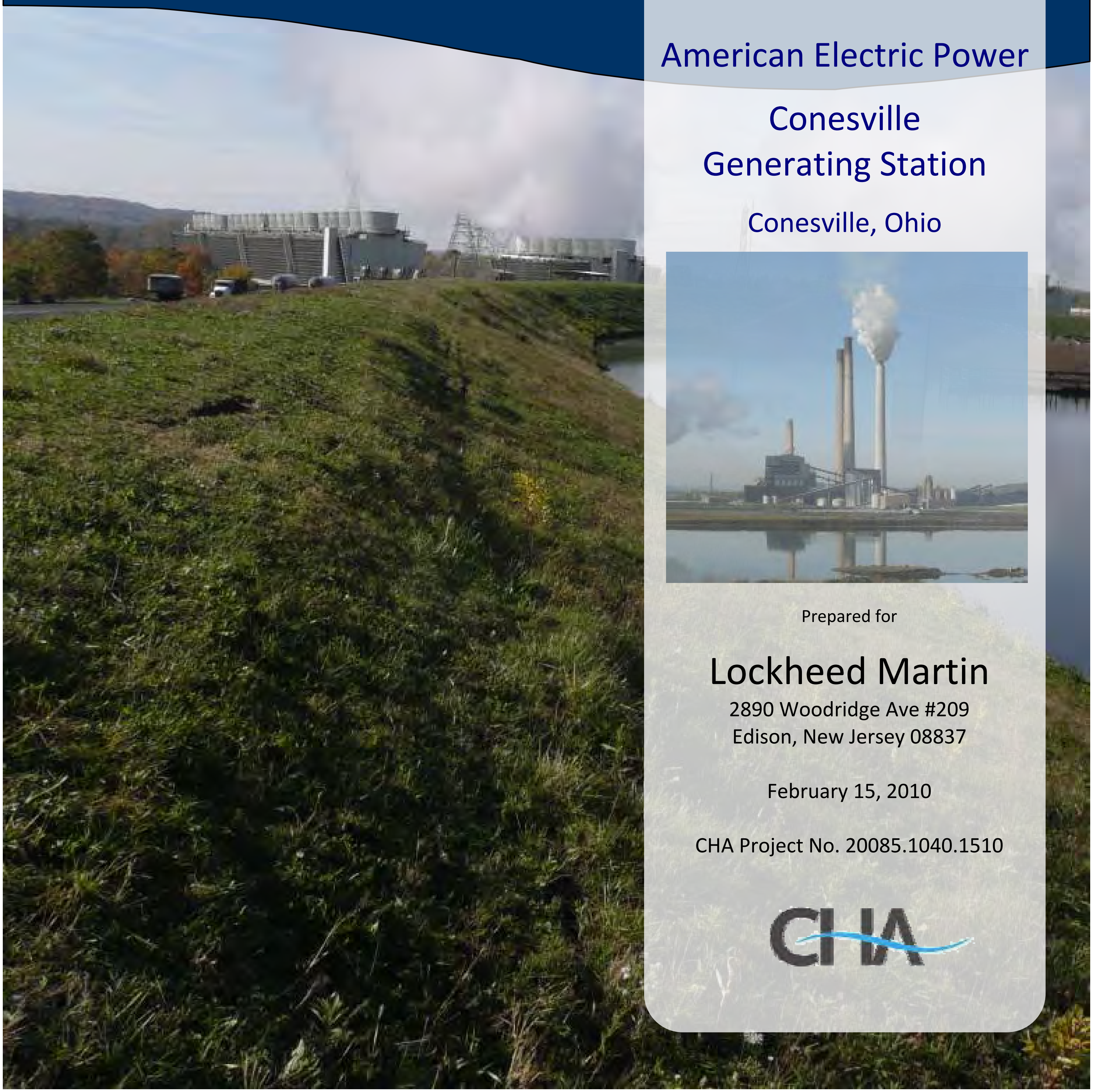
Assessment of Dam Safety
Coal Combustion Surface Impoundments (Task 3)
Final Report



American Electric Power

Conesville Generating Station

Conesville, Ohio

Prepared for

Lockheed Martin

2890 Woodridge Ave #209
Edison, New Jersey 08837

February 15, 2010

CHA Project No. 20085.1040.1510

I acknowledge that the management unit referenced herein:

- Ash Pond Complex

Has been assessed on October 22, 2009

STATE OF OHIO
MALCOLM D. HARGRAVES
E-62191
REGISTERED
PROFESSIONAL ENGINEER

Signature: ______________________________
Malcolm D. Hargraves, P.E.
Senior Geotechnical Engineer
Registered in the State of Ohio

Reviewer: ______________________________
Warren A. Harris, P.E.
Geotechnical Operations Manager

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APPENDIX

1.0 INTRODUCTION & PROJECT DESCRIPTION

1.1 Introduction

CHA was contracted by Lockheed Martin (a contractor to the United States Environmental Protection Agency) to perform site assessments of selected coal combustion surface impoundments (Project #0-381 Coal Combustion Surface Impoundments/Dam Safety Inspections). As part of this contract, CHA was assigned to perform a site assessment of American Electric Power's (AEP) Conesville Generating Station, which is located in Conesville, Ohio as shown on Figure 1 – Project Location Map.

CHA made a site visit on October 22, 2009 to inventory coal combustion surface impoundments at the facility, to perform visual observations of the containment dikes, and to collect relevant information regarding the site assessment.

CHA Engineers Malcolm Hargraves, P.E. and Rebecca Filkins were accompanied by the following individuals:

Company or Organization	**Name and Title**
American Electric Power	Gary Zych, Geotechnical Engineer
American Electric Power	Shah Baig, Geotechnical Engineer
American Electric Power	Chet Vance, Conesville Landfill Supervisor
American Electric Power	Gigi Hammond, Conesville
American Electric Power	Dana Limes, Environmental Services
American Electric Power	Shane Mender, Conesville
American Electric Power	Mark Borman, Conesville
American Electric Power	Angela Larrick, Conesville
ODNR	Peter George

1.2 Project Background

The Ash Pond Complex at the Conesville Generating Station is under the jurisdiction of the Ohio Department of Natural Resources (DNR) Division of Water – Dam Safety program. These impoundments are listed on the National Inventory of Dams (NID) with the following identification numbers:

Impoundment	**NID ID**	**Ohio ID**
Ash Pond Complex	OH01453	0116-002

The Ash Pond Complex impoundments are classified by Ohio DNR as Class II dams, which are likely to cause damage to infrastructure such as public water supply, roads, railroads, and utilities.

1.2.1 State Issued Permits

Ohio State Permit No. 0IB00013 (EPA NPDES Permit No. OH0005371) has been issued to Columbus Southern Power Company (c/o American Electric Power) authorizing discharge under the National Pollutant Discharge Elimination System (NPDES) to the Muskingum River in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit. The permit became effective November 30, 2007 and expires July 31, 2012.

1.3 Site Description and Location

The Conesville Generating Station currently has one disposal area for the coal combustion waste products (CCW). The site is located east of the Muskingum River as shown in Figure 2 – Photo Site Plan.

A map of the region indicating the location of the Conesville Generating Station and the Ash Complex and identifying schools, hospitals, or other critical infrastructure located within approximately five miles down gradient of the impoundments is provided as Figure 3 – Critical Infrastructure Map.

1.3.1 Ash Pond Complex Construction

Based on data provided to CHA, it appears that construction of the Ash Pond Complex began in the 1950's concurrent with construction of the power station. Figure 4 shows the Ash Pond Complex development history.

There are three main dikes that form the perimeter of the Ash Pond Complex, as shown on Figure 2: the Northern Haul Road Dike runs along the northern end of the complex parallel to County Road 273; the Coal Haul Road Dike runs along the southeastern side of the complex; and an unnamed dike runs the southwestern edge. The northeast corner is formed by a natural slope. The northwestern side is bordered by a landfill which is located within the original Ash Pond.

The northern embankment was constructed in 1974 with approximately 2.5H:1V upstream and downstream slopes and a 10 ft wide crest at approximately El. 772. The embankment was subsequently modified on the upstream slope by hydraulic placement of ash fill to support the Northern Haul Road with a 30 ft crest at approximately El. 775. Figure 5 shows a cross section through the Northern Haul Road Dike.

The earth embankment supporting the Coal Haul Road along the southeastern side of the complex was constructed in 1956. During construction, an approximately 1800-ft-long portion of the embankment near County Road 273 failed. Ten to 14 feet high berms were constructed on both sides of the embankment to provide additional support. These berms are no longer discernable. The crest of the Coal Haul Road rises from approximately El. 750 feet at the southwestern end near the plant to approximately El. 770 feet on the northeastern end near

County Road 273. The Coal Haul Road embankment has a crest width of approximately 30 feet. A secondary dike with a 10-foot-wide crest was constructed in 1974 of compacted earth material on the upstream side of the southwestern end of the Coal Haul Road embankment to raise the crest to approximately El. 770 feet. A cross section through the Coal Haul Road and Secondary embankments is shown on Figure 5.

Based on borings advanced in 1974 by C&SO and 1981 by AEP and information in the 1974 specifications, the Coal Haul Road and Northern Haul Road dikes were constructed from relatively homogeneous compacted earth material. The material consists of sand, sand and gravel, silty sand, and clayey silt.

The flue gas desulfurization (FGD) landfill located northwest of the Ash Pond Complex received fill between 1977 to June 1988. The landfill was closed in October 1988 by capping the landfill with two feet of clay and seeding the finished grade.

1.3.2 Current Ash Pond Complex Configuration

There are four primary areas within the Ash Pond Complex as indicated on Figure 2: the Fly Ash Storage, Fly Ash Pond, Bottom Ash Pond, and Clearwater Pond. Splitter dikes have been constructed within the complex between 1976 and 1981 to separate these areas. The splitter dikes were constructed from bottom ash and boiler slag placed above ash sediment. The Fly Ash Pond has been further divided by interior dikes constructed from bottom ash. Water levels on opposite sides of these interior dikes range from approximately El. 753 feet to approximately El. 760 feet.

Based on topographic mapping from March 2005 aerial photography, the top of the dikes on the southern portion of the Pond ranges from El. 766.4 to over El. 768, and on the northern portion of the pond the top of dike ranges from 772.9 to 773.9.

1.3.3 Other Impoundments

No other impoundments were identified at the Conesville Generating Station.

1.4 Previously Identified Safety Issues

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

1.5 Site Geology

The Ash Pond Complex is located east of the Muskingum River adjacent to the floodplain. The ground surface around the pond is at approximately El. 735. Based on a review of available bedrock geology maps (Bedrock Topography of the Conesville, Ohio Quadrangle, USGS open-file map, 1996) and reports by others the site is underlain by about 10 feet of alluvial silts, clays, and sands. Bedrock, according to the Geologic Map of Ohio, is likely comprised of Mississippian Aged shale, siltstone, and limestone of the Waverly and Maxwell formation.

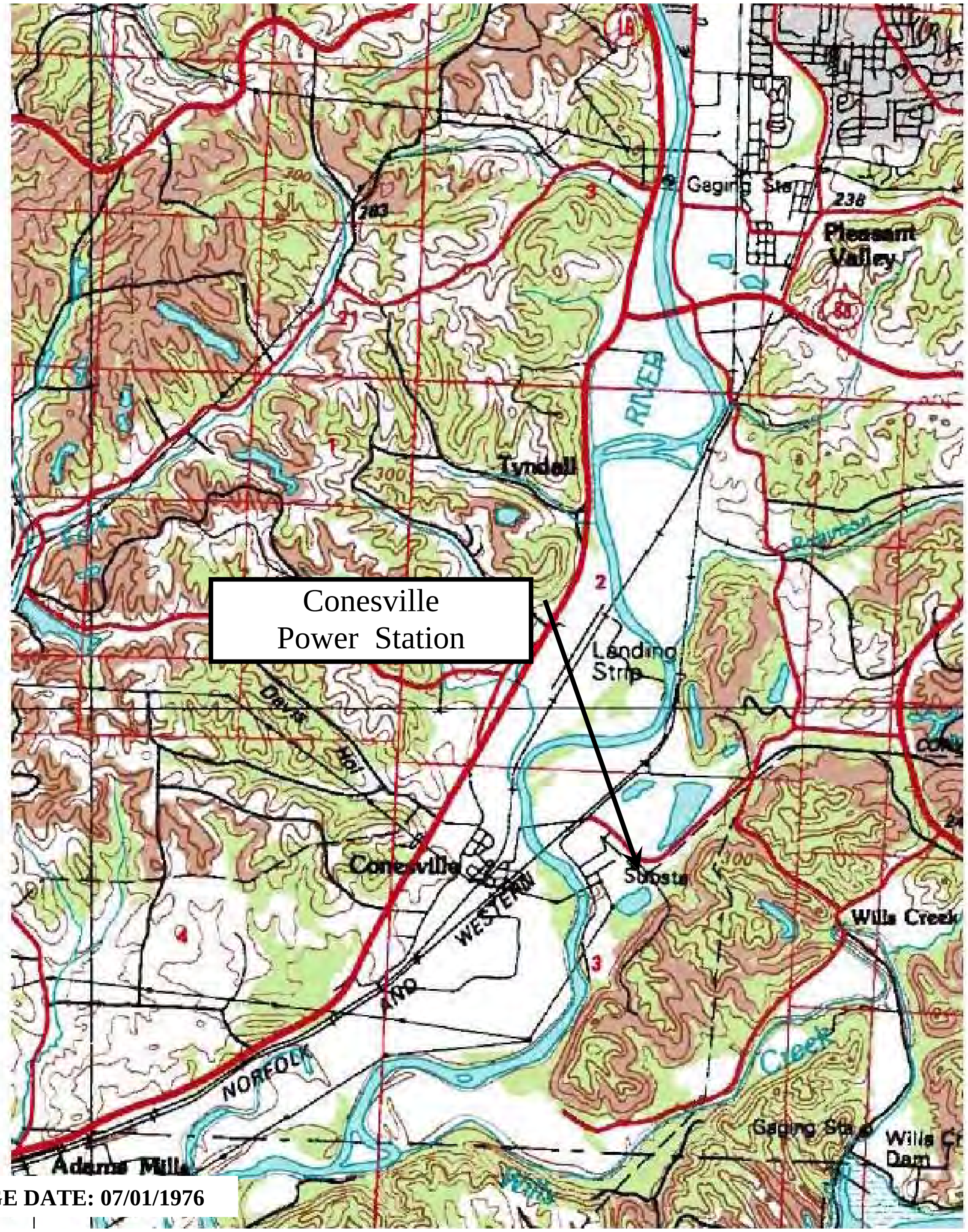
1.6 Datum

Elevations are referenced to the National Geodetic Vertical Datum (NGVD), which is equal to the USC&GS Mean Sea Level (MSL) Datum of 1929. Directional ordinates are referenced to magnetic north.

1.7 Bibliography

CHA reviewed the following documents in preparing this report:

- *2008 Annual Ash Basin Dike Inspection Report*, prepared for American Electric Power, prepared by H. C. Nutting, December 17, 2008.
- *2009 Annual Ash Basin Dike Inspection Report, H. C. Nutting, April 15, 2009.*
- *Conesville Generating Plant, Bottom Ash Pond Investigation, BBCM Engineering, Inc., July 2009.*
- *Conesville On-Site FGD Waste Disposal Facility Closure, letter from Columbus Southern Power Company to Coshocton County Recorder, November 15, 1988.*
- *Dam & Dike Inspection Report, Conesville Plant, Conesville, Ohio; Inspection Date December 27, 2005. AEP Services Corporation.*
- *Dam & Dike Inspection Report, Conesville Plant, Conesville, Ohio; Inspection Date December 24, 2006. AEP Services Corporation.*
- *Dam & Dike Inspection Report, Conesville Plant, Conesville, Ohio; Inspection Date October 22, 2007. AEP Services Corporation.*
- *Dam Safety Inspection, Conesville Ash Ponds, Woodward-Clyde Consultants, Inc, March 1983.*
- *Dam Safety Inspection, Conesville Plant Ash Pond Complex, File Number: 0116-002, Ohio Department of Natural Resources, December 22, 2008.*
- *DRAFT Emergency Action Plan, Burgess & Niple, Inc., June 2009.*
- *DRAFT Operation, Maintenance & Inspection Manual, Burgess & Niple, Inc., June 2009.*



N	CHA	**Figure 1** **Project Location Map**
	Scale: 1" = 1 mile | **Project No.: 20085.1040.1510**	**American Electric Power** **Conesville Power Station** **Conesville, OH**

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IMAGE REFERENCE: GOOGLE EARTH, IMAGE DATED FEBRUARY 28, 2006.

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PHOTO SITE PLAN ASH POND COMPLEX CONESVILLE POWER STATION CONESVILLE, OHIO	PROJECT NO. 20085.1040	
	DATE: 02/2010	
	FIGURE 2	

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IMAGE REFERENCE: GOOGLE EARTH, IMAGERY DATED FEBRUARY 28, 2006

LEGEND

16 STREET, HIGHWAY

CHURCH

FIRE DEPARTMENT

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CRITICAL INFRASTRUCTURE MAP

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO.
20085.1040

DATE: 02/2010

FIGURE 3

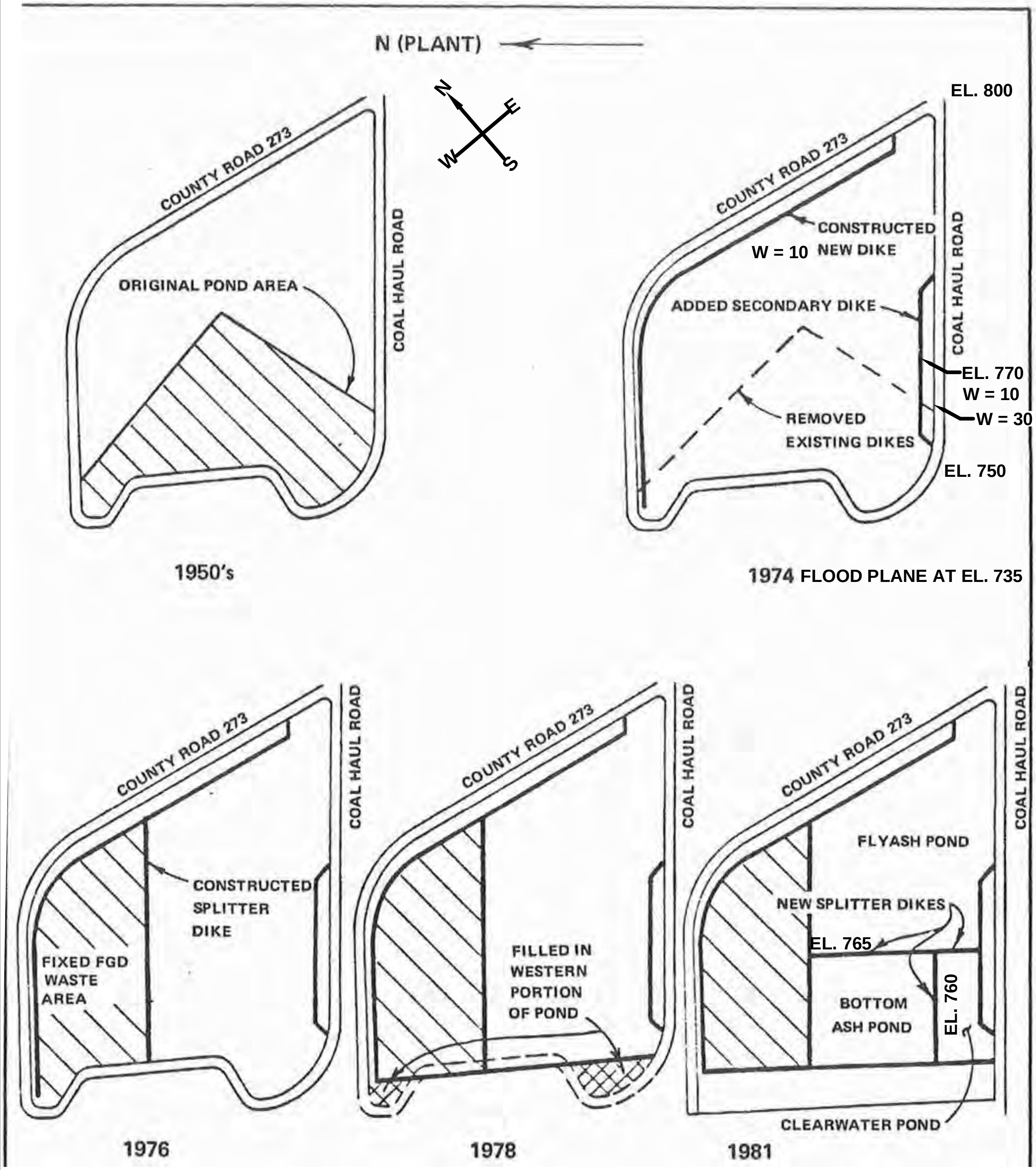

IMAGE REFERENCE: SUMMARY OF ASH POND MODIFICATIONS CONESVILLE GENERATING STATION, WOODWARD-CLYDE CONSULTANTS, INC. DATED JULY 26, 1983

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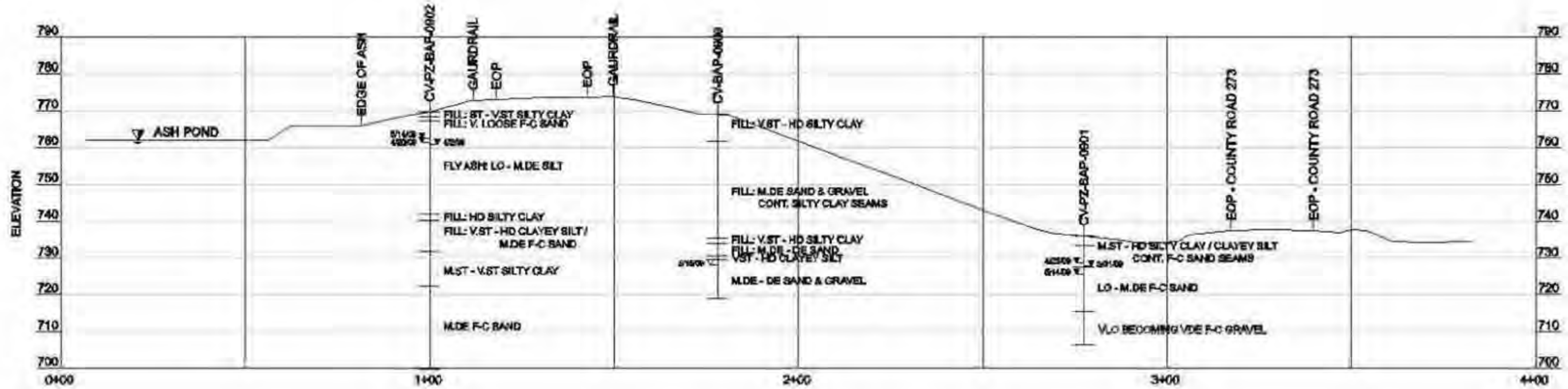
ASH POND COMPLEX DEVELOPMENT HISTORY

CONESVILLE POWER STATION
CONESVILLE, OHIO

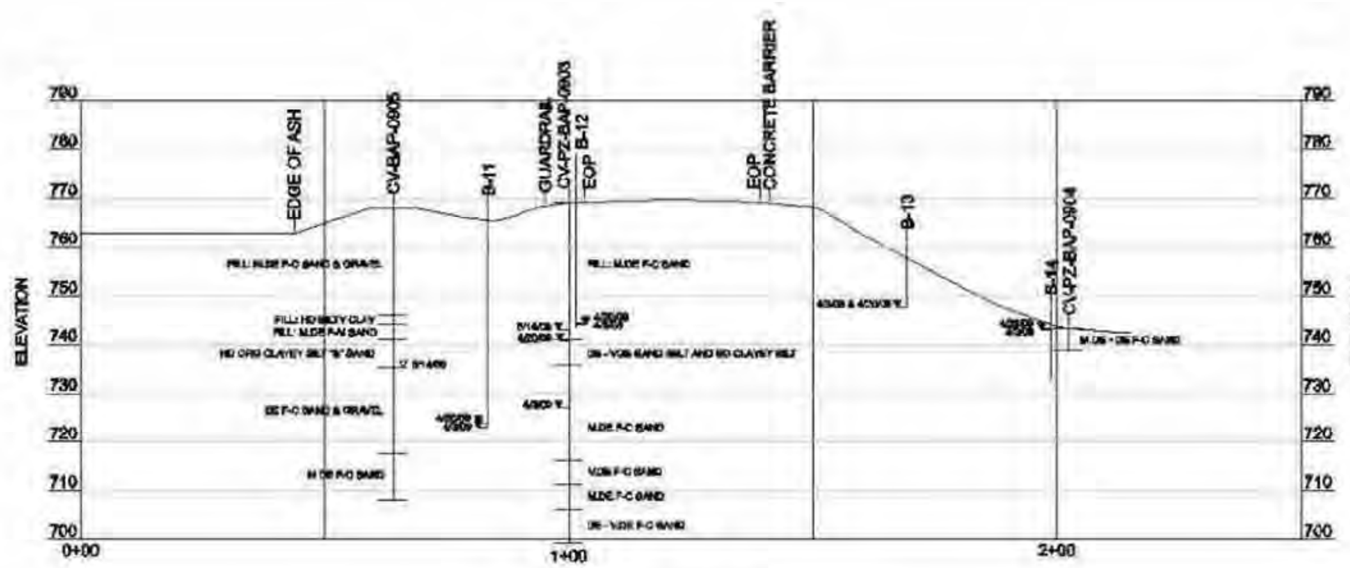
PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 4



SECTION 'A'- FLY ASH STORAGE POND
Borings BAP-0901, BAP-0902 & BAP-0906



SECTION 'B'- FLY ASH POND
Borings BAP-0903, BAP-0904 & BAP-0905

LEGEND

[illegible]	OBSERVATION WELL READING: ELEVATION AND DATE
[illegible]	WATER ELEVATION ENCOUNTERED DURING DRILLING
V.SO / SO	SOFT / VERY SOFT
M.ST	M. STIFF
ST / V.ST	STIFF / VERY STIFF
HD	HARD
V.LO / LO	VERY LOOSE / LOOSE
M.DE	MEDIUM DENSE
DE / V.DE	DENSE / VERY DENSE

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 22

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CROSS SECTIONS CONESVILLE POWER STATION CONESVILLE, OHIO	PROJECT NO. 20085.1040
	DATE: 02/2010
	FIGURE 5

2.0 FIELD ASSESSMENT

2.1 Visual Observations

CHA made visual observations of the Ash Pond Complex dikes 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. A Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form, prepared by the US Environmental Protection Agency, was completed on-site during the site visit. Copies of these completed forms were submitted via email to a Lockheed Martin representative approximately three days following the site visit to the Conesville Generating Station. Copies of these forms are included in Appendix A. A photo log and Photo Location Plan (Figure 6) are located at the end of Section 2.5.

CHA's visual observations were made on October 22, 2009. The weather was sunny with temperatures between 50 and 70 degrees Fahrenheit. Prior to the days we made our visual observations the following approximate rainfall amounts occurred (as reported by www.wunderground.com for the airport in Zanesville, Ohio which is approximately 27 miles south of the site).

Table 1 – Approximate Precipitation Prior to Site Visit

Date of Site Visit - October 22, 2009		
Day	**Date**	**Precipitation (inches)**
Friday	10/16/09	0.00
Saturday	10/17/09	0.00
Sunday	10/18/09	0.00
Monday	10/19/09	0.00
Tuesday	10/20/09	0.00
Wednesday	10/21/09	0.00
Thursday	10/22/09	0.00
Total	**Week Prior to Site Visit**	**0.00**
Total	**30 Days Prior to Site Visit**	**1.41**

2.2 Visual Observations of Ash Pond Complex

CHA performed visual observations of the Ash Pond Complex dikes. The perimeter dikes total approximately 6,630 feet in total length and are up to 35 feet high. A general view of the site is shown in Photo Nos. 1 and 2.

2.2.1 Northern Haul Road Dike – Embankments and Crest

The Northern Haul Road Dike along the northern side of the complex is about 1,880 feet long and about 35 feet high. A typical cross section through the Northern Dike is shown in Figure 4. In general, the alignment of the dike crest does not show signs of change in its horizontal alignment. No evidence of prior releases, failures or patchwork was observed at the time of the site visit. Photo Nos. 1 and 9 show the dike crest alignment.

The upstream slope was covered with grass vegetation. In order to keep dust levels low, the haul road along the crest has to be watered frequently resulting in run-off. Significant erosion rills, on the order of 12 inches in depth, have developed on the upstream slope, as well as areas where there is loss of grass cover due to the run off. Photo Nos. 3 through 7 show the upstream slope and close-ups of the erosion rills.

The downstream slope was generally uniformly graded, and covered with appropriate grass vegetation (Photo Nos. 8 and 9). There were isolated rodent burrows as shown in Photo No. 10. There are occasional areas where the grass is sparse, and rutting has occurred from mowing operations as shown in Photo No. 11. The drainage ditch at the toe of the dike, between the dike and County Road 273, has standing water as shown in Photo No. 12. Photo No. 13 shows the drainage pipe which conveys water from the ditch to the opposite side of County Road 273. The water level in the drainage ditch appeared to be controlled by the wetland area on the far side of County Road 273. Recently mowed cattail growth was also observed along the drainage swale area between the dike toe and County Road 273 as shown in Photo No. 49.

2.2.2 Coal Haul Road Dike – Embankments and Crest

The Coal Haul Road Dike along the southeastern side of the complex is about 3,600 feet long with a maximum height of about 30 feet. There are two portions of the Coal Haul Road Dike as indicated on Figure 4.

- The northeast portion is about 2,800 feet long and impounds the fly ash storage area and a portion of the Fly Ash Pond. This portion was constructed in 1956 as the Coal Haul Road.
- The Secondary Dike is about 800 feet long and impounds a portion of the Fly Ash Pond and the Clearwater Pond. This portion of the dike was constructed in 1974 on the upstream side of the Coal Haul Road to raise the crest elevation to approximately 770. A typical cross section through the Secondary Dike and Coal Haul Road is shown in Figure 5.

In general, the alignment of the Coal Haul Road and Secondary Dike crests do not show signs of change in horizontal alignment. No evidence of prior releases, failures or patchwork was observed at the time of the site visit. Photo Nos. 15 and 16 show the general condition of the dike crest.

The upstream slope along the Fly Ash Pond created by the Coal Haul Road and Secondary Dikes was relatively uniform and covered with appropriate grass cover. Photo Nos. 16 through 18 shows the general condition of the upstream slope in this area. The crest and upstream slope of the Secondary Dike adjacent to the Clearwater Pond is reasonably uniform as shown in Photo No. 19.

The downstream slope of the Coal Haul Road Dike adjacent to the Fly Ash Pond had moderate to heavy vegetation with trees along the toe starting from the northeastern end of the dike as shown in Photo No. 20. Farther southwest it becomes light vegetation with some brush and then becomes grass covered as shown in Photo Nos. 21 through 23.

Erosion features, similar to those on the Northern Haul Road Dike, were prevalent along the slope although these tended to be grown over with more extensive vegetation indicating that they were somewhat older than those on the Northern Haul Road Dike. An example of these erosion rills appears in Photo Nos. 50 and 51. There were also occasional rodent burrows, some of which had collapsed and become deep erosion rills as shown in Photo Nos. 52 through 54. Photo No. 55 shows a more recent rodent burrow on this slope.

In addition to the erosion features, a scarp with an adjacent depression and slump was also observed on the downstream slope along with older grass covered deformation features. These are likely the result of surficial soil softening, concentrated runoff from the roadway, and dust control efforts. In the case of the latter, finer grained coal dust, soil, and other debris is washed or swept from the road onto the slope and build up over time. These are shown in Photo Nos. 47, 48, and 56. Examples of the soil and dust transport from the roadway with subsequent grass cover loss can be seen in Photo Nos. 57 and 58.

Photo Nos. 24 and 28 shows that the downstream slope of the Secondary Dike adjacent to the Clearwater Pond was uniformly graded with appropriate grass cover. Photo No. 27 shows the upstream slope of the Secondary Dike adjacent to the Clearwater Pond. Isolated rutting and loss of the grass cover from mowing operations, as seen in Photo No. 29, was observed during the inspection.

2.2.3 Southwest Dike

The Southwest Dike is about 1,150 feet long and generally about 18 feet high. An exception is in the area of an access ramp excavated through the dike to access an area of the Bottom Ash Pond used for bottom ash handling activities on top of a bottom ash delta. In this area, the dike crest is approximately 8 feet lower than the remaining portion of the dike. Based upon a 2005 aerial survey, this would leave about 3 to 5 feet of effective freeboard above the water level at the edge of the bottom ash delta surface. Photo Nos. 39 and 59 show this ramp excavation through the dike. In general, the alignment of the Southwest Dike crest does not show signs of change in its horizontal alignment. No evidence of prior releases, failures or patchwork was observed at the time of the site visit. Photo No. 31 shows the dike crest alignment.

The upstream slope was covered with appropriate grass vegetation and generally appeared to be in a stable condition. Isolated minor features such as a collapsed, vegetated, likely abandoned rodent burrow, slope undulations likely due to grading activities, and stressed grass cover were observed in this area as indicated in Photo Nos. 38 and 60. Slight beaching erosion, as noted in Photo Nos. 36 and 37, could be seen on the upstream slope at the water surface where the water level appears to fluctuate over time. The downstream slope was generally uniformly graded, and covered with appropriate grass vegetation as shown in Photo No. 30.

2.2.4 Splitter and Temporary Dikes

There are three interior splitter dikes within the Ash Pond Complex which are shown on Figure 2.

- The first separates the Fly Ash Storage area on the northeastern end of the pond from the Fly Ash Pond (Photo Nos. 61 and 62);
- The second separates the Fly Ash Pond to the northeast from the Bottom Ash and Clearwater Ponds (Photo No. 25); and
- The third splitter dike extends southwest from the second splitter dike to the southern dike separating the Bottom Ash Pond and Clearwater Pond (Photo No. 32).

The crest of the splitter dikes appeared reasonably uniform as shown in Photo Nos. 25 and 32. Most of these splitter dikes were generally void of vegetation where activity in the pond area is ongoing or has been fairly recent. Less active areas, as noted in Photo No. 61, begin to support moderate weedy and small brushy vegetation. An approximately 1 to 3 foot difference in the water level on opposite sides of the splitter dikes was observed. No evidence of prior releases, failures or patchwork was observed at the time of the site visit.

Temporary dikes have been constructed within the Fly Ash Pond to divide this area into three areas. These dikes are constructed of Fly Ash and are changed as needed for pond management purposes.

2.2.5 Pond Outfall Structures

The Fly Ash Pond and Bottom Ash Pond outfalls are drop inlet structures adjacent to the southeastern corners of the respective pond areas that convey water to the Clearwater Pond. These appear in Photo Nos. 26 and 34, respectively. The Clearwater Pond outfall structure, seen in Photo No. 33, is a rectangular concrete spillway riser connected to a concrete outlet pipe running beneath the Coal Haul Road. This pipe outlet was mostly submerged at the time of the site assessment (Photo No. 44). During the site visit, these structures appeared to be functioning as intended, but were experiencing various levels of deterioration (corrosion). In the case of the Clearwater Pond outfall, the walkway to the outfall had fallen into the pond, and vegetation had started to establish itself in the platform servicing the riser.

2.3 Monitoring Instrumentation

There are 10 piezometers located on the Northern Haul Road Dike, the Coal Haul Road Dike, and on the Southwest Dike at the approximate locations shown on Figure 7. Four of these piezometers were installed as part of the 2009 geotechnical exploration program concerning the stability of the Ash Pond Complex dikes. Additionally, the water level within the ponds is recorded at the outlet structures. A weir is located in the drainage ditch between the Northern Haul Road dike and County Road 273; however, due to weed growth, measurements have not been collected at this location for an extended period. CHA did not observe this weir during the site visit.

Data for the piezometers and pond elevations is presented for data collected between June 2002 and October 2009 in Figure 10.

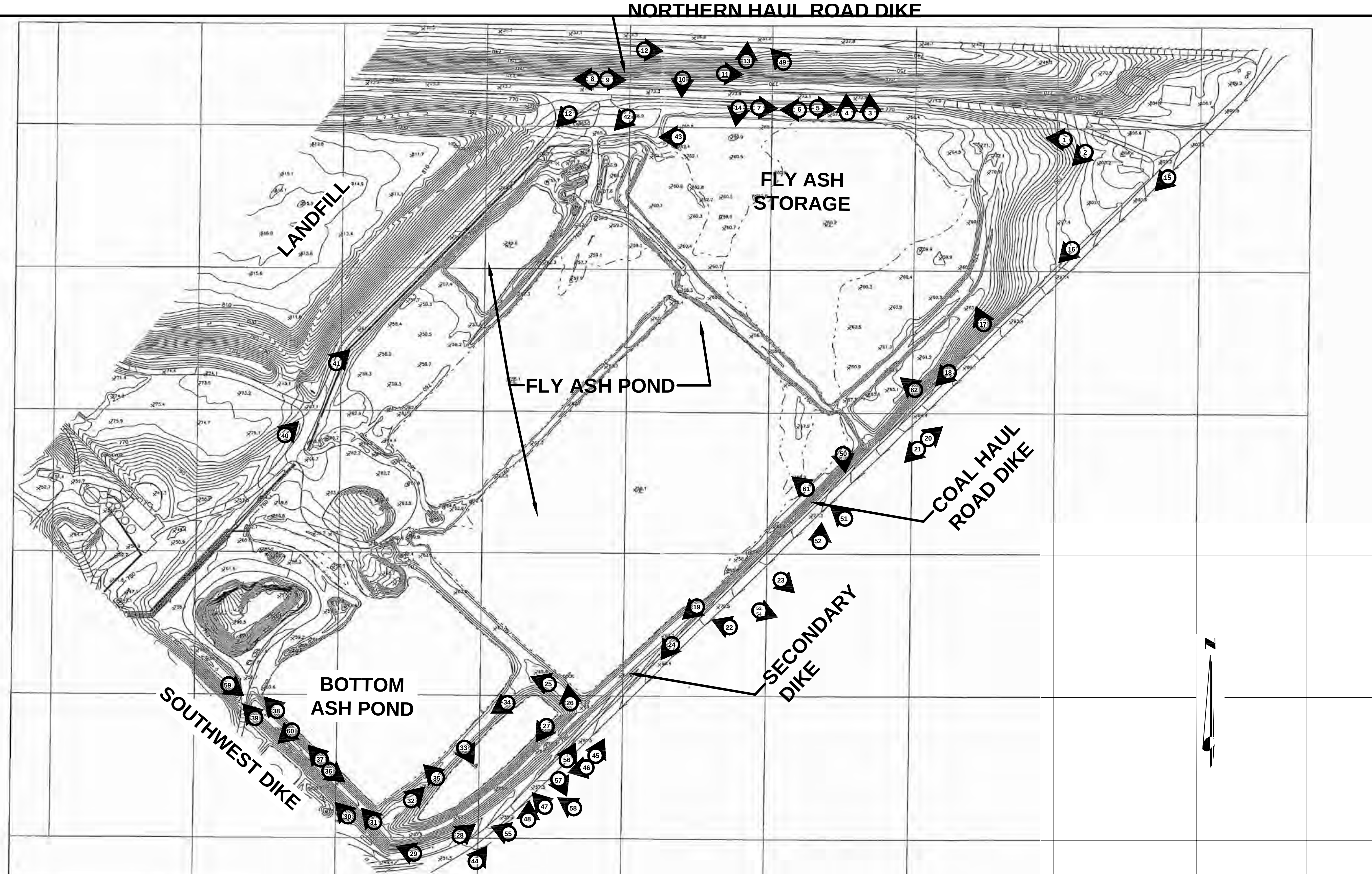

IMAGE REFERENCE: CONESVILLE BASEMAP (AERIAL 2005)

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III Winners Circle, PO Box 5269 · Albany, NY 12205-0269
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PHOTO LOCATION PLAN

ASH POND COMPLEX
CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 6

1

Looking west across the north corner of the Fly Ash Pond along upstream slope of North Haul Road Dike. The plant and closed FGD area are in the background.

2

Looking southwest across the Ash Pond Complex.

3

Erosion rills from haul road run off on the upstream slope of the North Haul Road Dike.

4

Large erosion rill and rutting on the upstream slope of the North Haul Road Dike.

5

A close up of a large erosion rill and loss of vegetation on the upstream slope of the North Haul Road Dike.

6

Looking west along the upstream slope of the North Haul Road Dike.

7

Looking east along upstream side of the North Haul Road Dike.

8

Looking west along downstream slope of the North Haul Road Dike. Country Route 273 shown on the right.

9

Looking east along downstream slope of the North Haul Road Dike.

10

Close up of an isolated rodent hole in the downstream slope of the North Haul Road Dike.

11

Close up of rutting and loss of vegetation on the downstream slope of the North Haul Road Dike.

12

Toe of the North Haul Road Dike, looking east.
Standing water in the road ditch along toe can be seen in left of photo.

13

Close up of the half submerged drainage pipe under the county road.

14

Vegetation and erosion rill at edge of Fly Ash Pond and construction road adjacent to the North Haul Road Dike.

15

Looking southwest along the Coal Haul Road. Road is wet to keep the dust from trucks down.

16

Looking southwest along the northeast crest and upstream slope of the Coal Haul Road Dike.

17

Looking northeast along upstream slope of the Coal Haul Road Dike.

18

Looking southwest at upstream slope the Coal Haul Road Dike toward the south corner of the Fly Ash Pond.

19

Looking southwest along the crest of the Coal Haul Road Dike where its alignment leaves the haul roadand runs parallel to it.

20

Looking northeast along downstream slope of the Coal Haul Road Dike.
Small trees and moderate vegetation lower on the slope can be seen in the shade in the right of the photo.

21

Looking southwest along downstream slope of the Coal Haul Road Dike.

22

Close up of the moderate vegetation on the downstream slope of the Coal Haul Road Dike.

23

Heavy vegetation near the toe of the Coal Haul Road Dike.

24

Looking southwest along downstream slope of the dike where the dike runs parallel to the west of the coal haul road.

25

Looking northwest along crest of the splitter dike between the Fly Ash Pond to the north and the Bottom Ash Pond and Clearwater Pond to the south. The Fly Ash Pond outfall structure is on the right side of photo.

26

Close up of the Fly Ash Pond outfall structure.

CHA	**AMERICAN ELECTRIC POWER CONESVILLE GENERATING STATION CONESVILLE, OH ASH POND COMPLEX**
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27

Looking southwest along upstream slope of the Coal Haul Road Dike adjacent to the Clearwater pond.

28

Looking northeast along the downstream slope of the Coal Haul Road Dike adjacent to the Clearwater Pond.

29

Close up of rutting and loss of grass vegetation on downstream slope due to mowing operations.

30

Looking northwest along downstream slope of the Southwest Dike.
The green metal cleaning tank can be seen on the left side of the background in the photo.

31

Looking northwest along crest of the Southwest Dike.

32

Looking northeast along crest of the splitter dike between the Bottom Ash Pond (left) and the Clearwater Pond (right).

33

The Clearwater Pond outfall structure.

34

The Bottom Ash Pond outfall structure.

35

Looking across the bottom ash pond at sluice lines into the pond.

36

Upstream slope at the Clearwater Pond. Notice the beaching along the water line of the slope.

37

Looking northwest along upstream slope of the Southwest Dike along the Bottom Ash Pond.
Notice beaching erosion along the waterline.

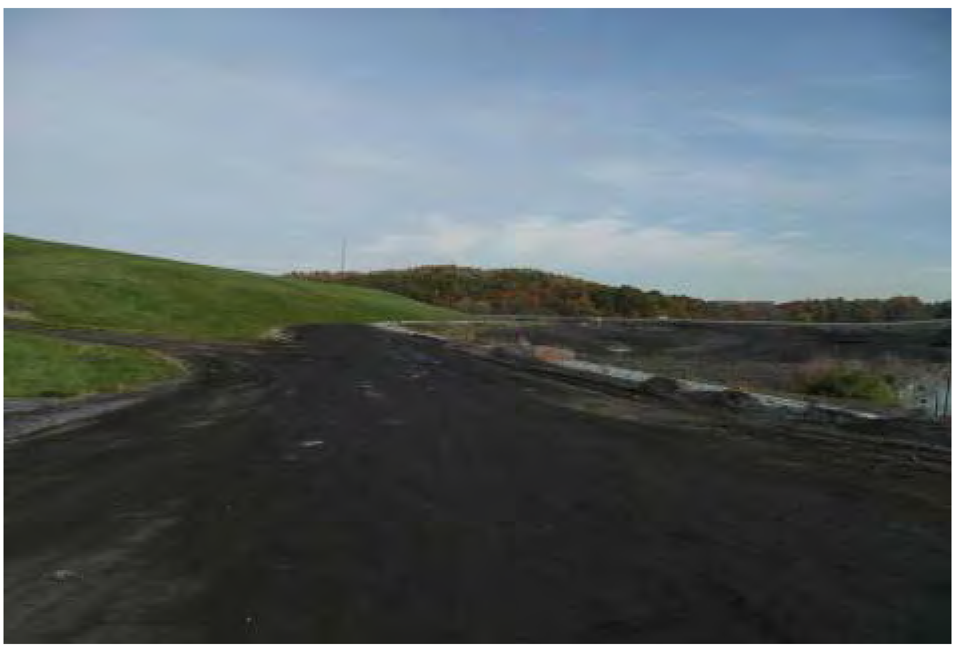
38

Looking northwest along upstream slope of the Southwest Dike near the northwest corner of the Bottom Ash Pond.
Note slope undulations likely resulting from past grading activities.

39

Close up of maintenance road cut in Southwest Dike near the plant's water treatment facility.

40



Looking northeast from the northwest end of the Southwest Dike along western side of the complex. The closed FGD area is to the left of the photo.

41

Sluice lines running to the Fly Ash Pond along the western side of the complex.

42

Sluice lines running into the Fly Ash Pond.

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Close up of sluice lines running into the Fly Ash Pond.

44

Outfall from Clearwater Pond into nearby creek. Heavy vegetation in this area

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45

Looking northeast along downstream slope of the Coal Haul Road embankment near the Ash Pond Complex outfall.

46

Looking southwest along Coal Haul Road embankment.

CHA	**AMERICAN ELECTRIC POWER** **CONESVILLE GENERATING STATION** **CONESVILLE, OH** **ASH POND COMPLEX**
CHA Project No.: 20085.1040.1510	October 22, 2009

47

Slough in downstream slope of Coal Haul Road Dike.

48

Another view of the slough in Coal Haul Road Dike, looking northeast.

49

Recently mowed cattail growth in drainage swale at toe of the North Haul Road Dike and County Route 273.

50

Grassed older erosion rill in upstream slope of Coal Haul Road Dike.

51

Grassed erosion rill on downstream slope of Coal Haul Road Dike. Hard hat is in bottom of rill.

52

Rodent burrow on downstream slope of Coal Haul Road Dike.

53

Open rodent burrow in area of older collapsed burrows that have become erosion rills (stick is in burrow) in Coal Haul Road Dike.

54

Another rodent burrow on downstream slope of Coal Haul Road Dike.

55

More recent rodent burrow in Coal Haul Road Dike with exposed soil spoil.

56

Grass covered deformation on downstream slope of Coal Haul Road Dike.

57

Example of soil and coal dust transport and intermittent grass cover loss near crest of Coal Haul Road Dike.

58

Soil and coal dust transport with intermittent grass cover loss on downstream slope of Coal Haul Road Dike.

59

Maintenance road cut in Southwest Dike near the plant's water treatment facility, looking southeast.

60

Collapsed, vegetated rodent burrow on upstream slope of Southwest Dike, likely abandoned (See arrow).

61

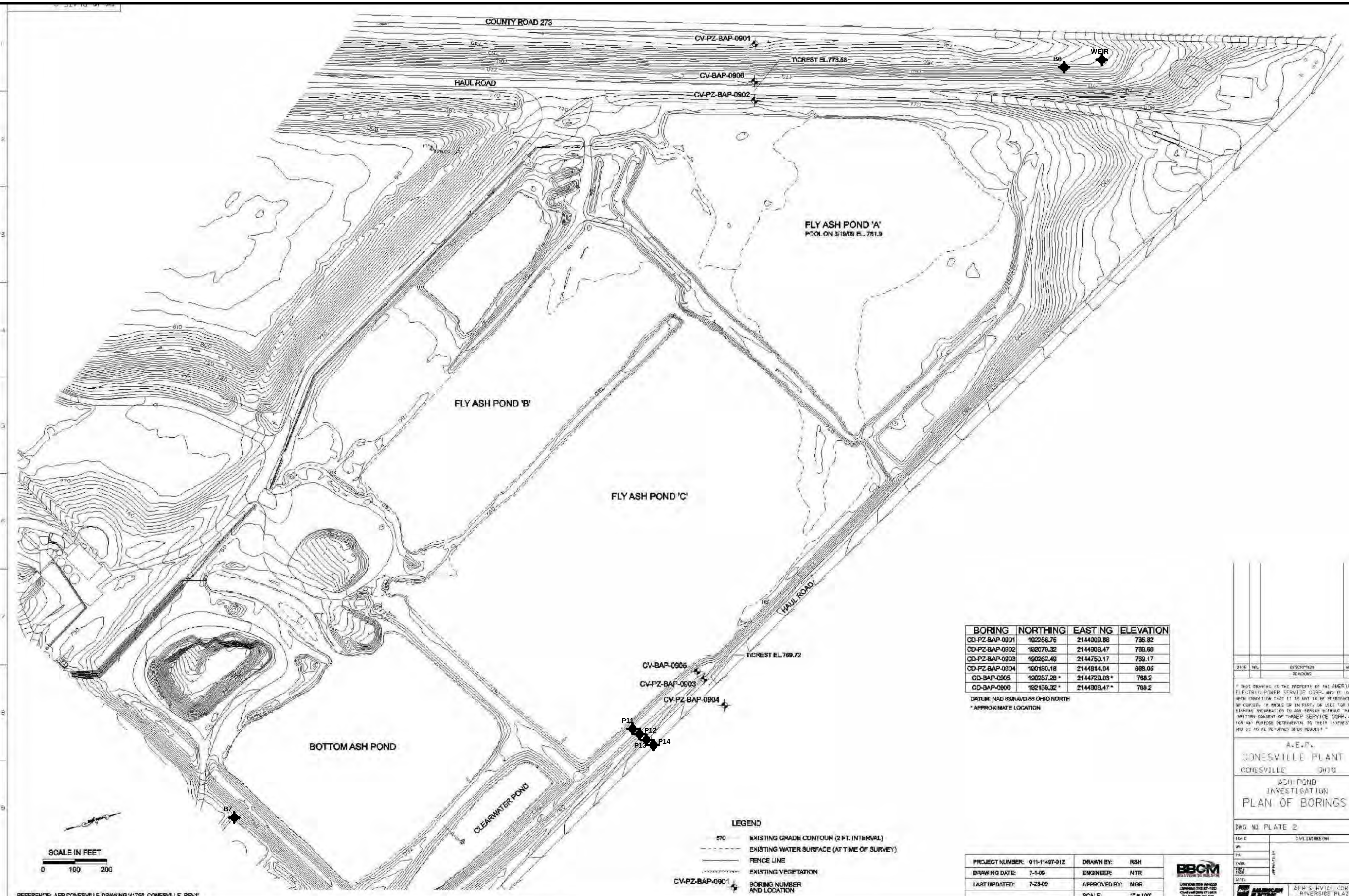
Central Fly Ash Pond area and vegetated interior divider dike between the Fly Ash Storage area and Central Fly Ash Pond area (see arrow on right side of photo).

62

Closer view of interior divider dikes (see arrows) the Fly Ash Storage Area and Central Fly Ash Pond area.

CHA	AMERICAN ELECTRIC POWER CONESVILLE GENERATING STATION CONESVILLE, OH ASH POND COMPLEX
CHA Project No.: 20085.1040.1510	October 22, 2009

File: K:\20085\CADD\ACAD\FIGURES\1040 CONESVILLE STATION\1040_2_PHOTO SITE PLAN.DWG Saved: 2/8/2010 3:40:17 PM Plotted: 2/8/2010 3:43:36 PM User: Gray, Timmolyn



BORING	NORTHING	EASTING	ELEVATION
CD-PZ-BAP-0901	192256.75	2144909.88	735.92
CD-PZ-BAP-0902	192079.32	2144908.47	769.69
CD-PZ-BAP-0903	190262.49	2144750.17	769.17
CD-PZ-BAP-0904	190180.18	2144814.04	868.05
CD-BAP-0905	190287.28 *	2144729.03 *	768.2
CD-BAP-0906	192136.32 *	2144908.47 *	769.2

DATUM: NAD 83/NAVD 88 OHIO NORTH
* APPROXIMATE LOCATION

PROJECT NUMBER:	011-11497-012	DRAWN BY:	RSH
DRAWING DATE:	7-1-09	ENGINEER:	MTR
LAST UPDATED:	7-23-09	APPROVED BY:	MGR
		SCALE:	1" = 100'

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 42

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INSTRUMENTATION LOCATION PLAN

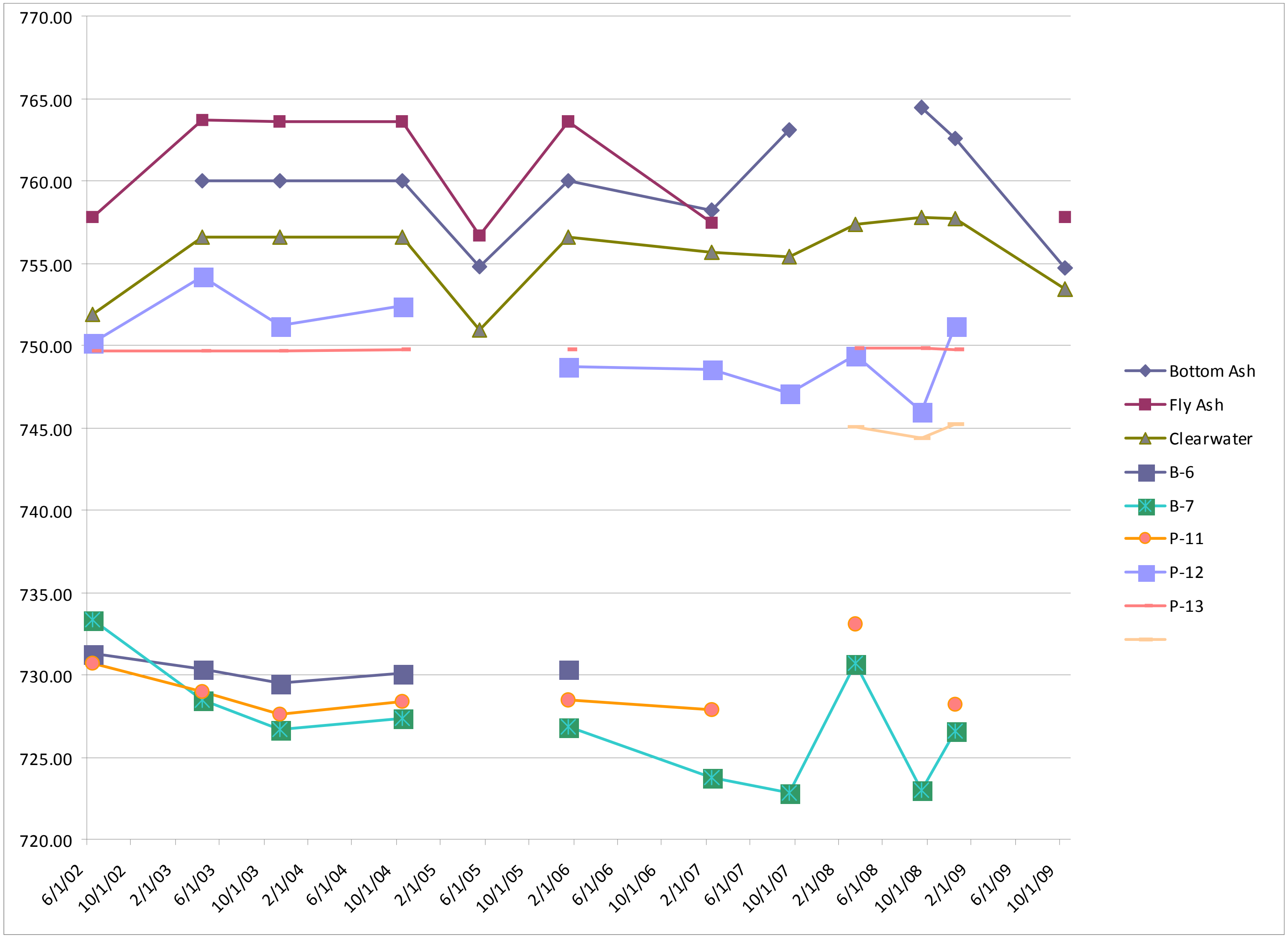
ASH POND COMPLEX
CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 7

File: K:\20085\CADD\ACAD\FIGURES\1040 CONESVILLE STATION\1040_2_PHOTO SITE PLAN.DWG Saved: 2/8/2010 3:40:17 PM Plotted: 2/8/2010 3:45:44 PM User: Gray, Timmolyn



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PIEZOMETER AND WATER LEVEL DATA

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 10

3.0 DATA EVALUATION

3.1 Design Assumptions

CHA has reviewed the design assumptions related to the design and analysis of the hydraulic adequacy and stability of the Ash Pond Complex (Bottom Ash Pond, Fly Ash Pond, and Clear Water Pond) available at the time of our site visits and provided to us by AEP. The design assumptions are listed in the following sections.

3.2 Hydrologic and Hydraulic Design

The Ash Pond Complex dikes are classified as Class II dams based on the Ohio Revised Code Chapter 1521 and Administrative Rules Chapter 1501:21 as indicated in the Division of Water Permit No. 87-159 dated February 19, 1987. This is based on the fact that a sudden breach or failure could release health hazardous industrial waste and impact the Muskingum River. As a Class II structure, the dikes are required to safely pass or store the inflow from 50% of the Probable Maximum Precipitation (PMP). This Chapter also requires a minimum freeboard of 5 feet above maximum operating pool unless otherwise approved by the chief (herein assumed to be the chief dam safety engineer for the State of Ohio).

The following table presents the typical operating pool elevations and the pool elevations at the time of the CHA representative's site visit on October 22, 2009.

Table 2 – Approximate Pool Elevations

Location	Typical Operating Pool Elevations (feet)	Pool Elevation on October 22, 2009 (feet)
Bottom Ash Pond	755 to 760	754.69
Fly Ash Pond	758 to 764	757.78
Clearwater Pond	755	753.39
Fly Ash Storage	760	N/A

Based upon the operating pool elevations provided in the table above, information from the March 2005 aerial photography, and topographic mapping that indicates that the lowest point on the embankment is at El. 766.4, the Ponds generally meet the minimum freeboard requirements. However, as noted in the Ohio DNR Dam Safety Inspection Report for December 22, 2008 and observed by the CHA representatives on October 22, 2009, an access road has been constructed into the Bottom Ash Pond effectively lowering the crest of the southern dike in this location by several feet. Therefore, the minimum operational freeboard requirement may not be met when considering this lowered portion of the embankment and may technically require the state dam engineer to grant an exception, lower the dike classification, or dictate a slight reduction, on the order of 1 to 2 feet, in the operating water level. CHA was not provided with updated survey data for this portion of the structure to assess the available freeboard or with documentation concerning such an exception.

AEP was not able to provide CHA with a hydraulic analysis showing the ability of the Ash Complex to safely pass the 50% PMP event. However, preliminary analyses performed by CHA suggests there is enough storage capacity at the current operating pool to safely withstand this rainfall event.

3.3 Structural Adequacy & Stability

The Ohio Department of Natural Resources, Division of Water, Dam Safety Program recognizes "design procedures that have been established by the United States Army Corps of Engineers, the United States Department of Interior, Interior Bureau of Reclamation, the Federal Energy Regulatory Commission, The United States Natural Resources Conservation Service, and others that are generally accepted as sound engineering practice, will be acceptable to the Chief."

In performing an evaluation of the structural adequacy and stability of the Ash Pond Complex, CHA has compared the computed factor of safety provided in the BBC&M Engineering, Inc. (BBCM) report dated July 28, 2009 with the minimum required factors of safety as outlined by the U.S. Army Corps of Engineers in EM 1110-2-1902, Table 3-1 and seismic factors of safety discussed in the FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005). The guidance values for minimum factor of safety are provided in Table 3. It should be noted that the recommended minimum values shown below are typically for new construction, and that the Army Corps of Engineers allows lower calculated safety factors for existing structures that have been in service and subject to long term observations of actual performance and routine periodic maintenance.

Table 3 - Minimum Safety Factors Required

Load Case	Required Minimum Factor of Safety
Steady State Conditions at Present Pool or Maximum Storage Pool Elevation	1.5
Rapid Draw-Down Conditions from Present Pool Elevation	1.3
Maximum Surcharge Pool (Flood) Condition	1.4
Seismic Conditions from Present Pool Elevation	1.0
Liquefaction	1.2-1.3

In Sections 3.3.1 and 3.3.2 we discuss our review of the effects of stability analyses and performance of the Ash Pond Complex.

AEP developed a scope of work to perform a geotechnical assessment to provide an indication as to the level of safety provided by the embankment dikes creating the Ash Pond Complex. An Ash Pond Investigation Report was prepared by BBCM in July 28, 2009. The scope of work consisted of the following;

- Advancement of a total of six borings;
- Installation of three monitoring wells;
- Laboratory testing on the recovered samples; and
- Engineering analyses of the existing embankments at the investigated sections with consideration to seepage, steady state slope stability, and seismic slope stability.

Static, steady state, and seismic slope stability analyses were performed on the downstream (outboard) embankment slopes for two cross sections. The strata considered at Cross Section A through the Northern Haul Road Dike consisted of the following:

- Cohesive embankment fill;
- Granular embankment fill placed in 1974 as part of the Complex expansion;
- Fly ash fill hydraulically placed to construct the Northern Haul Road;
- Alluvium silt and clay extending below and in front of the dikes;
- Loose glacial outwash sand and gravel in front of the embankment; and
- Medium dense glacial outwash sand and gravel.

The strata considered at Cross Section B through the Coal Haul Road Dike located on the southeastern side end of the Complex consisted of the following:

- Granular embankment fill placed during in 1956 for the haul road embankment;
- New granular embankment fill placed in 1974 to raise the crest elevation along the southern portion of the haul road;
- Fly ash fill within the Fly Ash Pond;
- Alluvium silt and clay extending below and in front of the dikes; and
- Medium dense overlying dense glacial outwash sand and gravel below the pond and embankment, and extending downstream.

The permeability and shear strength parameters used to represent the dike fill material and foundation soils were reportedly based on the totality of test data available across the entire site due to insufficient evidence to justify analyzing specific cross sections at every change encountered in the field and noted in the boring logs.

The shear strength and unit weight values used for the slope stability analyses were reportedly based on a combination of the laboratory index test results, triaxial shear test results, published values and correlations, and judgment, and were intended to be representative of long term conditions (drained). Laboratory shear strength tests were performed on samples from the cohesive embankment fill and ash fill layers. The properties of the seven strata model in the analyses are provided in Table 4.

Table 4 - Soil Strength Parameters Used in BBCM August 2009 Investigation Report

Soil Stratum	Unit Weight (pcf)	Static Loading Condition		Seismic Loading Condition	
		Friction Angle (φ)	Cohesion (psf)	Friction Angle (φ)	Cohesion (psf)
Cohesive Embankment Fill	125	28°	100	5°	2000
Granular Fill	125	24°	0	24°	0
Fly Ash Fill	100	30°	0	20°	1000
Alluvial	125	30°	0	30°	0
Loose Glacial Outwash	115	30°	0	30°	0
Medium Dense Glacial Outwash	120	34°	0	34°	0
Dense Glacial Outwash	125	38°	0	38°	0

For the purpose of the stability assessments, BBMC assumed that the water level in the Fly Ash Storage Area adjacent to Section A was at El. 762 which they reported as the normal pool operating level in this area. At Section B, BBMC noted that the water level in the Fly Ash Pond was at El. 758 (which is below the ash level adjacent to the Secondary Dike) although reported maximum operating pool is at El. 764. Based upon the elevation data obtained in October 2009 and presented in Table 2, the elevations used in the analyses are consistent with the current operating conditions. The elevations used in the analyses correspond to a freeboard ranging from 13 to 14 feet on the Northern Haul Road Dike and 11 to 22 feet along the Coal Haul Road and embankment on the southwestern side of the Fly Ash Pond.

The location of the phreatic surface within the embankments was estimated based on piezometer readings, conditions encountered during drilling, and a seepage analysis. The seepage analysis indicated a rapid decrease in the phreatic surface through the granular fill. Slope stability analyses were performed based on the phreatic surface developed by the seepage analysis and on a user-generated surface based on the piezometer readings. The user generated surface was within 5 to 10 feet above or below the seepage model prediction.

Seismic analyses were performed using a pseudo static analysis with a horizontal seismic coefficient of 0.06g. This coefficient was determined from the 2008 USGS National Seismic Hazard Maps for the Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years.

Table 5 provides a summary of the calculated factors of safety for the loading conditions outlined by the U.S. Army Corps of Engineers in EM 1110-2-1902, Table 3-1. Figures 8A through 8C and Figures 9A through 9C show the stability analyses outputs summarized in Table 5.

Table 5 – Summary of Safety Factors

Load Case	**Required Minimum Factor of Safety**	**Calculated Minimum Factor of Safety**	
		Section A	Section B
Steady State Conditions at Present Pool Elevation (Downstream Slope)	1.5	1.98	1.55
Rapid Draw-Down Conditions from Present Pool Elevation	1.3	Not Performed as Part of the BBCM Evaluation	
Maximum Surcharge Pool (Flood) Condition	1.4	Not Performed as Part of the BBCM Evaluation	
Seismic Conditions at Present Pool Elevation (Downstream Slope)	1.0	1.67	1.34
Liquefaction	1.3	Not Performed as Part of the BBCM Evaluation	

Review of BBCM's Slide™ outputs and corresponding factors of safety for the various loading conditions, boring logs, laboratory test data and parameter justifications provided in the appendices of the July 2009 investigation and evaluation report by BBCM indicate the following:

- Based upon our review of the data, it appears that a very soft layer of alluvium may have been encountered in BBCM's boring CV-PZ-BAP-0903, located at Cross Section B, at approximately 22 ft below grade where the sampler was advanced by the dead weight of the rods and hammer. Hand penetrometer tests performed on this sample ranged from 0.0 to 0.25 tsf. This observation may be consistent with comments in the 1983 Dam Safety Inspection report prepared by Woodward-Clyde Consultants that a 5 to 10-ft-thick layer of soft gray silty clay or clayey silt was encountered at several locations. These observations may warrant additional subsurface strata to define the soil behavior.
- The downstream slope stability outputs for the steady state load condition for Cross Section B show failure planes within the embankment soils. If the alluvium silt/clay was modeled with a soft layer at the depth corresponding to the low sample effort, a more critical failure plane may actually fall within the alluvium foundation soils and not the embankment soils.
- Analysis was not performed for the maximum surcharge pool (flood) condition.
- The rapid-draw down load case was not evaluated.
- A liquefaction assessment was not performed.

Section 4.7 outlines our recommendations for tasks that should be performed to confirm that the embankments are stable under the loading conditions discussed above.

3.4 Foundation Conditions

WCC's 1983 inspection report states that a 5 to 10 ft layer of slightly organic, soft gray silty clay or clayey silt was encountered at several locations. It is unclear if this material was removed during construction. The alluvial soils are underlain by a thick deposit of glacial outwash sand and gravel. Bedrock is anticipated at depths of approximately 120 feet.

3.5 Operations & Maintenance

AEP Conesville Power Plant staff makes quarterly inspections of the Ash Pond Complex. Piezometer readings are taken during the quarterly inspections. These inspections and instrumentation readings are consistent with the procedures outlined in the June 2009 Draft Operations, Maintenance & Inspection (OM&I) Manual.

On an annual basis, AEP engineers from the Columbus, Ohio office perform inspections of this facility with the most recent inspections in October 2007 and December 2006. The Ohio DNR Dam Safety personnel perform an inspection at least every five years; the most recent inspection was December 22, 2008. These dates are based upon the data provided to CHA.

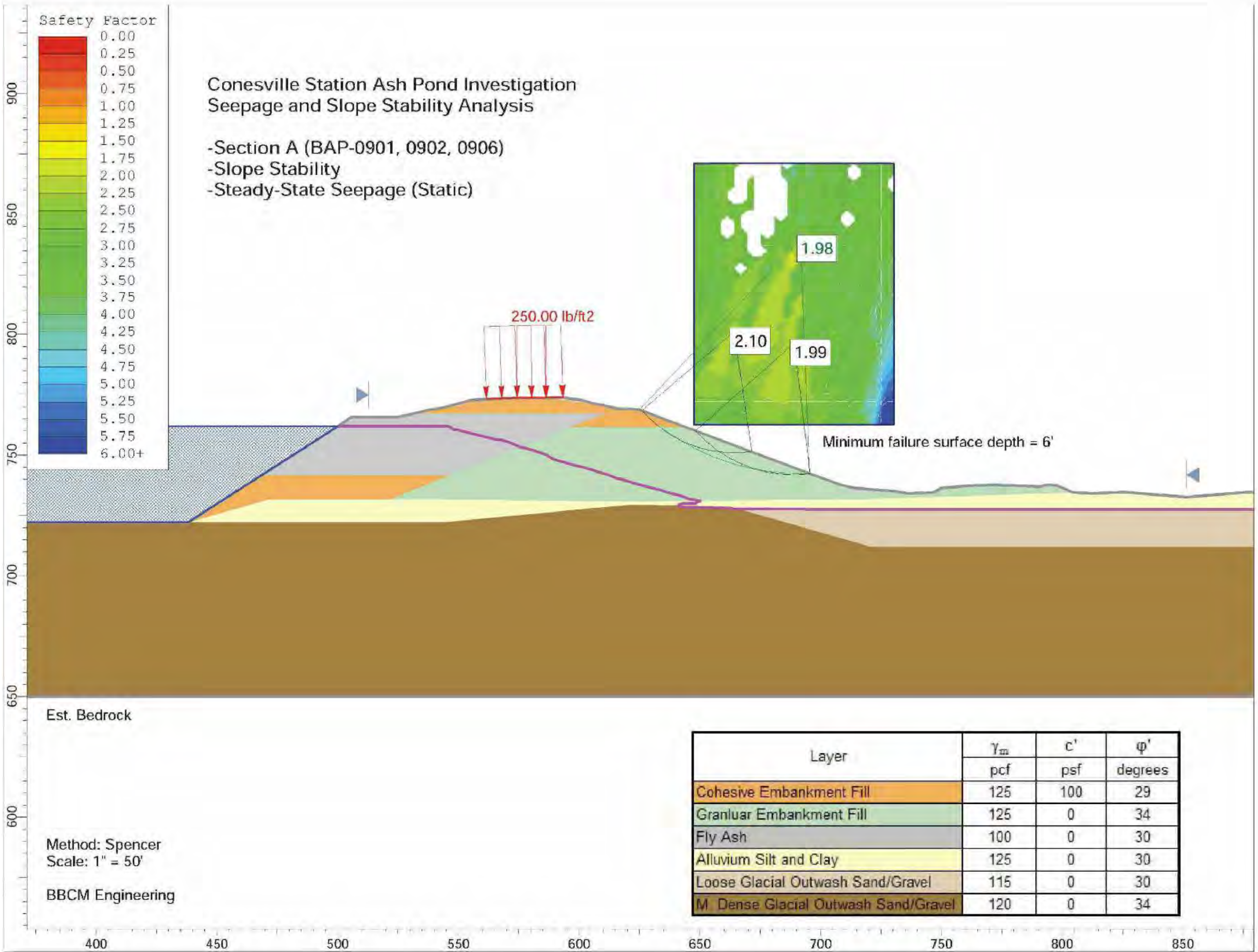
3.5.1 State of Ohio Inspections

Ohio Revised Code Section 1521.062 states that the owners of dams must monitor, maintain, and operate their dams safely. The owner is to maintain a safe structure and appurtenances through inspection, maintenance, and operation.

Representatives of the ODNR Dam Safety Program inspected the Conesville Plant Ash Pond Complex (Bottom Ash Pond, Fly Ash Pond and Clear Water Pond) structures on December 22, 2008. A Dam Safety Inspection Report was provided to AEP following the department's site visit. The report included required remedial measures based on observation made during the inspection, calculations performed and requirements of the Ohio Administrative Code. A summary of the required remedial measures outlined in the 2008 inspection reports is provided in Table 6. For Engineering Repairs and Investigations the dam owner must retain the services of a professional engineer to address the plans, specification, investigative reports, and other supporting documentation. The owner is required to complete the items within five (5) years. Owner repairs may be performed by the dam owner or by a hired contractor.

Table 6 – Summary of Required Remedial Measures

Conesville Plant Ash Pond Complex
Engineering Repairs and Investigations
None noted.
Owner Repairs
1. Remove trees and brush was noted around the effluent pipe outlet in the 2000 Periodic Inspection. Due to ice accumulation, this area could not be assessed during this inspection. If trees and brush are still growing around the effluent pipe outlet, they must be removed.
2. In the 2000 Periodic Inspection, an 8-foot low area was noted where a driveway crosses the crest; this low area was also noted during the 2008 Periodic Inspection. The owner must establish operating pools to guarantee a minimum of 5 feet of freeboard at all times relative to this low point or raise the low section of the crest to allow for this freeboard.
3. An 8 foot diameter depression was noted approximately 275 feet from the northwest corner of the embankment. Signs of rodent burrowing activity in the area indicated that this depression may have been caused by a collapsed rodent burrow. This area should be repaired by placing compacted fill in the depression. Monitor the repaired area for any additional settlement.
4. The appropriate time period for the preparation of an EAP and OMI has passed. These documents must be provided to the Division of Water.
5. Following the removal of tall vegetation in the road ditch at the toe of the north exterior slope, locate the monitoring weir near the road drainage culvert. Using the weir, monitor the area for changes in flow that may indicate seepage along the north embankment.



Layer	γ_m	c'	φ'
	pcf	psf	degrees
Cohesive Embankment Fill	125	100	29
Granluar Embankment Fill	125	0	34
Fly Ash	100	0	30
Alluvium Silt and Clay	125	0	30
Loose Glacial Outwash Sand/Gravel	115	0	30
M. Dense Glacial Outwash Sand/Gravel	120	0	34

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 134

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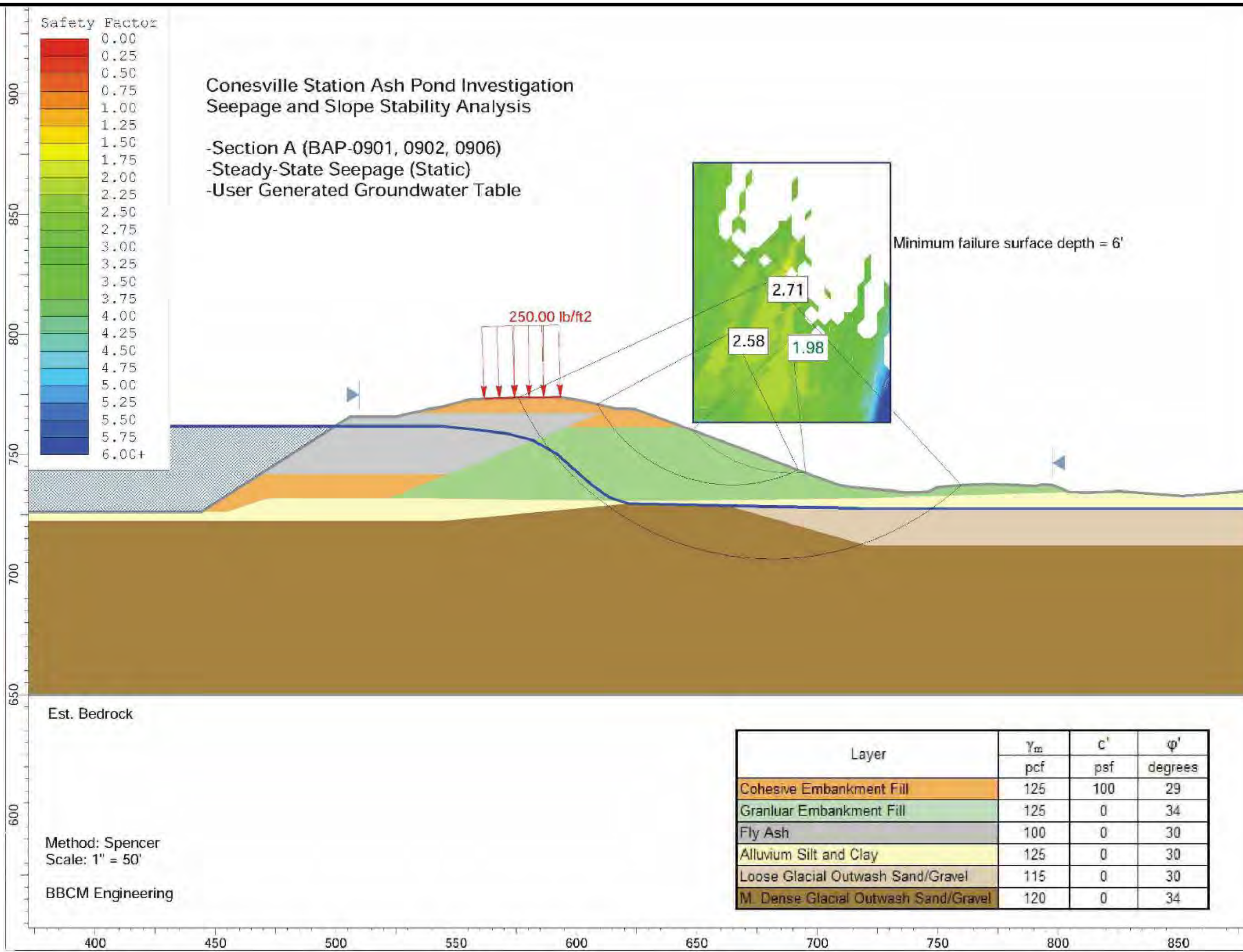
STATIC ANALYSIS – NORTH HAUL ROAD

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 8A



Layer	γ_m pcf	c' psf	φ' degrees
Cohesive Embankment Fill	125	100	29
Granluar Embankment Fill	125	0	34
Fly Ash	100	0	30
Alluvium Silt and Clay	125	0	30
Loose Glacial Outwash Sand/Gravel	115	0	30
M. Dense Glacial Outwash Sand/Gravel	120	0	34

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 135

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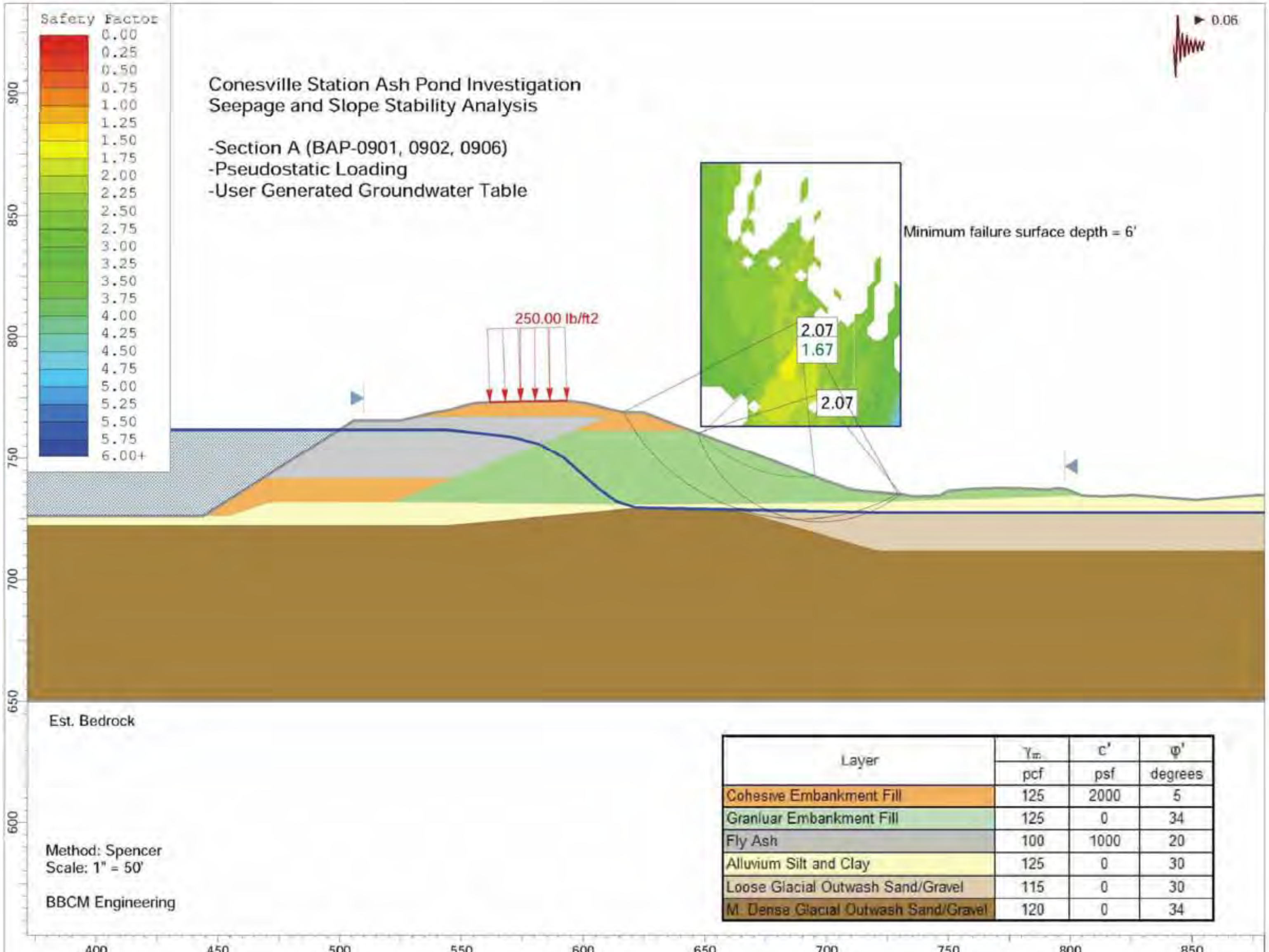
STATIC ANALYSIS – NORTH HAUL ROAD

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 8B



Layer	γ_m pcf	c' psf	φ' degrees
Cohesive Embankment Fill	125	2000	5
Granluar Embankment Fill	125	0	34
Fly Ash	100	1000	20
Alluvium Silt and Clay	125	0	30
Loose Glacial Outwash Sand/Gravel	115	0	30
M. Dense Glacial Outwash Sand/Gravel	120	0	34

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 136

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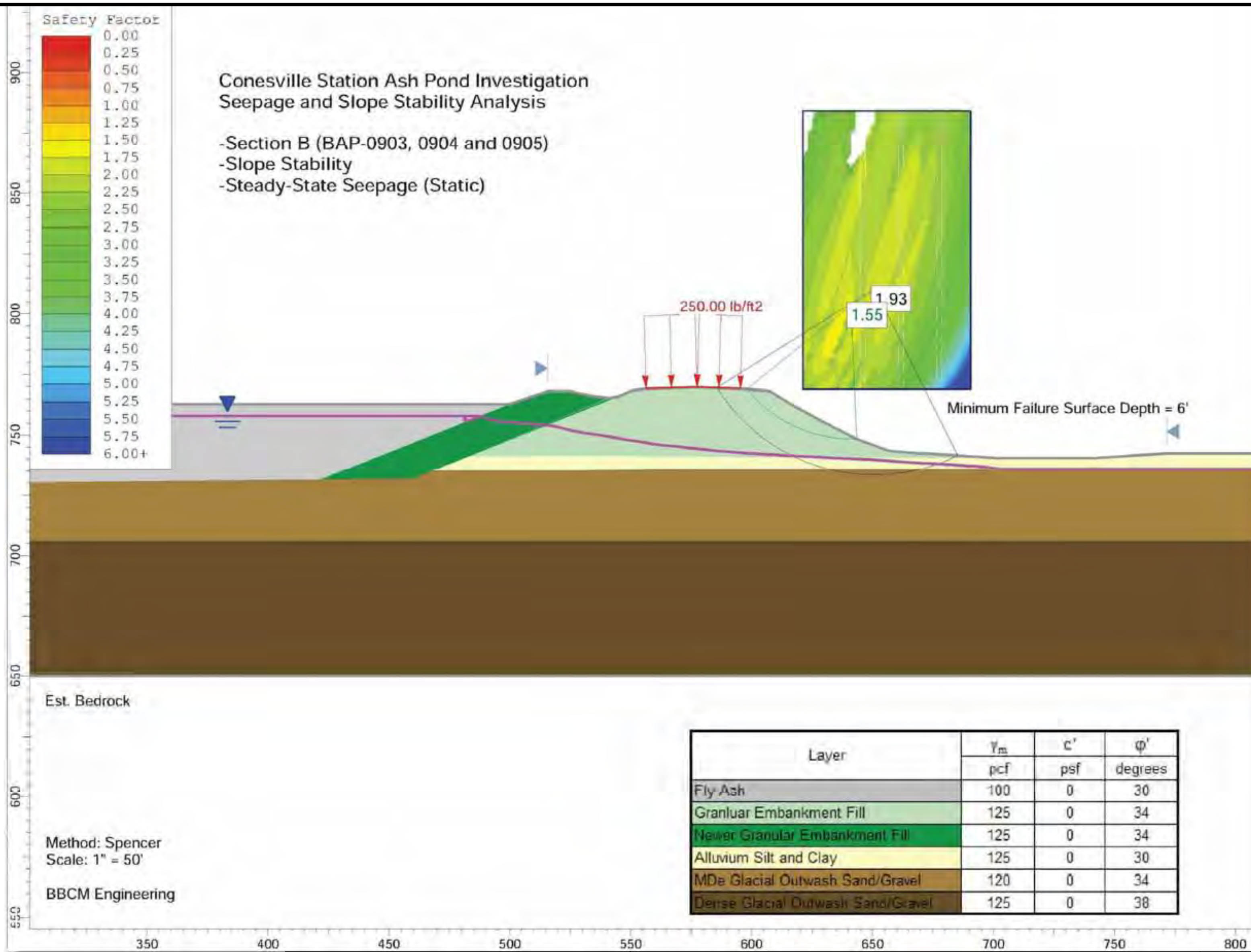
SEISMIC ANALYSIS – NORTH HAUL ROAD

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 8C



Layer	γ_m	c'	φ'
	pcf	psf	degrees
Fly Ash	100	0	30
Granluar Embankment Fill	125	0	34
Newer Granular Embankment Fill	125	0	34
Alluvium Silt and Clay	125	0	30
MDe Glacial Outwash Sand/Gravel	120	0	34
Dense Glacial Outwash Sand/Gravel	125	0	38

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 140

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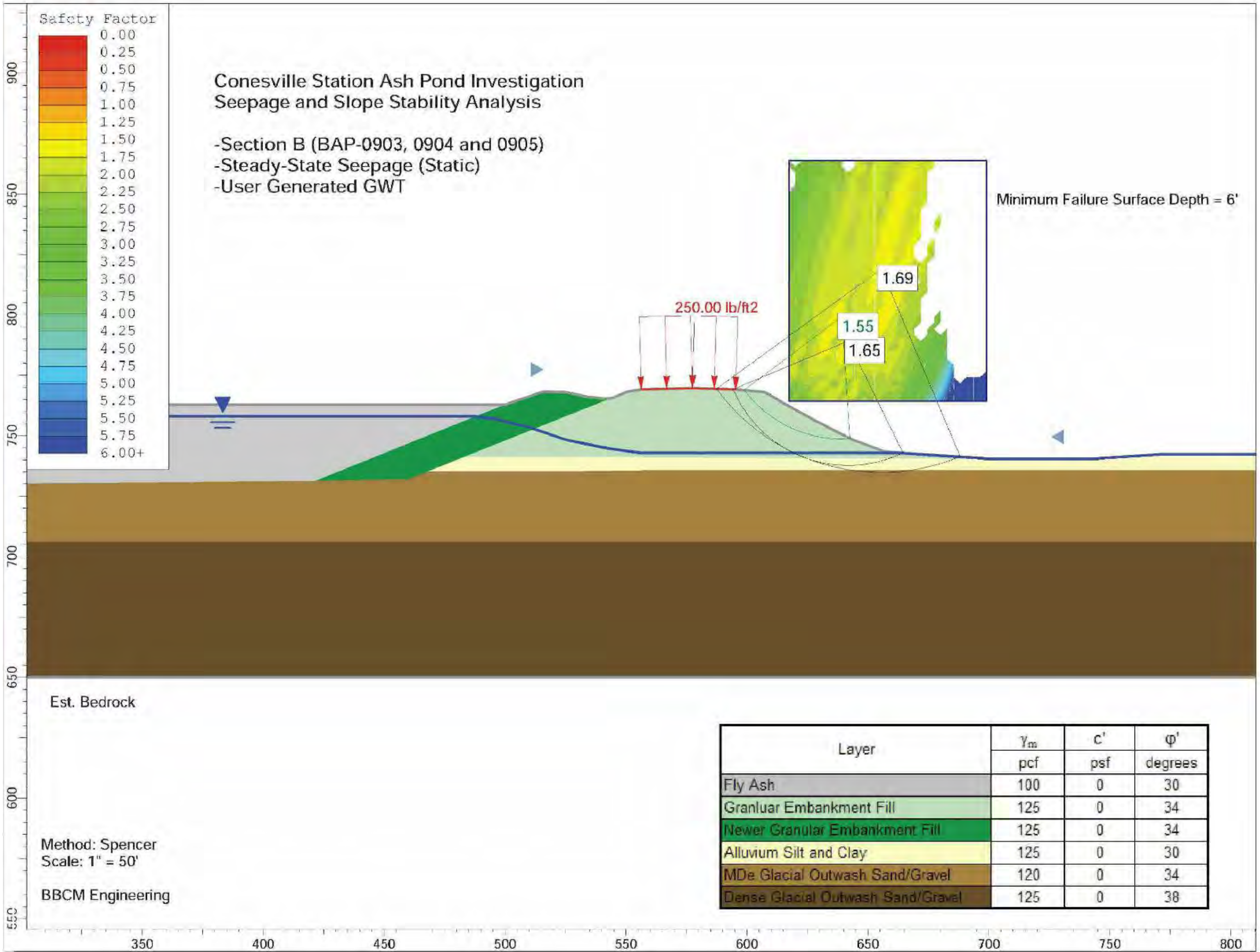
STATIC ANALYSIS – COAL HAUL ROAD AND SECONDARY DIKE

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 9A



Layer	γ_m pcf	c' psf	φ' degrees
Fly Ash	100	0	30
Granluar Embankment Fill	125	0	34
Newer Granular Embankment Fill	125	0	34
Alluvium Silt and Clay	125	0	30
MDe Glacial Outwash Sand/Gravel	120	0	34
Dense Glacial Outwash Sand/Gravel	125	0	38

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 141

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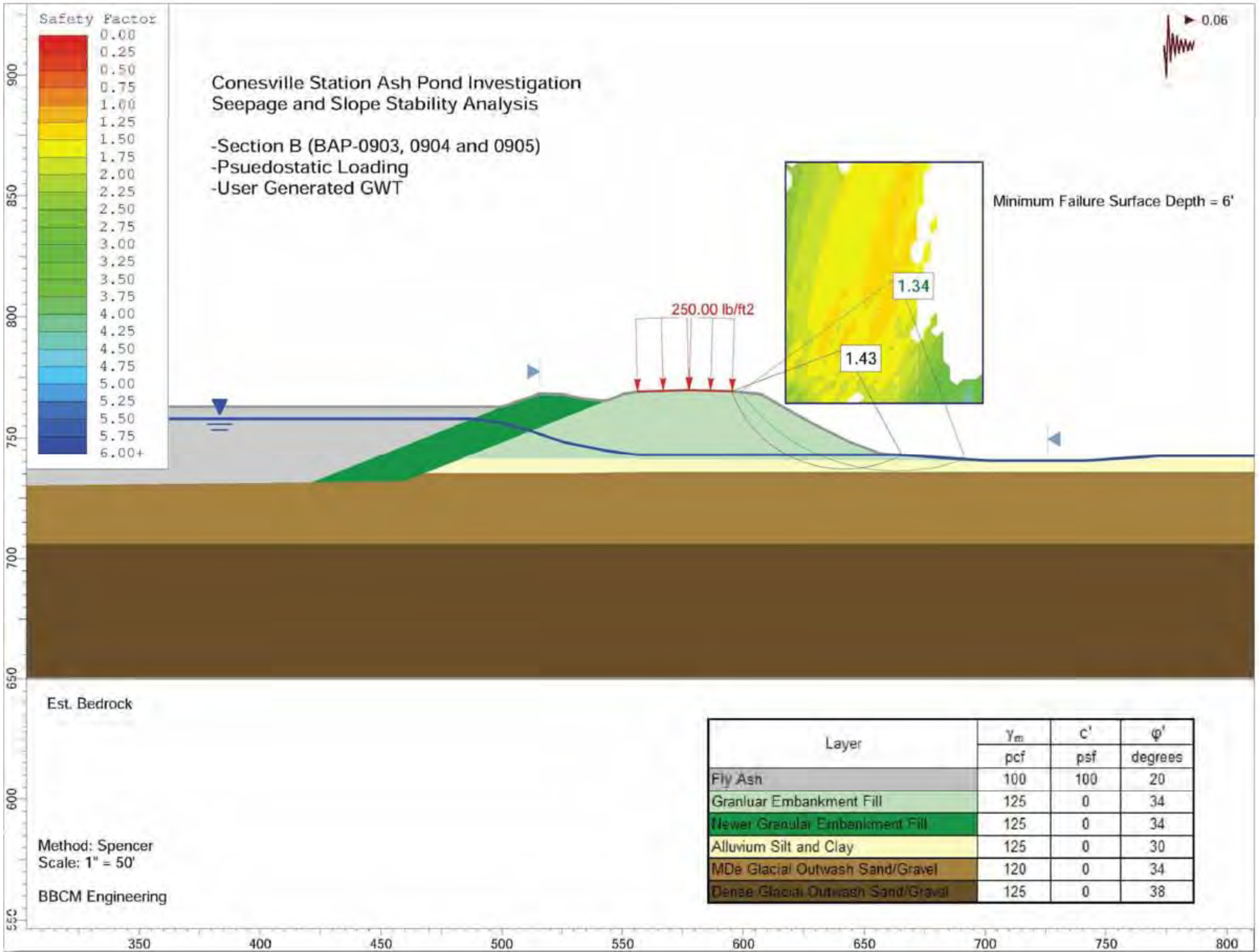
STATIC ANALYSIS – COAL HAUL ROAD AND SECONDARY DIKE

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 9B



Layer	γ_m pcf	c' psf	φ' degrees
Fly Ash	100	100	20
Granluar Embankment Fill	125	0	34
Newer Granular Embankment Fill	125	0	34
Alluvium Silt and Clay	125	0	30
MDe Glacial Outwash Sand/Gravel	120	0	34
Dense Glacial Outwash Sand/Gravel	125	0	38

IMAGE REFERENCE: 2009 BBCM REPORT, PAGE 142

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SEISMIC ANALYSIS – COAL HAUL ROAD AND SECONDARY DIKE

CONESVILLE POWER STATION
CONESVILLE, OHIO

PROJECT NO. 20085.1040

DATE: 02/2010

FIGURE 9C

4.0 CONCLUSIONS/RECOMMENDATIONS

4.1 Acknowledgement of Management Unit Condition

I acknowledge that the management units (Bottom Ash Pond, Fly Ash Storage, Fly Ash Pond, and Clearwater Pond) referenced herein were personally inspected by me and was found to be in the following condition: **Fair.** This indicates acceptable performance is expected under required loading conditions in accordance with applicable safety regulatory criteria; however some additional analyses should be performed and documented to verify that these criteria are met.

Evidence was observed indicating that AEP attempts and maintains proactive maintenance and monitoring program at this facility. These efforts should be continued.

CHA presents recommendations for maintenance and further studies to bring these facilities into Satisfactory in the following sections.

4.2 Maintaining and Controlling Vegetation Growth

The grass cover on the Bottom Ash Pond embankment appeared to be reasonably maintained, with only isolated areas of mild cover loss. This practice should continue.

Standing water and wetlands growth was observed between the Northern Haul Road Dike and County Road 273. This growth appears to be the result of water backing up into the drainage ditch at the toe of the dike from a poorly drained, swampy area on the north side of County Road 273. As a result, flow through the culvert below County Road 273 is restricted and runoff cannot be effectively conveyed from the ditch. CHA recommends drainage in this area be corrected so water is not standing/saturating the toe of the dike and observations of seepage, if any, can be seen. Additionally, weed growth has obstructed flow through the measurement weir and corresponding observations. The growth obstructing the weir should be cleared.

Brush growth was observed on the downstream slope of the Coal Haul Road Dike adjacent to the Fly Ash Pond. The woody vegetation should be removed under the supervision of a Professional Engineer.

CHA recommends that vegetation be cut prior to each quarterly inspection performed by AEP representatives so that adequate visual inspections can be made.

4.3 General Crest Areas and Slopes

The crest of the Northern Haul Road and Coal Haul Road dikes had intermittent erosion rills and subsequent loss of grass cover resulting from water flow from storm events and dust control water spray. These erosion rills should be filled in with compacted material and otherwise stabilized. CHA recommends on-going maintenance and/or a change to the surface treatments to reduce erosion from run-off. The facility may consider adding curbing with roadside gutters to collect runoff and direct it toward designated concrete lined ditches or rock protected outfalls.

The slump and scarp area located on the downstream slope of the Coal Haul Road dike should be stripped of vegetation, excavated, and subsequently repaired under the direction and observation of a Professional Engineer. It is currently not believed to be an immediate threat to the dike, and would affect the haul road well before endangering the Clearwater Pond area. If left unaddressed however, continued slope softening, deformation, and erosion will eventually cause a problem.

Rodent borrows were observed on the upstream side of the Northern Haul Road and Coal Haul Road dikes. Rodent control measures should be implemented and the affected areas should be backfilled with compacted fill.

A haul road has been cut across the southwestern dike. A topographic survey should be made of this area to compare the available free board to the low point elevation and regrading should be undertaken if needed to meet the freeboard requirements.

4.4 Outlet Structures

Vegetation had established itself at the outlet structure from the Clearwater Pond. Although it has not become a problem presently, removal is recommended to maintain this area before the vegetation obstructs the discharge flow. The access bridge to this outlet structure should also be repaired so that it does not present a hazard to personnel servicing the spillway riser. At the time of the site assessment, this bridge had partially collapsed, was sagging in the water, and did not appear to be passable.

Drop inlet structures conveying water from the Bottom Ash Pond and Fly Ash Pond to the Clearwater Pond were in various stages of deterioration. These inlets, as well as the small access bridges to them should be maintained and repaired as needed to accommodate plant personnel access and insure continued function.

4.5 Instrumentation

Plant personnel take readings in the piezometers and pond levels on a quarterly basis. We recommend that values be established as part of the OM&I manual for changes in instrumentation readings that warrant a review of the stability and pond operation.

Wetland vegetation has grown on the downstream side of the Northern Haul Road Dike obstructing operation and measurements at the monitoring weir. This vegetation should be cleared and routine measurements resumed.

4.6 Ash Complex Hydraulic Analysis

AEP was not able to provide CHA with a hydraulic analysis showing the ability of the Ash Complex to safely pass the 50% PMP event. However, preliminary analyses performed by CHA suggest there is enough storage capacity at the current operating pool to safely withstand this rainfall event. We recommend AEP perform a complete study to confirm this, and update the study if operating levels of the pond change in the future or the dike system is reclassified.

4.7 Additional Stability Analyses

Based on our review of available information for the Ash Complex we recommend that the following tasks be performed to confirm that the embankments are indeed stable under the various loading conditions outlined in Section 3.3.

- Subsurface data from the 1983 Woodward-Clyde and 2009 borings advanced by BBCM were used to assess the soil strength parameters. We recommend that subsurface information from borings advanced by C&SO in 1974 and AEP in 1981 also be included in the assessment. In particular, review available subsurface data for presence of a soft silty clay or clayey silt layer below the embankments as noted by WCC in their 1983 inspection report.
- We recommend that an investigation be performed in which the properties of the alluvium silt/clay layer can be investigated in more detail in order to determine the presence and thickness of the soft layer of material indicated in the boring CV-PZ-BAP-0903. This scope of work should include additional laboratory testing of samples retrieved from the alluvium layer.
- Additional cross sections should be evaluated, as the geometry of the dikes is not consistent and the cross sections that have been evaluated may not be representative of critical areas.
- CHA recommends stability analysis of a section through the northeastern portion of the Coal Haul Road where a secondary dike was not constructed.
- CHA recommends stability analysis of a section through the southwestern dike.
- CHA recommends stability analysis of Section B-B through the Secondary/Coal Haul Road Dike based upon the reported maximum operating pool at El. 764.

- CHA recommends that a stability analysis model be developed for the maximum surcharge pool (flood) condition.
- CHA recommends modeling the upstream slope stability for seismic and steady state seepage load cases.
- CHA recommends that the rapid draw-down load case be evaluated for the Ash Pond Complex. While a rapid drawdown is not a scenario that has a high probability of occurrence, CHA recommends understanding the condition and meeting recommended stability factors of safety for the unlikely event that water must be evacuated rapidly via methods other than the existing outlet control structures such as pumping to prevent a more catastrophic release should an emergency condition develop in the embankment.
- We recommend that a liquefaction analysis be performed in light of some of the loose to very loose alluvial soils encountered during the subsurface investigation for the site.

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 Cardinal Power Plant 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: Conesville Power Plant	Date: October 22, 2009
Unit Name: Conesville Plant Ash Pond Complex	Operator's Name: American Electric Power
Unit I.D.: OH01453	Hazard Potential Classification: High Significant Low
Inspector's Name: Malcolm D. Hargraves P.E. /Rebecca Filkins	

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?	quarterly		18. Sloughing or bulging on slopes?	x	
2. Pool elevation (operator records)?	754 to 758		19. Major erosion or slope deterioration?	see	note
3. Decant inlet elevation (operator records)?	754		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?		x
5. Lowest dam crest elevation (operator records)?	767		Is water exiting outlet, but not entering inlet?		x
6. If instrumentation is present, are readings recorded (operator records)?	x		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)?	n/a		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?		x
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?		x
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.

9 Brush and small saplings (1 - 2 inch diameter) were noted in an isolated area around the spillway outlet.

17, 18 An isolated scarp/slough (roughly 10' by 15' area) noted downstream slope of east dike below road bench near outlet pipe and erosion features. Likely due to water from dust control activities locally softening the slope.

19 Isolated erosion rills as noted above, and on upstream slope of west and east dikes; some grassed. Loss of cover in isolated ruts due to mowing activities on west and east dikes. Heavier erosion gullies on haul road constructed on pond at upstream face of west dike. Beaching noted on south dike (w/ associated minor slough).

23 Water at toe of east dike in isolated areas around outlet and along west dike in highway drainage ditch.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # OH0005371 INSPECTOR Hargraves/Filkins

Date October 22, 2009

Impoundment Name Conesville Plant Ash Pond Complex

Impoundment Company American Electric Power

EPA Region 5

State Agency (Field Office) Addresss Ohio EPA Southeast District Office
2195 Front Street; Logan, Ohio 43138-8687

Name of Impoundment Conesville Plant Ash Pond Complex

(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: Fly Ash and Bottom Ash disposal and processing.

Nearest Downstream Town : Name Beverly, Ohio

Distance from the impoundment 3.9 miles

Impoundment

Location: Longitude 81 Degrees 52 Minutes 11 Seconds
Latitude 40 Degrees 11 Minutes 18 Seconds
State Ohio County Coshocton

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

If So Which State Agency? ODNR - Division of Water

<u>HAZARD POTENTIAL</u> (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.

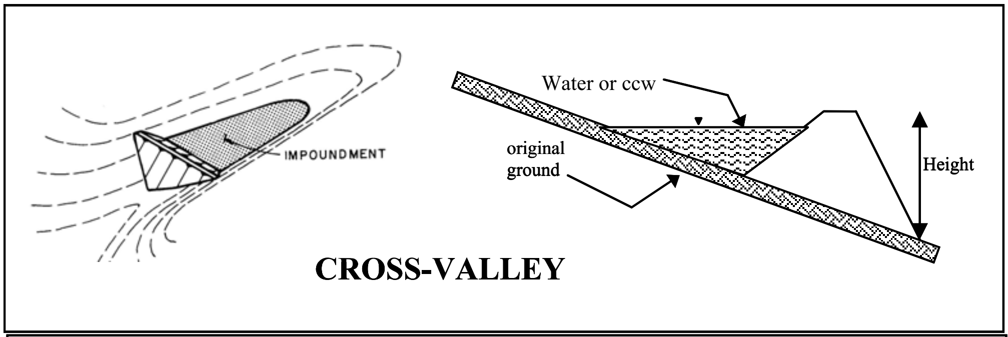
x______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

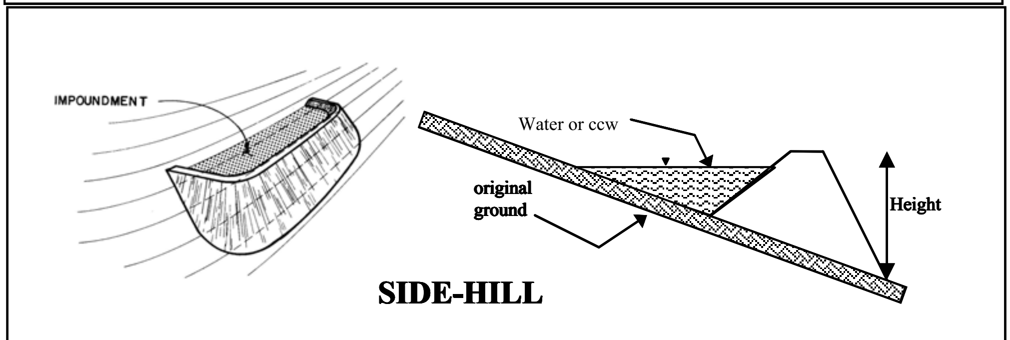
______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

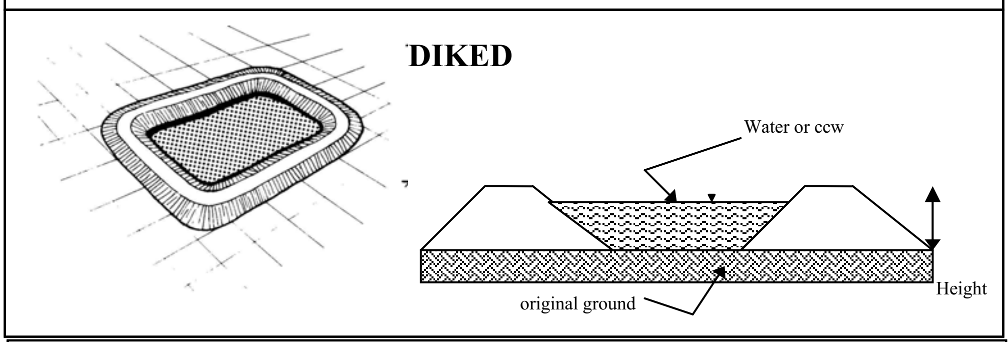
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

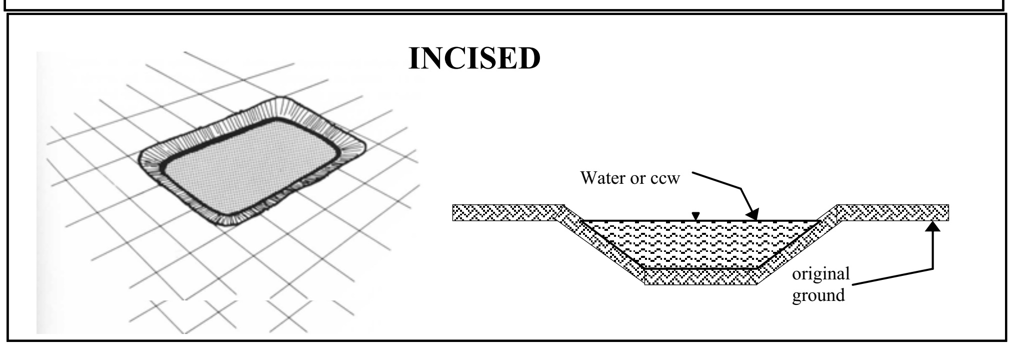
In the event of a failure under full pool the breach wave would likely impact plant haul roads, the facility and a tributary to the Muskingum River.

CONFIGURATION:









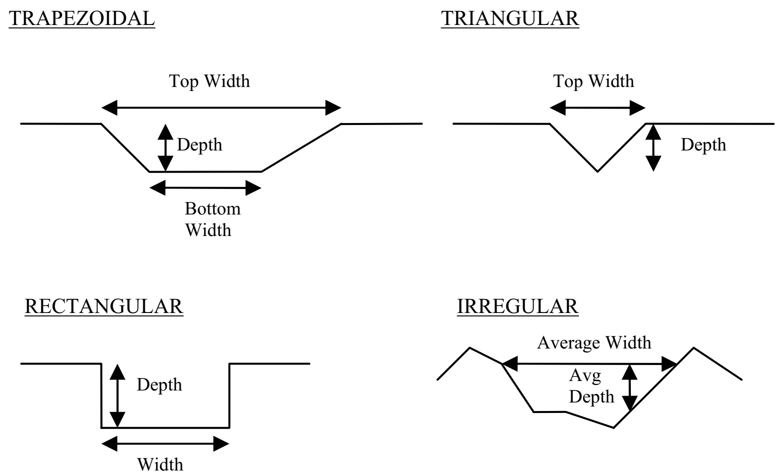
______ Cross-Valley
______ Side-Hill
______ Diked
______ Incised (form completion optional)
x_____ Combination Incised/Diked

Embankment Height 35 feet Embankment Material Earth fill
Pool Area 82 acres Liner none
Current Freeboard 9 to 13 feet Liner Permeability n/a

TYPE OF OUTLET (Mark all that apply)

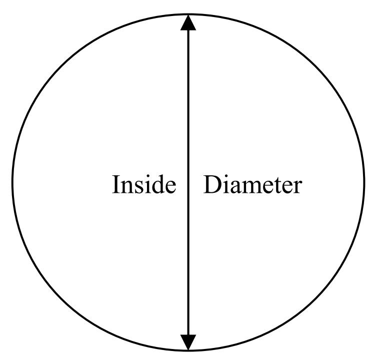
n/a **Open Channel Spillway**
______ Trapezoidal
______ Triangular
______ Rectangular
______ Irregular

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



x **Outlet**

18" 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 AEP

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 :