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COAL ASH IMPOUNDMENT
SITE ASSESSMENT DRAFT REPORT

F. B. Culley Power Generating Station
Vectren Corporation
Newburgh, Indiana

Prepared by:

KLEINFELDER
Bright People. Right Solutions.

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KLEINFELDER PROJECT NUMBER 112618-1

September 2010

I acknowledge that the coal combustion waste management units referenced herein:

- F. B. Culley Power Generating Station, West Ash Pond
- F. B. Culley Power Generating Station, East Ash Pond

were assessed on August 17, 2010.

Signature: _____ Date: _____

Anthony G. Devine, PE (Indiana)
Senior Professional

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EXECUTIVE SUMMARY

Background information taken from the U. S. Environmental Protection Agency's (EPA's) website:

> "Following the December 22, 2008 dike failure at the TVA/Kingston, Tennessee coal combustion waste (CCW) ash pond dredging cell that resulted in a spill of over 1 billion gallons of coal ash slurry, covered more than 300 acres and impacted residences and infrastructure, the EPA is embarking on an initiative to prevent the catastrophic failure from occurring at other such facilities located at electric utilities in an effort to protect lives and property from the consequences of a dam or impoundment failure of the improper release of impounded slurry."

As part of the EPA's effort to protect lives and the environment from a disaster similar to that experienced in 2008, Kleinfelder was contracted to perform a site assessment at the F. B. Culley Power Generating Station that is owned and operated by Vectren Corporation. This report summarizes the observations and findings of the site assessment that occurred on August 17, 2010.

The coal combustion waste impoundments observed during the site assessment included:

- West Ash Pond – Commissioned in the mid-1960's
- East Ash Pond – Commissioned in 1973

Preliminary observations made during the site assessment are documented on the Site Assessment Checklist presented in Appendix A. A copy of this checklist was transmitted to the EPA within 5 days of the field walk-through. A more detailed discussion of the observations is presented in Section 4, "Site Observations."

The west and east ash pond impoundments are not regulated by any state agency and therefore do not currently have a designated hazard rating. Due to the potential environmental and economic impacts that a failure at either of these impoundments would present by breaching the south banks into the Ohio River, it is recommended a Hazard Potential Classification of "Significant" be assigned to both impoundments.

Overall, the site is marginally well maintained and operated with a few areas of concern as discussed in Section 6, "Recommendations."

On the date of this site assessment, there appeared to be no immediate threat to the safety of the impoundment embankments. No assurance can be made regarding the impoundments condition after this date. Subsequent adverse weather and other factors may affect the condition. The conclusions of this report are subject to the conditions set forth in the "Limitations" section (Section 8).

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A brief summary of the Priority 1 and 2 Recommendations is given below. A more detailed discussion is provided in Section 6, "Recommendations."

Priority 1 Recommendations

1. Perform stability, seepage, and seismic analyses.
2. Evaluate large trees on south bank downstream slopes.
3. Control vegetation on the upstream and downstream slopes.
4. Repair erosion and over-steepening of upstream slopes.
5. Prepare an EAP for the facility.
6. Perform a hydrologic and hydraulic study.

Priority 2 Recommendations

1. Develop an Operation and Maintenance (O&M) manual for the impoundments and the facility.
2. Maintain a log of maintenance and other activities at the impoundments and supporting facilities.
3. Test the pump for the west pond annually.
4. Test the pump for the east pond annually.

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Table of Contents

EXECUTIVE SUMMARY 1

1 INTRODUCTION 5
- **1.1 GENERAL 5**
- **1.2 PROJECT LOCATION 5**
- **1.3 SITE DOCUMENTATION 5**

2 SITE ASSESSMENT 6
- **2.1 ATTENDEES 6**
- **2.2 IMPOUNDMENTS ASSESSED 6**
- **2.3 WEATHER DURING SITE ASSESSMENT 6**

3 SITE INFORMATION AND HISTORY 7
- **3.1 POWER GENERATING PLANT 7**
- **3.2 WEST ASH POND 7**
- **3.3 EAST ASH POND 8**
- **3.4 HYDROLOGY AND HYDRAULICS 9**
  - 3.4.1 West Ash Pond 9
  - 3.4.2 East Ash Pond 9
- **3.5 PERTINENT DATA 10**
- **3.6 REGIONAL GEOLOGY 12**
- **3.7 GEOTECHNICAL CONSIDERATIONS 12**
- **3.8 STRUCTURAL CONSIDERATIONS 12**
- **3.9 PERFORMANCE EVALUATIONS 13**
- **3.10 HAZARD POTENTIAL CLASSIFICATION 13**
- **3.11 SITE ACCESS 13**

4 SITE OBSERVATIONS 15
- **4.1 WEST ASH POND 15**
  - 4.1.1 Upstream Slope 15
  - 4.1.2 Crest 15
  - 4.1.3 Downstream Slope 16
  - 4.1.4 Downstream Toe Area 16
  - 4.1.5 Outlet Works 16
  - 4.1.6 Impoundment Inlet 17
- **4.2 EAST ASH POND 17**
  - 4.2.1 Upstream Slope 17
  - 4.2.2 Crest 17
  - 4.2.3 Downstream Slope 18
  - 4.2.4 Downstream Toe Area 18
  - 4.2.5 Outlet Works 18
  - 4.2.6 Impoundment Inlet 19
- **4.3 OTHER 19**

US EPA ARCHIVE DOCUMENT

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5 OVERALL CONDITION OF THE FACILITY IMPOUNDMENTS 20
5.1 CONCLUSIONS OF SITE ASSESSMENT 20
5.2 SUMMARY STATEMENT 1

7 RECOMMENDATIONS 22
7.1 DEFINITIONS 22
7.2 PRIORITY 1 RECOMMENDATIONS 22
7.3 PRIORITY 2 RECOMMENDATIONS 24

8 GLOSSARY OF TERMS 25
8.1 HAZARD POTENTIAL CLASSIFICATION 25
8.2 DAM CLASSIFICATION 25
8.3 OVERALL CLASSIFICATION OF DAM 26
8.4 CONDITION RATING CRITERIA 26
8.5 RECOMMENDATIONS 27

9 LIMITATIONS 28

10 REFERENCES 30

List of Figures

Figure 1 Critical Infrastructure Map
Figure 2 F. B. Culley Power Generating Station Aerial Location Map
Figure 3 Plan of Inspection Points

List of Appendices

Appendix A Site Assessment Checklists
Appendix B Site Assessment Photographs
Appendix C Response Letter to the EPA's Section 104(e) Request for Information

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1 INTRODUCTION

1.1 GENERAL

This report has been prepared for the United States Environmental Protection Agency (EPA) to summarize Kleinfelder's findings and observations from a site assessment of the west and east ash ponds at the F. B. Culley Power Generating Station on August 17, 2010.

The following sections present a summary of data collection activities, site information and performance history of the facility's ash ponds made available by the owner (Vectren Corporation), a summary of site observations, and recommendations resulting from the site assessment.

1.2 PROJECT LOCATION

The F. B. Culley Power Generating Station is located on the right bank of the Ohio River approximately two miles west of Newburgh, Indiana. The generating station is located in Warrick County at approximately latitude 37° 54' 38'' and longitude -87° 19' 32''. The area around the plant is a relatively flat to gently rolling rural agricultural area.

The project location with respect to nearby critical infrastructure is shown on Figure 1. An aerial photograph of the facility is shown on Figure 2.

1.3 SITE DOCUMENTATION

The following documents were provided from the owner for review:

- F. B. Culley West Pond 2008 Post Dredging Contours plan (Trans Ash, 2008)
- F. B. Culley Station Unit No. 3 (East Ash Pond) Site Grading Plan (Brown and Root, Inc., 1970)
- Plant and Coal Storage Fill Diversion of Little Pigeon Creek plan (1953)
- Civil Plan of Ash Pond Dike (East Ash Pond) (Mid-Valley, Inc., 1992)
- Ash Pond Leak or Breach – F.B. Culley Generating Station 1-page emergency action protocol
- Internal inspection reports for East and West Ash Pond, 2009 3rd Quarter
- Work order requests for internal inspection reports
- ATC Associates Inc. consulting report dated April 14, 2009

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2 SITE ASSESSMENT

2.1 ATTENDEES

The site assessment was performed on August 17, 2010 by Anthony Devine, P.E. (Indiana) and Travis Kluthe, E.I.T. of Kleinfelder. Other persons present during the site assessment include:

- Lisa Messinger – Vectren Corporation
- Keith Farrer – Vectren Corporation
- Chris Leslie – Vectren Corporation
- The EPA did not have a representative present for this assessment

2.2 IMPOUNDMENTS ASSESSED

The coal combustion waste impoundments observed during the site assessment included:

- West Ash Pond – Commissioned in the mid-1960's
- East Ash Pond – Commissioned in 1973

Preliminary observations made during the site assessment are documented on the Site Assessment Checklist presented in Appendix A. A copy of this checklist was transmitted to the EPA within five days of the field walk-through. A more detailed discussion of the site assessment observations is presented in Section 4, "Site Observations."

2.3 WEATHER DURING SITE ASSESSMENT

The weather experienced during the field walk-through was sunny and clear with temperatures ranging from 80° to 90° F and generally light winds.

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3 SITE INFORMATION AND HISTORY

3.1 POWER GENERATING PLANT

The F. B. Culley Power Generating Station plant was constructed in 1953 by excavating a portion of the hills located just north of the new plant and placing the material as fill to a finished grade elevation of 393 feet. This generally required about 15 feet of fill be placed across most of the new plant footprint. No details are available regarding the composition of the fill material, the placement methods, or degree of compactive effort applied during construction. A design drawing prepared by Commonwealth and Associates, Inc. approved for construction dated March 6, 1953 was provided for referencing plant details.

Part of the plant site development involved diversion of Little Pigeon Creek that previously flowed east-to-west across the plant area. The creek was diverted to the Ohio River at a bend located south/southeast of the plant (and southeast of the future east ash pond).

The south bank of the plant that extends to the Ohio River was designed to be a 3H:1V slope protected by 18 to 30 inches of riprap over nine inches of gravel. The riprap is designed to extend from an elevation of 344 feet (three feet below normal pool elevation in the river at an elevation of 347 feet) to a finished grade elevation of 393 feet. The design high water level in the river is indicated to be at an elevation of 391.5 feet. During the site assessment, the brush and trees covering the downstream slope of the south bank at the plant did not allow for an evaluation of the riprap protection. If still present, it is over-grown with vegetation.

3.2 WEST ASH POND

The West Ash Pond, commissioned in the mid-1960's, is primarily an incised pond. The surrounding ground surface just west, north, and east of the pond is relatively flat or rises slightly above the existing crest. The south bank downstream slope appears to also be an incised bank that falls to the Ohio River. The horizontal distance from the crest to the river varies from about 100 to 200 feet. The elevation drop is about 40 to 50 feet with an intermediate flatter terrace about half to two-thirds down the slope. Visually, the downstream slope appears to be at 2H:1V to 3H:1V. The upstream slopes are estimated to at approximately 1H:1V to 2H:1V.

No significant signs of slope instability or settlement were found during our assessment of the West Ash Pond. Accessibility (fenced at the downstream crest hinge point) and vegetation cover did not allow for assessment of the south bank downstream slope. The upstream slopes showed signs of erosion, over steepening, and some areas of weeds and small tree growth.

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The West Ash Pond is at about half its total storage capacity with eight to ten feet of freeboard. The pond has been used to much higher capacity in the past; however, discharge into the pond has decreased over the last several years. Fly ash, generated since 1999, is stored in a silo and shipped off to a cement kiln. A neighboring industrial site was discharging fly ash into the west pond from one of its units until 2007 when this source of input was stopped.

3.3 EAST ASH POND

The East Ash Pond, commissioned in 1973, is primarily an incised pond with the exception of the east bank, which is an earthen dike built during the diversion of Little Pigeon Creek in 1953. The east bank appears to be a fill embankment approximately six to eight feet high and about 100 to 150 feet long.

The surrounding ground surface just west of the pond is relatively flat (plant area). The ground surface north of the pond is relatively flat for 30 to 40 feet and then rises northward. The south bank's downstream slope appears to also be an incised bank that falls to the Ohio River. The distance from the crest to the river varies from about 100 to 250 feet. The elevation drop is about 40 to 50 feet with an intermediate flatter terrace about half to two-thirds down the slope. Visually, the downstream slope appears to be at 2H:1V to 3H:1V. The upstream slopes are estimated to at approximately 1H:1V to 2H:1V.

No significant signs of slope instability or settlement were found during our assessment of the East Ash Pond. Vegetation cover did not allow for assessment of the south bank downstream slope. The upstream slopes showed signs of erosion, over steepening, and some areas of weeds and small tree growth.

The East Ash Pond is the main storage for current production with typically one to two feet of freeboard.

The East Ash Pond was modified in 1992 to 1993 by filling an approximately 14,000 square foot area in the southwest corner to form a building pad for construction of the scrubber silos. The design drawing prepared by Mid-Valley, Inc. indicates this portion of the old East Ash Pond was excavated to an elevation of 370 feet (approximately 27,000 cubic yards of ash removed), leaving approximately five to ten feet of "existing compacted cinders and bottom ash." The bottom of the excavation was covered with two feet of coarse gravel fill (Indiana #1, #2, or #5 gradation). The area was then backfilled with "sandy clay (ML-CL)" to an elevation of 393 feet (approximately 2,200 cubic yards). A table in the design drawings, showing the estimated quantities of materials for bidding purposes, indicates this backfill material was "bentonite treated fill (ML-CL)." Neither the composition of the backfill, nor the methods of placement and compaction are known. The upstream slope facing the remaining east pond was designed at an angle of 1.3H:1V with 6 inches of bedding gravel beneath two feet of Type A riprap.

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3.4 HYDROLOGY AND HYDRAULICS

The pond embankments are not defined as jurisdictional dams by the State of Indiana and are not regulated by a state agency. Both ponds have undergone an in-house (Vectren Corporation) quarterly inspection since the third quarter of 2009. The protocol for the in-house inspections was developed from an outside consultant inspection in the second quarter of 2009 by ATC Associates from Indianapolis, Indiana.

3.4.1 West Ash Pond

The West Ash Pond has a surface area of approximately 18 acres and is used to store various waste from plant operations, about half of the stormwater that falls within the plant area, and the precipitation falling directly onto the pond surface. The exact limits of the watershed would be difficult to determine without an updated survey of the impoundments, plant footprint, and surrounding areas as well as storm sewer plans.

During the site assessment, no documents relating to a hydrologic study, hydraulic design calculations and assumption, or dam break analyses were provided for review. It is unknown what the designed inflow, capacity of the ponds, freeboard, or other important components of the impoundment designs are without these studies and documents.

The West Ash Pond does not have an open channel spillway or outlet works pipe. The pond is equipped with a pump station capable of recirculating water to the East Ash Pond. Material from the West Ash Pond was removed in 2008 and the pond has not been actively used since. Vectren staff indicated the pump station has not been operated since 2008 but should still be functional. Pump station capacity data was not provided to Kleinfelder for review.

A recent survey of the West Ash Pond embankment crest elevations was provided to Kleinfelder for review. The survey was limited to the embankment area; therefore, the exact extents of the drainage area to the pond could not be determined.

In the event of a failure of the south bank, the pond would discharge directly into the Ohio River. There are no buildings or roads between the pond and the Ohio River; however, a shipping dock could potentially sustain damage in the event of failure. The City of Newburgh, IN is located on the right bank of the Ohio River, approximately three miles downstream of the site, and would be the first critical infrastructure affected by a failure.

3.4.2 East Ash Pond

The East Ash Pond has a surface area of approximately seven acres and is used to store various waste from plant operations, about half of the stormwater that falls within

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the plant area, and the precipitation falling directly onto the pond surface. The exact limits of the watershed would be difficult to determine without an updated survey of the impoundments, plant footprint, and surrounding areas as well as storm sewer plans.

During the site assessment, no documents relating to a hydrologic study, hydraulic design calculations and assumption, or dam break analyses were provided for review. It is unknown what the designed inflow, capacity of the ponds, freeboard, or other important components of the impoundment designs are without these studies and documents.

The East Ash Pond does not have an open channel spillway or outlet works pipe.
A decommissioned weir box near the east embankment that historically drained to Little Pigeon Creek is now sealed with concrete. The pond is equipped with a pump station capable of recirculating water to the West Ash Pond. Vectren staff indicated the pump station is operated on a frequent basis. No documents were provided to determine the capacity of the pump station.

A recent survey of the East Ash Pond embankment crest elevations was provided to Kleinfelder for review. The survey was limited to the embankment area; therefore, the exact extents of the drainage area to the pond could not be determined.

In the event of a failure, the pond would discharge directly into the Ohio River or Little Pigeon Creek that eventually drains to the Ohio River. There are no buildings or roads between the pond and the Ohio River that could be damaged; however, some construction activity was observed east of the pond that could potentially be damaged in the event of a failure. The City of Newburgh, IN is located on the right bank of the Ohio River, approximately three miles downstream of the site, and would be the first critical infrastructure affected by a failure.

3.5 PERTINENT DATA

A. GENERAL

1. Name ..... F. B. Culley Power Generating Station
2. State ..... Indiana
3. County ..... Warrick
4. Latitude ..... 37° 54’ 38’’
5. Longitude ..... -87° 19’ 32’’
6. River used for Operations ..... Ohio River
7. Year Constructed 1953
8. Modifications ..... None
9. Current Hazard Classification ..... None
10. Proposed Hazard Classification ..... Significant
11. Size ..... Unregulated

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B. IMPOUNDMENT DETAILS

West Ash Pond

1. Type ..... Incised
2. Lowest Crest Elevation (west side of pond) ..... 394.4 feet[1]
3. Pool Elevation at Time of Assessment ..... 386.8 feet[1]
4. Average Annual Variation in Pool Elevation ..... ±0.5 feet
5. Crest Length ..... Approx. 5,100 feet
6. Crest Width (south bank) ..... 40 feet
7. Embankment Height (south bank) ..... 40 to 50 feet
8. Upstream Slope ..... 1H:1V to 2H:1V
9. Downstream Slope (south bank only) ..... 2H:1V to 3H:1V
10. Surface Area ..... 18 acres

East Ash Pond

1. Type ..... Combination Earthen Dike/Incised
2. Crest Elevation ..... 395.4 feet[1]
3. Pool Elevation at Time of Assessment ..... 392.1 feet[1]
4. Average Annual Variation in Pool Elevation ..... ±1 feet
5. Crest Length ..... Approx. 3,400 feet
6. Crest Width (south/east bank) ..... 20/10 feet
7. Embankment Height (south/east bank) ..... 40/15 feet
8. Upstream Slope ..... 1H:1V to 2H:1V
9. Downstream Slope (south/east bank) ..... 2H:1V to 3H:1V
10. Surface Area ..... 7 acres

C. DRAINAGE BASIN

1. Area of Drainage Basin ..... Limited to pond surface and plant area
2. Downstream Description ..... Down river is rural agricultural and small towns

D. IMPOUNDMENT CAPACITY AND INLET

West Ash Pond

1. Impoundment Capacity ..... 1,000,000 cubic yards
2. Impoundment Inlet ..... Multiple inlet pipes from the generating station

East Ash Pond

1. Impoundment Capacity ..... 600,000 cubic yards
2. Impoundment Inlet ..... Multiple inlet pipes from the generating station

E. PRIMARY SPILLWAY

West Ash Pond

1. Description ..... N/A – No Overflow or Spillway Present

East Ash Pond

1. Description ..... N/A – No Overflow or Spillway Present

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F. OUTLET WORKS

West Ash Pond

1. Description……....No outlet works present.
2. Recirculating pump to East Ash Pond available for pond drawdown.

East Ash Pond

1. Description……....No outlet works present.
2. Recirculating pump to West Ash Pond available for pond drawdown.

G. MANAGEMENT

1. Owner..... Vectren Corporation
2. Purpose ..... Coal-fired energy generation

Note: 1. Elevations were obtained from plant personnel or the original construction drawings by Sargent and Lundy Engineers, Chicago, Illinois.

3.6 REGIONAL GEOLOGY

The project is located in an area with approximately 200 feet of Quaternary age glacial deposits overlying Pennsylvanian age sedimentary rocks (Gray 1987). The glacial deposits mapped in the project area consist of loess, lacustrine silts and clays, and undifferentiated glacial outwash (Gray 1989). The Pennsylvanian age bedrock consists of sandstone and shale with thin beds of limestone, clay, and coal (Gray 1989).

Holocene age alluvium is superimposed on this regional geologic trend along existing streams and Ohio River. The alluvial deposits typically consist of variable combinations of gravel, sand, silt, clay, and organics. In general, the more coarse-grained materials are found within the existing channels or on near channel terraces from overbank and natural levee breach events. The finer-grained materials are typically found further from the channel on higher terraces and in areas of slow to stagnant water flow.

Fault structures of unknown age are found in the region generally located west, east, and south of the project area (USGS 2007). These features consist of normal faults trending northeast-southwest and east-west.

3.7 GEOTECHNICAL CONSIDERATIONS

Embankment stability or seepage analyses are not currently known or available.

3.8 STRUCTURAL CONSIDERATIONS

There are no major structural design elements, such as outlet works, that are known to exist or that were observed during the inspection of the F.B. Culley Power Generation Station impoundments. Also, during the inspection, no design documents were

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presented or reviewed that would suggest the presence of structural members at the F.B. Culley Power Generation Station impoundments.

3.9 PERFORMANCE EVALUATIONS

There have been no previous federal or state inspections of the ash pond impoundments at the F. B. Culley Power Generating Station. Vectren Corporation's plant personnel have performed quarterly inspections since the third quarter of 2009 of the impoundments and their associated structures. Based on observations made by Vectren Corporation personnel during their in-house inspections, there have been no major incidents involving the West Ash Pond or East Ash Pond impoundments.

Recommendations noted in the quarterly inspection reports include:

- Keep upstream and downstream slopes clear of brush and trees
- Repair erosion features and upstream slopes to 2.5H:1V
- Maintain gravel driving surface along portions of the crest
- Design and install emergency spillway(s)
- Update Emergency Action Plan for overtopping failure

In addition, an outside consultant (ATC Associates, Inc., Indianapolis, Indiana) was hired to perform an evaluation of the West Ash Pond and East Ash Pond impoundments in April 2009. Vectren Corporation personnel indicated this report was used to develop the protocol for their in-house quarterly inspections. A copy of ATC's report has been reviewed as part of this study. The important recommendations contained in that report are similar to those mentioned above from the in-house quarterly inspections.

3.10 HAZARD POTENTIAL CLASSIFICATION

The West Ash Pond and East Ash Pond impoundments are not regulated by any state agency and therefore do not currently have a designated hazard rating. Due to the potential environmental and economic impacts that a failure at either of these impoundments would present, it is recommended a Hazard Potential Classification of "Significant" be assigned to both impoundments. A "High" Hazard Potential Classification was not assigned to either impoundment, because loss of life would not be likely in the event of a failure. A loss of life is not expected because the ash ponds sit immediately adjacent to the Ohio River without any homes, recreational facilities, businesses, roads, or other structures immediately downstream of the impoundments.

3.11 SITE ACCESS

Following security point check-in to gain permission for access from Vectren Corporation personnel, the owner's representative lead the assessment team to the

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impoundments. The impoundments can be accessed by a standard vehicle under normal weather conditions.

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4 SITE OBSERVATIONS

The upstream and downstream embankment slopes, downstream toes, and pump stations of the west and east ash ponds were observed during an August 17, 2010 site assessment. A brief summary of the features observed is presented below.

A copy of the Site Assessment Checklist generated during the field walk-through for each impoundment is provided in Appendix A. Photographs taken during the site assessment are presented in Appendix B. Vectren Corporation responses to the EPA's Section 104(e) Request for Information are included in Appendix C.

4.1 WEST ASH POND

4.1.1 Upstream Slope

Overall, the upstream slope of the West Ash Pond was in fair condition. Photographs 1 through 17 in Appendix B show the conditions observed for the West Ash Pond. A plan map showing the photograph locations is shown on Figure 3. Specific observations include:

- The upstream slope was at approximately 1H:1V to 2H:1V. It is possible that cleanout operations could have cut into the embankment and steepened it over time.
- Minor erosion features, generally less than six inches deep, were noted on some of the upstream slopes. Some of these erosion gullies have been filled with gravel as shown in Photographs 6 and 7 in Appendix B.
- Intermittent grasses and woody bushes were observed on the upstream slope.
- The upstream slope surface consisted mostly of ash and some gravel. Short grass vegetation is not present on the majority of the upstream slope.
- A few power poles are located in the upstream slope on the east bank.

4.1.2 Crest

Overall, the crest of the impoundment was in fair to good condition. Specific observations include:

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- The crest of the West Ash Pond is a gravel-surfaced road along most of its length. In some areas, especially the west bank, the driving/wearing surface is ash.

- No major depressions or rutting were noted on the crest.

- A chain link fence is located near the south bank downstream crest hinge point.

- Minor erosion was noted on the crest in multiple locations. This erosion was typically less than six inches deep and typically appeared on the edges of the crest, where grade breaks occurred when transitioning to embankment slopes.

4.1.3 Downstream Slope

Overall, the downstream slope of the south bank was in fair to poor condition, based on limited access and visibility. The other three sides of the pond do not have downstream slopes. Specific observations include:

- The south bank downstream slope was at approximately 2H:1V to 3H:1V. Some areas of the south bank downstream slope appear to have riprap slope protection. Limitations to access and thickness of vegetation did not permit any further evaluation of the downstream slope protection.

- Brush and large mature trees were observed on the downstream slope and at the toe of the embankment for the majority of the south bank.

4.1.4 Downstream Toe Area

The downstream toe area of the south bank could not be evaluated in detail. Key features and observations of these areas include:

- The south bank downstream toe area was inaccessible.

- Brush and large mature trees were observed at the downstream toe for the majority of the south bank.

- Bathymetry of the river channel at the toe of the south slope was not available for review.

4.1.5 Outlet Works

The west ash pond does not have a traditional gravity outlet works configuration. The only means of drawdown is from the pump station located along the south bank of the pond. The pump station has a concrete intake structure and can pump water to the

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East Ash Pond via a 10-inch HDPE pipe. No data was provided regarding the capacity of the pump or the minimum drawdown elevation. According to Vectren personnel, the pump station was last operated in 2008.

4.1.6 Impoundment Inlet

Several discharge pipes were observed in the West Ash Pond at various locations. The only pipe actively discharging into the pond during the inspection was located in the southeast corner of the pond. Several decommissioned pipes were observed along the embankment. Vectren staff indicated the West Ash Pond is receiving less discharge than the East Ash Pond and is available mainly for overflow capacity for the east pond.

4.2 EAST ASH POND

4.2.1 Upstream Slope

Overall, the upstream slope of the impoundment was in fair condition. Photographs 18 through 31 in Appendix B show the conditions observed around the East Ash Pond. Specific observations include:

- The upstream slope was at approximately 1H:1V to 2H:1V. It is possible that cleanout operations could have cut into the embankment and steepened it over time.
- Minor erosion features, generally less than six inches deep, were noted on some of the upstream slopes.
- Intermittent grasses and woody bushes were observed on the upstream slope.
- A few areas had small diameter trees on the upstream slope.

4.2.2 Crest

Overall, the crest of the impoundment was in fair to good condition. Specific observations include:

- The crest is a gravel-surfaced road throughout the east pond.
- No major depressions or rutting were noted on the crest.
- Minor erosion was noted on crest in multiple locations. This erosion was typically less than six inches deep and typically appeared on the edges of the crest where grade breaks occurred when transitioning to embankment slopes.

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4.2.3 Downstream Slope

Overall, the east bank's (adjacent to Little Pigeon Creek) downstream slope was in fair to good condition, and the south bank's (adjacent to the Ohio River) downstream slope was in fair to poor condition. The downstream toe area of the south bank could not be evaluated in detail due to thick vegetation cover. Specific observations include:

- The south bank's downstream slope was at approximately 2H:1V to 3H:1V. The south bank's downstream slope was largely inaccessible. Brush and large mature trees were observed on the downstream slope for the majority of the south bank.

- The east bank's downstream slope was approximately 2H:1V. The east bank's downstream slope was accessible and covered with short mowed grasses. No signs of significant stability or uncontrolled seepage related distress were observed.

4.2.4 Downstream Toe Area

Overall, the east bank's downstream toe area was in fair to good condition, and the south bank's downstream toe area was in fair to poor condition. The downstream toe area of the south bank could not be evaluated in detail due to thick vegetation cover. Specific observations include:

- The south bank's downstream toe area was inaccessible. Brush and large mature trees were observed at the downstream toe for the majority of the south bank.

- The east bank's downstream toe area was accessible and covered with short mowed grasses. No signs of significant stability or uncontrolled seepage related distress were observed.

- Bathymetry of the river channel at the toe of the south slope was not available for review.

4.2.5 Outlet Works

The East Ash Pond does not have a traditional gravity outlet works configuration. The only means of drawdown is from the pump station located along the west bank of the pond. The pump station has a concrete intake structure and can pump water to the West Ash Pond via a 10-inch HDPE pipe. No data was provided regarding the capacity of the pump or the minimum drawdown elevation. According to Vectren personnel, the pump station is operated at least on a monthly basis. The East Ash Pond has a

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decommissioned outlet works structure located on the east embankment that has been sealed with concrete.

4.2.6 Impoundment Inlet

Several discharge pipes were observed in the East Ash Pond at various locations, mainly along the south embankment. Several pipes were actively discharging into the pond. Vectren personnel indicated the East Ash Pond receives the majority of discharges from the facility.

4.3 OTHER

During the site assessment, Emergency Action Plan (EAP) documentation was requested. Vectren Corporation plant personnel provided a one-page document, titled "Ash Pond Leak or Breach," that listed four steps to follow in the event of a leak or breach. The content of this document consisted mainly of emergency contact information of plant personnel, state and federal agencies, and subcontractors. Currently, there is not a more complete EAP for the ponds.

During the site assessment, Operation and Maintenance (O&M) manual documentation was requested. The O&M manual would document day-to-day operations at the plant, how to monitor the freeboard of the ponds, and what actions should be taken at critical water levels. The above referenced EAP should be part of this O&M manual but should also be capable of being a stand-alone document. A formal O&M document was not made available.

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5 OVERALL CONDITION OF THE FACILITY IMPOUNDMENTS

5.1 CONCLUSIONS OF SITE ASSESSMENT

The conclusions of our assessment are organized into three general categories as follows:

Safety of the Impoundments, including Maintenance and Methods of Operation

Kleinfelder understands that the impoundments have a history of safe performance. However, the future performance of these impoundments will depend on a variety of factors that may change over time, including surface water hydrology, changes in groundwater levels, changes in embankment integrity, etc. In light of this situation, Kleinfelder has noted several items, as follows, that present some concern in this regard:

- Large mature trees exist on the south slopes of both ponds.
- An Emergency Action Plan (EAP) is not currently in place at the site to mitigate damage in the event of an emergency related to failure of the impoundment(s).
- Analyses of the embankment slope stability, seepage conditions, or seismic integrity are not currently available for our review.
- Documentation of the impoundment capacity under potential hydrologic and hydraulic loading is not currently available for review.
- An Operation and Maintenance (O&M) manual is not currently in place for the site. Developing an O&M manual, which includes a section that discusses the safety inspection and monitoring program, would be recommended to standardize safety inspection and monitoring practice.

Changes in Design or Operation of the Impoundments following Initial Construction

Kleinfelder is not aware of significant changes in the design or operation of the impoundments.

Adequacy of Program for Monitoring Performance of the Impoundments

The present monitoring program primarily involves visual inspections by plant personnel. These visual inspections seem to be adequate to address issues such as surface erosion and general condition of the impoundments. However, a more detailed monitoring program is recommended to quantify various important factors associated with embankment stability.

Overall, the site is marginally well-maintained and operated with a few areas of concern as discussed in Section 6, “Recommendations.”

On the date of this site assessment, there appeared to be no immediate threat to the safety of the impoundment embankments. No assurances can be made regarding the impoundments condition after this date. Subsequent adverse weather and other factors may affect the condition.

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5.2 SUMMARY STATEMENT

I acknowledge that the management unit(s) referenced herein were personally inspected by me and found to be in the following condition:

FAIR

Signature: _____ Date: _____

Anthony Devine, PE (Indiana)
Senior Professional

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7 RECOMMENDATIONS

7.1 DEFINITIONS

Priority 1 Recommendations: Priority 1 Recommendations involve the correction of deficiencies where action is required to ensure the structural safety and operational integrity of the facility or that may threaten the safety of the impoundment.

Priority 2 Recommendations: Priority 2 Recommendations are where action is needed or required to prevent or reduce further damage or impair operation and/or improve or enhance the O&M of the facility, that do not appear to threaten the safety of the impoundment.

Based on the observations made during the site assessment, it is recommended that the following actions be taken at the F. B. Culley Power Generating Station.

7.2 PRIORITY 1 RECOMMENDATIONS

1. **Perform stability, seepage, and seismic analyses by December 31, 2010.** The upstream slopes of the West Ash Pond and East Ash Pond appear to be as steep as 1H:1V, and their stability is unknown. Downstream slopes along the Ohio River are difficult to inspect due to vegetation. The steepness of the river channel banks is also unknown. Due to the lack of engineering analysis, a subsurface investigation with stability, seepage, and seismic analyses of both impoundments should be completed.

2. **Evaluation of large trees on south bank downstream slopes by December 31, 2010.** The large mature trees that exist on the south bank's downstream slopes should be further evaluated as part of an overall engineering subsurface investigation, including slope stability, seepage, and seismic analyses (Priority 1 Recommendation #1) of the East Ash Pond. As part of this study, the "minimum design embankment prism" of the south bank of the East Ash Pond should be defined. With additional topographic survey information of the south bank geometry, further evaluation can determine the relationship of the large trees on the downstream slope to the minimum design embankment prism. Once this information is available, a determination regarding the removal of the large trees on the downstream slope of the south bank of the East Ash Pond can be made.

   The south bank downstream slope of the West Ash Pond appears to be a long established slope with many mature trees. No visible signs of significant slope distress were observed in the upper portions of the downstream slope or the crest. Given the potential complications associated with disturbing well-established, large rootballs on a slope next to a major waterway, further

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discussion should be initiated with state agencies and the Corps of Engineers for guidance. Also, given the relative inactivity of the West Ash Pond, perhaps monitoring the south bank would be an appropriate next step for evaluation of the West Ash Pond. The results of the engineering study for the south slope of the East Ash Pond should also be used to assist in making decisions for the West Ash Pond's south slope.

3. **Control vegetation on the upstream and downstream slopes by December 31, 2010.** Refer to Federal Emergency Management Agency (FEMA) Manual 534, "Impact of Plants on Earthen Dams" for guidance on vegetation removal. This manual is available on the FEMA website.

4. **Repair erosion and over-steepening of upstream slopes by December 31, 2010.** Minor erosion and over-steepening of the upstream slopes were observed for both the West Ash Pond and East Ash Pond. Where erosion has occurred, these areas should be filled in, and the slopes should be re-dressed with the appropriate fill materials to keep erosion from cutting into and compromising the embankment further. The slopes should have a consistent, well-maintained cover of short grasses.

   Preliminary upstream slope angle recommendations are no steeper than 2.5H:1V. Once the engineering stability evaluation is complete, more detailed recommendations should be available.

   Once the upstream slopes have been restored, the crest should be covered with a driving/wearing surface of crushed aggregate, where it currently is soil or ash covered.

5. **Prepare an EAP for the facility by March 1, 2011.** An EAP should be prepared for the West Ash Pond and East Ash Pond, as well as any other pertinent features at the facility. This document should be complied as soon as possible, and staff at the facility should be familiarized with its content.

6. **Perform a hydrologic and hydraulic study by December 31, 2010.** This study should be performed to determine if the existing ponds are capable of impounding the appropriate inflow design flood. A dam break analysis should also be completed to determine the possible effects on the safety of people and the environment downstream of the facility.

7. **Emergency spillway study by December 31, 2010.** This study should be performed to evaluate alternatives for an emergency outlet system to release flows during extreme precipitation events.

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7.3 PRIORITY 2 RECOMMENDATIONS

1. **Develop an Operation and Maintenance (O&M) manual for the impoundments and the facility by July 1, 2011.** An O&M manual has not been developed for the site and should be completed using the current staff's knowledge, as well as engineering judgment. The EAP should be included as part of this O&M manual once it has been developed.

2. **Maintain a log of maintenance and other activities at the impoundments and supporting facilities on an on-going basis.**

3. **The pump for the West Ash Pond should be tested annually.**

4. **The pump for the East Ash Pond should be tested annually.**

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8 GLOSSARY OF TERMS

For the EPA ash pond inspection program, the following glossary of terms shall be used unless otherwise noted.

8.1 HAZARD POTENTIAL CLASSIFICATION

"Hazard potential" means the possible adverse consequences that result from the release of water or stored contents due to the failure of an impoundment embankment, dam, or reservoir, or the mis-operation of the impoundment, reservoir, or appurtenances. The Hazard Potential Classification of a dam or reservoir shall not reflect in any way on the current condition of the dam or reservoir and its appurtenant works, including the dam or reservoir safety, structural integrity, or flood routing capacity. The classifications are described below:

1. **Low Hazard Potential**

   "Low Hazard Potential" means a dam or reservoir failure will result in no probable loss of human life and low economic or environmental loss. Economic losses are principally limited to the owner's property.

2. **Significant Hazard Potential**

   "Significant Hazard Potential" means a dam or reservoir failure will result in no probable loss of human life but can cause major economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Significant Hazard Potential Classification dams or reservoirs are often located in predominantly rural or agricultural areas but could be located in areas with an increased population density and significant infrastructure.

3. **High Hazard Potential**

   "High Hazard Potential" means a dam or reservoir failure will result in probable loss of human life.

8.2 DAM CLASSIFICATION

According to the Indiana Dam Inspection Manual (DNR, 2007), the classification of dams is defined in the Indiana Code (IC), Section 14-27-7.5. Dams, which are exempt from the Indiana Department of Natural Resources (IDNR), Division of Water jurisdiction, are defined in Indiana Revised Code, Section 14- 27-7.5. The manual also states a dam is currently exempt from the state's authority under IC Section 14-27-7.5 if

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it has a drainage area that is not more than one (1) square mile, if it does not exceed twenty (20) feet in height and its volume does not exceed more than one hundred (100) acre-feet of water. However, a dam that does not fall under the state's authority is still categorized by the hazard classification system and will be required to comply with the corresponding safety requirements. No size classification system could be found on the Indiana DNR website.

8.3 OVERALL CLASSIFICATION OF DAM

In a system similar to the U.S. Department of Interior's "Safety Evaluation of Existing Dams," when the following terms are capitalized they denote and shall be used to describe the overall classification of the dam as follows:

SATISFACTORY – No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, and seismic) in accordance with the applicable criteria. Minor maintenance items may be required.

FAIR – Acceptable performance is expected under all required loading conditions (static, hydrologic, and seismic) in accordance with the applicable safety regulatory criteria. Minor deficiencies may exist that require remedial action and/or secondary studies or investigations.

POOR – A management unit safety deficiency is recognized for any required loading condition (static, hydrologic, and seismic) in accordance with the applicable dam safety regulatory criteria. Remedial action is necessary. POOR also applies when further critical studies or investigations are needed to identify any potential dam safety deficiencies.

UNSATISFACTORY – the facility is considered unsafe. A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution. Reservoir restrictions may be necessary.

8.4 CONDITION RATING CRITERIA

In a system similar to the U.S. Department of Interior's "Safety Evaluation of Existing Dams," the terms "Satisfactory, Fair, Poor, and Unsatisfactory" are used in a general sense when describing the structural condition and the operational adequacy of the equipment for an impoundment or reservoir and its appurtenant works during the visual inspection. In addition, the term "Unknown" may be utilized as applicable.

SATISFACTORY – Expected to fulfill intended function.

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FAIR – Expected to fulfill intended function, but maintenance or other actions are recommended.

POOR – May not fulfill intended function; maintenance, repairs, or other actions are necessary.

UNSATISFACTORY – Is not expected to fulfill intended function; repair, replacement, or modification is necessary.

UNKNOWN – Not visible, not accessible, not inspected, or unable to determine the condition rating based on the observation taken.

8.5 RECOMMENDATIONS

Recommendations shall be written concisely and identify the specific actions to be taken. The first word in the recommendation should be an action word (i.e. "Prepare," "Perform," or "Submit"). The recommendations shall be prioritized and numbered to provide easy reference. Dam safety recommendations shall be grouped, listed, or categorized similar to the U.S. Department of Interior, "Reclamation Manual - Directives and Standards - Review/Examination Program for High- and Significant-Hazard Dams," FAC 01-07 dated July 1998 as follows:

Priority 1 Recommendations: Priority 1 Recommendations involve the correction of deficiencies where action is required to ensure the structural safety and operational integrity of the facility or that may threaten the safety of the impoundment.

Priority 2 Recommendations: Priority 2 Recommendations are where action is needed or required to prevent or reduce further damage or impair operation and/or improve or enhance the O&M of the facility, that do not appear to threaten the safety of the impoundment.

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9 LIMITATIONS

The scope of this work is for a preliminary screening for the EPA and plant owner/operator of the visible performance and apparent stability of the impoundment embankments based only on the observable surface features and information provided by the owner/operator. Other features below the ground surface may exist or may be obscured by vegetation, water, debris, or other features that could not be identified and reported. This site assessment and report were performed without the benefit of any soil drilling, sampling, or testing of the subsurface materials, calculations of capacities, quantities, or stability, or any other engineering analyses. The purpose of this assessment is to provide information to the EPA and the plant owner/operator about recommended actions and/or studies that need to be performed to document the stability and safety of the impoundments.

This work was performed by qualified personnel in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession, practicing in the same locality, under similar conditions, and at the date the services are provided. Kleinfelder's conclusions, opinions, and recommendations are based on a limited number of observations. It is possible that conditions could vary between or beyond the observations made. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided. Kleinfelder makes no warranty or guaranty of future embankment stability or safety.

This report may be used only by the client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance but in no event later than one (1) year from the date of the report.

The information, included on graphic representations in this report, has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, expressed or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. These documents are not intended for use as a land survey product nor are they designed or intended as a construction design document. The use or misuse of the information contained on these graphic representations is at the sole risk of the party using or misusing the information.

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Recommendations contained in this report are based on preliminary field observations without the benefit of subsurface explorations, laboratory tests, or detailed knowledge of the existing construction. If the scope of the proposed recommendations changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed and the conclusions of this report are modified or approved in writing by Kleinfelder. Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.

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10 REFERENCES

Gray, H.H., Ault, C.H., and Keller, S.J., 1987, Bedrock Geologic Map of Indiana, Indiana Geological Survey, Miscellaneous Map 48, scale 1:500,000.

Gray, H.H., 1989, Quaternary Geologic Map of Indiana, Indiana Geological Survey, Miscellaneous Map 49, scale 1:500,000.

Department of Natural Resources, Division of Water, Indianapolis, Indiana, Indiana Dam Safety Inspection Manual (2007), Prepared by Christopher B. Burke Engineering, Ltd. Indianapolis, Indiana.

USGS, 2007, Preliminary Integrated Geologic Map Databases for the United States, Minnesota, Wisconsin, Michigan, Illinois, and Indiana, Version 1.1, Updated December 2007, Open-File Report 2004-1355.

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AERIAL IMAGE

NTS

NOTE: IMAGE TAKEN FROM GOOGLE EARTH, 8/2010

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PROJECT NO.	112618
DATE:	8/30/10
DRAWN BY:	ACH
CHECKED BY:	TAK
FILE NAME:	

FB CULLEY CRITICAL INFRASTRUCTURE MAP

FB CULLEY POWER GENERATING STATION
3700 DARLINGTON RD
NEWBURGH, IN

FIGURE

1

02 Sep 2010, 2:49pm, AHastings

S:\112618 EPA Ash Pond Inspections\Task 1 - FB Culley\

AERIAL IMAGE

NTS

N

NOTE: IMAGE TAKEN FROM GOOGLE EARTH, 8/2010

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PROJECT NO.	112618
DATE:	8/30/10
DRAWN BY:	ACH
CHECKED BY:	TAK
FILE NAME:	

FB CULLEY GENERATING STATION AERIAL LOCATION MAP

FB CULLEY POWER GENERATING STATION
3700 DARLINGTON RD
NEWBURGH, IN

FIGURE

2

02 Sep 2010, 2:14pm, AHastings

S:\112618 EPA Ash Pond Inspections\Task 1 - FB Culley\

ATTACHED IMAGES: Images: Culley Aerlal.jpg
ATTACHED XREFS:
Den-L:\2008\95399
CAD FILE: S:\112618 EPA Ash Pond Inspections\Task 1 - FB Culley\ LAYOUT: General (2)

NOTE: IMAGE TAKEN FROM GOOGLE EARTH, 8/2010

WAYPOINT	DATE/TIME (DAY/MO/YEAR)	COORDINATES (LAT, LONG)	DESCRIPTION
1	17-AUG-10 10:47:51AM	N37 54.698 W87 19.791	Road base used on U/S slope
2	17-AUG-10 10:53:51AM	N37 54.749 W87 19.850	West Pond pump station
3	17-AUG-10 10:59:59AM	N37 54.783 W87 19.904	Decommissioned pipeline from neighboring facility
4	17-AUG-10 11:12:58AM	N37 54.674 W87 19.763	Riprap on D/S embankment slope
5	17-AUG-10 11:24:54AM	N37 54.517 W87 19.419	Vantage point for photos 18, 19, 20, 21
6	17-AUG-10 11:26:48AM	N37 54.514 W87 19.419	4" discharge pipe into East Pond
7	17-AUG-10 11:34:39AM	N37 54.533 W87 19.261	Decommissioned outlet pipe (sealed)
8	17-AUG-10 11:41:26AM	N37 54.568 W87 19.299	Raised embankment on East Pond
9	17-AUG-10 11:45:09AM	N37 54.595 W87 19.352	Trees on East Pond slope
10	17-AUG-10 11:50:46AM	N37 54.577 W87 19.459	East Pond pump station

Use circuit ticket or grab coordinates on cell for verify of location. Use circuit ticket or grab coordinates on cell for verify of location. Use circuit ticket or grab coordinates on cell for verify of location.

Appendix A

Site Assessment Checklists

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Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: F.B. CULLEY GENERATING STATION Date: 8/17/10

Unit Name: WEST ASH POND Operator's Name: VECTREN

Unit I.D.: N/A Hazard Potential Classification: High Significant Low

Inspector's Name: TONY DEVINE + TRAVIS KLUTHE

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?	See Below		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	"		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	"		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	"		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	"		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?		X	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)?		X	From underdrain?		X
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?	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?	N/A		Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	N/A		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	N/A		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

1. IN-HOUSE: QUARTERLY. EXTERNAL CONSULTANT INSPECTION (ATC ASSOCS. INC.) APRIL 2009. ATC'S RECOMMENDATIONS WERE USED TO DEVELOP THE IN-HOUSE PROTOCOL.

9. SOUTH SLOPE (BEYOND FENCE) IS ADJACENT TO THE RIVER, NUMEROUS TREES UP TO 48" DIAMETER THROUGHOUT.

14./15. NO SPILLWAY. OVERFLOW FROM EAST POND IS PUMPED INTO WEST POND. EAST POND IS 7 ACRES AND MOST USED. WEST POND IS 18 ACRES W/ 15 FEET OF FREEBOARD; IT HASN'T FILLED IN MANY YEARS.

EPA FORM -XXXX

NOTE: POOL, DECANT + LOW CREST ELEVATIONS PENDING FROM PLANT REPS.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # N/A INSPECTOR TONY DEVINE
Date 8/17/10 TRAVIS RUTHER

Impoundment Name F.B. CULLEY GENERATING STATION
Impoundment Company VECTREN
EPA Region 5
State Agency (Field Office) Addresss IDEM SOUTHWEST REGIONAL OFFICE
1120 N. VINCENNES AVENUE, PETERSBURG, IN. 47567
Name of Impoundment WEST ASH 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: SETTLING POND + ASH STORAGE

Nearest Downstream Town : Name NEWBURGH, IN.
Distance from the impoundment 2-3 MILES ALONG RIVER
Impoundment Location:
Longitude 87 Degrees 19 Minutes 46.145 Seconds
Latitude 37 Degrees 54 Minutes 43.136 Seconds
State INDIANA County WARRICK
} APPROX. CENTER OF WEST POND

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

If So Which State Agency? IDEM ISSUED A DISCHARGE PERMIT.

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.

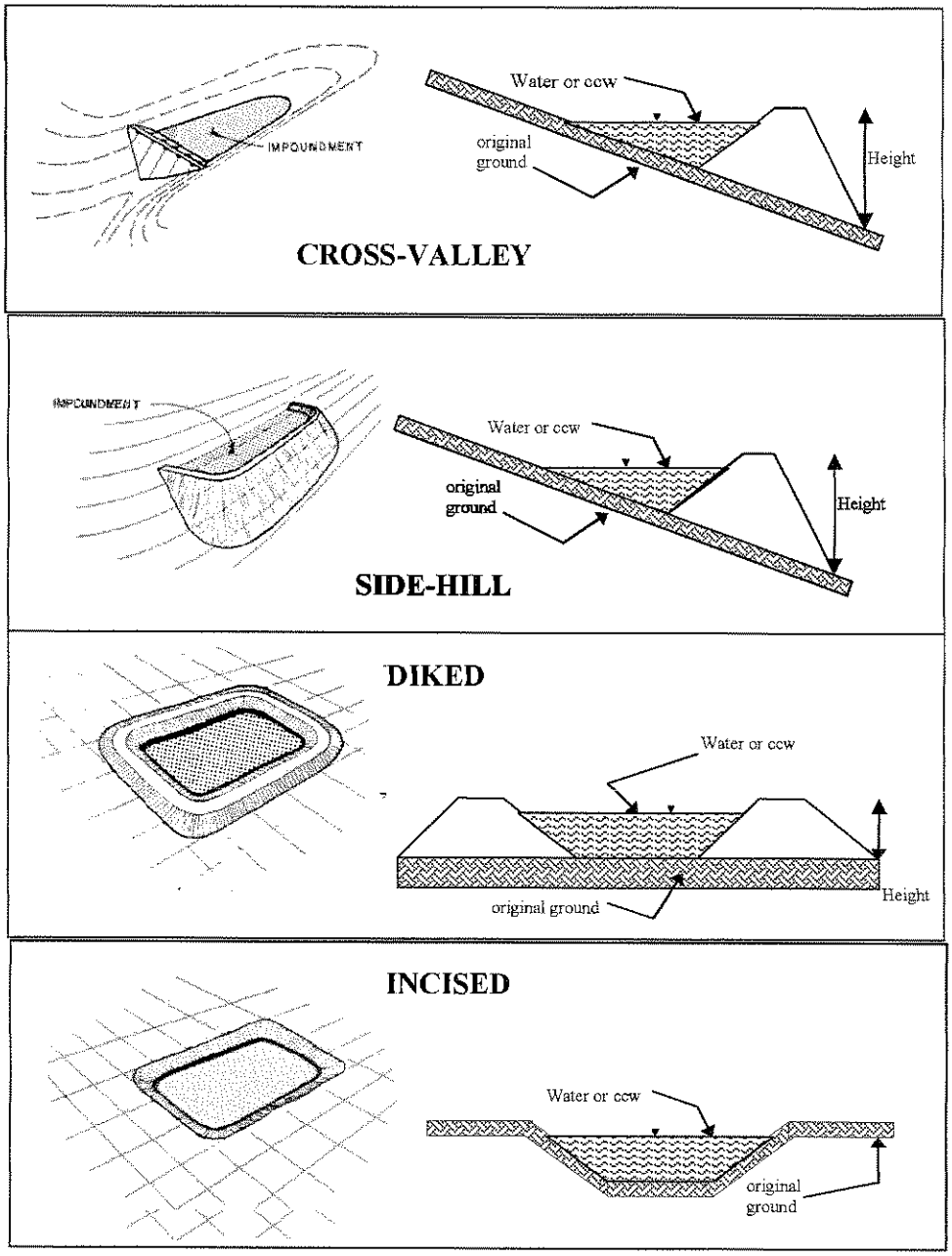
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

NO LOSS OF LIFE RISK. ONLY BANK THAT COULD FAIL IS ADJACENT TO OHIO RIVER. BREACH COULD RESULT IN DISCHARGE OF ASH INTO RIVER; ENVIRONMENTAL IMPACTS.

CONFIGURATION:

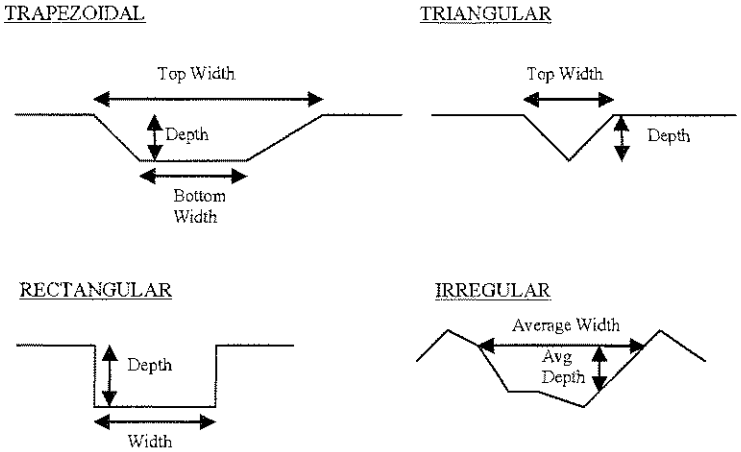


_____ Cross-Valley
_____ Side-Hill
_____ Diked
X Incised (form completion optional) — EXPOSED SOUTH DOWNSTREAM BANK TO RIVER.
_____ Combination Incised/Diked

Embankment Height N/A feet
Embankment Material NATURAL SOILS
Pool Area 18 acres
Liner NONE
Current Freeboard 15 feet
Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

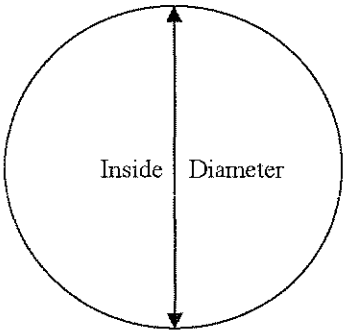
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ ~~Rectangular~~ → No SPILLWAY
_✓_ Irregular



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

_____ **Outlet**

_10"_ inside diameter



— RECIRC. BACK TO PLANT

Material
_____ corrugated metal
_____ welded steel
_____ concrete
_✓_ plastic (hdpe, pvc, etc.) DISCHARGE OUT TO PIPE
_____ other (specify) _____

— PUMPS BETWEEN PONDS

_____

Is water flowing through the outlet? YES _____ NO _____

_✓_ **No Outlet**

_____

_✓_ **Other Type of Outlet** (specify) RECIRC. PIPE

The Impoundment was Designed By NO HISTORY OR RECORDS OF DESIGN.

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 K

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: F.B. CULLEY GENERATING STATION Date: 8/17/10

Unit Name: EAST ASH POND Operator's Name: VECTREN

Unit I.D.: N/A Hazard Potential Classification: High (Significant) Low

Inspector's Name: TONY DEVINE + TRAVIS KLUTHE

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?	SEE BELOW		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	"		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	"		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	"		Is water entering inlet, but not exiting outlet?	N/A	
5. Lowest dam crest elevation (operator records)?	"		Is water exiting outlet, but not entering inlet?	N/A	
6. If instrumentation is present, are readings recorded (operator records)?		X	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)?		X	From underdrain?		X
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?	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?	N/A		Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?	N/A		22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	N/A		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

1. IN-HOUSE: QUARTERLY. EXTERNAL CONSULTANT INSPECTION (ATC ASSOCS. INC.) APRIL 2009. ATC'S RECOMMENDATIONS WERE USED TO DEVELOP THE IN-HOUSE PROTOCOL.

9. SOUTH SLOPE (BEYOND FENCE) IS ADJACENT TO THE RIVER, NUMEROUS TREES UP TO 48" DIAMETER THROUGHOUT. SMALL TREES (<2") AT NW CORNER.

14./15. NO SPILLWAY. OVERFLOW FROM EAST POND IS PUMPED INTO WEST POND. EAST POND IS 7 ACRES AND MOST USED. WEST POND IS 18 ACRES W/ 15 FEET OF FREEBOARD; IT HASN'T FILLED IN MANY YEARS.

EPA FORM -XXXX

NOTE: POOL, DECANT + LOW CREST ELEVATIONS PENDING FROM PLANT REPS.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW) Impoundment Inspection

Impoundment NPDES Permit # N/A INSPECTOR Tony Devine
Date 8/17/10 Travis Kluthe

Impoundment Name F.B. Culley Generating Station
Impoundment Company Vectren
EPA Region 5
State Agency (Field Office) Addresss IDEM Southwest Regional Office
1120 N. Vincennes Ave., Petersburg, IN. 47567
Name of Impoundment East Ash 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: Settling Pond + Ash Storage

Nearest Downstream Town : Name Newburgh, IN.
Distance from the impoundment 2-3 Miles along River
Impoundment Location:
Longitude -87 Degrees 19 Minutes 22.66 Seconds
Latitude 37 Degrees 54 Minutes 33.22 Seconds
State Indiana County Warrick
} Approx. Center of East Pond

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

If So Which State Agency? IDEM Issued Discharge Permit

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.

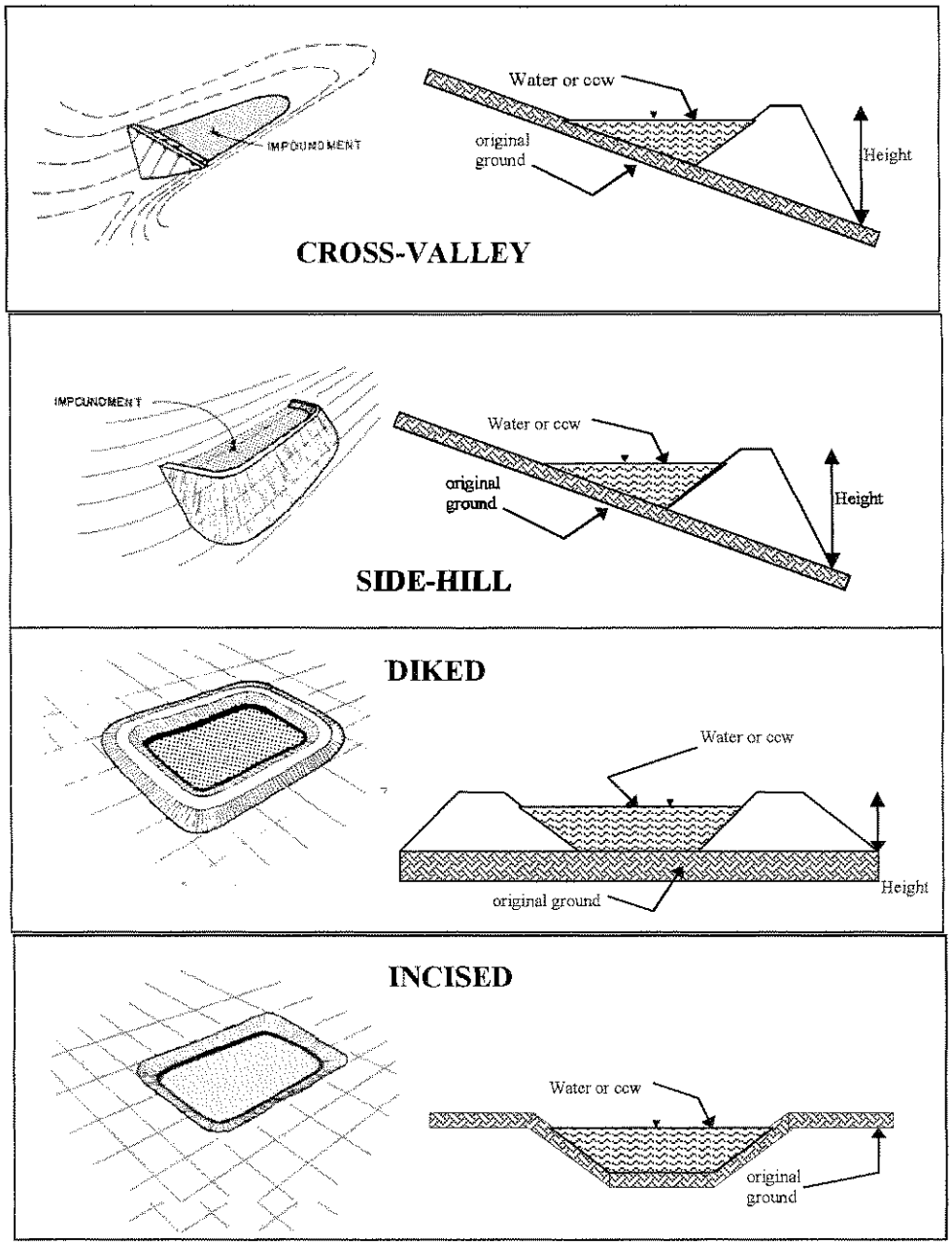
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

NO LOSS OF LIFE RISK. ONLY BLOCK THAT COULD FAIL IS ADJACENT (PIGEON CREEK) TO OHIO RIVER OR CREEK THAT FLOWS INTO THE RIVER. BREACH COULD RESULT IN DISCHARGE OF ASH INTO THE OHIO RIVER; ENVIRONMENTAL IMPACTS.

CONFIGURATION:

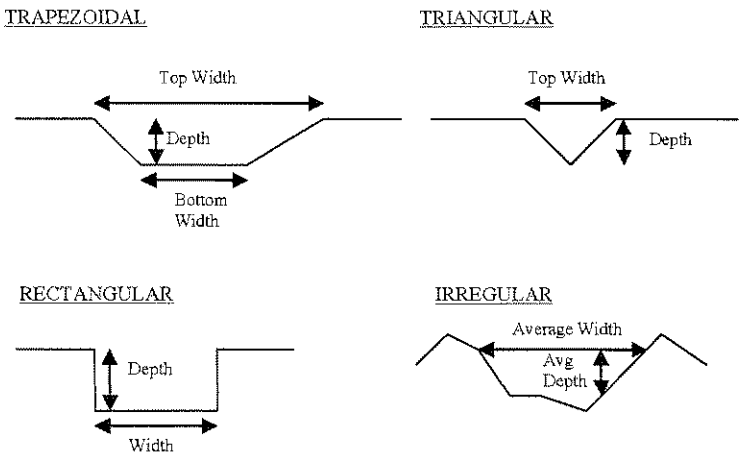


_____ Cross-Valley
_____ Side-Hill
_____ Diked
X Incised (form completion optional) — Exposed South + East Downstream Banks.
X Combination Incised/Diked

Embankment Height East: 15 feet Embankment Material Natural Soils
Pool Area 7 acres Liner None
Current Freeboard 4-5 feet Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

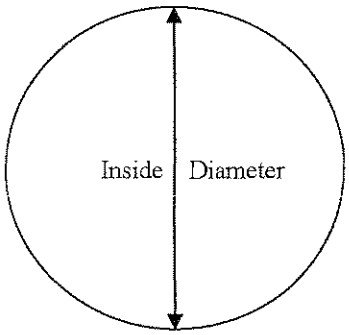
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ ~~Rectangular~~ → NO SPILLWAY
_____ ~~Irregular~~



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

_____ **Outlet**

10" inside diameter



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

_____

Is water flowing through the outlet? YES _____ NO _____

X **No Outlet**

_____

X **Other Type of Outlet** (specify) RECIRC. w/ PLANT + WEST POND

The Impoundment was Designed By NO HISTORY OR RECORD OF DESIGN

Has there ever been a failure at this site? YES _____ NO K

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 : RISER SYSTEM INSTALLED TO CONTROL WATER LEVEL.

Appendix B

Site Assessment Photographs

US EPA ARCHIVE DOCUMENT

Photo 1 – West pond looking north from southeast corner

Photo 2 - West pond looking west along upstream south bank

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Photo 3 - West pond looking north along east bank

Photo 4 - West pond looking west along south bank

Photo 5 - West pond looking west along south bank

Photo 6 – Road gravel on upstream south bank near southwest corner

US EPA ARCHIVE DOCUMENT

Photo 7 – West pond upstream south bank looking east at plant

Photo 8 – West pond pump near southwest corner

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Photo 9 – West pond pump near southwest corner

Photo 10 – West pond pump

Photo 11 – West pond looking north along upstream west bank

Photo 12 – Old ash line from neighboring site through west bank

US EPA ARCHIVE DOCUMENT

Photo 13 – West pond looking east along upstram south bank

Photo 14 – West pond looking west along downstream top of south bank

US EPA ARCHIVE DOCUMENT

Photo 15 – West pond looking east along downstream top of south bank

Photo 16 – Riprap and debris on downstream south slope of west pond near southeast corner

US EPA ARCHIVE DOCUMENT

Photo 17 – Pump lines along plant between west and east ponds (looking west)

Photo 18 – East pond looking northwest from southwest corner

US EPA ARCHIVE DOCUMENT

Photo 19 – East pond looking north from south bank

Photo 20 – East pond looking east from southwest corner

US EPA ARCHIVE DOCUMENT

Photo 21 – East pond looking east

Photo 22 – Discharge pipe into east pond near soutwest corner

US EPA ARCHIVE DOCUMENT

Photo 23 – East pond looking east along south bank

Photo 24 – Old overflow capped and plugged with concrete on east upstream bank

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Photo 25 – East pond looking west along upstream south bank

Photo 26 – East pond looking north along upstream east bank

Photo 27 – East pond looking east along downstream north bank near northeast corner

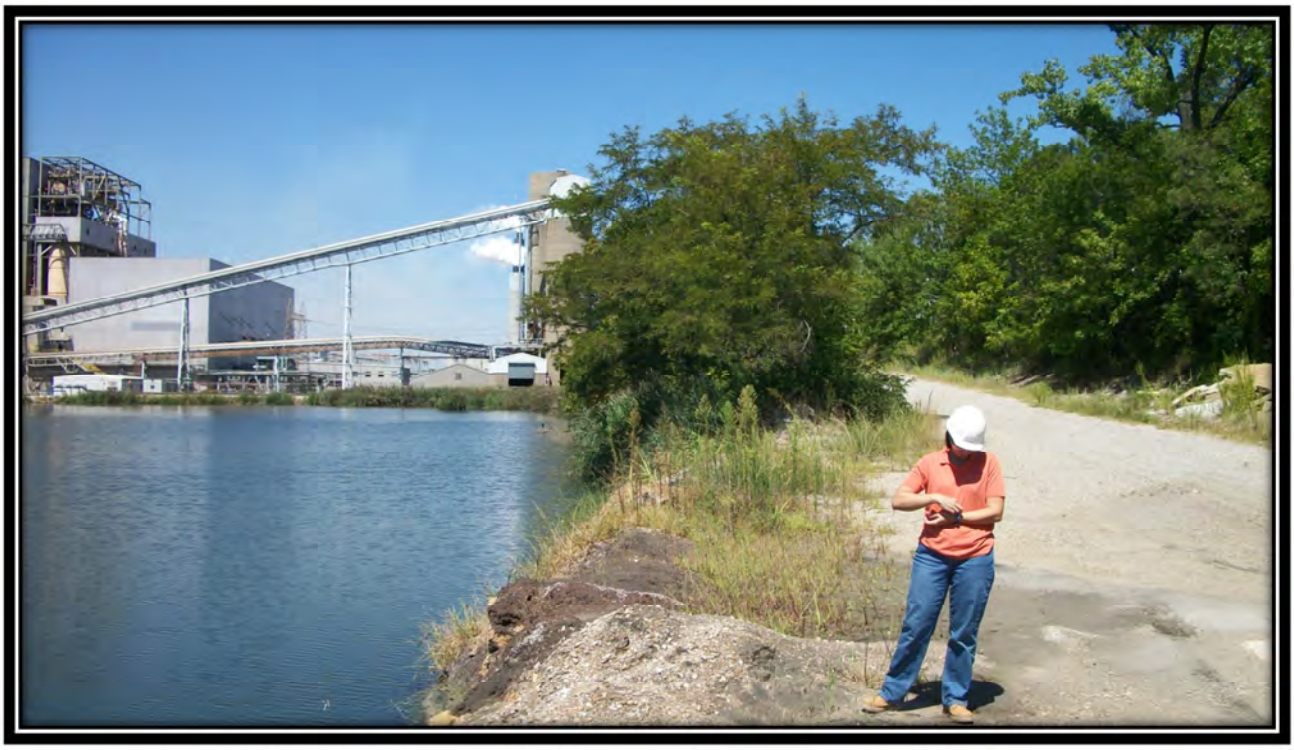


Photo 28 – East pond looking west along upstream north bank

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Photo 29 – East pond pump on upstream west bank

Photo 30 – East pond pump on upstream west bank

Photo 31 – East pond looking north from pump station along upstream west bank

US EPA ARCHIVE DOCUMENT

Appendix C

Response Letter to the EPA's Section 104(e) Request for Information

US EPA ARCHIVE DOCUMENT

Response to Information Request
Southern Indiana Gas and Electric Company – F. B. Culley Generating Station

The F. B. Culley Station has two ash management units.

1. The plant has two ash ponds identified as the East and West ponds. Both ponds were dug into the existing grade. They do not have defined dams and therefore do not have a dam hazard rating. The height of the pond edge is the natural height of the surrounding area.

2. The West pond was commissioned in the mid 1960's and the East pond was commissioned in 1973.

3. Liquid wastes that are sluiced into the ponds include fly ash, bottom ash, FGD belt filter wash down and water sump wastes, pyrites, coal pile run-off, plant floor drain wash downs, air pre-heater wash water, clarified river water line flush (river sediment), oily waste separator water overflow, boiler chemical cleaning wastes (once per 4-5 years), boiler seal trough discharges, and rainfall / storm water runoff from the plant.

   During nine of the last ten years (1999-2008), ash has been excavated from the ponds. The ponds are generally cleaned on an alternating year cycle to a level which will allow for at least 1-2 years of new input. Due to an extensive cleaning cycle in recent years, we do not anticipate needing to clean either pond for another 3-4 years.

4. We are not aware of a PE certification for the safety of the management units. Both ponds are dug into the existing grade. The East pond has a construction design drawing but it is not stamped by a PE.

5. Neither pond has an identified dam so no dam inspections have been conducted. An outside engineering firm, ATC Associates (Indianapolis, IN), has been contracted to perform an inspection of the ponds the first week of April 2009. During the inspection by ATC, personnel at the plant will be instructed on how to perform a proper pond inspection and going forward, in-house inspections will be conducted once per quarter.

6. Neither pond has an identified dam so no State or Federal dam inspections have been conducted.

7. NA – There have not been any inspections.

8. The West pond has a surface area of 18 acres. In order to maintain water capacity necessary to prevent suspended solid issues that would affect our NPDES permit, the pond is limited to 1 million cubic yards of usable storage capacity. As of January 1, 2009 the West pond contained 588,000 cubic yards of material. The East pond has a surface

area of 7 acres. The total storage capacity is estimated to be 600,000 cubic yards and the volume of material stored as of January 1, 2009 is 445,000 cubic yards.

9. No spills or unpermitted releases of ash from the pond have occurred with the last ten years.

Note: There are no additional ponds or settling basins on site. All water from the plant, including storm water, flows through one of the two ash ponds.