Assessment of Dam Safety
Coal Combustion Surface Impoundments (Task 3)
Final Report

Louisville Gas & Electric Company
(A subsidiary of E.ON U.S.)

Cane Run Power Station

Louisville, Kentucky

Prepared for

Lockheed Martin
2890 Woodridge Ave #209
Edison, New Jersey 08837

April 16, 2010

CHA Project No. 20085.9000.1510

I acknowledge that the management units referenced herein:

- Ash Treatment Basin Complex/E-Pond
- Basin Pond/Dead Storage Pond

Have been assessed on October 28, 2009.

Signature: Kath E Adnams
Katherine E. Adnams, P.E.
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21671
4/14/10

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1.0 INTRODUCTION

1.1 Introduction

CHA was contracted by Lockheed Martin (a contractor to the United States Environmental Protection Agency (EPA)) to perform independent engineering reviews of selected coal combustion surface impoundment inspection reports (Project #0-381 Coal Combustion Surface Impoundments/Dam Safety Inspections – Task 3). As part of this contract, CHA was assigned to perform a site assessment of Louisville Gas & Electric Company's (a subsidiary of E.ON U.S.) coal combustion waste (CCW) impoundments at the Cane Run Station, which is located in Louisville, Jefferson County, Kentucky as shown on Figure 1 – Project Location Map.

CHA made a site visit on October 28, 2009 to inventory CCW surface impoundments at the Cane Run facility, to perform visual observations of the containment dikes, and to collect relevant information regarding the site assessment.

CHA engineers Anthony Stellato, P.E. and Katherine Adnams, P.E. were accompanied by the following individuals:

Company or Organization Name	**Name & Title**
KY Dept. of Environmental Protection	Gary Wells, Dam Safety
Louisville Gas & Electric	Steven Turner, General Manager
Louisville Gas & Electric	Kevin Shaughnessy, Production Leader
E.ON U.S.	Michael Winkler, Manager Environmental Programs
E.ON U.S.	David Millay, P.E., Civil Engineer - Generation Eng.
Louisville Gas & Electric	Michael Hensley, Production Manager

1.2 Project Background

The Cane Run Station Ash Treatment Basin Dam (KY State ID No. 874, a.k.a. LG&E Waste Water Dam) is under the jurisdiction of the Commonwealth of Kentucky Department for Environmental Protection, Division of Water, Dam Safety and Flood Compliance Section of the Water Infrastructure Branch (KDEP). According to the Kentucky Revised Statute (KRS) Chapter 151, the KDEP Engineering Memo No. 5 (adopted 02-01-1975), Section B and KAR 401:030 – Design Criteria for Dams and Associated Structures the Ash Treatment Basin (ATB) Dam is classified by the Kentucky DEP as High Hazard, meaning the failure of the dam may cause loss of human life or major damage to dwellings, buildings, railroads, or important utilities. The ATB dam also meets the EPA criteria for a high hazard dam.

The Basin Pond/Dead Storage Pond Dam is not classified by the Kentucky DEP since this structure does not meet Kentucky's definition of a dam. As defined by the EPA criteria this structure would be classified as Low Hazard, meaning that failure of the dam would not be expected to cause loss of human life, and economic/environmental losses would be expected to be low.

1.2.1 State Issued Permits

Commonwealth of Kentucky Permit No. KY0002062 has been issued to Louisville Gas & Electric authorizing discharge under the National Pollutant Discharge Elimination System (NPDES) to the Ohio River in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit. The permit became effective on November 1, 2002. LG&E submitted a permit renewal application prior to the scheduled expiration date and received letter of completeness regarding the permit from the Kentucky Department of Water (KDOW) on May 21, 2007 and, consistent with state regulations, Cane Run continues to operate under the current permit pending issuance of a new permit by the KDOW.

1.3 Site Description and Location

The Cane Run Power Station has five ponds in two complexes for process water and stormwater run-off:

1. ATB receives bottom ash sluice, plant sump water, landfill run-off, coal pile run-off, FGD excess water, and precipitation run-off. This basin includes the E-Pond which receives landfill run-off where entrained solids settle before the water flows into the ATB.
2. Basin Pond receives precipitation and equipment wash-down run-off flows from the areas adjacent to the processing equipment for preparing residuals for the landfill. Solids primarily include calcium sulfites and fly ash used in scrubber sludge. Excess water is pumped to the Clearwell Pond.
3. Dead Storage Pond contains unused carbide-lime slurry and receives runoff from the portable lime-slakers and lime receiving areas. Excess water flows to the Basin Pond.
4. Clearwell Pond serves to settle suspended solids prior to limited reuse by FGD systems or discharge to the site ATB.
5. Coal Pile Run-Off Pond receives precipitation run-off from the coal pile, plant substation/roadway areas and adjacent grassy areas.

The location of these ponds is shown on Figure 2. This report focuses on the ATB/E-Pond Complex and the Basin Pond/Dead Storage Pond Complex because these ponds are impounded by earthen dikes and they receive coal combustion waste (CCW) products. While the Clearwell Pond has the potential to receive CCW, it is incised and therefore it is not discussed further in this report.

A map of the region indicating the location of the Cane Run Power Station, ATB/E-Pond Complex, and Dead Storage/Basin Pond Complex and identifying schools, hospitals, or other critical infrastructure located within approximately five miles down gradient of the impoundments is provided as Figure 3.

1.3.1 Ash Treatment Basin and E-Pond

The present day ATB (also referenced as the Main Ash Pond in other reports) has a surface area of approximately 40 acres. The ATB is situated approximately 1,200 feet east of the Ohio River. It was commissioned in 1972 as an expansion of an older ash pond that was in use prior to that time. The ATB was expanded in 1977 and reportedly contains bottom ash, fly ash, and other materials (coal fines, process water drainage and treated sanitary wastewater). The pre-1972 pond was in the area now containing the Cane Run landfill.

Addition plans for the ATB, included herein as Figure 4, indicate that it was originally constructed as a partially incised, roughly triangular shaped basin with a bottom at El. 420 feet and the crest at El. 460 feet. The original ground was at about El. 450. It measured roughly 6,600 feet around the perimeter, of which approximately 1,440 feet along the west side abutted against the original ash pond and an existing flood wall (levee) for the Ohio River. Approximately 750 feet of the north basin perimeter, as measured from the flood wall at northwest corner of the pond, was incised where the original ground surface approached El. 460. The remaining basin wall perimeter was constructed as an earthen dike up to 14 feet high constructed with 3 horizontal to 1 vertical (3H:1V) exterior slopes, 1.5H:1V interior slopes, and a 15-foot wide crest. Flatter 3H:1V interior slopes were planned for the west basin wall abutting the flood wall. Proposed cross sections are included on Figure 4.

A note on the 1972 plan indicates an overflow at El. 456.5 thus creating a pool up to 36.5 feet deep with an operating level about 6.5 to 8.5 feet above the exterior ground surface. This plan shows a series of manholes along the northern side of the pond connecting two 24-inch-diameter RCPs which collect water from the coal pile and ash basin to the Ohio River and to an area west of the pond.

An Emergency Sludge Pond (or E-Pond), approximately 1.5 acres, was proposed in the southwest corner of the basin. The 1972 plan indicated that dikes creating this sludge pond were 15 feet wide at the top with crest and floor elevations of 460 feet and 440 feet respectively. The E-Pond was designed with 1.5H:1V slopes for its interior and exterior slopes. Field observations by CHA suggest that the current E-Pond is off-set northeastward of the proposed 1972 plan location. The E-Pond is used as secondary storage for the sludge processing plant located approximately 200 feet west of the E-Pond.

A 2008 aerial and hydrographic survey produced by Fuller Mossberger Scott and May (FMSM) as part of an ash pond planning study for the Cane Run Facility indicates that the original ash pond that existed prior to 1972 and flood wall along the west edge of the expanded basin have been buried and are no longer discernable. This plan is included as Figure 5. A landfill operation where combustion ash stabilized flue-gas desulfurization (FGD) by-product is disposed now occupies the original ash basin and an area south of the ash basin. Elevations in this landfill are currently on the order of 560 feet or more.

As much as one-third to one-half of the present basin no longer retains open water. This includes the southwest corner of the basin area where the E-Pond has been constructed and where a 30 to 50-foot wide drainage channel now conveys water through the filled in area toward the open portion of pond. Ground surface elevations range from approximately 457 to 500 feet in this filled area where two prominent partially vegetated knolls are presently located. Cane Run personnel indicated that these knolls were stockpiled materials related to landfill operations. The elevation of the dike crest ranges from approximately El. 458 at the southwest corner to El. 460 at the east corner, to El. 458 at the northwest corner. The water surface elevation was about 454.6 feet at the time of the 2008 survey. Plant personnel indicated that the water surface elevation was about 450 at the time of the CHA site visit. The water level is controlled by an outflow structure located at the northwest corner of the pond. This structure connects to the twin 24-inch-diameter RCPs that discharge to the Ohio River.

1.3.2 Dead Storage / Basin Pond Complex

The Basin Pond/Dead Storage/Clearwater Pond complex is approximately 1,300 feet northeast of the ATB. This complex is situated approximately 1,200 feet from the Ohio River.

The Basin Pond and Dead Storage Pond are separated by a common divider dike. The Basin Pond measures approximately 2 acres in surface area, and the Dead Storage Pond measures approximately 4 acres. Compacted fill embankments up to 10 feet high and about 1,100 feet long were constructed on the north and east sides of this complex. These ponds receive process water drainage from the plant and run-off from the FGD/fly ash mixing area. Water is pumped from these ponds for plant process reuse. At the time of CHA's site visit, the water level in these ponds was about El. 445.

We understand that the Basin/Dead Storage Ponds will likely be decommissioned within the next two to three years when the station reconfigures the north portion of the site to create a new landfill area. Permitting is planned for 2010 with construction anticipated to begin in 2011.

1.3.3 Other Impoundments

One additional impoundment, the Clearwell Pond, potentially contains coal combustion byproducts. This pond is located directly west of the Dead Storage Pond. It measures approximately 1 acre in surface area and is fully incised.

1.4 Previously Identified Safety Issues

Based on our review of the information provided to CHA and as reported by Louisville Gas & Electric, there have been no identified safety issues at the Ash Pond Complex in the last 10 years.

1.5 Site Geology

The Cane Run Power Station, ATB, and Basin/Dead Storage Pond Complex, along with the surrounding industrial and residential areas, are located in the historic flood plain of the Ohio River in the southwest quadrant of the Louisville, Kentucky metropolitan area.

Based on a review of an available geology map included herein on Figure 6 (*Geologic map of parts of the Louisville West and Lanesville quadrangle, Jefferson County, Kentucky: U.S. Geological Survey, Geologic Quadrangle Map GQ-1202, 1974*), the west portion of the site, approximately from the center of the power station west to the Ohio River, is underlain by about 10 to 30 feet of alluvial silt, clay, and sand (noted as geologic unit Qal). Glacial outwash deposits consisting of a heterogeneous mixture of sand, gravel, silt, and clay is indicated on the east portion of the site (noted as geologic unit Qo). Artificial fill (geologic unit Af) is indicated within the power station; we assume that this fill is associated with earthwork activities at the plant.

1.6 Bibliography

CHA reviewed the following documents in preparing this report:

- *Ash Pond Addition – 1972,* Cane Run Generator Station, drawing prepared by Louisville Gas & Electric Co. Construction Department, August 10, 1972.
- *Ash Pond Hydrographic Survey Plan, Ash Pond Planning Study,* Cane Run Special Waste Disposal Facility, Fuller Massbarger Scott, & May Engineers, April 2008.
- *Geotechnical Investigation - Ash Pond Stability,* Cane Run Generating Station, Louisville Gas & Electric Company, ATEC Associates, November 20, 1976.
- *Louisville Gas and Electric Company, Cane Run/Maverick Steel Plant, 12" High Pressure Line.* Letter to Louisville Gas & Electric Company. Greenbaum Associates, Inc; September 2, 2005.

- *Response of Louisville Gas and Electric Company and Kentucky Utilities Company to Request for Information under Section 104(e) of the CERCLA*. Letter to U.S. Environmental Protection Agency, March 25, 2009.
- *Scheduled Inspection, ID of Dam: 0874, LG&E Waste Water Dam, Jefferson County, KY, Hazard Class: High.* Commonwealth of Kentucky, Environmental and Public Protection Cabinet, June 25, 2004.
- *Scheduled Inspection, ID of Dam: 0874, LG&E Waste Water Dam, Jefferson County, KY, Hazard Class: High.* Commonwealth of Kentucky, Environmental and Public Protection Cabinet, October 23, 2006.
- *Scheduled Inspection, ID of Dam: 0874, LG&E Waste Water Dam, Jefferson County, KY, Hazard Class: High.* Commonwealth of Kentucky, Environmental and Public Protection Cabinet, October 21, 2008.
- *Visual Site Assessment Report Eight Ash Pond Dams (sections applicable to Cane Run Station)*, prepared for E. ON U.S., ATC Associates, Inc., February 20, 2009.

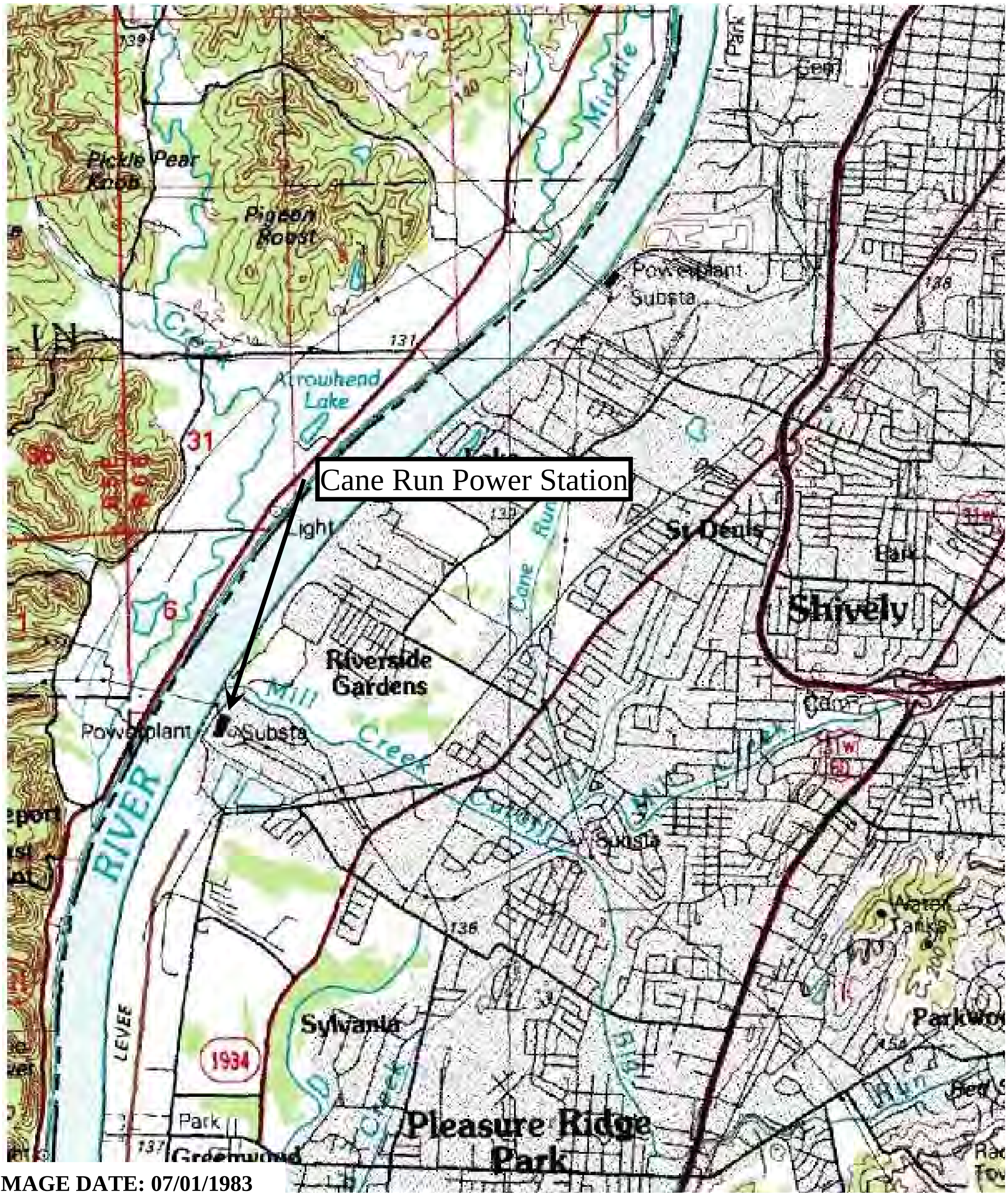

IMAGE DATE: 07/01/1983

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Figure 1
Project Location Map

Scale: 1" = 1 mile

Project No.:
20085.9000.1510

Louisville Gas & Electric
Cane Run Power Station
Louisville, KY

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IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED MARCH 2005.

0 495 990
Scale in feet

CHA
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PHOTO SITE PLAN

CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

PROJECT NO.
20085.9000

DATE: 04/2010

FIGURE 2

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IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED MARCH 2005.

LEGEND

(111) STREET, HIGHWAY

◎ FIRE DEPARTMENT

CHURCH

SCHOOL

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CRITICAL INFRASTRUCTURE MAP

CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

PROJECT NO.
20085.9000

DATE: 04/2010

FIGURE 3

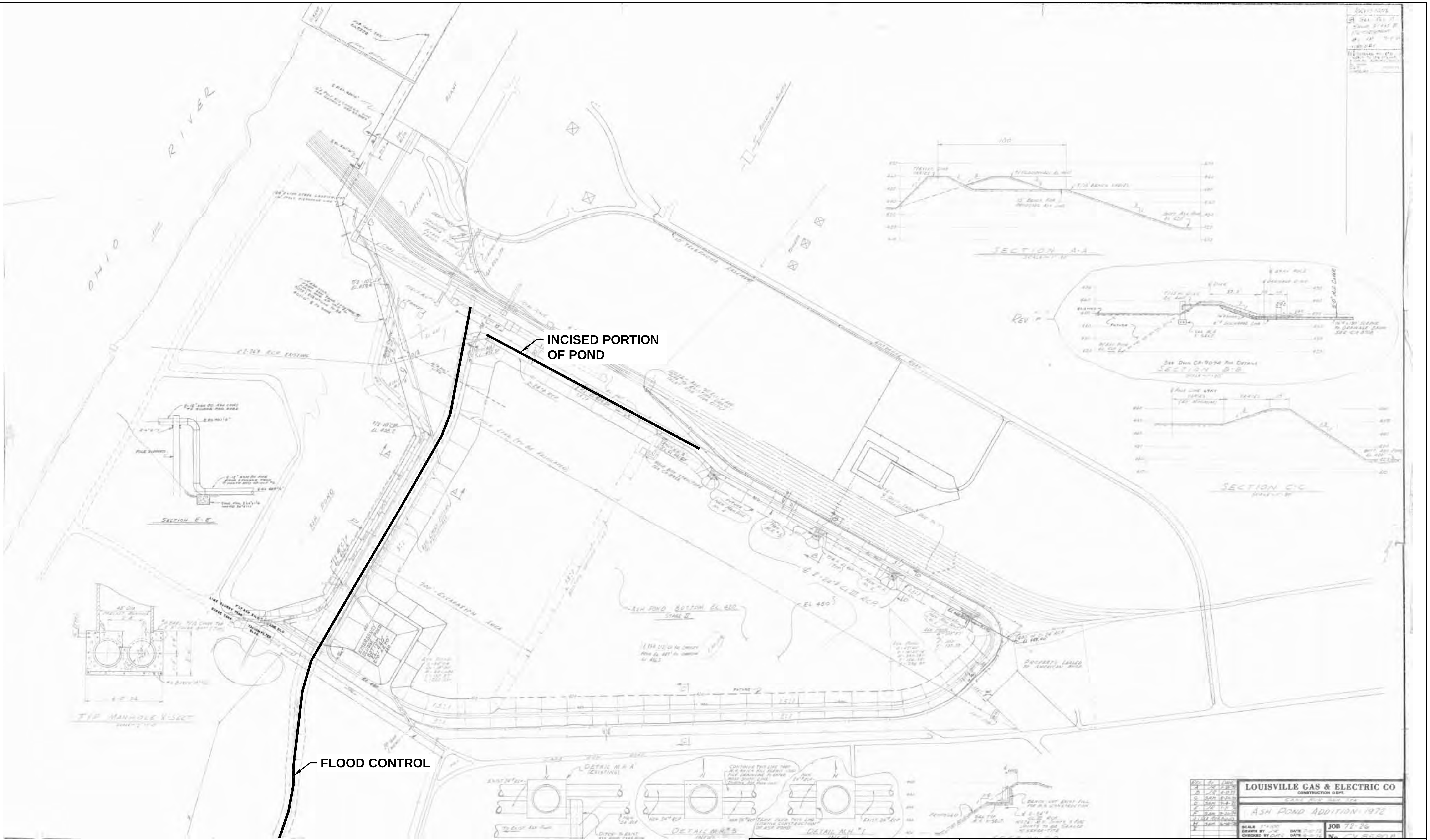

IMAGE REFERENCE: LOUISVILLE GAS & ELECTRIC CO., ASH POND ADDITION – 1972

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EXPANSION DESIGN PLAN

CANE RUN POWER STATION
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DATE: 04/2010

FIGURE 4

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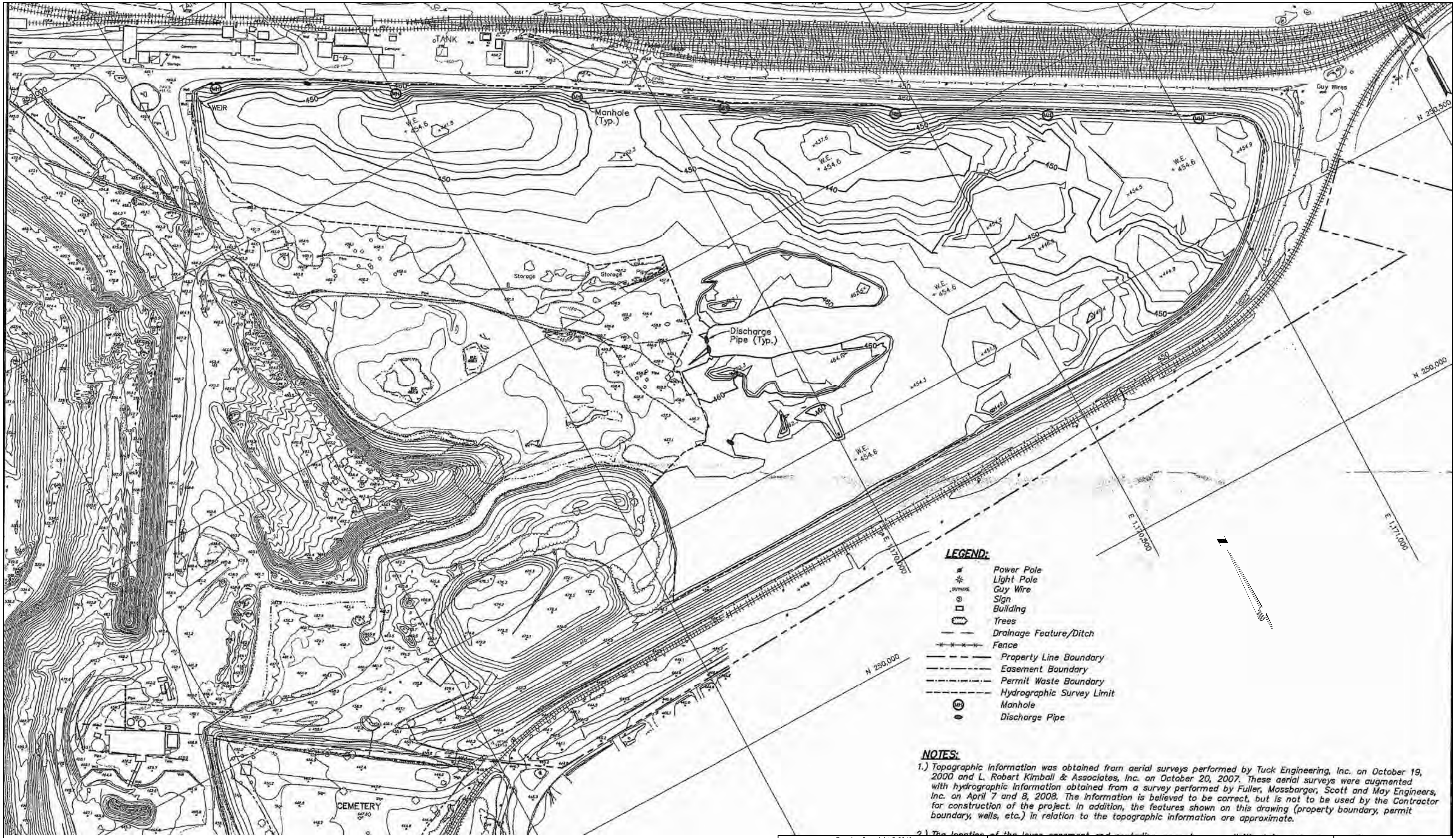

NOTES:

1.) Topographic information was obtained from aerial surveys performed by Tuck Engineering, Inc. on October 19, 2000 and L. Robert Kimball & Associates, Inc. on October 20, 2007. These aerial surveys were augmented with hydrographic information obtained from a survey performed by Fuller, Mossbarger, Scott and May Engineers, Inc. on April 7 and 8, 2008. The information is believed to be correct, but is not to be used by the Contractor for construction of the project. In addition, the features shown on this drawing (property boundary, permit boundary, wells, etc.) in relation to the topographic information are approximate.

IMAGE REFERENCE: FULLER, MOSSBARGER, SCOTT & MAY ENGINEERS INC., ASH POND PLANNING STUDY, APRIL 2008, ASH POND HYDROGRAPHIC SURVEY PLAN, SHEET 1 OF 2.

0 200 400
Scale in feet

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PRESENT TOPOGRAPHICAL DATA

CANE RUN POWER STATION
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FIGURE 5

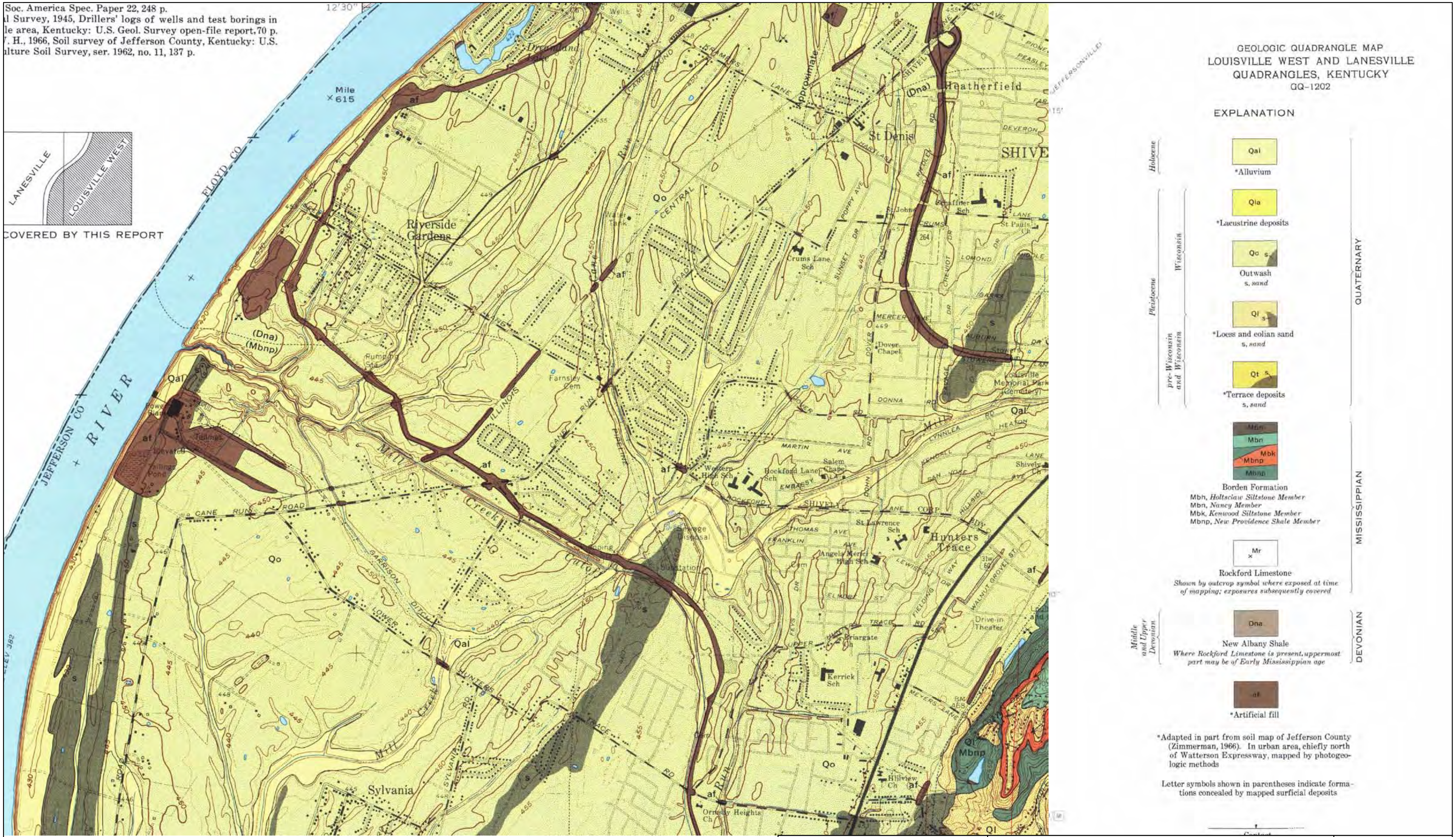

IMAGE REFERENCE: USGS: GEOLOGIC MAP OF PARTS OF THE LOUISVILLE WEST AND LANESVILLE QUADRANGLE, JFFERSON COUNTY, KENTUCKY; U.S. GEOLOGICAL SURVEY, GEOLOGIC QUADRANGLE MAP GQ-1202, 1974

0 3,249 6,497
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REGIONAL GEOLOGY

CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

PROJECT NO. 20085.9000

DATE: 04/2010

FIGURE 6

2.0 FIELD ASSESSMENT

2.1 Visual Observations

CHA performed visual observations of the ATB and Dead Storage/Basin Pond complexes following the general procedures and considerations contained in Federal Emergency Management Agency's (FEMA's) *Federal Guidelines for Dam Safety* (April 2004), and Federal Energy Regulatory Commission (FERC) Part 12 Subpart D to make observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Forms, prepared by the US Environmental Protection Agency, were completed on-site during the site visit. Copies of the completed forms were submitted via email to Lockheed Martin representatives approximately three days following the site visit to the Cane Run Power Station. Copies of these completed forms are included in Appendix A. A photo log and Site Photo Location Plan (Figure 7) are located at the end of Section 2.4.

CHA's visual observations were made on October 28, 2009. The weather was mostly cloudy with temperatures between 50 and 60 degrees Fahrenheit. Prior to the days we made our visual observations the following approximate rainfall amounts occurred (as reported by www.wunderground.com).

Table 1 - Approximate Precipitation Prior to Site Visit

Date of Site Visit – October 28, 2009		
Day	**Date**	**Precipitation (inches)**
Tuesday	October 20, 2009	0.00
Wednesday	October 21, 2009	0.00
Thursday	October 22, 2009	0.00
Friday	October 23, 2009	0.53
Saturday	October 24, 2009	0.00
Sunday	October 25, 2009	0.00
Monday	October 26, 2009	0.00
Tuesday	October 27, 2009	1.16
Wednesday	October 28, 2009	0.02
Total	**Week Prior to Site Visit**	**1.71**

Date of Site Visit – October 28, 2009		
Day	**Date**	**Precipitation (inches)**
Total	**Month of October**	**5.94**

2.2 Visual Observations – Ash Treatment Basin

CHA performed visual observations of the ATB Dike which is approximately 5,200 feet long and 10 to 14 feet high.

2.2.1 ATB Embankments and Crest

In general, the ATB dikes do not show signs of changes in horizontal alignment from the proposed alignment. The crest is uniformly graded and surfaced with crushed stone.

2.2.1.1 ATB North Dike

Photo 1 shows the north dike downstream slope is reasonably uniformly graded and appropriately vegetated with grass. Slope measurements indicate a variation from 2.5H:1V near the crest to 2H:1V near the toe. Occasional erosion rills have developed on the downstream slopes as shown in Photo 2. Photo 4 shows a slight irregularity in slope grading which occurs over a limited area of the downstream slope. This appears to be an overfilled repair, but could indicate soil creep. Tire ruts from mowers also exist in this area. This is common on earthen embankments, and requires observation to ensure that erosion and sloughing do not occur. Poor drainage at the toe of the slope results in ponding along much of the north dike. Photos 3, 5, and 6 show standing water and erosion at the toe likely resulting from this condition. E.ON U.S. is working with a consultant to design drainage improvements in this area. A small rodent hole, as shown in Photo 7 was seen in this area. A large area at the east end of the north dike has recently been re-graded (Summer 2009) with one to two feet of additional clay fill and sodded to address drainage problems, as shown in Photo 8. According to E.ON U.S., sod was used to avoid the difficulty of establishing grass on the slope from seed during the rainy fall season. Photos 9 through 12 shows the north dike upstream embankment, which is covered with rip rap.

2.2.1.2 ATB East Dike

The east dike downstream slope is shown in Photos 13 to 16. The surface appears uniformly graded and appropriately vegetated with grass. White utility markers run along the toe of slope indicating the location of a high-pressure gas line installed by open cutting along the toe of the embankment in 2005. The upstream slope is rip rap covered and similar in appearance to the north dike upstream slope as shown in Photo 17.

2.2.1.3 ATB South Dike

The gas line continues along the downstream toe of the south dike as shown in Photo 18. Photo 21 shows slight settlement which has occurred over the gas line in this area. Photo 19 shows a concrete lined swale running along the toe, which intercepts storm water and carries it to a culvert running under the adjacent railroad embankment (Photo 20). Photos 21 to 24 show the surface treatment and condition of both the upstream and downstream slopes are similar to the east dike, except for the west end, where soil material for use at the landfill has been stockpiled on the upstream side of the embankment (Photo 25).

The ATB south dike continues along the E-Pond. The downstream embankment of the western 420 feet of the south dike, as shown in Photos 26 through 30, becomes over-steepened and irregular, and vegetation appears predominantly weedy. Surface probing indicated soft conditions, with up to 18” of penetration observed. A concrete barrier runs between the crest and the downstream face. Photo 29 shows several erosion rills which have developed under this barrier. Photo 31 shows the E-Pond which was excavated within previously deposited ash slightly to the northeast of the E-Pond location indicated on a 1972 proposed site plan. Storm water runoff from capped and uncapped areas of the landfill to the west discharge into the E-Pond via a culvert shown in Photo 32. Overflows from the E-Pond enter the ATB.

2.2.2 ATB Control Structure and Discharge Channel

Photos 33 and 34 show the outlet control structure for the ATB. Outlet pipes flow to a NPDES permitted outfall on the Ohio River.

2.3 Visual Observations – Basin / Dead Storage Pond Complex

CHA performed visual observations of the Basin Pond/Dead Storage Pond Dike, which is approximately 120 feet long and about 10 feet high.

2.3.1 Basin / Dead Storage Pond Complex Embankments and Crest

The Basin and Dead Storage Ponds share the east dike and the north dike impounds the northern side of the Dead Storage Pond. The south and west sides of this complex are incised.

2.3.1.1 Basin / Dead Storage Pond Complex East Dike

Vegetation is weedy and non-uniform. Photos 35 through 38, and 44 show typical slope conditions along the east dike. Photo 39 and 40 show woody brush and tree stumps on the downstream slope that have been recently cut following an inspection by E.ON U.S.'s independent consultant. Photo 41 shows an erosion rill that has developed on the east dike which is typical of the condition of the east dike. Both downstream and upstream slopes are steep and irregular as shown in Photo 42, 43, and 44. Photo 42 shows a depression that was observed near the toe at the corner between the east and north dikes. The crest road surface is crushed gravel, and water ponds in areas (Photo 45) due to wind-rowing of gravel along the edges from routine access road repair and maintenance.

2.3.1.2 Basin / Dead Storage Pond Complex North Dike

Surface irregularities as shown in Photos 46, 47, 50, and 51 are typical along the downstream slope of the north dike, consisting of surface slumps, erosion rills and tire ruts. Surface probing indicated firm soils approximately 9 inches below the surface. Photos 48, 49, 52, 54, and 55 show recent repairs near the north dike crest which have not yet established vegetation. Surface irregularities are also apparent on the upstream slope as shown in Photo 53.

2.3.2 Basin / Dead Storage Pond Complex Control Structure and Discharge Channel

There is no outlet from the Basin Pond or Dead Storage Pond. These ponds drain into the incised Clearwell Pond (Photo 56), where water is re-used for plant processes.

2.4 Monitoring Instrumentation

Six piezometers were installed on the ATB in January and February 2010 and there is an electronic flow meter on the discharge of the ATB. No instrumentation is in place on the impounding dikes for the Basin Pond, or Dead Storage Pond.

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IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED MARCH 2005.

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SITE PHOTO LOCATION MAP

CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

PROJECT NO.
20085.9000

DATE: 04/2010

FIGURE 7

1

Downstream slope of north dike of the Ash Treatment Basin (ATB)
from west intersection with county flood control dike looking east.

2

Slight erosion rill from crest on ATB north dike looking east.

3

Downstream slope of north dike at ATB looking east. Poor drainage results in standing water at the toe of this dike. E.ON U.S. is working with a consultant to re-grade this area for better drainage.

4

Downstream slope of north dike at ATB looking east. Slight irregularity in slope grading difficult to distinguish as an "as constructed" condition or soil creep.

5

East end of north dike at ATB looking east. Mower ruts, and toe erosion from stormwater were observed.

6

Close up of toe erosion on ATB north dike.

7

Small rodent hole on ATB north dike.

8

East end of ATB north dike has been regraded and had sod placed to address drainage problems.
E.ON U.S elected to place new sod rather than seed because of this year's excessive rain.

9

Upstream slope of ATB north dike looking east from outlet structure.

10

Upstream slope and crest of ATB north dike looking east.

11

Upstream slope and crest of ATB north dike looking west.

12

Upstream slope and crest of ATB north dike looking east near east corner.

13

Downstream slope of ATB east dike looking south. The area at the toe was raised 1 to 2 feet in summer 2009 and sod placed to prevent stormwater pooling in this area. White markers indicate the location of a high pressure gas line installed in 2005.

14

Downstream slope of ATB east dike looking south.
White markers indicate the location of a high pressure gas line installed in 2005.

15

Downstream slope of ATB east dike at southwest corner.
White markers indicate the location of a high pressure gas line installed in 2005.

16

Crest of ATB east dike looking south.

17

Upstream slope of ATB east dike looking south.

18

Downstream slope of ATB south dike looking west.
White markers indicate the location of a high pressure gas line installed in 2005.
Drainage swale between dike and railroad tracks was cleaned out of sediment and debris in the fall of 2009.

19

Downstream slope of ATB south dike looking west.

20

Drainage swale outlet along ATB south dike looking south.

21

Downstream slope of ATB south dike looking east. White marker indicates locations of gas line. Slight depression appears to be over the pipe alignment along the south dike.

22

Crest of ATB south dike looking west.

23

Upstream slope of ATB south dike looking west.

24

Crest of ATB south dike looking east.

25

Stockpiled material for use at the landfill adjacent to ATB south dike looking west.

26

Downstream slope and crest of west end of ATB south dike where adjacent to the E-Pond, looking west.

27

Downstream slope of west end of ATB south dike. Note tree at the toe is on the adjacent property looking west.

28

Downstream slope of west end of ATB south dike looking east. Note weedy vegetation and irregular grading.

29

Erosion rills under concrete barriers at crest of south dike adjacent to the E-Pond.

30

South dike of ATB adjacent to the E- Pond is quite steep. A January 2010 survey indicates it is at 2H:1V.

31

E-Pond (left of people) is excavated within previously deposited ash.
Original ATB south dike and ash create south side of the impoundment.

32

Stormwater flows from landfill (capped and uncapped) areas and discharges into E-Pond within the ATB.

33

ATB discharge structure.

34

ATB discharge to KYPDES permitted outfall. Pipes (beyond flap gates) discharges at Ohio River.

35

Crest and downstream slope of east dike at Basin/ Dead Storage Pond looking north.

36

Downstream slope of east dike at Basin/ Dead Storage Pond at toe looking north.

37

Looking towards south abutment at Basin/ Dead Storage Pond.

38

Downstream slope of east dike at Basin/ Dead Storage Pond looking south.
Note steepness of the embankment and irregularity of grading. January 2010 survey showed the upper portion of the slope to be 1.7H:1V flattening to 2.8H:1V at the toe.

39

Example of woody brush recently cut following LG&E’s consultant’s independent inspection.

40

Example of cut, stump left in place following LG&E’s consultant’s independent inspection.

41

Erosion rill about 6 inches deep, 1.5 feet wide on east dike at Basin/ Dead Storage Pond.

42

Depressions and irregular grading at northeast corner of Basin/ Dead storage pond dike.

43

Upstream slope of east dike at Basin/ Dead Storage Pond looking north along south cell.

44

Upstream slope of east dike at Basin/ Dead Storage Pond looking north along north cell.

45

Standing water on east dike at Basin/ Dead Storage Pond looking south.

46

Downstream slope of north dike at Basin/ Dead Storage Pond looking west.

47

Irregularity on north dike at Basin/ Dead Storage Pond.
Combination of surface slumps, erosion rills, etc. Probes soft to about 9” then firm.

48

Recent patchwork repair along crest of north dike at Basin/ Dead Storage Pond.

49

Repair area at north dike of Basin/ Dead Storage Pond not yet reseeded.

50

Tire ruts in north dike of Basin/ Dead Storage Pond.

51

Downstream slope of north dike at Basin/ Dead Storage Pond looking west.

52

Irregularity on north dike at Basin/ Dead Storage Pond.
Combination of surface slumps, erosion rills, etc. Probes soft to about 9” then firm.

53

Upstream slope of north dike at Basin/ Dead Storage Pond looking west.

54

Recent regrading along crest of north dike of Basin/ Dead Storage Pond to improve stormwater control.

55

Crest of Basin/ Dead Storage Pond north dike looking east.

56

Clearwell Pond west of Basin/ Dead Storage Pond is incised.

3.0 DATA EVALUATION

3.1 Design Assumptions

CHA has reviewed information related to the design and analysis of the stability and hydraulic adequacy of the ATB and Basin/Dead Storage Pond Complex which were available at the time of our site visits and provided to us by Louisville Gas & Electric and E.ON U.S. The design assumptions are listed with the applicable summary of analysis in the following sections.

3.2 Hydrologic and Hydraulic Design

The ATB dam at the Cane Run Power Station is classified as high hazard (Class C) suggesting that loss of life is probable in the event of a failure by Kentucky regulations. The Basin/Dead Storage Pond dams are classified as low hazard (Class A). This is based on the fact that a sudden breach or failure would cause loss of the structure itself but would result in little or no additional damage to other property.

Kentucky regulations (as found in DNR&EP Engineering Memorandum 5 pertaining to KRS 151.250) require low hazard impoundments without emergency spillways to safely store or pass the 100-year, 6-hour storm (P100) and require high hazard impoundments without emergency spillways to safely store or pass the 6-hour Probable Maximum Precipitation (PMP). The Kentucky guidelines suggest that the principal spillway have the capacity to drain the stored volume of storm flows in 10 days or less. This requirement is considered to be met if 80 percent of the maximum storm storage is drained within 10 days.

Stantec provided Louisville Gas & Electric with information on a hydrologic and hydraulic analysis for the ATB in an e-mail message dated October 21, 2009. Their analysis was based upon the following assumptions:

- Normal pool at El. 454.5 based on the spillway elevation.
- Normal inflow of 6,000 gallons per minute (gpm) from sluicing.
- Peak additional inflow of 378.72 cfs (170,000 gpm) during a 100-year, 24-hour event.
- Peak additional inflow of 456.10 cfs (204,700 gpm) during a 500-year, 24-hour event.

The analysis indicated that the water level in the ATB would rise to El. 455.82 following the 100-year, 24 hour event and El. 456.10 following the 500-year, 24-hour event. Both of these water levels are below the top of the ATB at El. 460.0.

Stantec did not provide information regarding the drainage area used to compute these storm water flows, or information correlating the 500-year, 24-hour event with the 6-hour PMP.

3.3 Structural Adequacy & Stability

The Kentucky Department for Natural Resources and Environmental Protection provides guidelines for minimum accepted factors of safety associated with various loading conditions and the reservoir at normal pool level in Table 2 – Factors of Safety of the *Guidelines for the Geotechnical Investigation and Analysis of Existing Earth Dams*. These factors of safety are outlined in Table 2.

Table 2 – Factors of Safety from KY Guidelines

Load Case	Required Minimum Factor of Safety
Rapid Drawdown	1.2
Long-Term Steady State Seepage	1.5
Earthquake Loading	1.0

In addition to the load cases outlined in Table 2 CHA recommends that the maximum surcharge load cases as found in the US Army Corps of Engineers Engineering Manual (EM) 1110-2-1902 be modeled and analyzed. This load case and associated minimum recommended safety factor is outlined in Table 3.

Table 3- Minimum Safety Factor Recommended by US Army Corps of Engineers

Load Case	Required Minimum Factor of Safety
Maximum Surcharge Pool (Flood) Condition	1.4

Louisville, Kentucky falls into Seismic Zone 1, which for deterministic based evaluation of seismic acceleration results in an acceleration value of 0.05g for seismic analysis. Based on more recent probabilistic hazard analyses performed by the United States Geological Society (USGS) accelerations of about 0.05g and 0.10g are representative of seismic accelerations with a 10 and 2 percent probability of exceedance in 50 years, respectively (about 500-year and 2,500-year events, respectively).

Since CHA's submission of the Draft Report on December 18, 2009, Louisville Gas & Electric has contracted MACTEC Engineering and Consulting, Inc. (MACTEC) to perform geotechnical investigations and stability analyses due to the previous absence of this information for the Cane Run facilities. CHA has been provided with preliminary stability analyses, and boring logs and laboratory test results for the existing dikes around the ATB/E-Pond and Dead Storage/Basin Pond Complexes.

Sections 3.3.1 and 3.3.2 discuss our review of stability analyses for the ATB/E-Pond and Basin Pond/Dead Storage dikes, respectively.

3.3.1 Stability Analyses of the ATB/E-Pond Complex

CHA has reviewed preliminary analyses for the ATB preformed by MACTEC. Figure 8 shows an example cross section. MACTEC used the soil strengths as shown in Table 4 below:

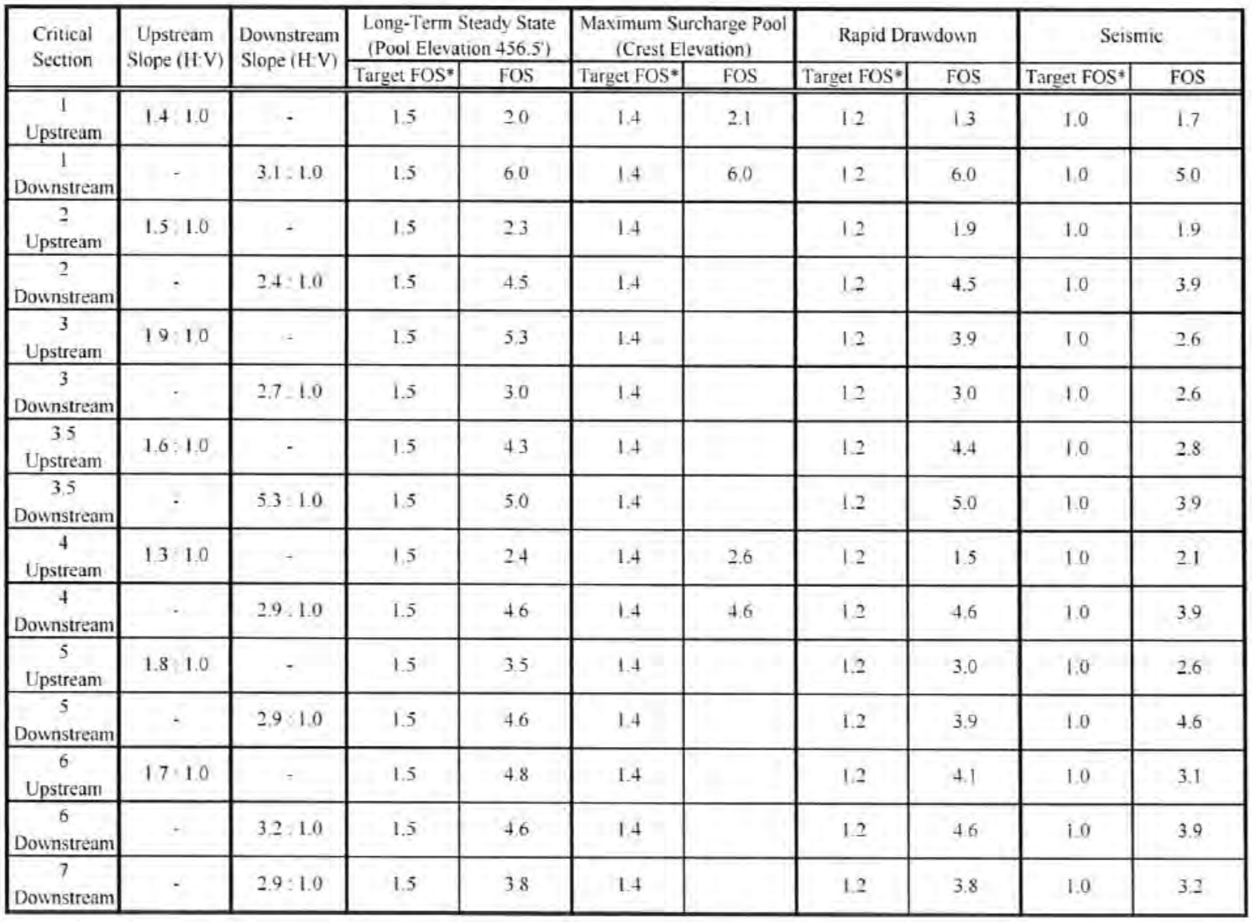
Table 4 – Soil Strength Parameters for the ATB

Soil Type	Unit Weight		Effective Stress	
	Total (pcf)	**Saturated (pcf)**	**Cohesion C' (psf)**	**Friction Angle Φ, (degrees)**
CL (stiff)	132	137	750	22
CL (firm)	125	130	375	16
SC (firm)	130	135	0	32
SP (firm)	104	109	0	35
SP (loose)	91	96	0	34
CCW	90	95	0	30
CL – Stockpile	134	139	200	30

MACTEC used a seismic acceleration of 0.05g for these analyses.

MACTEC performed 21 borings around the ATB/E-Pond dike. These included 9 crest/toe pairs for cross section development, as well as a crest boring in the area of the E-Pond, and two borings on a stockpile of material near the southeast end of the ATB. As of the data submission to CHA, MACTEC had completed stability analyses at 8 of these cross sections. Their stability results are presented in Table 5.

Table 5 – MACTEC Stability Analyses Results – ATB/E-Pond Complex



Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State (Pool Elevation 456.5')		Maximum Surcharge Pool (Crest Elevation)		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
1 Upstream	1.4 : 1.0	-	1.5	2.0	1.4	2.1	1.2	1.3	1.0	1.7
1 Downstream	-	3.1 : 1.0	1.5	6.0	1.4	6.0	1.2	6.0	1.0	5.0
2 Upstream	1.5 : 1.0	-	1.5	2.3	1.4		1.2	1.9	1.0	1.9
2 Downstream	-	2.4 : 1.0	1.5	4.5	1.4		1.2	4.5	1.0	3.9
3 Upstream	1.9 : 1.0	-	1.5	5.3	1.4		1.2	3.9	1.0	2.6
3 Downstream	-	2.7 : 1.0	1.5	3.0	1.4		1.2	3.0	1.0	2.6
3.5 Upstream	1.6 : 1.0	-	1.5	4.3	1.4		1.2	4.4	1.0	2.8
3.5 Downstream	-	5.3 : 1.0	1.5	5.0	1.4		1.2	5.0	1.0	3.9
4 Upstream	1.3 : 1.0	-	1.5	2.4	1.4	2.6	1.2	1.5	1.0	2.1
4 Downstream	-	2.9 : 1.0	1.5	4.6	1.4	4.6	1.2	4.6	1.0	3.9
5 Upstream	1.8 : 1.0	-	1.5	3.5	1.4		1.2	3.0	1.0	2.6
5 Downstream	-	2.9 : 1.0	1.5	4.6	1.4		1.2	3.9	1.0	4.6
6 Upstream	1.7 : 1.0	-	1.5	4.8	1.4		1.2	4.1	1.0	3.1
6 Downstream	-	3.2 : 1.0	1.5	4.6	1.4		1.2	4.6	1.0	3.9
7 Downstream	-	2.9 : 1.0	1.5	3.8	1.4		1.2	3.8	1.0	3.2

All analyses shown in this table show the ATB dike is stable under the required and recommended loading conditions. MACTEC noted in their Executive Summary that at Section 1, the upstream, rapid drawdown condition factor of safety was only 1.21 (the Table presents this factor of safety as 1.3). They note that this is in the area with the least deposited ash (near the discharge structure), and that if ash were to be dredged from this area, the loss of buttressing from the deposited ash would likely result in a factor of safety below the required value. MACTEC indicates that in their final report a critical ash elevation will be established to maintain adequate factors of safety under all loading conditions.

CHA performed independent sensitivity analyses on the critical downstream cross sections and found reasonable variation in soil properties based on interpretation of lab testing did not have a detrimental effect on the stability analyses.

3.3.2 Stability Analysis of Dead Storage/Basin Pond Complex

CHA has reviewed preliminary analyses for the Dead Storage/Basin Pond Complex preformed by MACTEC. MACTEC used the soil strengths as shown in Table 6 below:

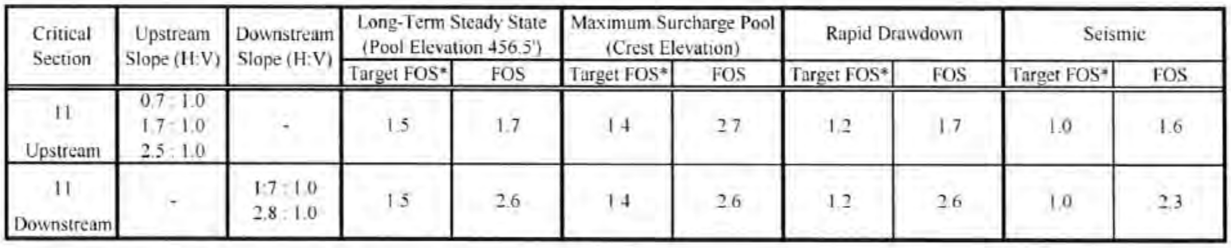
Table 6 – Soil Strength Parameters for the Dead Storage/Basin Pond Complex

Soil Type	Unit Weight		Effective Stress	
	Total (pcf)	Saturated (pcf)	Cohesion C' (psf)	Friction Angle Φ, (degrees)
CL (stiff)	125	130	500	22
SM (loose)	120	125	100	31
SP (loose)	91	96	0	34
SW-SM (firm)	108	113	0	35

MACTEC used a seismic acceleration of 0.05g for these analyses.

MACTEC performed 6 borings around the Dead Storage/Basin Pond dike in 3 crest/toe pairs for cross section development. As of the data submission to CHA, MACTEC indicated they had completed laboratory testing and a stability analyses at what they had determined to be the most critical cross section. Their stability results are presented in Table 7.

Table 7 – MACTEC Stability Analyses Results – Dead Storage/Basin Pond Complex



Critical Section	Upstream Slope (H:V)	Downstream Slope (H:V)	Long-Term Steady State (Pool Elevation 456.5')		Maximum Surcharge Pool (Crest Elevation)		Rapid Drawdown		Seismic	
			Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS	Target FOS*	FOS
11 Upstream	0.7 : 1.0 1.7 : 1.0 2.5 : 1.0	-	1.5	1.7	1.4	2.7	1.2	1.7	1.0	1.6
11 Downstream	-	1:7 : 1.0 2.8 : 1.0	1.5	2.6	1.4	2.6	1.2	2.6	1.0	2.3

CHA has noted that the lean clay (CL) noted in borings B-11C, B-11T, and B-12C was noted as containing ash (CCW) between about El. 429 and 443. In this zone, the Standard Penetration Testing blow counts appeared to be lower than in other portions of lean clay fill encountered ranging from 1 to 11 with an average of 6 with CCW, as compared with blow counts between 6 and 13, with an average of 10 where CCW was not mixed with the clay. The one laboratory strength test performed for this layer was performed on an undisturbed sample taken between SPT samples with blow counts of 10 and 13. The potential impact of the ash in this layer should be evaluated.

3.4 Foundation Conditions

Since CHA's initial site visit and Draft report submission, LG&E retained MACTEC to conduct a geotechnical exploration. The 1972 design drawing for the ATB does not provide information regarding subgrade preparation, embankment fill gradation, or embankment fill compaction criteria. However, borings performed during the January/February 2010 investigations suggest that the embankment was reasonably compacted and placed on firm natural ground.

CHA has not received drawings related to the Basin Pond or Dead Storage Pond. The recent subsurface explorations performed by MACTEC suggest that the dike for this complex was constructed over a mixture of clay and CCW. Blow counts suggest that this mixed material ranges from very soft to stiff.

3.5 Operations & Maintenance

CHA has not been provided with a copy of an Operation, Maintenance, and Inspection (OM&I) Manual or Emergency Action Plan (EAP) for the Cane Run Power Station. Based upon conversations during our site visit, we understand that staff performs security type observations twice per shift (i.e., six times each day) of the ATB and Basin/Dead Storage Ponds. The production support leader typically makes observations one to three times a week.

3.6 Inspections

3.6.1 State Inspections

Kentucky Revised Statues Chapter 151 (KRS 151) and associated regulations establishes minimum maintenance and design criteria for dams.

Kentucky DEP performs dam safety inspections of the ATB every two years based on its high hazard rating. Representatives of the Natural Resources and Environmental Protection Cabinet, Division of Water inspected the dike on October 16, 2008. The following required remedial measures were identified:

- Reseed the downstream slope
- Repair erosion areas.

3.6.2 Inspections by Engineering Consultants

LG&E hired a professional geotechnical engineering firm, ATC Associates, to perform a visual inspection of the ATB in February 2009. The findings and recommendations outlined in the visual inspections report included:

- Conduct another visual inspection of each facility during the growing season in 2009. Field work was performed in January and the ground was frozen in some cases was covered with snow.
- Prepare or update an Operations and Maintenance Manual for each facility.
- Prepare an Emergency Action Plan for each structure.
- Prepare or update topographical mapping of the facility.

- Institute and document regular structure inspections. These inspections will allow changes in the facility to be observed in a timely fashion and allow preventative measures to be taken during regular maintenance rather than on an emergency basis.
- The Dam Safety Regulations require that specific records be maintained for each facility. These include design drawings, as-built plans, subsurface exploration records, stability analyses of the dams and embankments as well as hydraulic and hydrologic design calculations. It was recommended that these records be maintained both at each Power Station as well as a central location such as a corporate office.

We understand that the consultant performed a follow-up visual inspection of the ATB and Basin/Dead Storage Pond on November 10, 2009 and that the report will be issued in the first quarter of 2010. According to LG&E, no urgent items were noted.

3.6.3 Inspection by Owner Representatives

Based on e-mail correspondence with Mr. David Millay of E.ON U.S. following CHA's site visit, we understand that members of the E.ON U.S engineering staff conducted a visual site assessment of the Basin Pond, Dead Storage Ponds, Emergency Pond and Clearwell Pond on March 17, 2009. An Action Items list was prepared for each pond and the action items are summarized below. These items were considered to be 'Normal Priority', meaning it was recommended that these action items be addressed as part of the ongoing maintenance of the structures.

- Basin Pond
    - Upstream Slope - Evaluate need to repair inner bank erosion.
    - Downstream Slope - Cut/mow vegetation.
    - Downstream Slope - Monitor outer bank erosion gullies.

- Dead Storage Pond
    - Crest - Evaluate need to establish stable road bed around perimeter of pond to improve access.
    - Upstream Slope - Evaluate need to repair inner bank erosion.
    - Upstream Slope - Relocate hoses to prevent bank erosion.
    - Upstream & Downstream Slopes - Cut/mow vegetation.
    - Downstream Slope - Monitor outer bank erosion gullies.

- Emergency Pond
    - Downstream Slope - Cut/mow vegetation.
    - Upstream Slope - Evaluate need to repair inner bank erosion.
    - Upstream Slope - Evaluate need to repair embankment at SPP discharge piping.

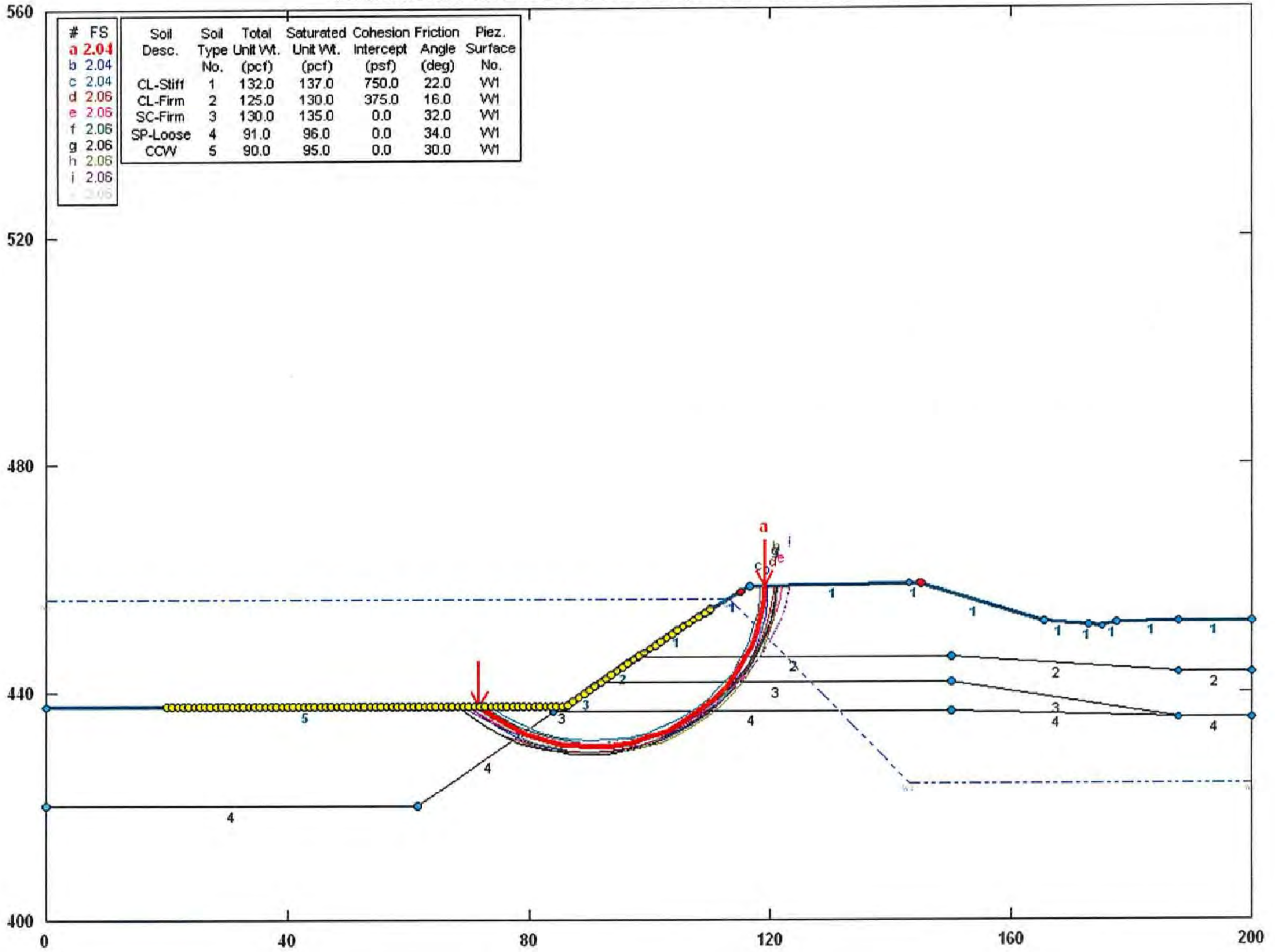
- Clearwater Pond
    - Upstream Slope - Evaluate need to repair bank erosion.
    - Crest - Remove vegetation from inner crest.
    - Upstream & Downstream Slopes - Cut/mow vegetation

Review of the items and comparison of E.ON U.S.'s photos from their March 19, 2009 site visit and the conditions observed on October 28, 2009, it is apparent that corrective actions have been undertaken at each of the ponds to address the noted deficiencies.

File: K:\20085\CADD\ACAD\FIGURES\9000 CANE RUN\9000 CANE RUN FIGURES.DWG Saved: 4/16/2010 12:19:31 PM PLotted: 4/16/2010 12:21:39 PM User: Gray, Timmolyn

Cane Run Station: Section 1, Upstream, Steady-State

C:\STEDWIN\CANERU~1\S1\UPSTREAM\1_SS.PL2 Run By: MACTEC albrenneman 2/19/2010 2:53PM



#	FS
a	2.04
b	2.04
c	2.04
d	2.06
e	2.06
f	2.06
g	2.06
h	2.06
i	2.06
	2.06

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
CL-Stiff	1	132.0	137.0	750.0	22.0	W1
CL-Firm	2	125.0	130.0	375.0	16.0	W1
SC-Firm	3	130.0	135.0	0.0	32.0	W1
SP-Loose	4	91.0	96.0	0.0	34.0	W1
CCW	5	90.0	95.0	0.0	30.0	W1

STABL6H FSmin=2.04

Safety Factors Are Calculated By The Modified Bishop Method

STED

IMAGE REFERENCE: GEOTECHNICAL EXPLORATION AND SLOPE STABILITY ANALYSES DATA PACKAGE, LG&E CANE RUN STATION – ASH TREATMENT BASIN/ E–POND COMPLEX, MACTEC ENGINEERING AND CONSULTING, INC. DATED 2/23/10

CHA

III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
Main: (518) 453-4500 · www.chacompanies.com

ATB – GENERAL CROSS SECTION AND STABILITY

CANE RUN POWER STATION
LOUISVILLE, KENTUCKY

PROJECT NO. 20085.9000

DATE: 04/2010

FIGURE 8

4.0 CONCLUSIONS/RECOMMENDATIONS

4.1 Acknowledgement of Management Unit Condition

I acknowledge that the **ATB/E-Pond Complex** management unit referenced herein was personally inspected by me and was found to be in the following condition: **Satisfactory**. This indicates that no existing or potential management unit safety deficiencies are recognized and acceptable performance is expected under all applicable loading conditions.

I acknowledge that the **Dead Storage/Basin Pond Complex** management unit referenced herein was personally inspected by me and was found to be in the following conditions: **Fair**. This indicates acceptable performance is expected under required loading conditions in accordance with applicable regulatory criteria; however some additional analyses should be performed and documented to verify that these criteria are met.

CHA presents the following recommendations for maintenance and updating of analyses to keep and/or bring these facilities into Satisfactory condition.

4.2 ATB General Condition Monitoring and Maintenance

Visually, a majority of the ATB dikes were found to be in satisfactory condition. A few areas were observed that warrant monitoring on a routine basis to confirm that changes are not occurring. These areas are as follows:

- Re-grade and/or stabilize the south dike section adjacent to the E-Pond.
- Fill the shallow erosion rills and rodent borrows on the downstream slope along the north side of the dike, and monitor for the development of similar features.
- Monitor the irregularity in the north downstream slope grading to assess if the irregularity is the result of an overfill repair or signs of slope creep.

- Tire ruts from mowing operations should be monitored to ensure they are not worsening or resulting in localized surficial sloughing or erosion. Periodic maintenance may be warranted.
- Continue efforts to improve drainage at the bottom of the downstream slope of the north dike. [We understand from LG&E's correspondence that additional drainage improvements were completed in November 2009.]
- The 1972 construction drawing indicates that the twin 24-inch-diameter drainage pipes extend below the ATB dike at the eastern corner. We recommend that the condition of these pipes below the dike be assessed and the pipe outlet be located.

4.3 Basin/Dead Storage Ponds

Visually the upstream and downstream slopes of the Basin / Dead Storage Ponds were found to be in poor condition. As discussed in Section 3.6, E.ON U.S. has undertaken remedial measures at these ponds following their March 19, 2009 inspection. The following areas were observed that warrant additional corrective measures or periodic maintenance, and monitoring on a routine basis to confirm that changes are not occurring. These areas are as follows:

- Establish routine mowing to promote growth of grass ground cover.
- Stump where woody brush and trees were cut monitored for decay. If depressions develop from stump decay, remove and backfill with compacted fill under the supervision of a Professional Engineer.
- Fill the shallow erosion rills on the upstream and downstream slopes along the east dike.
- Monitor the irregularity in the grading on the downstream side of the east and north dikes to assess if the irregularity is the result of slope creep. Irregularities include surface slumps, erosion rills and tire ruts.
- Improve grading along crest road surface to prevent water ponding.

4.4 Engineering Analysis

Since CHA's site visit and Draft report submission, LG&E has contracted MACTEC to perform a geotechnical investigation and stability analyses of the ATB/E-Pond and the Dead Storage/Basin Pond Complexes. The final report was not available at the time of this submission, and CHA has the following recommendations related to these investigations and analyses:

- Update the ATB Operation and Maintenance Plan with maximum dredge elevations where the "buttress" effect of deposited fly ash on the upstream slope is a key component of maintaining adequate factors of safety under all loading conditions.
- Evaluate the potential impact of soft clay/CCW fill that appeared to be in place below portions of the Dead Storage/Basin Pond Dike.

Additional information is required to clarify the Stantec hydrologic and hydraulic analysis for the ATB regarding their analysis parameters and how they relate to the Kentucky regulations. Hydrologic and hydraulic analysis for the Basin/Dead Storage Ponds should be performed.

5.0 CLOSING

The information presented in this report is based on visual field observations, review of reports by others and this limited knowledge of the history of the Cane Run Power Station surface impoundments. The recommendations presented are based, in part, on project information available at the time of this report. No other warranty, expressed or implied is made. Should additional information or changes in field conditions occur the conclusions and recommendations provided in this report should be re-evaluated by an experienced engineer.

APPENDIX A

Completed EPA Coal Combustion Dam Inspection Checklist Forms

&

Completed EPA Coal Combustion Waste (CCW) Impoundment Inspection Forms

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Cane Run Power Station

Date: 10-28-09

Unit Name: Ash Treatment Basin Complex/E-Pond

Operator's Name: Louisville Gas & Electric

Unit I.D.: Ash Treatment Basin Complex/E-Pond

Hazard Potential Classification: [✓ High] Significant Low

Inspector's Name: Katherine Adnams & Anthony Stellato, P.E.

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	1 to 3x/week		18. Sloughing or bulging on slopes?	X	
2. Pool elevation (operator records)?	450.0		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	450.0		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	Not Applicable		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	460.0		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	see note		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	NA		From underdrain?		N/A
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	N/A	
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	X		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		N/A
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?	X	
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments N/A = Not Applicable/Available

6. No instrumentation is in place on the impounding dikes for the Main Ash Pond.

18, 19. The majority of the main dike slopes are in good condition. At the southwest corner, the E-Pond is "incised" in the ash pond. The dike in this area has severe erosion and surface slough areas.

23. The west side of the main ash pond dike shows about about 8 inches of erosion at the toe due to surface water ponding. LG&E indicated they are working with a consultant on regrading/draining this area of surface water. A low area at the south corner of the dike has already been filled 1 to 2 feet and re-sodded to improve surface drainage characteristics.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # KY0002062 INSPECTOR Adnams/Stellato

Date October 28, 2009

Impoundment Name Main Ash Pond/E-Pond

Impoundment Company Louisville Gas & Electric

EPA Region 3

State Agency (Field Office) Addresss 9116 Leesgate Road
Louisville, KY 40222-5084

Name of Impoundment Main Ash Pond/E-Pond

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update X

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Primarily runoff from landfill, and emergency ash sluicing if landfill operations are interrupted.

Nearest Downstream Town : Name Shively, KY

Distance from the impoundment homes within 150 feet of dike

Impoundment Location:

Longitude 85 Degrees 53 Minutes 15 Seconds

Latitude 38 Degrees 10 Minutes 39 Seconds

State KY County Jefferson

Does a state agency regulate this impoundment? YES X NO ______

If So Which State Agency? KY Department of Environmental Protection - Dam Safety

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those 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 owner's property.

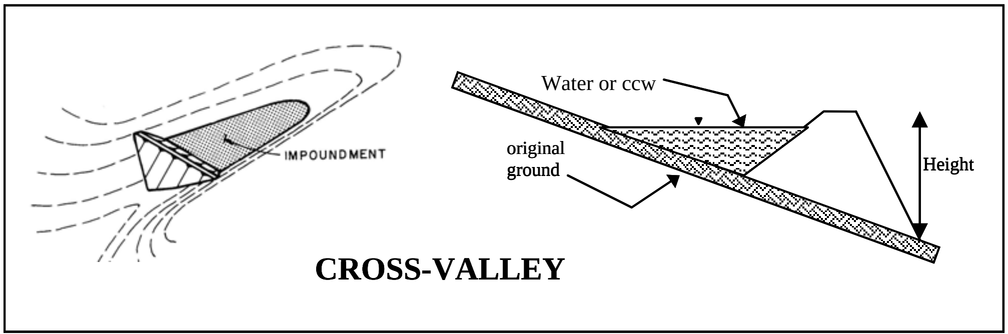
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

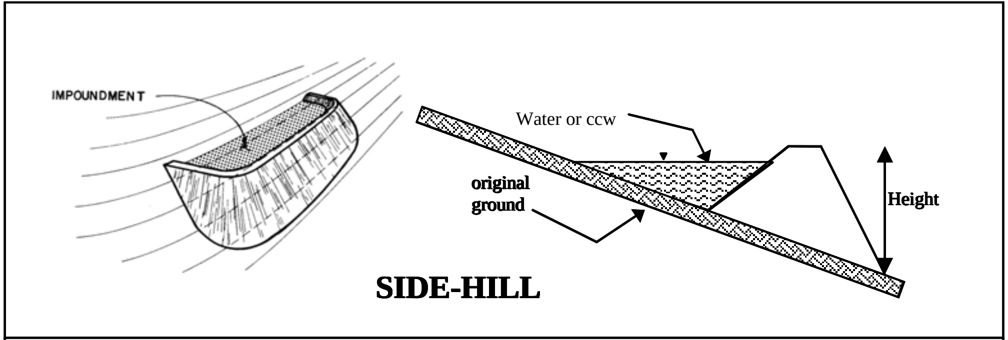
X_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

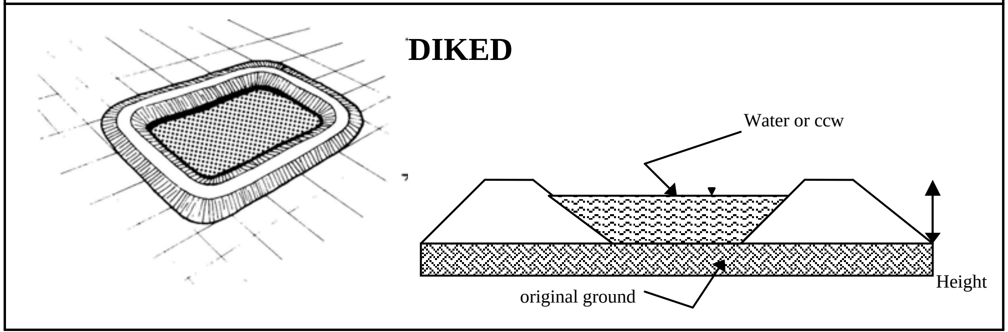
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

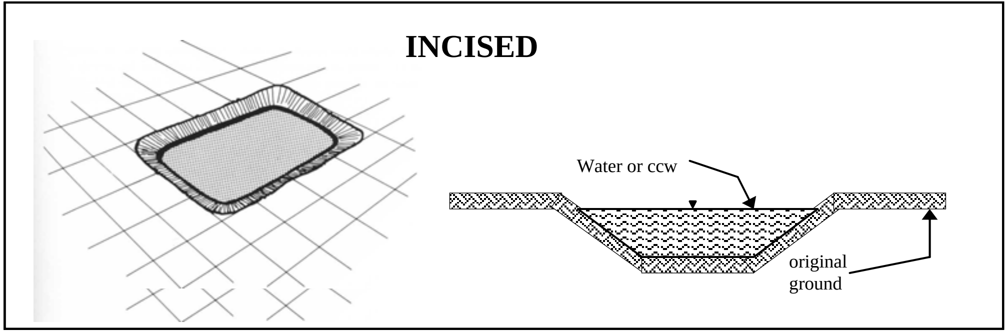
Homes across the street from the south side of the impoundment are at risk for inundation in the event of a failure.

CONFIGURATION:


CROSS-VALLEY


SIDE-HILL


DIKED


INCISED

______ Cross-Valley
______ Side-Hill
__X___ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

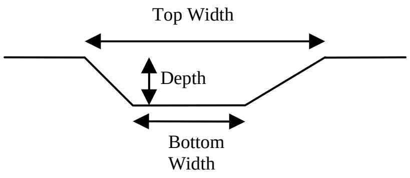
Embankment Height ___12___ feet
Embankment Material Homogeneous compacted fill
Pool Area __40__ acres
Liner None
Current Freeboard ~10____ feet
April 2008 survey indicated ~5.5 feet freeboard
Liner Permeability Not Applicable

TYPE OF OUTLET (Mark all that apply)

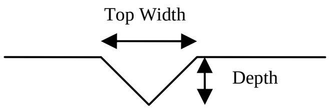
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

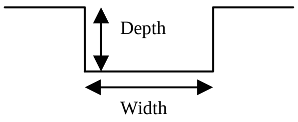
TRAPEZOIDAL



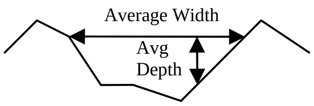
TRIANGULAR



RECTANGULAR

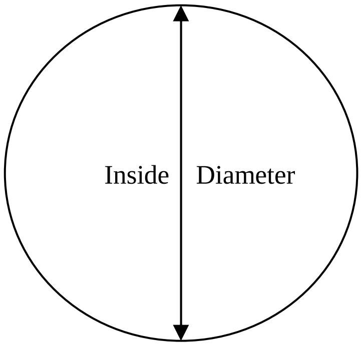


IRREGULAR



X **Outlet**

2 - 24 in. inside diameter



Material
_____ corrugated metal
_____ welded steel
X concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____________________

Is water flowing through the outlet? YES X NO _______

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) ______________________________

The Impoundment was Designed By LG&E Internal Engineers
____

Has there ever been a failure at this site? YES ___________ NO X___________

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___X___

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower
Phreatic water table levels based on past seepages or breaches
at this site? YES ________NO __X_____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Cane Run Power Station

Date: 10-28-09

Unit Name: Basin Pond/Dead Storage Pond

Operator's Name: Louisville Gas & Electric

Unit I.D.: Basin Pond

Hazard Potential Classification: High Significant [✓ Low]

Inspector's Name: Katherine Adnams & Anthony Stellato, P.E.

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	1 to 3x/week		18. Sloughing or bulging on slopes?	X	
2. Pool elevation (operator records)?	~445		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	N/A		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	Not Applicable		Is water entering inlet, but not exiting outlet?		N/A
5. Lowest dam crest elevation (operator records)?	~450		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	see note		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	NA		From underdrain?		N/A
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?	N/A	
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		N/A
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?	X		24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments N/A = Not Applicable/Available

6. No instrumentation is in place on the impounding dikes for the Basin and Dead Storage Ponds.

9. A few 4 to 6 inch diameter trees were cut following an inspection by a consultant in January 2009. Root balls remain in place.

17, 18, 19. The impounding dike slopes are very steep and have experienced frequent surface sloughs. Embankment is firm about 9 inches deep based on probing in many locations.

20. There is no outlet from the Basin Pond or Dead Storage pond. These ponds drain to the incised Reclaim Pond where water is reused for plant processes.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # KY0002062 INSPECTOR Adnams/Stellato
Date October 28, 2009

Impoundment Name Basin Pond/Dead Storage Pond
Impoundment Company Louisville Gas & Electric
EPA Region 3
State Agency (Field Office) Addresss 9116 Leesgate Road
Louisville, KY 40222-5084
Name of Impoundment Basin Pond/Dead Storage Pond
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New ________ Update X

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Process water drainage from the plant, and runoff from the FGD/fly ash mixing area. FGD/fly ash is landfilled.

Nearest Downstream Town : Name Shively, KY
Distance from the impoundment Plant within community.
Impoundment
Location: Longitude 85 Degrees 53 Minutes 05 Seconds
Latitude 38 Degrees 10 Minutes 59 Seconds
State KY County Jefferson

Does a state agency regulate this impoundment? YES X NO ______

If So Which State Agency? KY Department of Environmental Protection - Dam Safety

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

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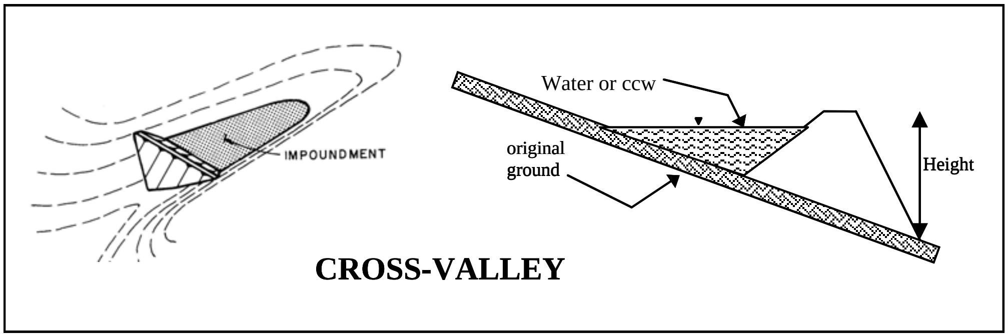
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

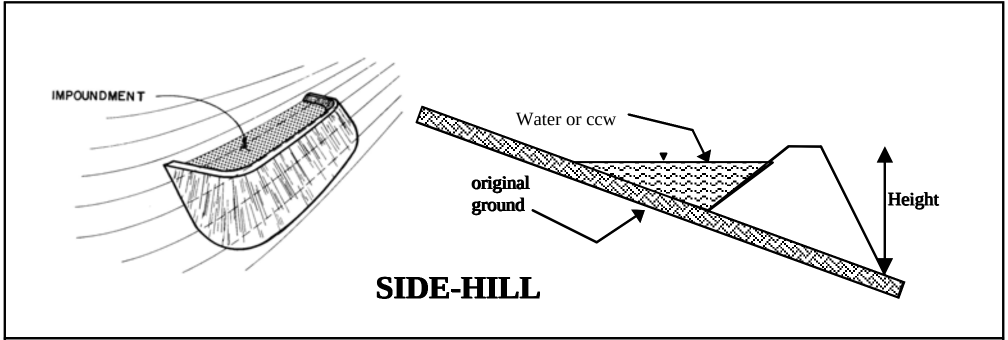
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

This pond is small and receives very little CCB. Failure will be primarily contained on LG&E property and may be completely contained through control of the county flood control pump station on site.

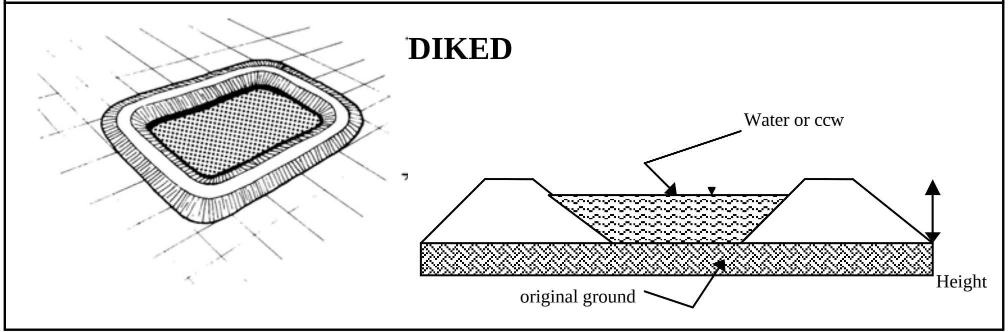
CONFIGURATION:



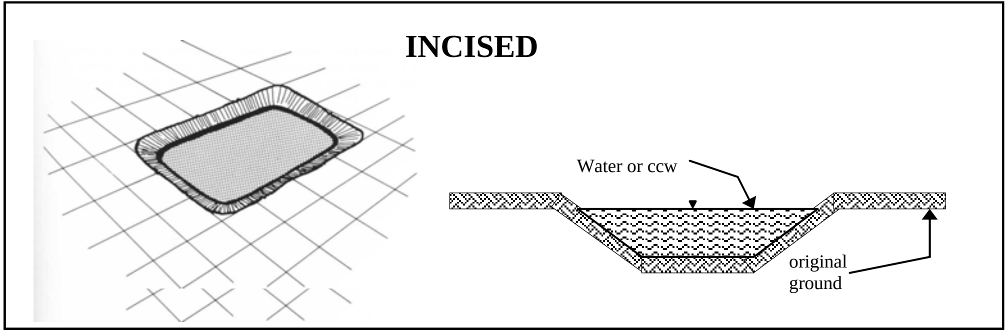
CROSS-VALLEY



SIDE-HILL



DIKED



INCISED

______ Cross-Valley
__X___ Side-Hill
______ Diked
______ Incised (form completion optional)
______ Combination Incised/Diked

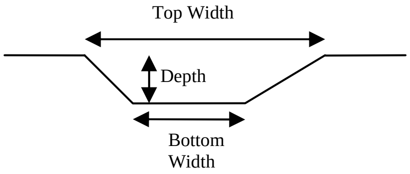
Embankment Height 10 feet
Embankment Material Homogeneous compacted fill
Pool Area 5 acres
Liner None
Current Freeboard ~5 to 7 feet
Liner Permeability Not Applicable

TYPE OF OUTLET (Mark all that apply)

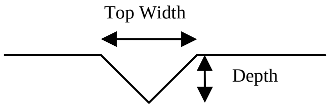
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

_____ depth
_____ bottom (or average) width
_____ top width

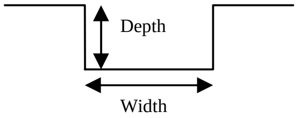
TRAPEZOIDAL



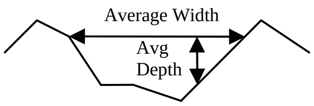
TRIANGULAR



RECTANGULAR

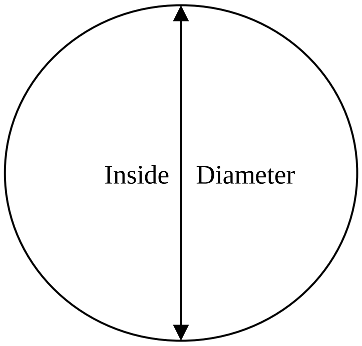


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material
_____ corrugated metal
_____ welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) ______________________

Is water flowing through the outlet? YES _______ NO _______

__X__ **No Outlet** Water levels are controlled through pump system for plant process reuse.

_____ **Other Type of Outlet** (specify) ___________________________________

The Impoundment was Designed By LG&E Internal Engineers

Has there ever been a failure at this site? YES ___________ NO X___________

If So When? ______________________________

If So Please Describe : ____

Has there ever been significant seepages at this site? YES ________ NO ___X___

If So When? ______________________________

IF So Please Describe: ______________________________

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________ NO __X__

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe : ____