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Report

Mountaineer Bottom Ash Complex Report

Lockheed Martin
Contractor for the USEPA

December 2009

O'BRIEN & GERE

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5851/44642

Report

Mountaineer Bottom Ash Complex Assessment Report

Lockheed Martin
Contractor for the USEPA

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December 2009

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1. Introduction

1.1. General

In response to the coal combustion waste (CCW) impoundment failure at the TVA/Kingston coal-fired electric generating station in December of 2008, the Environmental Protection Agency has initiated a nationwide program of structural integrity and safety assessments of CCW impoundments or "management units". A CCW management unit is defined as a surface impoundment or similar diked or bermed management unit or management units designated as landfills that receive liquid-borne material and are used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Management units also include inactive impoundments that have not been formally closed in compliance with applicable federal or state closure/reclamation regulations. The administration of this program is being supported by Lockheed Martin, who has authorized O'Brien & Gere to provide actual site specific impoundment assessments at selected facilities. This project is being conducted in accordance with the terms of Purchase Order No. 710051854, dated May 29, 2009, as amended on September 23, 2009.

1.2. Project Purpose and Scope

As stated in the Request for Proposal (RFP), the purpose of this work is to provide Dam Safety Assessments of CCW management units, including the following:

- Identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures
- Note the extent of deterioration, status of maintenance, and/or need for immediate repair
- Evaluate conformity with current design and construction practices
- Determine the hazard potential classification for units not currently classified by the management unit owner or by state or federal agencies

O'Brien & Gere's scope of services for this project includes performing a site specific dam safety assessment of select CCW management units at the subject facility. Specifically, the scope includes the following tasks:

- Perform a review of pertinent records (prior inspections, engineering reports, drawings, etc.) made available at the time of the site visit to review previously documented conditions and safety issues and gain an understanding of the original design and modifications of the facility.

- Perform a site visit and visual inspection of each CCW management unit and complete the visual inspection checklist to document conditions observed.

- Perform an evaluation of the adequacy of the outlet works, structural stability, quality and adequacy of the management unit's inspection, maintenance, and operations procedures.

- Identify critical infrastructure within 5 miles downgradient of management units.

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- Evaluate the risks and effects of potential overtopping and evaluate effects of flood loading on the management units.
- Immediate notification of conditions requiring emergency or urgent corrective action.
- Identify environmental permits issued for the management units
- Identify leaks, spills, or releases of any kind from the management units within the last 5 years.
- Prepare a report summarizing the findings of the assessment, conclusions regarding the safety and structural integrity, recommendations for maintenance and corrective action, and other action items as appropriate.

This report addresses the above issues for the Bottom Ash Complex management unit at Mountaineer Power Plant owned and operated by Appalachian Power Company (APC). APC is a subsidiary of American Electric Power Company (AEP). As such, AEP regularly provides engineering assistance to the APC Mountaineer Power Plant.

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2. Project/Facility Description

The Mountaineer Power Plant is located near the City of New Haven, Mason County, West Virginia. It is owned and operated by APC. The facility operates one surface impoundment for storing CCW called the Bottom Ash Complex. The safety assessment summarized in this report details the September 2009 inspection of the Bottom Ash Complex.

A site location map is provided as Figure 1.

2.1. Management Unit Identification

For the purposes of this report, the impoundment will be referred to as the Bottom Ash Complex. The Bottom Ash Complex carries the following identification numbers:

- West Virginia Department of Environmental Protection (WVDEP) state dam identification number #05307
- National Inventory of Dams #WV05307

A site layout map highlighting the location of the Bottom Ash Complex is provided as Figure 2. Please note the direction of plant north as commonly used by plant personnel. Plant north is referenced for convenience when describing the Bottom Ash Complex features and is not true north. Plant north will be used for compass reference of locations within this report.

2.2. Hazard Potential

The definitions for the four hazard potentials (less than low, low, significant and high) are included in the US EPA CCW checklist found in Appendix A. Based on the checklist definitions and as a result of this assessment, the hazard potential rating assigned to the Bottom Ash Complex is **SIGNIFICANT.** This rating was identified because failure of the embankments could result in environmental and economic damage. Potential environmental damage could include a release of ash slurry directly to Little Broad Run, a tributary of the Ohio River. Potential economic damage could include damage to the state highway and railway located along the east embankment.

For reference, it should be noted that in a 2009 WVDEP inspection the Bottom Ash Complex has been assigned a “2” hazard class. This WVDEP hazard class is most closely equivalent to US EPA’s SIGNIFICANT Hazard Potential Classification.

2.3. Impounding Structure Details

The following sections summarize the structural components and basic operations of the Bottom Ash Complex. A diagram of the Bottom Ash Complex and its relevant features is provided as Figure 3. Additionally, photos taken during the visual inspection are incorporated in a Photographic Log provided as Appendix B.

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2.3.1. Embankment Configuration

The Bottom Ash Complex is comprised of diked embankments on the north, east, and west sides. The south side of the Bottom Ash Complex is incised. There are six main ponds within the Bottom Ash Complex as listed below. The normal active pond elevations are also given. The Bottom Ash Ponds and Wastewater Ponds were designed in tandem; one Bottom Ash Pond and one Wastewater Pond are in service at a given time. At the time of this inspection, the West Bottom Ash and West Wastewater Ponds were active and their East counterparts were inactive. The current minimum crest elevation is approximately 610' near the southeast corner of the impoundment.

Table 1 *List of Main Ponds within the Bottom Ash Complex*

Pool Name	Normal Operating Elevation (feet)	Top of Dike Elevation
East Bottom Ash Pond	612.5	620.0
West Bottom Ash Pond	612.5	620.0
East Wastewater Pond	609.0	612.0
West Wastewater Pond	609.0	612.0
Reclaim Pond	603.1	610.0
Clearwater Pond	603.0	610.0

Source: American Electric Power Company 2009 Bi-Annual Inspection Report

Figure 3 details the layout of the various ponds within the Bottom Ash Complex and views of the embankment slopes can be seen in Photos 1 through 4 of Appendix B.

2.3.2. Type of Materials Impounded

The Bottom Ash Ponds within the complex are used for primary settling and storage of bottom ash. The Wastewater Ponds provide secondary settling. Additional facility wastewaters (non-ash) are also discharged to the Wastewater and Clearwater Ponds.

A photo of the influent slurry is provided as Photo 6 in Appendix B.

2.3.3. Stormwater Inflows

Stormwater inflows to the Bottom Ash Complex are minimal. The impounding structure is comprised of diked embankments on three sides which direct stormwater away from the impoundment and limit runoff to that which falls directly on the water surface. The land area to the south is open field area that is not generally graded toward the Bottom Ash Complex. Therefore, the area south of the impoundment is also not a source of significant run off.

2.3.4. Outlet Works

The main ponds within the Bottom Ash Complex have various outlet structures. The following table summarizes the outlet works for each pool.

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Table 2 *Summary of Inlet and Outlet Works*

Pond	Outlet	Controlling Dimensions	Notes
East Bottom Ash Pond	3-Sided Concrete Weir	~3' width, fixed at elevation 612.0'	At time of inspection only one side of the weir was accepting flow while the other two gates were closed. A wooden surface skimming structure is constructed around the weir box.
West Bottom Ash Pond	3-Sided Concrete Weir	~3' width, fixed at elevation 612.0'	At time of inspection West Bottom Ash Pond was inactive
East Wastewater Pond	Long concrete weir channel	~230' long, fixed at elevation 609.0'	At time of inspection West Wastewater Pond was inactive
West Wastewater Pond	Long concrete weir channel	~230' long, fixed at elevation 609.0'	2'wide x 2' high concrete channel conveys weir discharge to outlet.
Reclaim Pond	Inverted Pipe Elbow	~30" diameter	None
Clearwater Pond	Long concrete weir channel	~180' long, fixed at elevation 603.0'	Approximately 30 to 50% of the weir length is raised and accepts no flow. A wooden surface skimming structure is constructed around the weir box. The weir discharges to 30" pipe via a concrete junction chamber. The 30" pipe transitions into a 42" pipe near the outlet at the Ohio River.

Source: O'Brien & Gere

The photo log in Appendix B provides views of the various weir structures.

2.3.5. Instrumentation

The Bottom Ash Complex has instrumentation to monitor flow discharged from the impoundment and three piezometers to monitor phreatic water levels within the north portion of the east embankment. A flow meter is located near the Clearwater Pond outlet. Facility personnel reported that totalized flow is recorded by a facility data logging system. The water level in the three piezometers is measured and recorded monthly by plant personnel.

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3. Records Review

At the time of the site visit, APC provided historical Bottom Ash Complex documents for review. The following table summarizes reviewed documentation.

Table 3 *Summary of Bottom Ash Complex Documents Reviewed*

Document	Dates	By	Description
Design Drawings	1977	American Electric Power Company	Various plans and sections for the construction of the original impoundment and inlet/outlet works
Correspondence	1976 - 1977	Casagrande Consultants	Various geotechnical findings/recommendations prior to construction of the Bottom Ash Complex
Geotechnical Report	1977	Casagrande Consultants	Geotechnical investigation prior to construction of the Bottom Ash Complex
Dam Safety Report	1985	Woodward Clyde Consultants	Report documenting a dam safety inspection
Engineering Report	2006	Shaw – Stone & Webster	Engineering report detailing modifications to the north and west embankments to accommodate the construction of the gypsum conveyor. Includes WVDEP application, slope stability analysis, design drawings and specifications.
Construction Testing/Inspection Summaries	2006	H.C. Nutting	Engineering reports documenting geotechnical testing/inspection during the construction of the gypsum conveyor along the north and west embankments
Bi-Annual Inspection Reports	2007, 2009	American Electric Power Company	Annual inspection reports documenting inspection completed by corporate engineering staff.
Dam Safety Maintenance Plan & Approval	2007 - 2008	American Electric Power & WVDEP	Impoundment maintenance plan submitted by AEP to WVDEP and approval
WVDEP Order DS2009-0003	2009	WVDEP	Order from WVDEP to AEP to provide/update current impoundment records of inspections, calculations, etc.
Dam and Dike Inspection Report	2009	H.C. Nutting	Report documenting a dam safety inspection in response to the WVDEP order
Engineering Report	2009	H.C. Nutting	Engineering report documenting soil borings, piezometer installation, and slope stability analysis completed in response to the WVDEP order
Piezometer Data & Sketch	2009	American Electric Power Company	Data and sketch completed by AEP to document early findings from recently installed piezometers
Site NPDES Permit	2009	WVDEP	NPDES Permit #WV0048500 detailing allowable discharge parameters from the Bottom Ash Complex
Monthly/Quarterly Inspection Logs	2006 - 2009	Appalachian Power Company	Recent monthly/quarterly inspection checklists completed by Mountaineer personnel

Source: O'Brien & Gere

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3.1. Design Documents

3.1.1. Stability Analyses

The original design of the dikes for the Mountaineer Bottom Ash Complex resulted from analyses and recommendations made on behalf of AEP by Casagrande Consultants in April 1977. Casagrande Consultants performed a sliding wedge analysis based on an assumed dike configuration with 2.5H:1V side slopes and soil characteristics derived from subsurface investigations. Factors of safety against a sliding failure within clay foundation soils were calculated to be 3.5 and 3.2 for normal/static and earthquake conditions respectively. The dikes were subsequently constructed with 3H:1V side slopes, which would increase these factors of safety.

The stability of the north and west embankments were re-examined in 2006 to support an application for dam safety certification in connection with proposed modifications to the outboard slopes of those dikes to accommodate proposed gypsum conveyors. Stone & Webster, Inc. performed a two-dimensional slope stability analysis for two locations on the north embankment and one on the west embankment using the proposed embankment conditions following construction of the conveyors. The calculated Factors of Safety against sliding failure exceed the minimums required for steady state and earthquake loading conditions.

In response to an order from the West Virginia Department of Environmental Protection, H.C. Nutting was engaged to perform an investigation of the slope stability of the east dike. A field exploration was performed which included six borings and the installation of three observation wells. Two-dimensional slope stability analyses were performed for two cross sections of the east dike of the Bottom Ash Pond and one cross section of the east dike of the clear pond using the results of the field investigation. The resulting factors of safety meet the minimums required for long-term (steady state) and earthquake loadings. Plant personnel are continuing to monitor the water level in the three observation wells on a periodic basis.

3.1.2. Modifications since Initial Construction

The original dikes were constructed of soil borrowed from the site. In 2006, the north and west embankments were modified to accommodate a gypsum conveyor system. The following is a summary of the 2006 modifications.

- Additional fill was placed along the length of the downstream side of the north embankment to accommodate the conveyor and an access road

- Additional fill was placed at the toe of the northwest corner of the Bottom Ash Complex to accommodate a transfer house

- Approximately 1300’ linear feet of the downstream side of the west embankment was cut up to four feet deep and up to twenty feet up the slope to accommodate the conveyor and access road. During construction of the conveyor, the cut areas were reinforced using geotextile, compacted soil and rip rap.

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3.1.3. Monitoring Instrumentation

Three piezometers (observation wells) were installed in the north portion of the east embankment in February 2009. These piezometers are measured and recorded monthly by plant personnel. Records of these measurements were provided by APC at the time of the inspection.

Plant personnel reported that flow discharged from the Bottom Ash Complex has been continuously recorded in the facility's data logging system beginning in August 2009. Prior to August 2009, flow readings were recorded twice per month. Physical records of the flow rates were not observed at the time of the inspection.

3.2. Previous Inspections

The Bottom Ash complex has been inspected monthly by plant personnel since June 2009. Prior to June 2009, plant personnel inspected the Bottom Ash Complex quarterly. Completed inspection records for plant inspections dating back through 2006 were provided by APC at the time of the inspection.

A comprehensive bi-annual inspection is performed by the AEP corporate engineering staff. The 2007 and 2009 inspection reports were reviewed. In general, action items noted in the annual report have been carried out or plans were reported to be in place to complete the items.

A state inspection performed by the WVDEP was also recently performed in March 2009. Four recommendations were made. At the time of this inspection, recommendations made by WVDEP have been carried out or plans were reported to be in place to complete the items.

3.3. Facility Operator Interviews

Numerous plant and corporate owner personnel took part in the inspection proceedings. The following is a list of participants from the inspection of the Bottom Ash Complex:

Table 4 *List of Participants*

Name	Affiliation	Title
Chris Purdum	APC – Mountaineer	Landfill Supervisor
David Thompson	APC – Mountaineer	Environmental Health and Safety Supervisor
Randy Brown	APC – Mountaineer	Environmental Coordinator
Brett Dreger, PE	AEP – Corporate Engineering	Engineer
Paul Cree	AEP – Corporate Environmental	Engineer
Clark Conover	US EPA	
Gary Emmanuel, PE	O'Brien & Gere	Project Manager
Jason Huber	O'Brien & Gere	Design Engineer

Source: O'Brien & Gere

Facility personnel provided a good working knowledge of the Bottom Ash Complex and provided requested historical documentation. These personnel also accompanied O'Brien & Gere and US EPA staff throughout the visual inspections to answer questions and provide additional information as needed in the field.

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3.4. Site Geology Summary

The Mountaineer Bottom Ash Complex lies within the floodplain of the Ohio River and is bounded to the west by strongly dissected, flat-lying, bedded sedimentary rock formations. There are no major faults noted in the area. The floodplain deposits underlying the Bottom Ash complex ponds and overlying the bedrock are Quartenary alluvial deposits consisting of clays, silts, sand and gravels. Groundwater at the site was reportedly found at depths ranging from 47 to 60 feet below the surface before the ponds were constructed. The ponds and dikes were constructed by excavating clayey and silty fine sands, fine to medium sands and sandy clay encountered in the complex footprint and constructing the dikes from these materials. Bedrock remains 80 to 90 feet below the bottom of the ponds.

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4. Visual Inspection

The following sections summarize the inspection of the Bottom Ash Complex which occurred on September 1 and 2, 2009. At the time of the inspection, O'Brien & Gere completed a US EPA inspection checklist which was submitted electronically to US EPA on September 14, 2009. A copy of the completed inspection checklist is included as Appendix A.

4.1. Overview

The visual inspection consisted of a thorough site walk along the perimeter of the Bottom Ash Complex. O'Brien & Gere team members made observations at the toe, mid-slope and crest of the embankments and also observed inlet/outlet structures, monitoring instrumentation and current operation.

Photos were taken during the visual inspection. A photo log of relevant items is incorporated as Appendix B and locations of photos are noted within Figure 3.

4.2. Findings

The following is a summary of observations made during the visual inspection. Figure 3 depicts the locations of the observations listed below.

- Tall, weedy vegetation on the outboard slopes of the east and west dike embankments inhibited close inspection. Past vegetative growth and maintenance activities have left the slopes with numerous surface irregularities.
- A large wet area was observed at the toe of the north portion of the east embankment (Appendix B – Photo 1).
- A small wet area was observed at the toe of the central portion of the north embankment (Appendix B – Photo 2).
- Animal burrows were observed at numerous locations on the east embankment. Most burrows were recently filled and live traps were observed at various locations.
- Isolated sloughing of surface soil was observed along the east embankment where trees and shrubs were recently removed. The sloughing was observed occurring in locations where vegetative cover had not yet reestablished (Appendix B – Photo 10).
- An isolated eroded area was observed on the in-board slope of the north dike embankment near the crest roadway and below the walkway to the Turbine Room Sump Discharge into the West Bottom Ash Pond. The eroded area extended the full length of the slope, deepening to a gully more than one foot deep near the bottom of the slope (Appendix B – Photo 9).
- The Turbine Room Sump Discharge chamber in the West Bottom Ash Pond was observed to have separated from the west manifold pipe. The discharging water was roughly surging out of the separation and beginning to erode the soil behind the chamber, connecting with the erosion described above (Appendix B – Photo 8).
- An abandoned pipe and casing were observed in the central portion of the west embankment. An active rodent burrow was observed adjacent to the casing.

There was no evidence of prior releases, failures or patch work on the dikes based on the site inspection and discussion with facility representatives.

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5. Conclusions

Based on the ratings defined in the RFP (satisfactory, fair, poor and unsatisfactory), the information reviewed and the visual inspection, the overall condition of the Mountaineer Bottom Ash Complex is **SATISFACTORY**. The owner has implemented regular inspections and maintenance which enable the impoundment to be kept in a good working order. No conditions were observed that would invalidate the bases of past stability analyses.

The visual inspection did find several items requiring attention. Limited cutting of vegetation on the various dike slopes have led to surface irregularities and the growth of weedy vegetation that inhibits rodent control and safety inspection. Erosion occurring on the inboard slope of the north dike embankment at the walkway to the Turbine Room Sump Discharge requires attention before the underlying clay liner is compromised. Additional efforts are in order to re-establish vegetation on the outboard embankment slope of the east dike where trees were recently removed.

The wet area observed at the toe of slope near the north end of the east dike was cause for a recent investigation of the dike's stability. The March 2009 report by H.C. Nutting indicates that the dike meets minimum slope stability criteria under the current conditions. Review of historic records indicates that the observed conditions have persisted since the impoundment was constructed. H.C. Nutting's recommendation that means be developed for positive drainage of the wet area is appropriate.

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6. Recommendations

6.1. Immediate/Urgent Repair Recommendations

No immediate or urgent repairs are recommended at this time.

6.2. Long Term Improvements

Erosion of the dike embankment crest and slope at the Turbine Room Sump Discharge into the West Bottom Ash Pond should be repaired, including measures to prevent runoff from accumulating on the crest and being channeled to this location. The connection of the Turbine Room Sump discharge header to the junction chamber should also be restored to prevent pond slope and bottom erosion around the junction chamber.

Additional efforts should be taken to re-establish vegetation on the outboard embankment slope of the east dike where trees were recently removed.

The abandoned pipe casing penetrating the west embankment should be sealed as recommended by WVDEP and AEP corporate engineering.

The facility should consider more frequent maintenance of vegetation on the dike embankment slopes to facilitate inspection and promote a denser and more uniform vegetative cover.

6.3. Monitoring and Future Inspection Recommendations

Monitoring and future inspections should continue on their current schedule.

The minor crest erosion and Turbine Room Sump Discharge chamber at the West Bottom Ash Pond should be closely monitored during the monthly plant inspections.

6.4. Time Frame for completion of Repairs/Improvements

In the 2009 bi-annual report, AEP corporate engineering cited a November 1, 2009 completion date to seal the abandoned pipe casing penetrating the west embankment. The owner should continue toward completion of this project as planned.

For repair of the erosion and Turbine Room Sump Discharge chamber in the West Bottom Ash Pond, the West Bottom Ash Pond could be allowed to finish its annual service cycle. The repair should be completed prior to reinstating the West Bottom Ash Pond into service for its next annual cycle. Should the condition of this area be observed to significantly worsen prior to the end of the annual service cycle, the area should be repaired immediately.

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6.5 Certification Statement

I acknowledge that the Mountaineer Bottom Ash Complex management unit referenced herein was personally inspected by me on September 2, 2009 and was found to be in the following condition:

SATISFACTORY
FAIR
POOR
UNSATISFACTORY

Signature: _____ December 9, 2009
Gary B. Emmanuel, PE Date

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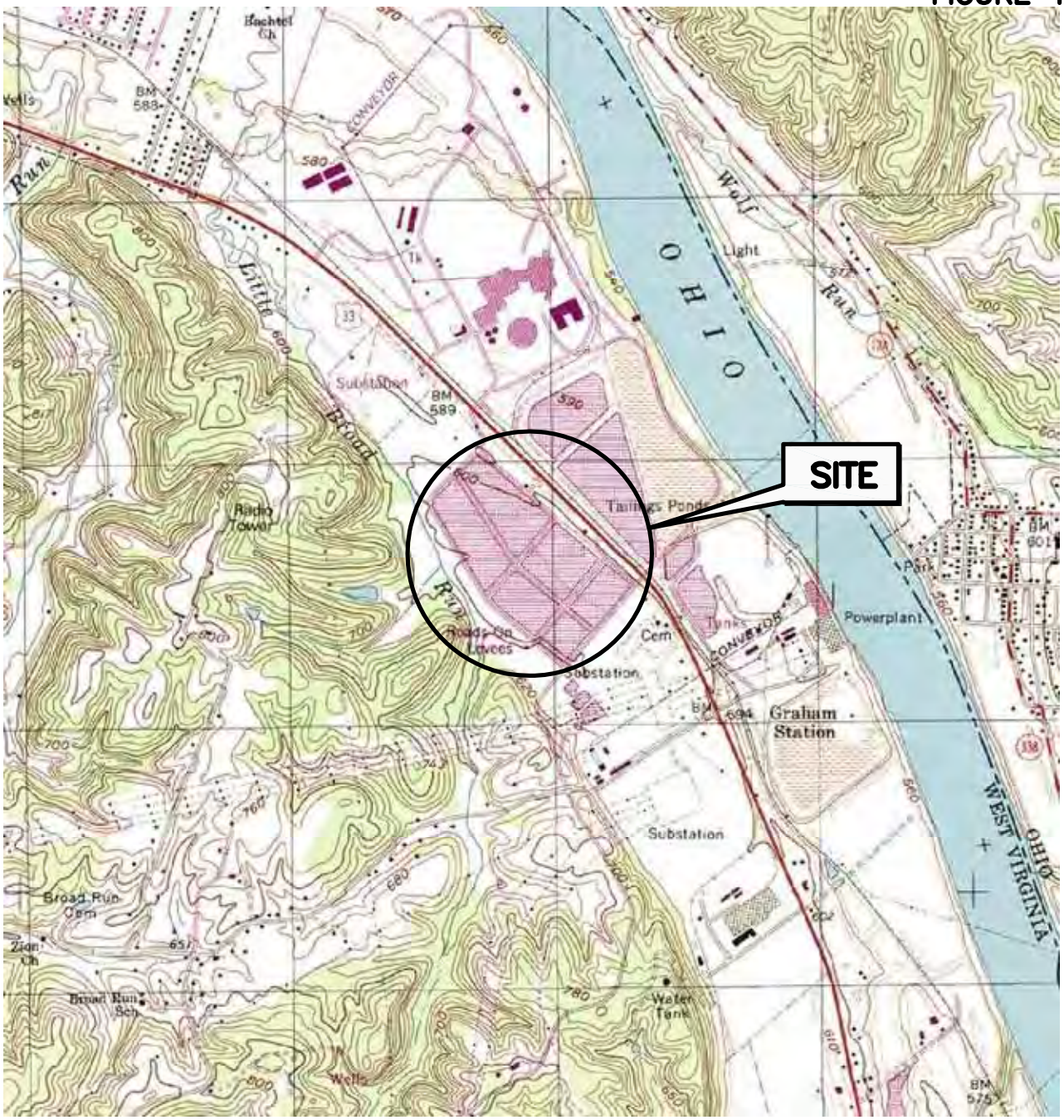
FIGURE 1


SITE
OHIO
WEST VIRGINIA
Graham Station
Powerplant
Substation
Substation
Tailings Ponds
Cem
Tanks
CONVEYOR
Wolf Run
Little Broad Run
Broad Run
Radio Tower
Broad Run Cem
Zion Ch
Broad Run Sch
Water Tank
Wells
Park
Light
Hachtel Ch
BM 588
BM 589
BM 694
BM 601
BM 575
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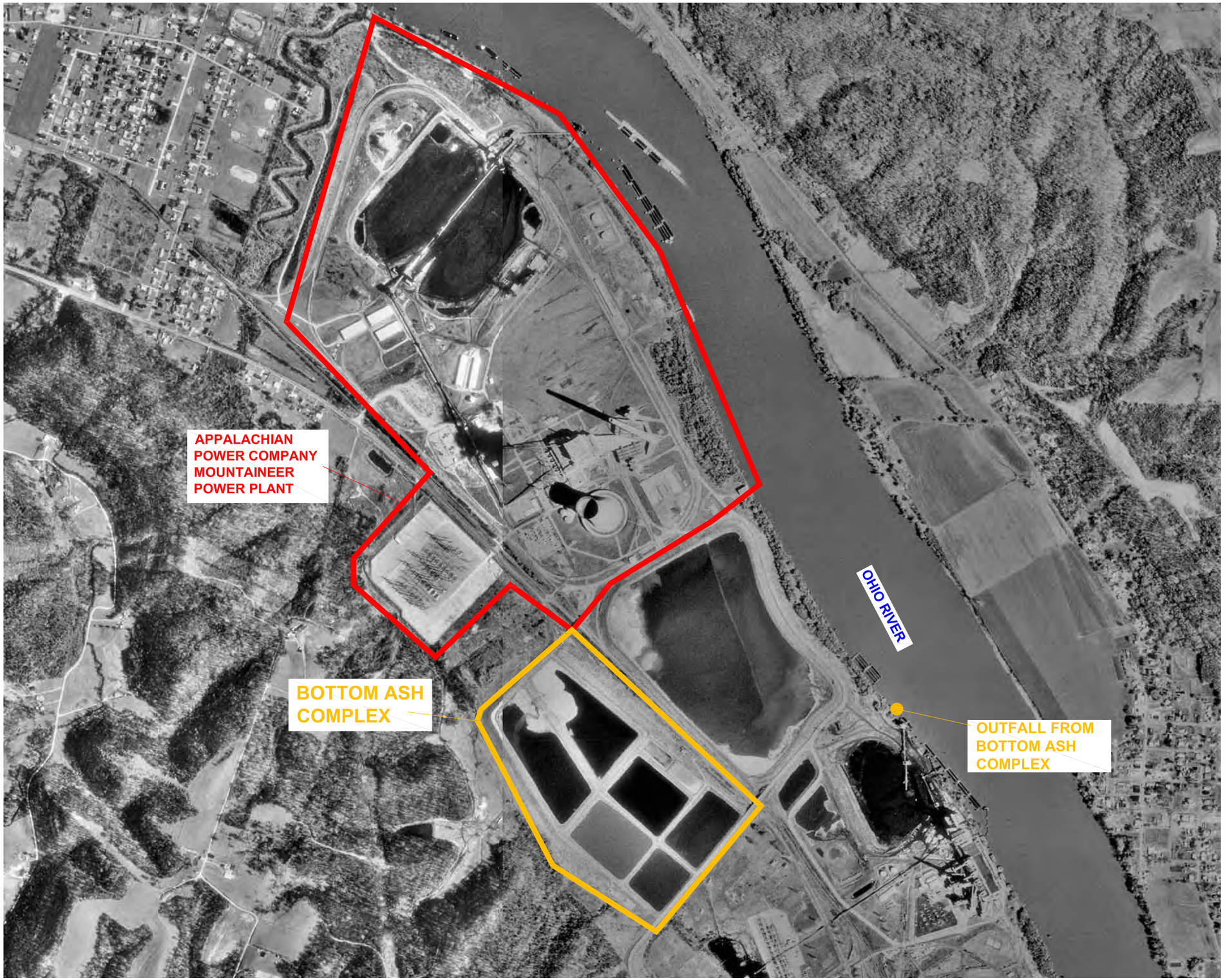
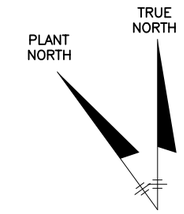


FIGURE 2



NOTE:
1. DRAWING BASE PHOTO DATED 2000. CERTAIN SITE FEATURES MAY NOT BE DEPICTED.

US EPA &
LOCKHEED MARTIN
DAM SAFETY ASSESSMENT
OF CCW IMPOUNDMENTS

MOUNTAINEER POWER PLANT
NEW HAVEN, WV

SITE LAYOUT MAP

1"=1000' 1000 0 1000

FILE NO. 5851/44642-006
SEPTEMBER 2009

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2009 © O'Brien & Gere Engineers, Inc.

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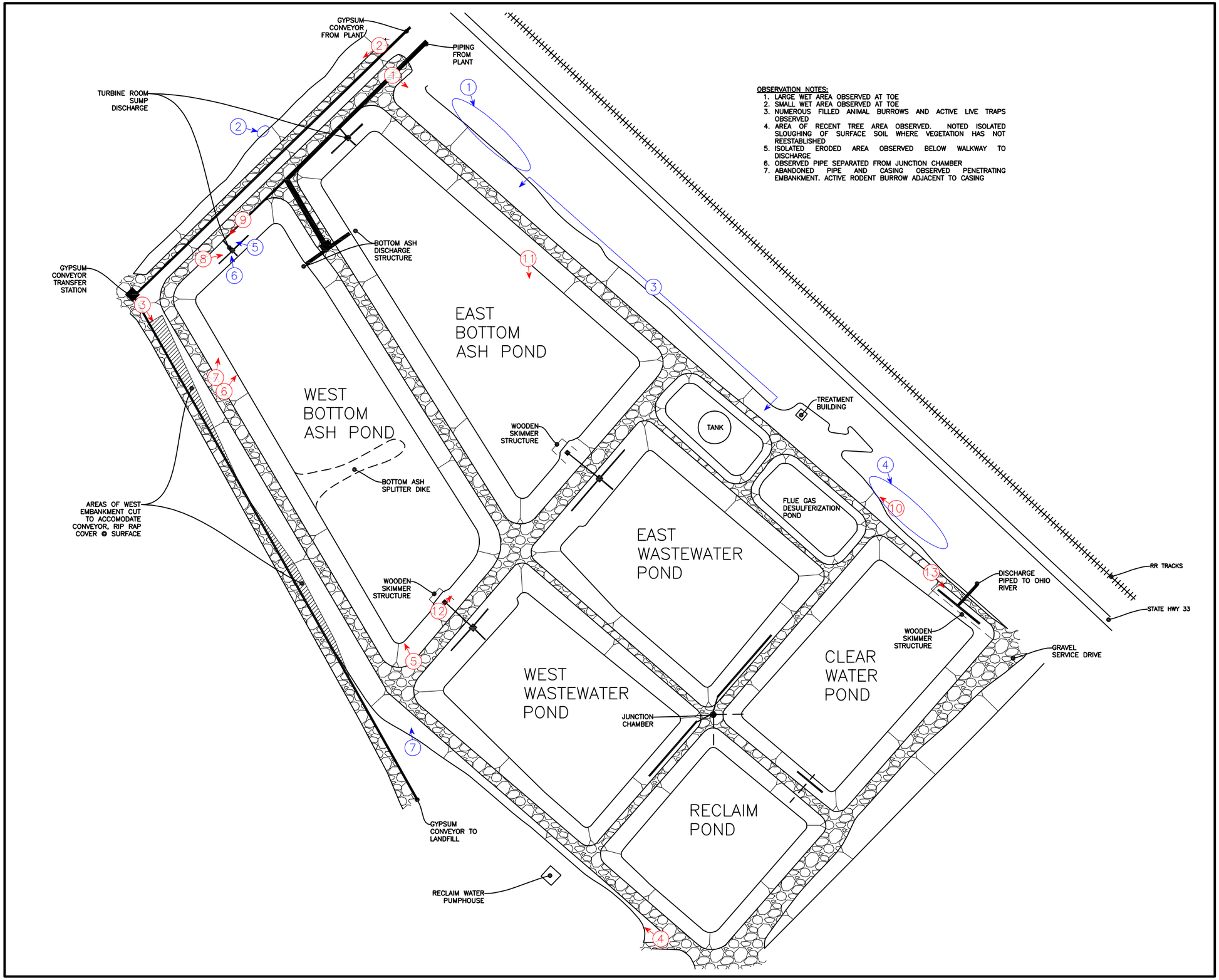
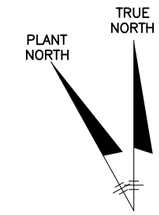
FIGURE 3



OBSERVATION NOTES:
1. LARGE WET AREA OBSERVED AT TOE
2. SMALL WET AREA OBSERVED AT TOE
3. NUMEROUS FILLED ANIMAL BURROWS AND ACTIVE LIVE TRAPS OBSERVED
4. AREA OF RECENT TREE AREA OBSERVED. NOTED ISOLATED SLOUGHING OF SURFACE SOIL WHERE VEGETATION HAS NOT REESTABLISHED
5. ISOLATED ERODED AREA OBSERVED BELOW WALKWAY TO DISCHARGE
6. OBSERVED PIPE SEPARATED FROM JUNCTION CHAMBER
7. ABANDONED PIPE AND CASING OBSERVED PENETRATING EMBANKMENT. ACTIVE RODENT BURROW ADJACENT TO CASING



LEGEND

(#) APPENDIX B PHOTO REFERENCE – ARROW DEPICTS ORIENTATION OF PHOTO

(#) VISUAL INSPECTION OBSERVATION – ARROW DENOTES LOCATION OF OBSERVATION(S) – SEE INSET NOTES

NOTE

1. PHOTO 14 WAS TAKEN AT DISCHARGE CHAMBER INTO OHIO RIVER. DISCHARGE LOCATION NOT DEPICTED IN THIS DRAWING.

US EPA &
LOCKHEED MARTIN
DAM SAFETY ASSESSMENT
OF CCW IMPOUNDMENTS

MOUTNAINEER POWER PLANT
NEW HAVEN, WV

BOTTOM ASH COMPLEX PLAN DIAGRAM

1"=300' 300 0 300

FILE NO. 5851/44642–008
SEPTEMBER 2009

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APPENDIX A

Visual Inspection Checklist

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Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Appalachian Power

Site Name: Mountaineer Plant

Date: September 2, 2009

Unit Name: Bottom Ash Complex

Operator's Name: Charles Powell-Plant Mgr

Unit I.D.:

Hazard Potential Classification: High Significant Low

Inspector's Name: Gary Emmanuel, P.E.

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Multiple		18. Sloughing or bulging on slopes?	X	
2. Pool elevation (operator records)?	Multiple		19. Major erosion or slope deterioration?	X	
3. Decant inlet elevation (operator records)?	Multiple		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	None		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	610'		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)?			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?	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

See following page

1.	Until 6/09 unit was inspected quarterly by Plant. Beginning 6/09, Plant began inspecting monthly per corporate direction. A P.E. from Corporate office also performs a bi-annual inspection. Complete inspection documents were observed dating back to 2006.
2., 3.	The bottom ash complex has multiple pools within it. Attached sketch shows these pools/elevations/decant structures.
6.	Piezometers are recorded monthly and to date were observed only 3 months of data exist. Flow discharged from the bottom ash complex is currently monitored continuously and readings are downloaded monthly. The practice has only begun in the last month. Previous readings were only taken twice per month. Actual records of flow measurements were not observed.
8.	Based on review of site records, the dikes were constructed from native sand/silty sand excavated from within the impoundment area. The correspondence language implies that the bottom ash complex embankment were constructed on native soils below and that the area was clear of trees/vegetation.
12.	Pond outlets are fitting with baffle systems or inverted pipe elbows to keep outlet weirs and piping clear of floating debris.
18.	Trees were recently removed from the downstream toe along a stretch of the east embankment. Minor sloughing of surface soil was observed in these areas where grassy vegetation has not yet taken root. Minor irregularities appear randomly on the embankment slopes that appear to be the result of vegetative growth, animal burrows and maintenance activities
19.	One area of erosion was noted along the upstream crest of the north embankment. This area is located at the center of the west bottom ash pond where piping from the turbine room sump discharges. Erosion was observed 12” – 18” deep starting near the crest running down the inside embankment slope below a wooden walkway leading to the discharge point. The concrete junction box at the discharge has also separated from the west discharge pipe allowing water to forcefully surge from the separation. This flow is eroding the slope behind the concrete junction up toward the erosion which is working down the slope.
21	Minor natural wet areas observed near northeast corner of bottom ash complex, area is poorly drained and is currently being monitored using piezometers to confirm/dispute that the water is a result of seepage.

US EPA ARCHIVE DOCUMENT

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # WY0048500 INSPECTOR Gary Emmanuel, P.E.
Date 9/2/09

Impoundment Name Bottom Ash Complex
Impoundment Company Appalachian Power
EPA Region III
State Agency (Field Office) Addresss West Virginia Dept. of Env. Protection
601 57th Street SE, Charleston, WV 25304

Name of Impoundment Bottom Ash Complex
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update NPDES X August 2009 - Latest Version

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

IMPOUNDMENT FUNCTION: Dewatering Bottom Ash, Wastewater Treatment of various process waters

Nearest Downstream Town : Name New Haven, WV
Distance from the impoundment < 1 mile
Impoundment Location:
Longitude 81 Degrees 56 Minutes 12 Seconds W
Latitude 38 Degrees 58 Minutes 12 Seconds N
State WV County Mason

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

If So Which State Agency? WVDEP

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.

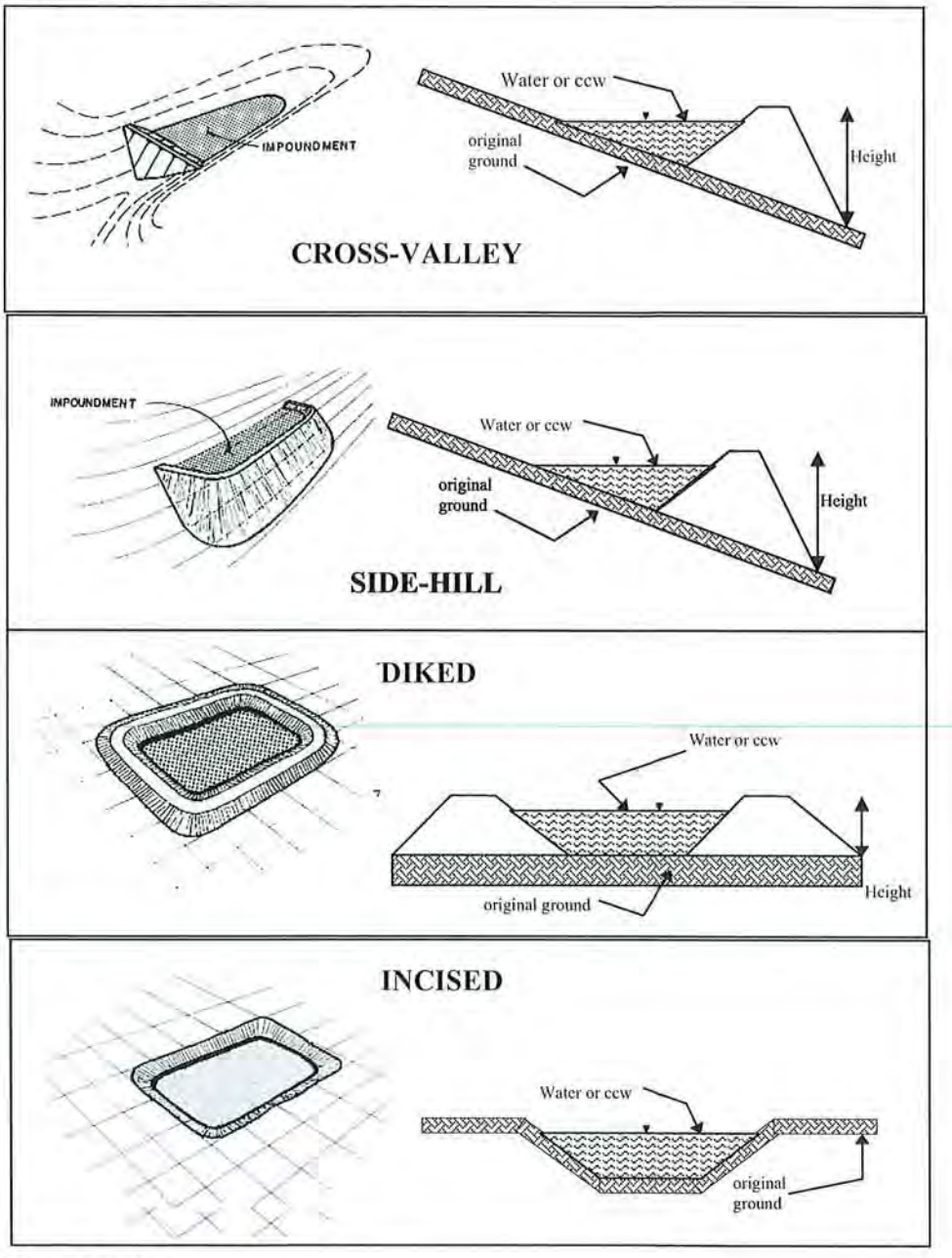
__X__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

Loss of human life is not expected, but the potential exists for significant private property and infrastructure damages as well as environmental damage to an adjacent stream and/or the Ohio River in the event of a release.

CONFIGURATION:



_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
__X__ Combination Incised/Diked

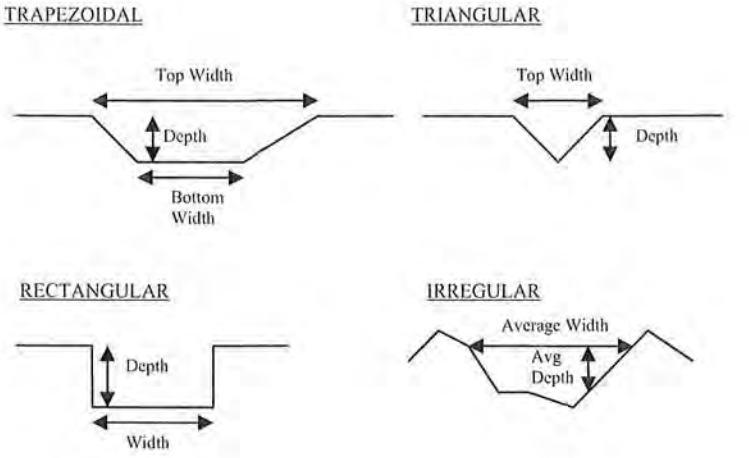
Embankment Height (max) 35 feet
Pool Area Approx 29 acres
Current Freeboard 7.0 to 7.5 feet per unit

Embankment Material native sand native silty sand
Liner Clay (3' thick beneath each unit)
Liner Permeability ~ 2.2 x 10-8 cm/sec

TYPE OF OUTLET (Mark all that apply)

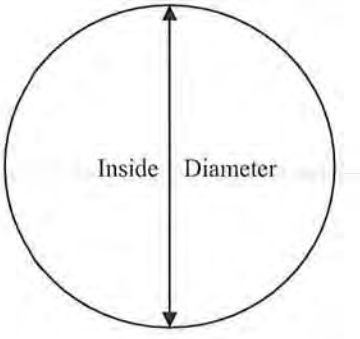
_____ **Open Channel Spillway**
_____ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

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



Main **Outlet** (Discharge from complex)

X inside diameter 30" @ clear pond weir transitions to 42" @ Ohio River Outfall



Material
X corrugated metal {Portions of each type}
X welded steel
_____ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____

Is water flowing through the outlet? YES _____ NO _____

_____ **No Outlet**

X **Other Type of Outlet** (specify) Weirs, inverted elbows connect internal ponds (see next sketch)

The Impoundment was Designed By Appalachian Power with consultation from Casagrande Consultants

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: _____

No "signficant" seepages have been observed at the Site. However, minor wet areas at downstream toe near north end of east dike and east end of north dike have been present dating back to mid-1980's (as indicated by site documents)

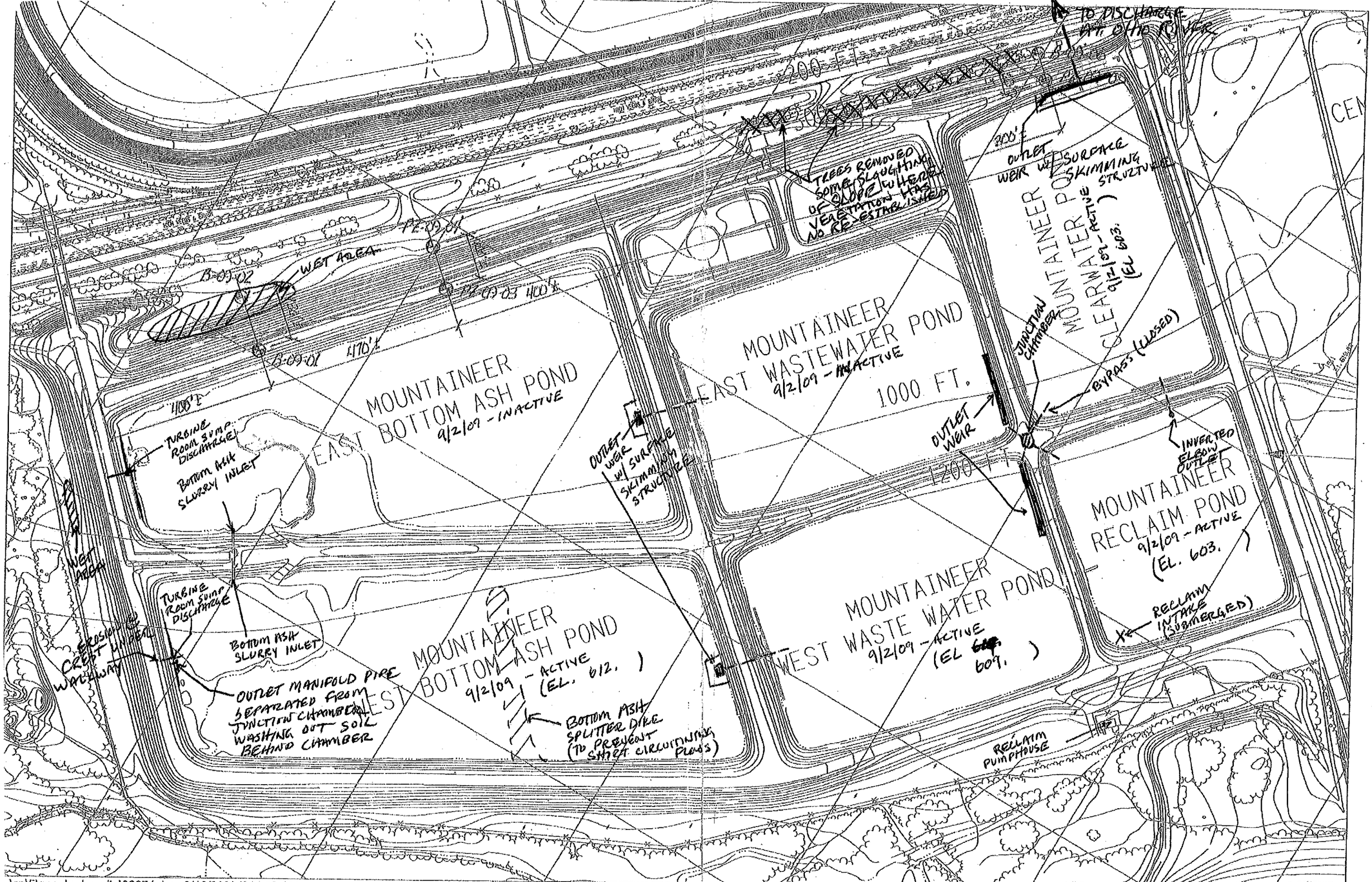
This area has been recently investigated using piezometers as a precaution, as directed by WVDEP. Early results indicate that the wet areas are not seepage, but rather natural poorly drained areas. Monitoring has only been in place since May 2009, and as such, results are only considered preliminary.

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

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

If so Please Describe :

3 piezometers have been installed around the north end of the east dike in 2009. their purpose and preliminary findings were detailed on the previous page.



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APPENDIX B

Photographs

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: South

Description: View along downstream side of east embankment. Note poorly drained area at toe as described in report.

Date: 9/2/2009

Photo Number: 1

Photographer: JPH

Orientation: West

Description: View along downstream side of north embankment. Note historically wet area and existing wet area at toe.

Date: 9/2/2009

Photo Number: 2

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: South

Description: View along downstream side of west embankment. Area of embankment covered by rip rap was cut away to make way for covered conveyor show at right.

Date: 9/2/2009

Photo Number: 3

Photographer: JPH

Orientation: North

Description: View along downstream side of west embankment.

Date: 9/2/2009

Photo Number: 4

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: North

Description: View along upstream side of west embankment across West Bottom Ash Pond. Note "splitter" dike in pond to prevent short circuiting of flow and contain ash to north end of pond.

Date: 9/2/2009

Photo Number: 5

Photographer: JPH

Orientation: East

Description: Inlet to West Bottom Ash Pond. Bottom Ash slurry enters the pond at this point.

Date: 9/2/2009

Photo Number: 6

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: Northeast

Description: Turbine room sump discharge structure into West Bottom Ash Pond

Date: 9/2/2009

Photo Number: 7

Photographer: JPH

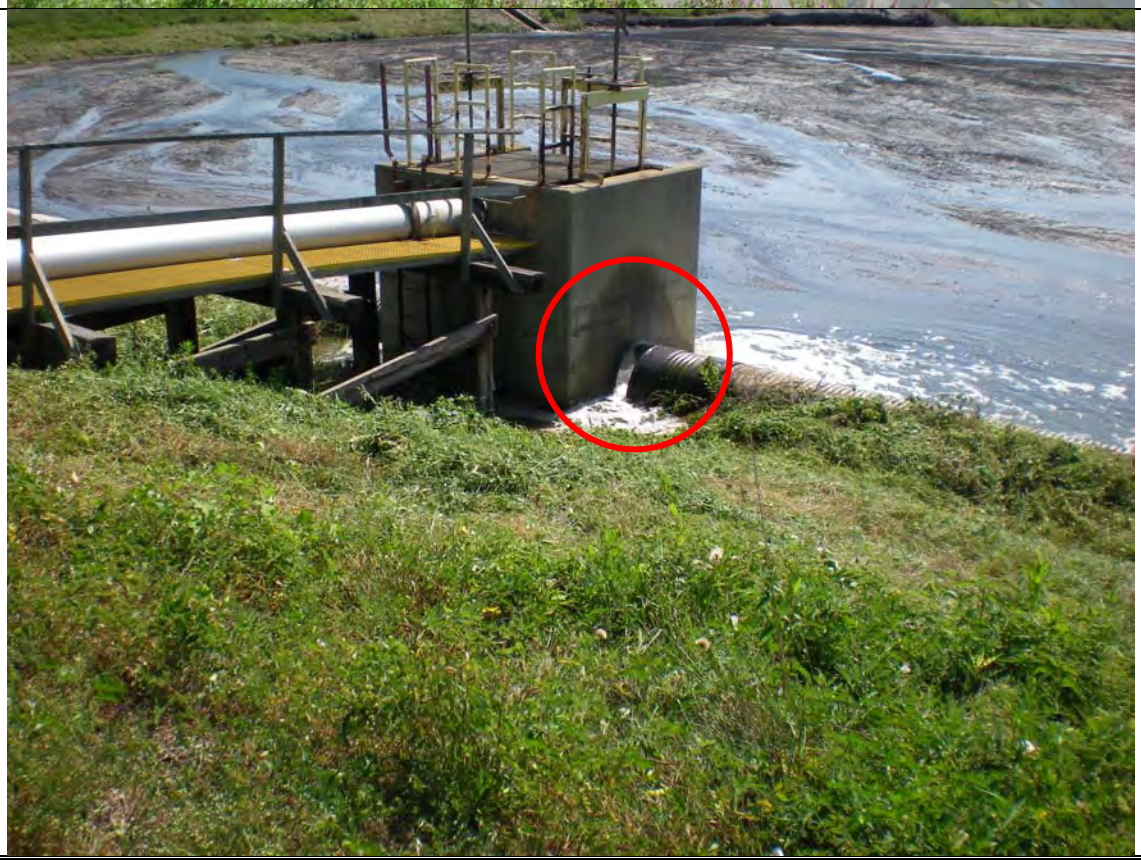
Orientation: Southeast

Description: Close up of Turbine Room Sump discharge junction box. Note pipe separated from junction box.

Date: 9/2/2009

Photo Number: 8

Photographer: JPH



US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: Southwest

Description: Erosion at crest of upstream side of north embankment below walkway to turbine room sump discharge

Date: 9/2/2009

Photo Number: 9

Photographer: JPH

Orientation: North

Description: Area on east embankment where trees were recently removed. Note sloughing of surface soil observed at numerous dead areas where vegetation not re-established.

Date: 9/2/2009

Photo Number: 10

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: Southwest

Description: Exterior view of outlet skimming structure in East Bottom Ash Pond.

Date: 9/2/2009

Photo Number: 11

Photographer: JPH

Orientation: Down

Description: View of water flowing into weir at discharge from West Bottom Ash Pond.

Date: 9/2/2009

Photo Number: 12

Photographer: JPH

US EPA ARCHIVE DOCUMENT

O'BRIEN & GERE

PHOTOGRAPHIC LOG

Client: US EPA / Lockheed Martin	Project Number: 5851/44642
Site Name: Mountaineer Plant – Bottom Ash Complex	Location: New Haven, WV

Orientation: South

Description: View of outlet weir from Clearwater Pond with surface skimmer structure.

Date: 9/2/2009

Photo Number: 13

Photographer: JPH

Orientation: North

Description: Discharge chamber at Ohio River

Date: 9/2/2009

Photo Number: 14

Photographer: JPH

US EPA ARCHIVE DOCUMENT