OCTOBER 2016

CLECO POWER LLC
DOLET HILLS POWER STATION

HAZARD POTENTIAL CLASSIFICATION ASSESSMENT: ASH BASIN No. 1

Prepared By:

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Project Number 002-185

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1.0 INTRODUCTION

Providence was contracted by Cleco Power LLC (Cleco) to conduct a hazard potential classification assessment of Ash Basin No. 1 at Cleco's Dolet Hills Power Station. Recent Coal Combustion Residual (CCR) regulations at 40 CFR 257.73(a)(2) established requirements for owners and operators to conduct a hazard potential classification assessment to assess the potential adverse incremental consequences that would occur if there was a failure of the CCR surface impoundment.

The Cleco Dolet Hills Power Station is located approximately 8 miles southeast of Mansfield, DeSoto Parish, LA. A site location map showing the Dolet Hills Power Station is included as **Figure 1**. This hazard potential classification assessment pertains to Ash Basin No. 1 utilized for the coal-fired generation unit. The Ash Basin No.1 is shown in **Figure 2**.

2.0 HAZARD POTENTIAL CLASSIFICATION

Per the CCR regulations, a hazard potential classification provides an indication for danger to life, development, or the environment in the event of a release of CCR from a surface impoundment. The new CCR rule requires an owner or operator of any existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment to determine which of the following hazard potential classifications characterizes their particular CCR unit. These potential classifications include the following:

- High Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation will probably cause loss of life.
- Significant Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.
- Low Hazard Potential CCR Surface Impoundment – means a diked surface impoundment where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment's owner's property.

Ash Basin No. 1 was analyzed to determine effects of a breach in the current levee system. Two scenarios were used in each model: Maximum and Most Probable Loss. In both scenarios, a shear break to the bottom of the levee was assumed. The Maximum scenario flow rate was calculated using a height of water measured from the bottom of pond to the top of levee. The Most Probable Loss scenario flow rate was calculated using a height of water measured from the bottom of pond to the normal operating elevation.

It should be noted that the Light Detection and Ranging (LIDAR) data obtained showed an elevation of 220‘ NAVD 88 in the area of the coal stockpile. Site investigations conducted as well as historical knowledge of plant operations

indicate that the average elevation of the stockpile is much higher than the LIDAR information; therefore, model conditions were altered to include a stockpile elevation of 270' NAVD 88. Size and elevation of the coal stockpile influences floodwater direction and intensity. Impacts of floodwater may change should the coal stockpile fall below 240' NAVD 88.

The results of the levee breach analysis for Ash Basin No.1 showed that the impact of a breach in the levee system would be routed to the area north of the power station. Minor impacts to power plant property and adjacent woodlands are expected. Initial flow will route to the south of the power plant and impact the storage silos and conveyor system. The floodwaters would be contained from continuing south by the existing road/levee. Floodwater would then be routed along the existing channel that runs north adjacent to the Coal Pile Runoff Pond downstream. No impact to power plant property south of the coal stock pile or adjacent residential property is expected.

For Ash Basin No. 1, the analysis showed an increase to headwater at a maximum of 7', for the Most Probable Loss condition, and a maximum of 11', for the Maximum Loss condition. The analysis showed that these maximum depths occur in the area of the silos and conveyor system. A breach in Ash Basin No. 1 does not affect the plant's railroad north of the station.

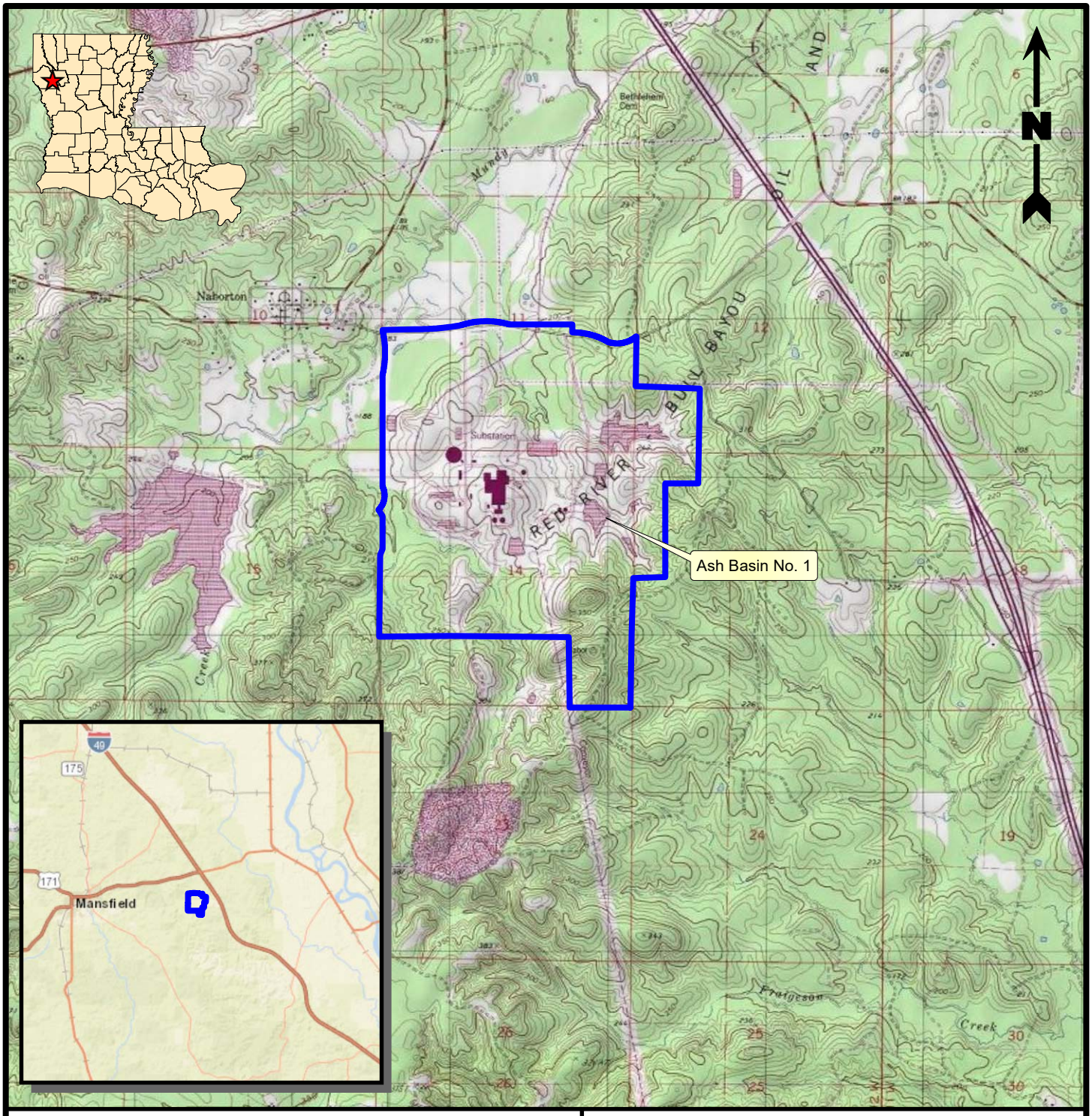
The complete Levee Breach Analysis can be found in **Appendix A.**

3.0 CONCLUSIONS

Based on the results of the maximum and most probable loss scenarios, Ash Basin No. 1 at Cleco's Dolet Hills Power Station is classified as a low hazard potential CCR surface impoundment. Losses anticipated from a levee breach would principally impact the onsite property and have less of an impact on the offsite wooded area and any streams within this area. **Appendix B** contains a P.E. Certification that attests to this assessment.

FIGURE 1

SITE LOCATION MAP



3,000 1,500 0 3,000 Feet

Legend

Facility 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

Hazard Potential Classification Assessment - Ash Basin No. 1
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

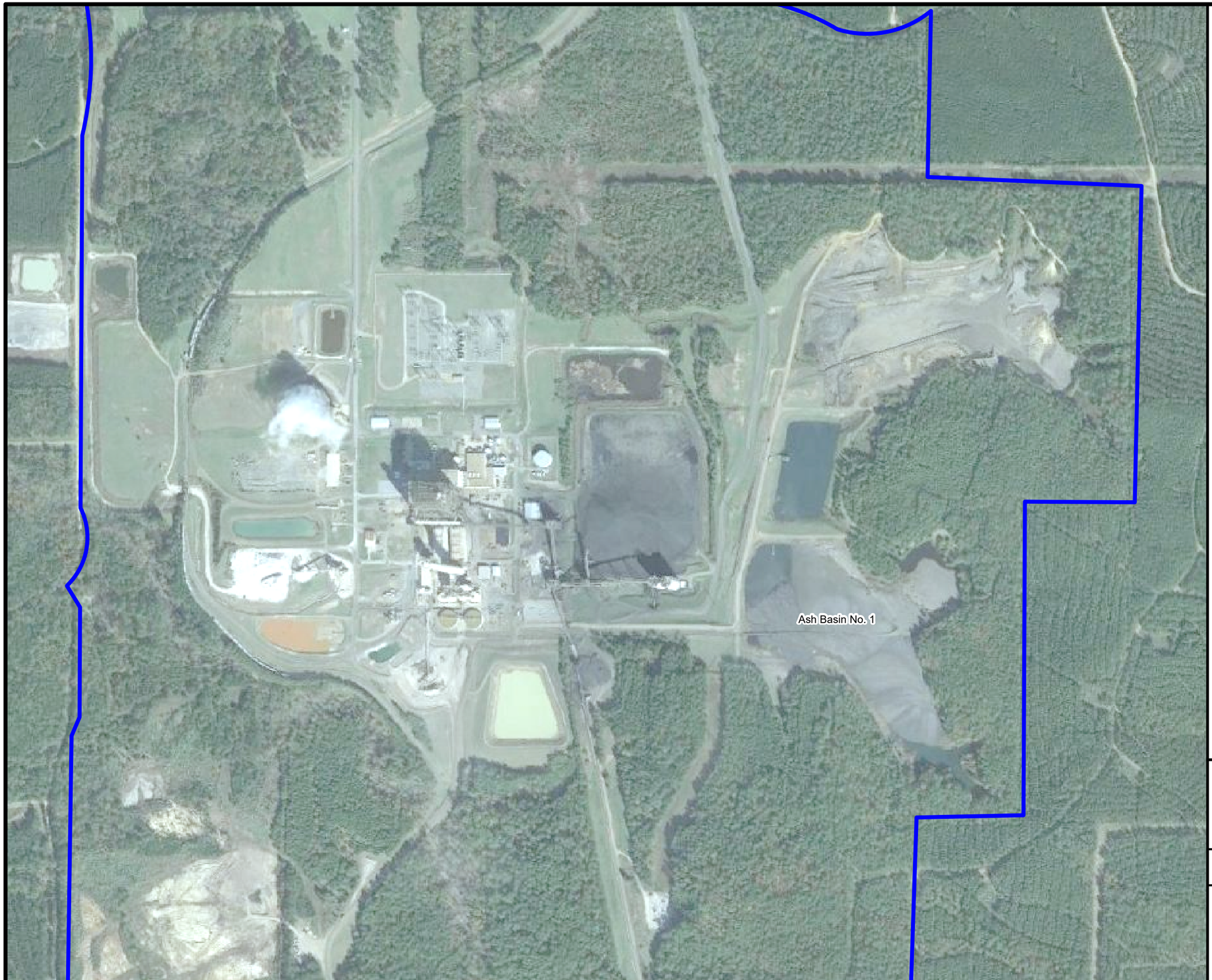
PROVIDENCE

Drawn By	LMM	10/06/16
Checked By	LMH	10/06/16
Approved By	CVH	10/06/16

Project Number	002-185
Drawing Number	002-185-A014
1	Figure

FIGURE 2

SITE MAP



N

Legend

Facility Boundary

Reference

Base map comprised of Google Earth aerial imagery from 11/06/12.

600 300 0 600
Feet

Site Map

Hazard Potential Classification Assessment - Ash Basin No. 1
Mansfield, DeSoto Parish, Louisiana

Cleco Power LLC
Dolet Hills Power Station

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2
Figure

APPENDIX A

LEVEE BREACH ANALYSIS

July 2016

CLECO DOLET HILLS POWER STATION
CLECO POWER LLC
DESOTO PARISH, MANSFIELD, LOUISIANA

LEVEE BREACH ANALYSIS REPORT: ASH BASIN NO. 1

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1.0 PROJECT DESCRIPTION

Cleco Dolet Hills Power Station is located west of Interstate 49 (I-49) in Mansfield, Louisiana. The power station uses lignite, a type of coal, to generate electricity. The site contains Ash Basin No. 1 that is sized to accept one year's ash production. This report documents the effort undertaken to study the effects of a breach of the Ash Basin No.1 levee.

2.0 DATA ACQUISITION

The proposed project is located on Federal Emergency Management Agency (FEMA) map panel 0325C in Desoto Parish which is bound by Bayou Pierre on the east, US 84 on the north, LA 509 on the west, and Par Rd 140 on the south. The study area is presented in **Figure 1**.

Elevation data for Ash Basin No.1 is included in **Appendix A**. This includes the maximum and normal operating elevations of Ash Basin No. 1.

Light Detection and Ranging (LIDAR) data was obtained to model existing site conditions both at the power plant and for adjacent properties. Average plant elevation is 240' NAVD 88. It should be noted that the data obtained showed an elevation of 220' NAVD 88 in the area of the coal stockpile. Site investigations conducted as well as historical knowledge of plant operations indicate that the average elevation of the stockpile is much higher than the LIDAR information, therefore model conditions were altered to include a stockpile elevation of 270' NAVD 88.

3.0 HYDRAULIC MODEL DEVELOPMENT

LIDAR information was used to develop a ground model of existing conditions for the project area. This information was imported into a hydraulic analysis program in order to model the effects of breaking the levee system. An elevation terrain was generated based on LIDAR data. Channel geometry for the outflows from each of the basins and from the pond was created using raindrop analysis, and cross sections were created by referencing the elevation terrain. Existing pond storage areas were also identified in the model. Cross sections were extended to cover any area of concern both within and surrounding the project site.

Ash Basin No. 1 was analyzed as two separate events. Two scenarios were used in each model: Maximum and Most Probable Loss. In both scenarios, a shear break to the bottom of the levee was assumed. The Maximum scenario flow rate was calculated using a height of water measured from the bottom of pond to the top of levee. The Most Probable Loss scenario flow rate was calculated using a height of water measured from the bottom of pond to the normal operating elevation.

The outflow was modeled in GeoHEC-RAS by inputting the steady flow data for each scenario. The upstream boundary for the Most Probable Loss scenario was

the normal operating elevation of this pond. The upstream boundary for the Maximum scenario was the top of levee elevation for this pond. The analysis was then computed on the steady flow data. The results for the flood maps and for the cross sections were then generated. It should be noted that these models were generated based on a continuous outflow from the pond as this was determined to be the most conservative way to model a levee breach. Real-world scenarios should be less impactful as the flow rate will steadily decrease as the pond empties.

4.0 MODELING RESULTS

The results for a breach in Ash Basin No. 1 show that the initial flow will route to the south of the power plant and impact the storage silos and conveyor system. The floodwaters would be contained from continuing south by the existing road/levee. Floodwater would then be routed along the existing channel that runs north adjacent to the Coal Pile Runoff Pond downstream. Minor impacts to power plant property and adjacent woodlands are expected.

For Ash Basin No. 1, the analysis showed an increase to headwater at a maximum of 7', for the Most Probable Loss condition, and a maximum of 11', for the Maximum Loss condition. The analysis showed that these maximum depths occur in the area of the silos and conveyor system. A breach in Ash Basin No. 1 does not affect the plant's railroad north of the station.

Although the above analysis considered a water column, a breach in the Ash Basins No. 1 would release a minimal amount of bottom ash and it would fall out quickly due to its specific gravity and grain size.

It should be noted that the average elevation shown in **Figures 2** and **Figure 3** represents the average elevation of the entire outflow path. Size and elevation of the coal stockpile influences floodwater direction and intensity. Impacts of floodwater may change should the coal stockpile fall below 240' NAVD 88.

5.0 COST ANALYSIS

A cost analysis was completed based on the information obtained in the Levee Breach Analysis and available historical cost data. A cost estimate was determined for both the Most Probable Loss and the Maximum Loss scenarios for Ash Basin No. 1. The flood area was broken into categories of wooded land, existing channels, plant property, and structures.

It is assumed that the levee breach and resulting flood waters would negatively impact onsite property and adjacent timber. The flood waters should dissipate in a relatively short amount of time depending on site conditions at the time of the levee breach. For this reason, it is assumed that only 40 percent of the total offsite impacted acreage would be adversely affected.

Cleanup costs associated with a levee breach are a substantial portion of the total cost for this analysis. Clearing & Grubbing of the impacted properties will be necessary to clear the existing timber that is damaged and was estimated at $2,000 per acre of affected wooded land.

A breach in Ash Basin No. 1 would release a minimal amount of bottom ash which would fall out quickly due to its specific gravity and grain size. The quantity of ash in this pond is constantly changing; therefore, it was assumed that this pond was half full of ash before the levee breach. Elevation data for Ash Basin No.1 is included in **Appendix A**. Multiple percentages of ash loss were analyzed, all of which were minimal (ranging from 10% to 20%). For the purpose of this report, the cost of a 20% ash loss has been included in the final cost for each scenario of this pond. The volume and cost for all assumed percentages can be found in **Appendix B**. The material would be sent to a landfill instead of being returned to the pond. The cost for removal and hauling ash to a landfill was estimated at $25 per cubic yard of ash.

It is assumed that the length of exposure of pond water to ash would be minimal and would not cause contamination of drinking water, nor would it contaminate the topsoil. For this reason, removal of topsoil is not necessary and was not included in the cost estimate.

It is assumed that any vegetation impacted by a levee breach would need to be re-established to original conditions. Site Preparation/Planting includes the re-establishment of pine/hardwood timber and the spraying of underbrush vegetation during re-establishment and was priced at $500 per acre of affected wooded land. The Loss of Timber Value assumes that valuable timber (pine/hardwood) was present and was priced at $750 per acre. Seeding and Fertilizing was also considered and includes the re-establishment of grass for erosion control of the cleared and grubbed acreage. This was priced at $2,500 per acre of land. Any value of the timber harvested was not included as a discount to the total cost.

It was also assumed that the affected levee of the pond would be rebuilt immediately, and no temporary measures for levee replacement would be necessary. The failure shape of the levee is assumed to be a shear type failure. in order to reconstruct the levee, an additional removal of material is anticipated to safely reconstruct the levee. The cost to reestablish the levee was estimated at $25 per cubic yard and $6.84 per square foot.

Ash Basin No. 1 would cause flooding around the silos and conveyor system located at the south end of the plant. It was determined that a breach in the levee system would cause no structural damage. The silos sit on top of, and are dowelled into, the reclaim tunnel, which is extremely robust and begins about 31 feet below the ground level at the east end of the silos.

Details of the Levee Risk Assessment Costs are included in **Appendix B**. The calculations show a total cost for each scenario of this pond. These costs are

broken down into the different percentages of ash loss. The total clean-up cost is then divided into the cost of on-site clean-up and the cost of off-site clean-up. These totals are also broken down into the different percentages of ash loss.

A cost for Mobilization/Demobilization was added to each total. For the on-site costs, mobilization/demobilization was estimated at $12,000. For the off-site costs, mobilization/demobilization was estimated at 8%.

The total costs for each scenario of this pond, assuming a 20% ash loss, are as follows:

- For Ash Basin No. 1, clean-up costs for the Most Probable Loss scenario total $3.0 million, and clean-up costs for the Maximum Loss scenario total $3.6 million.

The on-site costs for each scenario of each pond, assuming a 20% ash loss are as follows:

- For Ash Basin No. 1, on-site clean-up costs for the Most Probable Loss scenario total $1.8 million, and on-site clean-up costs for the Maximum Loss scenario total $2.3 million.

The off-site costs for each scenario of each pond, assuming a 20% ash loss are as follows:

- For Ash Basin No. 1, off-site clean-up costs for the Most Probable Loss scenario total $1.2 million, and off-site clean-up costs for the Maximum Loss scenario total $1.3 million.

FIGURE 1

LEVEE BREACH STUDY AREA

Ash Basin No. 1
Levee Breach Study Area

Mansfield, DeSoto Parish, Louisiana

Cleco Power, LLC

Cleco Dolet Hills Power Station

Note:

Base map comprised of ESRI World Imagery

500 250 0 500 1000 1500

PROVIDENCE

Drawn By	AMV	07/26/16
Checked By	JDM	07/26/16
Approved By	JDM	07/26/16

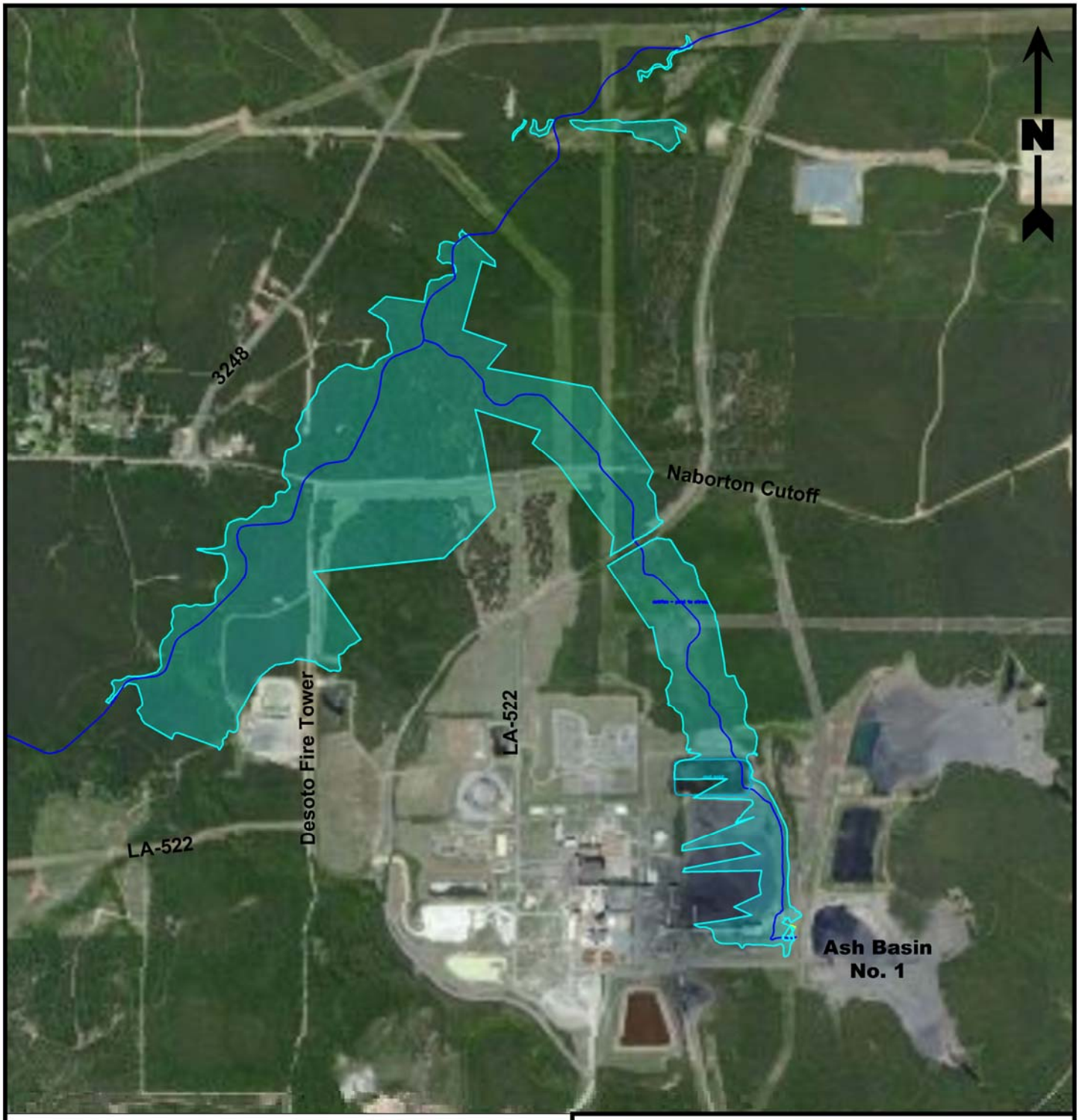
Project Number
002-185

Drawing Number
002-185-A008

1
Figure

FIGURE 2

ASH BASIN NO. 1 MOST PROBABLE LOSS



Legend

Most Probable Loss (Avg. El. 201.41')

Note:

Base map comprised of ESRI World Imagery

500 250 0 500 1000 1500

Ash Basin No. 1
Most Probable Loss

Mansfield, DeSoto Parish, Louisiana

Cleco Power, LLC

Cleco Dolet Hills Power Station

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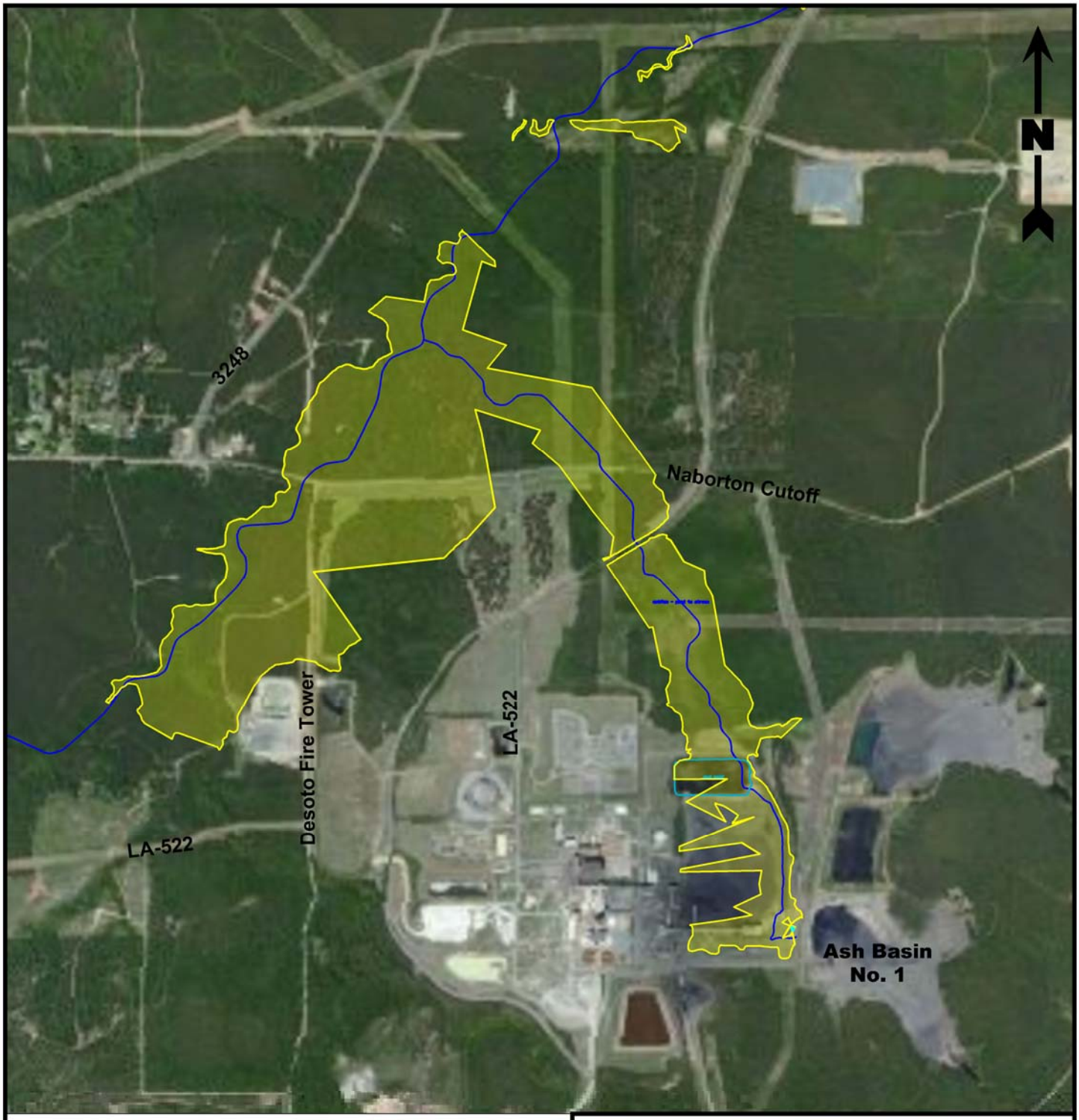
Drawing Number 002-185-A010

2 Figure

FIGURE 3

ASH BASIN NO.1 MAXIMUM LOSS



Legend

Maximum Loss (Avg. El. 203.08')

Note:

Base map comprised of ESRI World Imagery

500 250 0 500 1000 1500

Ash Basin No. 1
Maximum Loss

Mansfield, DeSoto Parish, Louisiana

Cleco Power, LLC

Cleco Dolet Hills Power Station

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Checked By	JDM	07/26/16
Approved By	JDM	07/26/16

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Drawing Number 002-185-A011

3 Figure

APPENDIX A

ACQUIRED DATA

Facility Name:		Cleco Dolet Hills Power Station		
Address:		963 Power Plant Rd. Mansfield, LA		
Surface Impoundment Name :	Ash Basin No. 1	**Owner:**	Cleco Power LLC	
Surface Impoundment ID:	P-0037	**Operator:**	Cleco Power LLC	
Nearest City:	Mansfield	**Parish:**	DeSoto	
GENERAL				
Dam Status:	Operational	**Year Built:**		1984
Latitude:	32° 01.82’ N	**Longitude:**		93° 33.68’ W
Dam Size:	400 Acre-Feet @ 253.5 ft.			
Bottom of Pond Elevation	220 ft. NAVD 88	**Top of Dike Elevation:**		256 ft. NAVD 88
Low Operating Level Elevation:	230 ft. NAVD 88	**High Operating Level Elevation:**		251 ft. NAVD 88
High Operating Level Storage:	330 acre-feet @ 251.0 ft. NAVD 88			
Maximum Storage:	400 acre-feet @ 253.5 ft. NAVD 88			
Maximum Surface Area:	30 Acres			
Spillway/Overflow Structure Type:	Internal adjustable concrete stoplog overflow weir structure. Also, has an auxiliary overflow spillway. The auxiliary spillway has 6" riprap on the bottom and sides of the spillway up to elevation 256.0 NAVD 88.			

APPENDIX B

CALCULATIONS

LEVEE BREACH COST ANALYSIS
APPENDIX B
ASH BASIN NO. 1

Description	Unit	Most Probable Loss	Maximum Loss
Wooded land on-site	acres	40.29	48.35
Wooded land off-site	acres	42.93	44.24
Existing channel (east of coal pile)	acres	2.20	2.20
Coal pond	acres	2.96	2.96
Coal pile	acres	8.15	9.04
Railroad (on-site)	acres	0.77	0.93
Roadways (on-site)	acres	0.78	0.93
Area of levee repair	sq ft	8,924	8,924
Volume of levee repair	cu yd	5,067	5,067
10% ash leaving pond	cu yd	43,560	55,660
15% ash leaving pond	cu yd	65,340	83,490
20% ash leaving pond	cu yd	87,120	111,320
Plant property (non-wooded land)	acres	10.56	18.65
Percentage of flood that is on-site (wooded land on-site, railroad, roadways & non-wooded land)		60.48%	65.25%

Ash Basin No. 1 Costs

Description	Unit	Unit Price	Most Probable Loss	Maximum Loss
Site prep/planting on-site[1]	acre	$500	$20,147	$24,175
Site prep/planting off-site[1]	acre	$500	$21,467	$22,118
Loss of timber value on-site[2]	acre	$750	$30,220	$36,263
Loss of timber value off-site[2]	acre	$750	$32,201	$33,177
Clearing & grubbing on-site	acre	$2,000	$80,587	$96,700
Clearing & grubbing off-site	acre	$2,000	$85,868	$88,473
Seeding & fertilizing on-site [3]	acre	$2,500	$127,133	$167,495
Seeding & fertilizing off-site [3]	acre	$2,500	$107,335	$110,591

LEVEE BREACH COST ANALYSIS
APPENDIX B
ASH BASIN NO. 1

Levee Repair	Unit	Unit Price	Most Probable Loss	Maximum Loss
Incorporation of lime, reprocessing, recompacting clay material on exterior of slope	cu yd	$25	$126,667	$126,667
Purchase and installation of structural geogrid material	sq ft	$0.50	$4,462	$4,462
Purchase and installation of HDPE membrane	sq ft	$0.42	$3,748	$3,748
Purchase and installation of fabric formed concrete revetment	sq ft	$5.50	$49,082	$49,082
Purchase and placement of erosion control matting	sq ft	$0.35	$3,123	$3,123
Seeding and fertilization	sq ft	$0.07	$625	$625
		Levee Repair Total	**$187,707**	**$187,707**

Ash Removal and Haul to Landfill[4]	Unit	Unit Price	Most Probable Loss	Maximum Loss
10% ash leaving pond	cu yd	$25	$1,089,000	$1,391,500
15% ash leaving pond	cu yd	$25	$1,633,500	$2,087,250
20% ash leaving pond	cu yd	$25	$2,178,000	$2,783,000

Mobilization/Demobilization on-site	$12,000	$12,000
Mobilization/Demobilization off-site	8%	8%

On-site Costs[5]

10% ash loss	**$1,116,453**	**$1,432,278**
15% ash loss	**$1,445,782**	**$1,886,247**
20% ash loss	**$1,775,112**	**$2,340,216**

Off-site Costs

10% ash loss	**$731,389**	**$796,956**
15% ash loss	**$963,773**	**$1,058,080**
20% ash loss	**$1,196,157**	**$1,319,203**

Total Costs

10% ash loss	**$1,847,842**	**$2,229,234**
15% ash loss	**$2,409,556**	**$2,944,327**
20% ash loss	**$2,971,269**	**$3,659,419**

NOTES:

1. Includes the re-establishment of pine/hardwood timber and the spraying of underbrush vegetation.

2. Assumes that valuable timber (pine/hardwood) is present.

3. Includes the re-establishment of grass for erosion control.

4. Assumes that half of the pond is filled with ash, and minimal amounts would be released.

5. Includes all levee repair costs and all costs for ash clean up that occurs on site. Assumes any ash that falls on the levee is included in the levee repair.

6. Assumes ash leaving pond spreads evenly throughout affected on-site area and 40% of the off-site area.

7. Timber value once purchased and brought to mill is not included.

8. Assume no contamination of topsoil; therefore, no removal necessary.

9. Assume length of exposure of pond water to ash is minimal and will not cause contamination of drinking water.

10.Assume affected pond is being rebuilt immediately and no temporary measures for levee replacement are necessary.

LEVEE BREACH COST ANALYSIS
APPENDIX B
ASH BASIN NO. 1

Ash Basin No. 1 Ash

Pond area (acre) 30.0

	Most Probable Loss	Maximum Loss
High Operating Level (ft)	251	
Top of Levee (ft)	256	256
Levee Toe (ft)	233	233
Half Full of Ash (ft)	9	11.5
Volume of Existing Ash (yd^3)	435,600	556,600

Volume of Ash Leaving Pond (yd^3):	Most Probable Loss	Maximum Loss
10%	43,560	55,660
15%	65,340	83,490
20%	87,120	111,320

Ash Basin No. 1 Levee

Slope = 4:1

	Most Probable Loss	Maximum Loss
Width At Break (ft)	184	184
Length Across Top	46	46
Depth of Failure	23	23
Volume of Failure	5,067	5,067

APPENDIX B

P.E. CERTIFICATION

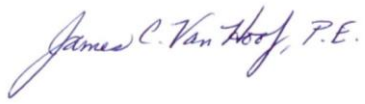
CLECO BRAME ENERGY CENTER
ASH BASIN NO.1
CCR HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that I have performed a hazard potential classification assessment for Cleco's Dolet Hills Power Station Ash Basin No.1 in accordance with the CCR requirements at 40 CFR 257.73(a)(2). This hazard potential classification assessment has determined that Ash Basin No.1 is classified as a low hazard potential surface impoundment.

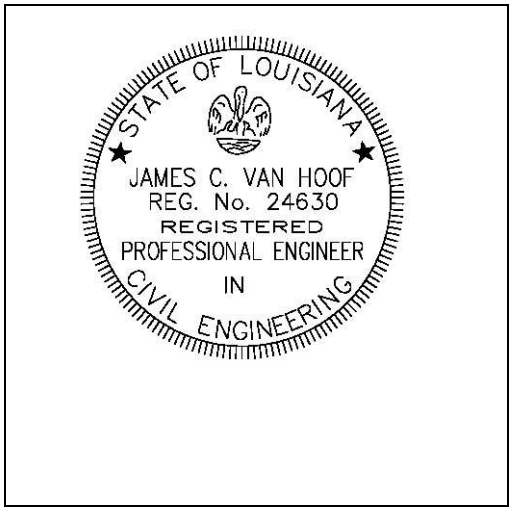
James C. Van Hoof
Name

24630 | **LA**
Registration No. | State



Signature

10/12/2016
Date



(Seal)