______ Sample Depth 2-4

Tested by R.L.

Contractor Cleco

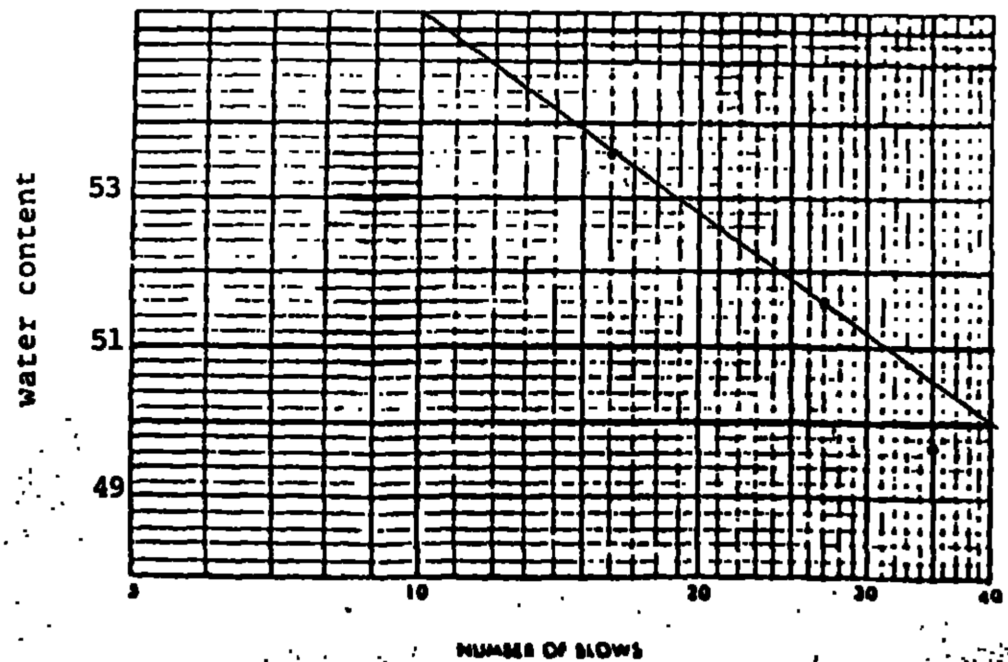
PLASTIC LIMIT

Can No.	AW		
Wet Wt.	10.05		
Dry Wt.	8.44		
Wt. Water	1.61		
T.W.	1.54		
Wt. Dry Soil	6.9		
% Water	23.3		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	27	16		
Can No.	AS	A-6	AP		
Wet Wt.	17.38	17.15	17.84		
Dry Wt.	12.12	11.84	12.15		
Wt. Water	5.26	5.31	5.69		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	10.58	10.3	10.61		
% Water	49.7	51.6	53.6		



LL 52

PL 23

PI 29

Symbol from plasticity chart ______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Brown Clay

Lab No. 13-3713

LOCATION SA-7

Date 10-26-83

Boring No. ____ Sample Depth 4-6

Tested by ____

Contractor Cleco

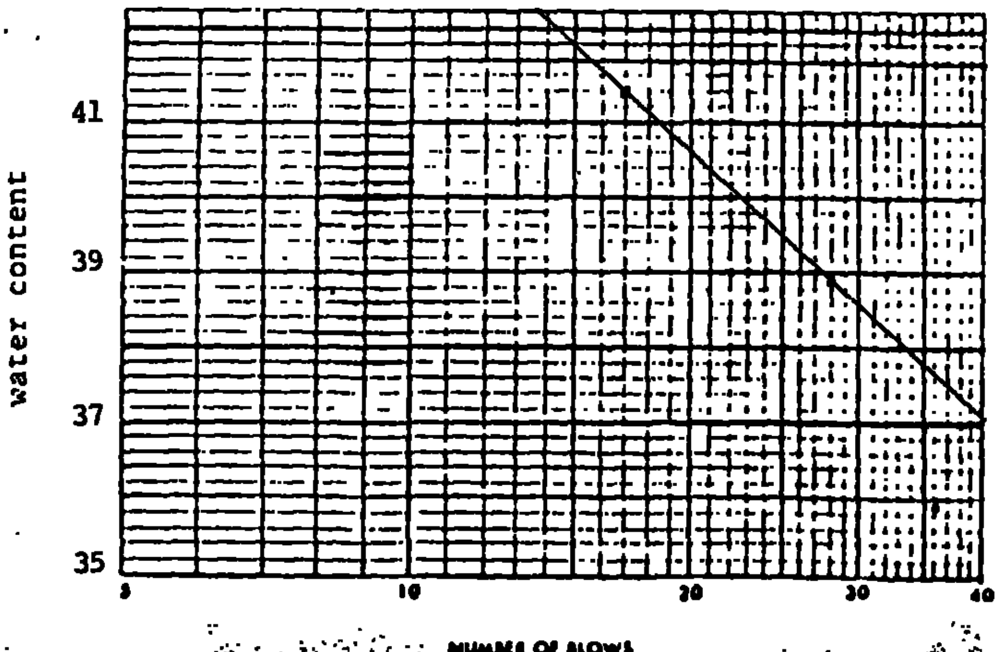
PLASTIC LIMIT

Can No.	A-14		
Wet Wt.	9.74		
Dry Wt.	8.46		
Wt. Water	1.28		
T.W.	1.54		
Wt. Dry Soil	6.92		
% Water	18.5		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	36	28	17		
Can No.	A-19	A-12	AZ		
Wet Wt.	15.59	15.56	16.09		
Dry Wt.	11.88	11.63	11.83		
Wt. Water	3.71	3.93	4.26		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	10.34	10.09	10.29		
% Water	35.9	38.9	41.4		



LL 39

PL 19

PI 20

Symbol from plasticity chart ____

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: SA-8
LOCATION: Rodemacher Power Sta.

Date: 10-26-83 Type: Auger Ground Elevation: 83.0

Depth, Feet	Symbol	Sample	Legend: ■ Sample X Penetration ▼ Water Description of Stratum
		■	Brown Clay.
5		■	Brown Clay.
		■	Brown Clay.
10		■	Brown Clay.
15			Bottom of Hole = 12' NO WATER
20			
25			
30			
35			
40			
45			
50			

LOG OF BORING

PROJECT: 9101550
CLIENT: Cleco

BORING NO.: CB-1
LOCATION: Rodemacher Power Sta.

Date: 10-26-83 Type: Auger Ground Elevation: 87.0

Legend:
■ Sample X Penetration ▼ Water

Depth, Feet	Symbol	Sample	Description of Stratum
			Brown Clay
5			Brown Sandy Clay.
			Brown Silty Sand.
10			Brown Silty Sand.
15			Bottom of Hole = 12'
			NO WATER
20			
25			
30			
35			
40			
45			
50			

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Reddish Brown Clay

Lab No. 13-3713

LOCATION CB-1

Date 10-26-83

Boring No. ______ Sample Depth 0-3

Tested by R.L.

Contractor Cleco

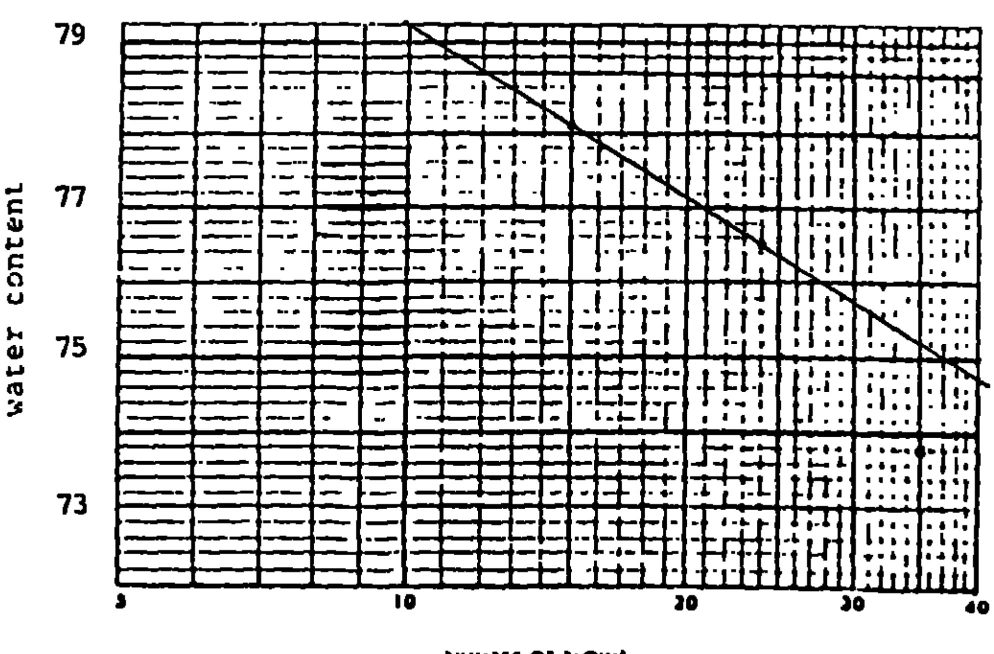
PLASTIC LIMIT

Can No.	A-4		
Wet Wt.	8.18		
Dry Wt.	6.9		
Wt. Water	1.28		
T.W.	1.54		
Wt. Dry Soil	5.36		
% Water	23.9		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	24	15		
Can No.	AD	AM	A-26		
Wet Wt.	14.61	14.71	15.13		
Dry Wt.	9.06	9.0	9.17		
Wt. Water	5.51	5.71	5.96		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	7.52	7.46	7.63		
% Water	73.8	76.5	78.1		



LL 76

PL 24

PI 52

Symbol from plasticity chart

______

SOUTHWESTERN LABORATORIES

SOIL MECHANICS LABORATORY

ATTERBERG LIMITS

SOIL SAMPLE Reddish Brown Clayey Silt

Lab No. 13-3713

LOCATION CB-1

Date 10-26-83

Boring No. ______ Sample Depth 3-6

Tested by R.L.

Contractor Cleco

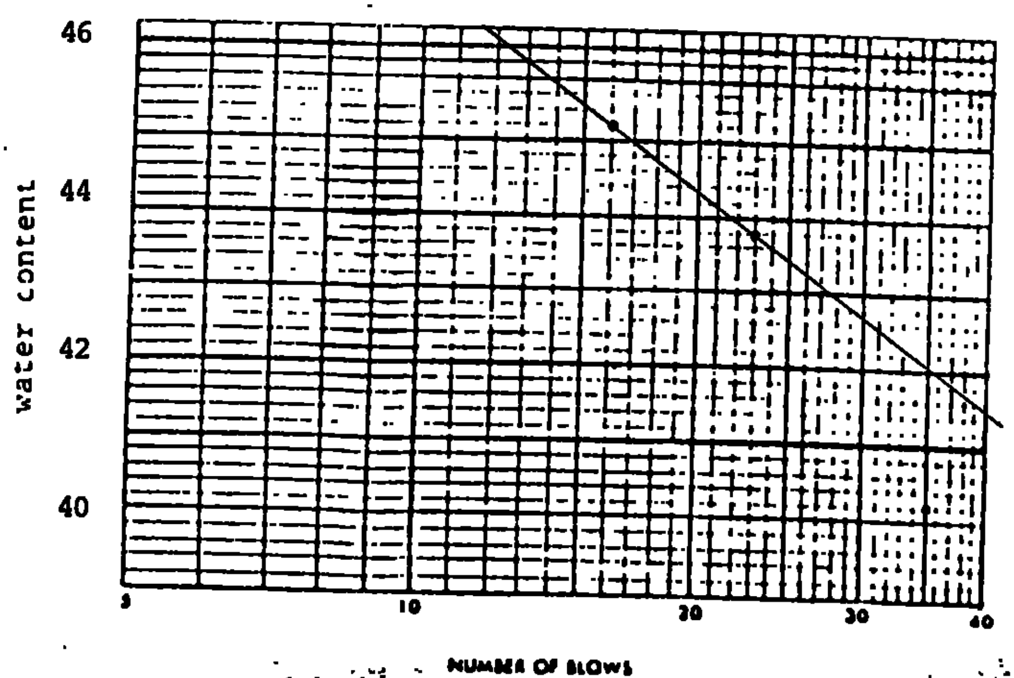
PLASTIC LIMIT

Can No.	AD		
Wet Wt.	9.64		
Dry Wt.	8.42		
Wt. Water	1.22		
T.W.	1.54		
Wt. Dry Soil	6.88		
% Water	17.7		

NATURAL WATER CONTENT

LIQUID LIMIT

No. of Blows	35	23	16		
Can No.	A-15	AN	AE		
Wet Wt.	14.83	14.81	15.41		
Dry Wt.	11.02	10.77	11.09		
Wt. Water	3.81	4.04	4.32		
T.W.	1.54	1.54	1.54		
Wt. Dry Soil	9.48	9.23	9.55		
% Water	40.2	43.8	45.2		



LL 43

PL 18

PI 25

Symbol from plasticity chart ______

ATTACHMENT 3

1981 PERMIT APPLICATION FLY ASH POND SECTION

6.4.3.B <u>SITE MASTER PLAN - FLY ASH POND</u>

6.4.3.B.1) <u>Site Plan for Fly Ash Pond</u>

a) Exhibit FA6.4.3.B.1-1 illustrates the Fly Ash Pond with original and final topographic contours. The Fly Ash Pond is located predominately in alluvial deposits of the Red River Valley. The pond was constructed by building a 20 foot wide dike around the area to be used. At elevation 103, the surface area of the pond will be 109 acres. The slope of the dikes are 3 horizontal to 1 vertical. The interior side of the dikes have a minimum 3 foot thick layer of compacted clay. There is an effective horizontal clay layer of about 10 feet.

b) Peripheral fencing is not planned for the Fly Ash Pond since the disposal facility is within the station proper and access is controlled.

c) It is not planned to monitor the daily quantity of dry ash put into the ash pond beyond normal plant engineering practice of every few years recording an elevation of the top of the sludge and computing the remaining volume versus projected disposal volumes. The volume of fly ash will be computed by using the amount of coal burned. The size of the pond was designed to accommodate the fly ash expected to be generated over the life time of Unit 2.

d) The waste in the Fly Ash Pond is non-combustible, thus no special fire protection facilities are planned.

e) The storage volume of the Fly Ash Pond is 1,560 acre-feet at elevation 103. The fly ash will be transported from the storage bin to the disposal site by truck. At the pond, the fly ash will be spread and moistened with water to prevent dust and cause a pozzolanic reaction.

f) No leachate collection or treatment facilities are planned for the relatively dry waste spread in the Fly Ash Pond. The design of the facility incorporates an impermeable silty clay

PROPOSED BORINGS

BORING NO.	LOCATION		DEPTH
A-101	N 268,750.00	E 1,939,320.00	20.0 FT.
A-102	N 267,500.00	E 1,936,500.00	20.0 FT.
A-103	N 265,150.00	E 1,939,420.00	20.0 FT.
A-104	N 264,871.99	E 1,937,682.24	15.0 FT.
A-105	N 264,750.00	E 1,938,000.00	15.0 FT.
A-106	N 264,500.00	E 1,939,500.00	20.0 FT.
A-107	N 264,250.00	E 1,936,500.00	15.0 FT.
A-108	N 264,250.00	E 1,937,250.00	20.0 FT.
A-109	N 264,250.00	E 1,938,000.00	15.0 FT.
A-110	N 263,500.00	E 1,937,250.00	15.0 FT.
A-111	N 263,500.00	E 1,938,000.00	15.0 FT.
A-112	N 263,000.00	E 1,937,500.00	15.0 FT.
D-1	N 266,420.00	E 1,936,000.00	75.0 FT.
D-2	N 266,100.00	E 1,936,920.00	50.0 FT.
D-3	N 265,600.00	E 1,937,200.00	50.0 FT.
D-4	N 265,100.00	E 1,937,800.00	50.0 FT.
D-5	N 264,600.00	E 1,938,450.00	50.0 FT.
D-6	N 264,000.00	E 1,938,435.00	50.0 FT.
D-7	N 263,500.00	E 1,938,395.00	50.0 FT.
D-8	N 263,000.00	E 1,938,350.00	50.0 FT.
D-9	N 262,700.00	E 1,937,800.00	50.0 FT.
D-10	N 262,400.00	E 1,937,400.00	50.0 FT.
D-11	N 262,900.00	E 1,937,300.00	50.0 FT.
D-12	N 263,250.00	E 1,936,750.00	50.0 FT.
D-13	N 263,750.00	E 1,936,250.00	50.0 FT.
D-14	N 264,040.00	E 1,935,850.00	50.0 FT.
D-15	DELETED		
D-16	N 265,000.00	E 1,931,000.00	75.0 FT.
D-17	N 265,500.00	E 1,935,150.00	75.0 FT.
D-18	N 264,950.15	E 1,934,929.78	50.0 FT.
D-19	N 266,130.00	E 1,936,550.00	50.0 FT.
D-20	N 264,961.88	E 1,936,544.15	50.0 FT.
D-21	N 265,120.00	E 1,934,350.00	50.0 FT.
D-22	N 265,120.00	E 1,931,930.00	50.0 FT.

LEGEND

- PROPOSED DESIGN BORINGS
- DRILLED DESIGN BORINGS
- PROPOSED AUGER BORINGS
- DRILLED AUGER BORINGS

NOTES

1. BORINGS D-1, D-6, D-8, D-9, D-12, D-13, D-17, AND D-18 SHALL HAVE SHELBY TUBE SAMPLES TAKEN ONLY AT DEPTHS OF 2.5, 5.0, 10.0, 15.0, 25.0, AND 35.0 FEET UNLESS OTHERWISE SPECIFIED BY THE CONSULTING ENGINEERS.
2. THE REMAINING DESIGN (D SERIES) BORINGS SHALL HAVE SPLIT-BARREL SAMPLING UNLESS OTHERWISE SPECIFIED BY THE CONSULTING ENGINEERS.
3. SOIL BORING WORK SHALL BE IN ACCORDANCE WITH THE TECHNICAL REQUIREMENTS FOR SOIL BORING WORK TO WHICH THIS DRAWING HAS BEEN ATTACHED.

REFERENCE DRAWINGS

S-209	SITE PLAN-GENERAL ARRANGEMENT SHEET-1
S-210	SITE PLAN-GENERAL ARRANGEMENT SHEET-2

DRAWING RELEASE RECORD

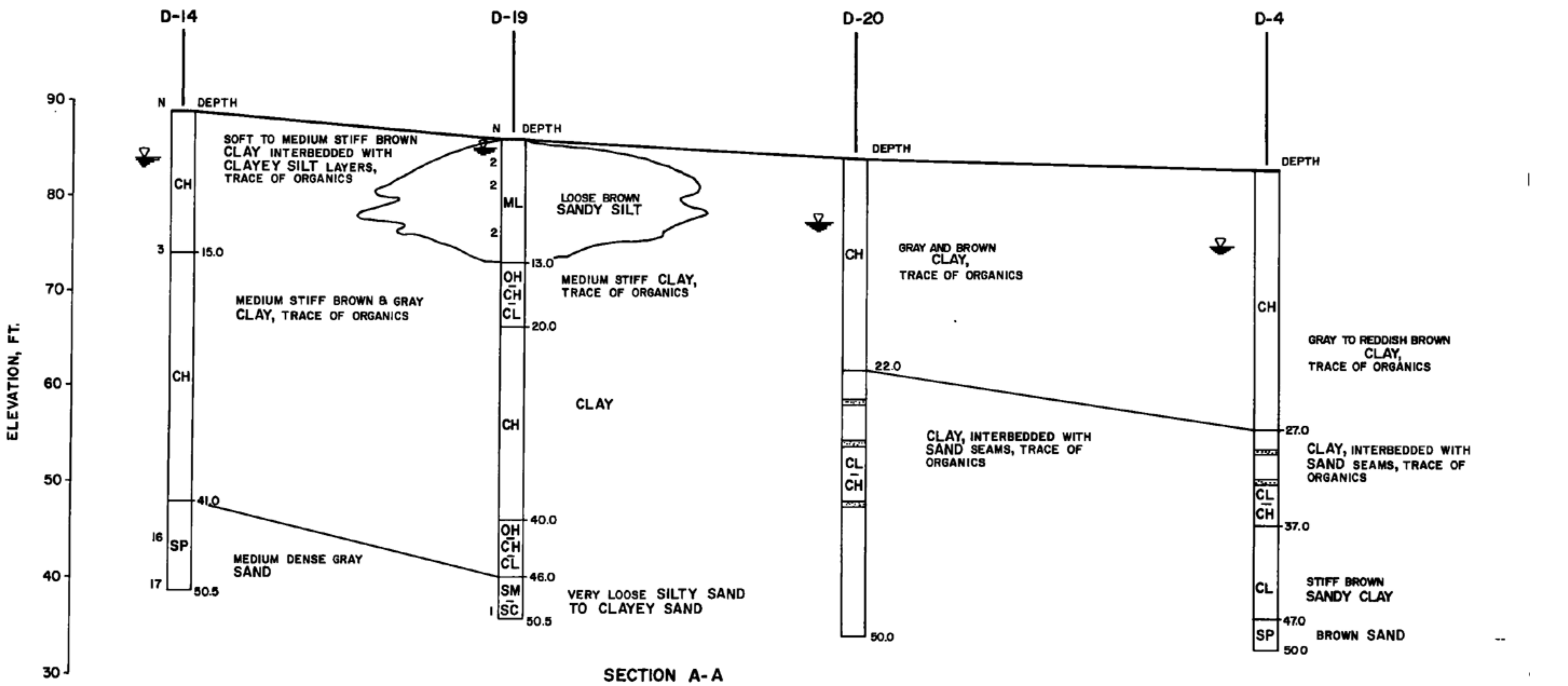
REV	PURPOSE
A	FOR REFERENCE
B	RECORD REVISION FOR BORINGS
C	REVISED DRAWING NUMBER
D	RECORD DRAWING PERMIT APPLICATION

BORING LOCATION
PLAN
ROCKMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT
PLAN PERMIT APPLICATION
EXHIBIT 4.3.3.2-1

SARGENT & LUNDY
CHICAGO

DRAWING NO. S-240 REV D

FORMERLY S-255



SECTION A-A

0 200'
HORIZONTAL SCALE IN FEET

LEGEND

N = STANDARD PENETRATION TEST, BLOWS PER FOOT

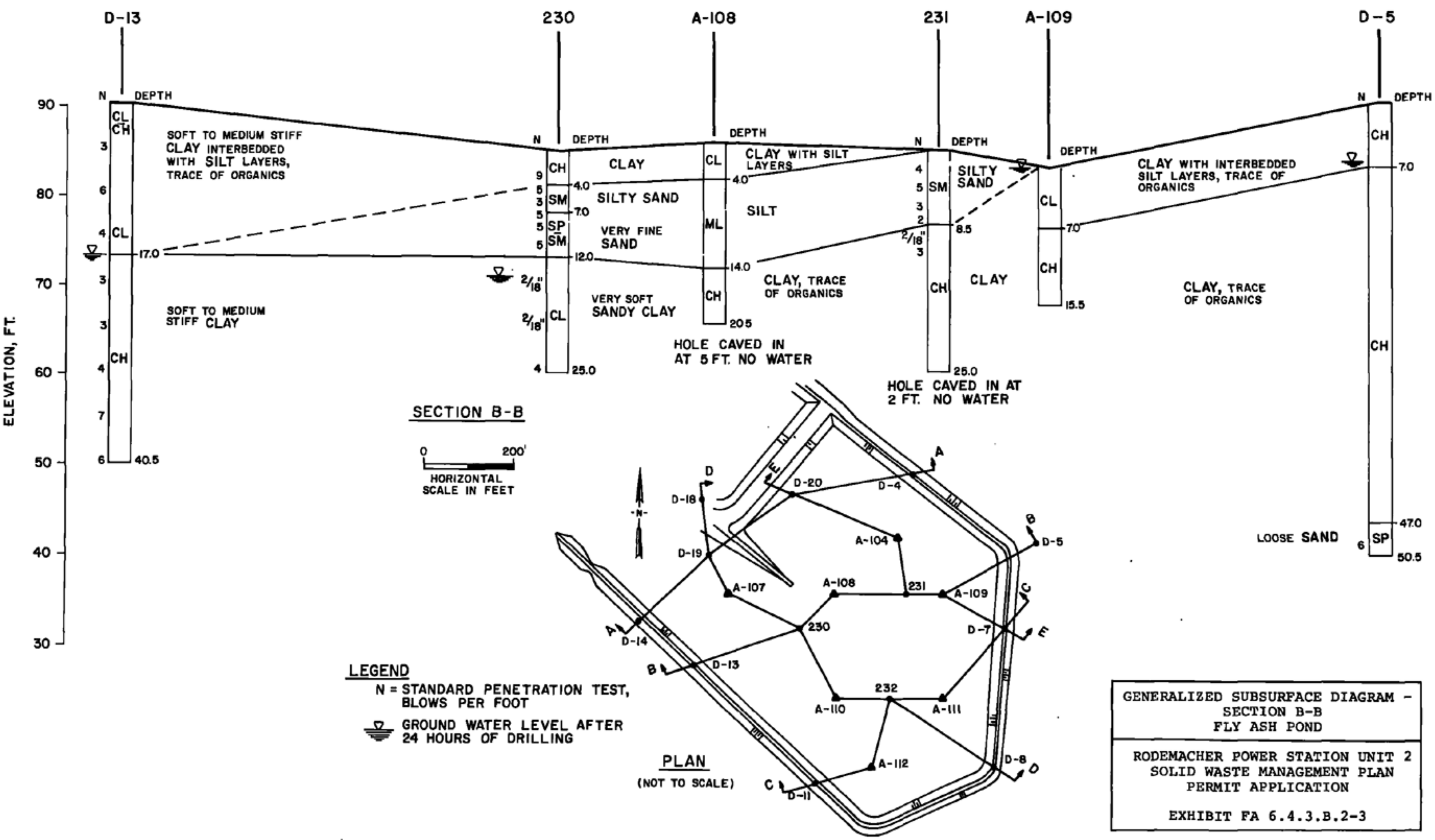
GROUND WATER LEVEL AFTER 24 HOURS OF DRILLING

NOTE:
FOR BORING LOCATION PLAN SEE SECTION B-B

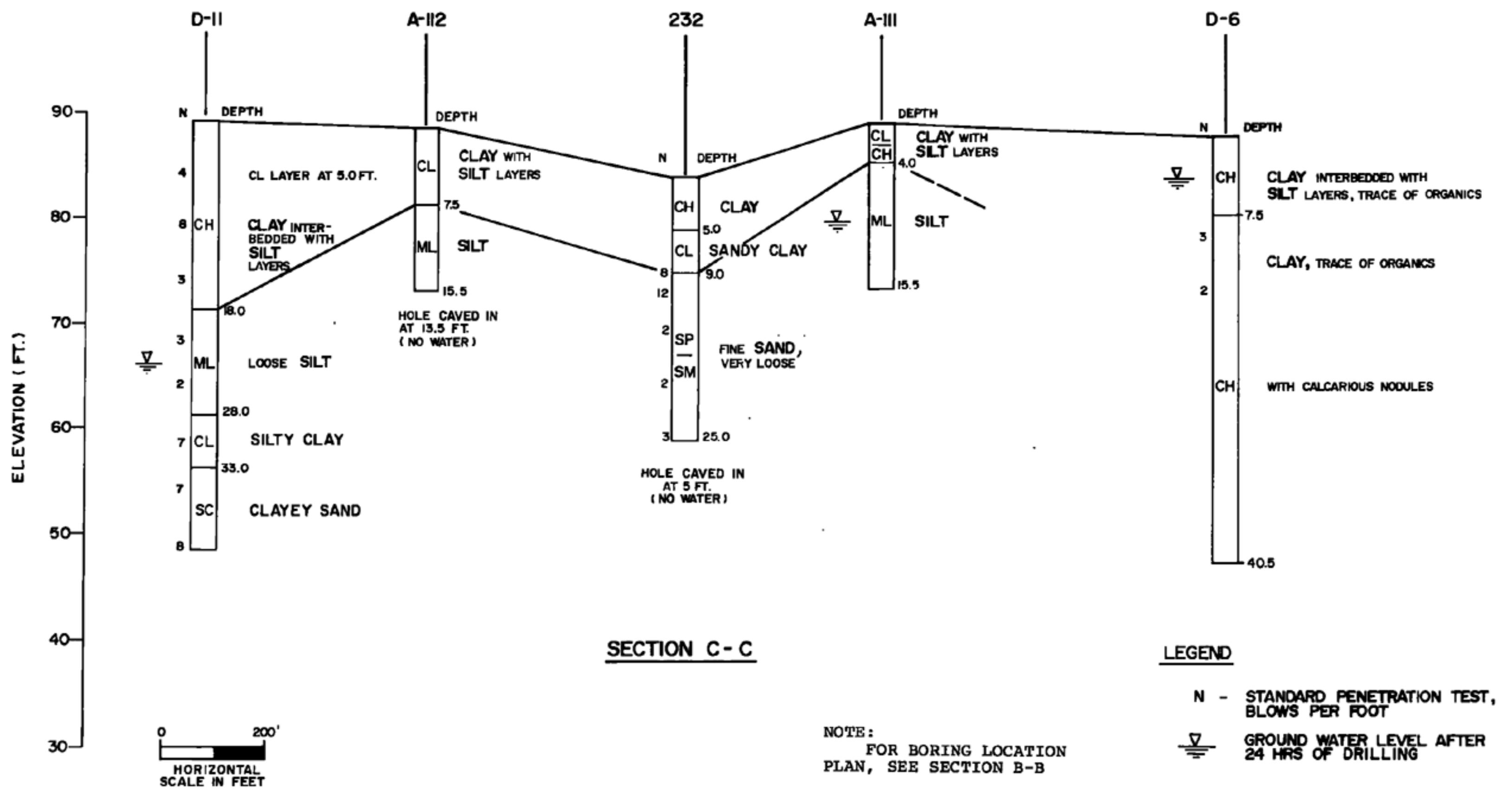
GENERALIZED SUBSURFACE DIAGRAM -
SECTION A-A
FLY ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT FA 6.4.3.B.2-2



GENERALIZED SUBSURFACE DIAGRAM - SECTION B-B FLY ASH POND
RODEMACHER POWER STATION UNIT 2 SOLID WASTE MANAGEMENT PLAN PERMIT APPLICATION EXHIBIT FA 6.4.3.B.2-3



SECTION C-C

NOTE:
FOR BORING LOCATION PLAN, SEE SECTION B-B

LEGEND

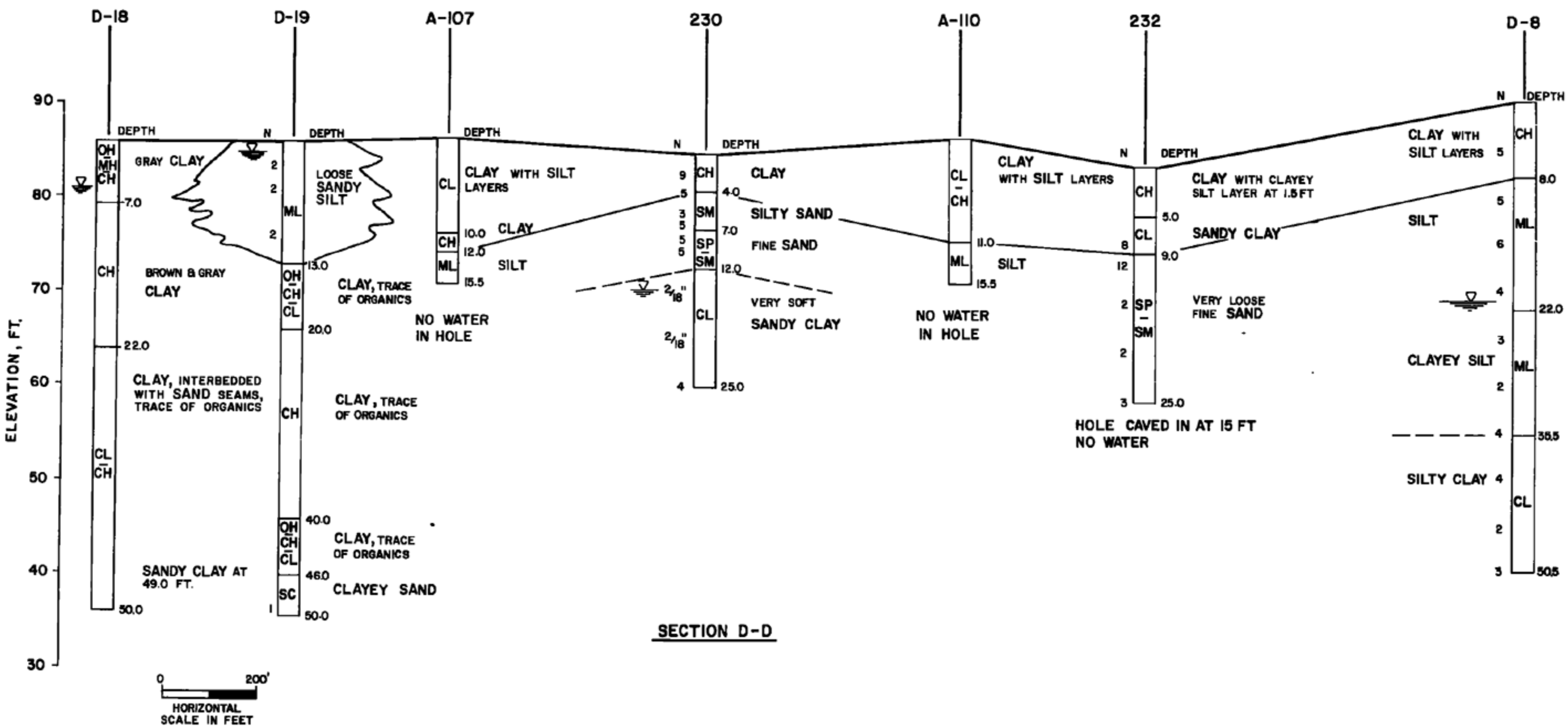
N - STANDARD PENETRATION TEST, BLOWS PER FOOT

GROUND WATER LEVEL AFTER 24 HRS OF DRILLING

GENERALIZED SUBSURFACE DIAGRAM - SECTION C-C FLY ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT FA 6.4.3.B.2-4



LEGEND

N = STANDARD PENETRATION TEST, BLOWS PER FOOT

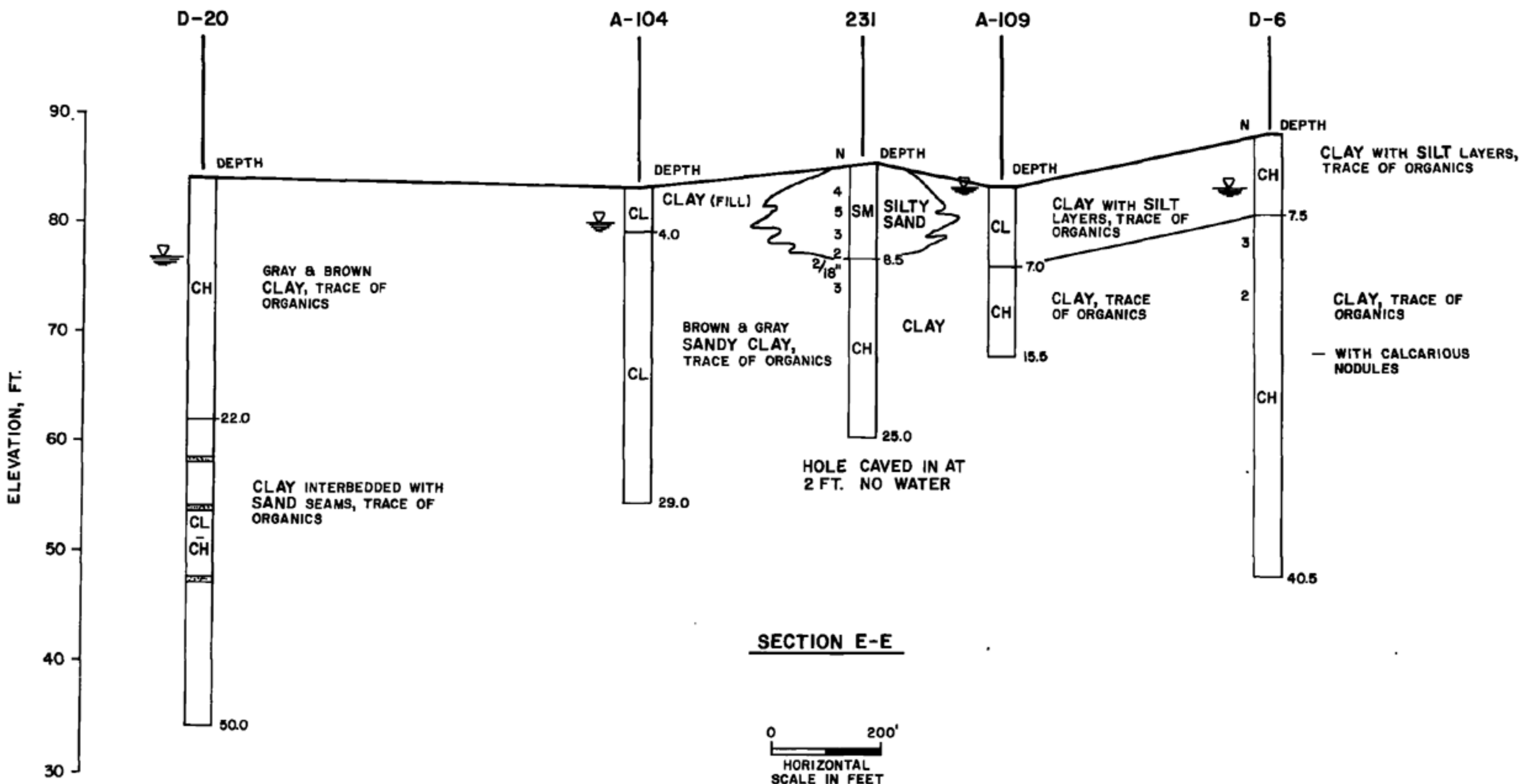
GROUND WATER LEVEL AFTER 24 HOURS OF DRILLING

NOTE:
FOR BORING LOCATION PLAN, SEE SECTION B-B

GENERALIZED SUBSURFACE DIAGRAM - SECTION D-D
FLY ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT FA 6.4.3.B.2-5



LEGEND

N = STANDARD PENETRATION TEST, BLOWS PER FOOT

GROUND WATER LEVEL AFTER 24 HOURS OF DRILLING

NOTE:
FOR BORING LOCATION PLAN, SEE SECTION B-B

GENERALIZED SUBSURFACE DIAGRAM -
SECTION E-E
FLY ASH POND

RODEMACHER POWER STATION UNIT 2
SOLID WASTE MANAGEMENT PLAN
PERMIT APPLICATION

EXHIBIT FA 6.4.3.B.2-6

6.4.3.B.4) Geological Characteristics

a) Exhibits FA 6.4.3.B.2-2 through 6 present representative soil conditions for the Fly Ash Pond. These borings were done before excavation of clay materials used to form a three foot thick compacted liner for the dikes. After excavation, the Fly Ash Pond will be underlain by a 3 foot to 13 foot top layer of reddish-brown clay to gray clay which grades in some areas to a silt/sandy silt. Beneath most of the Fly Ash Pond and underlying the top clay stratum is approximately 25 to 40 feet of clay below which are sands and clayey sands 10 feet or more in thickness. Laboratory permeability of the clay tested at 1.1×10^{-8} cm/sec. The Atterburg Limit values for Plasticity Index averaged 29 with an average liquid limit of 49 which classifies the clay as a CH according to the Unified Soil Classification System.

Compaction and Atterburg Limits tests were/and are being performed on the clay liner of the Fly Ash Pond dike. The minimum specified Plasticity Index is 15 with 60 percent passing the #200 seive and compaction is 95 percent of modified proctor test. The clay liner is being placed in 8 to 10 inch layers and compacted with "sheep's foot" equipment. Given these criteria and knowing the in situ characteristics of the clay which is being excavated (Average Plasticity Index 29), an effective protective layer should be present for the ground water.

Table FA 6.4.3.B.4-1 is a summary of representative laboratory tests on soils from the Fly Ash Pond area.

After clay liner material is borrowed from the Fly Ash Pond area, hand auger borings will be performed to confirm that a 3 foot thickness of clay remains over the bottom of the Fly Ash Pond.

TABLE FA 6.4.3.B.4-1

SUMMARY OF LABORATORY TESTS
FLY ASH POND

Feature	Boring No.[1] Sample No.	Bottom of Sample Depth, ft	Particle Size Analysis (% Passing)[2] No. 4 Sieve	No. 10 Sieve	No. 40 Sieve	No. 200 Sieve	Atterberg Limits[3] Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Unified Soil Classification Symbol	Natural[4] Water Content (%)	Dry Density lbs/ft3	Laboratory[5] (Vertical) Permeability cm/sec
Fly Ash Pond (Dry) Storage Area	230, 2	3.0	100	100	100	100	58	20	38	CH	25.6	-	
	8	15.0	-	-	100	66	27	19	8	CL	27.4	-	
	231, 2	3.0	-	-	-	37	N.P.[6]	N.P.	N.P.	SM	17.7	-	
	4	6.0	-	-	-	15	N.P.	N.P.	N.P.	SM	25.1	-	
	9	20.0	-	-	-	99	61	20	41	CH	38.9	-	
	232, 1	1.5	-	-	-	100	62	20	42	CH	35.3	-	
	3	4.5	100	100	100	98	58	19	39	CH	36	83	1.1×10^{-8}
	5	7.5	-	-	-	89	29	18	11	CL	24.1	-	

1 Laboratory testing performed by Southwestern Laboratories, Inc., Shreveport, Louisiana.
2 Laboratory Particle Size Analysis Tests Performed in accordance with ASTM D422 and ASTM D1140.
3 Laboratory Atterberg Limit Tests of Soils performed in accordance with ASTM D423 and ASTM D424.
4 Laboratory Water Content Tests of Soils performed in accordance with ASTM D2216.
5 Laboratory Permeability Test performed on undisturbed Shelby to be sample. Sample tested using Falling Head Test procedure in accordance with EM 1110-2-1906.
6 N.P. = Non Plastic

6.4.3.B.5) Environmental Characteristics for Fly Ash Pond:

a) There are no known historical or archaeological sites within 1000 feet of the Fly Ash Pond. No habitats for endangered species or other sensitive ecological species are within 1000 feet of the Fly Ash Pond.

The basis for these statements is the 1972-1973 ecological studies of the environment at the Rodemacher Station. The survey addressed in detail the terrestrial wildlife, the aquatic life, and vegetation in the area. Since that time the station and lake have been constructed and the immediate area of the station, including the Fly Ash Pond, is one of an industrial setting.

b) The operation of the Fly Ash Pond will have no adverse impact upon the use of the lake nor impair the quality of the lake environment.

6.4.3.C FACILITY PLANS AND SPECIFICATIONS - FLY ASH POND

1) Design, Plans, and Specifications: The plans submitted herein for the Fly Ash Pond were prepared and sealed by Professional Engineers with the required expertise in processing or disposing of solid waste as defined by the Solid Waste Management Plan.

2) Certification: Exhibit FA6.4.3.C.2-1 is a certification that the facility meets the requirements outlined in the state regulations.

3) Special Requirements:

a) Incineration. Incineration is not planned as a disposal option in the operation of the Fly Ash Pond.

b) Sanitary Landfills.

b.i) Typical cross sections of the Fly Ash Pond are similar to those of the adjacent Bottom Ash Pond and are shown in Exhibit FA6.4.3.B.1-2. The dry fly ash trucked to the pond will be spread and sprayed for dust control as well as for compaction by dozers spreading the material. Rain water

CERTIFICATE OF SARGENT & LUNDY ENGINEERS

I, Richard I. Gavin, make this certification as a registered Professional Engineer on behalf of Sargent & Lundy Engineers for the benefit of all persons interested in the application of Central Louisiana Electric Company, Inc. for a Solid Waste Disposal Permit from the Louisiana Department of Natural Resources, Office of Environmental Affairs.

I do hereby certify as follows:

1. I am a registered Professional Engineer in the State of Louisiana.

2. I have supervised preparation of the design, plans, and specifications for the Unit 2 Boiler Cleaning Waste Pond, Bottom Ash Pond, Fly Ash Pond, Clarifier Sludge Pond, and equipment associated with such waste ponds.

3. To the best of my knowledge, the design, plans, and specifications for the above mentioned waste disposal facilities at Rodemacher Power Station, Unit 2, meet applicable requirements of the Louisiana Solid Waste Rules and Regulations.

4. To the extent that this certification is based upon information and data prepared and analyzed by Sargent & Lundy personnel other than myself, I have reviewed this certification with such personnel to confirm its completeness and accuracy.

IN WITNESS WHEREOF, I have hereunto set my hand this 23 day of October, 1981.

Richard I. Gavin

Richard I. Gavin, Partner
Sargent & Lundy Engineers

STATE OF LOUISIANA
R. I. GAVIN
REG. NO. [illegible]283
REGISTERED
PROFESSIONAL ENGINEER
IN
MECHANICAL ENGINEERING

EXHIBIT FA 6.4.3.C.2-1

which will pond on the lowest sections of the Fly Ash Pond will be used for spraying the ash. The bottom of the Fly Ash Pond and completed dikes will have a minimum 3 foot thickness of relatively impermeable clay. This should protect the underlying ground water. Furthermore, the waste characteristics of the ash are such that no harmful effects should occur to the quality of ground water.

b.ii) Very plastic clay soils underlay the Fly Ash Pond and excavation of these soils is underway to form a 3 foot thick layer for the diked Fly Ash Pond. The soil liner is a CH material. Cross sections showing soil profiles are illustrated in Exhibits FA 6.4.3.B.2-2 through 6.

b.iii) Section 6.4.3.D.2 describes the characteristics of dry fly ash to be disposed of. Operation of the Fly Ash Pond should pose no harmful effects to the ground water.

b.iv) No cover material is planned during operation of the Fly Ash Pond. The dry ash will be spread and sprayed with water.

b.v) No special operations equipment will be needed for the disposal operations at the Fly Ash Pond.

b.vi) No leachate collection and/or treatment system is planned for the Fly Ash Pond since it is designed to contain liquids.

b.vii) As was discussed in Section 6.4.3.C.2.bvii for the Bottom Ash Pond, the ground water monitoring strategy for the Fly Ash and Bottom Ash Ponds is tied to down gradient monitoring wells. The proximity of these two ponds as shown on Exhibit FA 6.4.3.B.2-1 is such that the two monitoring wells shown on Exhibit 6.4.3.A.2-2 should serve as indicators if contamination should occur. This decision also considers the relatively clean characteristics of the bottom ash and fly ash waste and their relatively harmless influence on the environment. The two wells shown for the

ATTACHMENT 4

FLY ASH POND PERMEABILITY TESTS

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-1
Sample Length (inches):	39.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	6/7
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =62.0 %
Assumed Specific Gravity:	2.70
Atterbergs:	LL: 91 PL: 40 PI: 51

Parameter	Initial	Final
Height, in	2.38	2.33
Diameter, in	2.90	2.85
Area, in^2	6.61	6.38
Volume, in^3	15.7	14.9
Mass, g	410	401
Bulk Density, pcf	99	103
Moisture Content, %	56.6	53.4
Dry Density, pcf	63.2	66.9
Degree of Saturation, %	92.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 89.98 Cell Pressure Increment, psi : 4.98 Increased Cell Pressure,psi : 94.96

Sample Pressure, psi: 80.01 Corresponding Sample Pressure, psi: 84.66 B Coefficient: 0.93

Sample Pressure Increment, psi: 4.65 (β value did not increase with increase in pressure. Final degree of saturation > 95 %)

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/8	1	90	80	13.5	13.3	0.2	196	28.7	2.7E-08	20	1.000	2.7E-08
8/8	2	90	80	13.5	13.3	0.2	217	28.7	2.5E-08	20	1.000	2.5E-08
8/8	3	90	80	13.5	13.3	0.2	233	28.7	2.3E-08	20	1.000	2.3-08
8/8	4	90	80	13.5	13.3	0.2	255	28.7	2.1E-08	20	1.000	2.1E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 2.4 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-2
Sample Length (inches):	24.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	19/2
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content. Trimming moisture content =73.3 %
Assumed Specific Gravity:	2.70
Atterbergs:	LL: 118 PL: 28 PI: 90

Parameter	Initial	Final
Height, in	2.33	2.26
Diameter, in	2.91	2.80
Area, in^2	6.65	6.16
Volume, in^3	15.5	13.9
Mass, g	381	359
Bulk Density, pcf	93	98
Moisture Content, %	74.4	64.2
Dry Density, pcf	53.6	59.7
Degree of Saturation, %	94.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 91.99 Cell Pressure Increment, psi : 6.18 Increased Cell Pressure,psi : 98.17

Sample Pressure, psi: 82.01 Corresponding Sample Pressure, psi: 87.75 B Coefficient: 0.93

Sample Pressure Increment, psi: 5.74 (β value did not increase with increase in pressure. Final degree of saturation > 95 %)

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/8	1	92	82	13.5	13.3	0.2	100	29.6	5.4E-08	20.2	0.995	5.4E-08
8/8	2	92	82	13.5	13.3	0.2	108	29.6	5.0E-08	20.2	0.995	5.0E-08
8/8	3	92	82	13.5	13.3	0.2	115	29.6	4.7E-08	20.2	0.995	4.7E-08
8/8	4	92	82	13.5	13.3	0.2	121	29.6	4.4E-08	2.02	0.995	4.4E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 4.9 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-3
Sample Length (inches):	34.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	6/7
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content. Trimming moisture content =77.2%
Assumed Specific Gravity:	2.70
Atterbergs:	LL: 73 PL: 31 PI: 42

Parameter	Initial	Final
Height, in	2.63	2.51
Diameter, in	2.86	2.81
Area, in^2	6.42	6.20
Volume, in^3	16.9	15.6
Mass, g	415	394
Bulk Density, pcf	93	96
Moisture Content, %	75.6	66.7
Dry Density, pcf	53.2	57.8
Degree of Saturation, %	95.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 90.01 **Cell Pressure Increment, psi : 4.97** **Increased Cell Pressure,psi : 94.98**

Sample Pressure, psi: 80.01 **Corresponding Sample Pressure, psi: 84.71** **B Coefficient: 0.95**

Sample Pressure Increment, psi: 4.71

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/10	1	90	80	15.0	14.8	0.2	94	29.6	5.7E-08	19.6	1.010	5.7E-08
8/10	2	90	80	15.0	14.8	0.2	102	29.6	5.2E-08	19.6	1.010	5.3E-08
8/10	3	90	80	15.0	14.8	0.2	107	29.6	5.0E-08	19.6	1.010	5.0E-08
8/10	4	90	80	15.0	14.8	0.2	111	29.6	4.8E-08	19.6	1.010	4.9E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 5.2 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-4
Sample Length (inches):	36.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	11/1
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =103.0 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL:117 PL: 38 PI: 79

Parameter	Initial	Final
Height, in	2.69	2.55
Diameter, in	3.01	2.95
Area, in^2	7.12	6.83
Volume, in^3	19.1	17.4
Mass, g	471	454
Bulk Density, pcf	94	99
Moisture Content, %	72.0	66.0
Dry Density, pcf	54.4	59.7
Degree of Saturation, %	94.0	99.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 89.98 **Cell Pressure Increment, psi : 5.09** **Increased Cell Pressure,psi : 95.07**

Sample Pressure, psi: 80.02 **Corresponding Sample Pressure, psi: 84.86** **B Coefficient: 0.95**

Sample Pressure Increment, psi: 4.84

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/11	1	90.0	80.0	12.0	11.8	0.2	69	23.3	8.9E-08	20.5	0.988	8.8E-08
8/11	2	90.0	80.0	12.0	11.8	0.2	68	23.3	9.1E-08	20.5	0.988	8.9E-08
8/11	3	90.0	80.0	12.0	11.8	0.2	68	23.3	9.1E-08	20.5	0.988	8.9E-08
8/11	4	90.0	80.0	12.0	11.8	0.2	70	23.3	8.8E-08	20.5	0.988	8.7E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 8.9 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-5
Sample Length (inches):	33.0''
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	1/6
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =42.9 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL:91 PL: 33 PI: 58

Parameter	Initial	Final
Height, in	3.01	2.99
Diameter, in	2.93	2.88
Area, in^2	6.74	6.51
Volume, in^3	20.3	19.5
Mass, g	563	550
Bulk Density, pcf	105	107
Moisture Content, %	46.1	42.8
Dry Density, pcf	72.2	75.2
Degree of Saturation, %	94.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 91.95 **Cell Pressure Increment, psi : 5.12** **Increased Cell Pressure,psi : 97.07**

Sample Pressure, psi: 82.02 **Corresponding Sample Pressure, psi: 86.77** **B Coefficient: 0.93**

Sample Pressure Increment, psi: 4.75 **(β value did not increase with increase in pressure. Final degree of saturation > 95 %)**

FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/22	1	92.0	82.0	17.5	17.3	0.2	89	29.0	5.8E-08	20.1	0.998	5.8E-08
8/22	2	92.0	82.0	17.5	17.3	0.2	97	29.0	5.3E-08	20.1	0.998	5.3E-08
8/22	3	92.0	82.0	17.5	17.3	0.2	104	29.0	5.0E-08	20.1	0.998	5.0E-08
8/22	4	92.0	82.0	17.5	17.3	0.2	111	29.0	4.7E-08	20.1	0.998	4.7E-08

TEST RESULTS: PERMEABILITY AT 20 °C: 5.2 x10^{-8} cm/sec (@ 10 psi effective stress)

APS Engineering and Testing

HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIAL USING A FLEXIBLE WALL PERMEAMETER BY ASTM D 5084

Client:	Providence
Project Name:	Fly Ash Pond at Brame Energy Center
Visual Description:	Moist Dark Grayish Brown Clay
Boring No.:	-----
Sample:	FA-6
Sample Length (inches):	32.0'
Sample Type:	Intact
Permeant Fluid:	De-aired Distilled Water
Orientation:	Vertical
Cell:	3
Sample Preparation:	Cut, trimmed and placed into permeameter at as received density and moisture content .Trimming moisture content =36.7 %
Assumed Specific Gravity:	2.65
Atterbergs:	LL:87 PL: 30 PI: 57

Parameter	Initial	Final
Height, in	2.76	2.72
Diameter, in	3.10	2.87
Area, in^2	7.55	6.47
Volume, in^3	20.8	17.6
Mass, g	563	511
Bulk Density, pcf	103	110
Moisture Content, %	52.7	38.7
Dry Density, pcf	67.3	79.6
Degree of Saturation, %	96.0	95.0

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 95.02 **Cell Pressure Increment, psi : 5.01** **Increased Cell Pressure,psi : 100.03**

Sample Pressure, psi: 85.01 **Corresponding Sample Pressure, psi: 89.76** **B Coefficient: 0.95**

Sample Pressure Increment, psi: 4.75

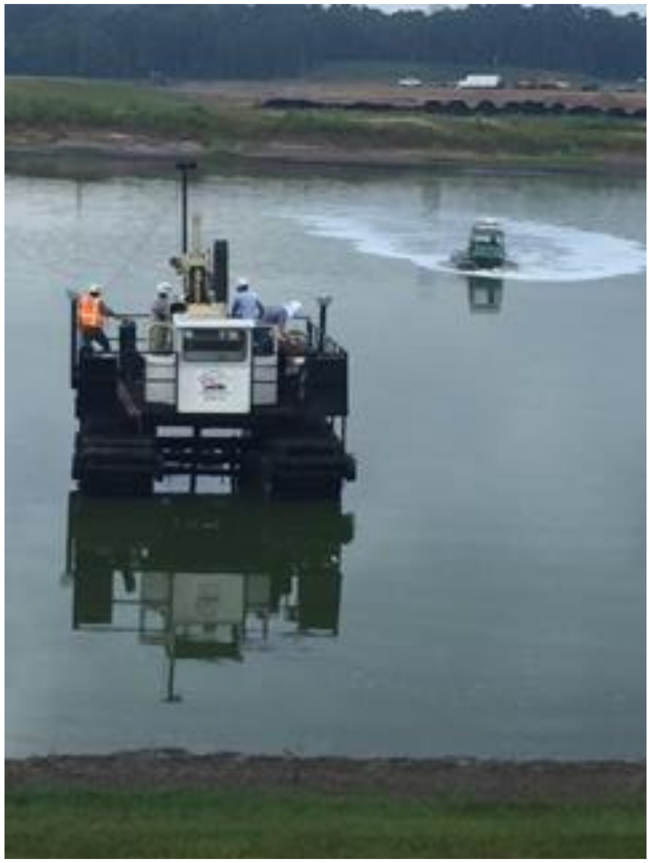
FLOW DATA

Date	Trial	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp., °C	R_t	Permeability K @ 20 °C cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
8/22	1	95.0	85.0	16.0	15.8	0.2	136	29.2	3.8E-08	20.1	0.998	3.8E-08
8/22	2	95.0	85.0	16.0	15.8	0.2	145	29.2	3.6E-08	20.1	0.998	3.6E-08
8/22	3	95.0	85.0	16.0	15.8	0.2	152	29.2	3.4E-08	20.1	0.998	3.4E-08
8/22	4	95.0	85.0	16.0	15.8	0.2	157	29.2	3.3E-08	20.1	0.998	3.3E-08

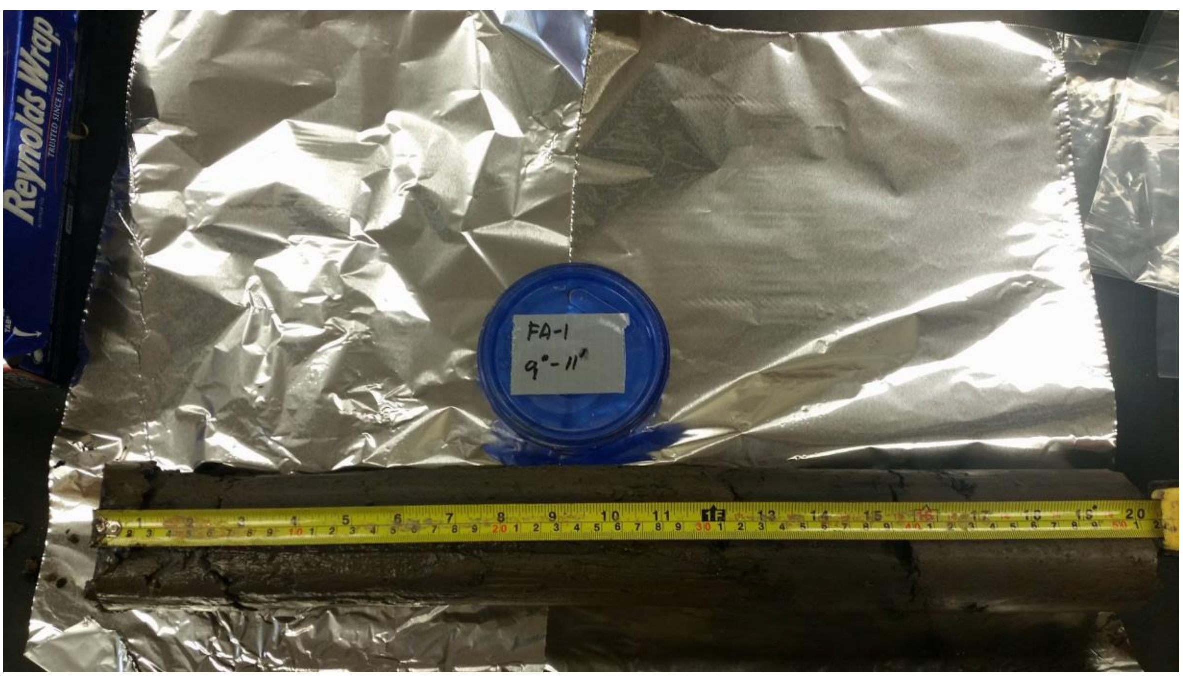
TEST RESULTS: PERMEABILITY AT 20 °C: 3.5 x10^{-8} cm/sec (@ 10 psi effective stress)

ATTACHMENT 5

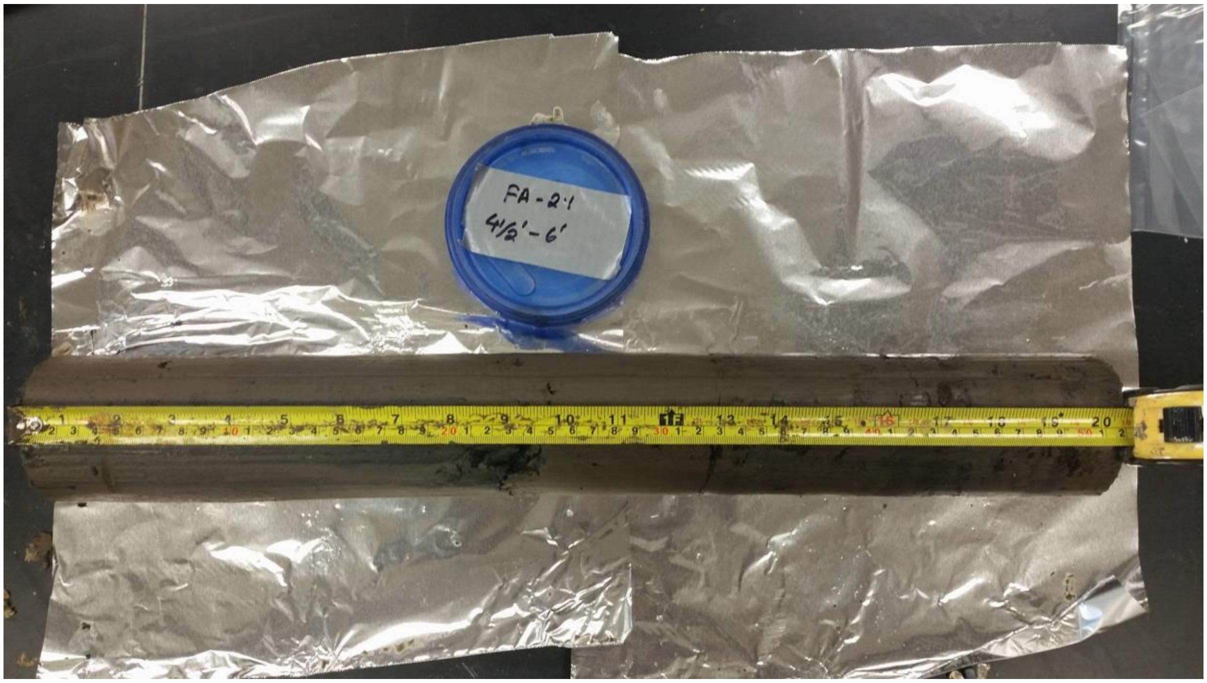
FLY ASH POND BORING PHOTOS



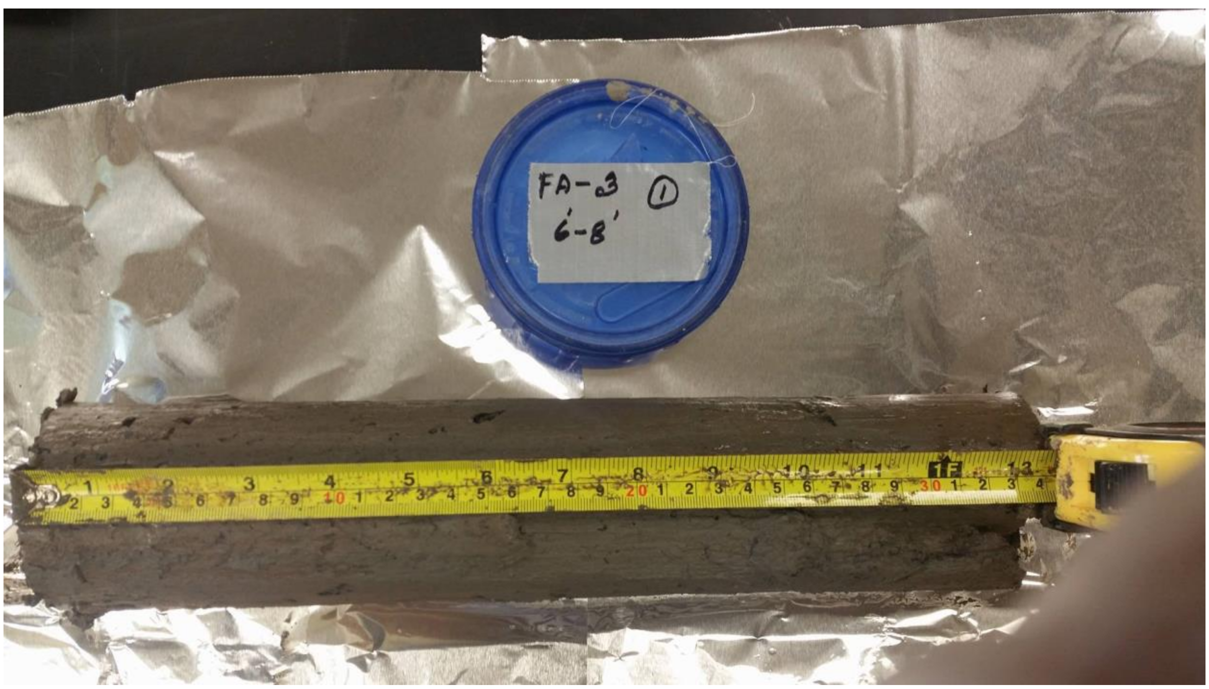
PHOTOGRAPH 1
Fly Ash Pond - Typical Geotechnical Drilling Rig Setup.



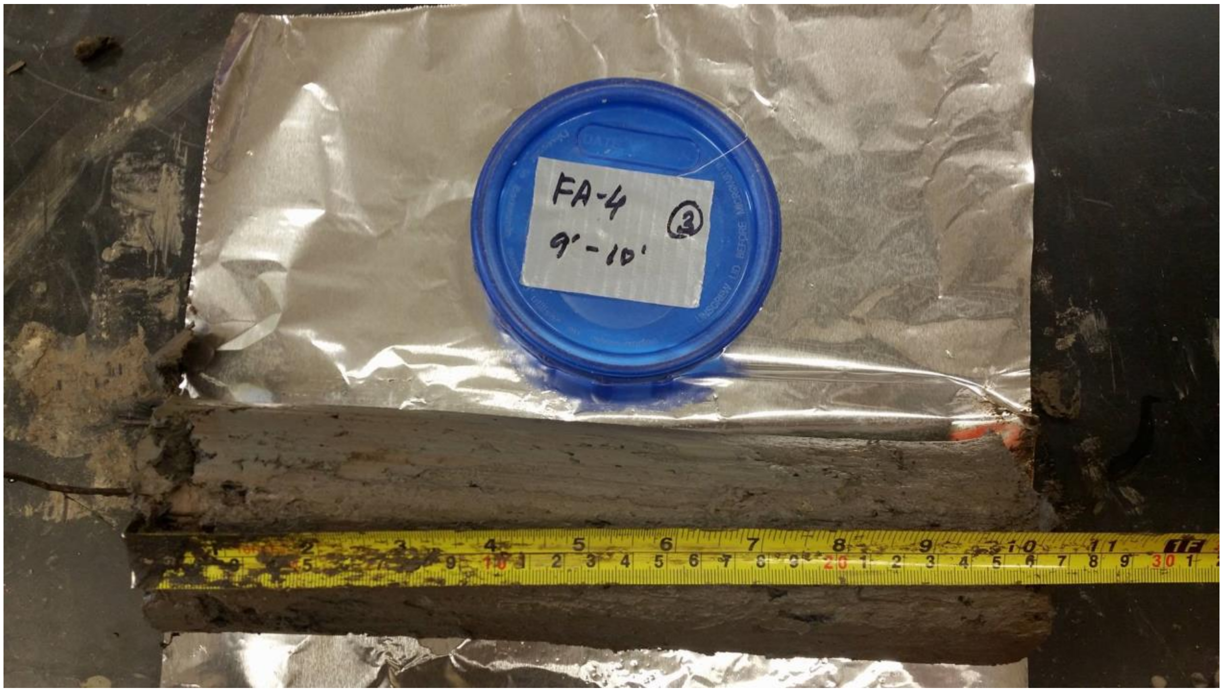
PHOTOGRAPH 2
Fly Ash Pond Undisturbed Soil Sample FA-1.



PHOTOGRAPH 3
Fly Ash Pond Undisturbed Soil Sample FA-2.

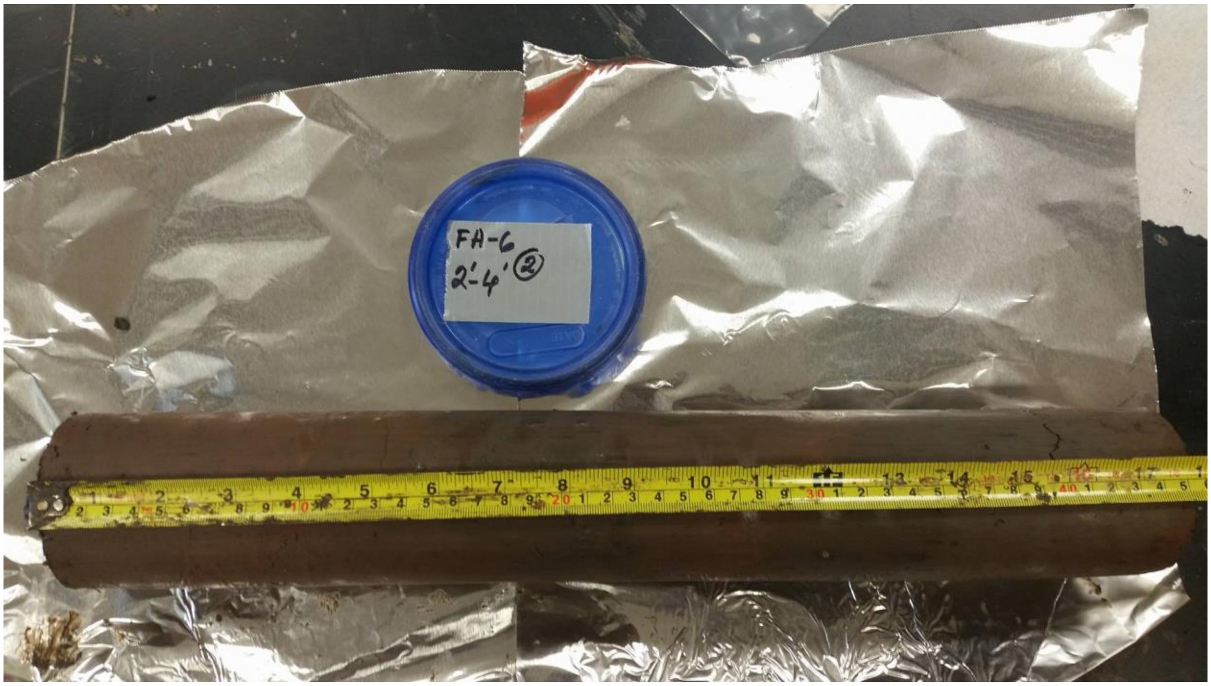


PHOTOGRAPH 4
Fly Ash Pond Undisturbed Soil Sample FA-3.



PHOTOGRAPH 5
Fly Ash Pond Undisturbed Soil Sample FA-4.

PHOTOGRAPH 6
Fly Ash Pond Undisturbed Soil Sample FA-5.



PHOTOGRAPH 7
Fly Ash Pond Undisturbed Soil Sample FA-6.

ATTACHMENT 6

FLY ASH POND P.E. CERTIFICATION

CLECO BRAME ENERGY CENTER
FLY ASH POND
CCR LINER VERIFICATION ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a liner verification assessment for Cleco's Brame Energy Center Fly Ash Pond in accordance with the 40 CFR 257.71 CCR requirements. This liner verification assessment has determined that the Fly Ash Pond has met the following requirement:

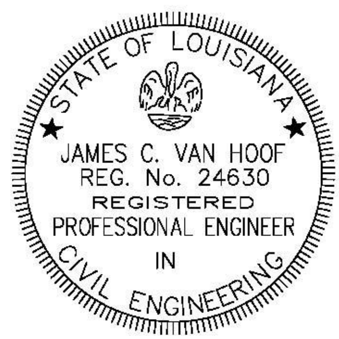
- A liner consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec

James C. Van Hoof
Name

24630 — Registration No.
LA — State

James C. Van Hoof, P.E.
Signature

10/12/2016
Date



(Seal)