US ERA ARCHIVE DOCUMENT

Coal Combustion Residue Impoundment Round 9 - Dam Assessment Report

Glen Lyn Power Plant

Ash Pond Management Units

Appalachian Power

d/b/a American Electric Power

Glen Lyn, VA

Prepared for:

United States Environmental Protection Agency Office of Resource Conservation and Recovery

Prepared by:

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Under Contract Number: EP-09W001727 **December 2011**

INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion residue from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008, which flooded more than 300 acres of land and damaged homes and property, is a wake-up call for diligence on coal combustion residue disposal units. A first step toward this goal is to assess the stability and functionality of the ash impoundments and other units, then quickly take any needed corrective measures.

This assessment of the stability and functionality of the Glen Lyn Power Station Ash Pond Management Units (Bottom Ash Pond and Fly Ash Pond) is based on a review of available documents and site assessment conducted by Dewberry personnel on February 16, 2011. In general, we found the supporting technical documentation provided to be adequate for preparation of this report (Section 1.1.3). In summary, the Bottom Ash Pond and Fly Ash Pond are **FAIR** for continued safe and reliable operation.

An engineer from the Virginia Department of Conservation and Recreation, Dam Safety and Floodplain Management (DCR DSFM) has indicated through a letter to Dewberry that the Commonwealth of Virginia plans to take action in 2012 to investigate potential hydrologic and structural stability issues with both the Flyash Pond and Bottom Ash Pond.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is investigating the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant, or High Hazard Potential ranking (for Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety).

In early 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or byproducts from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units (See Appendix C).

The purpose of this report is **to evaluate the condition and potential of residue release from management units for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit Owner (Appalachian Power d/b/a American Electric Power). Also, after the field visit, additional information was received by Dewberry & Davis LLC from the Owner about the Glen Lyn Ash Pond Management Units. The additional information was reviewed and also used in preparation of this report.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

Note: The terms "embankment", "berm", "dike" and "dam" are used interchangeably within this report, as are the terms "pond", "basin", and "impoundment".

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.



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Document 5	5: Final Design Report, by GAI Consultants	
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Document 9: Fly Ash Pond, Dam Inspection Checklist
Document 10: Bottom Ash Pond, Dam Inspection Checklist

1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit, February 16, 2011, and review of technical documentation provided by the Owner, which is provided in Appendix A.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The Fly Ash Pond and Bottom Ash Pond did not show any areas of significant structural concern during the one-day site visit.

Fly Ash Pond

The stability analysis report for the Fly Ash Pond was prepared by GAI engineers but did not draw specific conclusions regarding the structural soundness of the perimeter dike though factors of safety were provided for static and seismic loading conditions assuming the facility serves as a landfill in the future. Under these conditions, the minimum factors of safety calculated for static and seismic loading are 1.29 and 1.01, respectively. The GAI report submitted was part of a larger design document that was signed and sealed.

Currently, the Fly Ash Pond is not in service and contains no or minimal volumes of CCR. However, if it is ever put back into service, it is recommended that a stability analysis be performed that evaluates factors of safety for the perimeter dikes under a loading condition that assumes a water-surface elevation in the pond equal to the crest elevation of the pond spillway.

The Virginia DCR in its letter concerning the Flyash Pond indicated multiple rodent burrows and the poor condition of outlet structures leads to concerns about adequate structural stability (see appendix A – Document 7)

Bottom Ash Pond

The stability analysis report for the Bottom Ash Pond was prepared, signed and sealed by the Owner's engineers and indicates that the main perimeter dike for the Bottom Ash Pond is performing as intended. The

minimum factors of safety calculated for static and seismic loading conditions are 1.60 and 1.08, respectively.

The Virginia DCR in its letter concerning the Bottom Ash Pond indicated the state has concerns about offsite drainage filling the pond such that there are concerns about adequate structural stability (see appendix A – Document 8).

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

Hydrologic/Hydraulic calculations were not provided for either pond; therefore, conclusions regarding the Hydrologic/Hydraulic Safety of the ponds cannot be made at this time. The Virginia DCR agreed and indicated it will ask the utility to perform inflow and outflow hydrologic analyses on both ponds in 2012.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation provided is adequate for preparation of this report. Documentation reviewed did not contain hydrologic/hydraulic calculations. A discussion on liquefaction at either pond was not provided. Technical documentation reviewed in preparation of this report is provided in Appendix A.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the Fly Ash Pond and Bottom Ash Pond provided by the Owner was an accurate representation of what Dewberry observed in the field. Note that the Fly Ash Pond appears to contain no CCR at this time.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided adequate access to the Fly Ash Pond and Bottom Ash Pond to complete the field assessment. The visual assessment of the perimeter dikes for both ponds showed no significant signs of erosion, settlement or instability. Embankments appeared to be structurally sound. No indications of unsafe conditions or conditions needing immediate remedial action were noted during the one-day site visit.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

Current operation and maintenance procedures appear adequate for the Fly Ash Pond and Bottom Ash Pond. The Virginia DCR is concerned about excessive rodent burrowing on the Fly Ash Pond dam.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

Current surveillance and monitoring program procedures appear adequate for the Fly Ash Pond and Bottom Ash Pond. Both facilities are regulated and periodically inspected by Virginia Department of Conservation of Recreation (VA DCR), Division of Dam Safety.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The Fly Ash Pond is rated FAIR because additional technical analyses and documentation are needed, despite the minimal volumes of CCR or water. The Bottom Ash Pond is rated FAIR with acceptable performance expected under static and seismic loading conditions in accordance with applicable safety regulatory criteria. A hydrologic and hydraulic analysis is required for both facilities to demonstrate adequate hydrologic loading conditions. The Fair classification is based on the one-day visual assessment performed by Dewberry and supporting technical documentation provided in Appendix A of this report.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

Maintain the on-going inspection program for the Fly Ash Pond and Bottom Ash Pond. Perform a stability analysis of the Fly Ash Pond assuming it behaves as a surface impoundment. Alternatively propose breaching the perimeter dike of the Fly Ash Pond in accordance with appropriate regulations and requirements so that it does not impound water. Address the potential for liquefaction at the Fly Ash Pond and Bottom Ash Pond.

The Virginia DCR has indicated it will request new structural stability calculations in 2012 based on a full pond.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that the Owner perform hydrologic and hydraulic analyses to evaluate the safety of the Fly Ash Pond and Bottom Ash Pond in accordance with VA DCR DSFM requirements.

1.2.3 Recommendations Regarding the Supporting Technical Documentation

It is recommended that technical documentation be prepared and submitted that addresses the potential for liquefaction at the Fly Ash Pond and Bottom Ash Pond.

1.2.4 Recommendations Regarding the Maintenance and Methods of Operation

It is recommended that all underbrush and trees be removed from the Fly Ash Pond and Bottom Ash Pond in accordance with VA DCR DSFM requirements. This includes all woody vegetation at and beyond the toe of the Fly Ash Pond perimeter dike as well as the embankment and toe of the Bottom Ash Pond adjacent to East River.

It is recommended that any animal burrows located along the perimeter dike of the Fly Ash Pond and Bottom Ash Pond be backfilled in accordance with standard geotechnical engineering practices for dams, and monitored for future reoccurrence.

It is recommended that the Owner perform an interior inspection of the outlet pipe for the Bottom Ash Pond. Interior inspection should focus on the structural integrity of the pipe, seepage, and debris accumulation. The inspection report should summarize all findings and remedial action required, if any. An interior inspection of the outlet pipe for the Fly Ash Pond doesn't appear warranted at this time as the facility is currently inactive; however, if it becomes active then an interior pipe inspection should be performed as well.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants:

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1.3.2 Acknowledgement and Signature

We acknowledge that the management units referenced herein was assessed on February 16, 2011.

Scott C. Clarke, P.E.



orainne Ramos Nieves, P.E., CFM

2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Glen Lyn Power Plant, owned and operated by Appalachian Power d/b/a American Electric Power, is located just inside Giles County corporate limits in Glen Lyn, VA. The Plant is located along three watercourses; the New River to the north, Adair Run just east of the Fly Ash Pond and East River just west of the Bottom Ash Pond. The Plant functions as a coal fired electric power station, operating since 1919, and consists of two generator units with a total generation capacity of 335 MW. See Figure 2.1-1 Location Map and Figure 2.1-2 Aerial Photograph.

The Plant contains two management units for storing CCR, a Bottom Ash Pond and an auxiliary Fly Ash Pond. The Bottom Ash Pond is a multi-cell facility consisting of north, south and clearwater cells. The Fly Ash Pond is a single-cell facility that is currently inactive and does not receive CCR. Table 2.1 provides some general dimensions of both Ash Ponds.

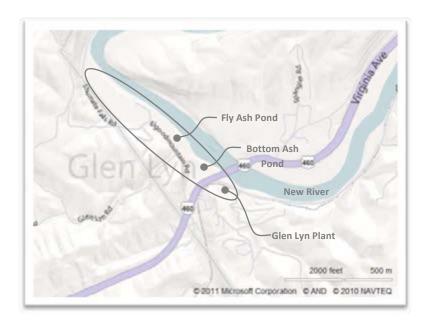


Figure 2.1-1: Location Map



Figure 2.1-2: Aerial Photograph

Table 2.1: Summary of Approximate Dimensions and Size of Ash Ponds			
	Fly Ash Pond	Bottom Ash Pond	
Dam Height (ft)	43	27	
Crest Width (ft)	30	25-40	
Length (ft)	2230	2500	
Side Slopes (upstream) H:V	2.5:1	2:1	
Side Slopes (downstream) H:V	2:1	1.5:1	

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

Fly ash generated inside boilers at this facility is collected by electrostatic precipitators (ESPs) and moved by forced draft air fans through ducts and into hoppers. Vacuum lines then carry dry ash collected within hoppers to a concrete fly ash silo. The concrete silos at the plant are about 35 ft tall and 30 ft in diameter; each rests on a concrete pad. No secondary containment exists for either the hopper or concrete silos. Once in silos, fly ash is conditioned with water to prevent dust emissions as well as to facilitate in its transportation. Wet fly ash residuals are either sold for

beneficial use or hauled in trucks for disposal at an offsite landfill located in West Virginia.

2.2.2 Bottom Ash

Bottom ash and clinkers from boiler tubes are collected inside hoppers below the boilers. The CCR are ground and sluiced through a concrete lined open channel, which leads to a tank where the slurry is then pumped into basalt-lined iron pipes measuring up to 1000 ft and leading into the bottom ash pond. The slurry pipes are primarily located above ground and have no secondary containment.

2.3 SIZE AND HAZARD CLASSIFICATION

According to VA DCR, Division of Dam Safety inventory reports, the Fly Ash Pond has a maximum capacity of 185 acre-feet with a maximum design height for storage of 43 feet (Appendix A, Document 2A). The Bottom Ash Pond has a maximum capacity of approximately 90 acre-feet with a maximum design height for storage of 27 feet (Appendix A, Document 2B). Based on Table 2.2a, the Fly Ash Pond is classified as an **Intermediate** size impoundment and the Bottom Ash Pond is classified as a **Small** size impoundment since dam height controls for both Ash Ponds.

Table 2.2a: USACE ER 1110-2-106 Size Classification		
Impoundment		
Category	Storage (Ac-ft)	Height (ft)
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

Both the Fly Ash Pond and Bottom Ash Pond have a **Low Hazard Classification** based on Table 2.2b.

The Fly Ash Pond is located along the southwest bank of the New River and a portion of the east bank of Adair Run near its confluence with the New River. Although the pond is also adjacent to Route 649, this road is not considered to be a heavily transited through-way. Consequently, the effects of a failure of this facility would be limited to the New River and/or Adair Run with no probable loss of human life and relatively low economic and/or environmental losses. VA DCR, Division of Dam Safety currently regulates this facility as a Low Hazard

impoundment, but has indicated in Document 7 that this classification may not be correct based on the Virginia regulatory definitions.

The Bottom Ash Pond is located along the southwest bank of the New River and portion of the East River near its confluence with the New River. A failure of this facility would be limited to the New River and/or East River with no probable loss of human life and relatively low economic and/or environmental losses. VA DCR, Division of Dam Safety currently regulates this facility as a Low Hazard impoundment, but has indicated in Document 8 that this classification may not be correct based on the Virginia regulatory definitions.

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification			
	Loss of Human Life	Economic, Environmental, Lifeline Losses	
Low	None Expected	Low and generally limited to owner	
Significant	None Expected	Yes	
High	Probable. One or more	Yes (but not necessary for	
	expected	classification)	

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The Fly Ash Pond is currently inactive and did not appear to have any CCR stored in its impoundment area. The volume of CCR stored in the Bottom Ash Pond at the time of the one-day field assessment was not available by the Owner. Table 2.3 summarizes the storage capacity for the Ash Ponds.

Table 2.3: Approximate Maximum Capacity of Ash Ponds			
	Fly Ash Pond ¹	Bottom Ash Pond (North & South Cells/ Clearwater Pond)	
Maximum Pool Surface Area (acre)	10	5.8	
Maximum Capacity (cubic yards)	303,845	145,200	
Maximum Capacity (acre-feet)	185	90	
Top of Dam (feet)	1540	1523 ² (1515)	
Normal Pool (feet)	1510	1505.5/1501.3	

¹When pond was active. ² Per VA DCR O&M Certificate; however, Owner also states this elevation to be 1515 feet

2.5 PRINCIPAL PROJECT STRUCTURES

2.5.1 Earth Embankment

Fly Ash Pond

According to a Dam Safety Inspection report dated July 18, 1978 (Appendix A, Document 3); the original layout of the Fly Ash Pond consisted of three separate fly ash pond cells: Upper, Middle and Lower. The Middle pond cell is currently a permitted landfill and the Lower pond cell serves as a storm-water management (SWM) basin for the landfill. The Upper pond cell, which is known today as the auxiliary Fly Ash Pond, is the facility that was assessed for this report. The Fly Ash Pond earthen embankment was originally constructed of clayey shale to a top elevation of approximately 1536 ft. Based on the documentation provided, it is not clear what transitions took place to raise the embankment to its current elevation, 1540 ft. The auxiliary Fly Ash Pond is understood to have an earthen embankment consisting of a compacted fly ash core and a 3 ft thick clay blanket along the inside slope of the embankment. The upstream and downstream slopes of the embankment are approximately 2.5H:1V and 2H:1V, respectively.

Bottom Ash Pond

According to a Stability Assessment Report dated March 16, 2011 (Appendix A, Document 6), the original crest of the perimeter dike was at elevation 1525 ft and later lowered to elevation 1515 ft, its current elevation today. The upstream and downstream slopes of the perimeter embankment are approximately 3.0H:1V and 2H:1V, respectively. The overburden foundation material consists of clay shale, sand and gravel and sandy clay layers. The aforementioned 1978 inspection report states that the perimeter embankment was constructed of a lean clay and shale mixture (Appendix A – Doc 3). The Stability Assessment Report (Appendix A – Doc 5) assumes the embankment was constructed of lean clay and bottom ash. The original design drawings and description of the Bottom Ash Pond perimeter embankment are not available.

The Bottom Ash Pond is divided into three cells by two internal splitter dikes that are built below the crest of the perimeter dike. No additional data were provided concerning these dikes.

2.5.2 Outlet Structures

Fly Ash Pond

The only outlet structure is located at the east end of the pond (Appendix A, Document 4). The outlet structure consists of a skimmer barrier connected to an overflow drainage shaft and 24 inch diameter corrugated metal pipe to Adair Run.

Bottom Ash Pond

The only outlet structure is located at the west end of the clearwater pond cell (Appendix A, Document 4). The outlet structure consists of a skimmer barrier connected to an overflow drainage shaft and a 30 inch diameter reinforced concrete pipe to East River.

2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

To the best of Dewberry's knowledge, there is no critical infrastructure within five miles downstream of both Management Units. The nearest downstream town is Hinton, West Virginia approximately 20.5 miles downstream of the Ash Ponds.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

VA DCR has a Dam Safety Program, under which both the Fly Ash Pond (Inventory Number 070101) and Bottom Ash Pond (Inventory Number 070102) are State Regulated. Each pond was issued a six-year Regular Class III Operation and Maintenance Certificate on March 20, 2008 (Appendix A, Document 2A and Document 2B). Under the dam safety program, the Owner is required to submit annual inspection reports to DCR as well as an engineer's inventory report and a renewal certification application at the conclusion of each six-year term. Permitting is administered by VA DCR dependent on information provided by the Owner regarding basic inventory of each pond, an emergency action plan and an operation and maintenance review.

Additionally, the ponds are permitted through Virginia Department of Environmental Quality (VA DEQ). The Fly Ash Pond and the Bottom Ash Pond are currently listed as Outfall 006 and Outfall 004 respectively, under NPDES Permit No. VA0000370, issued July 15, 2009.

3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

Fly Ash Pond

Documents supplied by the Owner indicated that a slope failure of the northern dike occurred upon first filling of the pond as well as a 10 ft deep sink hole along the south-west corner of the dike. The slope failure and sinkhole incidents appear to have occurred at separate times prior to 1978; however, no documentation could be found that confirmed a spill and/or release of CCRs due to these incidents. In response to the incidents it was recommended that the suitability of compacted fly ash as an embankment material be evaluated (Appendix A, Document 3).

Bottom Ash Pond

No documented spill/release incidents have occurred in association with the Bottom Ash Pond to the best of Dewberry's knowledge.

4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

Fly Ash Pond

The Fly Ash Pond was constructed in 1965. The original layout consisted of three separate fly ash pond cells: Upper, Middle and Lower. Please refer to Section 2.5.1 for construction material used during construction.

Bottom Ash Pond

The Bottom Ash Pond was constructed in 1963. The original layout consisted of an earthen embankment running along both the East River and New River. Please refer to Section 2.5.1 for construction material used during construction.

4.1.2 Significant Changes/Modifications in Design since Original Construction

Fly Ash Pond

Since original construction, the Middle pond cell has become a permitted landfill and the Lower pond cell has become a storm-water management (SWM) basin that serves the landfill. The Upper pond cell, which is known today as the auxiliary Fly Ash Pond, is the facility that was assessed for preparation of this report.

Engineering drawings provided by the Owner indicate some modifications to the Fly Ash Pond (Appendix A, Document 4). The outlet structure was modified to improve the drainage shaft masonry and reinforcement in 1965, and, in 1973, a pipe trestle was added to the slurry pipes that discharge into the pond. Drawings also indicate an increase in the capacity of upstream storage area in 1976; however, it is unclear whether this increase was for the Fly Ash Pond or Landfill storage areas. No record was found that documents the date and details of the installation of piezometers and observation wells along the embankment of the facility. This is also true for the toe drain system and riprap armor on the downstream embankment running along the New River.

Bottom Ash Pond

The Bottom Ash Pond layout was modified in 1976 to its current multicell layout. Engineering drawings note the modification of the bottom ash storage area and construction of the intermediate outfalls from the north pond cell and south pond cell to the clearwater pond cell (Appendix A, Document 4). No records were found that document the date and details of the installation of piezometers and observations wells along the embankment. This is also true for the riprap armor added to the downstream embankment running along the New River.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

Fly Ash Pond

The slope and sinkhole failures that occurred as discussed under Section 3.2 were repaired, but based on documentation provided, no information was found regarding the design and construction of the repairs. It appears no other significant repairs/rehabilitation have occurred since original construction based on the documentation provided by the Owner.

Bottom Ash Pond

It appears no significant repairs/rehabilitation have occurred since original construction based on the documentation provided by the Owner.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

Data reviewed by Dewberry did not contain the original operational procedures for the Fly Ash Pond or Bottom Ash Pond.

4.2.2 Significant Changes in Operational Procedures and Original Startup

Significant changes in operation procedures and original startup cannot be confirmed based on the documentation reviewed by Dewberry.

4.2.3 Current Operational Procedures

Fly Ash Pond

The Fly Ash Pond is currently not in operation and appears to be empty of CCRs. On the day of the assessment, the bottom of the facility was mostly dry with the exception of a small isolated low spot near the outfall of the pond where rainwater had collected. Until early 2009, the pond was used as an emergency backup pond for storing wet fly ash. From the 1970's to 2009 the pond intermittently received wet fly ash (on average four times a year) until 2009 when the slurry pipes to the pond were turned off. Today the Plant hauls 100% of all generated fly ash to permitted offsite landfills.

Bottom Ash Pond

The Bottom Ash Pond consists of two splitter dikes that create three cells: north, south and clearwater cells. Bottom ash from the Plant is sluiced to either the north or south cell while the other cell remains inactive. The inactive cell is periodically dredged of bottom ash after dewatering, and the material is loaded onto trucks where it is hauled offsite for permitted disposal. Overflow from the active cell is discharged to the clearwater cell through an outlet structure. Water from the clearwater cell flows into a skimmer structure and into a decant tower where it is conveyed to East River through a 30 inch diameter concrete pipe.

4.2.4 Other Notable Events since Original Startup

Based on the documentation provided, no other notable events have occurred with regards to operations since original startup of the Fly Ash Pond and Bottom Ash Pond.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Scott Clarke, P.E. and Lorainne Ramos Nieves, P.E., CFM performed a site visit on February 16, 2011 in company with the participants listed under Section 1.3.1.

The site visit began at 8:30 AM. The weather was clear and sunny. Photographs were taken of conditions observed and selected photographs are included in this report for visual reference. All pictures were taken by Dewberry personnel during the site visit. Appendix B includes two <u>Coal Combustion Dam Inspection Checklist Forms</u>; one for the Fly Ash Pond and one for the Bottom Ash Pond (see Appendix B – Docs 9 and 10). These checklists provide a good summary and inventory of the items assessed during the site visit.

5.2 FLY ASH POND

5.2.1 Crest

The crest of the perimeter dike had no significant signs of depressions, tension cracks or other indications of settlement or shear failure. Figure 5.2.1-1 and Figure 5.2.1-2 shows the typical crest conditions along the

perimeter dike.



Figure 5.2.1-1: Crest, Northwest. New River to the right not seen in this figure.



Figure 5.2.1-2: Crest, Southeast. Route 649 to the right.

5.2.2 Upstream/Inside Slope

The upstream slope of the perimeter dike, including all groins, had adequate and well maintained cover of grasses/weeds. There were no obvious signs of scarps, bulging cracks, depressions or other indications of slope instability. Some woody vegetation was noted growing on the northwest upstream slope of the pond. Figures 5.2.2-1 and 5.2.2-2 show representative upstream slope sections of the perimeter dike.



Figure 5.2.2-1: Upstream slope, Southeast. Note woody vegetation to right in foreground.



Figure 5.2.2-2: Upstream slope, North.

5.2.3 Downstream/Outside Slope and Toe

The downstream slope of the perimeter dike is vegetated with various species of maintained grasses and weeds. Significant woody vegetation and underbrush was noted growing at and beyond the toe of the north dike towards the New River. Based on what could be visually assessed, there were no scarps, sloughs, bulging, cracks, depressions or other indications of slope instability. Figures 5.2.3-1 thru 5.2.3-3 show representative downstream slope sections of the perimeter dike.



Figure 5.2.3-1: Downstream slope, Southeast. Note woody vegetation and trees growing at toe of the embankment.



Figure 5.2.3-2: Downstream slope, Southwest.



Figure 5.2.3-3: Downstream slope, Northwest.

5.2.4 Abutments and Groin Areas

All groins appear stable with a well maintained cover of grass. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability.



Figure 5.2.4: Groin, Northwest.

5.3 BOTTOM ASH POND

5.3.1 Crest

The crest of the perimeter dike had no significant signs of depressions, tension cracks or other indications of settlement or shear failure. Figure 5.3.1-1 and Figure 5.3.1-2 shows the typical crest conditions along the perimeter dike.



Figure 5.3.1-1: Crest, Northwest.



Figure 5.3.1-2: Crest, Northwest. New River to the right.

5.3.2 Upstream/Inside Slope

The upstream slope of the perimeter dike, including all groins, had adequate and well maintained cover of grasses/weeds. Some minor erosion repair work done along the upstream slope adjacent to outlet structure but overall no obvious signs of scarps, bulging cracks, depressions or other indications of slope instability. Figures 5.3.2-1 and 5.3.2-2 show representative upstream slope sections of the perimeter dike.

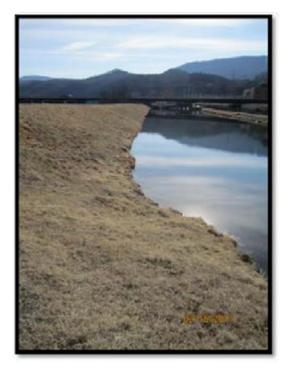


Figure 5.3.2-1: Upstream slope, Southwest.



Figure 5.3.2-2: Upstream slope, Southwest. Outlet structure in the background with erosion repairs to the right.

5.3.3 Downstream/Outside Slope and Toe

The downstream slope of the perimeter dike is vegetated with various species of maintained grasses and weeds. Significant woody vegetation and underbrush was noted growing on the slope of the dike adjacent to East River. Lower section of the dike adjacent to New River is protected

with rip-rap armoring. Based on what could be visually assessed, there were no scarps, sloughs, bulging, cracks, depressions or other indications of slope instability. Figures 5.3.3-1 thru 5.3.3-2 show representative downstream slope sections of the perimeter dike.



Figure 5.3.3-1: Downstream slope, Northwest. New River to the right.



Figure 5.3.3-2: Downstream slope, East. East River to the right. Note woody vegetation and trees growing on dike.

5.3.4 Abutments and Groin Areas

All groins appear stable. All are covered with grass that is maintained except the north groin adjacent to the outlet structure where erosion has been repaired with rip-rap armor. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability. Figure 5.3.4 shows the groin with the repair.



Figure 5.3.4: North groin. Note rip-rap placed in groin area.

5.4 OUTLET STRUCTURES

5.4.1 Overflow Structure

Fly Ash Pond

When the Fly Ash Pond was active, flow would exit the outlet structure over a skimmer and weir and into a discharge pipe that would convey the outflow to Adair Run. The invert of the weir is well above the invert of the pond implying there used to be a permanent pool when the facility was active. There is no low level drain for the facility. The outlet structure appears to be in satisfactory condition despite its discontinued use (Figure 5.4.1-1). Because there is no low level drain, runoff puddles at the bottom of the inactive facility until it evaporates and/or infiltrates into the ground.



Figure 5.4.1-1: Outlet structure, Northeast.

Bottom Ash Pond

The overflow spillway structure is located at the northwest perimeter dike (Figure 5.4.1). The structure appears to be in satisfactory condition. The water exiting the outlet structure into the East River appeared to be flowing clear and there were no signs of clogging.

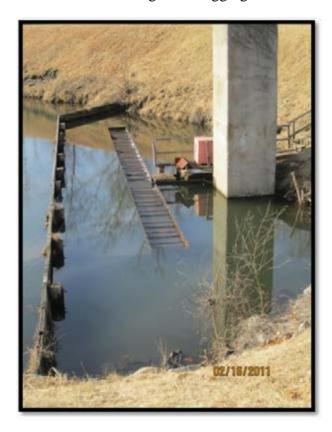


Figure 5.4.1: Outlet Structure, Southwest.

5.4.2 Outlet Conduit

Fly Ash Pond

Outlet conduit (Figure 5.4.2-1) consists of a 24-inch corrugated metal pipe with a weir at its outlet. It is suspected the weir was used for monitoring purposes when the facility was active. The conduit appeared to be in satisfactory shape based on what could be observed in the field. No signs of clogging were observed.



Figure 5.4.2-1: Fly Ash Pond outlet conduit to East River.

Bottom Ash Pond

Outlet conduit (Figure 5.4.2-2) consists of a 30-inch reinforced concrete pipe. The conduit appeared to be in satisfactory shape based on what was observed in the field; however, it was noted that there was some soil and rock debris inside the conduit lessening its capacity. Water exiting the outlet appeared to be flowing clear.



Figure 5.4.2-2: Bottom Ash Pond outlet conduit to East River.

6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

No documentation was provided to Dewberry regarding local flood records. USGS river gage (USGS 03176500) located along the New River at Glen Lyn shows the largest peak flows occurred during 1916 and 1940 (See Appendix A, Document 1, Exhibit 1). These peak flows are comparable to the New River 1% annual chance (100-year) discharges found in the Giles County FIS Study (See Appendix A, Document 1, Exhibit 2). Therefore, it appears that the flood of record is comparable to the base flood elevation of 1525 to 1526 feet specified in the Giles County FIRM dated December 25, 2009, Map Number 51071C0176C and the FIRM dated September 25, 2009, Map Number 51071C038C (See Appendix A, Document 1, Exhibits 3 and 4).

6.1.2 Inflow Design Flood

Data reviewed by Dewberry did not contain Inflow Design Flood information.

6.1.3 Spillway Rating

Data reviewed by Dewberry did not contain Spillway Rating information.

6.1.4 Downstream Flood Analysis

Data reviewed by Dewberry did not contain a downstream flood analysis

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Data reviewed by Dewberry did not contain the necessary documentation to make a proper determination on adequacy of hydrologic and hydraulic safety factors that were or were not considered in the design of the Fly Ash Pond and Bottom Ash Pond.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

No technical documentation was submitted regarding Hydrologic and Hydraulic Safety; therefore, an assessment cannot be made at this time.

Virginia DCR DSFM plans in 2012 to direct the Owner to further investigate runoff control to and from these ash ponds (see Appendix A – Docs 6 and 7). The request reflects the State's concern that the Owner has not provided adequate hydrologic information and has underestimated the amount of drainage to the ponds.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Fly Ash Pond

A stability analysis report was provided for the Fly Ash Pond (Appendix A, Document 5). The report was prepared by GAI in 2007 and revised in 2009. The report was prepared as part of a proposed expansion of the existing onsite landfill into the inactive Fly Ash Pond. The slope stability analysis of the Fly Ash Pond perimeter dike considered static and seismic loading assuming the facility acted as a landfill with soil saturated to existing groundwater levels (phreatic surface).

Bottom Ash Pond

A stability analysis report was provided for the Bottom Ash Pond (Appendix A, Document 6). The report was prepared by the Owner in 2011. The report was prepared as supporting documentation for use in preparation of this report. The slope stability analysis of the Bottom Ash Pond perimeter dike considered varying conditions of static and seismic loading.

7.1.2 Design Parameters and Dam Materials

Fly Ash Pond

Ten boring logs were completed in 2006 by GAI (Appendix A, Document 5). Borings indicate that soils consist primarily of fly ash and alluvium with lesser amounts of residuum. The thickness of the fly ash ranges from 28 ft to 50 ft. Alluvial and residual soils, consisting of sands with varying amounts of silt, clay and gravel, were encountered at all borings. Bedrock consisted primarily of shale. The steepest slope used in the analysis was 2.2H:1V.

Bottom Ash Pond

Nine boring logs were completed in 1995 by the Owner (Appendix A, Document 5). Overburden foundation material consists of layers of clay shale, sand and gravel, and sandy clay. Boring log shows bottom ash material throughout the embankment whereas the 1978 inspection report

(Appendix A, Document 3) states that the dikes were constructed of a lean clay and shale mixture. For the purposed of the slope stability analysis the embankment was assumed to be constructed of lean clay and bottom ash.

7.1.3 Uplift and/or Phreatic Surface Assumptions

Fly Ash Pond

Piezometer water-level readings vary from approximately elevation 1501 ft to 1487 ft and are significantly impacted by the New River according to the report by GAI (Appendix A, Document 3). Phreatic surfaces were incorporated into the stability analyses with the surface elevation between elevation 1488 ft and 1500 ft for Section A-A and at elevation 1500 ft for Section B-B.

Bottom Ash Pond

Uplift and/or Phreatic Surface Assumptions are not discussed in the stability analysis report.

7.1.4 Factors of Safety and Base Stresses

Fly Ash Pond

Factors of Safety range from 1.01 to 2.73 for static and seismic loading cases for landfill scenario, see Table 7.1.4-1.

Table 7.1.4-1: Factors of Safety for Fly Ash Pond

Section Location	Loading Condition	Calculated Safety Factor	Required Safety Factor (US Army Corp of Engineers)
	Static – Toe Failure	1.90	1.5
B-B	Seismic – Slope Length	1.92	1.0
Berm	Static – Slope Length	2.73	1.5
	Seismic – Toe Failure	1.45	1.0
A A	Static - Slope Length	2.12	1.5
A-A Protective	Seismic – Slope Length	1.23	1.0
Dike	Static – Toe Failure	1.29	1.5
DIKE	Seismic – Toe Failure	1.01	1.0

Bottom Ash Pond

Factors of Safety range from 1.08 to 1.73 for static and seismic loading cases, see Table 7.1.4-2

Table 7.1.4-2: Factors of Safety for Bottom Ash Pond

Section Location	Loading Condition	Calculated Safety Factor	Required Safety Factor (US Army Corp of Engineers)
	Steady-state seepage, drained	1.73	1.5
Upstream	Maximum surcharge, undrained	1.72	1.5
	Seismic loading undrained	1.16	1.0
Downstroom	Steady-state seepage, drained	1.60	1.5
Downstream	Seismic loading undrained	1.08	1.0

7.1.5 Liquefaction Potential

Liquefaction potential was not discussed in any of the documents submitted by the Owner for either pond.

7.1.6 Critical Geological Conditions

Documents submitted did not appear to indicate any critical geological conditions in the vicinity of the two ponds. It was noted by the Owner during the one-day site visit that the Plant is located near a fault that runs just south and approximately parallel to the ponds.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

The supporting technical documentation submitted to support the structural stability of the Bottom Ash Pond appears to be adequate. The supporting technical documentation submitted to support the structural stability of the Fly Ash Pond appears to be adequate if the pond remains empty and dry. However, if the pond may be used for impounding ash in the future, then static and seismic loading cases should be evaluated assuming the facility acts as an impoundment (instead of a landfill) with its pool full to the crest of its existing spillway.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Fly Ash Pond

Based on a visual site assessment and review of documentation provided, the overall structural stability of the perimeter dikes for the Fly Ash Pond appears to be fair. This rating considers the fact that there were no obvious signs of structural instability during the one-day site visit; that the facility is currently well maintained and inspected regularly; and that the drainage area to the facility is contained to the perimeter dikes. However, the facility has an undocumented history of slope and sinkhole failures that occurred prior to 1978; liquefaction potential was not evaluated; and the slope stability analysis did not evaluate the static and seismic loading cases where the facility acts as an impoundment (instead of a landfill).

The Virginia DCR indicated in its letter that it will require the Owner to perform an assessment of the structural stability of the pond, assuming a full impoundment. (see Appendix A – Doc 7)

Bottom Ash Pond

Based on a visual site assessment and review of documentation provided, the overall structural stability of the perimeter dikes for the Bottom Ash Pond appears to be fair. This rating considers the fact that there were no obvious signs of structural instability during the one-day site visit; that the facility is currently well maintained and inspected regularly; and that the drainage area to the facility is contained to the perimeter dikes. However the liquefaction potential was not evaluated; and the dike along the East River is heavily covered with woody vegetation making inspection of the dike in that area difficult.

The Virginia DCR indicated in its letter that it will require the Owner to perform an assessment of the structural stability of the pond, assuming a full impoundment to the crest. (see Appendix A - Doc 8)

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

Operating procedures reviewed appear adequate for the Fly Ash Pond and Bottom Ash Pond. Today only the Bottom Ash Pond is in operation whereas the Fly Ash Pond is currently inactive and being considered for transition into an extension of the adjacent onsite ash landfill.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

In 1983, the Owner adopted a Dam and Dike Inspection and Maintenance Program (DIMP), where all earthen dams and dikes used for ash storage or disposal, waste water ponds, and large cooling water storage facilities under the Owner's management are routinely inspected, documented, and monitored. Under this program, there are four separate levels of inspection. First is to routinely make inspections by plant personnel to monitor visible changes; second is to make formal 'checklist type' inspections completed by plant personnel on a quarterly basis; third is to routinely schedule engineering inspections supervised by a professional engineer according to the risk classification of the dam; and, fourth are non routine inspections completed after heavy rains, seismic activity or other major events. The inspection and maintenance program continues today for the Fly Ash Pond and Bottom Ash Pond.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Operating procedures appear adequate.

8.3.2 Adequacy of Maintenance

Maintenance procedures appear adequate.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Surveillance procedures are in conformance with the Owner's adopted DIMP as discussed under Section 8.2.

9.2 INSTRUMENTATION MONITORING

Instrumentation including piezometers and observation wells were installed at the Fly Ash Pond and Bottom Ash Pond as temporary measures to collect data for use in the slope stability analyses for each pond. A continuous record of observations from these instruments is not tracked.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Inspection program appears adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

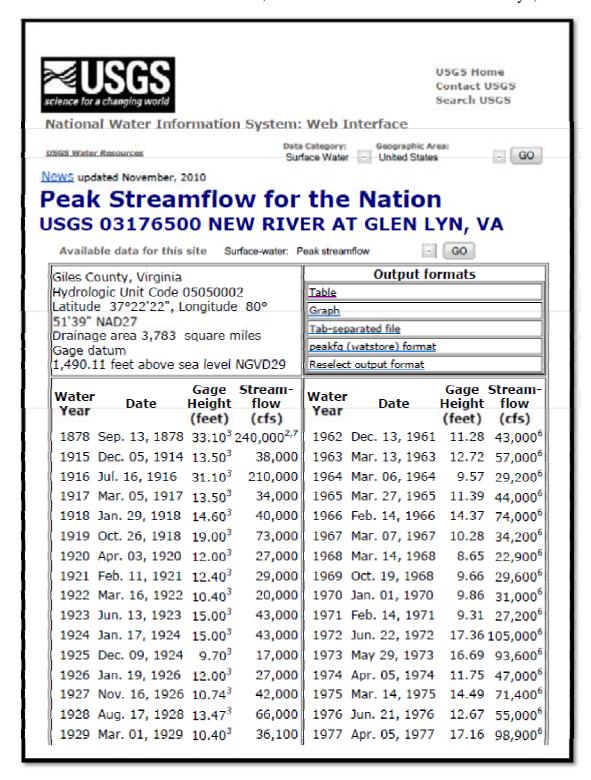
No permanent instrumentation monitoring program.

APPENDIX A

Document 1

Exhibits 1 - 5

Exhibit 1: USGS Peak Streamflow, USGS 03176500 New River at Glen Lyn, VA



```
1930 Oct. 03, 1929 16,753
                                    99,000 [
                                               1978 Nov. 07, 1977
                                                                        18.12 110,000<sup>6</sup>
1931 Aug. 23, 1931
                                               1979 Feb. 26, 1979
                         7.66^{3}
                                    19,600
                                                                        13.62 63,600<sup>6</sup>
1932 May 02, 1932
                         7.94^{3}
                                    21,200
                                              1980 Apr. 15, 1980
                                                                        12.08 49,700<sup>6</sup>
1933 Oct. 18, 1932
                         9.84^{3}
                                    32,500
                                              1981 May 29, 1981
                                                                         9.59 31,600<sup>6</sup>
1934 Mar. 28, 1934
                                   35,000<sup>2</sup>
                                              1982 Feb. 04, 1982
                                                                        12.14 50,400<sup>6</sup>
                                    63,600
1935 Jan. 23, 1935 13,403
                                              1983 Apr. 10, 1983
                                                                        12.96 57.100<sup>6</sup>
1936 Feb. 15, 1936 12,003
                                    51,600
                                              1984 Feb. 15, 1984
                                                                        11.96 48,700<sup>6</sup>
1937 Jan. 20, 1937 10,953
                                    43,500
                                              1985 Aug. 19, 1985
                                                                         8.95 24,700<sup>6</sup>
1938 Oct. 20, 1937 12,65<sup>3</sup>
                                    56,600
                                               1986 Nov. 05, 1985 12.55 53,600<sup>6</sup>
1939 Jan. 31, 1939
                         7.60^{3}
                                   20,100^6
                                               1987 Apr. 25, 1987
                                                                        15.97 85,200<sup>6</sup>
1940 Aug. 14, 1940
                        27.50
                                  226,000^{6}
                                               1988 Jan. 20, 1988
                                                                         6.47 12,900^6
1941 Jul. 06, 1941
                          8.30
                                   24.300^6
                                               1989 Sep. 23, 1989
                                                                        17.71\ 103,000^6
1942 May 22, 1942
                         10.91
                                   43,100^6
                                               1990 Nov. 17, 1989
                                                                        11.38 44,300<sup>6</sup>
1943 Dec. 31, 1942
                          9.55
                                   33,200<sup>6</sup>
                                               1991 Mar. 31, 1991
                                                                         9.61 \ 31,600^6
1944 Feb. 18, 1944
                         11.01
                                   43,900^6
                                              1992 Jun. 05, 1992
                                                                        17.47 100,000<sup>6</sup>
1945 Sep. 18, 1945
                                   76,000<sup>6</sup>
                         14.50
                                               1993 Mar. 24, 1993
                                                                        17.47 100,000<sup>6</sup>
1946 Jan. 08, 1946
                                                                        13.58 62,400<sup>b</sup>
                         13.50
                                   66,000<sup>6</sup>
                                               1994 Aug. 18, 1994
1947 Jan. 21, 1947
                         11.10
                                   44,700<sup>6</sup>
                                               1995 Jan. 16, 1995
                                                                        19.83 125,000<sup>6</sup>
1948 Feb. 15, 1948
                         11.32
                                   46,300<sup>6</sup>
                                               1996 Jan. 19, 1996
                                                                        18.01 105,000<sup>6</sup>
1949 Dec. 04, 1948
                                   49,700<sup>6</sup>
                                              1997 Dec. 02, 1996
                        11.66
                                                                        11.28 43,500<sup>6</sup>
1950 Feb. 02, 1950
                          9.09
                                   29,600<sup>6</sup>
                                               1998 Apr. 20, 1998
                                                                        12.93 56,700<sup>6</sup>
1951 Dec. 08, 1950
                                               1999 May 15, 1999
                         14.85
                                   79,000<sup>6</sup>
                                                                         6.88 16,300<sup>6</sup>
                                                                         7.49 18,100<sup>6</sup>
1952 Mar. 12, 1952
                          9.90
                                              2000 Apr. 19, 2000
                                   35,400^{6}
                         11.42
                                   47,100^6
                                                                         9.82 33,200<sup>6</sup>
1953 Feb. 22, 1953
                                               2001 May 23, 2001
1954 Mar. 01, 1954
                                   51,500^6
                                              2002 Mar. 19, 2002
                                                                        11.28 43,500<sup>6</sup>
                         11.93
1955 Apr. 15, 1955
                         10.13
                                   36,900^6
                                               2003 Feb. 23, 2003
                                                                        15.71 82,700<sup>6</sup>
1956 Apr. 17, 1956
                                   44,700^6
                                               2004 Nov. 20, 2003
                                                                        17.40 99,600<sup>6</sup>
                         11.13
1957 Apr. 06, 1957
                         13.57
                                   66,700^{6}
                                              2005 Mar. 29, 2005
                                                                        10.64 38,900<sup>6</sup>
1958 Mar. 31, 1958
                         10.41
                                   35,300<sup>6</sup>
                                               2006 Jun. 28, 2006
                                                                        11.01 41,500<sup>6</sup>
1959 Dec. 29, 1958
                         12.15
                                   52,000<sup>6</sup>
                                               2007 Mar. 17, 2007
                                                                         8.54 24,300<sup>6</sup>
1960 Mar. 31, 1960
                                   66,000^6
                                               2008 Oct. 27, 2007
                                                                         8.45 23,700<sup>6</sup>
                         13.60
1961 May 13, 1961
                                   51,000^6
                                               2009 May 08, 2009
                         12.14
                                                                         8.76 25,300<sup>b</sup>
```

Peak Gage-Height Qualification Codes.

 ^{3 --} Gage height at different site and(or) datum

Exhibit 2: FEMA Giles County FIS Study, Table 1-Summary of Discharges.

TABLE 2. SUMMARY OF DISCHARGES					
DRAINAGE PEAK DISCHARGES (cubic feet per second)					
FLOODING SOURCE AND LOCATION	AREA (sq. miles)	Annual- Chance	2-Percent- Annual- Chance	Annual- Chance	O.2-Percent- Annual: Chance
DOE CREEK					
At mouth, Pembroke	8.6	1,040	1.690	2.200	3,850
Above Mays Hollow, Pembroke	7.7	950	1,550	2,000	3.550
At U.S. Highway 460	6.9	830	1,350	1,700	3,150
Above U.S. Route 460, Pembroke	6.9	890	1,450	1,850	3,350
At State Route 678	5.3	720	1,180	1,500	2,815
At State Route 615	4	610	1,010	1,290	2,460
EAST RIVER					
U.S. Highway 460. Glen Lyn	76	5,200	8,150	9,750	14,000
GREENBRIER BRANCH					
At Mouth	2.8	300	480	600	900
At U.S. Highway 460	1.6	150	245	315	485
At State Route 605	1.1	140	230	290	450
LAUREL BRANCH					
At Mouth	4.3	535	890	1.125	1,740
At Private Route (State Route 628 Extended)	3.3	420	690	880	1,365
LITTLE STONY CREEK	24.2	0.000	4.000	£ 180	7.900
At Mouth, Pembroke	24.2	2,200	4,000	5,180	- 40 - 0 - 0
Johnson Avenue, Pembroke	22.8	2,100	3,850	4.900	7,450
At State Route 688 At Jefferson National Forest	21.7	2,100	3,600	4,500	6,900
Boundary	19.3	1.935	3,200	4,000	6,100
MAYS HOLLOW					
At Mouth, Pembroke	0.4	165	290	365	590
MILL CREEK					
At Mouth, Narrows	6.8	603	1,140	1,423	2,270
College Street, Narrows	6.5	578	1,095	1,378	2,090
PINEY CREEK					
At Mouth	3,04	400	650	825	1,275
6,900 Feet above Mouth	1.85	275	450	575	900
NEW RIVER					
At U.S. Highway 460, Glen Lyn	3,768	98,500	174,000	230,000	450,000
Cross Section F at Rich Creek	3,760	98,500	174,000	230,000	450,000
Downstream of Narrows	3,725	97,400	172,400	227,750	446,300

Exhibit 3: FEMA Giles County FIRM, Map Number 51071C0176C

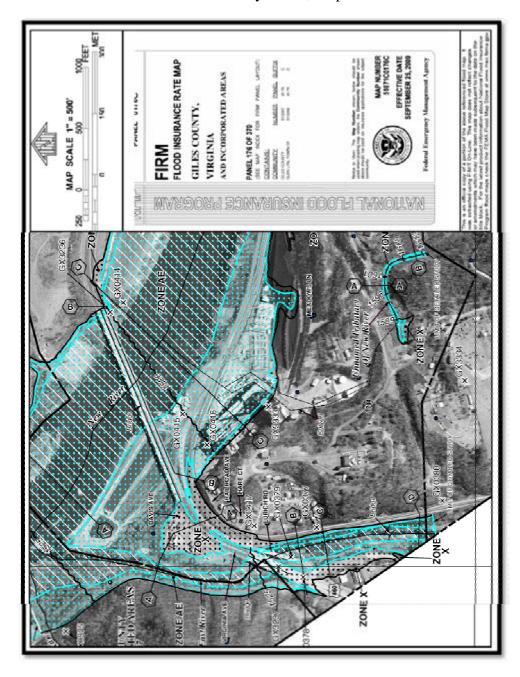


Exhibit 4: FEMA Giles County FIRM, Map Number 51071C0038C

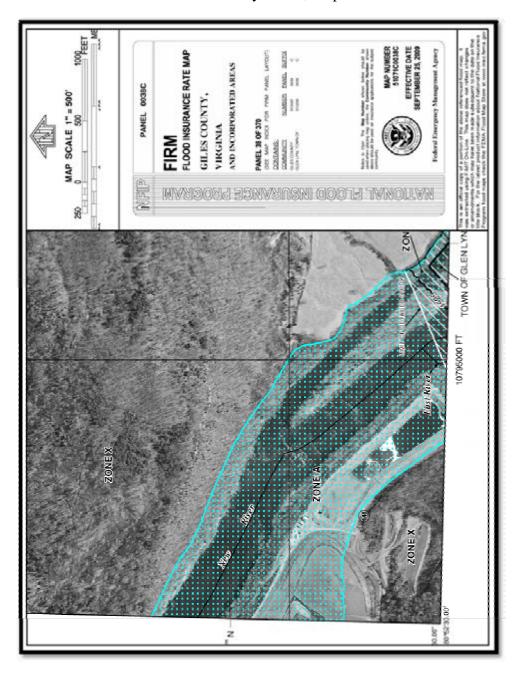
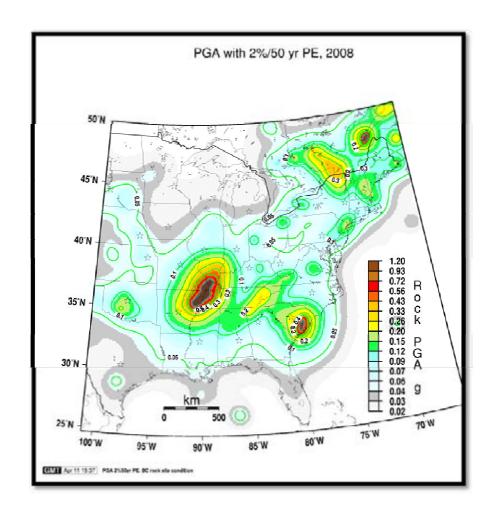


Exhibit 5: USGS Seismic-Hazard Map for Central/Eastern US, 2%/50 Years, 2008

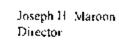


APPENDIX A

Document 2A

Virginia DCR Inventory Number 07101 Certificate, Inventory Report and Operation & Maintenance Program MAINTENANCE PROGRAM

L. Preston Bryant, Ji Secretary of Natural Resources



COMMONWEALTH of VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Steet, State 206 Richmond, Virginia 23219-2010 (804) 371-6095 Fax (804) 371-2630

April 4, 2008

Appalachian Power Company Attn: William Smith Post Office Box 2021 Roanoke, VA 24022-2122

RE: Glen Lyn Fly Ash Dam, Inventory Number 07101

Dear Mr. Smith:

The Operation and Maintenance Certificate Application for Glen Lyn Fly Ash Dam, Inventory Number 07101, and the required supporting documents have been reviewed for compliance with the provisions of the Code of Virginia, Dam Safety Act, (Section 10.1-604 et. seq.) and the regulations promulgated by the Virginia Soil and Water Conservation Board (Board). Based on this information, on March 20, 2008, the Board issued a six-year (03/20/2008 - 3/31/2014) Regular Class (II Operation and Maintenance Certificate (Certificate). The Certificate and other pertinent data are enclosed.

The Dam Safety Act requires dam owners to maintain their dam in a condition to prevent unreasonable threats to life and property of others. The classification of your dam and the Certificate issued were based on the current known downstream hazard potential from upstream characteristics, a re-inspection report, operation and maintenance application, and an emergency action plan. The actions contained in the documents accompanying your Certificate Application must be adhered to for the duration of the terms contained in the Certificate. To assist you in adhering to the terms of the Certificate, the following table provides a schedule of dates to submit required documents.

State Parks • Soil and Water Conservation • Natural Heritage • Outdoor Recreation Planning Chesapeake Bay Local Assistance • Dam Safety and Floodplain Management • Land Conservation William Smith April 4, 2008 Page 2

Annual Owner's Inspection Report	Owner's Engineer Inventory Report	Renewal Certification Six Year Application by Owner and Owner's Engineer
03/31/2009		
03/31/2010		
03/31/2011		
03/31/2012		
03/31/2013	12/31/2013	12/31/2013

Should you have questions, please direct them to Thomas I. Roberts, P.E., Dam Safety Regional Engineer, Department of Conservation and Recreation, Dam Safety and Floodplain Management Division, 8 Radford Street, Suite 203. Christiansburg, VA 24073, telephone 540-394-2550 or via e-mail at Thomas.Roberts@der.virginia.gov.

Sincerely/

William G. Browning

Director, Dam Safety & Floodplain Management Division

Enclosures as stated:

c: James M. Robinson, P.E., Dam Safety Program Manager Thomas I. Roberts, P.E. Dam Safety Regional Engineer

DATA SHEET - OPERATION AND MAINTENANCE CERTIFICATE

Department of Conservation & Recreation Division of Dam Safety & Floodplain Management 203 Governor Street, Suite 206 Richmond, VA 23219-2094

Name of Dam Glen Lyn Fly Ash Dam	Inventory Number 07101		
Location Offstream Dam Near New River	City County Gifes		
Owner Appalachian Power Company Attn: William Smith Address 40 Franklin Road, P.O. Box 2021 City/Town/Zip Roanoke, VA 24022-2121	Designed by Casa Grande Consultants Constructed by George Lynch Year Constructed 1965		
Type of Dani Earthfill	Purpose Sediment-Fly Ash		
Drainage Area (Sq. Mi.) 0.02	Type of Watershed N/A		
Total Height (Ft.) 43	Elevation 1540		
Normal Pool Height (Ft.): 13	Elevation 1510		
Maximum Capacity (Acre Ft.) 300	Maximum Area (Acres) 10		
Normal Capacity (Acre Ft.) 80	Normal Area (Acres) 5		
Size Classification Medium	Hazard Classification III		
Required Spillway Design Flood 14% PMF	Available Spillway Design Flood - Impounds PMF		
Type of Spillway N/A	(Note if Section 130)		

Operation and Maintenance Plans & Schedule by () Reinspection or (X) Inventory Report by

AEP/Pedro Jose Amaya-Trujillo, VA PE #036174 AEP/Pedro Jose Amaya-Trujillo, VA PE #036174

Emergency Action Plan filed with:

- (X) Virginia Dept. of Emergency Management
- (X) Local Coordinator of Emergency Services

City/County. Giles County

Application Reviewed and Recommended for Six-Year Regular O & M Certificate (3/20/2008-3/31/2014)

Ву

Thomas I Roberts, PE # 19966

Date | March 17, 2008

Concurrence with the Recommendation

By

William G. Browning, Divector

Date March 19, 2008



COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION DIVISION OF DAM SAFETY VIRGINIA SOIL AND WATER CONSERVATION BOARD

DAM SAFETY CERTIFICATE REGULAR CLASS III OPERATION & MAINTENANCE CERTIFICATE NUMBER 07101

Appalachian Power Company, owner of Glen Lyn Fly Ash Dam in Giles County, is entitled to operate and maintain this dam pursuant to the provisions of the Dam Safety Act (Section 10.1-604 et seq., Code of Virginia) and Regulations promulgated thereunder.

This certificate is for a term of six years. It becomes effective March 20, 2008 and expires March 31, 2014. In accordance with §4VAC50-20-100F of the Regulations, the owner shall apply for a new certificate 90 days prior to its expiration.

Joseph H. Maron



INVENTORY REPORT FOR CLASS III AND CLASS IV IMPOUNDING STRUCTURES

Reference: Impounding Structure Regulations, 4VAC50-20-00 et seq , Virginia Soil and Water Conservation Board

21	oject Intormation:
a.	Name of Impounding Structure Clen Lyn Fly Ash Dam
b	Inventory Number 071.01 Other Name (if any) Fly Ash Fond
¢	Name of Reservoir Glen Lyn Plant Fly Ash Pond
đ	Purpose of Reservoir Standby use for impoundment of coat combustion fl Sediment and stormwater runoff pond for ash landfill
Lo	eation of Impounding Structure:
a	City/County Olles County Magisterial District
ь	Located 1 feet/miles upstream/downstream of Highway No 460
с	Name of River or Stream Upground Reservoir adjacent to New River
đ	Latitude <u>N37 221 30*</u> Longitude W80 521
a b	Owner's Name Appalachian Power Company Mailing Address 40 Franklin Road; 2.0. Box 2011
	Roanoke, VA 24022-2121
¢.	Telephone (800) 956-423/
Own	et's Engineer:
a	Engineering Firm/Engineer American Electric Power Service Corporation
ь	Professional Engineer Virginia Number Pedro Gose Amaya-Trujillo VA#036174
c.	A Property of the Control of the Con
	Mailing Address 1 Riverside Plaza
	Mailing Address I Riverside Plaza Columbus, Obio 43215

(DCR 199-104) (12/01)

5.	Impounding Structure Data (All elevations NGVD unio	ess noted):
	a. Type of Material earth X concrete m	asonty
	Other	··
		Design Configuration
	b Top of Dam	154n Elev (if known)
	c Downstream Loe (Lowest)	appr. 1497 Elev (if known)
	d Height of Dam	1/ect
	e Crest Length (Exclusive of Spillway)	Feet
	f. Crest Width	Feet
	g Upstream Slope	2.5 H:1V
	h. Downstream Stope	2ff:1V
6	Reservoir Data	Design Configuration
	a Maximum Capacity	185Acre-feet
	b Maximum Pool	Blev (if known)
	c Maximum Pool Surface Area	Acres
	d Normal Capacity	155 Acro feet
	c Normal Puol	appx. 1510_Rev (if known)
	f Normal Pool Surface Area	Acres
	g Freeboard (Normal Pool to Top)	3 <u>0</u> [Feet
	h Precboard (Normal Pool to Emergency)	N/A Feet
7	Spillway Data <u>Ivpe</u> <u>Construction I</u>	Material Maximum Capacity
	a Low Level DrainN/A	
	b Principal Spillway Weir & Pipe Concrete	<u> </u>
	e Emergency Spillway N/A	<u> </u>
		Design Configuration
	d Low Level Drain	Flow (if known)
	e Principal Spillway	2538.0 Flev (if known)
	f. Emergency Spillway	<u>u/A</u> Elev (if known)

discharge to dam if looking downstream: N/A	
	_
The December of the second sec	
h. Describe the emergency spillway to include dimer	
channel or other construction, spillway surface protection.	
downstream:	·
	
	
·	
Watershed Data (Class III only):	
a Drainage Area	10 5 AcresSq Miles
2. Type and Extent of Watershed Development	Roadway around the crest o
•	
:. I ime of Concentration	
I Spillway Design Flood used (mark appropriate box	
PMF, source	
1/2 PMP, source	
100 Year, source	
50 Year, source	
Other, sourceNot Applicable	
Design inflow hydrograph: Volume	acre-feet;
Peak inflow	CFS;
Rainfall duration of design inflow hydrograph	hours
Freeboard during passage of spillway design flood _	feet
pounding Structure History	
Date construction completed	1965

(DCR 199-104) (12/01)

9.

ιl	Inspection	n dates 1978, 1980, 1982, and annually from 1984-2007
e	Inspection	ns by Woodward-Clyde Consultants, ARPSC, & Geosymted Consulta
f.	Description	on of repairs Brush and tree outling, filling encaion, gullieg,
	fillin	ng animal hojes, repairs to several seepage collection pipes.
g.	Has the i	impounding structure ever been overtopped? YesXNo
-		· · · · · · · · · · · · · · · · · · ·
Em	pounding :	Structure Assessment:
а	Provide b	riof descriptions for each item:
	i	Condition of the impounding structure Good
		. •
		
	ii	Condition of the convenience
	11	Condition of the reservoir Good
	Ш	Condition of the upstream area N/A
		·
	iv	Condition of the downstream area Good
ь	Provide a n	surrative describing any recent changes in the impounding structure, reservoir,
		and downstream area: No recept changes
-		und reservoir remains out of service for and is utilized very
		ly for wet ash disposal
	· -	
		-· · · · · · · · · · · · · · · · · · ·
		fations for comedial measures: Routine maintenance such as trees and
¢R	coommend	· · · · · · · · · · · · · · · · · · ·

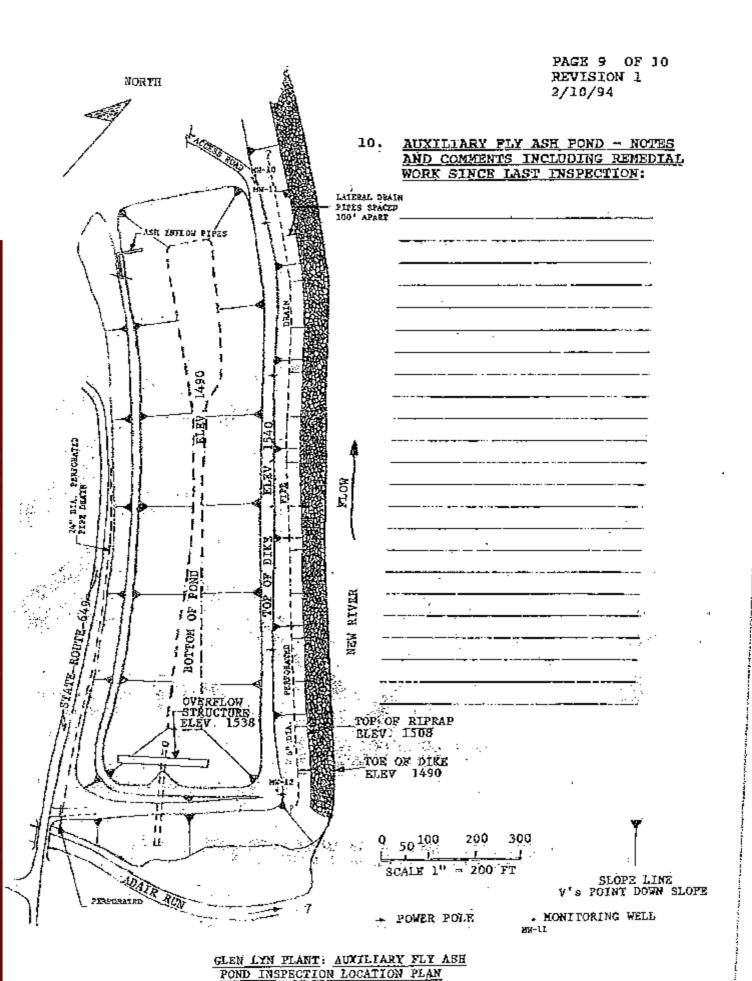
(DCR 199-104) (12/01)

See Attached Sketch

CERTIFICATION BY OWNER'S ENGINEER (Class iff only)

Charachy and the shot she is formation and the state of t	
I hereby certify that the information provided in this Inventory Report has been examined by me and found.	۶¦ ۲
to be true and correct in my professional judgment	4
Signed Pades & Cunay a State of Constitutional Engineer (Protessional Engineer) (Protessional Engineer) NO. 036174	i.
Vinginia Number <u>0</u> 36 <u>174</u> \\ \frac{1}{24} \ \lambda \\ \frac{1}{24} \ \frac{1}{24} \	
This 2 day of Awary	ÇĞ.
CERTIFICATION BY OWNER (Class IV only)	
I hereby certify that the information provided in this Inventory Report is true and correct Signed (Owner)	
This 28	
Please fill out and mail to:	
Please fill out and mail to: Department of Conservation and Recreation	
Please fill out and mail to:	

(DCR 199-104) (12/01)





OPERATION AND MAINTENANCE APPLICATION CLASS I, II AND III IMPOUNDING STRUCTURES

11(46)					Ash Fond
			wblc I, Impounding Struc		
	(Circle Ore		. –	Class III	
	-	•			
					A 24022-2121
)
Operat	ting Pian a	nd Schedule arrative for each item:			
				weir elevat	ion - See Attachment
(Operat	ion of Reservoir Drain See Attachment	(not to exceed ½ foot do	awdown per day	on cmbaukment dams).
THE RES	enance Pia	n and Schedule			
	rovide a na Embani		See Attachment 1		
P	rovide a na Embani (1)	urative for each item: unent Dams; embankment; principal spillway;	See Attachment	τ	
P	rovide a na Embani (1)	principal spillway:	See Attachment See Attachment	t t I	
P	rovide a na Embani (1) (2)	principal spillway: cmergency spillway.	See Attachment See Attachment	t t I	· · · · · · · · · · · · · · · · · · ·
P	(1) (2) (3)	principal spillway: cmergency spillway.	See Attachment Suc Attachment See Attachment	t	· · · · · · · · · · · · · · · · · · ·
P	(1) (2) (3) (4)	principal spillway: cmergency spillway. low level outlet:	See Attachment Suc Attachment See Attachment	t I	

(DCR 199-099) (12/01)

(2)	downstream face:	N/A	<i>y 40°</i>
(3)	crest:	N/A	
(4)	galleries:	N/A	
(5)	tunnels, etc ;	N/A	
(6)			
(7)	spillways:	N/A	
(8)	gates and outlets:	N/A	
(9)		N/A	
(1) operator (2) maintena annual. (3) technical every two Inspections Frovide the in a mainfall a b spillway.	safety teinspection by a property teins II dams every ection annually by a class II dams every ection annually by a class Schedule Virginia formation that initiates the mounts and/or: [lows: N/A	uarterly, semi-annual, annual) Onering Division - checklis ofessional engineer (required for whree years All dams inspected) Professional Engineer and Dept of Conservation and Emergency Action Plan:	reports are submitted to the d Rocreation - Dan Safety
8 For a newly construction inspected the impounding belief, the impounding	eted impounding structure, ing structure during constr structure and all appurtena	provide certification from a Profesuction that, to the best of the engineers have been constructed in constructed in Constructed in Constructed and Recre	ssional Engineer who has neer's judgment, knowledge and dormance with the plans,

N/A

OPERATION AND MAINTENANCE PERMIT APPLICATION

OPERATION AND MAINTENANCE SCHEDULES CERTIFICATION BY OWNER

Please fill out and mail this form to:
Department of Conservation and Recreation
Division of Dam Safety
203 Governor Street
Richmond, Virginia 23219-2094



GLEN LYN FLY ASH DAM INVENTORY NUMBER: 07101

OPERATION AND MAINTENANCE APPLICATION Attachment 1

item No. 5a.

- (1) Embankment: The upstream and downstream slopes are visually inspected by plant personnel several times each week. Items observed include signs of instability, seepage, erosion and vegetative cover. Tree and brush cutting is done as needed, usually in the Fall. Rodent burrows are filled in when they are found.
- (2) Principal Spillway: The principal spillway for the area referenced as the Auxiliary Fly Ash Pond has not operated in many years because this upground reservoir receives fly ash slurry very infrequently and at very short durations. It is checked periodically. The structure would need to be thoroughly inspected and repaired if plant operations were to necessitate resumption of wet disposal. The principal spillway for the area referenced as the West Pond consists of a sloping shaft and metal conduit. The structure has a fixed weir crest (constant stop log elevation) and a skimmer structure. This is routinely inspected via the weekly visits by plant personnel and the quarterly inspections.
- (3) Emergency Spillway: There is no emergency spillway along any section of the diking.
- (4) Low Level Outlet: Not applicable due to the nature of the sedimentation function of the ponds.
- (5) Reservoir Area: The pool area in the Auxiliary Fly Ash Pond varies depending on the use of the wet disposal system. It is generally less than 1 acre in surface area and an average of 2-3 feet deep. The reservoir area for the West Pond is approximately 2 acres at normal pool. The shoreline along both of these areas are inspected quarterly and observed during visits by plant personnel.
- (6) Downstream Channel: Plant personnel observe the receiving channel several times each week. Observations are recorded quarterly and repairs will be performed as necessary. To date, there has not been the need for any repairs since the last certification
- (7) Other: No additional items associated with this facility.

GLEN LYN PLANT DIKE INSPECTION CHECKLIST

7	GENERAL INFORMATION	
	Date of Inspection	<u>., .</u>
	Inspected by	
	Weather	
	Temperature	
	Rainfall (inches) since	
	Pond levels:	
	North Bottom Ash Pond	(1505.5*)
	South Bottom Ash Pond	(1506.3*)
-	Clearwater Pond (1501.3	J*)
	Auxiliary Fly Ash Pone	
	West Pond	to the second of
2.	EMBANKNENT CONDITION: AT	BOTTOM ASH AND CLEARWATER PONDS
Α.	which is found on Page 8 appropriate, a description each problem area. Then	om Ash Pond Inspection Location Plan Place a number or letter and, if ve sketch on the location plan at place the same number(s) or let- priate descriptions below.
	DESCRIPTION	LOCATION CODE
	Erosion	्राच्या स्थान का राज्याचा शहर का जाता है। जातुमा स्थान का राज्याचा शहर का जाता है।
	Ruts in Crest Road	
	Animal Burrows	
	Approximate normal pool 1	evels when in service.

<u>DESCRIPTION</u>	LOCATION CODE
Leaking Ash Pipe	
Seepage/Wetness	
Trees on Slope	
Vegetation condition	
Cracks/Bulges/Slides	
Other (Please specify)	
displacement of the rip last inspection? If so river flow event which	ificant deterioration, erosion or rap at the river shoreline since the , please describe condition and the caused it.
ash ponds because of the	of the shoreline inside the bottom e ash inflow pipas?
3. OUTLET WORKS AT BOTTOM A	ASH AND CLEARWATER PONDS
the appropriate space be	GOOD PROBLEM
North B. A. Pond Skimmer	the state of the s
North B. A. Pond Overflow Lip	Septime
South B. A. Pond Skimmer	
South B. A. Pond Overflow Lip	& Pipe
Perforated Water Distribution	†
Clearwater Pond Skimmer	

	GOOD	
	CONDITION	PROBLEM
Clearwater Pond Overlow Lip & Chu	te	
Clearwater Pond Spillway Tower		
Access Steps to Spillway Tower		<u></u> -
Outfall Pipe to East River	 ;	_
Access Path to Outfall Pipe		
B. Please describe problems belo	JW!	
<u> </u>	<u></u>	
		· .
	•	
tion Plan which is found on P letter and, if appropriate, a location plan at each problem number(s) or letter(s) next to below.	age 9. Place a numb descriptive sketch area. Then place the	er or on the
		he same scriptions
DESCRIPTION	LOCATION (he same scriptions
DESCRIPTION Erosion		ne same scriptions CODE
	LOCATION C	ne same scriptions CODE
Erosion	LOCATION C	ne same scriptions CODE
Erosion Ruts in Crest Road	LOCATION C	ne same scriptions CODE
Erosion Ruts in Crest Road Animal Burrows	LOCATION C	ne same scriptions CODE
Erosion Ruts in Crest Road Animal Burrows Leaking Ash Pipe	LOCATION C	ne same scriptions CODE
Erosion Ruts in Crest Road Animal Burrows Leaking Ash Pipe Leaking Embankment Drain Pipe	LOCATION C	ne same scriptions CODE

В

Exposed	Ash on Slope			
Cracks/B	ulges/Slides	<u> </u>		
Sinkhole	:			
Other (P.	lease specify)			-
B. Has this so, when	pond been used and for approxi	since the previ imately what dur	ious inspec ration?	etion?]
		· · · · · · · · · · · · · · · · · · ·		
C. Has the w the emban	water level in t Doment drains to	he pond been hi become active?	igh enough	to cause
			,	
				
OUTLET WO	RKS AT AUXILIAR	Y FLY ASH POND		• •
. Please ob	RKS AT AUXILIAR serve the featu	Y FLY ASH POND res listed belo		k the
. Please ob	RKS AT ADXILIAR serve the featur te space:	Y FLY ASH POND res listed belo		:
. Please ob	serve the featur te space:	Y FLY ASH POND res listed belo	w and check	:
. Please ob appropria	serve the featur te space:	Y FLY ASH POND res listed belo	w and check	:
. Please ob appropriat	serve the featur te space:	Y FLY ASH POND res listed belo	w and check	:
Please obe appropriat teel Trough	serve the featur te space: ner supports	Y FLY ASH POND res listed belo	w and check	:
Please obsappropriate teel Trough coden Skimmer rough or Skimm	serve the featur te space: uer supports	Y FLY ASH POND res listed belo	w and check	:
Please obsappropriate teel Trough coden Skimmer rough or Skimm concrete struct ther (Please s	serve the featur te space: er supports ure pecify)	y FLY ASH POND res listed belo GOOD CONDITION	w and check	:
Please obsappropriate teel Trough coden Skimmer rough or Skimm concrete struct ther (Please s	serve the featur te space: uer supports	y FLY ASH POND res listed belo GOOD CONDITION	w and check	:

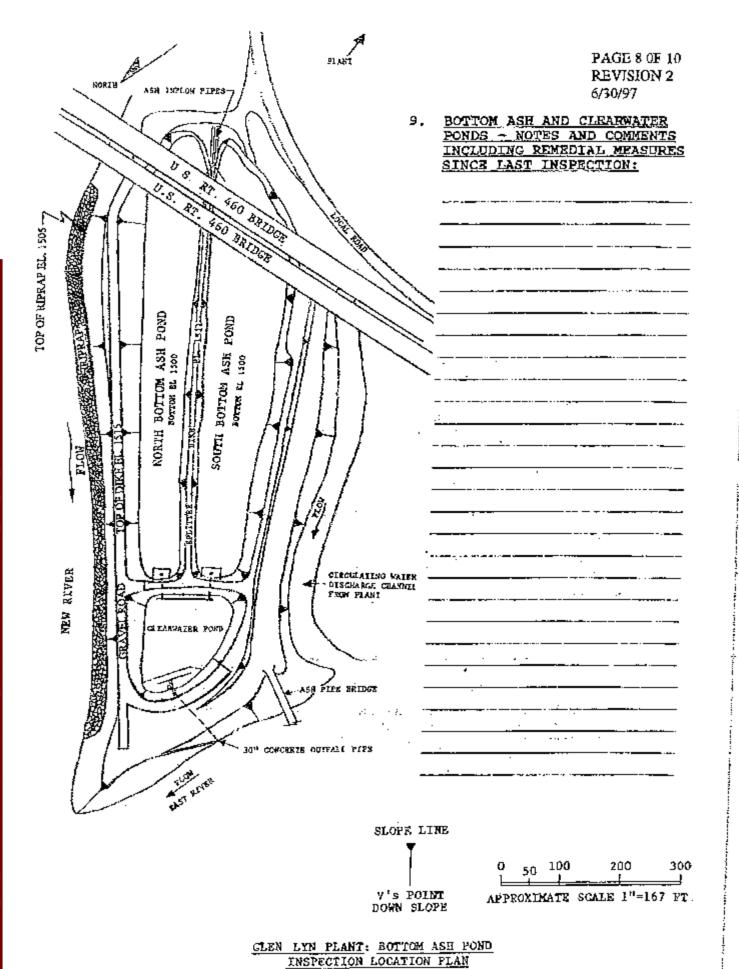
c.		end of the 24'th discharge pipe te pipe, please determine and
D.	Are there any other notewore seeping around the outside describe:	thy conditions, such as water of the pipe? If so, please
í -	EMBANKMENT CONDITION AT WEST	POND .
	appropriate, a descriptive seach problem area. Then plater(s) next to the appropria	ketch on the location plan at ce the same number(s) or let- te descriptions below. <u>LOCATION CODE</u>
	each problem area. Then plater(s) next to the appropria	ce the same number(s) or let- te descriptions below. <u>LOCATION CODE</u>
	each problem area. Then plater(s) next to the appropria	ce the same number(s) or let- te descriptions below. LOCATION CODE
	each problem area. Then plater(s) next to the appropria DESCRIPTION Erosion Ruts in Crest Road	ce the same number(s) or let- te descriptions below. LOCATION CODE
	each problem area. Then plater(s) next to the appropria DESCRIPTION Erosion	ce the same number(s) or let- te descriptions below. LOCATION CODE
	each problem area. Then plater(s) next to the appropriation DESCRIPTION Erosion Ruts in Crest Road Animal Burrows	ce the same number(s) or let- te descriptions below. LOCATION CODE
	each problem area. Then plater(s) next to the appropriation DESCRIPTION Erosion Ruts in Crest Road Animal Burrows Seepage/Wetness Woody Vegetation on Dikes Cracks/Pulges/Slides	ce the same number(s) or lette descriptions below. LOCATION CODE

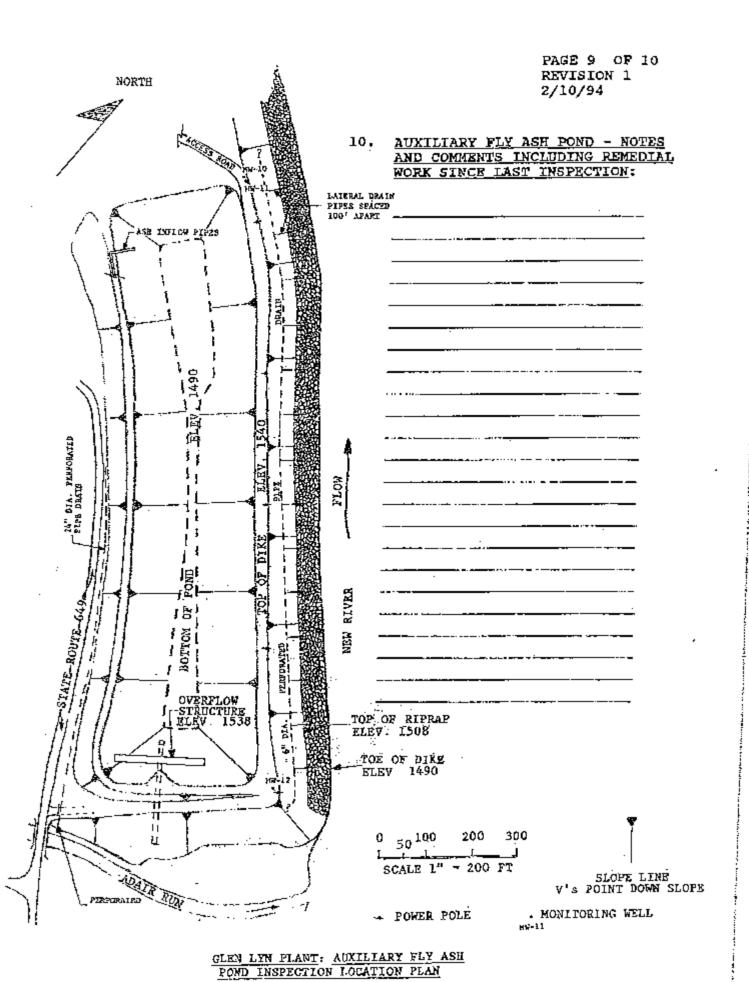
c

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-		 Морке ат	WEST PONI	<u></u>	 	
		-		_		
		observe t iate spac		reș liste	d below a	ind check th
					COOD	
				CON	NOITION	PROBLEM
s	teel: Ti	coudh				
_		Lough		-	100	· †
W	ooden S	Skimmer				<u> </u>
τ.	-1a + C +	ructure	•			
1	utec ac	Tuccute				-
P.	ipe Pio	blems				<u>[</u>
				-		:
) (cner (p	lease sp	ecity)			
į	15-45-4	escribe :	observed j	problems .	bėlow:	•
	tease d		•		7.2	····:
	rease d					
					 	

					<u> </u>
<u>GENERAL</u>	<u>PMBANKMEN</u>	r CONDITI	ONS - ALL	ONDS	
since t	mowing, by the previous a done, who n plan.	s inspect	ion? If so	, please s	tate bel
	 			<u> </u>	
			· · · ·		
Has the	river leve ion, and if	l come up so, app:	o significa roximately	ntly since what eleva	the las
and when			·		
			 		
		<u>.</u> -			
and when					

the property of





APPENDIX A

Document 2B

Virginia DCR Inventory Number 07102 Certificate, Inventory Report and Operation & Maintenance Program L. Preston Bryant, Jr Secretary of Natural Resources



Joseph H. Maroon Director

COMMONWEALTH of VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street, Suite 206 Richmond, Virginia 23219-2010 (804) 371-6095 Fax (804) 371-2630

April 4, 2008

Appalachian Power Company Attn: William Smith Post Office Box 2021 Roanoke, VA 24022-2121

RE: Glen Lyn Bottom Ash Dam, Inventory Number 07102

Dear Mr. Smith:

The Operation and Maintenance Certificate Application for Glen Lyn Bottom Ash Dam, Inventory Number 07102, and the required supporting documents have been reviewed for compliance with the provisions of the Code of Virginia, Dam Safety Act, (Section 10.1-604 et. seq.) and the regulations promulgated by the Virginia Soil and Water Conservation Board (Board). Based on this information, on March 20, 2008, the Board issued a six-year (03/20/2008 - 3/31/2014) Regular Class III Operation and Maintenance Certificate (Certificate). The Certificate and other pertinent data are enclosed.

The Dam Safety Act requires dam owners to maintain their dam in a condition to prevent unreasonable threats to life and property of others. The classification of your dam and the Certificate issued were based on the current known downstream hazard potential from upstream characteristics, a re-inspection report, operation and maintenance application, and an emergency action plan. The actions contained in the documents accompanying your Certificate Application must be adhered to for the duration of the terms contained in the Certificate. To assist you in adhering to the terms of the Certificate, the following table provides a schedule of dates to submit required documents.

State Parks * Soil and Water Conservation * Natural Heritage * Outdoor Recreation Planning Chesapeake Bay Local Assistance * Dum Safety and Floodplain Management * Land Conservation William Smith April 4, 2008 Page 2

Annual Owner's Inspection Report	Owner's Engineer Inventory Report	Renewal Certification Six Year Application by Owner and Owner's Engineer
03/31/2009		
03/31/2010		
03/31/2011		
03/31/2012		
03/31/2013	12/31/2013	12/31/2013

Should you have questions, please direct them to Thomas I. Roberts, P.E., Dam Safety Regional Engineer, Department of Conservation and Recreation, Dam Safety and Floodplain Management Division, 8 Radford Street, Suite 203. Christiansburg, VA 24073, telephone 540-394-2550 or via e-mail at Thomas.Roberts@der.virginia.gov.

Sincerely,

William G. Browning

Director, Dam Safety & Floodplain Management Division

Enclosures as stated:

c: James M. Robinson, P.E., Dam Safety Program Manager Thomas I. Roberts, P.E. Dam Safety Regional Engineer

EPA ARCHIVE DOCUMEN

DATA SHEET - OPERATION AND MAINTENANCE CERTIFICATE

Department of Conservation & Recreation Division of Dam Safety & Floodplain Management 203 Governor Street, Suite 206 Richmond, VA 23219-2094

Name of Dam Glen Lyn Bottom Ash Dam	lityentory Number 07102
Location Offstream Dam Near New River	City/County Giles
Owner Appalachian Power Company Attn: William Smith Address: 40 Franklin Road, P.O. Box 2021 City/Town/Zip Roanoke, VA 24022-2121	Designed by Casa Grande Consultants Constructed by Unknown Year Constructed 1950
Type of Dam Earthfill	Purpose Sediment-Fly Ash
Drainage Area (Sq. Mi.) 0.01	Type of Watershed N/A
Total Height (F) 28	! Elevation 1523
Normal Pool Height (Ft.) 14	Elevation 1509
Maximum Capacity (Acre Fr.) 90	Maximum Area (Acres) 5.8
Normal Capacity (Acre Ft.) 31	Normal Area (Acres): 3.7
Size Classification Small	Hazard Classification III
Required Spillway Design Flood: 60 Yr	Available Spillway Design Flood - Impounds PMF
Type of Spillway: N/A	(Note if Section 130)

Operation and Maintenance Plans & Schedule by.

() Reinspection of (\mathbf{X}) Inventory Report by

AEP/Pedro Jose Amaya-Trujillo, VA PE #036174 AEP/Pedro Jose Amaya-Trujillo, VA PE #036174

Emergency Action Plan filed with

(X) Virginia Dept-of Emergency Management

(X) Local Coordinator of Emergency Services

City/County Giles County

Application Reviewed and Recommended for Six-Year Regular O & M Certificate (3/20/2008-3/31/2014)

Bv

Thomas I Roberts, PE # 19966

Date March 17, 2008

Concurrence with the Recommendation:

Ву

William G. Browning, Director

Date March 19, 2008



COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION DIVISION OF DAM SAFETY VIRGINIA SOIL AND WATER CONSERVATION BOARD

DAM SAFETY CERTIFICATE REGULAR CLASS III OPERATION & MAINTENANCE CERTIFICATE NUMBER 07102

Appalachian Power Company, owner of Glen Lyn Bottom Ash Dam in Giles County, is entitled to operate and maintain this dam pursuant to the provisions of the Dam Safety Act (Section 10.1-604 et seq., Code of Virginia) and Regulations promulgated thereunder.

This certificate is for a term of six years. It becomes effective March 20, 2008 and expires March 31, 2014. In accordance with §4VAC50-20-100F of the Regulations, the owner shall apply for a new certificate 90 days prior to its expiration.

Joseph H. Maron



. INVENTORY REPORT FOR CLASS III AND CLASS IV IMPOUNDING STRUCTURES

Reference: Impounding Structure Regulations, 4VAC50-20-00 et seq., Virginia Soil and Water Conservation Board

1.	Pro	ject Information:
	a.	Name of Impounding Structure Glen Lyn Bottom Ash Dikes
	ь	Inventory Number 97102 Other Name (if any)
	¢	Name of Reservoir Glen Lyn Plant Bottom Ash Ponds
	d.	Purpose of Reservoin Sedimentation of bottom ash and decanting of clear ash transport water
2	Loc	ation of Impounding Structure:
	a	City/County Giles County Magisterial District
	ь.	Located at feet/ miles upstream/downstream of Highway No us 460
	с	Name of River or Stream appround Reservoir adjacent to New River & East River
	d	Latitude <u>N37 22' 30"</u> Longitude <u>W60 52'</u>
3.	Own a b.	Crship: ()wner's Name Appalachian Power Company Mailing Address 40 Frankliz Road; P.O. Box 2011
		Roanoke, VA 24022-2121
	c	Telephone (900) 956-4237
1	Owne	n's Engineer:
	a	Engineering Firm/Engineer American Electric Fower Service Corporation
	Ъ	Professional Engineer Virginia Number Pedro Jose Amaya-Trujillo VA#036174
	c	Mailing Address 1 Riverside Plaza
		Columbus, Obio 43215
	d	felephone (613) 716-1000 or (614) 716-2926

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5.	Impounding Structure Data (All elevations NGVD unless	noted):
	a Type of Material earth X concrete mas	omy
	Othe:	
		<u>Design Configuration</u>
	b Top of Dam	15-15 Elev (if known)
	c Downstream Toe (Lowest)	appz. 1495 Elev (it known)
	d Height of Dam	20 27 Feet
	e Crest Length (Exclusive of Spillway)	2500 Feet
	f. Crest Width	varies 35-40 Feet
	g Upstream Slope	<u>2</u> H:1V
	à Downstream Slope	1.5_H:1V
	•	
6	Reservoir Data	Design Configuration
	a Maximum Capacity	90 Acro feet
	h Maximum Pool	1515 Elev (if known)
	c. Maximum Pool Surface Area	5, <u>9</u> Actes
	d. Normal Capacity	31.4 Acto-feet
	e Normal Pool	Blev (if known)
	f Normal Pool Surface Area	Acres
	g Freeboard (Normal Pool to Top)	17.5 <u>\$ 21.7</u> Feet
	h Preeboard (Normal Pool to Emergency)	N/A Feet
	* Bottom Ash Ponds = 1505 5	Clearwater, Pond = 1501 3
7	Spillway Data <u>Type</u> <u>Construction Ma</u>	sterial Maximum Capacity
	a Low Level Drain None	
	b Principal Spillway <u>Drop tower w/concrete pi</u>	pc 20 cfs
	e Emergency Spillway None	
		Design Configuration
	d Low Level Drain	Elev. (if known)
	e Principal Spillway	Elev (if known)
	f Emergency Spillway	Elev (if known)

construction, trash guards, location in reservoir and through dam, and orientation of intake discharge to dam if looking downstream: No low level droins due to the sedim of ash. Drup tower has stopled which are 2 feet long and empties into a generate discharge pipe. A timber skimmer harrier protects hower from floating dobris. h Describe the emergency spillway to include dimensions, whether the spillway is an eard channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimetex Watershed Data (Class III only): a Drainage Area	g. Briefly describe the low level drain and principal s	
of ash. Drop tower has stoplog which are 2 feet long and empties into a concrete discharge pipe. A timber skimmer harrier protects tower from floating dobris. h Describe the emergency spillway to include dimensions, whether the spillway is an eard channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note: This is an upground reservoix which receives water by pumping Drainage area is the reservoix perimetex. Watershed Data (Class III only): a Drainage Area		_
floating debria. h Describe the emergency spillway to include dimensions, whether the spillway is an eard channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter. Watershed Data (Class III only): a Drainage Area		
h Describe the emergency spillway to include dimensions, whether the spillway is an eard channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter Watershed Data (Class III only): a Drainage Area	of ash. Drop tower has stoplog which are	2 feet long and empties into a
h Describe the emergency spillway to include dimensions, whether the spillway is an eard channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note - This is an upground reservoir spillway for this dam. Note - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter. Watershed Data (Class III only): a Drainage Area	concrete discharge pipe. A timbor skimmer	harrier protects tower from
channel or other construction, spillway surface protection, and orientation to dam if looking downstream: There is no emergency spillway for this dam. Note - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter. Watershed Data (Class III only): a Drainage Area	floating debris.	
downstream: There is no emergency spillway for this dam. Note - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter Watershed Data (Class III only): a Drainage Area b Type and Extent of Watershed Development crest and u/s slape c Lime of Concentration	h Describe the emergency spillway to include dimer	isions, whether the spillway is an earth
Mote - This is an upground reservoir which receives water by pumping Drainage area is the reservoir perimeter Watershed Data (Class III only): a Drainage Area	channel or other construction, spillway surface protection	tion, and orientation to dam if looking
Note - This is an upground reservoir which receives water by	downstream: There is no emergency spill	way for this dam.
Watershed Data (Class III only): a Drainage Area	-	
Watershed Data (Class III only): a Drainage Area	Note - This is an upground reservoir whi	ch receives water by
a Drainage Area	pumping Drainage area is the reservoir	perimeter
a Drainage Area		
a Drainage Area003 Sq. Mile b Type and Extent of Watershed Development Nono - Grass covered dike crest and u/s stone c Time of Concentration	Watershed Data (Class III only):	
b Type and Extent of Watershed Development None - Grass covered dike exest and u/s slope c Time of Concentration Method d Spillway Design Flood used (mark appropriate box) PMF, source	a Drainage Area	
c Time of Concentration Method d Spillway Design Flood used (mark appropriate box) PMF, source	b Type and Extent of Watershed Development	
c Time of Concentration	,	***************************************
d. Spiliway Design Flood used (mark appropriate box) PMF, source1/2 PMF, source100 Year, source50 Year, sourceOther, source		
PMF, source		
Other, source		
e. Design inflow hydrograph: Volumeacre feet; Peak inflow		
Peak inflow		
Rainfall duration of design inflow hydrographhours f. Freehoard during passage of spithway design floodfeet Impounding Structure History a Date construction completed1950's; modified 1977		
f. Freehoard during passage of spillway design floodfeet Impounding Structure History Date construction completed1950's; modified 1977		
Impounding Structure History Date construction completed 1950's; modified 1977		· -
Date construction completed 1950's; modified 1977	Freehoard during passage of spittway design flood	
Dato construction completed 1950's; modified 1977	manuadine Structure History	
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	•	•
	Built byanknown	Date: 1950's; modified 1977

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9.

-	-	ucture Assessment: "descriptions for each its	en:		
	i.	Condition of the impou		Good	
1	ΰ	Condition of the reserve	_	Good	
·i	ij.	Condition of the upstrea	am area		
i	iv			N/A	
	-			· ·	·
		ative describing any rec d downstream area:			
last Co	ertific	eation in 2002.			

4

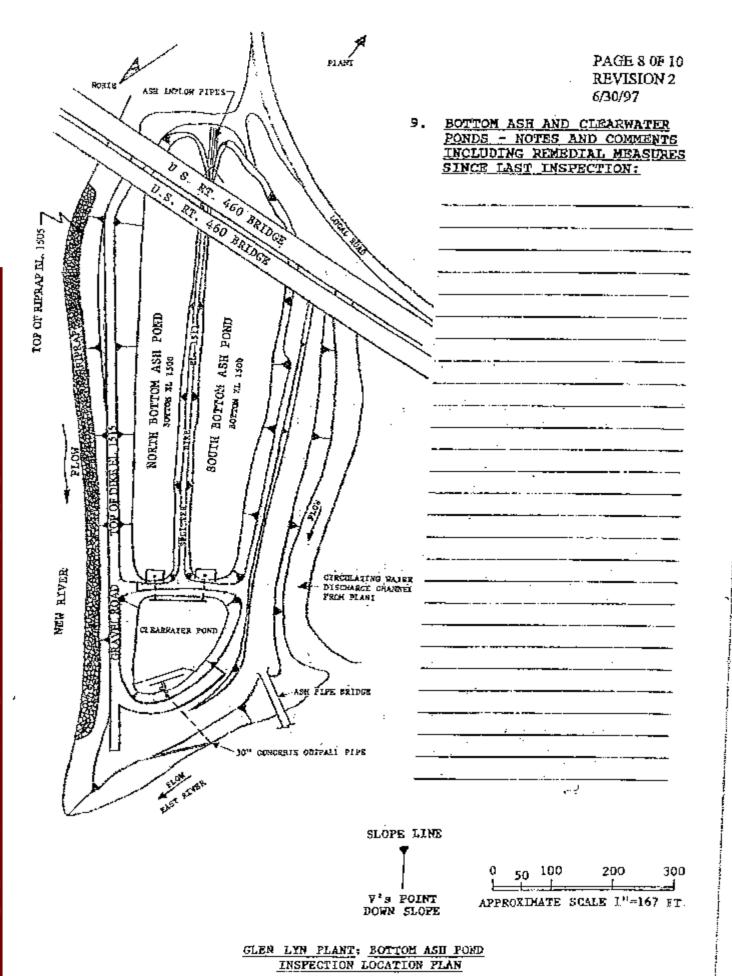
See Attached Sketch

CERTIFICATION BY OWNER'S ENGINEER (Class III only)

	has been examined by messing that HO
be true and correct in my professional judgment.	ુ ^{તું} . કુઈ '
gned Redu & amaya (Professional Engineer)	has been examined by mesting spale H Op
	7 KU.00014
irginia Number <u>03 6 17 4</u>	9 1/21/08
is_ 21 day of January	20 D 8 200NAL EN
	
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CERTIFICATION BY OWNER (Class	s IV only)
ereby certify that the information provided in this Inventory Report is	is true and concet
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nedBradface	
(Owner)	
(Owner)	
(Owner)	
sday of	
s day of	
(Owner)	

203 Governor Street Richmond, Virginia 232192094

(DCR 199-104) (12/01)





OPERATION AND MAINTENANCE APPLICATION CLASS I, II AND III IMPOUNDING STRUCTURES

Invento	_				Ash Dikes			
					е (if аду)			
					roctore Regulatio	_		
	irele On	-	Class (Çlaşş IJ	***************************************			
					прапу			
					DZZ, Roanske			
			6-4237	-	(Residential)	—		
Operating Pro	g l'ilan aa wide a n	td Schedule arrative for each	item:					
а	Operati				Attachment 1			
b.	Operat	ion of Reservoir.	Drain (not	to exceed 1/2 foo	t drawdown per d	lay on emba	nkment dan	ıs)
		Sce Attach	ment I		· ·			.,,
	(1)	ment Dams:		e Attachment	<u>: r</u>		<u>. </u>	
			·					
		principal spilly	· yay:8	co Attachmen				·
	(2)	principal spilly	yay:8	co Attachmen	t I			
	(2)	principal spilly	yay: 8 	co Attachmen	t I			
	(2)	principal spilly	yay: 8 	co Attachmen	t I			
	(2) (3) (4)	principal spilly emergency spil	yay:8	See Attachmen See Attachme	t I ment I ent I			
	(2) (3) (4) (5)	principal spilly emergency spil low level outlet	yay:S	See Attachmen See Attachme	t I ment I ent I			
	(2) (3) (4) (5)	principal spilly emergency spil low level outlet	yay:S	See Attachmen See Attachme	t I ment I ment I			

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(2)	downstream face:N/A
(3)	crest: N/A
(4)	galleries:N/A
(5)	tunnels, etc: N/A
(6)	abutments:
(7)	spillways:
(8)	gates and outlets: N/A
(9)	nther: N/A
(1) operator (2) maintena annual. (3) technical every two Inspector 7 Emergency Action P Provide the in a rainfall at b spillway: a frequency 8. For a newly construction of the impounding	involves and/or: This is an upground reservoir with no drainage area beyond town perimeter. Water inflow is controlled by pumping of ash/ of observation: water sluxry. RAP would be triggered by commissent instability or failure due to piping or ecosion. ted impounding structure, provide certification from a Professional Engineer who has ag structure during construction that, to the best of the engineer's judgment, knowledge and tructure and all appurtenances have been constructed in conformance with the plans,
8. For a newly construction inspected the impounding belief, the impounding	or failure due to piping or erosion. or failure due to piping or erosion. ted impounding structure, provide certification from a Professional Engineer who has ng structure during construction that, to the best of the engineer's judgment, knowledge and

N/A

OPERATION AND MAINTENANCE PERMIT APPLICATION

OPERATION AND MAINLENANCE SCHEDIFLES CERTIFICATION BY OWNER

I hereby certify that the operation and maintenance plans and schedules provided herewith will be adhered to during the life of the project except in cases of unanticipated emergency requiring departure therefrom in order to mitigate hazards to life and property, at which time my engineer and the Department of Conservation and Recreation will be notified

Signed:

(Owner)

CERTIFICATE BY OWNER'S ENGINEER

I hereby certify that the information provided in this form has been examined by me and found in my professional judgment to be appropriate to operation and maintenance considerations for this dam

Signed: Sedio & Circay a Virginia Number: 036174

Professional Engineer

This 21 day of January , 20 08

Remarks:

Please fill out and mail this form to: Department of Conservation and Recreation Division of Dam Safety 203 Governor Street Richmond, Virginia 23219-2094



(DCR 199-099) (12/01)

GLEN LYN BOTTOM ASH DIKES INVENTORY NUMBER: 07102

OPERATION AND MAINTENANCE APPLICATION Attachment 1

Item No. 4

a: Operation for Control Gates and Spillway: The discharge structure for this pond consists of a concrete tower with a fixed weir elevation (stop-logs) connected to a 30-diameter concrete pipe. There are no variable gates to be controlled. Freeboard at this point is sufficient to store the Probable Maximum Flood.

b: Operation of Reservoir Drain: There is no reservoir drain for this facility because such a drain would either become clogged with or would discharge bottom ash from the pond. The pond can be drained by pumping if desired.

Item No. 5a.

- (1) Embankment: The upstream and downstream slopes are visually inspected by plant personnel several times each week. Items observed include signs of instability, seepage, erosion and vegetative cover. Tree and brush cutting is done as needed, usually in the Fall. Rodent burrows are filled in when they are found.
- (2) Principal Spillway: The principal spillway for this upground reservoir consists of a concrete tower with a fixed weir elevation (stop-logs) connected to a 30-diameter concrete pipe. It is inspected visually several times per week by plant personnel, and would be repaired promptly by plant personnel or contracted forces if necessary.
- (3) Emergency Spillway: There is no emergency spillway see 4a above.
- (4) Low Level Outlet: Not applicable see 4b above.
- (5) Reservoir Area: Since this is an upground reservoir, the reservoir area is checked when the upstream slopes are observed.
- (6) Downstream Channel: The outlet from the 30-inch diameter pipe discharges directly into the East River, which is a tributary to the New River. The size and flow capacity of the East River far exceeds the discharge from the pond. There have been no problems experienced with blockage or restrictions.
- (7) Other: No additional items associated with this facility.

GLEN LYN PLANT DIKE INSPECTION CHECKLIST

I GENERAL INFORMATIO	<u> N</u>			
Date of Inspection	ı			·
Inspected by		<u>.</u>	··	·
Weather		<u> </u>		<u> </u>
Temperature			<u> </u>	·
Rainfall (inches)				
Pond levels:	:		1 4	
North Bottom Ash		 	<u> </u>	
South Bottom Ash	Pond (1506.3*)	· .		
Clearwater Pond ((1501.3*)		<u> </u>	<u>.</u>
Auxiliary Fly Ash	Pond	 		
West Pond	<u> </u>	· <u> : - : : : : : : : : : : : : : : : </u>	orthogram	· · :
EMBANKMENT CONDITION	N AT BOTTOM ASI	I AND CLEAR	WATER POND	S [†] ′
A. Please refer to the which is found on Pa appropriate, a descreach problem area. ter(s) next to the a	Bottom Ash Por ige 8. Place a riptive sketch Then place the	d Inspecti number or on the loc same numb criptions 1	letter and ation plan er(s) or le	n Plan d, if at
<u>DESCRIPTION</u>	LOCATION	CODE		
Erosion			\$	
Ruts in Crest Road	1 % J/4 - 5 .	et (kin)ini		· · · · ·
Animal Burrows	# # # T T		e general de la composition della composition de	<u> </u>
Approximate normal po	ool levels when	in servic	. · :8.	

DESCRIPTION	LOCATION CODE
Leaking Ash Pipe	
Seepage/Wetness	
Trees on Slope	
Vegetation condition	
Cracks/Bulges/Slides	
Other (Please specify)	
displacement of the riprocess. It so, river flow event which co	
C. Has there been erosion of ash ponds because of the	ash inflow pipes?
C. Has there been erosion of ash ponds because of the	
C. Has there been erosion of ash ponds because of the	ash inflow pipes?
C. Has there been erosion or ash ponds because of the	ash inflow pipes?
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell	ash inflow pipes? H AND CLEARWATER PONDS: ing drainage structures and check ow:
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell	ash inflow pipes? H AND CLEARWATER PONDS: ing drainage structures and check ow: GOOD CONDITION PROBLEM
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell	H AND CLEARWATER PONDS: ing drainage structures and check ow: GOOD CONDITION PROBLEM
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell North B. A. Pond Skimmer	H AND CLEARWATER PONDS: ing drainage structures and check ow: GOOD CONDITION PROBLEM
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell North B. A. Pond Skimmer North B. A. Pond Overflow Lip	H AND CLEARWATER PONDS: ing drainage structures and check ow: GOOD CONDITION PROBLEM
C. Has there been erosion of ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell North B. A. Pond Skimmer North B. A. Pond Overflow Lip	H AND CLEARWATER PONDS ing drainage structures and check CONDITION PROBLEM Pipe Pipe
C. Has there been erosion of ash ponds because of the ash ponds because of the 3. OUTLET WORKS AT BOTTOM AS A. Please inspect the follow the appropriate space bell north B. A. Pond Skimmer South B. A. Pond Overflow Lip & South B. A. Pond Skimmer	H AND CLEARWATER PONDS ing drainage structures and check CONDITION PROBLEM Pipe Pipe

	GOOD CONDITION	PROBLEM
Clearwater Fond Overlow Lip & Chute]
Clearwater Pond Spillway Tower		
Access Steps to Spillway Tower]
	*	ļ
Outfall Pipe to East River		
Access Path to Outfall Pipe	· 	ļ
B. Please describe problems below:		
	criptive sketch	tion Loca- er or on the
location plan at each problem are number(s) or letter(s) next to the below.	criptive sketch a. Then place the	er or on the he same
number(s) or letter(s) next to th	criptive sketch a. Then place the	er or on the he same scriptions
number(s) or letter(s) next to the below.	criptive sketch ea. Then place the appropriate des	er or on the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION	scriptive sketch ea. Then place the e appropriate des	er or on the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION Erosion	criptive sketch ea. Then place the eappropriate des LOCATION (er or the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION Erosion Ruts in Crest Road Animal Burrows	criptive sketch ea. Then place the eappropriate des LOCATION (er or the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION Erosion Ruts in Crest Road Animal Burrows Lesking Ash Pipe	criptive sketch ea. Then place the eappropriate des LOCATION (er or the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION Erosion Ruts in Crest Road Animal Burrows Leaking Ash Pipe Leaking Embankment Drain Pipe	criptive sketch ea. Then place the eappropriate des LOCATION (er or the he same scriptions
number(s) or letter(s) next to the below. DESCRIPTION Erosion Ruts in Crest Road Animal Burrows Lesking Ash Pipe	criptive sketch ea. Then place the eappropriate des LOCATION (er or the he same scriptions

Cracks/Bulges/Slides Sinkhole Other (Please specify) 3. Has this pond been used since the previous inspection? so, when and for approximately what duration? 4. Has the water level in the pond been high enough to cauthe embankment drains to become active? OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough oden Skimmer ough or Skimmer supports morete structure mer (Please specify) Please describe problems below:			
Other (Please specify) Has this poind been used since the previous inspection? so, when and for approximately what duration? Has the water level in the poind been high enough to can the embankment drains to become active? OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough Condition PROBLEM Deel Trough or Skimmer supports Cortects structure Deer (Please specify) Please describe problems below:	Cracks/Bulges/Slides		
Has this pond been used since the previous inspection? so, when and for approximately what duration? Has the water level in the pond been high enough to can the embankment drains to become active? OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION. PROBLEM Deel Trough Conden Skimmer Dugh or Skimmer supports Corete structure er (Please specify) Please describe problems below:	Sinkhole		
Nas the water level in the pond been high enough to can the embankment drains to become active? OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough Condition Skimmer Dugh or Skimmer supports Acrete structure er (Please specify) Please describe problems below:	Other (Please specify)		·
Has the water level in the pond been high enough to cau the embankment drains to become active? OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough Deel Trough Deel Skimmer Dugh or Skimmer supports Derete structure Deer (Please specify) Please describe problems below:	. Has this pond been used sin so, when and for approximat	ce the previo	nus inspection? tion?
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OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough Conden Skimmer Dugh or Skimmer supports Corete structure er (Please specify) Please describe problems below:	Has the water level in the	pond been hig	h enough to caus
OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Please Skimmer Sugh or Skimmer supports Crete structure er (Please specify) Please describe problems below:	the empanament drains to be	come active;	
OUTLET WORKS AT AUXILIARY FLY ASH POND Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Please Skimmer supports crete structure er (Please specify) Please describe problems below:			·
Please observe the features listed below and check the appropriate space: GOOD CONDITION PROBLEM Deel Trough Condition Problem Deel Trough Condition Problem Co			
appropriate space: GOOD CONDITION PROBLEM Deel Trough Condition Condition PROBLEM Condition Condition Condition Condition Condition Condition Condition Condition Problem Condition Co	the second secon	T 1 / 1 / 1 / 1 / 1	
condition Problem eel Trough den Skimmer ough or Skimmer supports crete structure er (Please specify) Please describe problems below:		listed below	
eel Trough oden Skimmer ough or Skimmer supports crete structure er (Please specify) Please describe problems below:			and check the
eden Skimmer ough or Skimmer süpports crete structure er (Please specify) Please describe problems below:		GOOD	*G
er (Please specify) Please describe problems below:	THE STATE OF THE S	GOOD	*G
er (Please specify) Please describe problems below:	eel Trough	GOOD	PROBLEM
er (Please specify) Please describe problems below:	eel Trough oden Skimmer	GOOD	PROBLEM
Please describe problems below:	eel Trough den Skimmer ough or Skimmer süpports	GOOD	PROBLEM
	eel Trough den Skimmer ough or Skimmer süpports crete structure	GOOD	PROBLEM
te d'all a la company de la co	eel Trough den Skimmer ough or Skimmer süpports crete structure er (Please specify)	CONDITION	PROBLEM
	eel Trough oden Skimmer ough or Skimmer supports crete structure er (Please specify)	GOOD CONDITION	PROBLEM

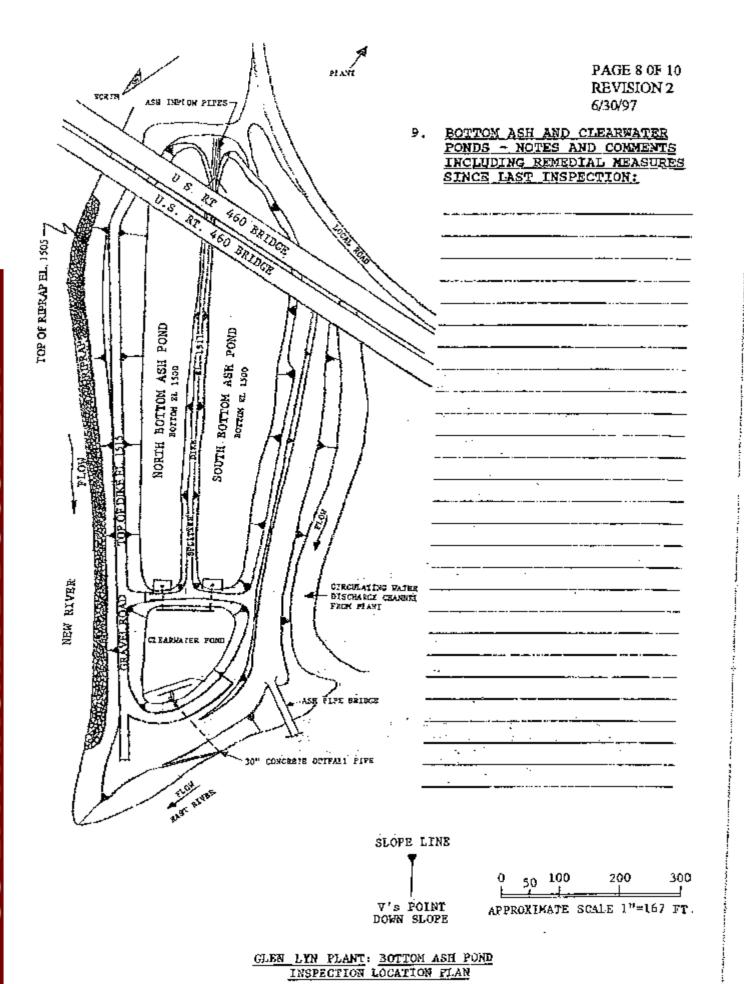
в.

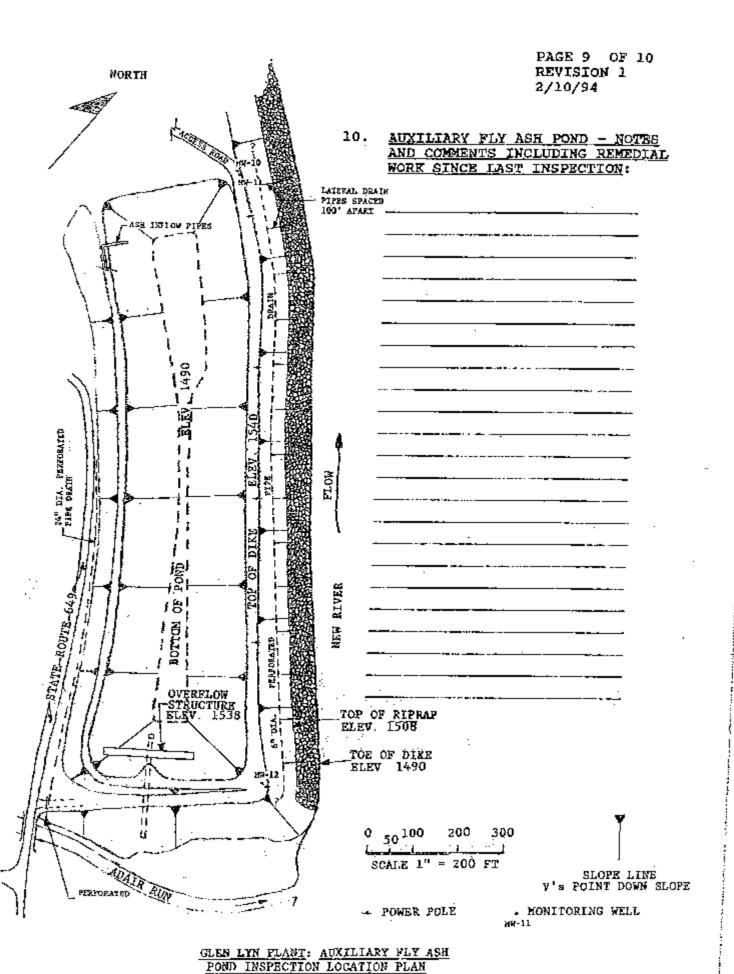
Are there any other notew seeping around the outsid describe:	worthy conditions, such as water he of the pipe? If so, please
EMBANEMENT CONDITION AT W	EST POND
is found on Page 10. Place	Pond Inspection Location Plan W ce a number or letter and, if e sketch on the location plan a
each problem area. Then p ter(s) next to the appropr	place the same number(s) or let- riate descriptions below.
each problem area. Then property ter(s) next to the approproprocess. DESCRIPTION	place the same number(s) or let-
each problem area. Then p ter(s) next to the appropr	place the same number(s) or letriate descriptions below. LOCATION CODE
each problem area. Then percenter(s) next to the approprince of the ap	place the same number(s) or letriate descriptions below. LOCATION CODE
each problem area. Then percenter(s) next to the approprince of the approprince of the appropriate of the ap	place the same number(s) or letriate descriptions below. LOCATION CODE
each problem area. Then percenter(s) next to the approprince of the approprince of the appropriate of the ap	place the same number(s) or letriate descriptions below. LOCATION CODE
each problem area. Then percenter(s) next to the approprint DESCRIPTION Brosion Ruts in Crest Road Animal Burrows Seepage/Wetness	place the same number(s) or letriate descriptions below. LOCATION CODE

С

	ase describe):
OUTLET WORKS AT WEST	r DOND
	- · · · -
Please observe the f appropriate space:	features listed below and check the
	GOOD
	CONDITION PROBLEM
teel Trough	<u> </u>
ooden Skimmer	
nlet Structure	
ipe Problems	
ther (please specify	y)
leace describe chee	rved problems below:
rease describe obser	Tree problems below.
	A Control of the Cont

GENERAL ENDANK	MENT CONDITIONS - AI	L PONDS	
Has any mowing, since the previ what was done, location plan.	, brush and tree cut lous inspection? If when and by whom, a	ting or spraying so, please standard ahow the are	ng bea ste be sa on
····		<u> </u>	
		5 × 5	
-	······································		
inspection, and and when?	evel come up signif if so, approximate	ly what elevati	on war





APPENDIX A

Document 3

Dam Safety Inspection Report, by Woodward-Clyde Consultants Report On

Dam Safety Inspection

GLEN LYD FLY ASE &

BOTTOM ASH POND

GLEN LYN POWER PLANT

Glen Lyn, Virginia

Report On

Dam Safety Inspection

GLEN LYN FLY ASH &

BOTTOM ASH POND

GLEN LYN POWER PLANT

Glen Lyn, Virginia

Prepared by Woodward-Clyde Consultants Clifton, New Jersey

For

AMERICAN ELECTRIC POWER SERVICE CORPORATION

Two Broadway

New York, New York

18 July 1978

77C110

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2.0	PROJECT DESCRIPTION	1
3.0	SITE GEOLOGY	6
4.0	SUMMARY OF ENGINEERING DATA AVAILABLE	6
5.0	RESULTS OF VISUAL INSPECTION	7
6.0	OPERATIONAL PROCEDURES	9
7.0	HYDROLOGIC AND HYDRAULIC EVALUATION	10
8.0	OVERALL EVALUATION	10

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APPENDIX B - VISUAL INSPECTION CHECKLIST $\{\{\{a_{n,n}\}_{n\in\mathbb{N}}\}\}_{n\in\mathbb{N}}$

GLEN LYN POWER PLANT

1.0 INTRODUCTION

The results of a dam safety inspection of the fly ash and bottom ash dikes at the Glen Lyn Power Plant are presented in this report. The purposes of the investigation were to gather and evaluate available data on the design and construction of the dams at the power plant and to complete a visual inspection of the integrity of the dikes so that an evaluation could be made of the need for additional investigation and/or remedial action.

The investigation was performed in accordance with our proposal dated 11 October 1977. It consisted of review of data concerning the Glen Lyn Dikes available in AEP's files, field inspection of the dikes, engineering evaluation and the preparation of this report. The field inspection was performed on 11 May 1978 by Messrs. John H. Frederick, Jr. and Noel Ravneberg.

2.0 PROJECT DESCRIPTION

The location of the Glen Lyn Power Plant is shown in Fig. 1. Two diked areas for storage of fly ash and bottom ash are currently in service at the Glen Lyn Plant.

2.1 Fly Ash Dikes

The fly ash storage area consists of a series of dikes enclosing three separa'e fly ash retention ponds. The layout and cross section of the three ponds, referred to herein as the upper, middle and lower ponds, is shown in Fig. 2.

The fly ash storage area, constructed in 1965 (according to the information contained in the Directory of Dams & Dikes, prepared by AEPSC), consisted originally of one large area with dikes on the river side abutting the hill on the west. The original dike was constructed of locally available clayey shale fill to approximately el 1536 ft.* Sometime between 1965 and 1973 the storage area was partitioned to form its present configuration of three separate ponds.

2.1.1 Upper Fond

Within the last several years, the capacity of the upper pond appears to have been increased. This increase is indicated on AEPSC Drawing No. 16-3540-2 by a note dated 12/6/76. We are uncertain as to the modifications made to increase the storage capacity of the upper pond. The drawing indicates the crest of the dike at el 1540 ft. It is not clear whether the original dike in this area was at el 1536 ft and the dikes were raised to 1540 ft or whether new dikes were built to form the upper pond, i.e., the original dikes did not encompass what is now the upper pond. understand that the dikes forming the upper pond consist of a compacted fly ash core and a clay blanket.

^{*}All elevations are USGS mean sea level datum.

The interior face of the present dikes, against which the water impinges to form the upper pend, is shown on AEPSC Dwg. 16-3544 inclined at 2.5H:1V. Based on the ground surface contours shown on the drawing, the downstream face appears inclined at approximately 2H:1V. The bottom of the pend varies from el 1490 ft to el 1500 ft.

The clay blanket is shown on AEPSC Dwg. 16-3544 to have typically an 8 ft horizontal dimension. For an inclination of the face of the dike of about 2.50:1V, a thickness perpendicular to the slope of approximately 3 ft. is required. On the north dike however, we understand that only a 1 ft thick clay blanket was placed.

A 12 inch diam corrugated metal pipe for transportation of fly ash slurry to the pond was constructed on timber bents founded in the northern dike. We have been told that, on first filling, a slope failure occurred in the northern dike, washing out the timber bents and the header pipe. The slope has not yet been repaired and the pond is still out of service.

A skimmer barrier and outlet pipe is located at the southern end of the pond.

2.1.2 Middle Pond

The Middle Pond has been filled with fly ash sediment to the top of the perimeter dikes. At the present time, dry fly ash is being placed in the Middle Pond above the level of the top of the dikes. AEPSC drawing 16-3640-2 dated 10/2/73 indicates that compacted fly ash is to be placed to el 1585 ft over the entire Middle Pond. The sides of this fly ash embankment are to be inclined at 3H:lv. At the time of our inspection it appeared that approximately two thirds of the pond area has now been filled. As currently operated, the Middle Pond no longer functions as a water impounding area.

2.1.3 Lower Pond

This is the only pond in the fly ash storage area currently in service. The dikes surrounding this pond are constructed of local borrow material and crest at el 1536 ft, approximately 17 ft above the toe of the dike. The dikes are shown on AEPSC drawing 16-3540-2 inclined towards the reservoir at 3H:1V.

The dike spillway consists of a 2.5 ft diameter drainage pipe which channels the overflow towards the New River. A skimmer barrier, similar to that constructed at the upper pond, is provided.

2.2 Bottom Ash Dikes

The bottom ash storage area is shown in Fig. 3.

The perimeter dikes and the divider dike separating the two sections of the pond are constructed of compacted clayey shale. The crest of the perimeter dike is at cl 1520 while that of the divider dike is at el 1511.

As currently operated, only half of the storage area is used at any one time. While one pond is in operation, a front end loader removes bottom ash from the other pond for sale to a cinder block manufacturer.

Water from the storage pond in use, overflows through an 18 in dia. corrugated metal pipe to a clear water pond. Water from the clear water pond flows under a skimmer barrier and through a 30 in dia. concrete pipe to the East River. The bottom of bottom ash pond is shown on AEPSC Drawing No. 16-11249-35-64-1 at el 1500 ft while that of the clear water pond is shown at el 1499 ft. The depth of water in the bottom ash pond is approximately 7 to 8 ft while that in the clear water pond is approximately 5 to 6 ft.

Although portions of the bottom ash perimeter dike and intake structure were raised to provide increased storage capacity, this work was never completed.

3.0 SITE GEOLOGY

The Glen Lyn Power Plant is located within the Valley and Ridge physiographic province. Bedrock consists of the Bluefield and Minton formations of Mississippian age.

The Bluefield formation, which underlies the bottom-ash pond, is a shale with some thin interbedded layers of sandstone, siltstone and limestone. Although there are no outcrops of the Bluefield at the bottom-ash pond, exposures along a nearby roadcut show a competent, though steeply dipping, bedrock.

Outcrops of the Hinton Formation, interbedded shale and sandstones, are exposed in road cuts adjacent to the fly ash ponds. Also adjacent to the ponds is a deeply weathered portion of the formation which is presently being used as a borrow area for dike construction material.

4.0 SUMMARY OF ENGINEERING DATA AVAILABLE

The drawings made available to us by AEP, for use in this investigation are listed in Table 1. The drawings listed in Table 1 contain references to other drawings on which additional details on the dikes and the outlet structures are to be found. These additional drawings, however, were not available to us.

No design data or calculations were found in AEP's Glen Lyn file.

5.0 RESULTS OF VISUAL INSPECTION

The inspection consisted of a visual survey of the dikes and outlet structures. The results of the visual inspection of both the fly ash and bottom ash dikes are described in the Visual Inspection Check Lists contained in Appendix 3 (a separate checklist was completed for the fly ash and bottom ash dikes) and are summarized below. Photos of the dikes are presented in Appendix A.

.5.1 Fly Ash Storage Areas

Upper Pond

- 1. There was no visual evidence of surface cracks or of unusual movement at or beyond the too. The vertical and horizontal alignment of the crest appeared normal to the eye.
- 2. A sinkhole was noted in the crest of the dike at the location shown in Fig. 2. Ponded surface water apparently seeped into the fly ash i.e., found an opening in the clay blanket, and washed out material at the downstream face. This localized piping failure appears to have resulted in subsequent collapse and enlargement of the sinkhole. The sinkhole is approximately 10 ft. deep.
- 3. There was no evidence of displacement or erosion of the downstream dike slopes. These slopes are protected by riprap.

4. The slopes of the dikes forming the upper pond were completely exposed at the time of the inspection. The failure of a portion of the dike on the northern portion of the pond was described earlier. Some erosion was noted on the slope of the southern dikes at a point where it appeared that the inflow pipe had once been located.

Lower Pond

- 1. In general, the condition of the dike appeared good, with no evidence of cracks, misalignment, or seepage, that might suggest movement or deterioration of the dikes.
- 2. Runoff from the hills located immediately southwest of the pond is presently channeled into a drainage ditch adjacent to Route 649, running approximately parallel to the west dike of the pond. Some blockage of the ditch was noted. The blockage has caused a portion of the flow in the ditch to be diverted toward the toe of the dike. This flow has resulted in minor erosion.

5.2 Bottom Ash Storage Area

At the time of the inspection, both halves of the pond were out of service and operators were converting from operation of the south half to operation of the north half. Water was standing in the clear water pond. Some water was ponded on the surface of the sediment in the recently-filled south half.

- 1. There was no visual evidence of surface cracks or of unusual movement at or beyond the toe. The vertical and horizontal alignment of the crest appeared to the eye to be normal.
- Considerable sloughing of the dike separating the two portions of the pond was noted.
- There was no evidence of scepage through the dikes.
- 4. The outflow from the clear water pond appeared clear and less turbid than the river water.
- 6.0 OPERATIONAL PROCEDURES
- 6.1 Maintenance and Operation

We understand that there are no documented operation or maintenance procedures established for either the fly ash or bottom ash ponds.

6.2 Monitoring and Warning System

There is no instrumentation installed to monitor the performance of the dikes or to provide advance warning of impending problems. We understand that plant personnel inspect the dikes daily to ascertain the condition of the dikes. However, there is no documented procedure for response to damage or to deterioration of the dikes.

7.0 HYDROLOGIC AND HYDRAULIC EVALUATION

7.1 Hydrology

The fly ash and bottom ash storage areas are enclosed impoundments. As such, there is no natural drainage into the reservoir. Flow is piped in under controlled conditions. The only source of inflow other than the piped-in slurry is rainfall precipitation. The maximum 1-hr precipitation for the 100 year storm in this portion of Virginia is 3.5 inches.* The maximum rainfall results in a flow increment of approximately 35 cfs in the flyash lower pond (which has the largest surface area).

7.2 Hydraulic Considerations

At the time of our inspection, only the lower fly ash pond was in service. The 30 inch outflow pipe had only a few inches of flow under the normal operating conditions. Thus, it appears that there is ample reserve capacity available to handle temporary increases due to rainfall inflow. However, no computions have been done to substantiate this conclusion.

8.0 OVERALL EVALUATION

8.1 Fly Ash Ponds

The only pond currently in service is the lower pond. The dikes of this pond are constructed of the locally available clayey shale material. There appeared to be no evidence of cracks, misalignment, or seepage which

^{*}U.S. Dept of Commerce, "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, May, 1961

might indicate malfunction or deterioration of the dikes. The ditch for diverting side hill runoff bordering the easternmost dike shows some signs of erosion and blockage. This ditch should be cleaned and repaired.

As a result of the slope failure that occurred during initial filling, the upper pond has not yet been put into service. In our opinion, the suitability of compacted fly ash as an embankment material needs to be evaluated in light of the slope failure and the evidence of erosion of the dike material at locations where the clay blanket has been breached. The existing sinkhole in the Upper Pond dike should be repaired before the pond is returned to service.

8.2 Bottom Ash Pond

There was no visual evidence of cracking, misalignment or seepage which might indicate malfunction or deterioration of the perimeter dikes. Sloughing of the partition dike between the two halves of the pond was noted. However, this does not, in our opinion, adversely affect the retention capability of the pond as a whole.

8.3 Hazard Rating

In general, we see little cause for concern about the integrity of the dikes. However, if one of the dikes were to fail, the result would be a release of either flyash or bottom ash slurry into the adjacent river. Since the volume of material contained in any of the dike areas is relatively small, it is unlikely that release of this material into the river would cause significant flooding or damage downstream.

Fly Ash Ponds

Based on the above observations, it is not clear that the classification of "high" hazard potential classification assigned to this dam in the U.S. Army Corps of Engineers' National Inventory of Dams is appropriate. This classification suggests that if the dikes were to fail, "more than a few" lives would be lost and "excessive" property damage would occur. In our opinion, a "significant" rating may be more appropriate for these dikes.

Bottom Ash Pond

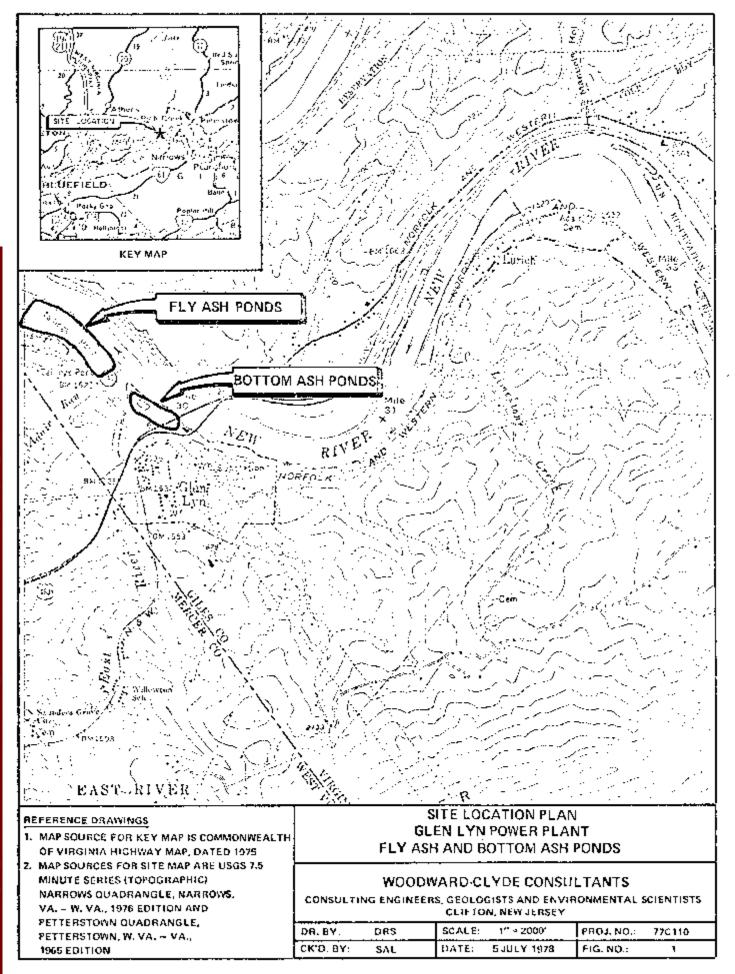
The field inspection disclosed significant differences between inventoried and actual dimensions of this facility. Although construction was started several years ago to raise the level of the dikes and overflow structure to the inventoried heights, this work was never completed. As currently operated, the hydraulic head in the pond is never more than seven feet. Furthermore, the pond is partitioned so that only half of the area is filled at any given time.

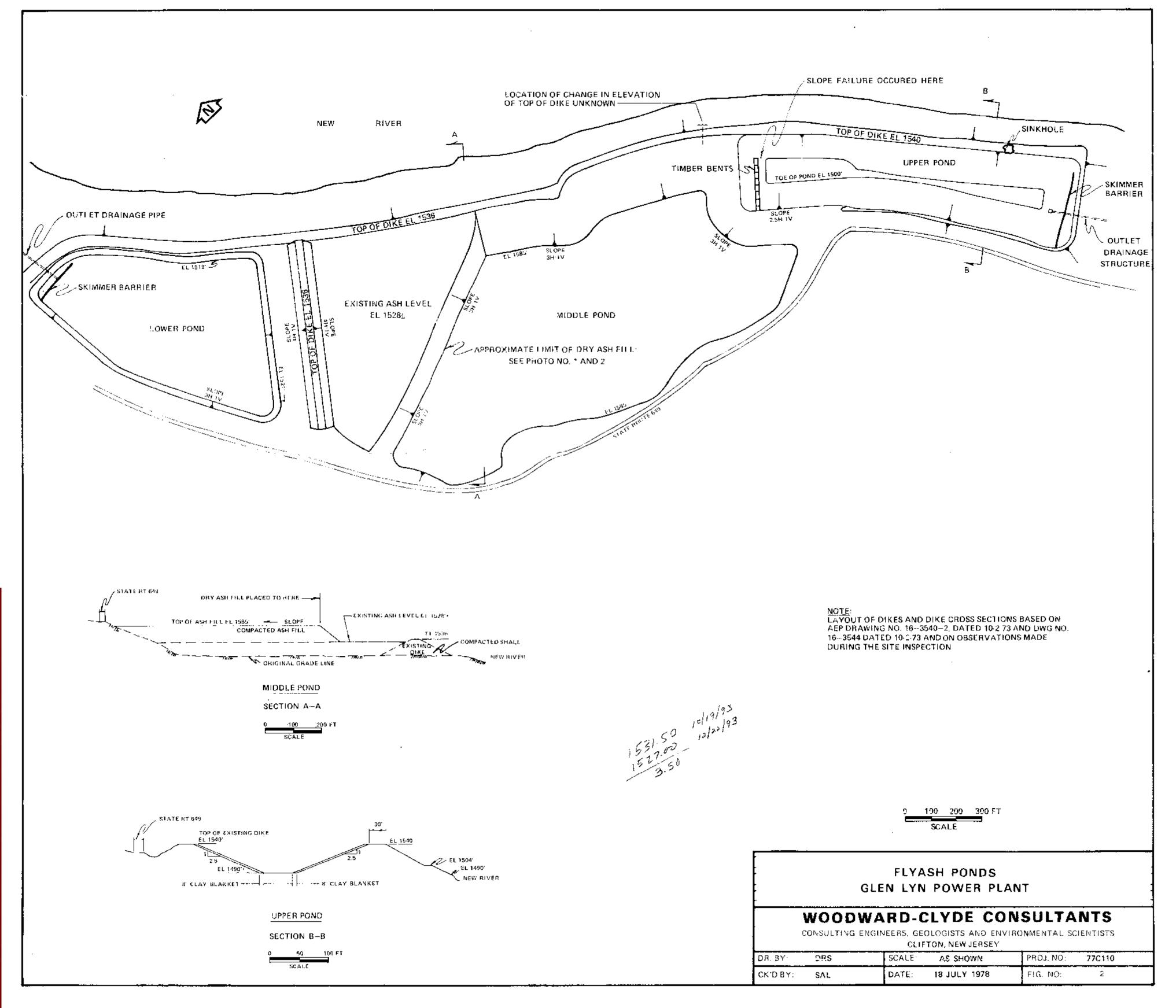
Consistent with these observations, it is recommended that the inventories (both Corps. of Engineers and AEPSC) be corrected to reflect true conditions... As corrected, we believe these data will indicate a "Low" hazard potential classification, rather than the "High" classification assigned by the Corps.

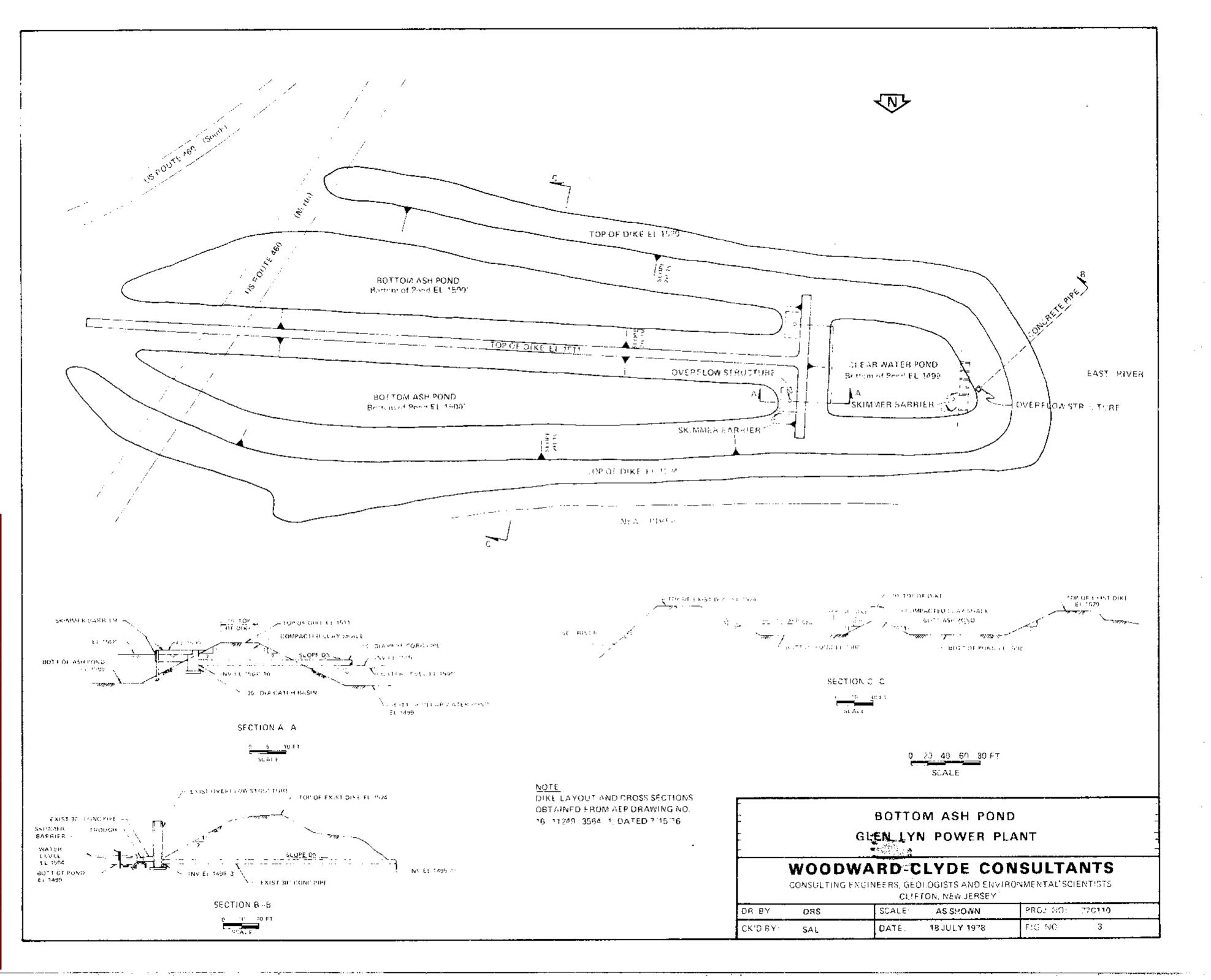
TABLE 1

LIST OF DRAWINGS AVAILABLE FROM AEP GLEN LYN POWER PLANT FLY ASH AND BOTTOM ASH STORAGE PONDS

Drawing No.	<u>Date</u>	Date of Last Revision	<u>Title</u>
16-11249-3564-1	7/15/76	8/16/76	Bottom Ash Storage Area Modification
16-3540-2	10/2/73	12/6/76	Fly Ash Storage Area-General Plan
16-3542-1	10/2/73	12/6/76	Fly Ash Storage Area-Dikes sheet 2 of 3
16-3543-1	10/2/73	12/6/76	Fly Ash Storage Area-Dikes sheet 3 of 3
16-3548A-1	9/14/76	1/17/77	Ply Ash Storage Area-Modification of Overflow Structure
16-3544	10/2/73	none	Fly Ash Storage Area-Dike Sections







APPENDIX A PHOTOGRAPHS

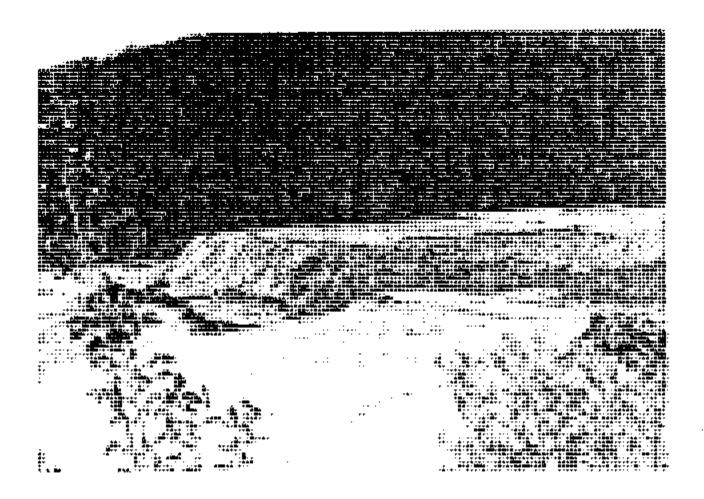


Photo I. Middle Fly Ash Pond, Looking North

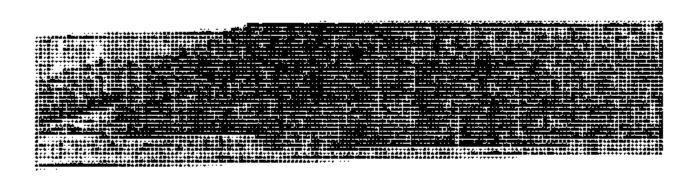




Photo 2. Lower Fly Ash Pond, Looking East

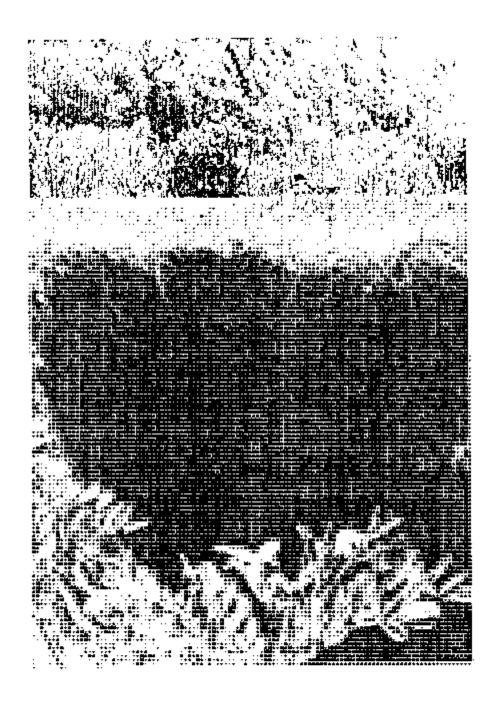


Photo 3. Upper Fly Ash Pond, Sinkhole on NE Crest of Dike

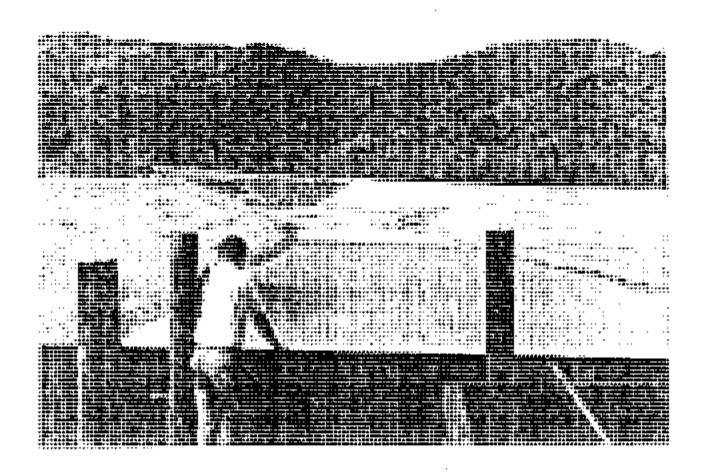


Photo 4. Upper Fly Ash Pond, Looking West

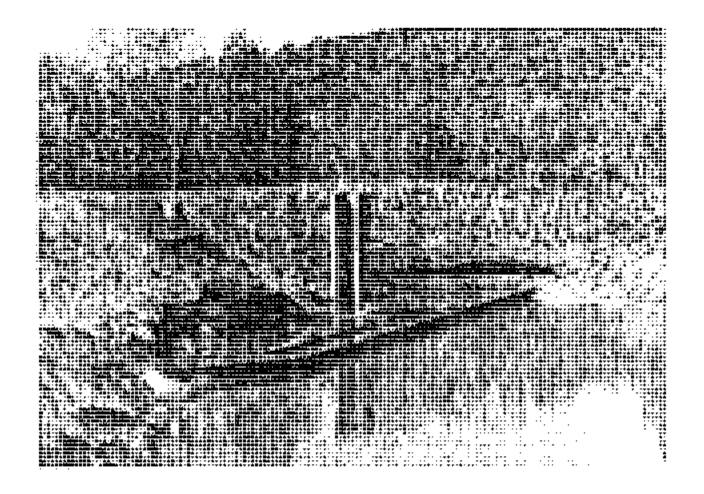


Photo 5. Bottom Ash Pond, Showing Skimmer Barrier of Clear Water Pond

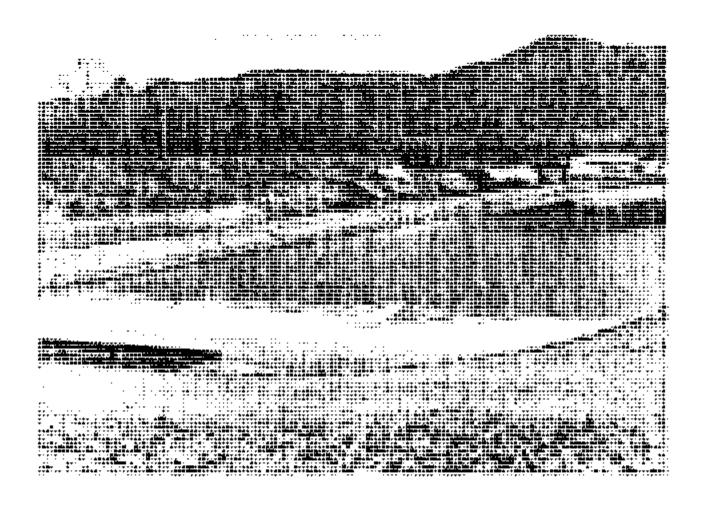


Photo 6. West Half of Bottom Ash Pond

APPENDIX B
VISUAL INSPECTION CHECKLIST

GLEN LYN
FLY ASH POND

A.E.P. DAM SAFETY INSPECTION VISUAL INSPECTION CHECK LIST

State VA.	High	Temperature ± 75	ans	Tailwater at Time of Inspection 1494 M.S.L.				Recorder		g upper, middle and lower punds.	Upper pond dry and lower pond in [u]] service.	dikes,
Name Dam Upper and Lower Flyash Pond County Giles	Type of Dam Homogeneous Clay Hazard Category +	Cate(s) Inspection 5/11/78 Weather clear Tempo	+ From U.S. Army Corps of Engineers' National Inventory of Dams	Pool Elevation at Time of Inspection 1527 M.S.L. Tailwater	Inspection Personnel:	Noel Baymeboxg	Jack Frederick	Jack Frederick	Remarks:	Glen Lyn Flyash dam actually three separate systems of dikes enclosing upper, middle and lower punds.	At time of inspection middle pond full and out of service. Upper por	Unless otherwise noted, remarks perlain to both upper and lower pond dikes,

CONCRETE/MASONRY DAMS

Not Applicable

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECORMENDATIONS
AKY NOTICEABLE SEEPAGE (faces, abutments, toe, etc)		
N/A		
STRUCTURE TO ABUTEMENT/EMBANKMENT JUNCTIONS	-	
DRAIMS, CHARACTERISTICS OF DISCHARGE		
WATER PASSAGES (Erosion, cavitation, obstructions, cracks, etc)		
FOUNDATION (possible damage or undermining of downstream toe)		

CONCRETE/MASONRY DAMS

Not Applicable

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT (abnormal settle- ments, heaving, deflections		
MONOLITH AND CONSTRUCTION JOINTS (filler material movement, leak-		
ABUTMENTS (instability, excessive weathering, etc)		

Sheet 4 of 11

EMBANKMENT

VISUAL EXAMINATIONS OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
SURFACE CRACKS None noted	
ONUSUAL MOVEMENT OR None noted CRACKING AT OR BEYOND THE TOE	
SLOUGHING SLIDING OR EROSION OF EMBANKWENT AND ABUTMENT SLOPES	Large (30-40 yd ³) sinkhole in orest of upper flyash pond dike formed by erosion (piping) of flyash embankment material. Surface water collecting on crest of dam apparently sceped into flyash and washed out material at face of downstream slope, with subsequent collapse and enlargement of sinkhoie.
	None noted in the lower pend dikes
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Appears normal

ENBANKMENT

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RIPRAP FAILURES Do pr	Downstream toe of dikes adjac protect ayainst erosion. No	Downstream toe of dikes adjacent to river are covered with 1-2 yd ³ rocks and rip-rap to protect against erosion. No evidence of displacement or crosion at toe of slope.	rocks and rip-rap to toe of slope.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM (erosion, leakage etc)	۷۲ None noted ۹۷ skage		
ANY NOTICEABLE SEEPAGE (embankment and abutment downstream slopes, toc, etc)	3E No seepage noted nent oc,		-

Not applicable

DRAINS, CHARACTERISTICS OF DISCHARGE

OUTLET WORKS

VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN	OF Not applicable	OMMENDATIONS
INTAKE STRUCTURE	pper pond: not in se	
OUTLET STRUCTURE	Lower pond: appeared normal	
	Lower pond: no ovidence of seepage around outside of pipe	
EMERGEWOY GATE	Not applicable	
STILLING BASIN	Not applicable	

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS CONCRETE MEIR APPROACH CHANNEL DISCHARGE CHANNEL BRIDGE AND PIERS STILLING BASIN		UNGATED SPILLINAY	Sheet 7 of 11
EL OBSERVATIONS FIL OBSERVATIONS NEL OBSERVATIONS		Not Applicable	
RS REL	VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WELL RS	CONCRETE WEIR		
NS NEL	APPROACH CHANNEL		
DISCHARGE CHANNEL BRIDGE AND PIERS STILLING BASIN			
BRIDGE AND PIERS STILLING BASIN	DISCHARGE CHANNEL		
STILLING BASIN	BRIDGE AND PIERS		
	STILLING BASIN		

	GATED SPILLWAY	Sheet 8 of 11
	Not applicable	
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
COMCRETE SILL		
APPROACH CHANNEL		
	• .	
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		
STILLING BASIN		

RESERVOIR

Sheet 9 of 11

REMARKS OR RECOMMENDATIONS Upper now slopes were completely exposed (pend empty). Northwest slope had failed on first filling OBSERVATIONS VISUAL EXAMINATION OF SLOPES

that inflow pipe was once located. Otherwise all slopes appeared to be stable and free of displacements. and placed out of survice. Some erosion of southwest slope was also noted at point where it appeared with resulting collapse of discharge header pipe pile foundations. Because of this, pond was emptied

SEDIMENTATION

sediment in lower pond. Estimated life of lower pond at present rate of filling reported to Soundings were being made by others to determine depth of full of sediment with no free water on surface, upper pond was completely empty and dry, and At time of inspection middle pond was Purpose of reservoirs is to collect flyash sediments. lower pond was in active service. be an additional 12 to 18 months.

POTENTIAL UPSTREAM

Munoff from the hill located wost of the upper pond is picked up by storm sever facilities Limited watershed (less than 1,0 M12) from natural side hill, west of the lower mond, is Shis adjacent to Route 649. There is virtually no watershed between Route 649 and the Upper No natural drainage into reservoir. All flow is piped in under controlled conditions. diverted through side channel ditch boarding casternmost dike of lower pond. Natural springs and erosion in this area have caused some blockage along diversion ditch. ditch should be cleared and regraded to provent run off from entering flyash youd

DOWNSTREAM CHANNEL

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECOMMENDATIONS
CONDITION (Obstruction, debris, etc)	No obstructions or debris, free flow directly into New River.

SLOPES Downstream channel is essentially river bed of New River

Ponds exist immediately adjacent to New River with no inhabitants or developed property between ponds or river. Any spill would go directly into river with slight ...) rise in water level, probably confined to existing flood plain. POTENTIAL DOWNSTREAM Nom HAZARD AREAS (No. of prohomes, population, etc...)

INSTRUMENTATION

Sheet 11 of 11

VISUAL EXAMINATION	OBSERVATIONS RECOMMENDATIONS
SURVEY MONUMENT	No formal instrumentation installed. However, daily inspection is made by plant personnel to ascertain condition of piping system and pends. At time of visit, others were making a field survey to determine the extent of siltation in lower pend, This included determination of depth of water at fixed grid not locations over entire area of pend.
SETTLEMENT PLATES, INCLINOMETERS	

		ICES
		FLOW MEASURING DEVICES
		SURIN
		OW ME
		RS / FL
		WEIRS/

OBSERVATIONS WELLS, PIEZOMETERS '

HEADWATER, TAIL WATER GAGES

OTHER

GLEN LYN
BOTTOM ASH POND

A.E.P. DAM SAFETY INSPECTION VISUAL INSPECTION CHECK LIST

Neme Dam Glen Lyn Bottom Ash Dam County Giles State Virginia	
Type of DamEarth Embankment	
Cate(s) Inspection 11 May 1978 Weather <u>Clear</u> Temperature ± 750 E	
+ From U.S. Army Corps of Engineers' National Inventory of Dams	
Pool Elevation at Time of Inspection N/A M.S.L. Teilwater at Time of Inspection M.S.L.	:-{
Inspection Personnel:	
Noel Ravneberg	į
Jack Frederick	
Jack Frederick	
Remarks:	
At time of inspection operators were converting from operation of the south	

CONCRETE/MASONRY DAMS N/A

ANY NOTICEABLE SEEPAGE (faces, abutments, toe , etc) STRUCTURE TO ABUTEMENT/EMBANKMENT JUNCTICKS	VISUAL EXEMINATION OF	08SERVATIONS	REMARKS OR RECOMENDATIONS
STRUCTURE TO ABUTEMENT JUNCTICKS	ANY NOTICEABLE SEEPAGE (faces, abutments, toe, etc)		
STRUCTURE TO ABUTEMENT/EMBANKMENT JUNCTIONS			
	STRUCTURE TO ABUTEMENT/EMBANXMENT JUNCTIONS		

AINS, CHARACTERISTICS DISCHARGE	WATER PASSAGES (Erosion, cavitation, obstructions, cracks, etc)
DRAINS, C OF DISCH	WATER PAS cavitatio cracks, e

FDUNDATION (possible damage or undermining of downstream toe)

DAMS
/MASONRY
CONCRETE

V/N

VISUAL EXAMINATION OF	<u>OBSERVATIONS</u>	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
YERTICAL AND HORIZOWTAL ALIGNÆNT (abnormal settle-		
ments, heaving, deflections etc)		
MONDETTH AND CONSTRUCTION JOINTS		

(filler material movement, leakage, etc...)

ABUTMENTS (instability, excessive weathering, etc...)

Sheet 4 of 11

EMBANKKENT

VISUAL EXAMINATIONS OF		08	OBSERVAT10%S	REMARKS OR RECOMMEMDATIONS
SURFACE CRACKS None	None Noted			
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted			
SLOUGHING SLIDING CR EROSION OF EMSARCHENT AND ABUTHENT SLOPES	OSION OF	Considerable in balf. No impoundment,	Considerable sloughing of partition dike which separates the pond in balf. No displacement of porimeter dike which contains the impoundment.	ch separates the pond which contains the
				-

VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST

Normal

EMBANKMENT

VISUAL EXAMENATION OF	CBSERVATIONS RECOMMENDATIONS
RIPRAP FAILURES Large from h	Large (1-2 yard ³) stone and riprap on lower balf of downstream slope to protect embankment from high river flow. No displacement failures noted.
JUNCTION OF EMBANCHENT AND ABUTMENT, SPILLMAY AND DAM (erosion, leakage etc)	ge Closed porimeter dike with no natural abutments.
AXY NOTICEABLE SEEPAGE (empankment and abutment downstream slopes, toe, etc)	Youe noted.
ORAINS, CHARACTERISTICS OF DISCHARGE	No natural flow into impoundment. All inflow controlled by pumping from plant. Overflow discharges into fixed elevation skimmer trough and through outlet conduit to East River. Outflow from pond appears that and less turbid than flow in river.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS REMARKS OR RECCHMENDATIONS
CANCKING AND SPALLING OF CCHCHETE SURFACES IN OUTLET CONDUIT	Concrete surfaces appear fresh with no significant cracking or spalling.
INTAKE STRUCTUR E	Rectangular concrete intake tower extends about 15 feet above pond level of stilling basin. Provision to place stop logs in open slot of one ball to raise pond level has never been used. Overflow remains fixed at present lovel by virtue of tressle supported metal skimming trough collection system, connected to intake.
OUTLET STRUCTURE	Concrete box culvert connects to 30" RCP outlet conduit through embankment to Hast River at D.S. toe of slope.
EMERGENCY GATE	None
STILLING BASIN	A separate stilling basin exists upstream from the intake structure and downstream from the bottom ash ponds. It is connected by overflow pipes which collect essentially clear water from the surface of the pends. This water undergoes a second settling process before passing over the lip of the skimmer troughs connected to the intake/outlet structure.

Sheet 7 of 11

UNSATED SPILLMAY NONE

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR		
APPROACH CHARNEL		
DISCHARGE CHANNEL		
BRIDSE AND PIERS		
STILLING BASIN		

	GATED SPILLMAY	NONE	Sheet 8 of 11
VISUAL EXAMINATION OF	OBSERVATIONS		REMARKS OR RECOMMENDATIONS
COMORETÉ SILL			
Approved Chambel			
אריהטאטרו כחאוויהב			
DISCHARGE CHANNEL			
BRIDGE AND PIERS			
GATES AND OPERATION EQUIPMENT			
STILLING BASIN	1		

SYCHERENDYMOUTE OF SYCKWIG	Newson on Appendictions
DWOLLDWOOD	V0055878-1 - U40
VICTIAL EXAMINATION OF	VISCAC EARTHMENTON OF

RESERVOIR

Sheet 9 of 11

STOPES

å Severe sloughing of partitional dike between separate halves of bottom ash pond. significant slouging of upstream slopes of main dikes.

SEDIMENTATION

Used for purposes of sedimentation. Left half full of sediment. Right half recently excavated to remove all sediment and begin new cycle.

> POTENTIAL UPSTREAM HAZARD AREAS

None. Operates as self-contained unit with no natural watershed or natural upstream slopes.

The only constant reserveir is the stilling basin which is estimated to contain less than 10 acre-ft. of water.

٠,,

HANNEL	
DOWNSTREAM C	

Sheet 10 of 11

<pre>CCMOITION (Obstruction, debris, etc)</pre>		
	The outlet works connect directly to East River which is a natural water course.	ist River which
SLOPES	Natural river channel	
POTENTIAL DOWNSTREAM HAZARD AREAS (No. of homes, population, etc)	None beyond those posed by normal flooding of East and New Rivers.	fing of East and New Rivers.

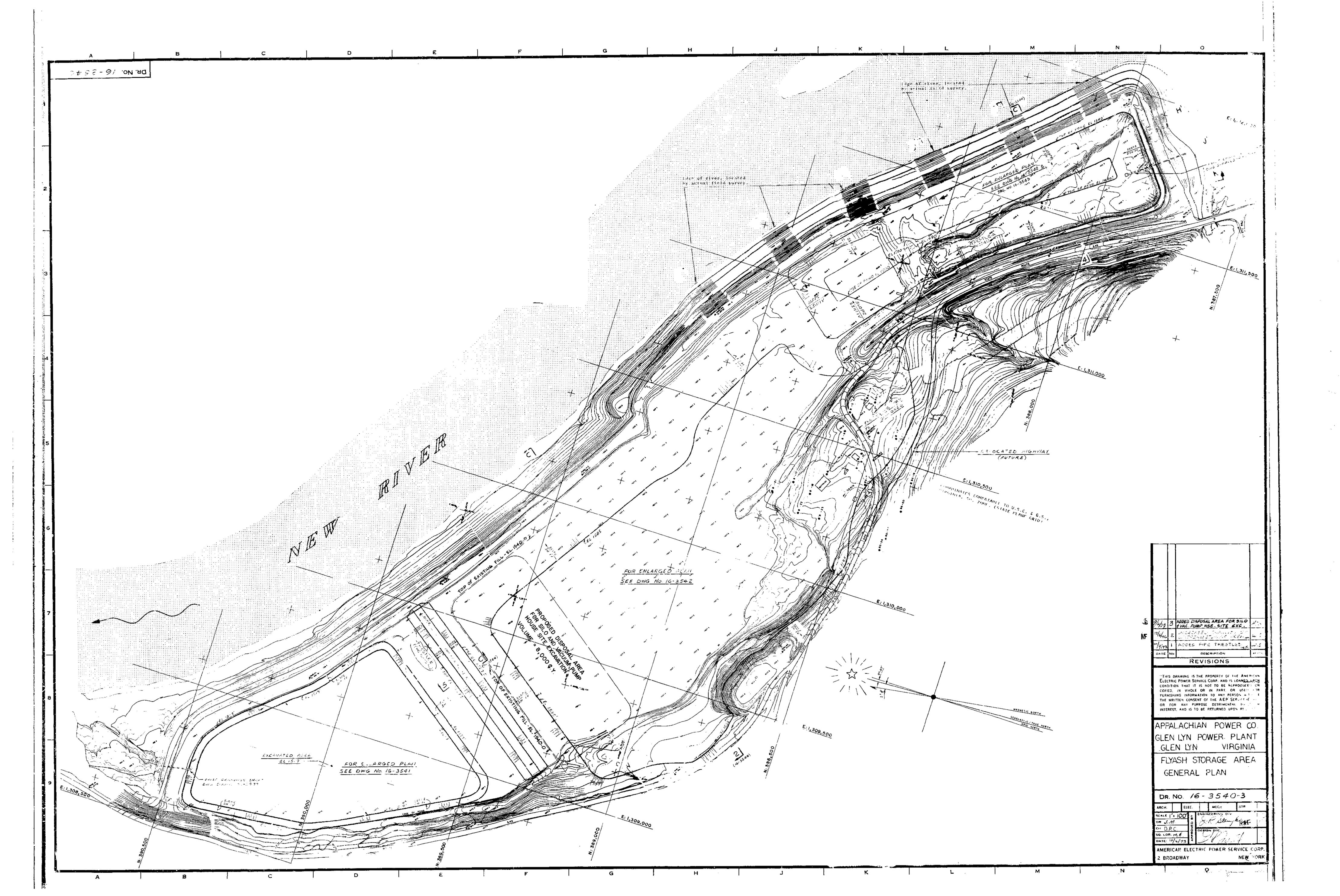
	INSTRUMENTATION	NONE	Sheet 11 of 11
VISUAL EXAMINATION SURVEY MONUMENT	0BSERVATIONS		REMARKS OR RECOMMENDATIONS
SETTLEMENT PLATES, INCLINOMETERS			
OBSERVATIONS WELLS, PIEZOWETERS '			
WEIRS/FLOW MEASURING DEVICES			
HEADWATER, TAIL WATER GAGES			
ОТИЕК			

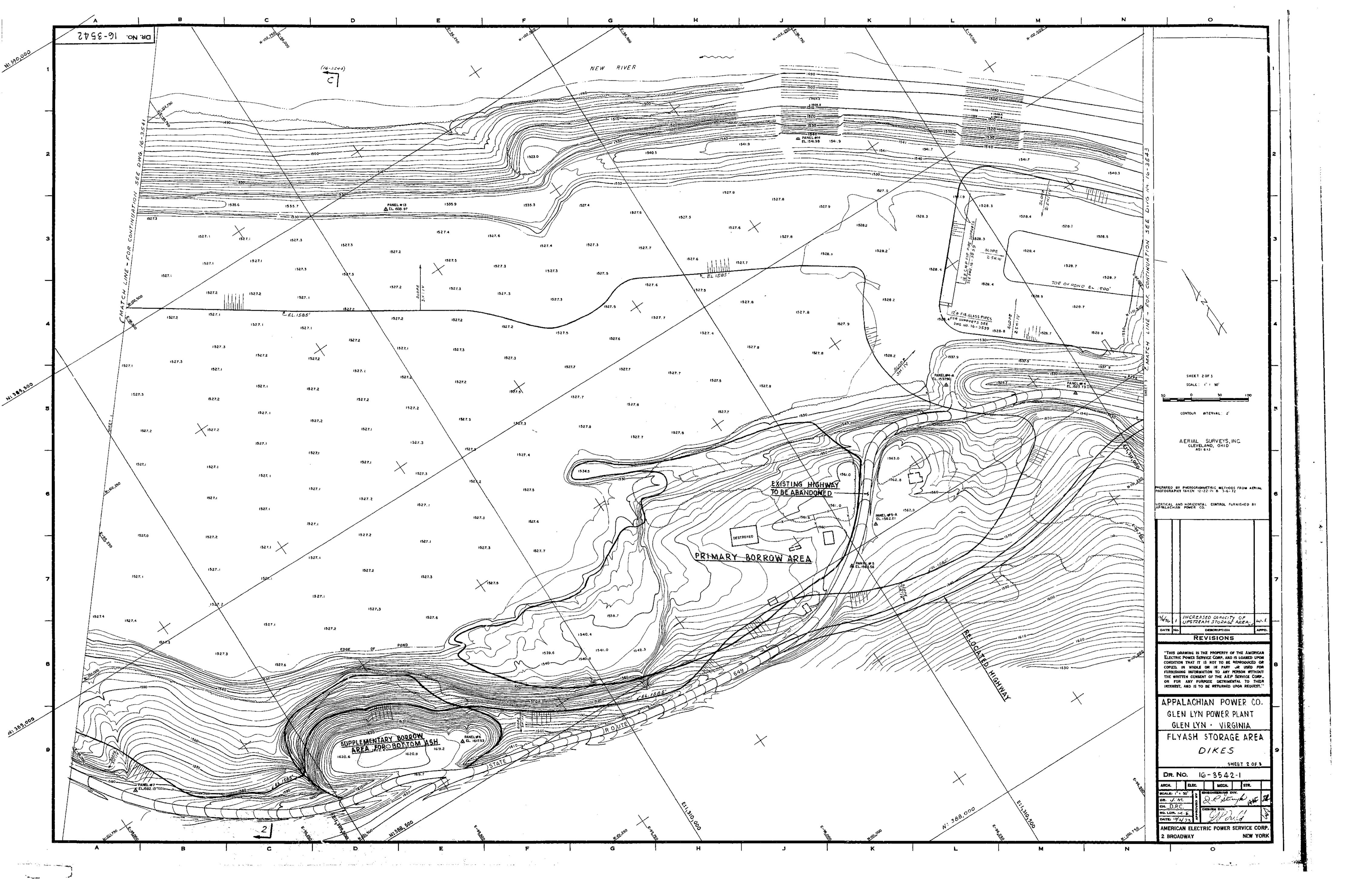
APPENDIX A

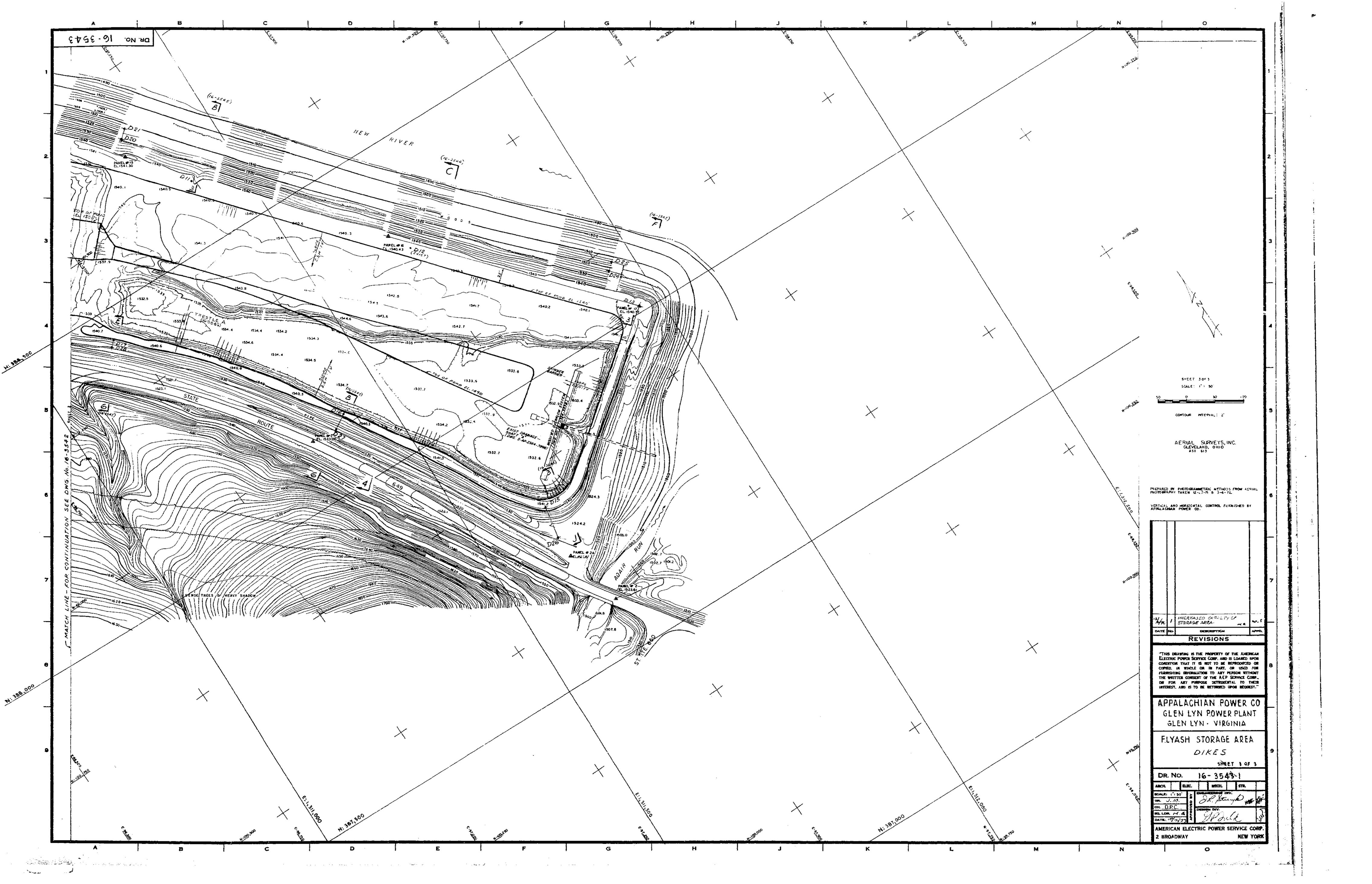
Document 4

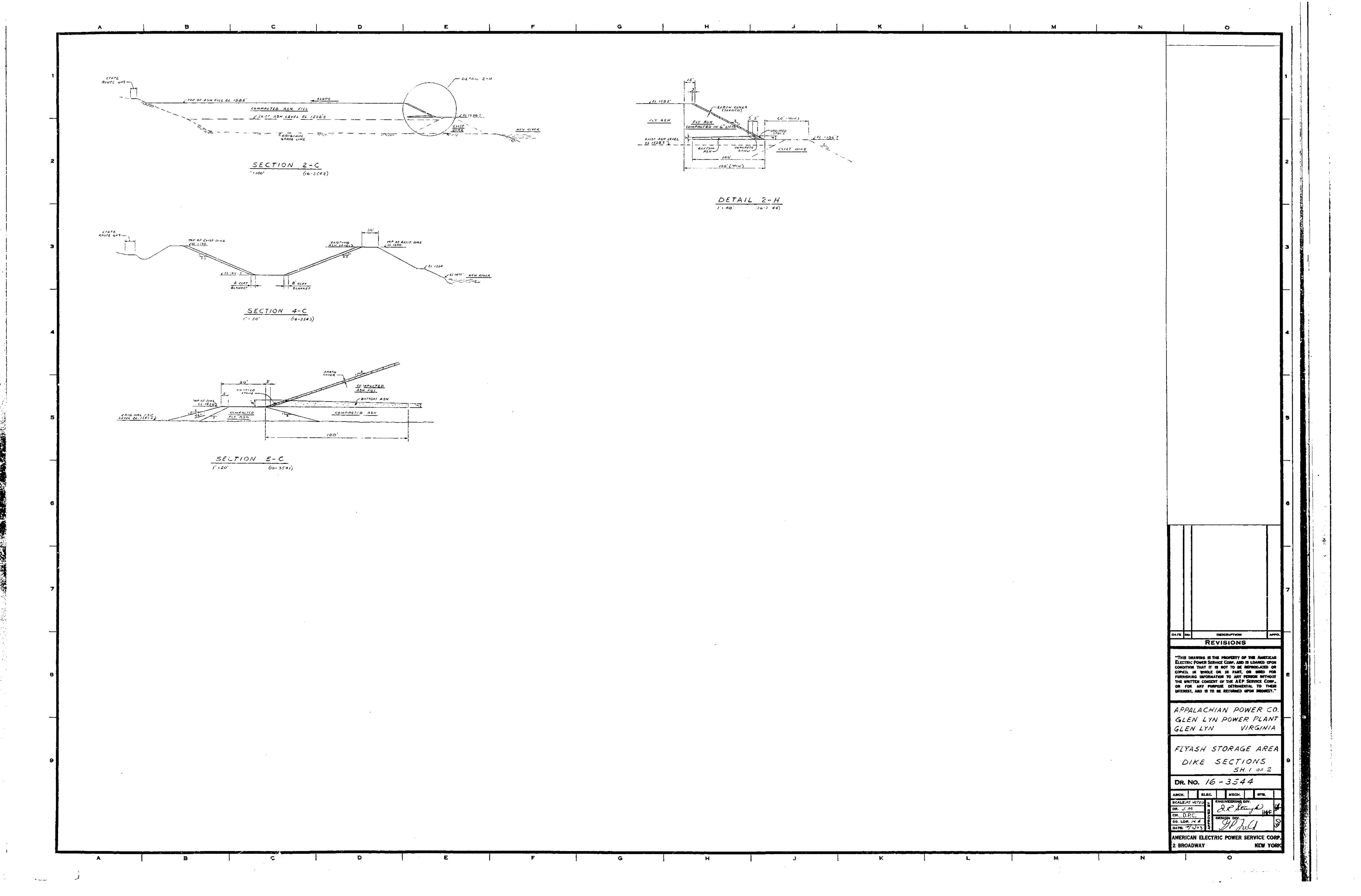
AEP Engineering Drawings

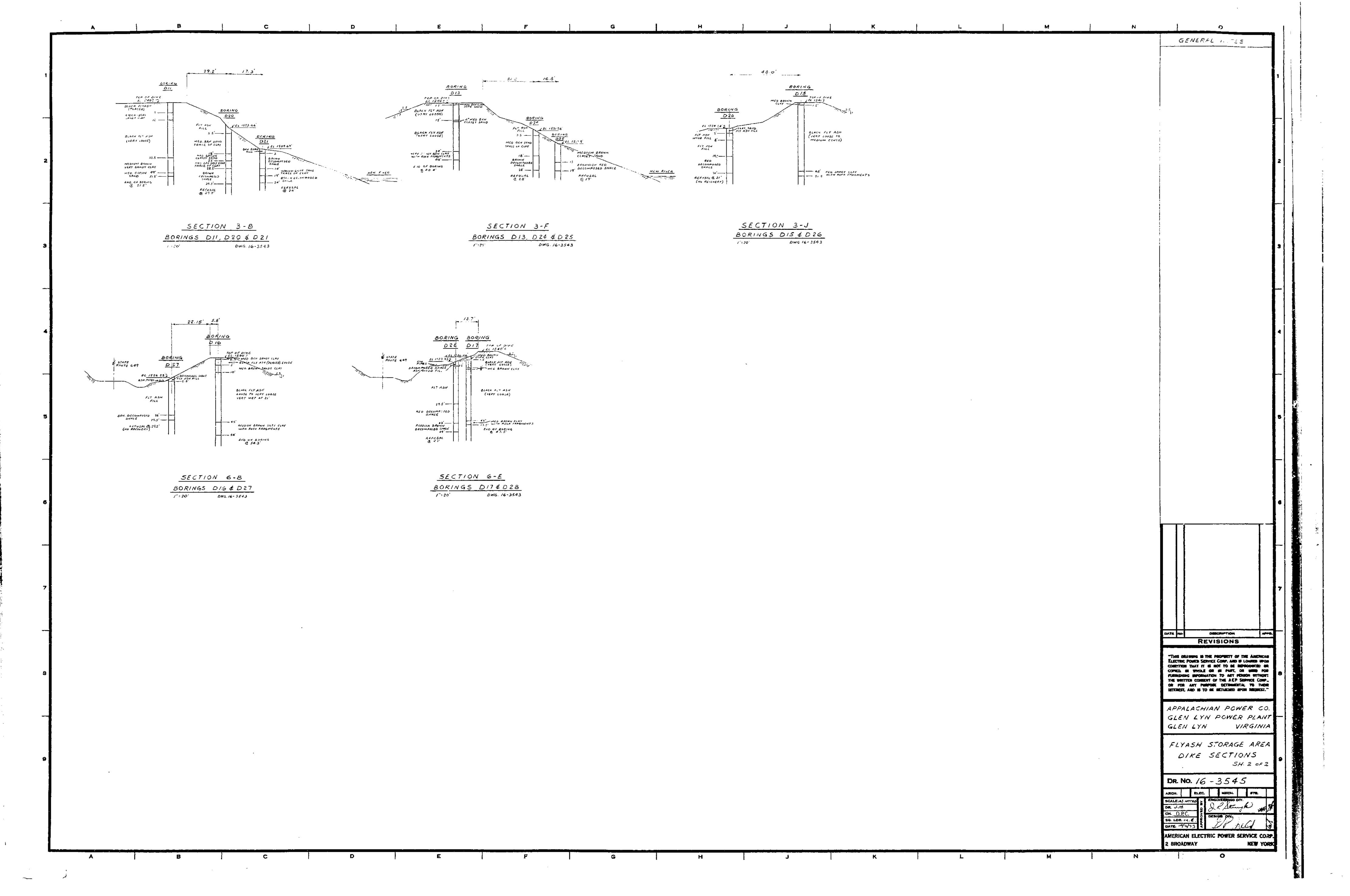
DOCUMENT 4: AEP ENGINEERING DRAWINGS

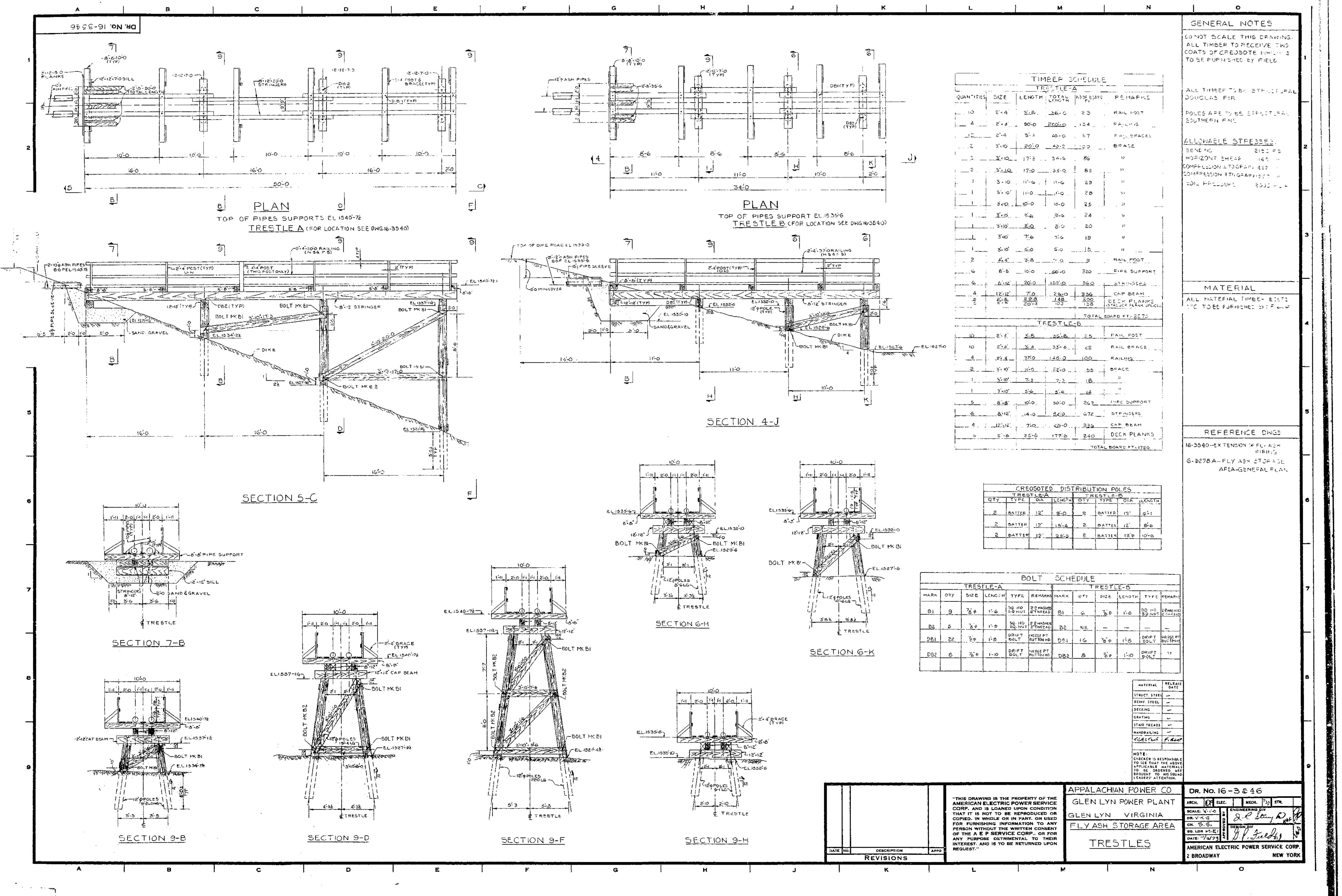


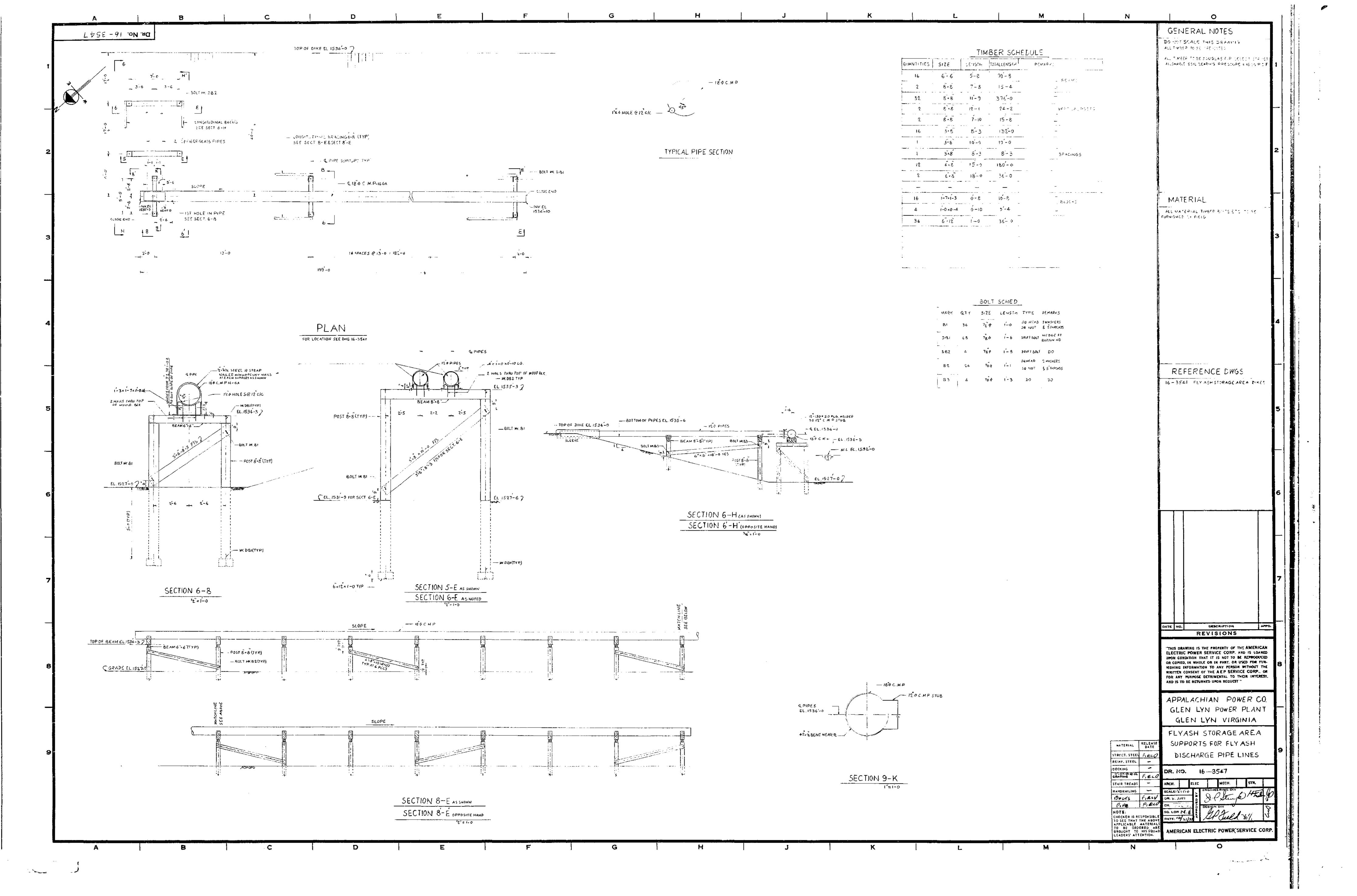


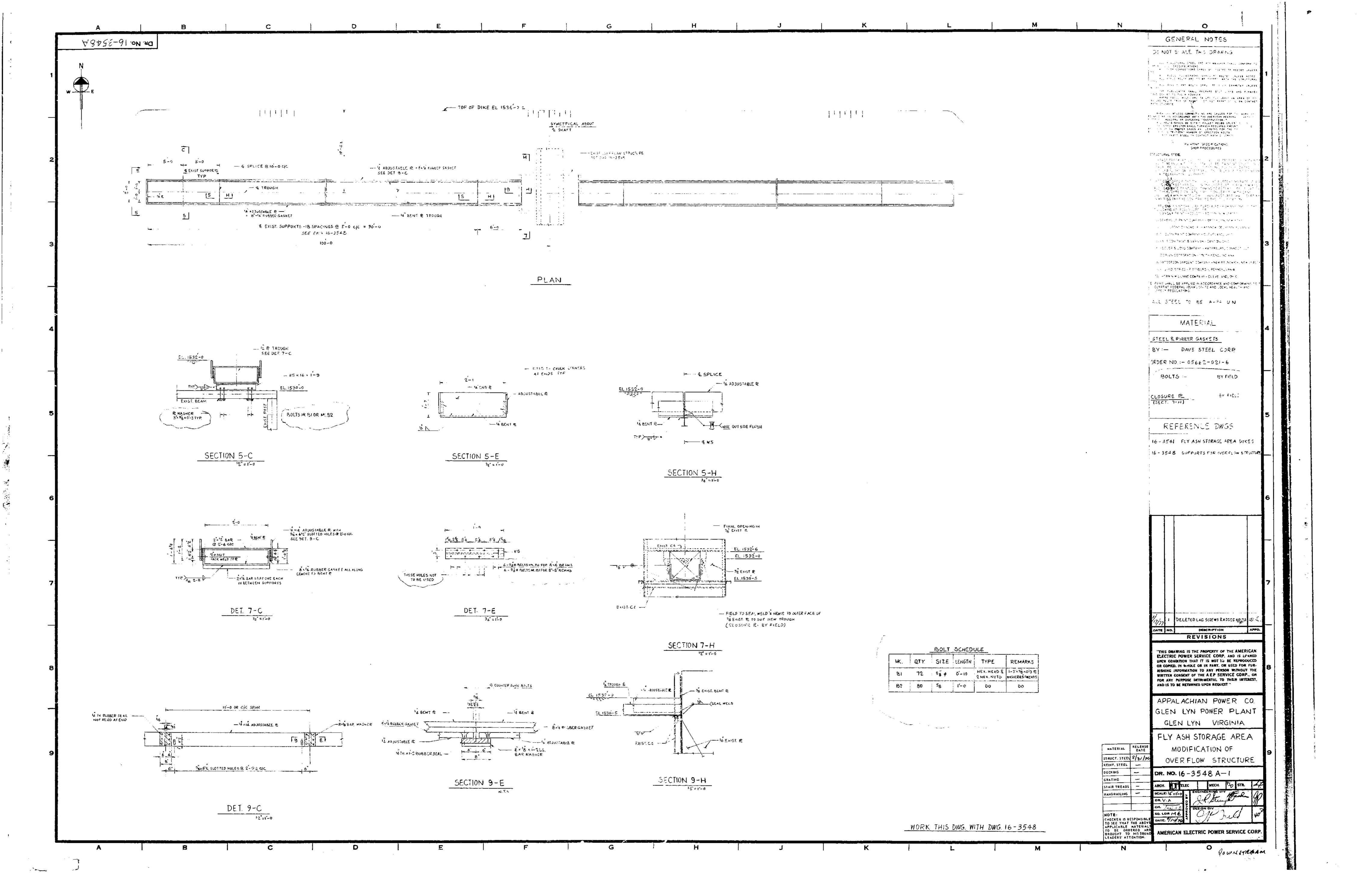


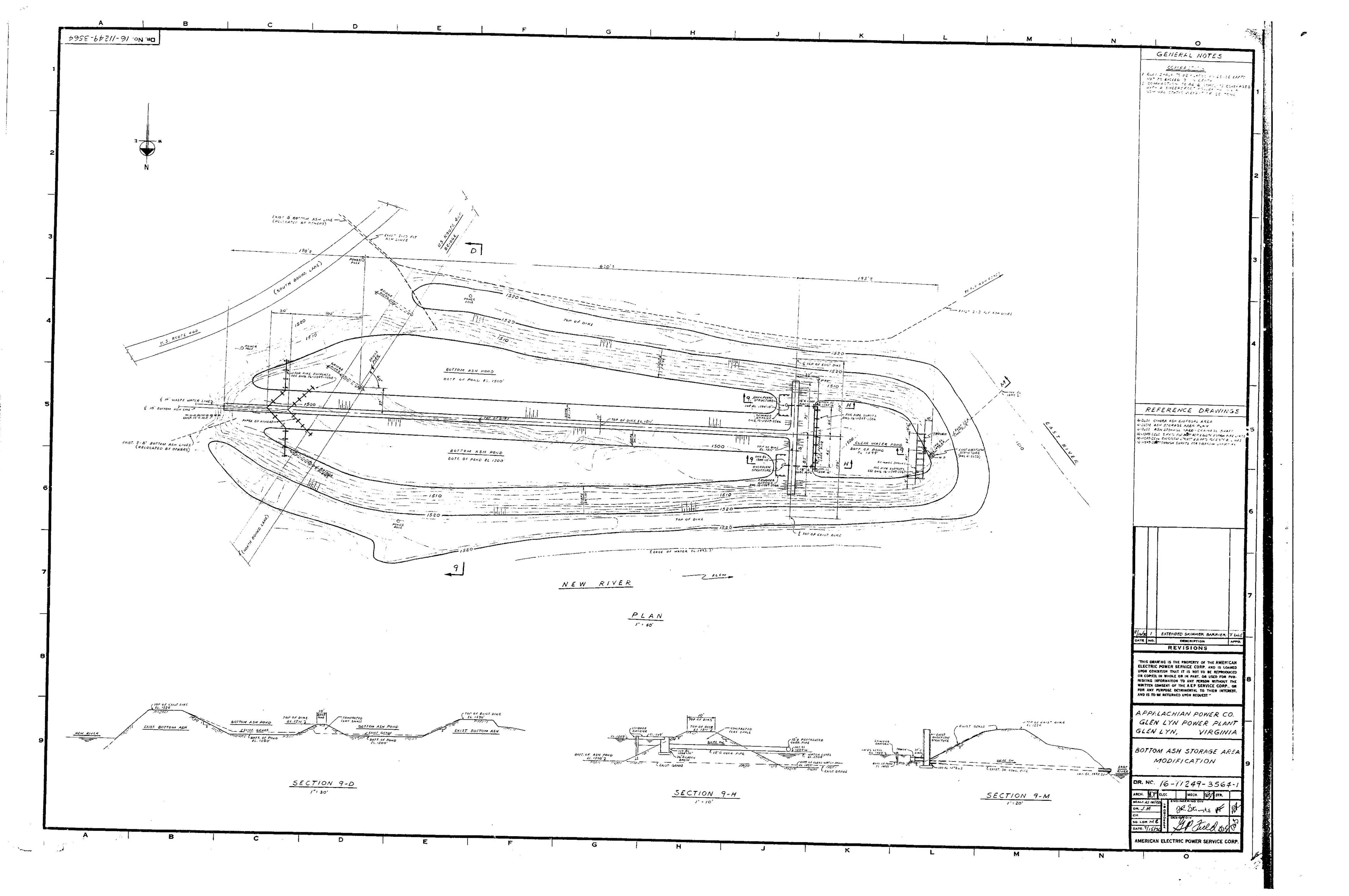












SUMMARY OF AEP'S DAM AND DIKE INSPECTION AND MAINTENANCE PROGRAM (DIMP)

Subject: Join and Bike Inspection and Markenance Program

Category: CiVIL (Maintenance)

CL# CLM CL 010G

Revision:

Division professional description of the second of the

Purpose:

To detail to may eather it comments on and routine menterands duties and responsibilities of Plant, Region Engineering, Environments, Selvices and Engineering Services under the AEP Early Inspection and Maintenance Program. The program applies to all verifier diens and disease and or addices for EGC studies storage or disposal, was to writer pends and large cooling water storage fact sear this AEP System. Seeling IV of this lutter briefly discusses Emergency Action Plans (EAP) but does not addices actions to be taken under encargency conditions. For response to entergency conditions error to the facility's Emergency Action Elan flagproadile or contact AEPSQ Gentechnical Engineering Section.

Background:

From the 1940's through the 1970's as the AFP Syde in was expanded. AFP consorted extensively on the dams and divide with one of the profit are of geotrehmoal engineering. Professor Arthur Casagram eith-faivant diministry. If a Jam is divide eith-field problems. AFP worst monitor and repair if uncler the guidence. In the 1960's and 1970's large consulting companies originate of major dam construction projects with Casagrandir Consultants acting as the lowner's temporar.

In the 1676s AEP began to perform dam inspections with internal statt. In addition, the U.S. Army Corns of Fing seers inspected several AEP clams in the tate 1970's as part of a net onal program in response to the Bullato Creek disaster in West Virginia. In 1876, AEP contracted with Woodward Civic Consultants to begin inspecting ashibits, osed dams and cities on the AEP System every two years in 1903 AEP Civil Engineering initiated the Dam hispaction and Maintenance Emigram. Its purpose whis to provide for systemation inspection, followed our significant inspect on Indings and to as ribbish a contract point for clant concerns. Inspection, check ists were created and the prons were asked to perform periodic dispections.

Through the 199 is to the present, the program has been uniform and consistent. The purpose of this revision is to further strengthen the program throughout the entire AFP System and it. reinforce the need to paraim and document routine and formal inspections, called the instrumentation date where applicable and implement maintenance and namedial activities to assure the facilities are operated and maintained in a condition consistent with their design basis.

The Gentedin cell Engineering Scalinn (GES) of AFPSC Engineering Services developates the overall program, which is largely based on state requiations. Federal Emergency Management Agency quide inest and sound engineering practice.

The inspection component of the program consists of four levels of inspection (1) rootine serve bence respections by Plact personnel looking for changes in conditions (stips using dam face) are one gather excessive settlement implicationing dialos new seepage away attal), (2, forms, otherwist type inspections by Plant or Rog on Engineering staff performed on a scheduled basis (3) engineering inspections purformed under the direction of a P.E., at a frequency determined by the dam's task classification (1, 2, a) 3 year (mervals), and (4) increasing in it inspections after unusual events such as heavy learns se single vents, or other events that could cause a change in the condition of the facility.

Inserction Se	thedule for Plant Formal Joheckilsti Inspections
VA	
Clinich Rover FAD 1A-1B	leopiect disurterly
c nich Kwer HAD /	Jospant Oughery
Glen Lyn FAR	lospect Ocartery
osler Lyn SAP	Project Overlery
Glen Lyn West Fon :	Inspect Ocaltery

DAM & DIKE INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GLEN LYN PLANT GLEN LYN, VIRGINIA

INSPECTION DATE January 13, 2009

PREPARED BY Hary F. Zych. Gary F. Zych. P.E.

DATE 2/16/09

REVIEWED BY BLAS

DATE 2-16-2009

APPROVED BY

Pedro J. Xmava, P.E.

DATE 2-16-2009

Manager - Geotechnical Engineering

QA/QC DOCUMENT NO.

GERS - 09 - 003

EDRO JOSE AMAYA-TRIJ NO.036174

PROFESSIONA ENGINEER SEAL & SIGNATURE

2009 INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GLEN LYN PLANT GLEN LYN, VIRGINIA

> PREPARED BY GEOTECHNICAL ENGINEERING AEP SERVICE CORPORATION 1 RIVERSIDE PLAZA COLUMBUS, OHIO

2009 INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GLEN LYN PLANT GLEN LYN, WEST VIRGINIA

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SUMMARY OF VISUAL OBSERVATIONS	2
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West Pond	5
ASSESSMENT OF RECENT INSTRUMENTATION DATA	6
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Auxiliary Pond	
West Pond	
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FIGURE 3: West Pond Inspection Location Plan	
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INTRODUCTION

AEPSC Civil Engineering administers the company's Dam Inspection and Maintenance Program (DIMP). As part of DIMP, staff from the Geotechnical Engineering Section periodically conduct the dike and dam inspections. Mr. Gary F. Zych, P.E. conducted the 2009 inspection. This report has been prepared under the direction of Mr. Pedro J. Amaya, P.E. and presents a summary of the inspection and assessment of the condition of the facilities.

Mr. Joe Ryder, Jr., Plant Civil Engineer at the Glen Lyn Plant, was the project facility contact. The inspection was performed on January 13, 2009. Weather conditions were sunny and cool. The temperature was 37° F. There was approximately 1.5 inches of rainfall and 2 inches of snow during the seven days prior to the inspection. All of the snow was completely melted by the day of the inspection.

At the Glen Lyn Plant there are three ponds that are part of the annual dike and dam inspection. These ponds are the Bottom Ash Pond Complex, the Auxiliary Fly Ash Pond and the West Pond, and are depicted in plan in Figures 1, 2 and 3, respectively. The Bottom Ash Pond Complex consists of the North and South Bottom Ash Ponds and a Clear Water Pond. The New River and the East River border it. The Auxiliary Fly Ash Pond is a wet fly ash pond adjacent to the New River and is used only as an emergency backup pond. The West Pond is a stormwater runoff pond for the dry ash landfill, which is located west of the Auxiliary Fly Ash Pond and of the landfill. In general, all ponds have earth embankments less than or equal to 50-ft in height and slopes of 2 to 3 Horizontal to 1 Vertical.

SUMMARY OF VISUAL OBSERVATIONS

General

The summary of the visual observations uses terms to describe the general appearance or condition of an observed item, activity or structure. Their meaning of these terms is as follows:

Good: A condition or activity that is generally better or slightly better than

what is minimally expected or anticipated from a design or

maintenance point of view.

Fair or A condition or activity that generally meets what is minimally

Satisfactory: expected or anticipated from a design or maintenance point of view.

Poor: A condition or activity that is generally below what is minimally

expected or anticipated from a design or maintenance point of view.

Minor: A reference to an observed item (e.g., erosion, seepage, vegetation,

etc.) where the current maintenance condition is below what is normal

or desired, but which is not currently causing concern from a structure safety or stability point of view.

Excessive:

A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

Appendices A, B and C contain selected photographs taken during the inspection of the Bottom Ash Pond, Auxiliary Fly Ash Pond and West Pond, respectively.

Bottom Ash Pond Complex (refer to Figure 1)

- 1. The South Bottom Ash Pond was the active pond for receiving ash sluice water. The North Bottom Ash Pond was inactive and completely drained to accommodate dredging of the bottom ash. (Photo 1)
- 2. The interior slopes of both the North and South Bottom Ash Ponds appeared stable and in good condition. The crest and slopes of the Splitter dike between the two ponds also appeared stable and in good condition.
- 3. Flow over the South Bottom Ash Pond discharge structures was smooth with no obstructions. The structures appeared in good condition. In particular, the North BA Pond discharge structure was fully visible and no issues were noted about its condition. Modifications/repairs to the outfall structures were completed in Summer 2008. (Photo 2)
- 4. The South Bottom Ash Pond exterior slope, opposite to the discharge channel, was well vegetated and contained no visible animal burrows or areas of slope instability.
- 5. The North Bottom Ash Pond exterior slope along the New River appeared stable and well protected with vegetation and riprap. There were no signs of movement or displacement of the riprap. (Photo 3)
- 6. The interior slopes of the Clearwater Pond were also well vegetated and in good condition. The riprap in the northeast corner of the pond was stable.
- Wisible portions of the Clearwater Pond concrete discharge structure, wood steps, wood railing, platform, and intake structure were in satisfactory condition. The vegetation growing along the intake structure and within the stoplog channel of the discharge structure as noted in the past Inspection Reports have been removed. (Photo 4)
- 8. The Clearwater Pond outfall pipe (RCP 30-inch diameter), walkway and railing were in satisfactory condition. Discharge from the outfall pipe was unobstructed and there was

- no erosion or scour at the outlet. There was no visual evidence of significant settlement or depressions above the pipe alignment. There was no seepage from around the outside of the pipe.
- 9. The inlet structure and distribution pipe at the Clearwater Pond was in good condition. This structure was also repaired during 2008. The structure is performing as intended.
- 10. The dike roads are in good condition as shown in several of the photographs referenced.

<u>Auxiliary Fly Ash Pond</u> (refer to Figure 2)

- 1. There was more water than normal in the Auxiliary Pond. The approximate water line is shown on Figure 2. Discussions with Mr. Joe Ryder indicated that the plant had recently used the wet ash handling system and sluiced into the pond for 48 hours.
- 2. The lower section of the north dike (exterior slope along the New River) is part of the natural river bank and has vegetation and tree cover. There was no indication from the top of the bench that any instability exists.
- 3. The upper section of the exterior slope along the New River is well vegetated. The dike appeared to be mowed late in 2008 because the height of the vegetation was very low. This slope appeared stable and there were no new signs of surficial sloughing and there were no signs of any movement or displacement. (Photo 1)
- 4. The old erosion slide at the northeast corner of the exterior slope at the tree line did not appear to worsen. There were no signs of more exposed soil at the scarp interface.
- 5. The exterior slope of the east dike appeared satisfactory with no signs of apparent instability. This section of dike had been mowed recently. There were no signs of rodent holes or erosion gullies. As noted in other reports, the exterior slopes are steeper than the north dike. (Photo 2)
- 6. The outlet of the pond's discharge pipe, wood steps and railing were inspected and found in good condition. There was less than 1 gpm of flow through the open valve from the outfall. This flow is presumed to be from leakage into the discharge tower.
- 7. The exterior slope of the south side dike along Route 649 was also well vegetated. There were no signs of slope instability or any recent erosion gullies. Also as noted in other reports, the exterior slopes are steep along the eastern length of the dike. (Photo 3)
- 8. The interior slopes of all three dikes appeared stable and well vegetated. The slopes were recently mowed. (Photo 4)
- 9. The pond was inactive at the time of inspection. The current discharge into the pond is located in the central portion of the pond. Ash transfer pipes run down the slope and

discharge to the bottom of the pond. The approximate limits of exposed ash and water line are shown on the Inspection Plan.

West Pond (refer to Figure 3)

- 1. The northwest interior slope of the pond and visible portions of the wood baffle structure and the discharge structure including platform and wood railings were in fair condition. The discharge from the pond was directed through the center weir box via the inverted pipe skimmer in the box. The water level in the pond was approximately 2-3 inches above the weir crest. (Photo 1)
- 2. The NPDES Outfall No. 007 discharge pipe located at the west end of the pond was unobstructed and in satisfactory condition. Flow was through the pipe and slightly over the concrete plug/weir. The slopes and dike surface above the pipe did not exhibit any evidence of settlement or instability and the flow was clear. The wood steps and railing were in good condition.
- 3. The western section of dike was well maintained and mowed in Fall 2008. This section of dike appears to be stable and there are no signs of sloughing. There were several isolated woody stems on the slope that were not cut by the mowing operation. (Photos 2 & 3)
- 4. The toe area from about the west abutment to just east of the access stairs was dry as compared to past several inspections. There were no wet or moist areas observed.
- 5. There was a moist area from the toe to approximately one-third up the slope along the eastern end of the dike. This area has not been reported as moist in past inspections. The moist zone was limited in depth 2-3 inches and presumed to be due to the snow melt and earlier precipitation. There were no signs of sloughing or other movement.
- 6. The interior slope of the western road dike is in satisfactory condition. Slopes are protected with riprap. There were several 2-4 inch diameter trees growing on the slope, and vegetation is growing through the riprap at the shoreline.
- 7. The drainage ditch along the exterior slope of the western road dike was unobstructed and protected from erosion with riprap.
- 8. The top of dike road was in good condition with no evidence of significant dike settlement or misalignment.
- 9. The southeast end of the pond borders the landfill Leachate collection pond and dike. The dike and toe area appeared in good condition. The siphon from the Leachate pond into the West pond was not operating.

ASSESSMENT OF RECENT INSTRUMENTATION DATA

Pond water levels were obtained from Plant personnel for the date of the inspection. These levels are summarized below along with water levels measured during previous annual inspections. The Plant performs quarterly inspections and records pond levels and facility conditions.

Pond	Pond Elev.	Pond Elev.	Pond Elev.	Pond Elev.	Pond Elev.
	Ft.	Ft.	Ft.	Ft.	Ft.
Name	13Jan2009	30Oct 2007	1Nov 2005	14 Dec 2004	9 Sep 2003
Clearwater	1501	1501.3	1501.3	1501.3	1501.3
NBAP	dewatered	dewatered	dewatered	dewatered	1505.5
SBAP	1506.3 (full)	1506.3 (full)	1506.3 (full)	1506.3 (full)	1506.3
West	1531.5	1531.5	1531.5	1531.5	1531.5
Aux FAP	~ 1515	~1511	~1510	~ 1513	

The water level in the New River was elevation 1494.5 feet based on the USGS gage data. The water levels in the ponds are consistent with previous levels, expect for the Aux FAP. No other instrumentation data is available for the dikes at the Plant.

CONCLUSIONS

Bottom Ash Pond Complex

The Bottom Ash Pond Complex earthen embankments and structures are in good condition. The slopes of the embankments are protected from erosion with vegetation or riprap and the facility is well maintained. The stone slope protection along the river was in satisfactory condition. The discharge structures were also in satisfactory condition.

Auxiliary Pond

Overall, the earthen embankments forming the Auxiliary Fly Ash Pond are in good condition. The vegetation covering the slopes is established and well maintained.

West Pond

Overall, the earthen embankments forming the West Pond are in good condition. The vegetation covering the slopes is established and well maintained. The inlet and outlet of the discharge structure are in satisfactory condition.

RECOMMENDATIONS

Bottom Ash Pond Complex

1. Continue routine maintenance items as necessary.

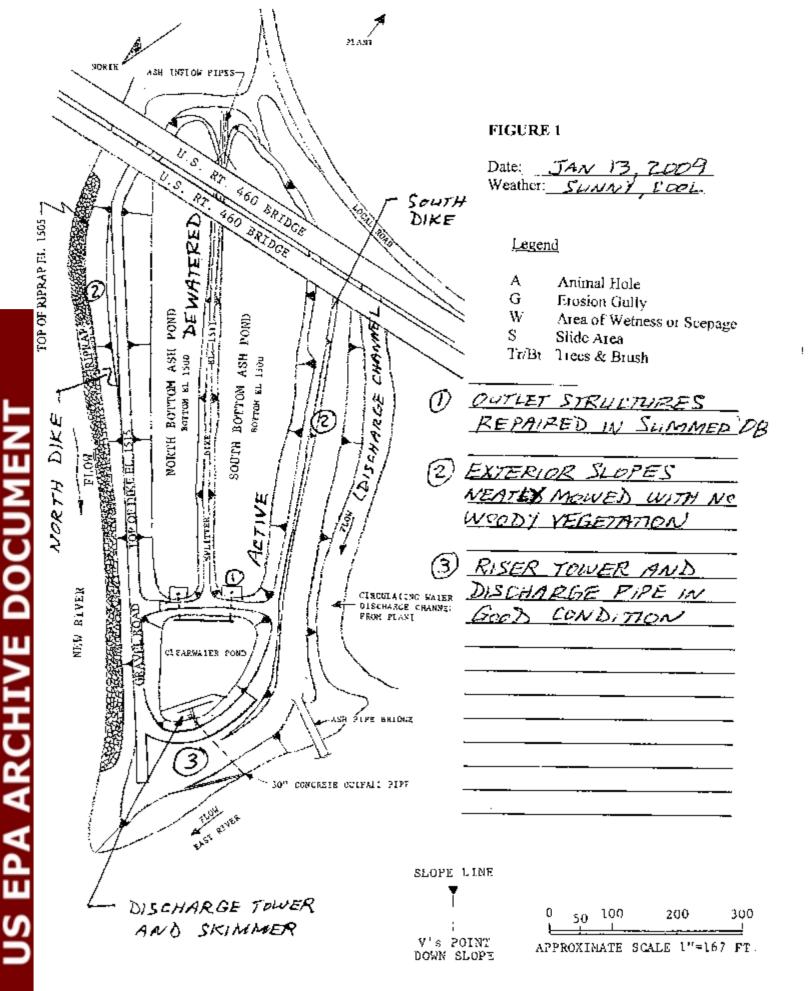
Auxiliary Pond

Continue routine maintenance items as necessary.

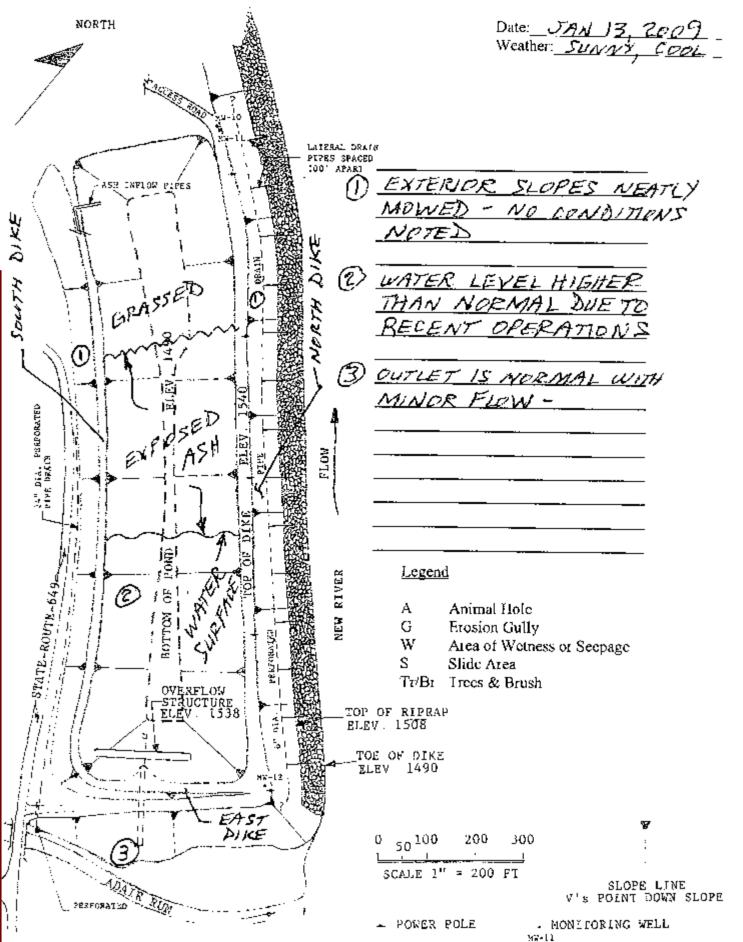
West Pond

1. Continue routine maintenance items as necessary.

In general, routine inspections, monitoring and maintenance by plant personnel should continue. If you have any questions with regard to this report, please do not hesitate to contact Gary Zych at 614-716-2917 (audinet 200-2917).



GLEN LYN PLANT: BOTTOM ASH POND INSPECTION LUCATION PLAN



GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

APPENDIX A: BOTTOM ASH BOTTOM PHOTOGRAPHS

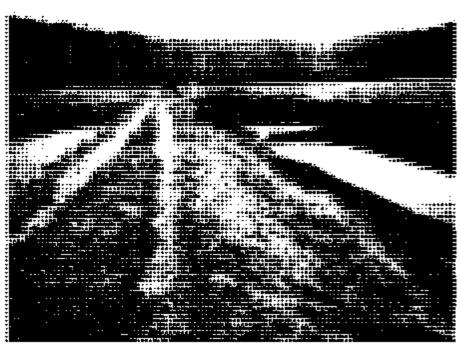


Photo #1 - Active south pond; excavated north pond



Photo #3 - Exterior slope of north dike

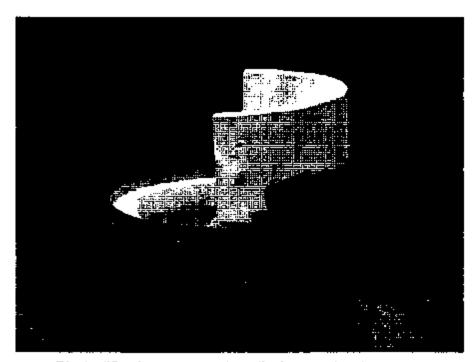


Photo #2 - Improvement to discharge structure

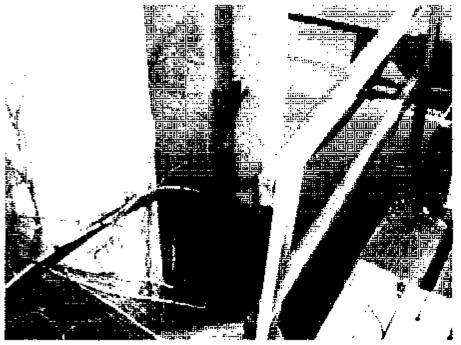


Photo #4 – Discharge tower with vegetation removed

APPENDIX B: AUXILIARY FLY ASH POND PHOTOGRAPHS

4f Antomaf Davi & Dike Inspections/DIMP 2009/Glen I yn/Glen I yn/2009RP4 dog



Photo #1 - Exterior slope of north dike, looking west



Photo #3 – Exterior slope of south dike, looking west



Photo #2 - View of east dike, looking south



Photo #4 - View of interior slopes and water level

APPENDIX C: WEST POND PHOTOGRAPHS



Photo #1 – View of outlet structure and skimmer



Photo #3 - Exterior slope of eastern portion



Photo #2 - Exterior slope of western portion

2) WR SMITH 3-19-09
3) File

PAGE 1 OF 10 REVISION 2 1/16/98

GLEN LYN PLANT DIKE INSPECTION CHECKLIST

ı.	GENERAL INFORMATION		
	Date of Inspection	3/1/09	
	Inspected by	Joe Ryder Jr., P.E.	
	Weather	CLDY Light who mit rack	
	Temperature	60	
	Rainfall (inches) since (date	e) about + 1" above more	m
	Pond levels:		
	North Bottom Ash Pond	(1505.5*) DENATERED - Chow out in proj	11255
	South Bottom Ash Pond	(1506.3*) <u>Full</u>	
	Clearwater Pond (1501.3*	(*) <u>Full</u>	
	Auxiliary Fly Ash Pond		,
	West Pond	Full fond-outfall + 0.05	
2,	EMBANKMENT CONDITION AT H	BOTTOM ASH AND CLEARWATER PONDS	
Α.	which is found on Page 8. appropriate, a descriptive each problem area. Then	com Ash Pond Inspection Location Plan 3. Place a number or letter and, if 3. Ve sketch on the location plan at 4 place the same number(s) or let- 5 priate descriptions below.	
	DESCRIPTION	LOCATION CODE	
	Erosion		
	Ruts in Crest Road	<u> </u>	
	Animal Burrows		

Approximate normal pool levels when in service.

South B. A. Pond Skimmer

Clearwater Pond Skimmer

South B. A. Pond Overflow Lip & Pipe

Perforated Water Distribution Pipe

DESC	RIPTION	LOCATION CODE
Leak	ing Ash Pipe	<u>/</u>
Seep	age/Wetness	
Tree	s on Slope	
Vege	tation condition	- That
Crac	ks/Bulges/Slides	
othe	r (Please specify)	
в.	displacement of the ripr last inspection? If so, river flow event which c	Lood Spaper
c.	Has there been erosion o ash ponds because of the	f the shoreline inside the bottom ash inflow pipes?
3.	OUTLET WORKS AT BOTTOM A	SH AND CLEARWATER PONDS
Α.	Please inspect the follo the appropriate space be	wing drainage structures and check low: GOOD CONDITION PROBLEM
Nort	h B. A. Pond Skimmer	
Nort	h B. A. Pond Overflow Lip	& Pipe

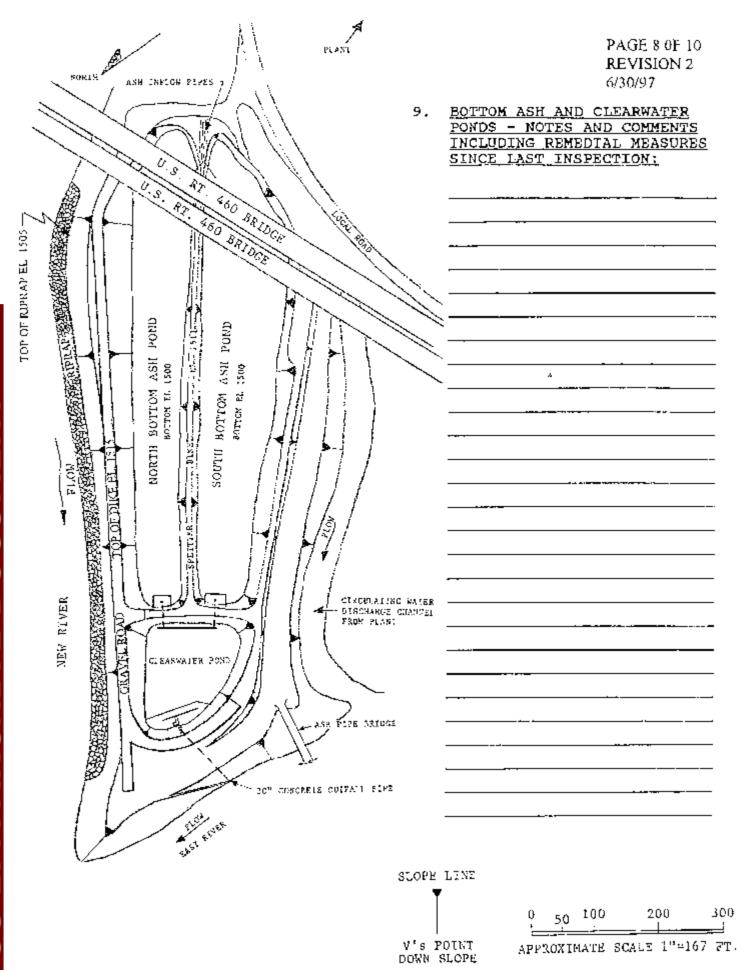
	GOOD
	CONDITION PROBLEM
Clearwater Pond Overlow Lip & Chut	:e
Clearwater Pond Spillway Tower	
Access Steps to Spillway Tower	
Outfall Pipe to East River	
Access Path to Outfall Pipe	
B. Please describe problems belo	
	, <u>, , , , , , , , , , , , , , , , , , </u>
4. EMBANKMENT CONDITION AT AUXIL	IARY FLY ASH POND
tion Plan which is found on Planter and, if appropriate, a location plan at each problem	descriptive sketch on the
DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	<u> </u>
Leaking Ash Pipe	
Leaking Embankment Drain Pipe	
Seepage/Wetness	
Trees on Slope	

	Exposed Ash on Slope	
	Cracks/Bulges/Slides	
	Sinkhole	
	Other (Please specify)	
в.	Has this pond been used sin so, when and for approximat	nce the previous inspection? If tely what duration?
c.	the embankment drains to be A / A	pond been high enough to cause ecome active?
		<u> </u>
5.	OUTLET WORKS AT AUXILIARY F	
Α.	Please observe the features appropriate space:	GOOD CONDITION PROBLEM
Stee	1 Trough	NA
Wood	en Skimmer	NA to be removed
Trou	gh or Skimmer supports	NA '
Conc	rete structure	
Othe	r (Please specify)	
в.	Please describe problems be	elow: Area dormand
		<u></u>
	<u> </u>	

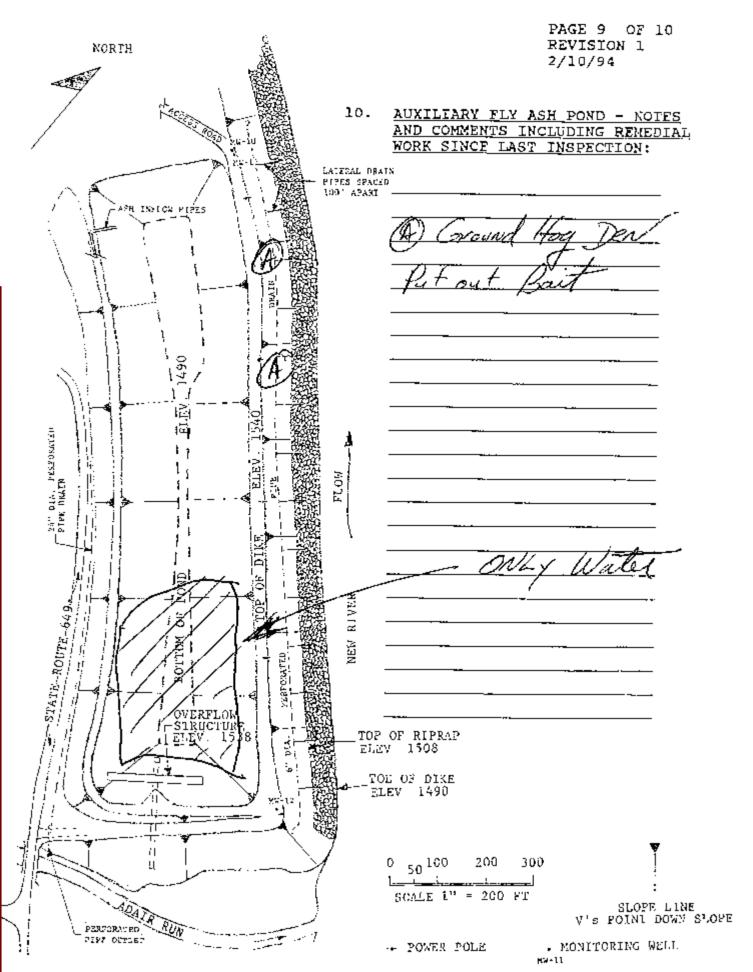
•	Please observe the outlet end If water is issuing from the record the flow rate:	d of the 24% discharge pipe. pipe, please determine and
	only trickle	سا
•	Are there any other noteworth seeping around the outside of describe:	ny conditions, such as water
		·
	EMBANKMENT CONDITION AT WEST	POND
	Please refer to the West Pond is found on Page 10. Place a appropriate, a descriptive sk each problem area. Then place ter(s) next to the appropriate	metch on the location plan at the the same number(s) or let-
	DESCRIPTION	LOCATION CODE
	Erosion	
	Ruts in Crest Road	
	Animal Burrows	
	Seepage/Wetness	<i>A</i>
	Woody Vegetation on Dikes	
	Cracks/Bulges/Slides	
	Sediment Buildup in Inlet Ditches	
	Has there been significant ruthe last inspection?	noff from the landfill since
	NO	

•	Has the water level reached the last inspection? <u>yes</u> current water level relative to full power + 0.05	the overflo	low trough since ease record the ow trough
	Other problems (please describ		1 /
	Will Need So	me pain	HING
	this Summer a	v Disch	uge Box
	OUTLET WORKS AT WEST POND		,
	Please observe the features 1: appropriate space:	isted below ar	nd check the
		CONDITION !	PROBLEM_
	िन्न Steel Troug h		Need Some Pais
	Wooden Skimmer		
	Inlet Structure	<u> </u>	SAME
	Pipe Problems		
	Other (please specify)	, , , , , , , , , , , , , , , , , , ,	
	Please describe observed prob	lems below: _	
	Orevall &	wood Sh	pe
	Please observe the outlet end If water is issuing from the precord the flow rate, in gollo	pipe, please o	Meceimine and

	No
GENERAL EMBA	NEMENT CONDITIONS - ALL PONDS
since the pro	ng, brush and tree cutting or spraying been evious inspection? If so, please state below, when and by whom, and show the area on the contract of the contract
	Downant
Some	Yucca Plants to spray Aux
Dike	
Has the river inspection, a and whem? <i>No</i>	r level come up significantly since the last and if so, approximately what elevation was
evel receded.	apparent damage to the dikes when the rive of the so, please indicate below what the date slides, etc.) and show its location on the
	* 1/1 .



GLEN LYE PLANT: BOTTOM ASH FOND INSPECTION LOCATION PLAN



GLEN LYM PLANT: AUXILIARY FLY ASU POND INSPECTION LOCATION PLAN

APPENDIX A

Document 5

Final Design Report, by GAI Consultants



Final Design Report

Glen Lyn Landfill Permit No. 222 Amendment Appalachian Power Company Glen Lyn Plant, Glen Lyn, Virginia Volume 1 of 2

GAI Project Number: C050540.20

TR B

JULY 2009

August 2007

CTAZ MARCH 2009

Prepared for American Electric Power Service Corporation
1 Riverside Plaza

Columbus, Ohio 43215

Prepared by: GAI Consultants, Inc.

Pittsburgh Office

385 East Waterfront Drive

Homestead, Pennsylvania 15120-5005



... transforming ideas into reality

PART 7 SLOPE STABILITY ANALYSIS

SUBJECT: AEP G	<u>".EN LYN PLANT -LANDFI</u>	LL AMENDMENT	(•
	<u>SEATED STABILITY ANAL</u>	YSES	G
BY SDA	DATE 03/23/2007	PROJ NOC0505 <u>40.20</u>	•
CHKD BY BLK	DATE 4/2/67	SHEET NO. 1 OF 6	gai consultants
OBJECTIVE:			

Evaluate deep-seated rotational failure surfaces under static and seismic conditions for the proposed lateral expansion of the CCB landfill facility for AEP's Glen Lyn Power Plant

METHODOLOGY:

Stability will be evaluated for both static and seismic conditions using two-dimensional limit equilibrium methodology and the computer program STEDWin 2.79

REFERENCES:

- 1 Virginia Legislative Code, Chapter 80, Solid Waste Management Regulations, V A R December 19, 2005.
- Hynes-Griffin, Mary, E., Arley, Franklin, G., <u>Rationalizing the Seismic Coefficient Method</u>, [Vicksburg, Mississippi], Department of the Army [Waterway Experiment Station, Corps of Engineers], July, 1984
- 3 Part B Application for Glen Lyn Industrial Waste Landfill. Final Report. November, 2006 GAl Consultants, Inc
- 4 Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years, USGS Map, October, 2002.

BACKGROUND:

American Electric Power is proposing the construction of a lateral expansion of the CCB landfill located at the Glen Lyn Plant, in Giles County, Virginia. The proposed expansion will occur over the Auxiliary Fly Ash Pond (AUX FAP) located to the east of the operational landfill. The proposed CCB landfill is shown in plan on Part 1. Located on the west bank of the New River, the existing landfill and the proposed lateral expansion are approximately 55 acres and 17 acres in size, respectively. Existing conditions and test boring locations are shown on the attached plan view.

Overburden soils consist predominately of fly ash and alluvium with lesser amounts of residuum. Composed of silt, the fly ash thickness ranged from 28 feet (06-GLLE-10) to 50 feet (06-GLLE-01). Alluvial and residual soils, consisting of sands with varying amounts of silt, clay and gravel, were encountered at each boring location and ranged from 5.2 to 16.4 feet thick in Borings 06-GLLE-03 and 06-GLLE-07, respectively

Bedrock was sampled at boring locations (06-GLLE-01, -03, -04, -06, -07, and -08) and consisted primarily of shale. In each boring, soil sampling was terminated once an SPT value of 50 blows per 6 inches, or less, was recorded. Samples recovered from the borings at terminal depths were described as decomposed shale or shale fragments indicating the likely.

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	ce. This surface elev				11 4 to 1494 1 feet above

ANALYSIS:

In order to determine the factor of safety against sliding failure, overall thickness of each soil layer across the site, and engineering properties of each soil layer were determined. To conservatively estimate minimum factor of safety, the steepest slope was used for the dike analysis. Based on inspection of the proposed grading plan, the steepest slope (2.2H:1V) occurs in the southeast corner, on the AUX FAP embankment. This slope represents approximately 30 percent of the slopes considered in design. The remaining 70 percent of the slopes are either between 2.5H: 1.0V and 3.0H: 1.0V.

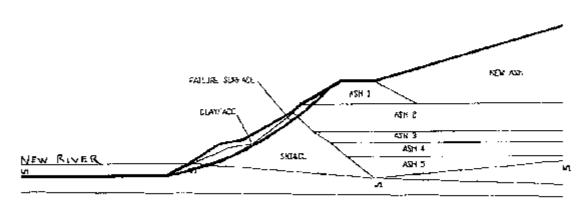
Upon consolidating all the needed information, the estimated factor of safety was determined for the most critical sections. Output files from the STEDWin program are provided as Part 7, Stability Analysis Results.

Subgrade elevations for the proposed landfill expansion are shown on Drawing No. E-M003 (Base Grade Plan) and will be attained primarily by placing and compacting structural fill, drainage material, or protective cover in the location of the proposed Reduced AUX FAP location. The basic geometry for landfill development will be:

Subgrade sideslopes: 2 2H:1V (steepest); 3H:1V (typical);
 Landfill sideslopes: 4H:1V between benches; and

Benches: 15 feet wide; spaced every 25 vertical feet

For these analyses, potential failure surfaces within the landfilled CCBs and through the landfill foundation will be evaluated. Generic cross-sections depicting these analysis limits are shown below:



Section AA

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Section BB

Two cross-sections, one through the reduced capacity lagoon starting at boring 06-GLLF-10 and another through the containment dike adjacent to the river, were selected for this analysis. The cross-section locations are shown in plan on Figure E-B001. The cross-section locations were chosen based on following considerations:

- The proposed expansion is essentially a rectangle which will tend to align the most critical deep-seated analysis sections with the long and short axes;
- The critical insitu layers identified at the site include the dewalered fly ash within the AUX FAP and the embankment materials used to construction the containment dikes. These soils were designated as critical layers because they contain zones of moderate to low shear strength materials; and
- The critical engineered layers identified at the site-include the structural fill layers placed
 within the proposed landfill expansion. These fill layers provide positive drainage from the
 upstream end of the AUX FAP to the proposed reduced AUX FAP at the toe of the CCB
 embankment. They were designated as critical layers because they will be the soil
 foundation layers evaluated in the deep-seated analysis sections.

The geometry and stratigraphy of the two sections were entered into the computer program STEDWin which was used to evaluate potential failure surfaces along the cross-sections. The analysis section data was compiled as follows:

<u>Top of Rock</u> – Data from the geologic characterization of the proposed landfill site were used to construct the approximate top of rock elevation. Data from the boring logs indicate that the top of rock varies along the analysis sections from elevation ~ 1493 feet to ~ 1481 feet. Based on this information, top of rock profiles were incorporated into the stability analyses. Since the bedrock under the proposed landfill is competent material, the deep-seated failure surfaces evaluated herein were constrained to the soil layers overlying the top of rock surface.

<u>Temporal High Phreatic and Piezometric Surfaces</u> – Data from the hydrogeologic characterization of the proposed landfill site were used to construct a potentiometic surface map. Based on data from the hydrogeologic investigation, the only phreatic or piezometric surface likely to affect the

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stability of the facility during its development is the phreatic surface present in the AUX FAP Piezometer water level readings varied from ~ 1501 feet to ~ 1487 feet, and are significantly impacted by the New River Based on this information, phreatic surfaces were incorporated into the stability analyses with the surface elevation between 1488 and 1500 for Section AA and at elevation 1500 for Section BB

<u>Subgrade</u> – Elevations were obtained from Drawing No. E-M003 (Base Grading Plan) and incorporated into the stability analyzes

<u>Ultimate Development Grades</u> – Elevations were obtained from Drawing No. E-M006 (Final Topography Plan)

<u>Soil and CCB Properties</u> – The soils and CCBs that comprise the proposed landfill and landfill foundation consist of a variety of materials. All of these materials have varying index and shear strength properties that affect the evaluation of landfill stability. The engineering properties assigned to the proposed landfill soils and CCBs are summarized and discussed below:

		SECTION	AA		
Soil Type	STEDWin Soil No.	/т (pcf)	γs∍ι (pcf)	φ=φ' (Degree <u>s)</u>	c=c' (psf)
New Ash	1	80	85	32	<u>.</u>
Ash No.1	2	65	70	35	0
Clayface	3	120	125	0	1000
Ash No 2	4	65	70	32	.0
Ash No 3	5	65	70	30 j	0
Ash No 4	6	65	70	28	0
Ash No.5	7	65	70	24	0
Snd&cl	8	110	115	28	. 0
Rock	9 "	150	155	30	1500

SECTION BB

STEDWin Soil No.	γτ (pcf)	γ̃sat (pcf)	φ=ò' (Degrees)	ç≂c' (psf)
1	80	85	32	0
2	80	85	32	0
3	65	70	32	O
4	65	70	28	0
5	110	115	28	0
6	150	155	30	1500
	\$ soil No. 1 2 3 4 5	Soil No. (pcf) 1 80 2 80 3 65 4 65 5 110	Soil No. (pcf) (pcf) 1 80 85 2 80 85 3 65 70 4 65 70 5 110 115	Soil No. (pcf) (pcf) (Degrees) 1 80 85 32 2 80 85 32 3 65 70 32 4 65 70 28 5 110 115 28

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Insitu soils that comprise the proposed landfill expansion foundation (Soil Nos. 4 and 3 for Sections AA and BB, respectively) are fly ash sluiced then dewatered in-place. The insitu soils that comprise the protective dike (Soil Nos. 2, 4, and 8 from Cross-Section AA) consist of sand and clay for the portions constructed as part of the initial development and fly ash for the portions of the AUX FAP constructed during subsequent development.

Insitu sand and clay consists of low- to medium plasticity clays and silty clays with varying amounts of sand. Site-specific shear strengths were developed for these materials from bore hole dilatometer, CPT, and SPT testing

Bedrock beneath the proposed landfill (Soil No. 9) is sedimentary in origin and consists of sandstone, shale, and siltstone. As previously noted, the properties of the bedrock underlying the site will not affect these analyses as deep-seated failure surfaces will be constrained to the overlying landfill layers which will be much weaker than bedrock. Therefore, for these analyses, no conditions significant to rock fracture mechanics are included in these analyses.

Seismic Conditions – The proposed expansion is located in north-central Giles County, as shown on Drawing No. 1 (Title Sheet and Location Map). This area is defined as a Seismic Impact Zone by VDEQ. Based on using a 2 percent probability of exceedance in 50 years of a maximum horizontal acceleration in lithified earth material, as a percentage of Earth's gravitational pull (g), equal to or greater than 0.10g, an a_{max} =0.18(g) was used. This acceleration was estimated using Reference 4, which is included in Attachment 4. Site-specific load/response data is not available for the proposed facility to determine if, and to what extent, horizontal ground accelerations may be amplified or dampened. In lieu of this, the value obtained from the USGS figure was used for the stability analyses. Based on the Poisson Model, a 2% probability of exceedance in 50 years is approximately equal to a 10% probability of exceedance in 250 years, which is stated in 9VAC20-80-10. With guidance from Reference No. 2, 50% of a_{max} was used for the pseudostatic analysis (a_{max} =0.09).

SUMMARY:

Stability analyses prepared for the proposed facility are summarized in the following table. Static conditions were evaluated using Bishop's method, which is widely considered the most conservative of the typically used limit equilibrium analysis methods. A "search" routine in STEDWin was used to evaluate a large number of deep-seated failure surfaces and isolate the ten most critical surfaces for each analysis section.

Seismic analyses, using guidance from Reference 2, were run on each static stability failure surfaces. Graphical output files for the most critical failure surfaces are included as Part 10. The results of the deep-scated stability analyses are summarized on the next page:

SUBJECT:AEP	<u>GLEN LYN P</u> L <u>A</u> NT -LANOR	ILL AMENDMENT	4-
	P-SEATED STABILITY ANA	LYSES	(j
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	DEEP-SEATED FAILU	RE ANALYSIS						
Cross-Section	File Name	Analysis Condition	Aralysis Zone	FSmin				
38	GLYNB8 PL2-Toe Failure Analysis	STATIC	BERM	190				
	GLYNB7 PL2-Siope Length Analysis	SEISMIC BERM						
	GLYNB6 PL2- Slope Length Analysis	STATIC	BERM	2 73				
	GLYNB5 PL2-Toe Failure Analysis	SEISMIC	BERM	1 45				
AA	GLYNA3 PL2-Slope Length Analysis	STATIC	PROTECTIVE DIKE	2 12				
	GLYNA4 PL2-Slope Length Analysis	SEISMIC	PROTECTIVE DIKE	1 23				
	GLYNA2 PL2-Toe Failure Analysis	STATIC	PROTECTIVE DIKE	1 29				
	GLYNA5 PL2-Toe Failure Analysis	SEISMIC	PROTECTIVE DIKE	101				

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PART 8 STABILITY CROSS-SECTION LOCATIONS

ON GAD THE PLANTAGE SHOOL MICHANISM SHOP SHOULD BE SHOULD THE TAXABLE STATES

PART 9 ANGLE OF FRICTION OF FLY ASH AND SOIL USING LABORATORY AND IN-SITU TESTING METHODS

Angle of Friction of Fly Ash and Soil Using Laboratory and In-Situ Testing Methods Glen Lyn Landfill Permit Amendment

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Angle of Friction of Fly Ash and Soil Using Laboratory and In-Sita Testing Methods Glen Lyn Landfill Permit Amendment (Continued)

Depth	Depth	Borio	sg 06-,GL	LE-01	Borin	g 06-GL	LE-03	Borin	g 0 6-GL 1	LE-04	Borin	g 06-GL	LE-07	Borh	ig 06-GL	
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Lab = Laboratory Test Result (ASTM D3080-04)

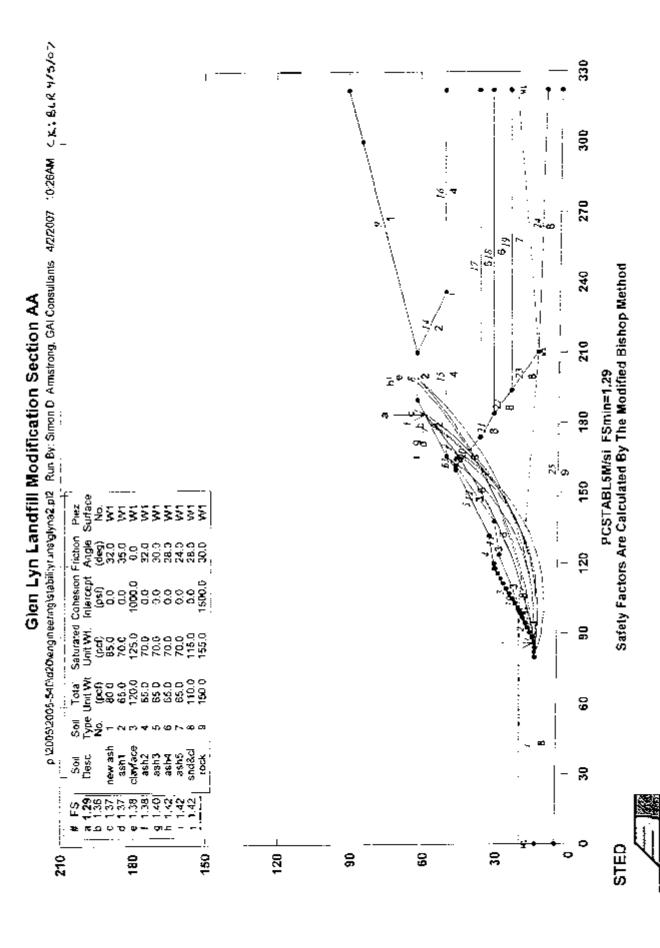
DM I = Dilatometer Tast Result

BST - Barchele Shear Test

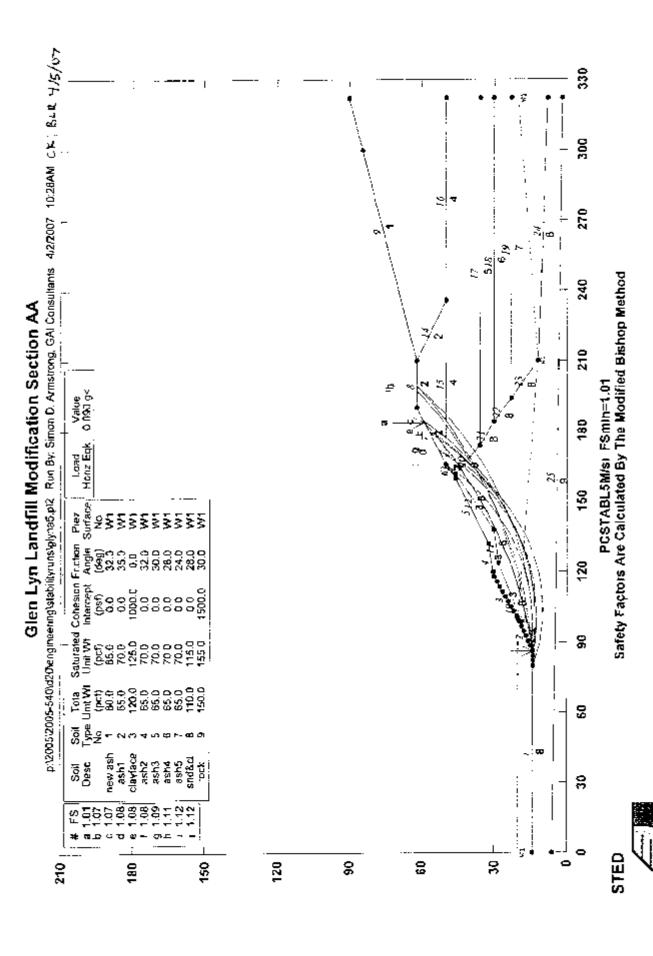
indicates sock. All other are fly ash materials

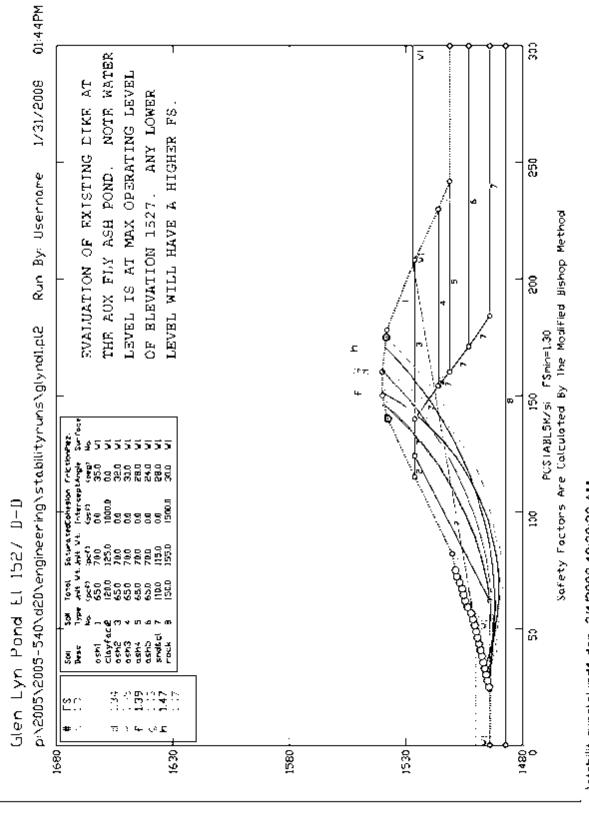
PART 10 STABILITY ANALYSIS RESULTS

US EPA ARCHIVE DOCUMENT



US EPA ARCHIVE DOCUMENT





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Appendix X

Boring Logs, Construction Diagrams and Certification



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^{*} POCKET PENETROMETER READINGS

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^{*} POCKET PENETROMSTER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



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^{*} POCKEY PENETROMETER READINGS

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^{*} POCKET PENETROMETER READINGS

[&]quot;METHOD OF ADVANCING AND CLEANING BORING



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^{*} POCKET PENETROMETER READINGS

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BORING 06 6 LLE-03

^{*} POCKET PENETRONETER READINGS

[&]quot; METHOD OF ADVANOING AND CLEANING BORING



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BORI<u>NG -96- ŒLL€~07</u> (8-4)

^{*} POCKET PENETROMETER READINGS

[&]quot; METHOD OF ADVANCING AND QUEANING BORING



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^{*} POCKET PENSTROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



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BORING 06-666 -04

^{*} POCKET PENSTROMETER READINGS

^{**} METHOD OF ADVANCING AND CLEANING BORING



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80RNG 06-GLLE-0L (A-6)

¹ POCKET PENETROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING SCRING



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BCRING 26-GLLE-06 (3-6)

^{*} POCKET PENETROMETER READINGS

^{**} ME THOO OF ADVANCING AND CLEANING BORING



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ELEVAT	ION <u>1540</u>	.61	G7	VL (	) HRS	: <u>S</u> 3	<u>ک</u> ور، م	-	<del></del>	_		и до то со со со со со со со со со со со со со
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	1			Π					DESCRIPTION			
DEPTH (FT.)	RLOWS PER S.X INCHES OR CORE RECOVERWORK	SAMPLE NO, TYPE &	- 32	꾶	<u> </u>	SOR, DENS TY.	CONSISTENCY OR ROCK HARDNESS	<del>_</del>	MATERIAL CLASSIF: CATION	USCS OR	ROCK BROKENNESS	REMARKS*
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									2. \$ MON, TOK HE WELL.  18 STALLED  CLOUIT 010-1007  PELLETS 104-107  SCREEN 110-120  TIP 120'			
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REMARKS **									<u> </u>			

30RING <u>06-GUE-e</u>6 (84)

^{*} POCKET PENETROMETER READINGS

[&]quot; METHOG OF ADVANCING AND CLEANING BORING



PROJEC	π <u>.</u> Α ,€.!	C: GLE	h (	44 <u>7</u>	ليفي ١٩٦٨	ارة ما ال	READONS GIRA WAY VA	60	RING NO D6-GULE-O
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30,0	<u>' 2 ƙ</u>	64. <u>1.4</u>				<u> </u>	V	_₩	₩

REMARKS "BRILLED BY TERRA TESTING ENGINE WASHINGTON PA WANG COME-USC KNORET TRACK MONTHS DRICK BRING BRING BOWANCED WIND 31/20 HOLLOWSTEIN AUSTRIC CONTINUOUS SPT WY AUTOMOTIC HAMMER UK GAL NOW

BORING 06-GUE-07

^{*} POCKET PENETROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



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510	<u>, , , , , , , , , , , , , , , , , , , </u>	50-39 Aud 13	<del> </del>	1	n.ng	nis	<u> </u>	<del></del>	<u> </u>	<b>-</b>
<u> </u>	<u>دا (</u> باره س	5-35	<del>                                     </del>	t	مارز سارز			<del></del>	-	N82 .
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	₩			( <i>क्षान्त्र</i> ः	26#		, R <b>a</b> , C	BILLY SHALE: SOME MODERATELY	UBA.	
	$\perp \perp$							STAINED FRACTURES (0-45°)		ريو <u>دد ده دې ۲۲ تا</u> امام کوم الح
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]_	$\perp \downarrow$				اوز بالا		CALPY	SAADY SHALE	J84	
58.8	<b>A</b>		-a-	24.8	M. HA	ار ک	GRAY	STONO : THE ! FINE POLICE	BR	
J								BOTTOM OF ROLING: 528'		
MARKS										

WIOLES - NEWER OF WARMAND : WOLF - WELFORT IT ADM

BORING 06-GLLE-07

^{*} POCKET PENETROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



PR0/E0	т <u>А.С.</u>	<u>P.: GLEN</u>	Ly	<u> </u>	<u> ANDFILL</u>	Magi	Frentind GLER LYN VA	<b>6</b> .0	80-2715-50 CN BNISC
ELEVAT	ION <u>254</u>	13:46 GV	VI (	) itrs	542			_	ROJECT NO COSOSY 0. 2
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	Ī	T -	Ţ <u> </u>				DESCRIPTION	T	
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DSPTH (PT.)		SAMPLE NO. TYPE & RECOVERY OR % ROOK RECOVERY		PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIA! C! ASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
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	4 5	3-2			<u> </u>	╬┈╁┈┧	FO SOME FLAT SAND	<del>                                     </del>	ļ
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··· 4:34-	<u> </u>	AEC 0.3			₩'₽£₩₽₹			<u> </u>	<del> </del>
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15.0	7."	5-8 REG, 1-8	<u> </u>		V. 20016		FLYASH	<u>- (y</u>	Dirt
'-=-'-	<del></del> -	5-5	<b>-</b> [		1	<del>┞┈</del> ┼─┼	······································	$\dashv$	<b></b>
13.5		Etc. 15	ゴ	ĺ	$\neg + \neg$	<u> </u>	- <del></del>	-	
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22.5	4	8-26 F	_]	ſ	. <u> </u>			·†	
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30.0	4.2	A-6G IA	_	Д,		<u> </u>		$\checkmark$	· · · · · · · · · · · · · · · · · · ·

REMARKS" DRILLED BY TERMATESTAK, FOR OF WARM WATER FOR MISSEL & OME 45 C ALMERS HOLD DATELL PORTER FOR ALL FOR MALE PARTY OF FOR ALL FOR MALE PARTY OF FURTHER OF SPET FUTURES

BORING 06 CELE --- 8

^{*} POCKST PENSTROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



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ELEVAT	юм <u>454</u>	(3.46, G	WE	Q HR	s <u>54,2                                    </u>				ко.ест No <u>Со<b>5</b> обУо.</u> Да
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i		ļ	ļ	_		·,	DESCRIPTION		
DEPTH (PT.)	<u>. L</u>	SAMPLE NO. TYPE & RECOVERY OR SACK RECOVERY	18	<del></del>	SOIL DENSITY - COMSISTENCY OR ROCK HARDNESS		EATERIAL CLASSIFICATION	LISCS OR ROCK BROKENNESS	REMARKS'
30.1	2	3	1.	5	6	7 035k	8	8	10
315	<del></del>		<del></del>	1	3000 M	OSEK CYME	FLYASH (CONT)	241-Jan	was -
33.0	4	Pec 15	$\vdash$	-	LOSE	GAM		<del> </del>	M.DIIT
7	17 1	5.23	<del>  -</del>	1	V. LO356	<b>†</b> ~~—		ł	W. Dell
. 34.5	7 -	16 € 1.1 K : 1 √		4	} <del></del>	<b>†</b>	<del></del>	-	
<u> </u>	· 2.	R&C 1.5		]					MOIST TO WET
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39.6	<del>                                     </del>	Ac 15	ŀ		ļ · ——	<del>}</del> -		$\vdash$	WET
	7	5-27	-	1		· <b>-</b> - ·—		┼	ωε τ
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4).0	- L	BEC 15	ļ	]	<b></b>	<u> </u>			
** <del>1</del> 3.5	2-	5-29 866 7.5				<u> </u>			
	72	5-50		1	}	<b></b>	·-·-		,
42'0	T ,	5-31		!			·		
गर-ड		Ave 15 1		<u> 46.3</u>		BROWN		_:.,_::	
42.0	32	150 1.5		l	STIFF	BASMY	SILTY CLAY, TYLAGE SAND	21	# 1.0.TSF MOLK
	1 7	<i>5</i> -33			· · · · —	<u> </u>	·	1	4 1.25 TSF, MOIST
<u>- 49.5</u>	<del></del>	35. 15	[					·  ···	# 1.24 1.75 ADD 07
<b>ζ</b> 1.5	<u> 4 u</u>	42E 15	1		M. STIPPS	الافرات . الافرات :	SANDY CLAY	c.l	אווס אנו אבון אים אור מונבר
<u> 53.5</u>	2	S-35			ئد • ا <del>وار</del> س				A FATSE MUST
<del></del>		S; 3!»		Ì			<u> </u>	<b> </b>	<u> </u>
54.0	<del>7 1</del>	2000 / 12 / 12 / 12 / 12 / 12 / 12 / 12	$\dashv$	ļ			SOME ROCK FRACTOR	<b> </b>	# 1.15 12F WOILE
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57,0	11 50	65c. / }	— <u> </u>	<u>54.4</u> 53.6		···			4 1 25 TSF MAILS
-30 <u>2</u> ].		<u> </u>	┯╬	52.0 (ह्यात्रम	5,0 <del>[- 5</del>	Még'	Decambres super	36	TOP OF 35 CA: 57.5
-+	$\neg \dashv$		一	ŀ	+		TRACEPTY OF PROFE		
			$\dashv$	Ì			TO A DEPOT OF POLO FOR	<b> </b>	
POARKS	. No.CI64	r Ani i	1.065	Jef	HELPFR: 1		1:		

BORING 06-GELE-38

^{*} POCKET PENETROMETER READINGS

^{**} METHOD OF ADVANCING AND CLEANING BORING



PROJEC ČLEVATI	T <u>FA. 4</u> ON 154	€ . β <u></u> 3.4 <b>6</b> ον	GC W 0	HRS €}	24.5	<u>₩3 Ę</u> * (	LL MODIFICATION GLENCYN	_V#	3O	RING NO <u>DIS-GULETAR</u> DIECTNO <b>COSTOSY</b> O. <u>2</u>
			2	YMRS	55.5		DAN FANGER			
137.12	11.50	105 2036	<u> </u>	U! A:	35 F EU 61			- PA	.GE	3 or _3
	100				<u> </u>		DESCRIPTION			
Бартн (ят.)	BLOWS PER SIX INCHES OR OR	SAMPLE NO., 1YPE & RECOVERY OR # ROCK RECOVERY	RGD (%) OR TORVANE	FROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HAKDNESS	color	MATERIAL CLASSIFICATION	USCSOR	ROCK BROKENNESS	REMARKS*
1	2	3	4	- j	6		ę			10
							2" D MONITORING WELL WETALLED CLOUT 0-645' PELLETS CH.5-675' SAND C7,5-500' TORESH 70.0,80.0'			
KEMARKS **										

BCRI<u>NG 06-GLLE-⊃</u>8 ( è-४)

^{*}POCKET PENETROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING SORING



PROJE	er ALEP G	-64 <u>(</u> 41	E LANDELL	<u>د الاحلام کا</u>	FICATION GLEF LYN, VA	BORI	NGRO Ob GUE OG
<b>ČLEVA</b>	TION <u>1529,84</u> GW	L OHRS	3 <u>37.4°.</u>	<u> </u>			5CT 4C C250540.10
DATE	ia e o		<u> </u>			1.7	-
DATE	12 5uc 2004	. Cl.A	SSIFIED BY	D	AN SANGER	PAGĘ	ot2
1		<u> </u>	·		DESCRIPTION	Ţ	<u> </u>
OSPTH (FT.)	BLOWS PER SIX INCHES OR OCRE RECOVERY/RUN SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	ROD FW) OR TORVANE PROFICE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR FOCK PROKENNESS	RemArks*
1	2 5	4 5 7.0	6	7 00 x 33	В	9	10
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* POCKET PENETROMETER READINGS

BCRING 06 - GEE -09

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



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^{*} POCKET PENETROMETER READINGS

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* POCKET PENETROMETER READINGS

POWER SOMERS WINE 34 ED. USERNISTEM AMERICA AND CONFIRMOUS 197 WINE PURPOMETER

808:NG 06-61-6-10

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^{**} METHOD OF ADVANCING AND QUEANING BORING



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^{*} PCCKET PENSTROMETER READINGS

[&]quot; METHOD OF ADVANCING AND CLEANING BORING



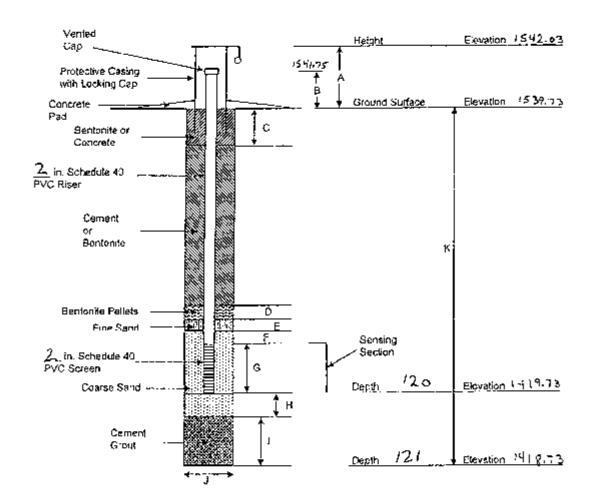
(10) 20 30	aiat	
Project AEP: GLEN LYN.	Project No <u>C25</u>	<u>0540.20</u>
Date 18 TAL 2006 Engineer/Geologist	<u>DBS</u>	Well No 06-GELE -03
Drilling Company TERRA TEST OF JAC	Driller: Bolly LAWRE 1208	
, , , , , , , , , , , , , , , , , , ,		
Vented Cap	Height	Elevation (54.2.95
Protective Casing with Looking Cas	(42.6 <u>2</u> )	
Concrete	Ground Surface	Efevalion: 7\$43.97
Fad Sentanite or Concrete	_	
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Bentonite )	κ	
Bentonite Pellets O		
Fine Sand	Sensing	
2_ in. Schedule 40 G	Section	
Coarse Sand H	· · · · · · · · · · · · · · · · · · ·	Elevation 19(60.57
Cement Crou!		
Crast	Depth $\mathcal{S}O$ , $O$	Elevation (1970-00)

#### STANDPIPE PIEZOMETER INSTAU ATION SKETCH

DIMENSIONS (Feet)						
A	В	C	D	<u> </u>		
2.ទូទ ន	2.55 H	9 e	30	<u>"/^</u>	3.0	
100	2.5	8/A	0.33	80.0		
Remarks 4 = 1.985 x 10-5 CM/SAGE						



Project A. E. P. 16 LEN 1	۲47		Proje	at No _	Co5	<u>554</u>	۵, ۲, ک	
Date 09 AUG JOOG	Engineer/Geologist _	DB	5			Wel. No	<u> ۱۵۵۶ - ما ۵</u>	34
Drilling Company TEVAA 7E'S	Tire	_ Oriller: _	Bos	بهر	معرف م	<u>a</u>		



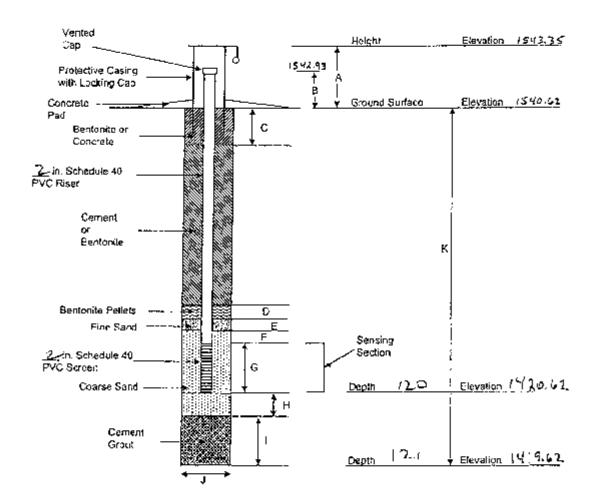
#### STANDPIPE PIEZOMETER INSTALLATION SKETCH

F	DIMENSIONS (Feet)							
	Α	В	С	D	E	F		
	2.30	<i>.2</i> .o2.	3.0	3.0	H/A	3.3		
	G	Н		<u> </u>	长			
	13.5	~10	3/4	0.33	121-0			

Remarks K > 1.228 x 10 CM SEC MOTE: BAILED 3:37 GALVAS WITH MO DROP IN INITIAL WATERLENEL



Project A.E.P. GLEN	LYN	Project No	C050540.20
Dale 27 Luc 3-036	Engineer/Geologist	DB 2	WOUND OF GILE-06
Drilling Company TEALA	76.22.14C	Driller: <u>Ban B. LA</u> '	wrence

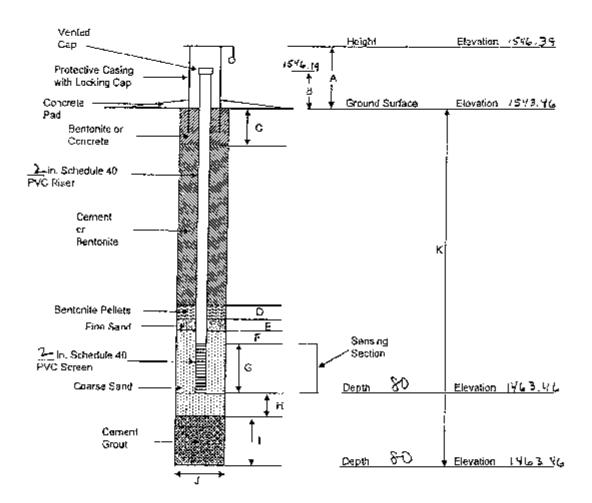


#### STANDPIPE PIEZOMETER INSTALLATION SKETCH

		DIMENS	SIONS (Feet)		
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2.73	2.31	3,0	3.5	2/4	3.0
G	Н	_	-	. к	
10.0	၂.၁	M/A	0.33	12-1	
Remarks	<u> </u>	1.22	BXI	0 ⁻⁴ .0	m/sec
					<u>'</u>



Project	A.E.P. GLENLUN		_	Project No	CO 50540,	<b>2-</b> 0
Date_	20 Jul 2006	Engineer/Geologist	DBS		Well No	80-3112-08
Dritting	Company TERAA TEST N	s <b>(</b> ,	Critten	BOB LAG	کھے لم تھے۔ آل	



#### STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENS.ONS (Feet)  A 3 C D E F							
2,93	2.73	N,O	3,0	15/A	2.5		
<u> </u>	Н .		j	Χ			
100	1°/A	4/4	0.33	80.2			
Remarks K = 1.344 x 10-6 CYN/Sec							
	· · · -						

# CONSTRUCTION CERTIFICATION GROUND WATER MONITORING WELLS AEP GLEN LYN PLANT GLEN LYN, VIRGINIA

I certify as a qualified ground water scientist that monitoring wells 06-GLLE-03, 06-GLLE-04, 06-GLLE-06 and 06-GLLE-08 were installed in accordance with the boring logs and monitoring well construction details provided for those wells to comply with 9VAC20-80-300, A, 3d. This certification has been prepared to comply with the requirements of 9VAC20-80-300, A, 3f (3).

Signature

9/22/06 Date

Robert J. Turka, PG, CPG Senior Staff Hydrogeologist GAI Consultants, Inc Pittsburgh Office 385 East Waterfront Drive Homestead, Pennsylvania 15120-5005



#### * FOR INFORMATIONAL PURPOSES ONLY*

PI A	NY Appalachian Power Company NT Glon Lyn	Appalachian Power Company
ASH MANAGEMENT UN	IIT Bottom Ash Pond	Glen Lyn
	No. 1 - Card	Fly Ash Pond
QUESTION	医大学 医乳病病性内的 计二字单	ada i amenin ku alam ili ili ki
<u>Dam H</u> azard Ra <u>ti</u>	ng Low	. I Low
Who Established Rati		VADCR
Basis for Rati		Health Hazard
No Raling Assign	ed  N/A	N/A
Year Commission		
Year(s) Expande	ed 1963 ed N/A	1965
QUESTION 3 - Mark all that apply	entral Pour la la compania de la compania de la compania de la compania de la compania de la compania de la compania d	N/A
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Boiler Sta	_{ig}   ··	·
Flue Gas Emission Control Residua	<u>'s</u>	•
Other (Specification 4	(v)	— — —
	<u>.</u>	
Dosigned by P I		Not Available
		Not Available
UESTION 6	η Yes	Yes
Date of Last Company Salely Assessmen	1/13/2009	
Dascobe Evaluator's Credential	s VA DE	1/13/2009
Describe Past Followup Corrective Action	SI Routine maintenance	VA P.E.
—_Describe Credontials of Corrective Action Implementer.	s Under plant supervision	Routing maintenance Under plant supervision
Pescribe Planned Followup Action:	S Routine maintenance	Routine maintenance
Date of Next Safety Assessmen	2010	2010
Date of Last Regulatory Safety Inspection		3/16/2008
Agency Name Date of Planned Regulatory Safety Inspection	·	Va DCR
Agency Name		<u> </u>
Copy of Most Recent Regulatory Inspection Included		N/A
JESTION 7	¶ 1 <b>世界</b> 1 第7 日本 1 名 1 日本 1 日本 1 日本 1 日本 1 日本 1 日本 1	Yes
Safety Issues from Regulatory Inspections win Past Year	1 None	N. Mana
Corrective Actions		None
Documentation Included		
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Surface Area (acres)	5.1 acres - The bottom ash pond complex	randa en en en en en en en en en en en en en
	is a multi-pond system whore other	
	wastewaters are separately treated in	
	contiguous cells. Those pand complexes	
	typically also include secondary (and in	7.6 acres
	some cases tertiary) settling ponds for final "polishing" of effluent quality. The	
	information provided is based on the entire	
	impoundment as regulated under dam	
	safety rules.	
Total Storege Capacity	90 acro-ft	185 acre-ft
Volume Currently Stored	Variable - ash is routinely removed for	Unable to be determined in the time alloted
· · · · · · · ·	boneficial use	to complete this survey
Date of Volume Measurement	N/A	N/A
Meximum Height (feet)	35	43
Spills or Unpermitted Release History (10 Years)		TO CONTRACT TO THE STATE OF THE
ESTION 10	No. Protestas valsava or vise ou i transporta do matava valsa la	No. 2000 of 160 and 150 7 form who we make more asset
All legal owner(s) and operator(s)/	Annula him Barra C	Appalachian Power Company
THE IMPORTANT AND THE PROPERTY OF THE PROPERTY		



"Thomas Roberts" <Thomas.Roberts@dcr.virgini a.gov>

cc bcc

To <wrsinith@aep.com>.

03/18/2008 05:38 PM

Subject 01701 & 01702 Glen Lyn Bottom & Fly Ash Dams visits

History

🖎 This message has been forwarded.

#### William Smith:

Visited the Glen Lyn Bottom & Fly Ash Dams today with Joe Ryder. Both looked fine. Understand from Joe Ryder that future modifications are planned for the Fly Ash Dam that will greatly reduce its size. I told Joe Ryder that modifications of this type require an Alteration Permit. Based on the description by Joe Ryder, it sounds like when done the dam will be too small to be regulated. The Alteration Permit application is very simple and currently no application fee. I recommend applying as soon as possible to make it before the regulations change.

Will e-mail you after visiting Carbo.
Thank you for setting up these visits.
Tom Roberts

New Address and Contact Information:

Thomas I. Roberts P.E. - Regional Engineer - Dam Safety Virginia Department of Conservation and Recreation Dam Safety and Floodplain Management 8 Radford Street, Suite 201 Christiansburg, Virginia 24073 - 3341 Phone - 540 394 2550 Fax - 540 394 2551 cell - 888-408-5564 thomas_roberts@dcr.virginia.gov
Web Site <a hre="http://www.dcr.virginia.gov">http://www.dcr.virginia.gov</a>

* FOR INFORMATIONAL PURPOSES ONLY*



American Electric Power
I Riverside Stare
Colombia GII 43219 2273
WWW appices

Thomas I Roberts P.E. - Region 4 Dam Safety Engineer Virginia Department of Conservation and Recreation Dam Safety Program 8 Radford St. Christiansburg, Virginia 24073

April 17, 2009

Re: Clinch River Hy Ash Dike No. 1 (16701)

Clinch River Hy Ash Dike No. 2 (16702).

Glen Lyn Hy Ash Dain (07101) Glen Lyn Bottom Ash Dam (07102)

Dear Mr. Roberts:

finelosed please find the completed Annual Inspection Report forms the Clinch River facility, Ash Ponds 1A and IB (Fly Ash Dike No 1), and the Glen I yn facility, Fly Ash Dam and Bottom Ash Dam for 2009

If you have any questions, or if I can be of further assistance, please do not hesitate to contact me at (614) 716-2906.

Sincerely,

William R. Smith

ALP Service Corp., Civil Engineering

<u>wasmith@?nep.com</u>

Attachments: 1 2009 Annual Dam Inspection Report Clinch River Plant

2 2009 Annual Dam Inspection Report - Glen Lyn Plant

cc: J. Saunders - Clinch River (w/ Clinch River at(acliments)

J. Ryder -- Glen Lyn (w/ Glen Lyn attachments).

P. J. Amaya – AEP Service Corp., Geotechnical Engineering (w/o attachments).

File



Date Prepared: Feb 16, 2009
Prepared By: Gary Zych

#### ANNUAL INSPECTION REPORT FOR VIRGINIA REGULATED IMPOUNDING STRUCTURES

Reference: Impounding Structures Regulations, 4VAC 50-20-10 et seq., including 4VAC 50-20-105, Virginia Soil and Water Conservation Board Owner's Information __ Inventory Number: Name of Dam: Glen Lyn Plant, Appalachian Power company Location-County/City: Owner's Name: Giles county Contact Person (if different from above); 40 Franklin Road Hazard Classification: Class IJI Owner's Address: Name of reservoir: Purpose of reservoir: Settling pond Telephone No: (Residential) ____ (Business) 800-956-4237 Other means of communication: Owner's Engineer American Electric Power Service Corporation Name of Engineering him and Engineer: Professional Engineer Virginia License Number: Mailing Address: Civil Engineering, 1 Riverside Plaza Columbus, OH 43215 Telephone No: (Business) 614-716-2926 Directions: Make note of all pertinent conditions and changes since the last inspection, or, if this is the first inspection, since the filing of a design report. Date of This Inspection 1/13/09 Date of Last Inspection 10/25/2007 1 EMBANKMENT Any afteration made to the embankment? None b Erosion on embankment? None - vegetative cover is full c Settlement, misalignment or cracks in embankment? None observed during this inspection d Scenage? If so, seepage flow rate and location (describe any turbidity and observed color within the flow): None observed 2 UPSTREAM SLOPE a Woody vegetation discovered? None - recently mowed b Rodent binrows discovered? No remedial was previously recommended or required c Remedial work performed? 3 INTAKE STRUCTURE a Deterioration of concrete? Structure does not not mally impound any more than 3 feet of water which is 15 Feet or so below spillway crest. b. Exposure of rebar reinforcement? c Is there a need to repair or replace the trash tack? d Any problems with debris? No applicable since it is a settling pond e Was the drawdown valve operated?

(DCR199-098) (09/08)

4.	a. Any seepage? If so, estimate the flow rate and describe the location of the seep or damp areas (describe any turbidity and observed color within the flow):  No seepage observed
5	EARTHEN EMERGENCY SPILLWAY  a Obstructions to flow? If so, describe plans to correct: Not applicable  b Rodent burrows discovered?  c. Any deterioration in the approach or discharge channel?
6.	CONCRETE EMERGENCY SPILLWAY  a Deterioration of concrete? Not applicable  b Exposed steel reinforcement?  c Any leakage below concrete spillway?  d Obstructions to flow? If so, lists plans to correct:
7.	DOWNSTREAM SLOPE  a. Woody vegetation discovered? None – recently moved  b. Rodent burrows discovered? none  c. Are seepage drains flowing? No seepage drains were observed  d. Any seepage or wet areas? No seepage areas were observed
8.	Office PIPE  a Any water flowing outside of discharge pipe through the none Impounding Structure?  b Describe any deflection of damage to the pipe: None observed
9.	STILLING BASIN  a Deterioration of concrete structures? Not applicable  b Exposure of rebar reinforcement?  c Deterioration of the basin slopes?  d Repairs made?  e Any obstruction to flow?
10	a Gate malfunctions of repairs?Not_applicable
fl	RESERVOIR/WATERSHED  a New developments opsneam of dam? Not applicable – this is an upground reservoir  b Slides or crosion of take banks around the rim?  c General comments to include silt, algae or other influence factors:

INSTRUMENTS	
a List all instruments none	
b Any readings of instruments? c Any installation of new instruments?	
c. Any installation of new instruments?	
DOWNSTREAM/HAZARD ISSUES	
a New development in downstream intradation zone?	No new development
b. Note the maximum storm water discharge or peak elevation during the provious	us year Not applicable - no discharge
<ul> <li>Was general maintenance performed on dam? If so, when? Yes, mowing w</li> </ul>	
d List actions that need to be accomplished before the next inspection: Conti	nue mowing
OVERALL/EVAULATION OF IMPOUNDING STRUCTURE AND APPU	
	RIENANCES
(Check one) EXCELLENT X GOOD P	
(Check one) EXCELLENT X GOOD P	
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#### CERTIFICATION BY OWNER'S ENGINEER (required only when an inspection by an engineer is required)

> Mail the executed form to the appropriate Department of Conservation and Recreation Division of Dam Safety and Floodplain Management Regional Engineer

This / 23 day of Fab , 20 09 .

(DCR199-098) (09/08)



Date Prepared: Feb 16, 2009 Gary Zych Prepared By:

#### ANNUAL INSPECTION REPORT FOR VIRGINIA REGULATED IMPOUNDING STRUCTURES

Reference: Impounding Structures Regulations, 4VAC 50-20-10 et seq., including 4VAC 50-20-105, Virginia Soil and Water Conservation Board Owner's Information Bottom ash pond Inventory Number: Name of Dam: Glen Lyn Plant, Appalachian Power company Location-County/City: Giles county Owner's Name: Contact Person (if different from above): Hazard Classification: Class III Owner's Address: 40 Franklin Road Name of reservoir: Purpose of reservoir: Settling pond Telephone No.: (Residential) Other means of communication: Owner's Engineer American Electric Power Service Corporation Name of Engineering I had and Engineer: Professional Engineer Virginia License Number: Mailing Address: Civil Engineering, 1 Riverside Plaza Columbus, OH 43215 614-716-2926 Lalephone No : (Business) Directions: Make note of all pertinent conditions and changes since the last inspection, or, if this is the first inspection, since the filing of a design report. Date of This Inspection 1/13/09 Date of Last Inspection 10/25/2007 I. EMBANKMENT a Any alteration made to the embankment? None b Erosion on embankment? None - vegetative cover is full c Settlement, misalignment or cracks in embankment? None observed during this inspection d Seepage? If so, seepage flow rate and location (describe any turbidity and observed color within the flow): None observed 2. UPSTREAM SLOPE a Woody vegetation discovered? None - recently mowed. b Rodent burrows discovered? None No remedial was previously recommended or required c Remedial work performed? 3 INTAKE STRUCTURE Concrete of discharge tower was OK and no deterioration observed. a Deterioration of concrete? b Exposure of rebail teinforcement? No exposure of rebar observed c Is there a need to repair or replace the trash rack? No - facility has a skimmer structure that is in good condition

d Any problems with debtis? None - this is an upground reservoir e Was the drawdown valve operated? No applicable since it is a settling pond

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4.	a. Any seepage? If so, estimate the flow rate and describe the location of the seep or damp areas (describe any turbidity and observed color within the flow):  No seepage observed
5.	EARTHEN EMERGENCY SPILLWAY  a Obstructions to flow? If so, describe plans to correct: Not applicable  b Rodent burrows discovered?  c Any deterioration in the approach or discharge channel?
6.	CONCRETE EMERGENCY SPILLWAY  a Deterioration of concrete?Not applicable  b Exposed steel reinforcement?  c Any leakage below concrete spillway?
7.	BOWNSTREAM SLOPE  a Woody vegetation discovered? None – recently mowed  b Rodent burrows discovered? none  c Are seepage drains flowing? No seepage drains were observed  d Any scepage or wet areas? No seepage areas were observed
8.	OUTLET PIPE  a Any water flowing outside of discharge pipe through the none Impounding Structure?  b Describe any deflection or damage to the pipe: None observed
9.	STILLING BASIN  a Deterioration of concrete structures? Not applicable  b Exposure of rebar reinforcement? c Deterioration of the basin slopes? d. Repairs made? e Any obstruction to flow?
10	GATES a Gate malfunctions of repairs? Not applicable b Corrosion of damage? c Were any gates operated? If so, how often and to what extreme?
11	RESERVOIR/WATERSHED  a New developments upstream of dam? Not applicable – this is an upground reservoir  b Slides or erosion of lake banks around the rim?  c General comments to include silt, algae or other influence factors:

							<del></del>
	REAM/HAZARD /elopinent in down		zone?			No new deve	opment
Was gen	eral maintenance p	erformed on dam	? If so, when?	during the previou Yes, mowing waspection: Continue	as performed		o discharge
					·		
)VERALI	EVAULATION E)  EXCEL		NG SIRUCIU	TRE AND APPUE	RI ENANCE OOR	s	
- OVERALI (Check on	e)  EXCEL	LENT	<u>  X</u> GOOD		OOR		
- OVERALI	e) EXCEL	LENT	<u>  X</u> GOOD	P(	OOR		

#### CERTIFICATION BY OWNER'S ENGINEER (required only when an inspection by an engineer is required)

l hereby cer professional		report has been exam	ined by me and found to be true and correct in my
Signed:	Professional Engineer's Signature	Print Name	Virginia Number:
This	day ot	, 20	
			<u>\</u>
	Fagin	eer's Virginia Scalt	
		;	
		;	
		•	
	c	ERTIFICATION B	Y OWNER
I hereby cor	tify that the information provided in this	tepott has been exam	ined by me
Signed: 🗹	Owner's Signature		BRACL JONES Print Nanic
ihis 🗡 .	23 day of Feb	,20 <u>09</u> .	and the second of the second o

Mail the executed form to the appropriate Department of Conservation and Recreation Division of Dam Safety and Floodplain Management Regional Engineer

(DCR199-098) (09/08)

# INSPECTION REPORT 2009 Calendar Year BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GERS - 09-045

GLEN LYN PLANT GLEN LYN, VIRGINIA

> PREPARED BY GEOTECHNICAL ENGINEERING AEP SERVICE CORPORATION 1 RIVERSIDE PLAZA COLUMBUS, OHIO

### DAM & DIKE INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GLEN LYN PLANT GLEN LYN, VIRGINIA

INSPECTION DATE October 28, 2009

PREPARED BY

Sary E. Zych, P. B.

DATE 12-8-2009

**REVIEWED BY** 

Behrad Zand

DATE /2/10/2001

APPROVED BY

Jedno 1 ( Musuga) - DATE 18-18-2609 Pedro S. Amaya, P.E. No. 036174

Manager - Geotechnical Engineering

QA/QC DOCUMENT NO.

GERS - 09 - 045

SEEORO JOSE A VA-TRUILLO S NO. 9. CT

PROFESSIONAL ENGINEER SEAL & SIGNATURE

#### 2009 ANNUAL INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

#### GLEN LYN PLANT GLEN LYN, WEST VIRGINIA

INTRODUCTION	2
SUMMARY OF VISUAL OBSERVATIONS	2
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Bottom Ash Pond Complex	
Auxiliary Fly Ash Pond	
West Pond	
ASSESSMENT OF RECENT INSTRUMENTATION DATA	
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Auxiliary Pond	6
West Pond	6
RECOMMENDATIONS	
Bottom Ash Pond Complex	
Auxiliary Pond	6
West Pond	

FIGURE 1: Bottom Ash Pond Inspection Location Plan

FIGURE 2: Auxiliary Fly Ash Pond Inspection Location Plan

FIGURE 3: West Pond Inspection Location Plan APPENDIX A: Bottom Ash Pond Photographs

APPENDIX B: Auxiliary Fly Ash Pond Photographs

APPENDIX C: West Pond Photographs

Excessive:

A reference to an observed item (e.g., crosion, scepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to properly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

Appendices A, B and C contain selected photographs taken during the inspection of the Bottom Ash Pond, Auxiliary Fly Ash Pond and West Pond, respectively.

#### Bottom Ash Pond Complex (refer to Figure 1)

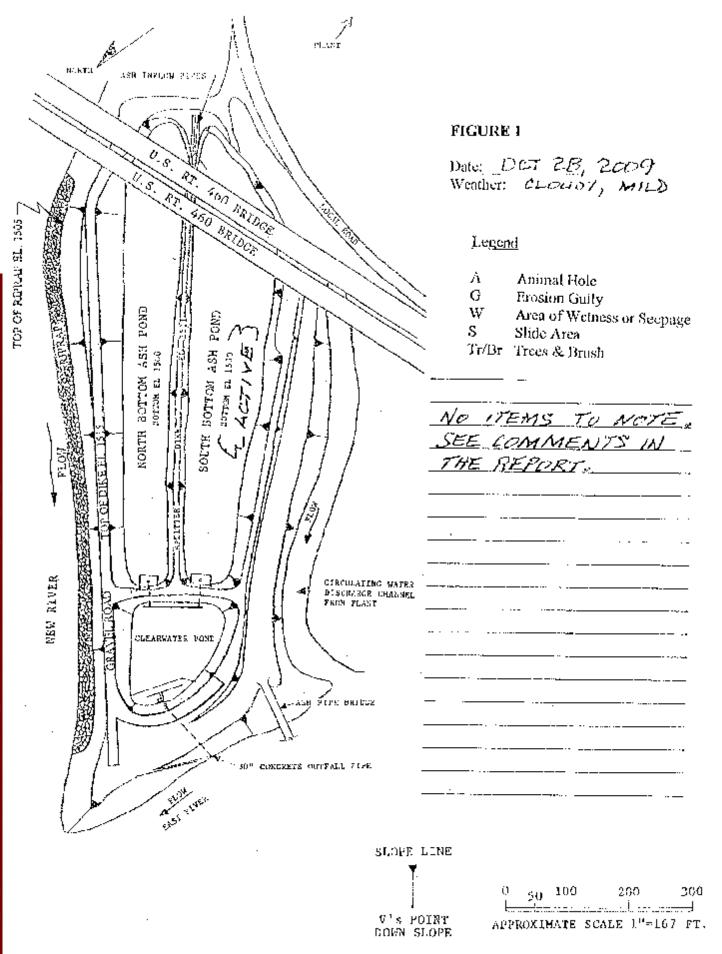
- The South Bottom Ash Pond was the active pond for receiving ash sluice water (Photo 1).
- The North Bottom Ash Pond was inactive. It was completely drained and all bottom ash was exeavated. Cohesive fill was recently placed on a portion of the bottom and interior slopes. (Photo 2)
- The interior slopes of both the North and South Bottom Ash Ponds appeared stable and in good condition. The crest and slopes of the Splitter dike between the two ponds also appeared stable and in good condition.
- 4. Flow over the South Bottom Ash Poud discharge structure was smooth with no obstructions. The structures appeared in good condition. In particular, the North BA Pond discharge structure was fully visible and no issues were noted about its condition. (Photo 3)
- The South Bottom Ash Pond exterior slope, adjacent to the discharge channel, was well vegetated and contained no visible animal burrows or areas of slope instability. (Photo 4)
- 6. The interior slopes of the Clearwater Pond were also well vegetated and in good condition. The riprap in the northeast corner of the pond was stable (Photos 5-6).
- Visible portions of the Clearwater Pond concrete discharge structure, wood steps, wood railing, platform, and intake structure were in satisfactory condition.
- 8. The Clearwater Pond outfall pipe (RCP 30-inch diameter), walkway and railing were in satisfactory condition. Discharge from the outfall pipe was unobstructed and there was no crosion or scaur at the outlet. There was no visual evidence of significant settlement or depressions above the pipe afignment. There was no scepage from around the outside of the pipe. (Photo 7)
- The inlet structure and distribution pipe at the Clearwater Pond was in good condition. (Photo 8)
- 10. The dike roads are in good condition. There is no rutting along the surface.

- 2. The NPDLS Outfoll No. 007 discharge pipe located at the west end of the pond was unobstructed and in satisfactory condition. Due to the pumping operations, the flow was higher than normal. The slopes and dike surface above the pipe did not exhibit any evidence of settlement or instability and the flow was clear. The wood steps and railing leading to the outfall were in good condition.
- The main dike was well maintained. This section of dike appears to be stable and there are no signs of sloughing. (Photo 2-3)
- The toc area on both sides of the stairs was moist to wet. The previous inspection noted the area as dry. There was no visual scepage from this area.
- 5. The interior slope of the western road dike is in satisfactory condition except for one area. A slide area of the interior slope, about 15 yards long, has occurred. Repairs were being planned by plant personnel. The slide was presumed to be associated with the drawdown of the pond level. (Photo 4)
- 6. The drainage ditch along the exterior slope of the western road dike was unobstructed and protected from erosion with riprap.
- The top of dike road was in good condition with no evidence of significant dike settlement or misalignment.
- The southeast end of the pond borders the landfill Leachate collection pond and dike. The dike and toe area appeared in good condition. The siphon from the Leachate pond into the West pond was not operating.

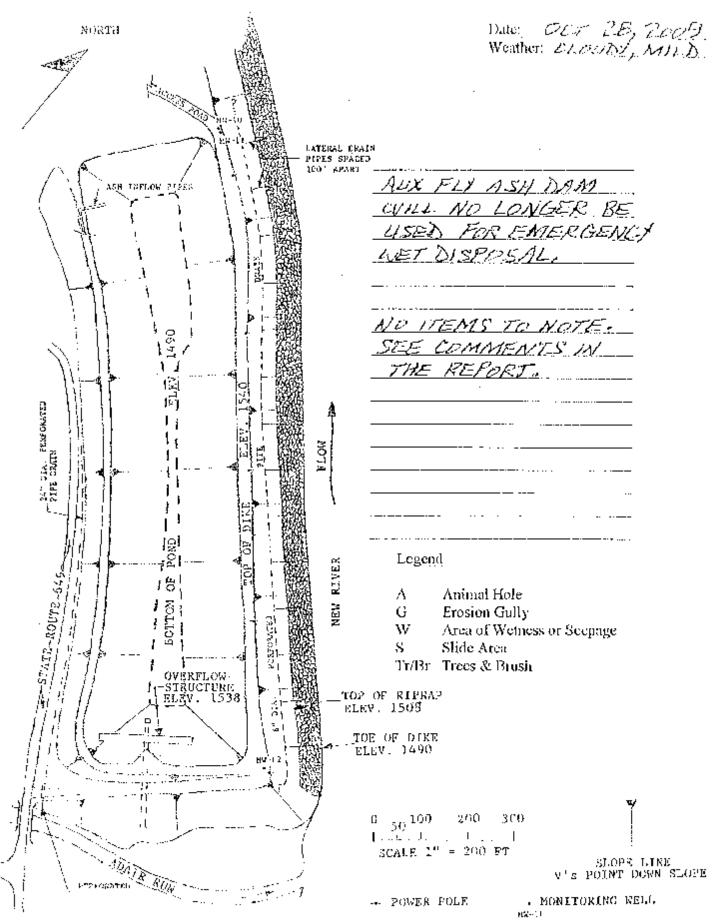
#### ASSESSMENT OF RECENT INSTRUMENTATION DATA

Pond water levels were obtained from Plant personnel for the date of the inspection. These levels are summarized below along with water levels measured during previous annual inspections. The Plant performs quarterly inspections and records pend levels and facility conditions.

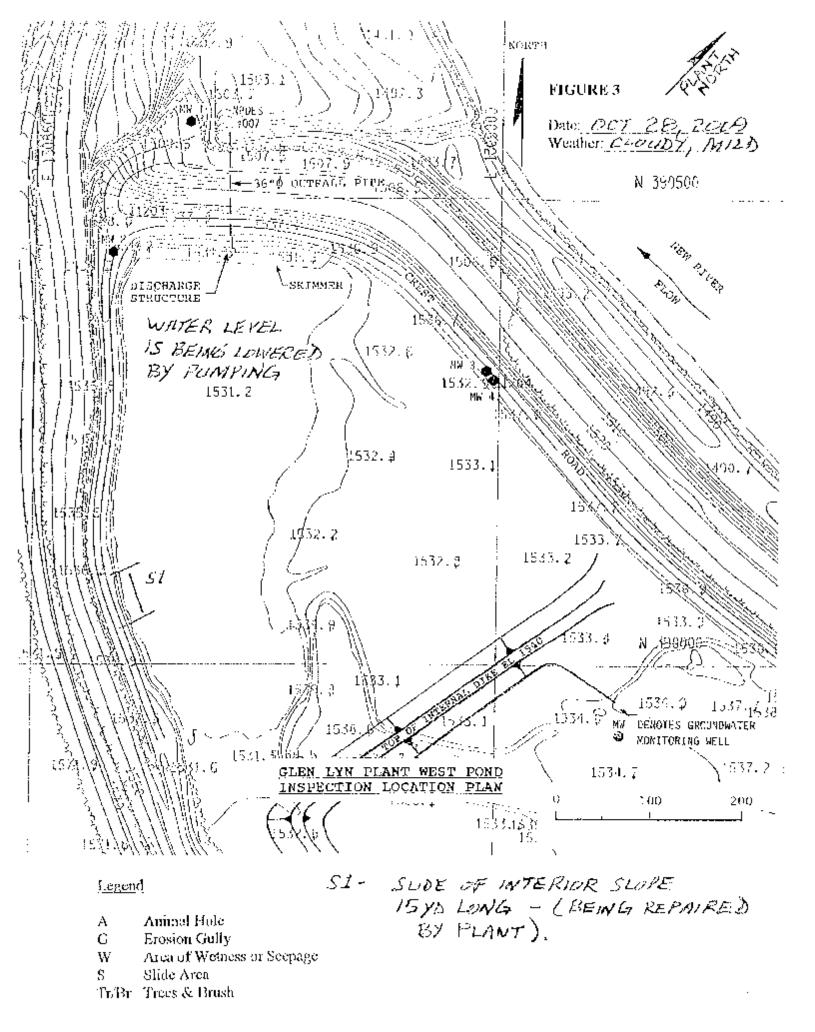
Pond	Pond Elev.	Pond Elev.	Pond Elev.	Pond Elev.	Pond Elev.
	Pt.	Pt.	i Ft.	F1.	Ft.
Name	28Oct2009	13Jan2009	30Oct 2007	1Nov 2005	14 Dec 2004
			:		
Clearwater	1501	1501	1501.3	1501.3	1501.3
NBAP	dewatered	dewatered	dewatered	dewatered	dewatered
SBAP	1506.3 (full)	1506.3 (full)	1506.3 (full)	1506.3 (full)	1506.3 (full)
West	1528	1531.5	1531.5	1531.5	1531.5
Aux FAP	1515	- 1515	1511	- 1510	1513



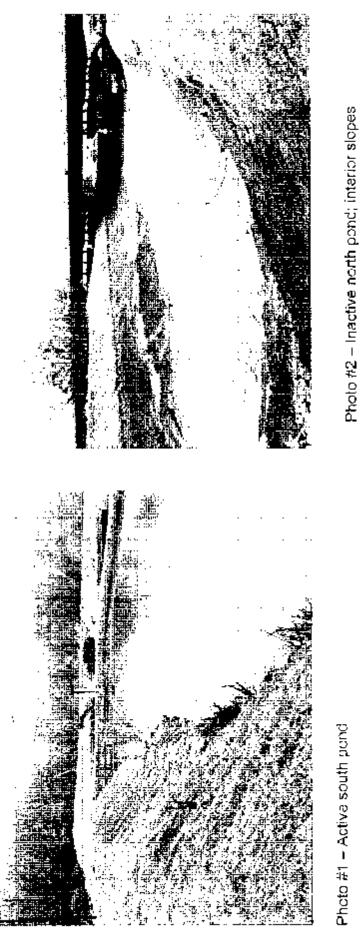
GLEN LYN PLANT: EGITOM ASH POND INSPECTION LOCATION PLAN



GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOGATION PLAN



# APPENDIX A: BOTTOM ASH POND COMPLEX PHOTOGRAPHS



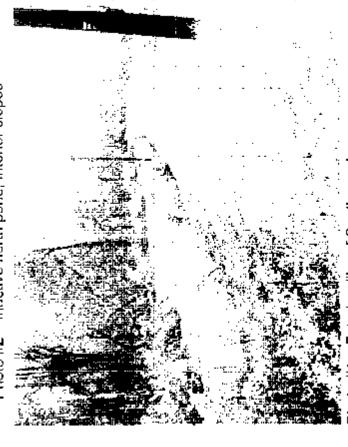


Photo #4 - Exterior clike of South pond

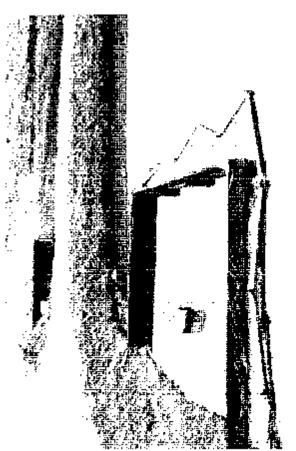


Photo #3 - South pond discharge structure

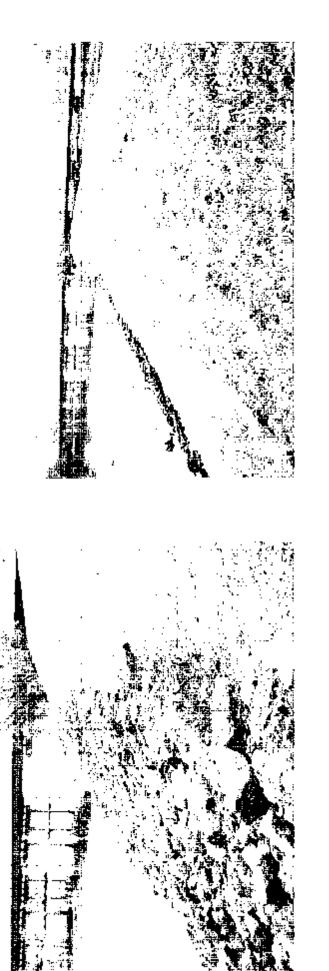


Photo #10 - Exterior slope of North dike

Photo #9 - Exterior slope of North dike

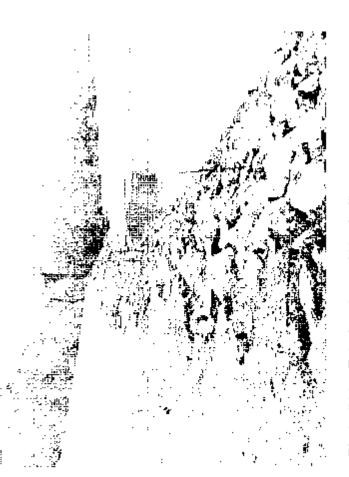


Photo #11 – Exterior slope of North dike

# APPENDIX B: AUXILIARY FLY ASH POND PHOTOGRAPHS

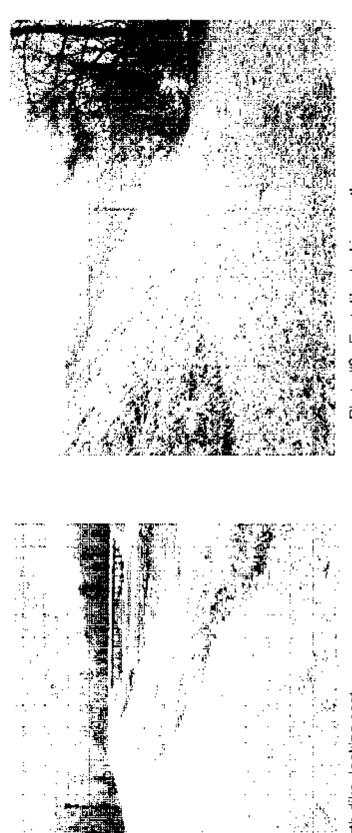


Photo #2 ~East dike, locking north



Photo #3 - Exterior slope of south dike, looking west

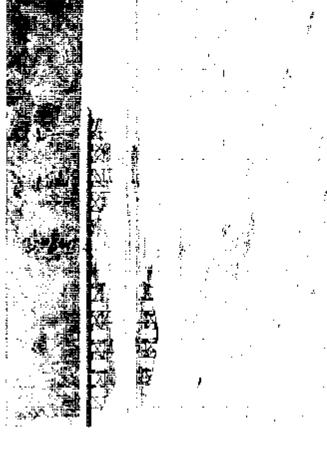


Photo #4 - Interior of Aux fly ash pond

# APPENDIX C: WEST POND PHOTOGRAPHS

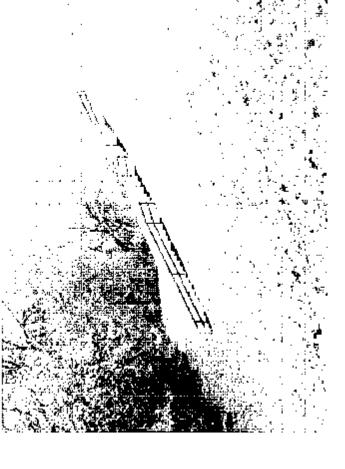


Photo #2 - Exterior slope main dke



Photo #1 - Skimmer structure/water level



Photo #3 - Exterior slope of main dike

Photo #4 - Interior slope of road dike

# DAM & DIKE INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

GLEN LYN PLANT GLEN LYN, VIRGINIA

INSPECTION DATE November 18, 2010

PREPARED BY

**DATE**  $_{1/2}/_{\mathbb{R}_{+}}/_{\mathbb{R}^{n}}$ 

**REVIEWED BY** 

Behrad Zand P.E.

DATE 12/6/200

**APPROVED BY** 

Pedro Amaya, P.E. / Director, Civil Engineering DATE /2/7/20/0

QA/QC DOCUMENT NO.

GERS-10-049



PROFESSIONAL ENGINEER SEAL & SIGNATURE

# 2010 ANNUAL INSPECTION REPORT BOTTOM ASH POND COMPLEX AUXILIARY FLY ASH POND WEST POND

# GLEN LYN PLANT GLEN LYN, WEST VIRGINIA

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FIGURE 1: Bottom Ash Pond Inspection Location Plan

FIGURE 2: Auxiliary Fly Ash Pond Inspection Location Plan

FIGURE 3: West Pond Inspection Location Plan APPENDIX A: Bottom Ash Pond Photographs

APPENDIX B: Auxiliary Fly Ash Pond Photographs

APPENDIX C: West Pond Photographs

¹¹ Internal Diag & Dive Tispeville as DRMP 7010 Glea Livi Glea Lyvi (GyzRP) dire

#### INTRODUCTION

AEPSC Civil Engineering administers the company's Dam Inspection and Maintenance Program (DIMP). As part of DIMP, staff from the Geotechnical Engineering Section periodically conduct the dike and dam inspections. Mr. Gary F. Zych, P.E. conducted the inspection for the 2010 calendar year. This report has been prepared under the direction of Mr. Pedro J. Amaya, P.E. and presents a summary of the inspection and assessment of the condition of the facilities.

Mr. Frank Tanner, Process Supervisor, at the Glen Lyn Plant, was the project facility contact. The inspection was performed on November 18, 2010. Weather conditions were cloudy and cool. The temperature was 40° F. There was approximately 0.8 inches of rainfall during the seven days prior to the inspection with more than fifty percent occurring within 48 hours before the inspection.

At the Glen Lyn Plant there are three ponds that are part of the annual dike and dam inspection. These ponds are the Bottom Ash Pond Complex, the Auxiliary Fly Ash Pond and the West Pond, and are depicted in plan in Figures 1, 2 and 3, respectively. The Bottom Ash Pond Complex consists of the North and South Bottom Ash Ponds and a Clear Water Pond. The New River and the East River border it. The Auxiliary Fly Ash Pond was a wet fly ash pond adjacent to the New River and used for a backup system to the dry handling system. The Plant discontinued the option to utilize this pond as a backup in early 2009 and hence the facility is dry, excluding direct precipitation. The West Pond is a stormwater runoff pond for the dry ash landfill, which is located west of the Auxiliary Fly Ash Pond and of the landfill.

#### SUMMARY OF VISUAL OBSERVATIONS

#### General

The summary of the visual observations uses terms to describe the general appearance or condition of an observed item, activity or structure. Their meaning of these terms is as follows:

Good: A condition or activity that is generally better or slightly better than

what is minimally expected or anticipated from a design or

maintenance point of view.

Fair or A condition or activity that generally meets what is minimally

Satisfactory: expected or anticipated from a design or maintenance point of view.

Poor: A condition or activity that is generally below what is minimally

expected or anticipated from a design or maintenance point of view.

Minor: A reference to an observed item (e.g., crosion, seepage, vegetation,

etc.) where the current maintenance condition is below what is normal

or desired, but which is not currently causing concern from a structure safety or stability point of view.

Excessive:

A reference to an observed item (e.g., erosion, seepage, vegetation, etc.) where the current maintenance condition is above or worse than what is normal or desired, and which may have affected the ability of the observer to preperly evaluate the structure or particular area being observed or which may be a concern from a structure safety or stability point of view.

Appendices A, B and C contain selected photographs taken during the inspection of the Bottom Ash Pond, Auxiliary Fly Ash Pond and West Pond, respectively.

# Bottom Ash Pond Complex (refer to Figure !)

- The North Bottom Ash Pond was the active pond for receiving ash shake water and other waste water streams. (Photo 1).
- 2. The South Bortom Ash Pond was inactive. It was completely drained and all bottom ash was excavated. (Photo 2)
- The interior slopes of both the North and South Bottom Ash Ponds appeared stable and in good condition. The crest and slopes of the Splitter dike between the two ponds also appeared stable and in good condition.
- 4. Flow over the North Bottom Ash Pand discharge structure was smooth with no obstructions. The structures appeared in good condition. In particular, the South BA Pond discharge structure was fully visible and no issues were noted about its condition. (Photo 3)
- The South Bottom Ash Pond exterior slope, adjacent to the discharge channel, was well
  vegetated and contained no visible animal burrows or areas of slope instability. (Photo 4)
- 6. The interior slopes of the Clearwater Pond were also well vegetated and in good condition. The riprap in the northeast corner of the pond was stable (Photo 5).
- 7. Visible portions of the Clearwater Pond concrete discharge structure, wood steps, wood railing, platform, and intake structure were in satisfactory condition. Lower portions of the interior slope adjacent to this area are very steep, however, there are no other signs of instability or sloughing. (Photo 6)
- 8. The Clearwater Pond outfall pipe (RCP 30-inch diameter), walkway and railing were in satisfactory condition. Discharge from the outfall pipe was unobstructed and there was no erosion or scour at the outlet. There was no visual evidence of significant settlement or depressions above the pipe alignment. There was no scepage from around the outside of the pipe. (Photo 7)

- 9. The inlet structure and distribution pipe at the Clearwater Pond was in good condition.
- 16. The dike roads are in good condition. There is no rutting along the surface.
- The North Bottom Ash Pend exterior slope along the New River appeared stable and wellprotected with vegetation and riprap. There were no signs of movement or displacement of the riprap. (Photo 8)

# Auxiliary Fly Ash Pond (refer to Figure 2)

- This pond is no longer used as an emergency wet fly ash pond. The Plant, in early 2009, decided to eliminate any future use.
- 2. There was no standing water in the pond. (Photo 1)
- The lower section of the north dike (exterior slope along the New River) is part of the natural river bank and has vegetation and tree cover. There was no Indication from the top of the bench that any instability exists.
- 4. The upper section of the exterior slope along the New River is well vegetated. This slope appeared stable and there were no signs of surficial sloughing, movement or displacement. (Photo 2)
- 5. The old crosion slide at the far eastern corner of the exterior slope at the tree line was well vegetated.
- 6. The exterior slope of the east dike appeared satisfactory with no signs of apparent instability. There were no signs of redent holes or erasion guillies.
- The outlet of the pond's discharge pipe, wood steps and railing were inspected and found in good condition. There was no flow through the open valve from the outfall.
- The exterior slope of the south side dike along Route 649 was also well vegetated. There
  were no signs of slope instability or any recent crosion gullies.
- The interior slopes of all three dikes appeared stable and well vegetated. The slopes had a stand of tail grass. (Photo 3)

## West Pond (refer to Figure 3)

 The water level in the pond was approximately 4 feet below the platform over the discharge structure. There was no discharge from the structure. (Photo 1)

- 2. The NPDFS Outfall No. 007 discharge pipe located at the west end of the pond was unobstructed and in satisfactory condition. There was a slight trickle of water from the outlet presumably from minor seepage into the conduit. The slopes and dike surface above the pipe did not exhibit any evidence of settlement or instability and the flow was clear. The wood steps and railing leading to the outfall were in good condition.
- The main dike was well maintained. This section of dike appears to be stable and there
  are no signs of sloughing. (Photo 2-3)
- 4. The toe area on both sides of the stairs that is normally moist was dry.
- 5. The interior slope of the western road dike is in good condition. The slide area that was noted in 2009 was repaired. (Photo 4)
- The drainage ditch along the exterior slope of the western road dike was unobstructed and protected from erosion with riprap.
- The top of dike road was in good condition with no evidence of significant dike settlement or misalignment,
- The southeast end of the pond borders the landfill Leachate collection pond and dike.
  The dike and toe area appeared in good condition. The siphon from the Leachate pond into the West pond was not operating.
- 9. The dike portion that extends eastward along the river was cleared of trees in late 2009. This section of dike forms the confining berm for the dry ash landfill. The dike has naturally revegetated and is in satisfactory condition. There are no signs of instability or seepage along this section of dike. (Photos 5-6)

### ASSESSMENT OF RECENT INSTRUMENTATION DATA

Pond water levels were obtained from Plant personnel for the date of the inspection. These levels are summarized below along with water levels measured during previous annual inspections. The Plant performs quarterly inspections and records pond levels and facility conditions.

Pond	Pond Elev.	Pond Elev.	Pond Flev.	Pond Hev.	Pond Elev.
	Fit.	11.	Pt.	Ft.	Ft.
Name	18Nov2010	220ct2009	13Jan2009	30Oct 2007	1Nov 2005
Clearwater	1501	1501	1501	1501.3	1501.3
NBAP	1506.3 (full)	dewatered	dewatered	dewatered	dewatered
SBAP	dewatered	1506.3 (full)	1506.3 (full)	1506.3 (full)	1506.3 (full)

West	1528	1531.5	. 1531.5	1531.5	1531.5	İ
Aux FAP	dry	1515	1 - <b>151</b> 1	1510	1513	
New River	1493.1	· 	•	:	-	İ

The water level in the New River was based on the USGS gape data. No other instrumentation data is available for the dikes at the Plant.

#### CONCLUSIONS

## **Bottom Ash Pond Complex**

The Bottom Ash Pond Complex carthen embankments and structures are in good condition. The interior slopes of the embankments are well vegetated above the normal water level. The stone slope protection along the river was in good condition. The discharge structures were also in satisfactory condition. The facility is well maintained.

## Auxiliary Poud

Overall, the earthea embankments forming the Auxtliary Fly Ash Pond are in good condition. The vegetation covering the slopes is well established and maintained.

## West Pond

Overall, the earthen embankments forming the West Pond are in good condition. The vegetation covering the slopes is established and well maintained. The inlet and outlet of the discharge structure are in satisfactory condition.

### RECOMMENDATIONS

# Bottom Ash Pond Complex

Continue routine maintenance items as necessary.

### Auxiliary Pond

1. Continue routine maintenance items as necessary.

## West Pond

Continue routine maintenance items as necessary.

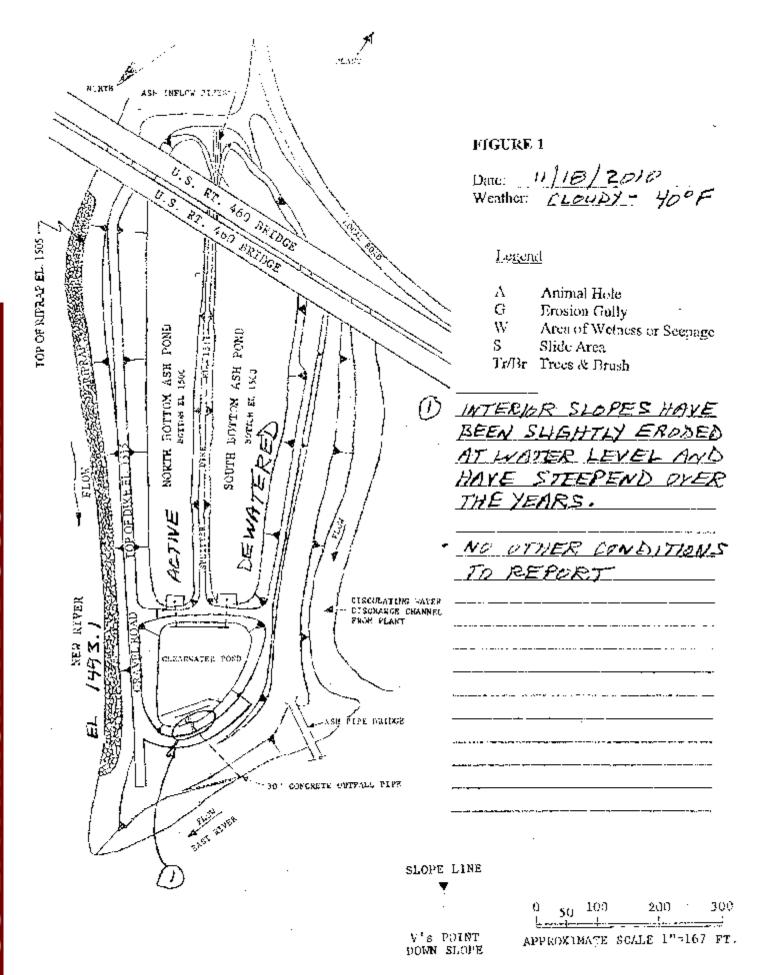
In general, routine inspections, monitoring and maintenance by plant personnel should continue. If you have any questions with regard to this report, please do not hesitate to contact Gary Zyeli at 614-716-2917 (audinet 260-2917).

# FIGURES

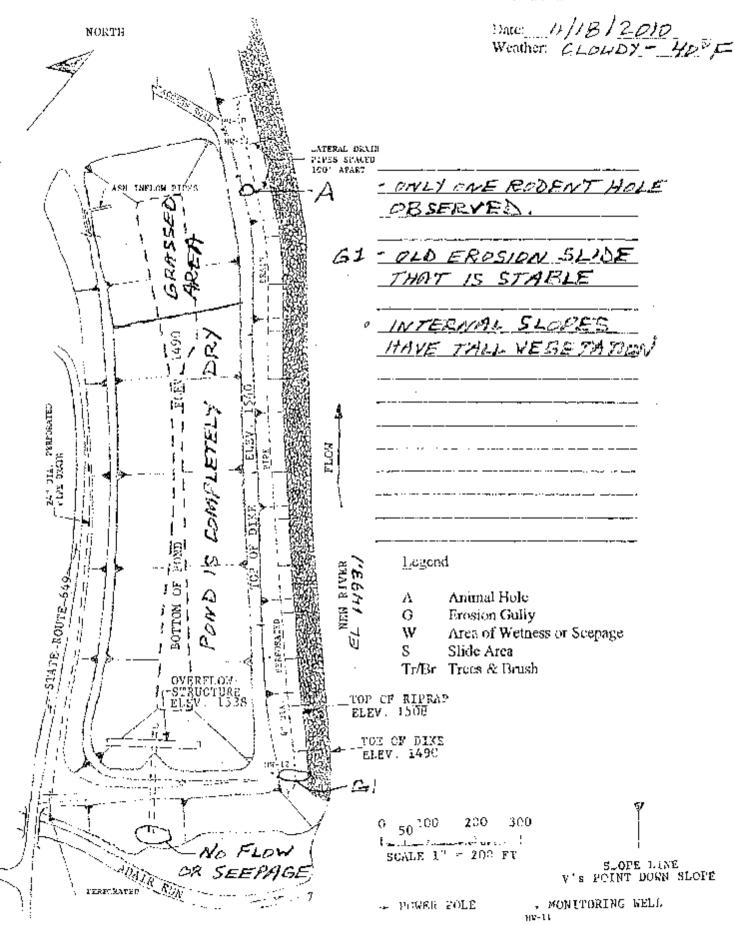
FIGURE 1: BOTTOM ASH POND INSPECTION LOCATION PLAN

FIGURE 2: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

FIGURE 3: WEST POND INSPECTION LOCATION PLAN



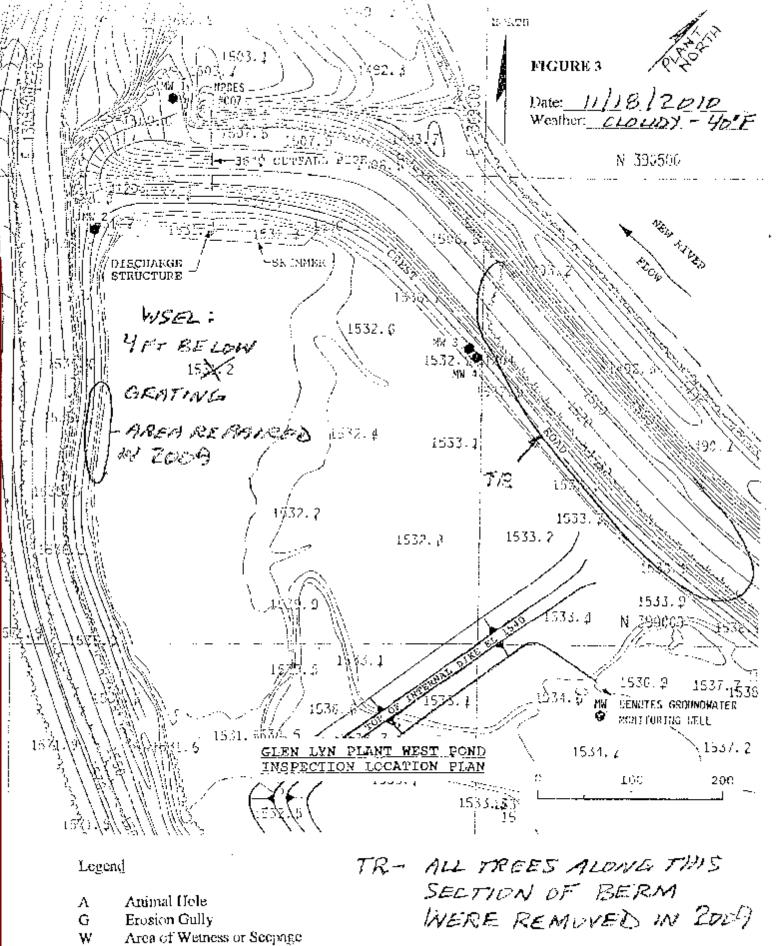
GLEN LYN PLANT: SOTTOM ASH POND INSPECTION LOCATION PLAN



GLEN LYM PLANT: AUXILIARY FLY ASR FOND CHEFTETION LOCATION PLAN

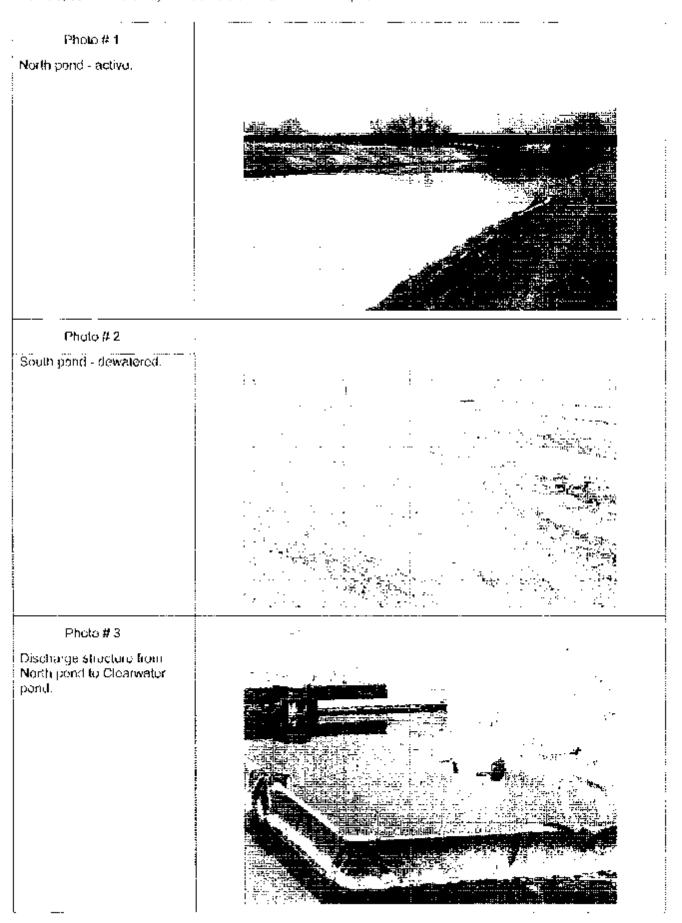
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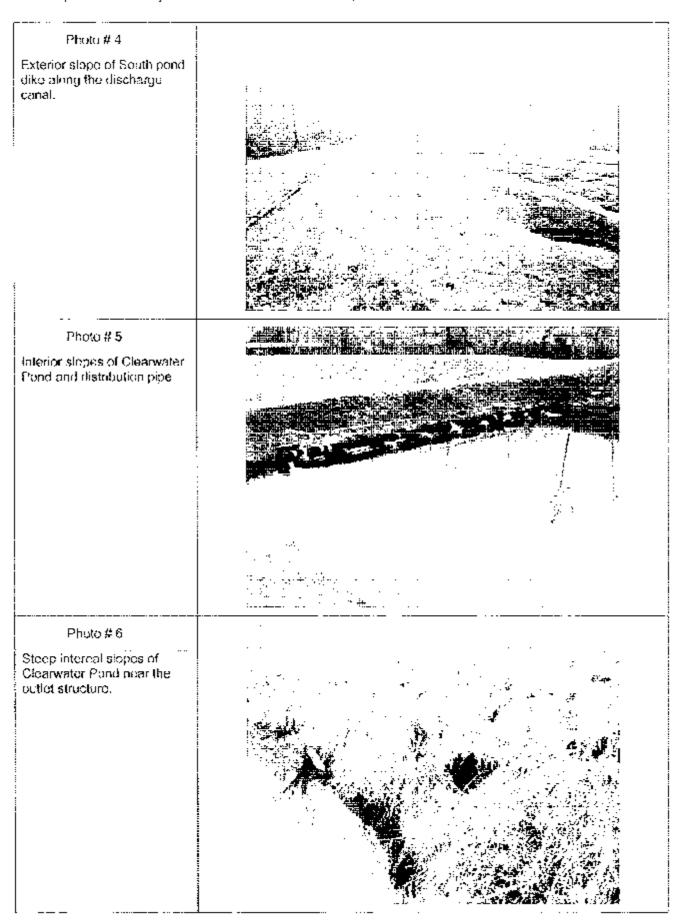
Slide Area Tr/Br Trees & Brush

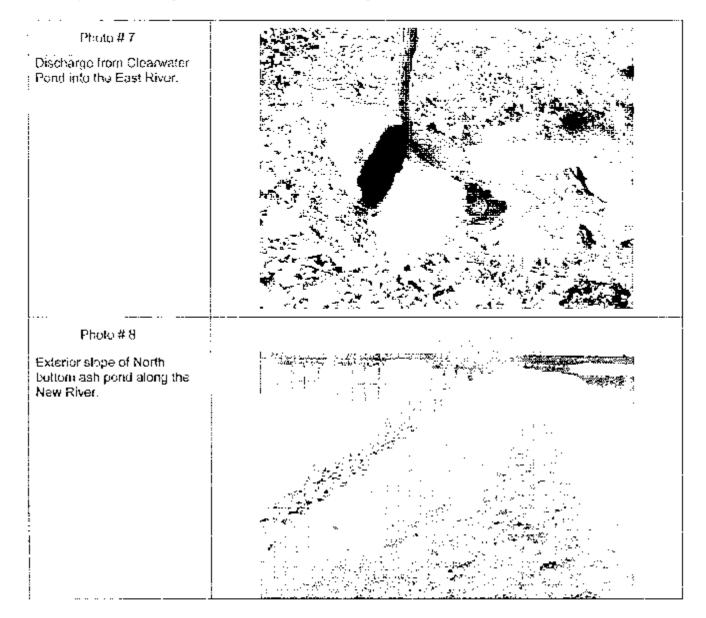


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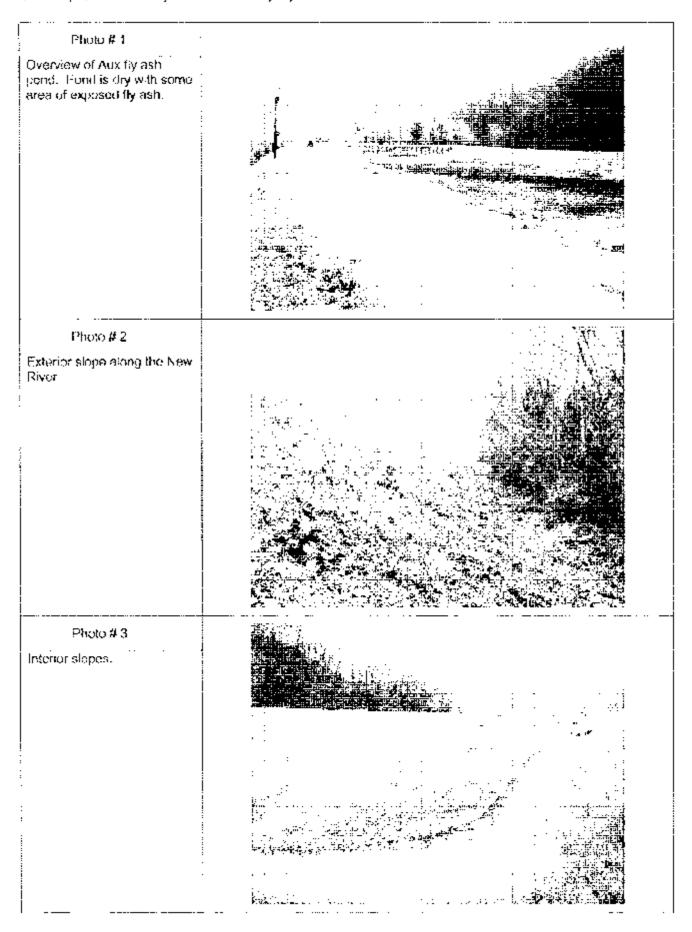
APPENDIX A: BOTTOM ASH POND PHOTOGRAPHS



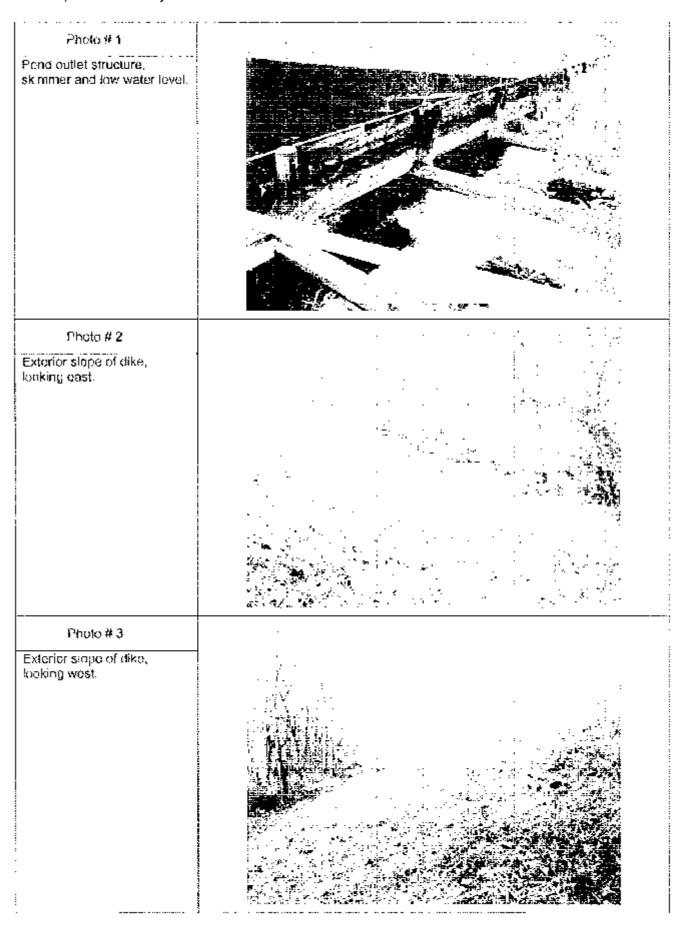


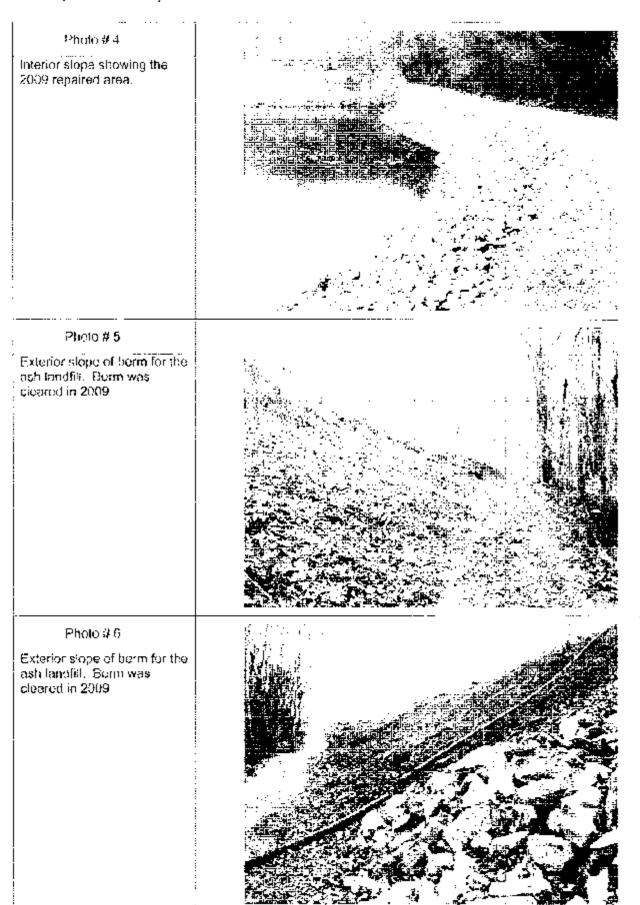


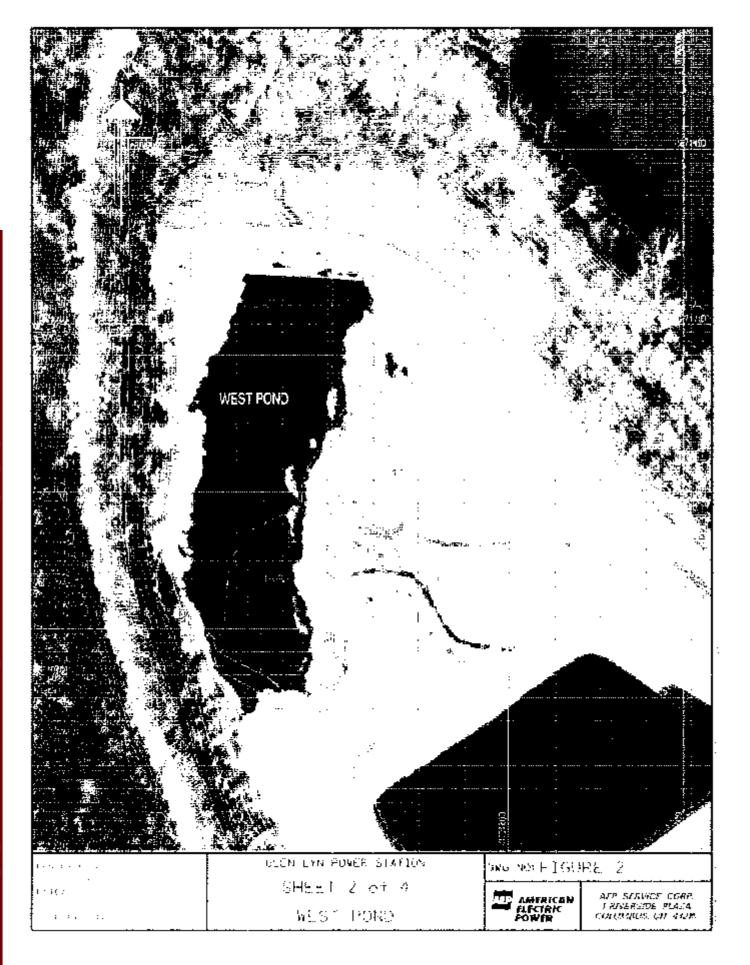
APPENDIX D: AUXILIARY FLY ASH POND PHOTOGRAPHS



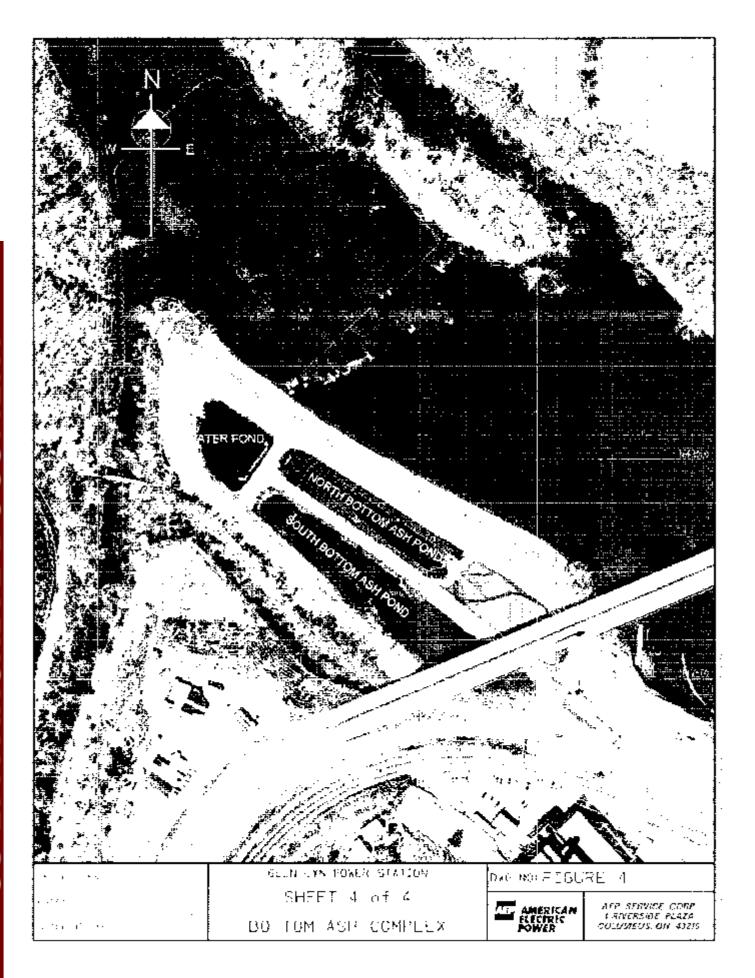
APPENDIX C: WEST POND PHOTOGRAPHS



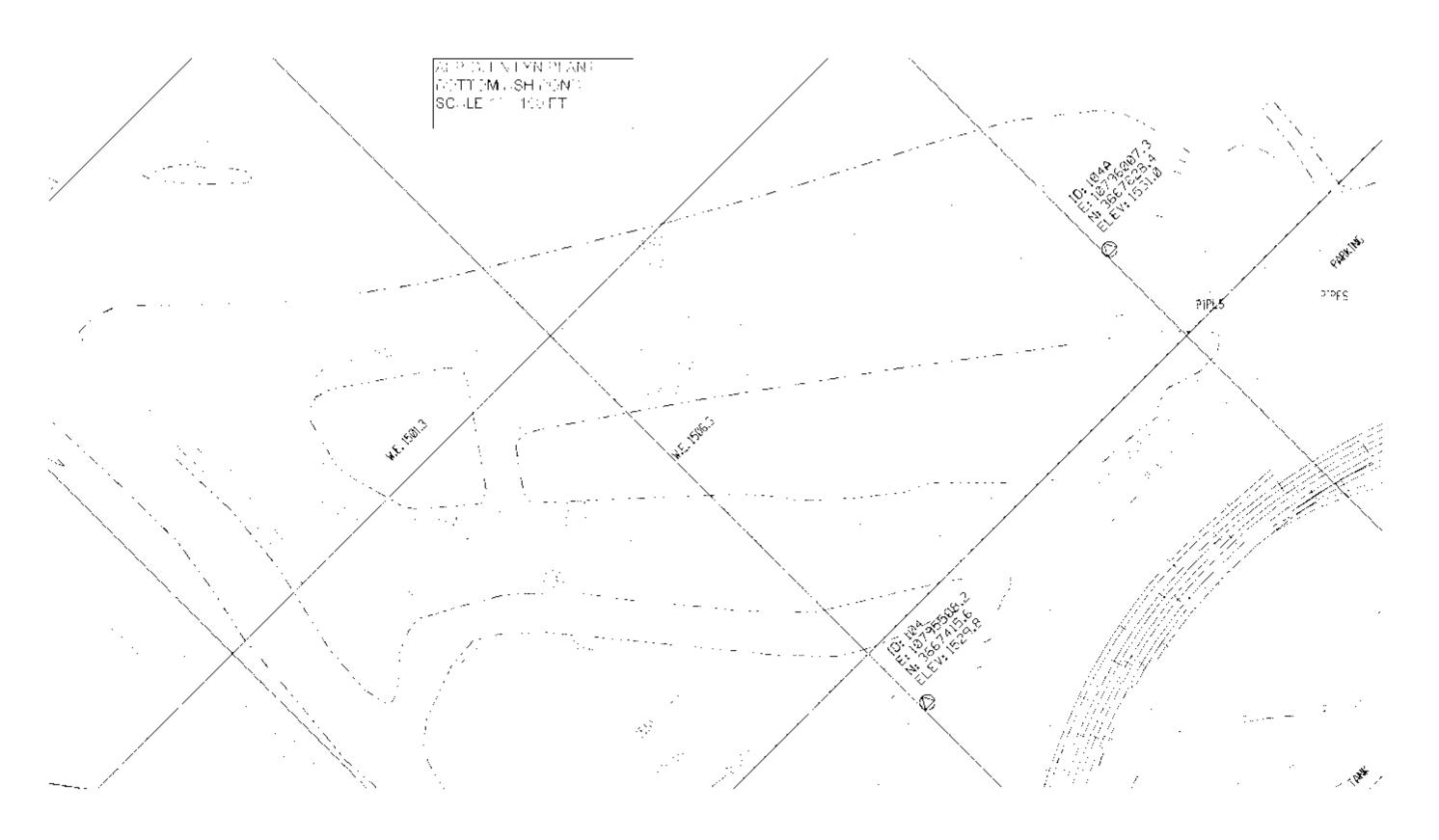








# *FOR INFORMATIONAL PURPOSES ONLY*



# APPENDIX A

# Document 6

Stability Assessment Report, Bottom Ash Pond, March 16, 2011, by AEP

#### STABILITY ASSESSMENT REPORT

#### **BOTTOM ASH POND**

GLEN	LYN	<b>POWER</b>	STATION
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GLEN LYN, VA

PREPARED BY

Behrad Zand, Engineer

Date | 63/16/2011

**REVIEWED BY** 

Hing F

Date

3/14/2011

Gary F. Zych,

Section Manager, Geotechnical Engineering

APPROVED BY

Date

ite

Pedro J. Amaya, P.E. Director, Civil Engineering

QA/QC DOCUMENT NO.

GERS-11-006



**PROFESSIONAL ENGINEER** 

SEAL & SIGNATURE

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#### GLEN LYN PLANT

#### STABILITY ASSESSMENT OF BOTTOM ASH POND

March 14, 2011

#### Introduction

In this study the stability of the bottom ash dikes at Glen Lyn Power Station is assessed. The Glen Lyn plant, owned by Appalachian Power Company (APCO), a subsidiary of American Electric Power (AEP), is a coal burning power plant located near Glen Lyn, Virginia. The plant currently has two units, namely Unit 5 and Unit 6, with a total generation capacity of 335 MW. The bottom ash disposal facility consists of a perimeter dike, approximately 1000 ft long along the bank of New River, and two splitter dikes separating North Bottom Ash Pond (adjacent to the river), South Bottom Ash Pond, and Clear Water Pond (location map enclosed). The bottom ash produced in the two units of the plant is sluiced in either the north or the south pond while the other pond remains mactive. The bottom ash is excavated from the inactive pond periodically using a front loader for beneficial use. The over flow from the active pond is discharged into the clear water pond through an 18 in diameter corrugated metal pipe. The water from the clear water pond flows under a skimmer structure into a decant tower and is discharged into East River through a 30 inch diameter concrete pipe.

The original crest of the perimeter dike was at elevation 1525. The crest was later lowered to the approximate elevation of t515 ft. Thus, the current crest elevation of the perimeter dike is approximately 1515 ft while the crest elevation of the splitter dikes is approximately 1511 ft. The original bottom of the north and south and the clear water ponds are approximately 1500 ft and 1499 ft, respectively. The outboard slope of the perimeter dike is approximately 3 horizontal to 1 vertical (3:1) in most places and the inboard slope is approximately 2:1. The maximum normal operating pool level of the north and south ponds is 1506 ft while that of the clear water pond is 1501.

In 1978 AEP retained Woodward-Clyde Consultants to conduct a safety inspection of this facility. As a part of 1978 inspection, the consultant reviewed all the pertinent documents and drawings that were available at the time to provide a summary on the history and design of the facility. The inspection program of this facility has continued ever since and currently it is inspected annually by a certified engineer. The visual inspections of the facility since 1978 have not indicated any adverse condition that would raise a concern on the stability and safety of the dikes.

#### Material Properties

An idealized section of the perimeter dike was developed (Figure 1) based on the available data (enclosed) from boring log HP-0525 drilled in 2005. The overburden foundation material consists of layers of clay shale, sand and gravel, and sandy clay. While the boring log HP-0525 shows bottom ash material throughout the embankment, the 1978 inspection report stats that the dikes were constructed of local lean clay and shale mixture. The embankment; therefore, was assumed to be constructed of lean clay and bottom ash as shown in Figure 1. The original design drawings of the bottom ash dike is unavailable, however, the dike structure presented in Figure 1 is similar to the design of the original fly ash dikes. The material properties of the compacted lean clay were selected based on recommendations of NAVFAC DM-7.2, Foundations and Earth Structures, Design Manual 7.2, 1982. The general description and mechanical properties of the material are presented in Table 1.

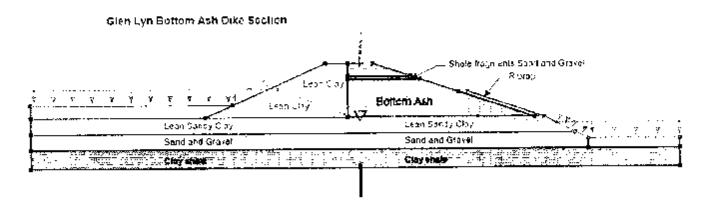


Figure 1. Idealized dike section

Page 4 of 8

Material Type	Undrained Friction Angle (deg)	Undrained Cohesion (psf)	Effective Friction Angle (deg)	Effective Cohesion (psf)	Unit Weight (pcl)
Compacted lean clay, embankment	()	400	28	200	110
Compacted bottom ash, embankment	40	í)	40	0	80
Embankment sand and shale fragments	34	0	3-4	Û	120
Rip rap	40	0	40	0	130
Foundation lean sandy clay	0	300	22	0	90
Foundation sand and gravel	40	O	40	0	125
Weathered shale and reck	15	2000	15	2000	120

Table 1. Material properties

#### Stability Analysis

Stability factors of safety for the authoard and inhoard slopes were calculated for static condition and pseudo-static seismic loading condition. Limit equilibrium analysis method of Morgenstern-Price was used for the assessment. Peak ground acceleration of 0.12g used in the seismic analysis was inferred from 2008 USGS map for 2% probability of exceedance in 50 years. Presented in Table 2 are the calculated factors of safety for the dike section. All the safety factors are within the acceptable range for this type of facility; that is a low head low hozard dike that has been in operation for several decades with no recorded safety or stability issue. Figures 2 through 6 show the calculated factors of safety along with corresponding failure surfaces.

Based on the results of this study the facility is believed to be performing as intended.

Slope	Loading condition	Calculate d Safety Factor	Location of the critical failure surface
Downstream	Steady-state seepage,	, 1.73	Outboard slope near toc
	drained		Et 1510 to 1496 ft
	Maximum surcharge, undrained	. 1.72	Outboard slope near toe El 1509 to 1496 ft
	Seismic loading undrained	1.16	From inboard slope at El. 1513 ft to outboard slope El. 1501 ft
Upstream	Steady-state scepage, drained	1.60	From middle of crest to bottom of pond
	Seismic loading undrained	1.08	From edge of crest to inboard toe

Table 2. Calculated stability safety factors for the upstream and downstream slopes

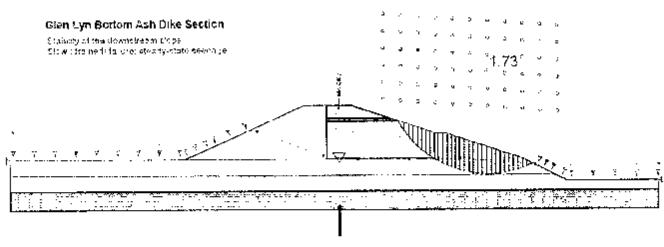


Figure 2. Stability analysis of the outboard slope under steady-state condition.

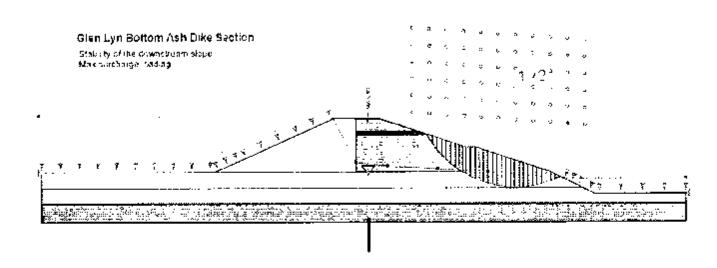


Figure 3. Stability analysis of the outboard slope under maximum surcharge pool level

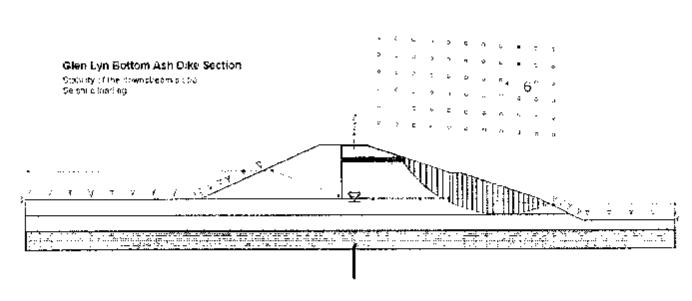


Figure 4. Stability analysis of the outboard slope under seismic loading

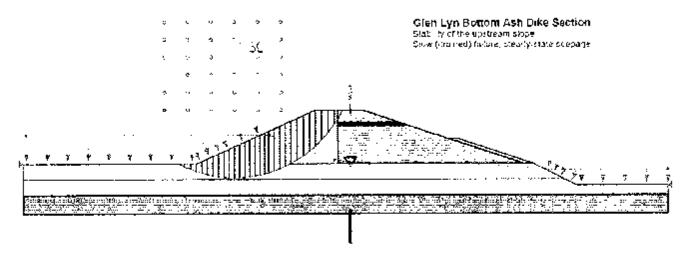


Figure 5. Stability analysis of the inboard slope under steady-state condition.

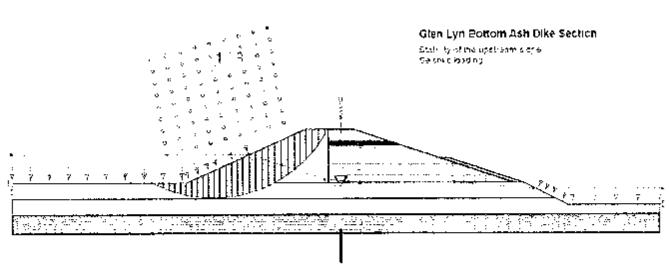
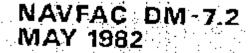
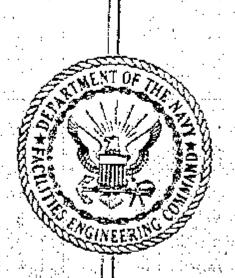


Figure 6. Stability analysis of the inboard slope under seismic loading



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# FOUNDATIONS AND EARTH STRUCTURES

#### DESIGN MANUAL 7,2

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND

ALEXANDRIA, VA. 22332

TABLE 1
Typical Properties of Compacted Smils

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, JAR HAMMER

## AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOB NUMBER 3031 SHEET 1 COMPANY APPALACHIAN POWER COMPANY 20R:NG NO. 9501 CATE 2/7/11 BURING FINISH 2/1/95 FROJECT GLEN LYN BOTTOM ASH DIKE BORING START 2/1/95 WELL TYPE COORDINATES PREZOMETER TYPE .... HGT, RISER ABOVE GROUND. GROUND ELEVATION SYSTEM STATE PLANE DEPTH TO TOPICS WELL SCREEN ... BOTTOM. Water Levet, IL N DRY BACKFILL CEMENT/RENTONITE WELL DEVELOPMENT ... RME RR9 CME-75 PIECD PARTY TUHERLY DATE 2-1-95 STANDARD PROPERTY OF STANDARD SAMITIE: SAMPLE VUMBER SAMPLE DIGILER'S DEPTH SOB / ROCK INFECT IDENTIFICATION: NOTES BLOWS / 6" FROM TO 90 1 1.5 4-4-4 BROWN CLAYEY SANDJorst, 100% v-fine SS 1.1 BLACK ASHDry to moist with nite limestone. ុន្ធន 3.0 3.3.2 .7 1.5 233 SS 3.045 SS 45 6.05-6-5 4 SS βO 7.5 3-4-6 1.1 SS 7.5 90 5.9.9 10.5 5-5-3 1.2 10 17 J 55 19.5 \$8 1 12 3 15 REDDISH BROWN CLAYEY SANDY P17.3 DRIFTING 10 | 88 | 173 | 188 | 12 16 1B ì THROUGH AREAS. GRAVEL&leist, 1/2" max size, augu ac Continued Next Page TYPE OF CASING USED _NO.2 ROOK CORE PIEZOMETUR TYPE | PT = OPEN TUBE POROUS TIP, S\$ = OPEN TUBE 61 x 3 25 HSA . ..... SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC 91 x 6 25 NSA HW CASING ADVANCER. WELL TYPE. OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON 3-.... 6* SW/CASING SWICASING. RECORDER RLY



JOB NUMBER 3031

	WASSIAN NUNSISSA	DEI IN F ITROM	PLC PTH EET TO	GTANDARD PENETRATION RESISTANCE BLOWS / 6*	TOTAL TENGTH RECOVERY	Ren оз % н		SOIL/ROCK IDENTILICATION	TI3M	DRILLS NOTE
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JOB NUMBER 3031 COMPANY APPALACHIAN POWER COMPANY 60RING NO 9502 ____OATF, **2/7/11** 5HE:: 1 PROJECT GLEN LYN BOTTOM ASH DIKE 2/1/95 BORING FINISH 2/1/95 BORING START WELL TYPE PIEZONETER TYPE CCORDINATES HGT, RISER ABOVE GROUND A1C GROUND ELEVATION SYSTEM STATEPLANE DEPTH TO TOP OF WELL SCREEN. **ECTTOM** Water Level, it / DRY ..... BACKFILI CEMENT/BENTONITE WILL DEVELOPMENT. HME RELD PARTY TUHERLY **CME-75** DATE 2-1-95 STANJARD ZERVAZ DEPTH OF THE PENETRATION ZERVAZ DEPTH OF THE P SAMPL? VLNBER SAMPLE SAMPLE DEPTH SOIL / ROCK DIGLIENS IN FFET ω ⊐ MOTES IDENTIFICATION BLOWS / 61 FROM TO BLACK ASH, LIMESTONE ROAD BASE 00 : 15 12-13-13 53 BROWN CLAYEY SANDIN BLACK ASHMeist to cry 20 30 333 1.2 0.04-6-6 SS 4.5 1.1 88 : 6.0 2-2-2 1.2 7.5 SS 7.5 9.0 224 1.1 15 SS 90 10.5 2-3-4 1.3 TRACE OF LIMESTONE GRAVEL 58 10.5 12.0 4/8 1 1 1 BROWN SANDY CLAYDIY. SS . 12.5 14.0 9-25-20 15 2 : 88 : 15.0 16.5 4-5-5 17.3 DRILLING RED BRICKS GRAY SANDY CLAY BLACK 17:50 10 SS | 175 | 185 10 N-ROUGH AREAS **COAL AND WOOD FRAGMENTS** TODEST FUND SAID AS DIVANNED TYPE OF CASING USED Continued Next Page PIEZOMETER TYPE PT = OPEN TUBE POROUS 18P, SS = OPEN TUBE NO 2 ROCK CORF 61×3.25 HSA SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC $9^{\circ} \times 6.25 \text{ HSA}$ HW CASING ADVANCER WELL TYPE. OW # OPEN TUBE SLOTTED SCREEN, GM = GEOMON 3" NW CAS NO. SWICASING RECORDER RLY AR HAMMER, _______



JOB NUMBER 3031

330 (13)(6)(1)	
COMPANY APPALACHIAN POWER COMPANY	BORING NO. 9502 9ATE 2/7//1 SHEET 2 04 2
PROJECT GLEN LYN BOTTOM ASH DIKE	BORING START 2/1/95 SORING FINISH 2/1/95

NOUSER SAMPLE	SAM DEF IN A FROM	и 6 ИН ЕЕТ 10	STANDARD PENETRA ION RESISTANCE BLOWS (6)	TOTAL FENGTH BROOVER	DEPTH IN FEET	GRAPHIC LG3 U3 C S	SUIL / ROCK IDENTIFICATION	- III-W	DRILLER'S NOTES
11 SS	22.5	240	13 7 7	.8	•		<u>BROWN SAND</u> L'ry with trace of limestone gravel size malerial		
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JOB NUMBER 3031 _ DATE 2/7/11 SHEET 1 OF COMPANY APPALACHIAN POWER COMPANY HORING NO. 9503 BORING START 2/1/95 PROJECT GLEN LYN BOTTOM ASH DIKE BORING FINISH 2/1/95 COORDINATES PIEZOMETER TYPE: ... WELL TYPE SYSTEM STATE PLANE HGT RISER ABOVE GROUND. DIA OROUND ELEVATION POTTOM ... BEPTH TO TOP OF WELL SOREEN. Water Level, it DRY BACKFILL CEMENT/BENTONITE WITH DEVELOPMENT HME FILLO PARTY TJH=RLY RG CME-75 DATE 2-1-95 STANJARD X ROU DEPTH O MEDITARION RESISTANCE ON WE FEET O F SAMPLE SAMPLE SAMPLE FEL DRILLER'S CEPTH \$GIL/ROCK (NIFEE) NOTES IDENT:FICATION FROM TO BLOWS / 6" ; ; LIMESTONE GRAVEL ROAD BASE 13-13-16 00 . 15 SS: BROWN CLAYEY SANDMolat : **ELACK ASH**D y to most 2 83 1.5 30 351 30 4.5 4 4 3 \$8 ឲ្ព 1.2 4.5 4-3-3 is. ٠. _\$5 İ 60 75 2-2-3 1.3 . 1 65 4 7.5 6 SS 90 222 .8 Ą 10.5 2-1-1 SS 90 .3 60 10 224 55 10.5 12.0 DRILLED 12.6 14-34-12 THROUGH INTERMITTANT HOURERS. COBSLES TO 22 6 16-3 100 15 6 900 BLUE GRAY SHALEY SANDSTONE INGUISION appears to be broken fragments of cabble. TO CONTROL OF THE PROPERTY OF THE ACT 10 85 178 186 16.50 1.0 TYPE OF CASING USED Continued Next Page PIEZOMETER TYPE | PT = OPEN TUSE POROUS TIP, SS = OPEN TUBE NO 2 ROCK CORE. 6" x 3 25 MSA SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC 9" x 6 25 HSA HWICASING ADVANCER. WHILL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON NW CASING ... SWICASING RECORDER RLY APROTAMINED .....



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COMPANY APPALACHIAN POWER COMPANY	aoring no. 9503	DATS 2/7/11 SHEET 2 OF	2
PROJECT GLEN LYN BOTTOM ASH DIKE	BURING START 2/1/95	BORING FINISH 2/1/95	

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NUMBER SANPLE	SAMI DEP IN FE EROM	PLL TH FFT TO	STANDARD PENETRATION RESISTANCE BLOWS/6	TOTAL LENGTH RECOVERY SECONDARY	DEPTH IN FEFT	GPAPH.C LOG	Soso	SCIL/ROCK IDENTIFICATION		DRILLER'S NOTES
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# AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



ЈОВ МИМИЕК - **3031** COMPANY APPALACHIAN POWER COMPANY BORING NO. 9504 ___ DATE 2/7/11 SHEET 1 BORING FINISH 2/1/95 PROJECT GLEN LYN BOTTOM ASH DIKE BORING START 2/1/95 ... WELL TYPE PIEZOMETER CYPE COCRDINATES SYSTEM STATEPLANE HIGT IRISER ABOVE GROUND GROUND ELEVATION: DEPTH TO TOP OF WELL SCHEEN. BOTTOM: Water Cevel, II 💛 DRY BACKFILL CEMENT/BENTONITE WELL DEVELOPMENT ...... THATE RIG CME-75 FIELD PARTY TJH=RLY DATE 2-1-95 CONTROL DEPTH OF SECURITY OF S STANDANG PENETRATION SEED PRESISTANCE DES STANDARD SAMPLE SARPLE VUL'OCR SAMI-LE DRID(FRS SQUITEDOCK DEPTH IN FECT IDENTIFICATION NOTES eLowsio: ( FROM TO BROWN CLAYEY SANOMOISI, 100% v-fine 00 - 15 6-6-7 BLACK ASHDiy to moist 2 88 1.5 3.0 3-3-3 8 30 2.22 3:58 4.5 1.1 2-2-1 4 | \$8 4.5 0.01 1 5 58 6.0 SS 7.5 90 2 2 2 1 | 2-2-3 SS 90 10.5 1 Ĵ 10 155 10.5 12.0 20-20-21 LIGHT BROWN SANDY SHALE roken into gravet and sand's ze material. BLACK ASHOry to moist. SG i 12.5 14.0 7-5-3 1.1 117.3 DRILLING g, 10 | 88 | 17.5 | 19 0 6.5.4 THROUGH AREAS. Continuosi Noxt Pago TYPE OF CASING USED PLANMITTER TYPE. PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE NO 2 ROCK CORE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC  $6\% \times 3.25~\mathrm{MSA}$ 9" x 6 25 HSA IMM CASING ADVANCER. WELL TYPE: OW = OPEN TUBE SHOTTED SCREEN, GM = GEOMON NW CASING. SW CASING: RECORDER RLY.

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# AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



COMPANY APPALACHIAN POWER COMPANY BURING NO. 9504 (SALE 2/7/11 SHEET 2 OF PROJECT GLEN LYN BOTTOM ASH DIKE BORING START 2/1/95 BORING HINSH 2/1/95

NUMBER A	SAMPLE	SAM DEF IN FI PROM	PUE 11H RET TO	STANDARD PENETRATION RESISTANCE BLOWS 76"	LENGTH RECOVERY	% DEPTH	SRAPHIC	1808	SOL/ROCK IDSN DEICATION	THAM .	DRILLER'S NOTES
					:		10000000000000000000000000000000000000				
	SS	22.5	240	9-13-4	7	:			BROWN SANDY CLAMfoist, 100% v-linu grain with gravet and solid size fragments		
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JOS NUMBER 3031 SHEET 1 OF SORING NO. HP-9524 EATE 2/7/11 COMPANY APPALACHIAN POWER COMPANY 11/7/95 HORING FINISH 11/8/95 PROJECT GLEN LYN BOTTOM ASH DIKE BORING START WELL TYPE PIEZOMETER TYPE NVA COORDINATES N 387,329.6 E 1,312,372.4 HOT, RISCRIADOVE GROUND NVA GROUND ELEVATION 1524.0 SYSTEM STATE PLANE DEPTH TO TOP OF WELL SCREEN. NVA. BOTTOM N\A Weter Level, N 💛 WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT TIME RIG CME-75 FIELD PARTY TJH-REG 11-7-95 DATE STANDARO HARRADON ZONO DEPTH OF PLINEYRATION ZONO IN THE RESISTANCI CAROLINA FEET OF PROPERTY OF THE PROPERTY SAMPLE SAMPLE SAMPLE SAMPLE DRILLER'S DEPTH SOIL / ROCK IN FEET NOTES (DENTIFICATION BLOWS / 6" FROM TO TIME PIL COND. REDOX TEMP. Pump test one hour : a approximately 5 12:46 4.15 222 281 18,15C 7.20 227 258 16.62C GPM prior to test by 12:53 12:57 7.24 231 261 16.72C p and 1:02 7.21 234 233 16.98C personat Packer oid. 1:06 7:23 237 214 1:08 SAMPLE TAKEN between 36.5 and 16.98C 7.23 237 <u>214</u> 9.9-11 49 O SS 26 1:13 7.18 238 205 BLACK SILTY CLAYRoots, maist. 5 Water return at all Limes BOTTOM ASHDay. SS 7.6 9.1 2-3-3 10 . 88 12.6 14.1 injernation bolders 1-2-2 1.2 idi forner notodi. 44 إ دا 201 12 4 SS 176 191 7-9-15 CL j BROWN SILTY CLAYMo SI BROKEN FRAGMENT OF GRAVEL DARK GRAY May be conducted Continued Next Page TYPE OF CASING USED PIEZOMETER TYPE. PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE NO-2 ROCK GORE 61 x 3 25 HSA SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC 9"x,8.75,88A WHILITYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON TIW CASING AGVANCER. NW CASING SWICASINO. 6" RECORDER REB AIR HAMMER .....



JOB NUMBER | 3031

NUCLER NUCLER	.•	22 6	.TO	8LOWS / 6"	1.1		1f'+T 25	HGY2D	CP.	BROKEN SAND AND GRAVEL SIZE FRAGMENT OF SANDSTONE AND SHALE		
3 3	s	27.6	29.1	2:3:5	12		33		ici.	BROWN SANDY CLAY. to ist, low plasticity.		Approximate/y 23 natural material
7 S	s	32.6	341	7-15-26	10		35			GRAY BROWN SAND AND GRAVEWed to spturated, 20% lines, 1 3/81 max size, rounded to sub-roundeds	Σ'	
8 S		33 5 35 9	36 9 40 ()	79/4	3.0	48		•,	GP	SAME AS SAMPLE NO.7 SATURATED, ANGULAR, 40% FINES GRAY SANOSTONE land well concented, line grain with shale laminations	1	
ż	. !	49 G	495				43			-		Lised 2 15/46 roll bit to advance to Augurs in a bind.
			<u>-</u>				45					: : : : : : : : : :



JOB NUMBER 3031

11/8/95 DR N
18/95 DR N



ithe M	l ik²	B+R - 3	3031				LO	G O	F BURING	النصار
				CHIAN POWE	R CON	PANY		(31)	RING NO HP-9525 DAME 2/7/11 SI	HEFT_1OF 3
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JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY BORING NO. HP-9626 DATE 2/7/11 SHEET 3 OF 3 PROJECT GLEN LYN BOTTOM ASH DIKE BORING START 11/14/95 BORING FIN SH 11/14/95

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JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY PROJECT _ GLEN LYN BOTTOM ASH DIKE

BORING NO HP-9528 DATE 2/7/11 SHEET 2 OF 2 BORING START 11/15/95 BORING SINISH 11/15/95

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JOB NUMBER 3031 SORING NO. HP-9528 DATE 2/7/11 SHEET 1 COMPANY APPALACHIAN POWER COMPANY **CORING FINISH** 11/15/95 ....._ BORING START 11/15/95 PROJECT GLEN LYN BOTTOM ASH DIKE WELL TYPE , NA COORDINATES N 386,682.4 E 1,313,336.1 PIEZOMETER TYPE NVA HGT RISER ABOVE GROUND NIA, .... GROUND ELEVATION 1515.3 SYSTEM STATE PLANE DEPTH TO FOR OF WELL SCREEN INVA. SOLTON INVA. Water Level, ft 🔝 WELL DEVILOPMENT SEE NOTE | BACKFILL QUICK GROUT 11841-**CME-75** FIELD PARTY TJH-REB DATE PEET S STANDARD THE PENETRALICH CONTROL CONTR STANDARD SAMPLE DROLLERS DEPTH SOIL/ROCK IN FELT IDLINITICICATION NOTES: BLOWS / 6" FROM TO 11-16-95 TIME Ph COND. REDOX TEMP. Pump lest one from tal appreximately 5 9:42 7.42 276 318 19.81C GPM prior to test by plant 9:46 7.57 ? 293 19.67C 9:48 7.60 ZTB 283 19.83C 9:51 7.59 280 270 19.83C personal Packers set betwenn 29 G 10 1 88 25 4.0 9:54 SAMPLE TAKEN and 40% 9:65 7.56 279 260 19 69 DARK BROWN SANDY CLAYMOST to well with trace of pea size gravet. : Water return at all times BLACK MIXTURE OF CLAY AND BOTTOM 9.0 1 1 88 7.5 2-3-5 0.4 ASH Most 소기 10 BLACK BOTTOM ASH/oist 4.5.5SS 12.5 14 0 15 Approximately 17.5 SC ! BROWN CLAYEY SANDJool to wet, slight 4 \$5, 175 190 to non plasticity. natural material (28) ながらないまるから Continued Next Page TYPE OF CASING USED ING 2 ROCK CORE PREZOMETER TYPE | PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE 61x375168A. SLOTTED SCREEN, G = CEONOR, P = PNEUMATIC 9" x 6 25 H\$A HWICASING ADVANCER. WELL TYPE OW TOPEN TUBE SLOTTED SCREEN, GM TIGEOMON. NW CASING ____ SWICASING RECORDER REB ARCHAMMER



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# AMERICAN ELECTRIC POWER SERVICE CORPORATION AEP CIVIL ENGINEERING LABORATORY LOG OF BORING



JOB NUMBER 3031 SHEFT 1 OF COMPANY APPALACHIAN POWER COMPANY BORING NO. HP-9526 DATE 2/7/11 BORING FIN SH 11/9/95 CORING START 11/8/95 PROJECT GLEN LYN BOTTOM ASH DIKE WITCH TYPE NVA ...... PIEZOMETER TYPE: NIA. COURDINATES N 387,441.9 E 1,312,324.2 HGT RISER AROVE GROUND NA CROUND ELEVATION 1508.9 DIA SYSTEM STATEPIANE DEPTH TO TUPICS WELL SCREEN NIA BOTTON NIA Water Level 4 17.9 BACKFILL QUICK GROUT WHILL DEVELOPMENT SEE NOTE 7:00 TIME RIG CME-75 HELD PARTY TJH-REB DATE 11-9-95 STANDARD TERMIN OF SENTING PRESISTANCE CHANGE OF SENTING SENTI SAMPLE SAMPLE NUNDER SAMPLE SOIL/ROCK DRUG ER'S DEPTH SHAME IN FEET NOTES IDENTIFICATION. FROM TO 11-9-95 Freeig test and hour al approximately 5 TIME Ph. GOND, REDUX LEMP 11:35 6.65 278 33D 17.36C GPM pnor to lest by plant 11:4<u>0 6.95 287</u> 285 16.53C 11:42 7.02 286 262 15.45C 11:45 7 03 286 249 16.45C personal Patker self between 23.5 and 1 88 2.5 40 7/9-19 11:47 SAMPLE TAKEN 34.01 11:60 7.03 285 227 16.49C BROWN SANDY CLAYTrace of gravel and Water return at all timas. CL : MULTI-COLORED SANDY CLAYDry, WIR Augered through 0.016,22.26 2 88 7.5 1.: holders and hard some sandstone and shate gravel size. gan area maleri31 10 FOIL BROWN SANDY OF AYMORD, low plassicity Approximately 12.5 98 125 140 9-8-10 1.1 natural moleculwith trace of wood. 15 BROWN SILTY SAND AND GRAVELVEI to 188 175 190 19/15/19 1.0 saturated, burneed to sele rounded, 30 A. Tries. Continued Next Page TYPE OF CASING USED PINZOMETER TYPE | PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE NG 2 BOCK CORE *** X., 6% x 3.25 USA SLOTTED SCREEN, C = CEONOR, P = PNEUMATIC9" x 6 25 USA HWICASING ADVANCER. WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON NW CASING 3" SWICASING. RECORDER REB

#### APPENDIX A

#### **Document 7**

Letter from Virginia Department of Conservation and Recreation, December 29, 2011, Glen Lyn Flyash Dam #07101





#### COMMONWEALTH of VIRGINIA

#### DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street Richmond, Virginia 23219-2010 (804) 786-1712

December 29, 2011

Dewberry Attn: Jerome Strauss P.E. 8401 Arlington Boulevard Fairfax, Virginia 22031

Re: Comments for Coal Combustion Residue Impoundment Round 9 - Dam Assessment Report, Glen Lyn Power Plant, Glen Lyn Flyash Dam #07101

Dear Jerry,

Thank you for providing Virginia Department of Conservation and Recreation Dam Safety Region 4 the opportunity of including some comments on the Glen Lyn Power Plan Ash Pond Management Units for possible inclusion in the above referenced report. The following are my comments:

#### Summary

Under the provisions of 4VAC50-20-220 Unsafe Conditions, C. Nonimminent danger..." the of the Virginia Department of Conservation and Recreation Impounding Structure Regulations, Thomas I. Roberts, P.E., C.F.M. Regional Dam Safety Engineer intends to provide American Electric Power (AEP), a draft report in January 2012 indicating known deficiencies in the dam, and in February 2012 recommend that the current Regular Certificate to Operate the dam be replaced with a Conditional Certificate to Operate the dam. The Conditional Certificate to Operate the dam will contain a listing of requirements and completion dates that must be met by AEP. Once AEP has satisfactorily met the minimum safety requirements for their dam, AEP may apply for a new Regular Certificate to Operate and Maintain the dam.

#### Current Conditions

The Glen Lyn Flyash Dam, NID #VA07101, currently has a Regular Certificate to Operate and Maintain issued March 20, 2008 and expires March 31, 2014. Our records indicate that it is 43 feet high and has a potential storage capacity of 300 acre-feet. The dam had functioned by pumping flyash/water slurry into the impoundment in the past but the piping is currently disconnected. A potentially limited amount of storm water can flow into the facility. Based on information mentioned by AEP personnel onsite and conditions observed (rodent hole expelled material) it appears that the bulk of the embankment is made of coal combustion residue

materials. Several rodent holes were observed onsite and file data indicates there is a long history of rodents residing in the embankment. Woody vegetation control on the dam does not comply with the minimum standards in the regulations. There is no Auxiliary Spillway (Emergency Spillway) and the safe reliable operation of the principal spillway is doubtful. No calculations are available for the safe spillway capacity for this structure. Though AEP staff have indicated in recent years that there is an intent to decommission the dam and make it no longer a regulated impounding structure, nothing has been provided to VA DCR Dam Safety & FM to date on this.

#### Hazard Classification

The facility has been listed for many years as a Low Hazard Dam due to the proximity of the New River. The Hazard Classifications for dams in Virginia is based on the Virginia Impounding Structure Regulations (Dam Safety) 4VAC50-20-40 "Hazard potential classifications of impounding structures.

- A. Impounding structures shall be classified in one of three hazard classifications as defined in subsection B of this section and Table 1.
- B. For the purpose of this chapter, hazards pertain to potential loss of human life or damage to the property of others downstream from the impounding structura in event of failure or faulty operation of the impounding structure or appurtenant facilities. Hazard potential classifications of impounding structures are as follows:
- 1. High Hazard Potential is defined where an impounding structure failure will cause probable loss of life or serious economic damage. "Probable loss of life" means that impacts will occur that are likely to cause a loss of human life, including but not limited to impacts to residences, businesses, other occupied structures, or major roadways. Economic damage may occur to, but not be limited to, building(s), industrial or commercial facilities, public utilities, major roadways, railroads, personal property, and agricultural interests. "Major roadways" include, but are not limited to, interstates, primary highways, high-volume urban streets, or other high-volume roadways.
- 2. Significant Hazard Potential is defined where an impounding structure failure may cause the loss of life or appreciable economic damage. "May cause loss of life" means that impacts will occur that could cause a loss of human life, including but not limited to impacts to facilities that are frequently utilized by humans other than residences, businesses, or other occupied structures, or to secondary roadways. Economic damage may occur to, but not be limited to, building(s), industrial or commercial facilities, public utilities, secondary roadways, railroads, personal property, and agricultural interests. "Secondary roadways" include, but are not limited to, secondary highways, low-volume urban streets, service roads, or other low-volume roadways.

- 3. Low Hazard Potential is defined where an impounding structure failure would result in no expected loss of life and would cause no more than minimal economic damage. "No expected loss of life" means no loss of human life is anticipated
- C. The hazard potential classification shall be proposed by the owner and shall be subject to approval by the board. To support the appropriate hazard classification, dam break analysis shall be conducted by the owner's engineer. Present and planned land-use for which a development plan has been officially approved by the locality in the dam break inundation zones downstream from the impounding structure shall be considered in determining the classification.
- D. Impounding structures shall be subject to reclassification by the board as necessary."

With the knowledge of economic costs and environmental damage caused by failures of other Coal Combustion Residue Impoundments, the currently listed "Low Hazard" classification might not be the correct current hazard classification based on the Virginia regulatory definitions. One important issues that arises from the Hazard Classification is the minimum required safe spillway capacity.

#### Minimum Required Safe Spillway Capacity

Once the actual hazard classification has been determined, Table 1 of 4VAC50-20-50 "Performance Standards Required for Impounding Structures" is used to determine the minimum safe spillway capacity.

Hazard Potential Class of Dam	Spillway Design Flood (SDF) ^B For New Structures ^F	Spillway Design Flood (SDF) ⁸ for Existing Impounding Structures ^{F,G}	Minimum Threshold for Incremental Damage Analysis
High	PMF	0.9 PMP ^H	100-YR ^D
Significant	50 PMF	.50 PMF	100-YR ^D
Low	100-YR ^D	100-YR ^D	50-YR ^E

Since the main hazard in this dam is the material impounded and the material in the dam, an Incremental Damage Analysis under the provisions of 4VAC50-20-52 would not be applicable for this dam.

An analysis of the inflow and safe outflow for this structure is required. Past claims that the facility has the capacity impound the Probable Maximum Flood (PMF) have not been substantiated with adequate calculations based on present conditions.

#### Structural Stability

With the history of rodent burrows on the dam, the unknowns on how much of the impoundment will fill under extreme conditions and the poor conditions of outlet structures, the adequate structural stability of the embankment is in doubt. Even ignoring the potential for piping failure due to the rodent burrows, the files indicate that structural stability calculations have not been provided based on full pond.

#### Conclusion

With the better understanding of the inherent environmental and economic dangers posed by a the failure of a Coal Combustion Residue Impoundments, especially one that is at least partially constructed of Coal Combustion Residue materials, AEP as owner, should immediately take action to bring this dam at least in compliance with the minimum safety standards in the Virginia Impounding Structure Regulations.

Please contact me if there are questions on my comments above at: Thomas I. Roberts, P.E., C.F.M., Region 4 Dam Safety Engineer, VA DCR Dam Safety & Floodplain Management, 8 Radford Street, Christiansburg, Virginia, 24073. Phone 540-394-2550, and e-mail Thomas Roberts@dcr.virginia.gov.

Sincerely

Thomas I. Roberts P.E., C.F.M.

cc Robert Bennett, P.E, R.A., C.F.M., Div. Director VA DCR Dam Safety & Floodplain Management

# APPENDIX A

# **Document 8**

Letter from Virginia Department of Conservation and Recreation, December 29, 2011, Glen Lyn Bottom Ash Dam #07102





# COMMONWEALTH of VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street Richmond, Virginia 23219-2010 (804) 786-1712

December 29, 2011

Dewberry Attn: Jerome Strauss P.E. 8401 Arlington Boulevard Fairfax, Virginia 22031

Re: Comments for Coal Combustion Residue Impoundment Round 9 – Dam Assessment Report, Glen Lyn Power Plant, Glen Lyn Bottom Ash Dam #07102

Dear Jerry,

Thank you for providing Virginia Department of Conservation and Recreation Dam Safety Region 4 the opportunity of including some comments on the Glen Lyn Power Plan Ash Pond Management Units for possible inclusion in the above referenced report. The following are my comments:

### Summary

Under the provisions of 4VAC50-20-220 Unsafe Conditions, C. Nonimminent danger..." the of the Virginia Department of Conservation and Recreation Impounding Structure Regulations, Thomas I. Roberts, P.E., C.F.M. Regional Dam Safety Engineer intends to provide American Electric Power (AEP), a draft report in January 2012 indicating known deficiencies in the dam, and in February 2012 recommend that the current Regular Certificate to Operate the dam be replaced with a Conditional Certificate to Operate the dam. The Conditional Certificate to Operate the dam will contain a listing of requirements and completion dates that must be met by AEP. Once AEP has satisfactorily met the minimum safety requirements for their dam, AEP may apply for a new Regular Certificate to Operate and Maintain the dam.

### Current Conditions

The Glen Lyn Bottom Ash Dam, NID #VA07102, currently has a Regular Certificate to Operate and Maintain issued March 20, 2008 and expires March 31, 2014. Our records indicate that it is 28 feet high and has a potential storage capacity of 90 acre-feet. The dam had functioned by pumping bottom ash/water slurry into the impoundment. Some storm water from U.S. 460 flows into the facility. Based on information mentioned by AEP personnel onsite and conditions observed it appears that the bulk of the embankment is made of coal combustion residue materials. Woody vegetation control on the dam does not comply with the minimum

standards in the regulations. There is no Auxiliary Spillway (Emergency Spillway) and the safe reliable operation of the principal spillway is doubtful. No calculations are available for the safe spillway capacity for this structure. Copper fine mesh screen used over the outlet structure was observed onsite in the grass adjacent to the only outlet structure.

### Hazard Classification

The facility has been listed for many years as a Low Flazard Dam due to the proximity of the New River. The Hazard Classifications for dams in Virginia is based on the Virginia Impounding Structure Regulations (Dam Safety) 4VAC50-20-40 "Hazard potential classifications of impounding structures.

A. Impounding structures shall be classified in one of three hazard classifications as defined in subsection B of this section and Table 1.

- B. For the purpose of this chapter, hazards pertain to potential loss of human life or damage to the property of others downstream from the impounding structure in event of failure or faulty operation of the impounding structure or appurtenant facilities. Hazard potential classifications of impounding structures are as follows:
- 1. High Hazard Potential is defined where an impounding structure failure will cause probable loss of life or serious economic damage. "Probable loss of life" means that impacts will occur that are likely to cause a loss of human life, including but not limited to impacts to residences, businesses, other occupied structures, or major roadways. Economic damage may occur to, but not be limited to, building(s), industrial or commercial facilities, public utilities, major roadways, railroads, personal property, and agricultural interests. "Major roadways" include, but are not limited to, interstates, primary highways, high-volume urban streets, or other high-volume roadways.
- 2. Significant Hazard Potential is defined where an impounding structure failure may cause the loss of life or appreciable economic damage. "May cause loss of life" means that impacts will occur that could cause a loss of human life, including but not limited to impacts to facilities that are frequently utilized by humans other than residences, businesses, or other occupied structures, or to secondary roadways. Economic damage may occur to, but not be limited to, building(s), industrial or commercial facilities, public utilities, secondary roadways, railroads, personal property, and agricultural interests. "Secondary roadways" include, but are not limited to, secondary highways, low-volume urban streets, service roads, or other low-volume roadways.
- 3. Low Hazard Potential is defined where an impounding structure failure would result in no expected loss of life and would cause no more than minimal economic damage. "No expected loss of life" means no loss of human life is anticipated

- C. The hazard potential classification shall be proposed by the owner and shall be subject to approval by the board. To support the appropriate hazard classification, dam break analysis shall be conducted by the owner's engineer. Present and planned land-use for which a development plan has been officially approved by the locality in the dam break inundation zones downstream from the impounding structure shall be considered in determining the classification.
- D. Impounding structures shall be subject to reclassification by the board as necessary."

With the knowledge of economic costs and environmental damage caused by failures of other Coal Combustion Residue Impoundments, the currently listed "Low Hazard" classification might not be the correct current hazard classification based on the Virginia regulatory definitions. One important issue that arises from the Hazard Classification is the minimum required safe spillway capacity.

## Minimum Required Safe Spillway Capacity

Once the actual hazard classification has been determined, Table 1 of 4VAC50-20-50 "Performance Standards Required for Impounding Structures" is used to determine the minimum safe spillway capacity.

Hazard Potential Class of Dam	Spillway Design Flood (SDF) ^B For New Structures ^F	Spillway Design Flood (SDF) ⁸ for Existing Impounding Structures ^{F,G}	Minimum Threshold for Incremental Damage Analysis
High	PMF ^C	0.9 PMP ^H	100-YR ⁰
Significant	.50 PMF	.50 PMF	100-YR ⁰
Low	100-YR ^D	100-YR ⁵	50-YR ^E

Since the main hazard in this dam is the material impounded and the material in the dam, an Incremental Damage Analysis under the provisions of 4VAC50-20-52 would not be applicable for this dam.

An analysis of the inflow and safe outflow for this structure is required that includes flow runoff from U.S. 460. Past claims that the facility has the capacity to impound the Probable Maximum Flood (PMF) have not been substantiated with adequate calculations based on present conditions.

### Structural Stability

AEP staff mentioned that the stability calculations provided only were for a additional pool depth of 3' rather than the additional depth of 14' to top of the embankment. With unaccounted for drainage entering the impoundment from U.S. 460, unreliable outlet structures due to the installation of screens that can clog, and the embankment made from Coal Combustion Residue materials the structural stability of the embankment is in doubt. The files indicate that structural stability calculations have not been provided based on full pond.

### Conclusion

With the better understanding of the inherent environmental and economic dangers posed by a the failure of a Coal Combustion Residue Impoundments, especially one that is at least partially constructed of Coal Combustion Residue materials, AEP as owner, should immediately take action to bring this dam at least in compliance with the minimum safety standards in the Virginia Impounding Structure Regulations.

Please contact me if there are questions on my comments above at: Thomas I. Roberts, P.E., C.F.M., Region 4 Dam Safety Engineer, VA DCR Dam Safety & Floodplain Management, 8 Radford Street, Christiansburg, Virginia, 24073. Phone 540-394-2550, and e-mail Thomas Roberts@dcr.virginia.gov.

Sincerely

Thomas I. Roberts P.E., C.F.M.

cc Robert Bennett, P.E, R.A., C.F.M., Div. Director VA DCR Dam Safety & Floodplain Management

# **APPENDIX B**

# APPENDIX A

# Document 9

Fly Ash Pond, Dam Inspection Checklist



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Site Name:	Glen Lyn Plant	Date:	February 16, 2011
Unit Name:	Auxiliary Fly Ash Pond	Operator's Name:	Appalachian Power
Unit I.D.:	NID: VA07101	Hazard Potential Classification:	High Significant Low
	Inspector's Name:	Scott Clarke, P.E. and Lorainr	ne Ramos Nieves, P.E., CFM

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.

Note: Comments regarding each issue number have been listed below as needed.

<u>lssue #</u>	Yes	No	<u>Issue #</u>	Yes	No
Frequency of Company's Dam Inspections?	>		18. Sloughing or bulging on slopes?		~
2. Pool elevation (operator records)?		~	19. Major erosion or slope deterioration?		~
Decant inlet elevation (operator records)?	>		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?		N/A	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
If instrumentation is present, are readings recorded (operator records)?	>		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		<b>~</b>	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		<b>~</b>	From underdrain?		~
Trees growing on embankment? (If so, indicate largest diameter below)	<b>&gt;</b>		At isolated points on embankment slopes?		~
10. Cracks or scarps on crest?		~	At natural hillside in the embankment area?		~
11. Is there significant settlement along the crest?		~	Over widespread areas?		~
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		~
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		<b>~</b>	"Boils" beneath stream or ponded water?		•
14. Clogged spillways, groin or diversion ditches?		~	Around the outside of the decant pipe?		~
15. Are spillway or ditch linings deteriorated?		~	22. Surface movements in valley bottom or on hillside?		~
16. Are outlets of decant or underdrains blocked?		~	23. Water against downstream toe?	~	
17. Cracks or scarps on slopes?		~	24. Were Photos taken during the dam inspection?	~	

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.

Issue #	Comments
1.	Impoundments are inspected quarterly by the plant personal and annually through an outside consultant.
2.	The Auxiliary Fly Ash Pond is currently inactive and on the day of the assessment had no significant pooling behind the dike; no normal pool elevations were available for this impoundment.
3.	The invert at the Auxiliary Fly Ash Pond outlet is ±1502.0'
5.	A quarterly inspection report indicates a lowest crest elevation of 1540.0' for the the Auxiliary Fly Ash Pond. Plan view hard copies of pond surveys completed in 2007 confirm listed elevations.
6.	According to the plant owner, instrumentation at either impoundment was installed with the intent of being temporary; no continual record of readings is kept for piezometers or observation wells at either impoundment. The



	only readings recorded as part of the quarterly reports are pond elevations, as previously noted.
9.	Between the toe of the northeastern embankment and the New River there is significant tree growth; largest tree size ranged from 12"- 18" diameter. Several tree saplings ranging from 2.0" to 2.5" diameter were observed along the northeastern inside groin. Virginia DCR requires a 25 ft clear zone (i.e. no trees) beyond the toe of all impounding structures.
20.	The second impoundment, Auxiliary Fly Ash Pond, is currently inactive and had no pooling behind the dike; no discharge could be seen leaving impoundment through the outlet.
23.	The Auxiliary Fly Ash Pond has Adair Run along the southeastern embankment and the New River along the northeastern embankment.
*	Three animal burrows were observed along the northeastern embankment of the Auxiliary Fly Ash Pond. The first was located at the north end of the toe of the embankment. The remaining burrows were flagged for maintenance by the plant personal; one located midway up the embankment towards the midpoint of the pond and the other located about three quarters of the way up the embankment between the midpoint and southern end of the embankment.

# **US EPA ARCHIVE DOCUMENT**

# Coal Combustion Waste (CCW) **Impoundment Inspection**

Impoundment	NPDES Peri	wit VA 00003	370 / Outfall	INSPECTO	R Scott Clarke Nieves, P.E.	e, P.E. and Lor , CFM	ainne Ramos
Impou	Da ndment Na	<b>ate</b> February <b>me</b> Auxiliary	16, 2011 Fly Ash Pond (Ir	nactive)			
Impoundm	nent Compa EPA Regi		alachian Power				
Name of I	State Ager ffice) Addre mpoundme	ess Floodpla ent Auxiliary	Department of C in Management Fly Ash Pond (Ir	; 8 Radford S nactive)	t., Suite 201 Ch	ristiansburg, V	A 24073
	ach impoun		parate form und	der the same	Impoundment I	NPDES Permit i	number)
New 🔀		Update			Yes		No
	v currently	being pumped	ently under condinate into the important	undment?	osal		
			Hinton, West Vi	, ,			
Distance fr	om the imp	ooundment:	20.5 mi.				
Location: Latitude	37	Degrees	22	Minutes	42.8	Seconds	N
Longitude	80	Degrees	52	Minutes	32.1	Seconds	W
	State	Virginia		<b>County</b> G	iiles		
	Does a sta	ate agency reg	ulate this impo		Yes		No
		ŀ	f So Which Stat	0 1 20 00 01 J	Virginia DCR, Di Floodplain Mar		



HAZARD POTEN	NTIAL (In the event the impoundment should fail, the following would occur):
	<b>LESS THAN LOW HAZARD POTENTIAL:</b> 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.
	<b>SIGNIFICANT HAZARD POTENTIAL:</b> 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.
	<b>HIGH HAZARD POTENTIAL:</b> 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:**

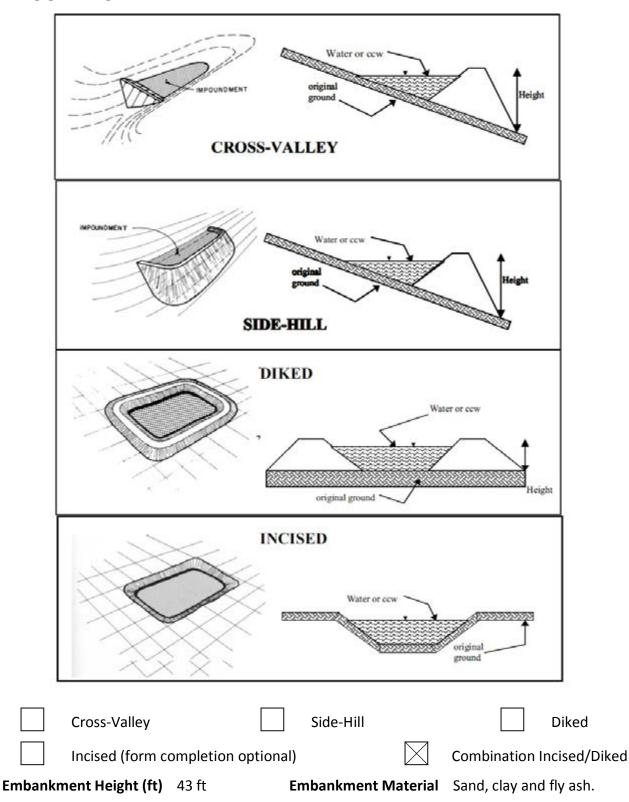
Auxiliary Fly Ash Pond is located along the left bank of the New River and portion of the left bank of Adair Run near its confluence with the New River. A failure of this facility would be limited to the New River and/or Adair Run with no probable loss of human life and relatively low economic and/or environmental losses. Virginia DCR, Division of Dam Safety and Floodplain Management, currently regulate this facility as a low hazard impoundment.

Pool Area (ac) 10 acre-ft

**Current Freeboard (ft)** N/A



### **CONFIGURATION:**



1"-3" thick

Liner

**Liner Permeability** Clay



# TYPE OF OUTLET (Mark all that apply)

	Open Channel Spillw	<i>y</i> ay	
	Trapezoidal	<u>TRAPEZOIDAL</u> <u>TRIANGULAR</u>	
	Triangular	Top Width  Top Width	
	Rectangular	Depth	- 2
	Irregular	Bottom	
	depth (ft)	Width	
	average bottom width (ft)	RECTANGULAR IRREGULAR	
	top width (ft)	Depth Width  Avg Depth  Width	
	Outlet (Inactive)		
	24" inside diameter		
<u>M</u>	aterial_		
	corrugated metal	Inside Diameter	
	welded steel		
	concrete		
	plastic (hdpe, pvc, etc.)		
	other (specify):		
		Yes No	
	Is water flowing through out	the   let?	
	No Outlet		
	Other Type of Outlet		

The Impoundment was Designed By AEP Engineers

(specify):



# The Impoundment was Designed By AEP Engineers

		Yes	No	
Has there ever been a failure at this si	te?			
If So Whe	n?	Prior	to	1978.

### If So Please Describe:

Documents supplied by the Owner indicated that a slope failure of the northern dike occurred upon first filling of the pond as well as a 10 ft deep sink hole along the southwest corner of the dike. The slope failure and sinkhole incidents appear to have occurred at separate times prior to 1978; however, no documentation could be found that confirmed a spill and/or release of CCRs due to these incidents.



Yes No

Has there ever been significant seepages at this site?

 $\square$ 

If So When? Prior to 1978.

### If So Please Describe:

Documents supplied by the Owner indicated that a slope failure of the northern dike occurred upon first filling of the pond as well as a 10 ft deep sink hole along the southwest corner of the dike. The slope failure and sinkhole incidents appear to have occurred at separate times prior to 1978; however, no documentation could be found that confirmed a spill and/or release of CCRs due to these incidents.

	Yes	No
Has there ever been any measures undertaken to		
monitor/lower Phreatic water table levels based		
on past seepages or breaches		
at this site?		
If so, which method (e.g., piezometers, gw		
pumping,)?		

If So Please Describe:

### **ADDITIONAL INSPECTION QUESTIONS**

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No plans or information were available at the time of the site visit regarding embankment foundation. Information has been requested from AEP and will be provided after clearing AEP legal.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The AEP Senior Civil Engineer and the AEP Geotechnical Engineer for the Glen Lyn Plant were both present during the site visit, however no plans or information were available at the time of the site visit regarding the design foundation preparation. Information has been requested from AEP and will be provided after clearing AEP legal.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No evidence of prior releases, failures, or patchwork on dikes could be noted at the time of the site visit.

# APPENDIX A

# **Document 10**

Bottom Ash Pond, Dam Inspection Checklist



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Site Name:	Glen Lyn Plant	Date:	February 16, 2011
Unit Name:	Bottom Ash Pond	Operator's Name:	Appalachian Power
Unit I.D.:	NID: VA07102	Hazard Potential Classification:	High Significant Low
	Inspector's Name:	Scott Clarke, P.E. and Lorainr	ne Ramos Nieves, P.E., CFM

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.

Note: Comments regarding each issue number have been listed below as needed.

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

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.

Issue #	Comments
1.	Impoundments are inspected quarterly by the plant personal and annually through an outside consultant.
2.	A quarterly inspection report, titled Dike Inspection Checklist, indicates normal pool elevations at 1505.5', 1506.3' and 1501.3' for the North Bottom Ash Pond, South Bottom Ash Pond and Clearwater Pond, respectively.
5.	A quarterly inspection report indicates a lowest crest elevation of 1515.0' for the Bottom Ash Pond. Plan view hard copies of pond surveys completed in 2007 confirm listed elevations.
6.	According to the plant owner, instrumentation at either impoundment was installed with the intent of being temporary; no continual record of readings is kept for piezometers or observation wells at either impoundment. The only readings recorded as part of the quarterly reports are pond elevations, as previously noted.



9.	Several tree saplings ranging from 1.0"-1.5" diameter were observed protruding from riprap armor along the northern embankment of the Bottom Ash Pond (adjacent to the New River). Additional tree clusters were also observed on either end of the riprap armor, largest tree size ranged from 18"- 24" diameter. The eastern embankment of the Bottom Ash Pond (adjacent to the East River) had plentiful tree cover, largest tree size ranged from 12"- 18" diameter.
16.	The Bottom Ash Pond outlet to East River was partially obstructed with sediment.
19.	The northeastern groin area of the cleanwater pond cell of the Bottom Ash Pond has been armored with riprap to prevent further slope deterioration due to erosion. In addition, some slope deterioration of the interior slope is noted along the eastern embankment of the bottom ash clear water pond cell, near the access walkway to outlet structure.
23.	The Bottom Ash Pond has the New River along the downstream toe of the northern embankment and the East River along the downstream toe of the eastern embankment.

# **US EPA ARCHIVE DOCUMENT**

# Coal Combustion Waste (CCW) **Impoundment Inspection**

Impoundment	NPDES Peri	wit VA 00003	370/ Outfall	INSPECTO	Scott Clarke Nieves, P.E.	e, P.E. and Lo , CFM	rainne Ramos
Impou	Da ndment Na	•	16, 2011 Ash Pond				
Impoundn	nent Compa EPA Regi		alachian Power				
-	State Ager Office) Addro	<b>ess</b> Floodpla	Department of ( in Managemen Ash Pond				•
(Report e	ach impoun	ndment on a se	parate form un	der the same	Impoundment I	NPDES Permit	number)
New 🔀		Update					
	w currently	being pumpe	ently under cond into the impo	undment?	Yes  disposal.		No 
Nearest Do	wnstream T	own Name:	Hinton, West V	irginia.			
Distance fr	rom the imp	ooundment:	20.5 mi.				
Location: Latitude	37	Degrees	22	Minutes	21.4	Seconds	N
Longitude	80	Degrees	51	Minutes	55.6	Seconds	w
	State	Virginia		<b>County</b> G	iles		
	Does a sta	ate agency reg	ulate this impo	undment?	Yes		No
		ı	f So Which Stat	ο Λαοριού)	Virginia DCR, Di Floodplain Mar		



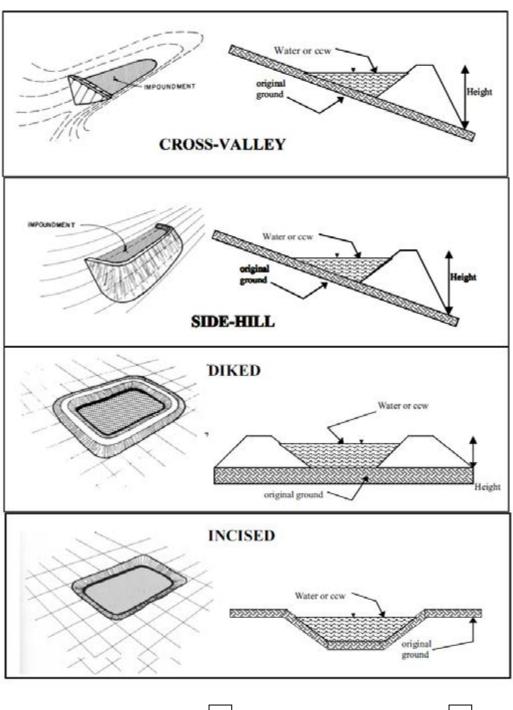
HAZARD POTEN	VIIAL (In the event the impoundment should fail, the following would occur):
	<b>LESS THAN LOW HAZARD POTENTIAL:</b> Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.
	LOW HAZARD POTENTIAL: Dams assigned the low hazard potential 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.
	<b>SIGNIFICANT HAZARD POTENTIAL:</b> 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.
	<b>HIGH HAZARD POTENTIAL:</b> 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:**

Bottom Ash Pond is located along the left bank of the New River and portion of the right bank of the East River near its confluence with the New River. A failure of this facility would be limited to the New River and/or East River with no probable loss of human life and relatively low economic and/or environmental losses. Virginia DCR, Division of Dam Safety and Floodplain Management, currently regulate this facility as a low hazard impoundment.



## **CONFIGURATION:**



Cross-Valley Side-Hill Diked

Incised (form completion optional) Combination Incised/Diked

Embankment Height (ft) 27 ft Embankment Material Clayey Shale

Pool Area (ac) 5.8 acre-ft Liner None

Current Freeboard (ft) 17.5 ft / 17.5 ft / 21.7 ft (Normal Freeboard) Liner Permeability None



# TYPE OF OUTLET (Mark all that apply)

	Open Channel Spillw	ay		
	Trapezoidal	TRAPEZOIDAL		TRIANGULAR
	Triangular	То	p Width	Top Width
	Rectangular		epth	Depth Depth
	Irregular	4	Bottom	✓ •
	depth (ft)	1	Vidth	
	average bottom width (ft)	RECTANGULAR		IRREGULAR
	top width (ft)	Depth		Average Width Avg Depth
	Outlet			
30"	30" inside diameter (Clear	water Pond)		
	18" inside diameter (North	/South Pond)		
<u>M</u>	aterial_		Inside Diameter	)
	corrugated metal (North/So	outh Pond)		
	welded steel			
	Concrete (Cleanwater Pon	d)		
	plastic (hdpe, pvc, etc.)			
	other (specify):			
		Yes	No	
I	s water flowing through outl	IXI		
	No Outlet			
	Other Type of Outlet (specify):			



# The Impoundment was Designed By AEP Engineers

	Yes	No
Has there ever been a failure at this site?		
If So When?		
If So Please Describe :		



	Yes	No
Has there ever been significant seepages at this site?		
If So When?		

If So Please Describe:

Yes	No
	Yes

If So Please Describe:



### **ADDITIONAL INSPECTION QUESTIONS**

Concerning the embankment foundation, was the embankment construction built over wet ash, slag, or other unsuitable materials? If there is no information just note that.

No plans or information were available at the time of the site visit regarding embankment foundation. Information has been requested from AEP and will be provided after clearing AEP legal.

Did the dam assessor meet with, or have documentation from, the design Engineer-of-Record concerning the foundation preparation?

The AEP Senior Civil Engineer and the AEP Geotechnical Engineer for the Glen Lyn Plant were both present during the site visit, however no plans or information were available at the time of the site visit regarding the design foundation preparation. Information has been requested from AEP and will be provided after clearing AEP legal.

From the site visit or from photographic documentation, was there evidence of prior releases, failures, or patchwork on the dikes?

No evidence of prior releases, failures, or patchwork on dikes could be noted at the time of the site visit.