DRAFT

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:

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727
April 2011

INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response the U.S. EPA is assessing the stability and functionality of coal combustion ash impoundments and other management units across the country and, as necessary, identifying 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

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management units) 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 its first wave of 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 by-products 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. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

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.

Factors considered in determining the hazard potential classification of the management units(s) included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

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).

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.

DRAFT

Table of Contents

Page

EXHIBITS

APPENDIX A

APPENDIX B

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 unsigned and unsealed.

An analysis should also be performed that assumes the facility acts as an impoundment with a permanent pool at the crest of the existing spillway.

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.

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.

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.

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.

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 and Bottom Ash Pond are 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

Perform a stability analysis of the Fly Ash Pond that assumes a proposed breaching of 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 as it appears that this was not addressed in either stability analysis report.

1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that the Owner confirm with VA DCR, Division of Dam Safety whether or not a hydrologic and hydraulic analysis should be performed to evaluate the hydrologic/hydraulic safety of the Fly Ash Pond and Bottom Ash Pond. If so, perform the analysis in accordance with VA DCR requirements, and, if not, document the reasons why the analysis is not required by VA DCR.

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 Dam Safety 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.

DRAFT

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:

Gary Zych, American Electric Power
Senior Engineer, Civil Engineering
Behrad Zand, American Electric Power
Engineer II, Geotechincal Engineering
Frank Tanner, American Electric Power
Glen Lynn Plant Director
Greg Lee, American Electric Power
Thomas I. Roberts, PE, CFM, VA Dept. of Conservation & Recreation
Dam Safety Regional Engineer
Jim Kohler, United States Environmental Protections Agency
LCDR, Public Health Services
Patrick Kelly, United States Environmental Protections Agency
Public Health Services
Scott Clarke, P.E., Dewberry
Associate, Water Resources
Lorainne Ramos Nieves, P.E., CFM, Dewberry
Engineer III, Water Resources

DRAFT

1.3.2 Acknowledgement and Signature

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

Scott Clarke, P.E.	Lorainne 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.

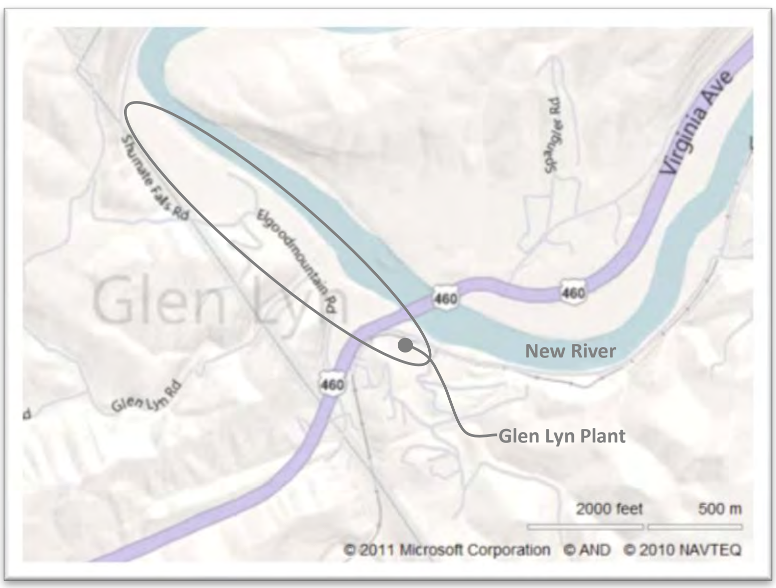


Figure 2.1-1: Location Map

DRAFT

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 1). 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 2). 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

Category	Impoundment 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 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. VA DCR, Division of Dam Safety currently regulates this facility as a Low Hazard impoundment.

The Bottom Ash Pond is located along the left 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.

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 expected	Yes (but not necessary for 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
Normal Pool (feet)	1510	1505.5/1501.3

[1]When pond was active.

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 15), 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 1979 inspection report states that the perimeter embankment was constructed of a lean clay and shale mixture. The Stability Assessment Report assumes the embankment was constructed of lean clay and bottom ash. The original design drawings of the Bottom Ash Pond perimeter embankment are not available.

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 1 and Document 2). 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

<u>Fly Ash Pond</u>

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).

<u>Bottom Ash Pond</u>

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.

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.

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 multi-cell 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 Coal Combustion Dam Inspection Checklist Forms; one for the Fly Ash Pond and one for the Bottom Ash Pond. 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.

DRAFT

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.

DRAFT

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.

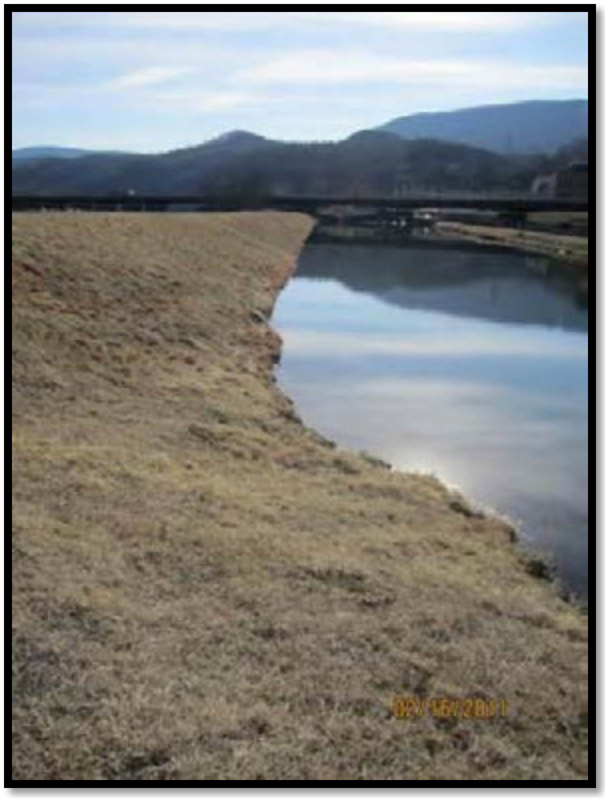


Figure 5.3.2-1: Upstream slope, Southwest.

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.

DRAFT

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.

DRAFT

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.

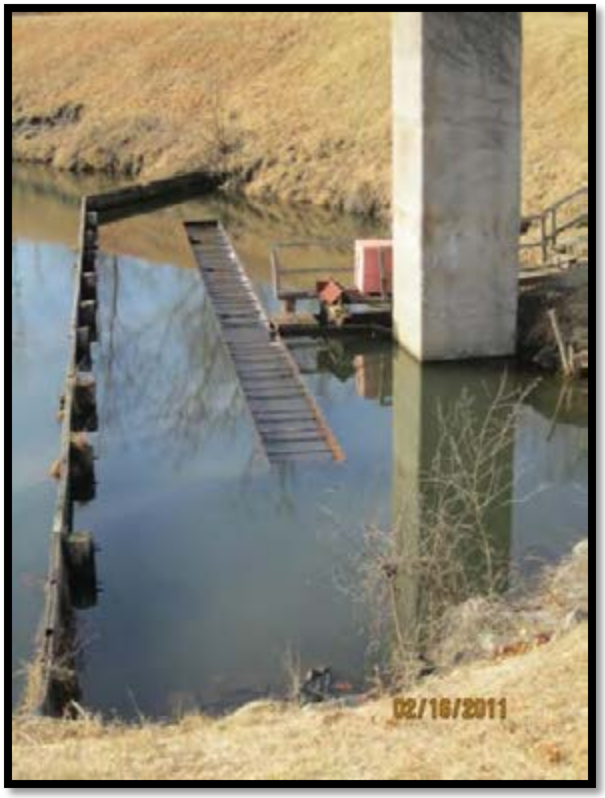


Figure 5.4.1: Outlet Structure, Southwest.

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's 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 (Exhibit 1). These peak flows are comparable to the New River 1% annual chance (100-year) discharges found in the Giles County FIS Study (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 (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.

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 8). 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 16). 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 8). 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 8). 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 (Appendix A, Document 3, Page 6 of 6).

Bottom Ash Pond

Factors of Safety range from 1.08 to 1.73 for static and seismic loading cases (Appendix A, Document 3, Page 6 of 8).

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. As well, the supporting technical documentation submitted to support the structural stability of the Fly Ash Pond appears to be adequate though 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; that the drainage area to the facility is contained to the perimeter dikes; but, that the facility has an undocumented history of the 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).

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; that the drainage area to the facility is contained to the perimeter dikes; but, that 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.

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.

DRAFT

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

USGS science for a changing world

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category: Surface Water | Geographic Area: United States | GO

News updated November, 2010

Peak Streamflow for the Nation

USGS 03176500 NEW RIVER AT GLEN LYN, VA

Available data for this site Surface-water: Peak streamflow GO

Giles County, Virginia
Hydrologic Unit Code 05050002
Latitude 37°22'22", Longitude 80° 51'39" NAD27
Drainage area 3,783 square miles
Gage datum 1,490.11 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- peakfq (watstore) format
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)	Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1878	Sep. 13, 1878	33.10[3]	240,000[2,7]	1962	Dec. 13, 1961	11.28	43,000[6]
1915	Dec. 05, 1914	13.50[3]	38,000	1963	Mar. 13, 1963	12.72	57,000[6]
1916	Jul. 16, 1916	31.10[3]	210,000	1964	Mar. 06, 1964	9.57	29,200[6]
1917	Mar. 05, 1917	13.50[3]	34,000	1965	Mar. 27, 1965	11.39	44,000[6]
1918	Jan. 29, 1918	14.60[3]	40,000	1966	Feb. 14, 1966	14.37	74,000[6]
1919	Oct. 26, 1918	19.00[3]	73,000	1967	Mar. 07, 1967	10.28	34,200[6]
1920	Apr. 03, 1920	12.00[3]	27,000	1968	Mar. 14, 1968	8.65	22,900[6]
1921	Feb. 11, 1921	12.40[3]	29,000	1969	Oct. 19, 1968	9.66	29,600[6]
1922	Mar. 16, 1922	10.40[3]	20,000	1970	Jan. 01, 1970	9.86	31,000[6]
1923	Jun. 13, 1923	15.00[3]	43,000	1971	Feb. 14, 1971	9.31	27,200[6]
1924	Jan. 17, 1924	15.00[3]	43,000	1972	Jun. 22, 1972	17.36	105,000[6]
1925	Dec. 09, 1924	9.70[3]	17,000	1973	May 29, 1973	16.69	93,600[6]
1926	Jan. 19, 1926	12.00[3]	27,000	1974	Apr. 05, 1974	11.75	47,000[6]
1927	Nov. 16, 1926	10.74[3]	42,000	1975	Mar. 14, 1975	14.49	71,400[6]
1928	Aug. 17, 1928	13.47[3]	66,000	1976	Jun. 21, 1976	12.67	55,000[6]
1929	Mar. 01, 1929	10.40[3]	36,100	1977	Apr. 05, 1977	17.16	98,900[6]

1930	Oct. 03, 1929	16.75[3]	99,000	1978	Nov. 07, 1977	18.12	110,000[6]
1931	Aug. 23, 1931	7.66[3]	19,600	1979	Feb. 26, 1979	13.62	63,600[6]
1932	May 02, 1932	7.94[3]	21,200	1980	Apr. 15, 1980	12.08	49,700[6]
1933	Oct. 18, 1932	9.84[3]	32,500	1981	May 29, 1981	9.59	31,600[6]
1934	Mar. 28, 1934		35,000[2]	1982	Feb. 04, 1982	12.14	50,400[6]
1935	Jan. 23, 1935	13.40[3]	63,600	1983	Apr. 10, 1983	12.96	57,100[6]
1936	Feb. 15, 1936	12.00[3]	51,600	1984	Feb. 15, 1984	11.96	48,700[6]
1937	Jan. 20, 1937	10.95[3]	43,500	1985	Aug. 19, 1985	8.95	24,700[6]
1938	Oct. 20, 1937	12.65[3]	56,600	1986	Nov. 05, 1985	12.55	53,600[6]
1939	Jan. 31, 1939	7.60[3]	20,100[6]	1987	Apr. 25, 1987	15.97	85,200[6]
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[6]
1943	Dec. 31, 1942	9.55	33,200[6]	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[6]
1945	Sep. 18, 1945	14.50	76,000[6]	1993	Mar. 24, 1993	17.47	100,000[6]
1946	Jan. 08, 1946	13.50	66,000[6]	1994	Aug. 18, 1994	13.58	62,400[6]
1947	Jan. 21, 1947	11.10	44,700[6]	1995	Jan. 16, 1995	19.83	125,000[6]
1948	Feb. 15, 1948	11.32	46,300[6]	1996	Jan. 19, 1996	18.01	105,000[6]
1949	Dec. 04, 1948	11.66	49,700[6]	1997	Dec. 02, 1996	11.28	43,500[6]
1950	Feb. 02, 1950	9.09	29,600[6]	1998	Apr. 20, 1998	12.93	56,700[6]
1951	Dec. 08, 1950	14.85	79,000[6]	1999	May 15, 1999	6.88	16,300[6]
1952	Mar. 12, 1952	9.90	35,400[6]	2000	Apr. 19, 2000	7.49	18,100[6]
1953	Feb. 22, 1953	11.42	47,100[6]	2001	May 23, 2001	9.82	33,200[6]
1954	Mar. 01, 1954	11.93	51,500[6]	2002	Mar. 19, 2002	11.28	43,500[6]
1955	Apr. 15, 1955	10.13	36,900[6]	2003	Feb. 23, 2003	15.71	82,700[6]
1956	Apr. 17, 1956	11.13	44,700[6]	2004	Nov. 20, 2003	17.40	99,600[6]
1957	Apr. 06, 1957	13.57	66,700[6]	2005	Mar. 29, 2005	10.64	38,900[6]
1958	Mar. 31, 1958	10.41	35,300[6]	2006	Jun. 28, 2006	11.01	41,500[6]
1959	Dec. 29, 1958	12.15	52,000[6]	2007	Mar. 17, 2007	8.54	24,300[6]
1960	Mar. 31, 1960	13.60	66,000[6]	2008	Oct. 27, 2007	8.45	23,700[6]
1961	May 13, 1961	12.14	51,000[6]	2009	May 08, 2009	8.76	25,300[6]

Peak Gage-Height Qualification Codes.

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

DRAFT

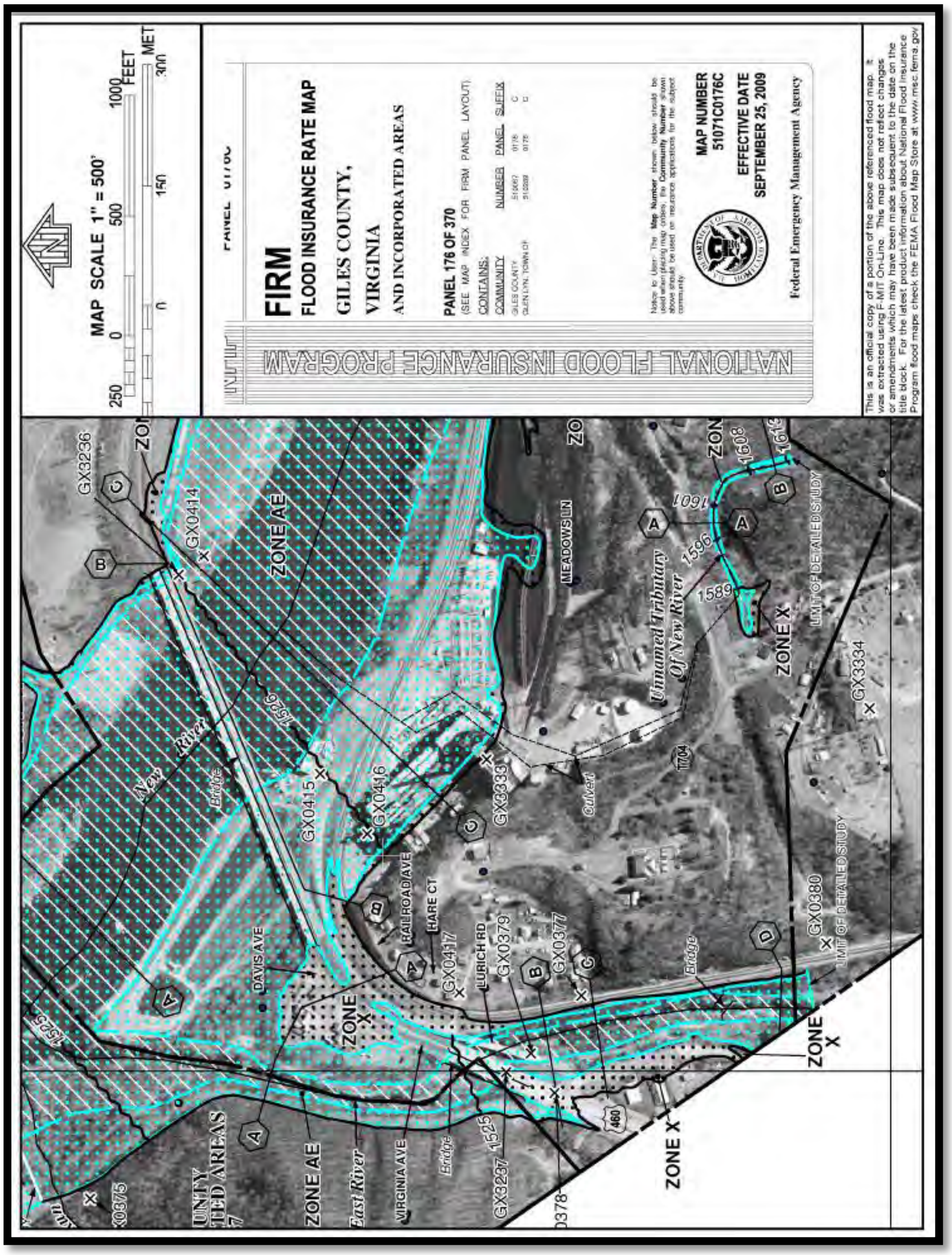
Exhibit 2: FEMA Giles County FIS Study, Table 1-Summary of Discharges.

TABLE 2. SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-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					
At Mouth, Pembroke	24.2	2,200	4,000	5,180	7,900
Johnson Avenue, Pembroke	22.8	2,100	3,850	4,900	7,450
At State Route 688	21.7	2,100	3,600	4,500	6,900
At Jefferson National Forest 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

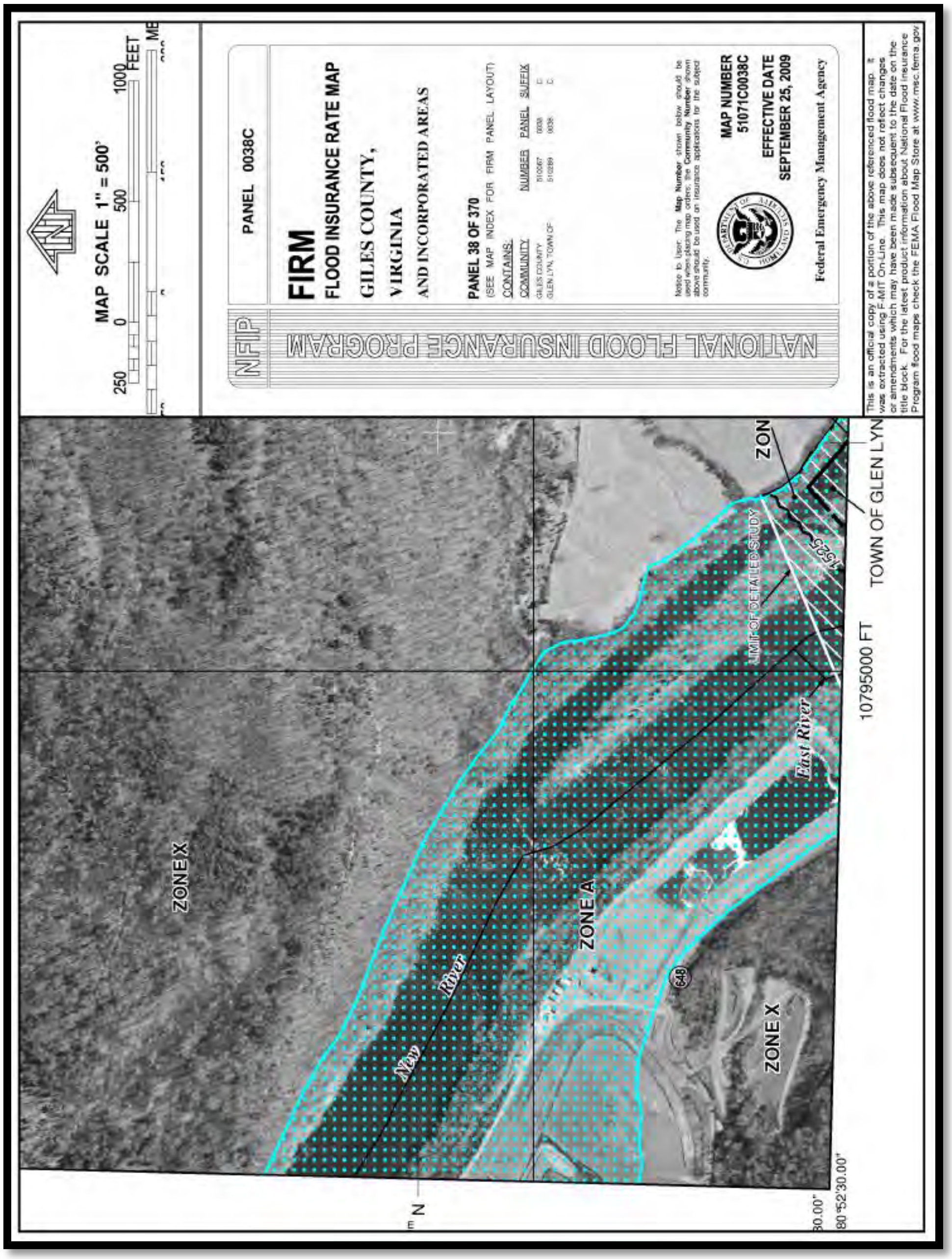
DRAFT

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



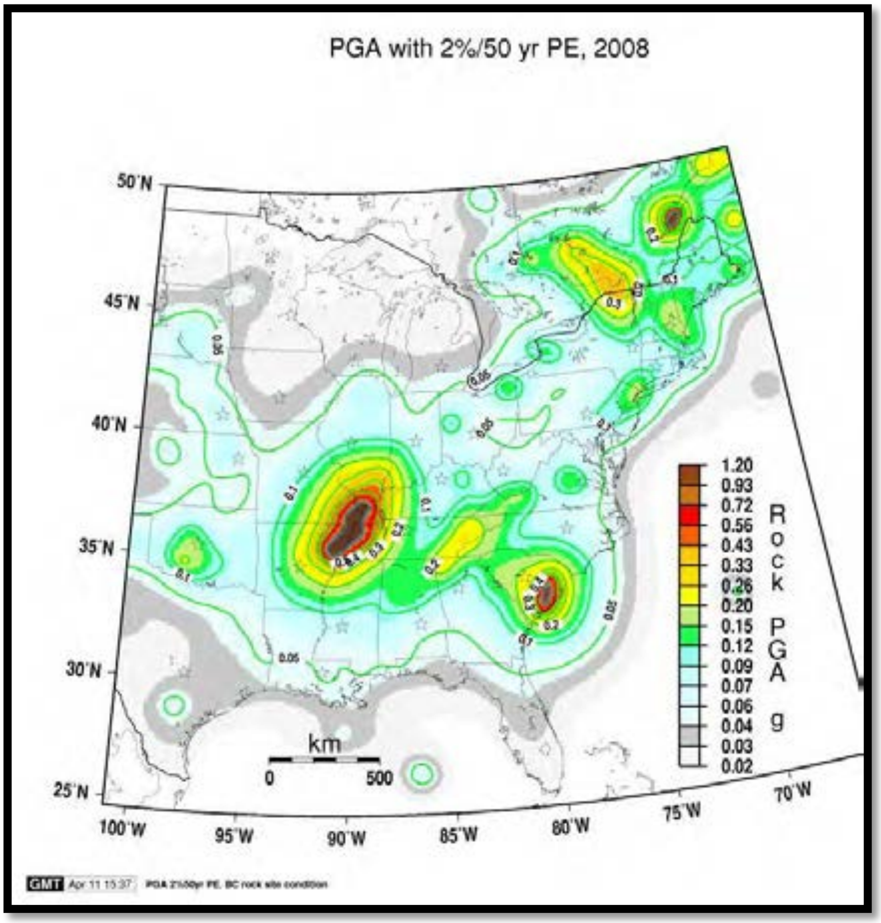
DRAFT

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



DRAFT

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



APPENDIX A

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 24022-2122

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 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.

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@dcr.virginia.gov.

Sincerely,

William G. Browning
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 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 George Lynch Year Constructed 1965
Type of Dam 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 AEP/Pedro Jose Amaya-Trujillo, VA PE #036174
() Reinspection or (X) Inventory Report by 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)

By Thomas I Roberts, PE # 19966 Date March 17, 2008

Concurrence with the Recommendation

By 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 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. Maroon

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

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 Project Information:

a. Name of Impounding Structure Glen Lyn Fly Ash Dam

b Inventory Number 07101 Other Name (if any) Fly Ash Pond

c Name of Reservoir Glen Lyn Plant Fly Ash Pond

d Purpose of Reservoir Standby use for impoundment of coal combustion fly ash. Sediment and stormwater runoff pond for ash landfill

2 Location of Impounding Structure:

a City/County Giles County Magisterial District

b Located 1 ~~feet~~/miles ~~upstream~~/downstream of Highway No 460

c Name of River or Stream Upground Reservoir adjacent to New River

d Latitude N37 22' 30" Longitude W80 52'

3. Ownership:

a Owner's Name Appalachian Power Company

b Mailing Address 40 Franklin Road; P.O. Box 2011
Roanoke, VA 24022-2121

c. Telephone (800) 956-4237

4 Owner's Engineer:

a Engineering Firm/Engineer American Electric Power Service Corporation

b Professional Engineer Virginia Number Pedro Jose Amaya-Trujillo VA#036174

c. Mailing Address 1 Riverside Plaza
Columbus, Ohio 43215

d Telephone (614) 716-1000 or (614) 716-2926

(DCR 199-104) (12/01)

AEPGL000075

5. Impounding Structure Data (All elevations NGVD unless noted):

a. Type of Material earth ___X___ concrete _______ masonry _______

Other ____

	Design Configuration	
b. Top of Dam	1540	Elev (if known)
c. Downstream Toe (Lowest)	appr. 1497	Elev (if known)
d. Height of Dam	43	Feet
e. Crest Length (Exclusive of Spillway)	2230	Feet
f. Crest Width	30	Feet
g. Upstream Slope	2.5 H: 1 V	
h. Downstream Slope	2 H: 1 V	

6. Reservoir Data

	Design Configuration	
a. Maximum Capacity	185	Acre-feet
b. Maximum Pool	1538	Elev (if known)
c. Maximum Pool Surface Area	10	Acres
d. Normal Capacity	155	Acre feet
e. Normal Pool	appr. 1510	Elev (if known)
f. Normal Pool Surface Area		Acres
g. Freeboard (Normal Pool to Top)	30	Feet
h. Freeboard (Normal Pool to Emergency)	N/A	Feet

7. Spillway Data

Spillway Data	Type	Construction Material	Maximum Capacity
a. Low Level Drain	N/A	---	--
b. Principal Spillway	Weir & Pipe	Concrete & Steel	300 cfs
c. Emergency Spillway	N/A	---	--

	Design Configuration	
d. Low Level Drain	N/A	Elev (if known)
e. Principal Spillway	1538.0	Elev (if known)
f. Emergency Spillway	N/A	Elev (if known)

AEPGL000076

g. Briefly describe the low level drain and principal spillway to include dimensions, materials of construction, trash guards, location in reservoir and through dam, and orientation of intake and discharge to dam if looking downstream: N/A

h. Describe the emergency spillway to include dimensions, whether the spillway is an earth channel or other construction, spillway surface protection, and orientation to dam if looking downstream: N/A

8. Watershed Data (Class III only):

a. Drainage Area 10.5 Acres .016 Sq. Miles

b. Type and Extent of Watershed Development Roadway around the crest of dike.

c. Time of Concentration -- Method --

d. Spillway Design Flood used (mark appropriate box)

___ PMF, source

___ 1/2 PMF, source

___ 100 Year, source

___ 50 Year, source

___ Other, source Not Applicable

e. Design inflow hydrograph: Volume -- acre-feet;

Peak inflow -- C.F.S.;

Rainfall duration of design inflow hydrograph -- hours

f. Freeboard during passage of spillway design flood -- feet

9. Impounding Structure History

a. Date construction completed 1965

b. Design by Casagrande Consultant Date: 1964

c. Built by unknown Date: 1965

AEPGL000077

d. Inspection dates 1978, 1980, 1982, and annually from 1984-2007

e. Inspections by Woodward-Clyde Consultants, AEPSC, & Geosyntec Consultants

f. Description of repairs Brush and tree cutting, filling erosion, gullies, filling animal holes, repairs to several seepage collection pipes.

g. Has the impounding structure ever been overtopped? _____ Yes __X__ No

10 Impounding Structure Assessment:

a. Provide brief descriptions for each item:

i. Condition of the impounding structure Good

ii. Condition of the reservoir Good

iii. Condition of the upstream area N/A

iv. Condition of the downstream area Good

b. Provide a narrative describing any recent changes in the impounding structure, reservoir, upstream area, and downstream area: No recent changes

This upground reservoir remains out of service for and is utilized very infrequently for wet ash disposal.

c. Recommendations for remedial measures: Routine maintenance such as trees and brush cutting, filling of erosion gullies or animal burrows if they occur

11 Provide a sketch of the impounding structure

See Attached Sketch

CERTIFICATION BY OWNER'S ENGINEER (Class III only)

I hereby certify that the information provided in this Inventory Report has been examined by me and found to be true and correct in my professional judgment

Signed Pedro J Amaya
(Professional Engineer)

Virginia Number 036174

This 21 day of January, 20 08

COMMONWEALTH OF VIRGINIA
PEDRO JOSE AMAYA-TRUJILLO
NO. 036174
1/21/08
PROFESSIONAL ENGINEER

CERTIFICATION BY OWNER (Class IV only)

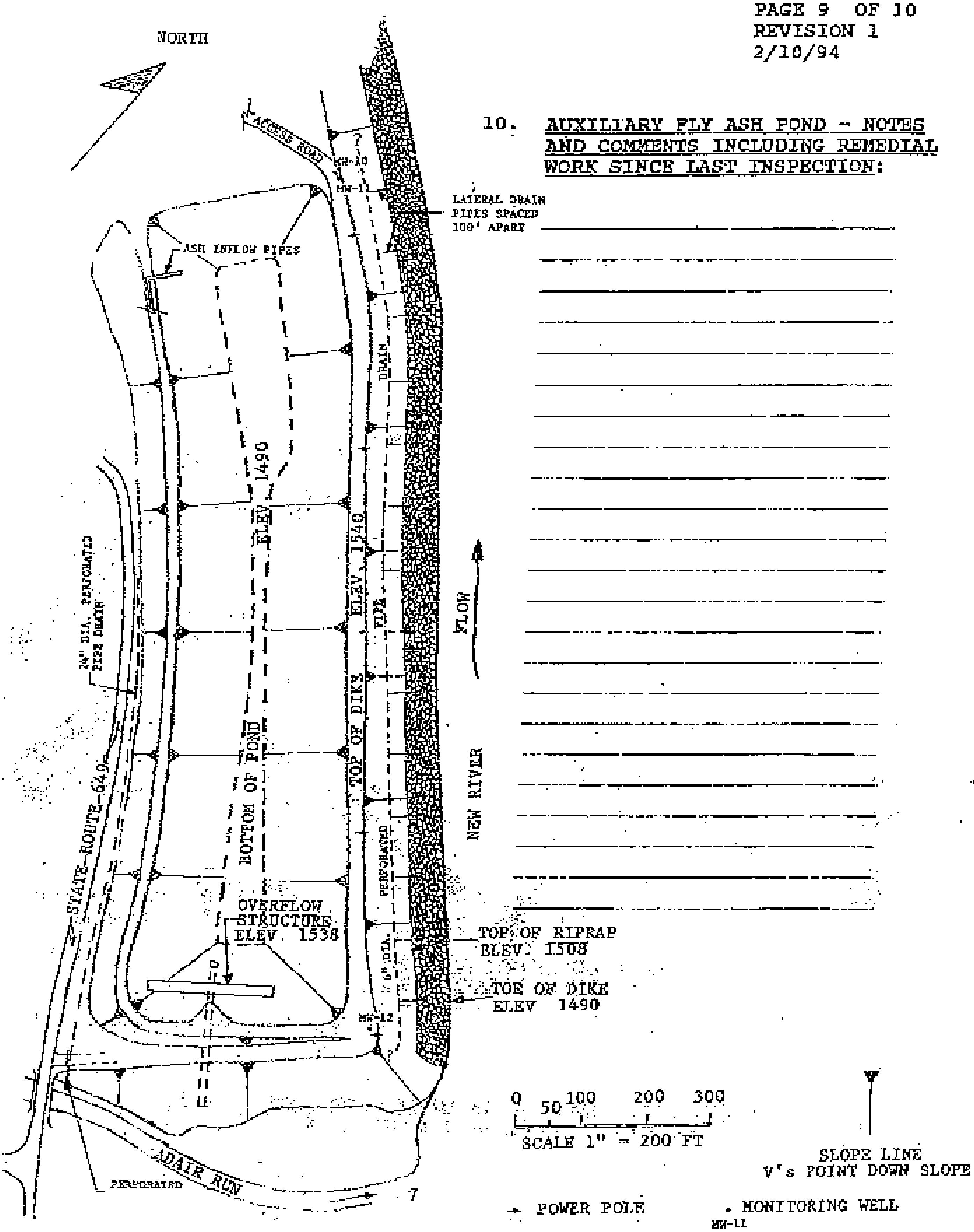
I hereby certify that the information provided in this Inventory Report is true and correct

Signed Brad [illegible]
(Owner)

This 28 day of January, 20 08

Please fill out and mail to:
Department of Conservation and Recreation
Division of Dam Safety
203 Governor Street
Richmond, Virginia 232192094

AEPGL000079



10. AUXILIARY FLY ASH POND - NOTES AND COMMENTS INCLUDING REMEDIAL WORK SINCE LAST INSPECTION:

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

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

Reference: Impounding Structures Regulations, 4VAC 50-20-00 et seq., Virginia Soil and Water Conservation Board

1. Name of Impounding Structure: Glen Lyn Fly Ash Dam
   Inventory Number: 07101 Other Name (if any) Fly Ash Pond
2. Hazard Potential Classification from Table 1, Impounding Structure Regulations:
   (Circle One) Class I Class II Class III
3. Name of Owner: Appalachian Power Company
   Address: 40 Franklin Road; P.O. Box 2021, Roanoke, VA 24022-2121
   Telephone: (Business) (800) 956-4237 (Residential) ( )
4. Operating Plan and Schedule
   Provide a narrative for each item:
   a. Operation of control gates and spillways Fixed weir elevation - See Attachment I
   b. Operation of Reservoir Drain (not to exceed ½ foot drawdown per day on embankment dams).
      See Attachment I
5. Maintenance Plan and Schedule
   Provide a narrative for each item:
   a. Embankment Dams:
      (1) embankment: See Attachment I
      (2) principal spillway: See Attachment I
      (3) emergency spillway: See Attachment I
      (4) low level outlet: See Attachment I
      (5) reservoir area: See Attachment I
      (6) downstream channel: See Attachment I
      (7) other: See Attachment I
   b. Concrete dams (including masonry and others):
      (1) upstream face: N/A

(2) downstream face: N/A

(3) crest: N/A

(4) galleries: N/A

(5) tunnels, etc.: N/A

(6) abutments: N/A

(7) spillways: N/A

(8) gates and outlets: N/A

(9) other: N/A

6 Inspection schedule (attach schedule and checklist):

(1) operator inspection (daily, weekly, etc.) Inspected Weekly - No Checklist

(2) maintenance inspection (monthly, quarterly, semi-annual, annual) Quarterly by plant personnel, plus annual by AEP Civil Engineering Division - checklist attached

(3) technical safety reinspection by a professional engineer (required for certification update: Class I dams every two years, Class II dams every three years. All dams inspected after overtopping) Inspection annually by a Professional Engineer and reports are submitted to the Virginia Dept. of Conservation and Recreation - Dam Safety

7 Emergency Action Plan Schedule

Provide the information that initiates the Emergency Action Plan:

a. rainfall amounts and/or: N/A

b. spillway flows: N/A

c. frequency of observation: N/A

8 For a newly constructed impounding structure, provide certification from a Professional Engineer who has inspected the impounding structure during construction that, to the best of the engineer's judgment, knowledge and belief, the impounding structure and all appurtenances have been constructed in conformance with the plans, specifications and drawings submitted to the Department of Conservation and Recreation.

N/A

OPERATION AND MAINTENANCE PERMIT APPLICATION

OPERATION AND MAINTENANCE SCHEDULES
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: Brad [signature]
(Owner)

This 28 day of January, 20 08

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: Pedro J. Amaya 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

COMMONWEALTH OF VIRGINIA
Pedro J Amaya
PEDRO JOSE AMAYA-TRUJILLO
NO 036174
1/21/08
PROFESSIONAL ENGINEER

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

1. GENERAL INFORMATION

Date of Inspection	______
Inspected by	______
Weather	______
Temperature	______
Rainfall (inches) since ______ (date)	______
Pond levels:	______
North Bottom Ash Pond (1505.5*)	______
South Bottom Ash Pond (1506.3*)	______
Clearwater Pond (1501.3*)	______
Auxiliary Fly Ash Pond	______
West Pond	______

2. EMBANKMENT CONDITION AT BOTTOM ASH AND CLEARWATER PONDS

A. Please refer to the Bottom Ash Pond Inspection Location Plan which is found on Page 8. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	______
Ruts in Crest Road	______
Animal Burrows	______

* Approximate normal pool levels when in service.

DESCRIPTION	LOCATION CODE
Leaking Ash Pipe	
Seepage/Wetness	
Trees on Slope	
Vegetation condition	
Cracks/Bulges/Slides	
Other (Please specify)	

B. Has there been any significant deterioration, erosion or displacement of the riprap at the river shoreline since the last inspection? If so, please describe condition and the river flow event which caused it.

C. Has there been erosion of the shoreline inside the bottom ash ponds because of the ash inflow pipes?

3. OUTLET WORKS AT BOTTOM ASH AND CLEARWATER PONDS

A. Please inspect the following drainage structures and check the appropriate space below:

	GOOD CONDITION	PROBLEM
North B. A. Pond Skimmer		
North B. A. Pond Overflow Lip & Pipe		
South B. A. Pond Skimmer		
South B. A. Pond Overflow Lip & Pipe		
Perforated Water Distribution Pipe		
Clearwater Pond Skimmer		

	GOOD CONDITION	PROBLEM
Clearwater Pond Overlow Lip & Chute		
Clearwater Pond Spillway Tower		
Access Steps to Spillway Tower		
Outfall Pipe to East River		
Access Path to Outfall Pipe		

B. Please describe problems below: ______

4. EMBANKMENT CONDITION AT AUXILIARY FLY ASH POND

A. Please refer to the Auxiliary Fly Ash Pond Inspection Location Plan which is found on Page 9. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	
Leaking Ash Pipe	
Leaking Embankment Drain Pipe	
Seepage/Wetness	
Trees on Slope	

Exposed Ash on Slope ____________________

Cracks/Bulges/Slides ____________________

Sinkhole ____________________

Other (Please specify) ____________________

B. Has this pond been used since the previous inspection? If so, when and for approximately what duration?

____

____

C. Has the water level in the pond been high enough to cause the embankment drains to become active?

____

____

5. <u>OUTLET WORKS AT AUXILIARY FLY ASH POND</u>

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel Trough		
Wooden Skimmer		
Trough or Skimmer supports		
Concrete structure		
Other (Please specify)		

B. Please describe problems below: ____________________

____

____

C. Please observe the outlet end of the 24"ϕ discharge pipe. If water is issuing from the pipe, please determine and record the flow rate:

____

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

____

____

6. EMBANKMENT CONDITION AT WEST POND

A. Please refer to the West Pond Inspection Location Plan which is found on Page 10. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	____________
Ruts in Crest Road	____________
Animal Burrows	____________
Seepage/Wetness	____________
Woody Vegetation on Dikes	____________
Cracks/Bulges/Slides	____________
Sediment Buildnp in Inlet Ditches	____________

B. Has there been significant runoff from the landfill since the last inspection? ____________________

____

C. Has the water level reached the steel overflow trough since the last inspection? ______________. Please record the current water level relative to the overflow trough ________

____

D. Other problems (please describe): ______________________

____

____

7. OUTLET WORKS AT WEST POND

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel Trough		
Wooden Skimmer		
Inlet Structure		
Pipe Problems		
Other (please specify)		

B. Please describe observed problems below: ______________

____

____

C. Please observe the outlet end of the 36"ф discharge pipe. If water is issuing from the pipe, please determine and record the flow rate, in gollons per minute: __________

____

____

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

____

____

8. <u>GENERAL EMBANKMENT CONDITIONS - ALL PONDS</u>

A. Has any mowing, brush and tree cutting or spraying been done since the previous inspection? If so, please state below what was done, when and by whom, and show the area on the location plan.

____

____

____

B. Has the river level come up significantly since the last inspection, and if so, approximately what elevation was it and when?

____

____

____

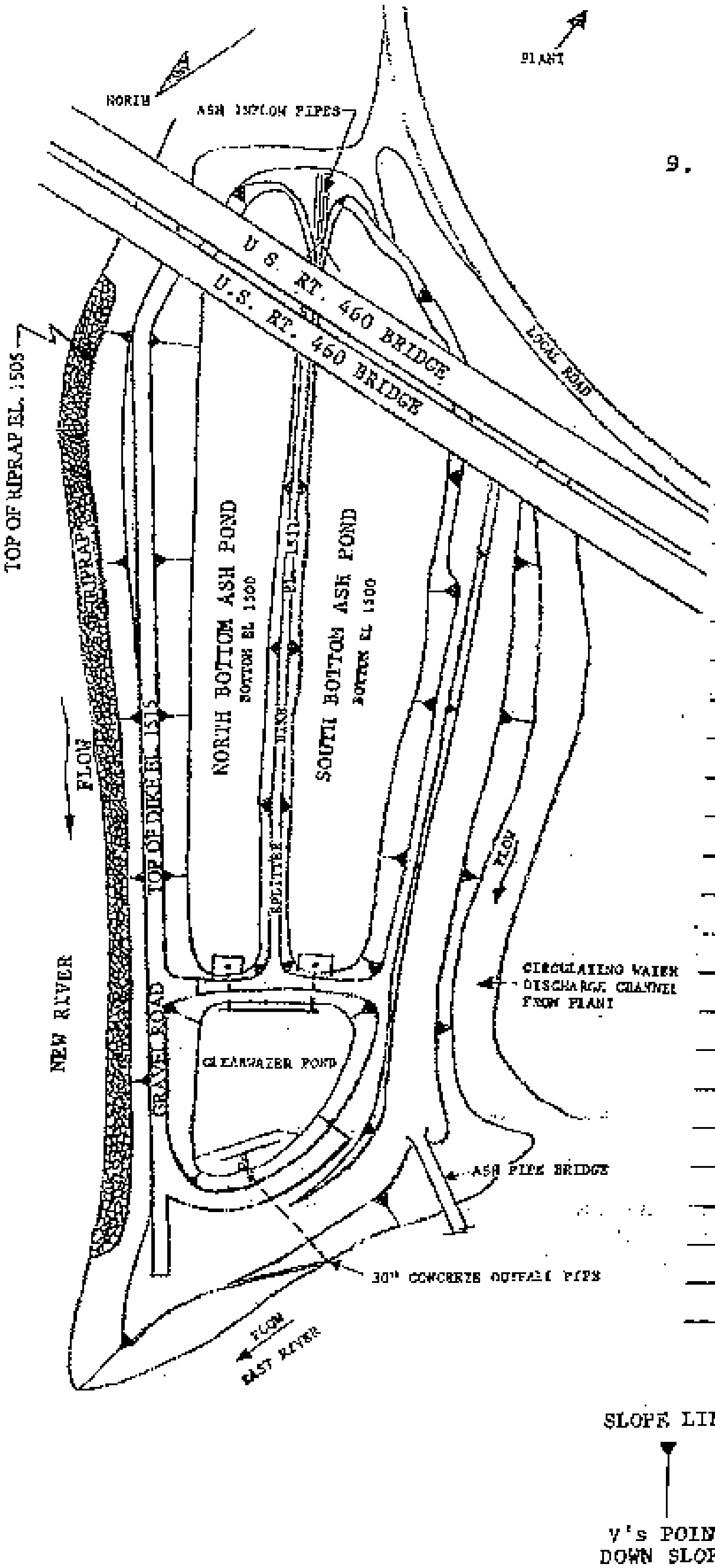
C. Was there any apparent damage to the dikes when the river level receded? If so, please indicate below what the damage was (erosion, slides, etc.) and show its location on the location plan.

____

____

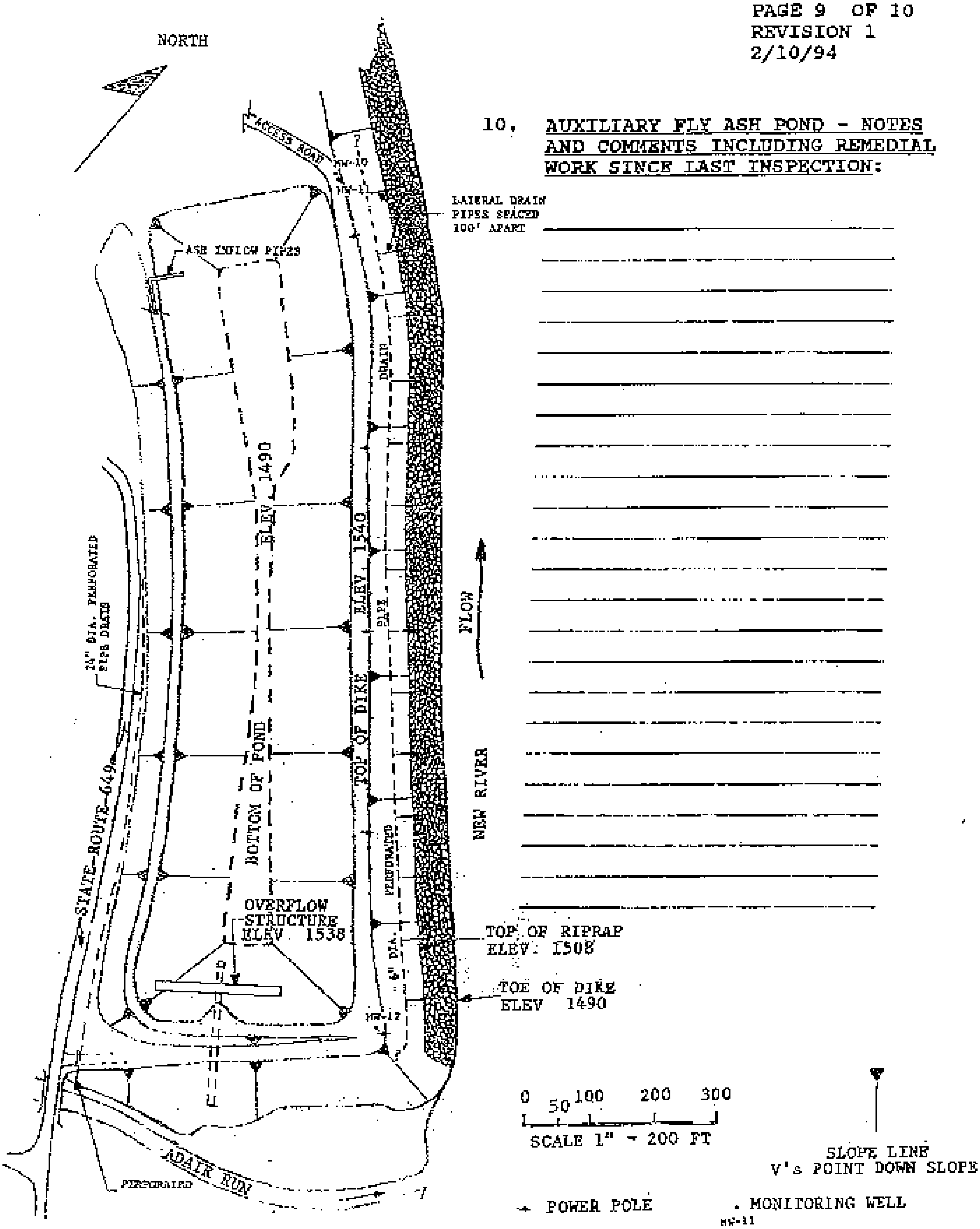
____

9. **BOTTOM ASH AND CLEARWATER PONDS - NOTES AND COMMENTS INCLUDING REMEDIAL MEASURES SINCE LAST INSPECTION:**



GLEN LYN PLANT: BOTTOM ASH POND
INSPECTION LOCATION PLAN

AEPGL000092



10. AUXILIARY FLY ASH POND - NOTES AND COMMENTS INCLUDING REMEDIAL WORK SINCE LAST INSPECTION:

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

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.

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@dcr.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 Bottom Ash Dam**	Inventory 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 (Ft.) **28**	Elevation **1523**
Normal Pool Height (Ft.) **14**	Elevation **1509**
Maximum Capacity (Acre Ft.) **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: **AEP/Pedro Jose Amaya-Trujillo, VA PE #036174**
( ) Reinspection or **(X)** Inventory Report by **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)**

Thomas J Roberts

By **Thomas J Roberts, PE # 19966** Date **March 17, 2008**

Concurrence with the Recommendation:

William G. Browning

By **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. Maroon

Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

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. Project Information:

   a. Name of Impounding Structure: Glen Lyn Bottom Ash Dikes
   b. Inventory Number: 07102 Other Name (if any): ...
   c. Name of Reservoir: Glen Lyn Plant Bottom Ash Ponds
   d. Purpose of Reservoir: Sedimentation of bottom ash and decanting of clear ash transport water

2. Location of Impounding Structure:

   a. City/County: Giles County Magisterial District:
   b. Located at feet/~~miles~~ upstream/downstream of Highway No US 460
   c. Name of River or Stream: Upground Reservoir adjacent to New River & East River
   d. Latitude: N37 22' 30" Longitude: W80 52'

3. Ownership:

   a. Owner's Name: Appalachian Power Company
   b. Mailing Address: 40 Franklin Road; P.O. Box 2011
      Roanoke, VA 24022-2121
   c. Telephone (800) 956-4237

4. Owner's Engineer:

   a. Engineering Firm/Engineer: American Electric Power Service Corporation
   b. Professional Engineer Virginia Number: Pedro Jose Amaya-Trujillo VA#036174
   c. Mailing Address: 1 Riverside Plaza
      Columbus, Ohio 43215
   d. Telephone (614) 716-1000 or (614) 716-2926

5. Impounding Structure Data (All elevations NGVD unless noted):

a Type of Material earth __x__ concrete ____ masonry ____

Other ____________________

	Design Configuration
b Top of Dam	~~1515~~ 1523 Elev (if known)
c Downstream Toe (Lowest)	appr. 1495 Elev (if 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	2 H: 1 V
h Downstream Slope	1.5 H: 1 V

6 Reservoir Data

	Design Configuration
a Maximum Capacity	90 Acre feet
b Maximum Pool	1515 Elev (if known)
c Maximum Pool Surface Area	5.9 Acres
d. Normal Capacity	31.4 Acre-feet
e Normal Pool	* Elev (if known)
f Normal Pool Surface Area	3.72 Acres
g Freeboard (Normal Pool to Top)	17.5 & 21.7 Feet
h Freeboard (Normal Pool to Emergency)	N/A Feet

* Bottom Ash Ponds = 1505 5 Clearwater Pond = 1501 3

7 Spillway Data

	Type	Construction Material	Maximum Capacity
a Low Level Drain	None	---	--
b Principal Spillway	Drop tower	w/concrete pipe	20 cfs
c Emergency Spillway	None	---	--

	Design Configuration
d Low Level Drain	-- Elev. (if known)
e Principal Spillway	1501.3 Elev (if known)
f Emergency Spillway	-- Elev (if known)

g. Briefly describe the low level drain and principal spillway to include dimensions, materials of construction, trash guards, location in reservoir and through dam, and orientation of intake and discharge to dam if looking downstream: No low level drains due to the sedimentaion of ash. Drop tower has stoplog which are 2 feet long and empties into a 30" concrete discharge pipe. A timber skimmer barrier protects tower from floating debris.

h. Describe the emergency spillway to include dimensions, whether the spillway is an earth 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

8 Watershed Data (Class III only):

a. Drainage Area 5 8 Acres .009 Sq. Miles

b. Type and Extent of Watershed Development None - Grass covered dike crest and u/s slope

c. Time of Concentration -- Method --

d. Spillway Design Flood used (mark appropriate box)

_____PMF, source

_____1/2 PMF, source

_____100 Year, source

_____50 Year, source

_____Other, source Not Applicable

e. Design inflow hydrograph: Volume -- acre-feet;

Peak inflow -- CFS;

Rainfall duration of design inflow hydrograph -- hours

f. Freeboard during passage of spillway design flood -- feet

9. Impounding Structure History

a. Date construction completed 1950's; modified 1977

b. Design by American Electric Power Date: 1950's; modified 1976

c. Built by unknown Date: 1950's; modified 1977

d. Inspection dates 1978, 1980, 1982, and annually from 1984-2007

e. Inspections by Woodward-Clyde Consultants, AEP, & Geosyntec Consultants

f. Description of repairs Brush and tree cutting, filling erosion, gullies, filling animal holes, repairs to leaking pip and repair at shoreline erosion in ponds.

g. Has the impounding structure ever been overtopped? _____ Yes X No

10 Impounding Structure Assessment:

a. Provide brief descriptions for each item:

i. Condition of the impounding structure Good

ii. Condition of the reservoir Good

iii. Condition of the upstream area N/A

iv. Condition of the downstream area N/A

b. Provide a narrative describing any recent changes in the impounding structure, reservoir, upstream area, and downstream area: There have been no changes since last Certification in 2002.

c. Recommendations for remedial measures: Continue routine monitoring, brush and tree cutting, repair of erosion features, filling of animal burrows as req

11 Provide a sketch of the impounding structure

See Attached Sketch

CERTIFICATION BY OWNER'S ENGINEER (Class III only)

I hereby certify that the information provided in this Inventory Report has been examined by me and found to be true and correct in my professional judgment.

Signed Pedro J. Amaya
(Professional Engineer)

Virginia Number 036174

This 21 day of January, 20 08

COMMONWEALTH OF VIRGINIA
Pedro J. Amaya
PEDRO JOSE AMAYA-TRUJILLO
NO. 036174
1/21/08
PROFESSIONAL ENGINEER

CERTIFICATION BY OWNER (Class IV only)

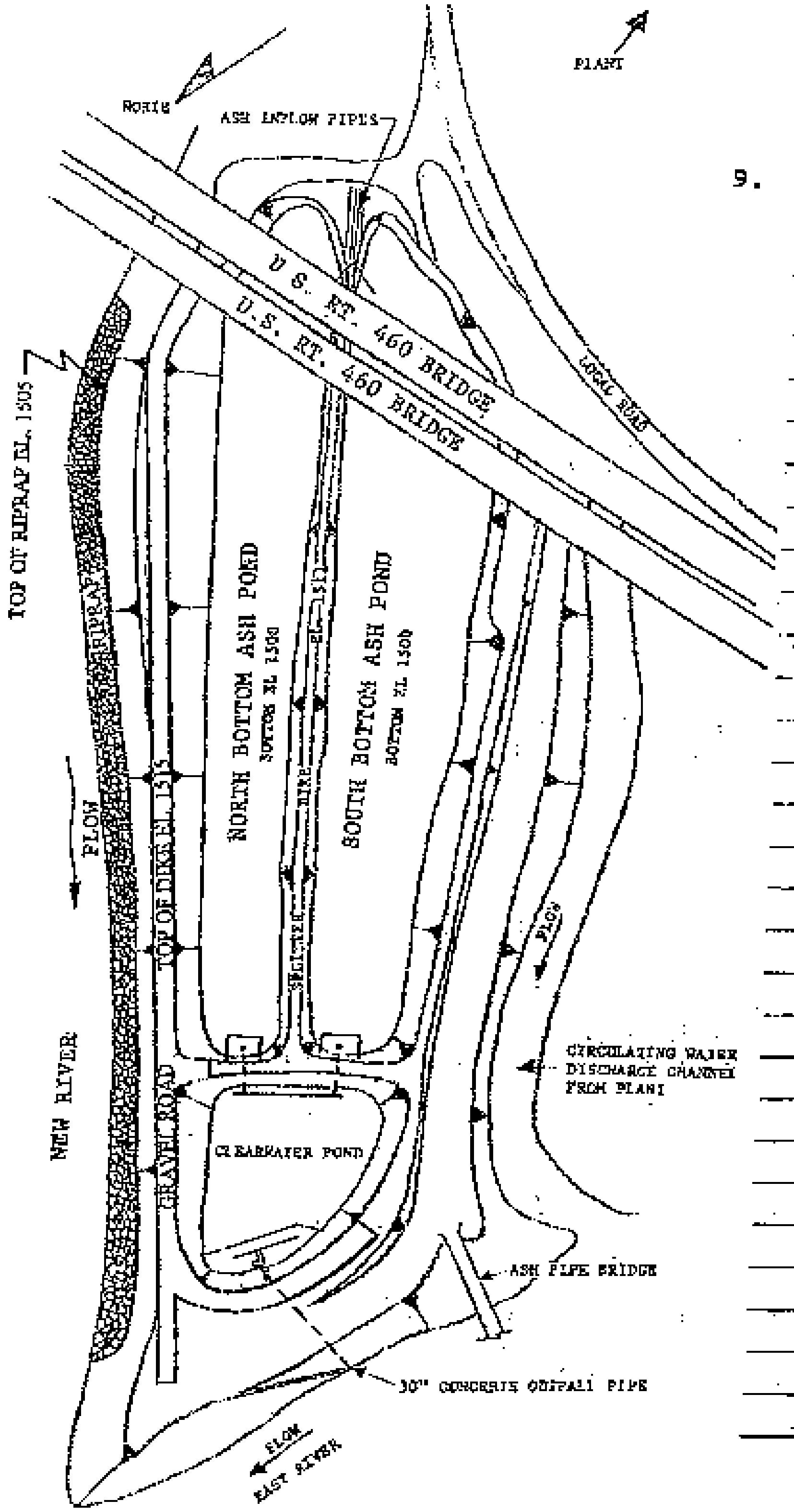
I hereby certify that the information provided in this Inventory Report is true and correct

Signed Brad fox
(Owner)

This 28 day of January, 20 08

Please fill out and mail to:
Department of Conservation and Recreation
Division of Dam Safety
203 Governor Street
Richmond, Virginia 232192094

AEPGL000046



9. BOTTOM ASH AND CLEARWATER PONDS - NOTES AND COMMENTS INCLUDING REMEDIAL MEASURES SINCE LAST INSPECTION:

SLOPE LINE

V's POINT DOWN SLOPE

0 50 100 200 300

APPROXIMATE SCALE 1"=167 FT.

GLEN LYN PLANT; BOTTOM ASH POND INSPECTION LOCATION PLAN

Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

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

Reference: Impounding Structures Regulations, 4VAC 50-20-00 et seq , Virginia Soil and Water Conservation Board

1 Name of Impounding Structure: Glen Lyn Bottom Ash Dikes

Inventory Number: 07102 Other Name (if any)

2. Hazard Potential Classification from Table 1, Impounding Structure Regulations:

(Circle One) Class I Class II Class III

3 Name of Owner: Appalachian Power Company

Address: 40 Franklin Road, P.O. Box 2021, Roanoke, VA 24022-2121

Telephone: (Business) (800) 956-4237 (Residential) ( )

4 Operating Plan and Schedule
Provide a narrative for each item:

a Operation of control gates and spillways. Attachment I

b. Operation of Reservoir Drain (not to exceed ½ foot drawdown per day on embankment dams)
See Attachment I

5 Maintenance Plan and Schedule
Provide a narrative for each item:

a Embankment Dams:

(1) embankment: See Attachment I

(2) principal spillway: See Attachment I

(3) emergency spillway: See Attachment I

(4) low level outlet: See Attachment I

(5) reservoir area: See Attachment I

(6) downstream channel: See Attachment I

(7) other: See Attachment I

b Concrete dams (including masonry and others):

(1) upstream face: N/A

(DCR 199-099) (12/01)

AEPGL000048

(2) downstream face: N/A

(3) crest: N/A

(4) galleries: N/A

(5) tunnels, etc.: N/A

(6) abutments: N/A

(7) spillways: N/A

(8) gates and outlets: N/A

(9) other: N/A

6 Inspection schedule (attach schedule and checklist):

(1) operator inspection (daily, weekly, etc.) Weekly - No Checklist

(2) maintenance inspection (monthly, quarterly, semi-annual, annual) Quarterly by plant personnel, plus annual by AEP Civil Engineering Division - checklist attached

(3) technical safety reinspection by a professional engineer. (required for certification update: Class I dams every two years, Class II dams every three years. All dams inspected after overtopping) Inspection annually by a Professional Engineer

7 Emergency Action Plan Schedule

Provide the information that initiates the Emergency Action Plan:

a rainfall amounts and/or: This is an upground reservoir with no drainage area beyond

b spillway flows: its own perimeter. Water inflow is controlled by pumping of ash/

c frequency of observation: water slurry. EAP would be triggered by embankment instability or failure due to piping or erosion.

8. For a newly constructed impounding structure, provide certification from a Professional Engineer who has inspected the impounding structure during construction that, to the best of the engineer's judgment, knowledge and belief, the impounding structure and all appurtenances have been constructed in conformance with the plans, specifications and drawings submitted to the Department of Conservation and Recreation

N/A

OPERATION AND MAINTENANCE PERMIT APPLICATION

OPERATION AND MAINTENANCE SCHEDULES
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: Brad Fun
(Owner)

This 28 day of January, 20 08

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: Pedro J. Amaya — 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

COMMONWEALTH OF VIRGINIA
Pedro J Amaya
PEDRO JOSE AMAYA-TRUJILLO
NO. 036174
1/21/08
PROFESSIONAL ENGINEER

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

1. GENERAL INFORMATION

Date of Inspection	______
Inspected by	______
Weather	______
Temperature	______
Rainfall (inches) since ______ (date)	______
Pond levels:	______
North Bottom Ash Pond (1505.5*)	______
South Bottom Ash Pond (1506.3*)	______
Clearwater Pond (1501.3*)	______
Auxiliary Fly Ash Pond	______
West Pond	______

2. EMBANKMENT CONDITION AT BOTTOM ASH AND CLEARWATER PONDS

A. Please refer to the Bottom Ash Pond Inspection Location Plan which is found on Page 8. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	______
Ruts in Crest Road	______
Animal Burrows	______

* Approximate normal pool levels when in service.

DESCRIPTION	LOCATION CODE
Leaking Ash Pipe	
Seepage/Wetness	
Trees on Slope	
Vegetation condition	
Cracks/Bulges/Slides	
Other (Please specify)	

B. Has there been any significant deterioration, erosion or displacement of the riprap at the river shoreline since the last inspection? If so, please describe condition and the river flow event which caused it.

C. Has there been erosion of the shoreline inside the bottom ash ponds because of the ash inflow pipes?

3. OUTLET WORKS AT BOTTOM ASH AND CLEARWATER PONDS

A. Please inspect the following drainage structures and check the appropriate space below:

	GOOD CONDITION	PROBLEM
North B. A. Pond Skimmer		
North B. A. Pond Overflow Lip & Pipe		
South B. A. Pond Skimmer		
South B. A. Pond Overflow Lip & Pipe		
Perforated Water Distribution Pipe		
Clearwater Pond Skimmer		

	GOOD CONDITION	PROBLEM
Clearwater Pond Overlow Lip & Chute		
Clearwater Pond Spillway Tower		
Access Steps to Spillway Tower		
Outfall Pipe to East River		
Access Path to Outfall Pipe		

B. Please describe problems below: ______

______

______

______

4. EMBANKMENT CONDITION AT AUXILIARY FLY ASH POND

A. Please refer to the Auxiliary Fly Ash Pond Inspection Location Plan which is found on Page 9. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	
Leaking Ash Pipe	
Leaking Embankment Drain Pipe	
Seepage/Wetness	
Trees on Slope	

Exposed Ash on Slope ____________________

Cracks/Bulges/Slides ____________________

Sinkhole ____________________

Other (Please specify) ____________________

B. Has this pond been used since the previous inspection? If so, when and for approximately what duration?

____

____

C. Has the water level in the pond been high enough to cause the embankment drains to become active?

____

____

5. <u>OUTLET WORKS AT AUXILIARY FLY ASH POND</u>

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel Trough		
Wooden Skimmer		
Trough or Skimmer supports		
Concrete structure		
Other (Please specify)		

B. Please describe problems below: ____________________

____

____

C. Please observe the outlet end of the 24"ϕ discharge pipe. If water is issuing from the pipe, please determine and record the flow rate:

____

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

____

____

6. EMBANKMENT CONDITION AT WEST POND

A. Please refer to the West Pond Inspection Location Plan which is found on Page 10. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	____________
Ruts in Crest Road	____________
Animal Burrows	____________
Seepage/Wetness	____________
Woody Vegetation on Dikes	____________
Cracks/Bulges/Slides	____________
Sediment Buildup in Inlet Ditches	____________

B. Has there been significant runoff from the landfill since the last inspection? ____________________

____

C. Has the water level reached the steel overflow trough since the last inspection? ______________. Please record the current water level relative to the overflow trough ________

____

D. Other problems (please describe): ______________________

____

____

7. <u>OUTLET WORKS AT WEST POND</u>

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel Trough		
Wooden Skimmer		
Inlet Structure		
Pipe Problems		
Other (please specify)		

B. Please describe observed problems below: ______________

____

____

C. Please observe the outlet end of the 36"ϕ discharge pipe. If water is issuing from the pipe, please determine and record the flow rate, in gollons per minute: ____________

____

____

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

____

____

8. GENERAL EMBANKMENT CONDITIONS - ALL PONDS

A. Has any mowing, brush and tree cutting or spraying been done since the previous inspection? If so, please state below what was done, when and by whom, and show the area on the location plan.

____

____

____

B. Has the river level come up significantly since the last inspection, and if so, approximately what elevation was it and when?

____

____

____

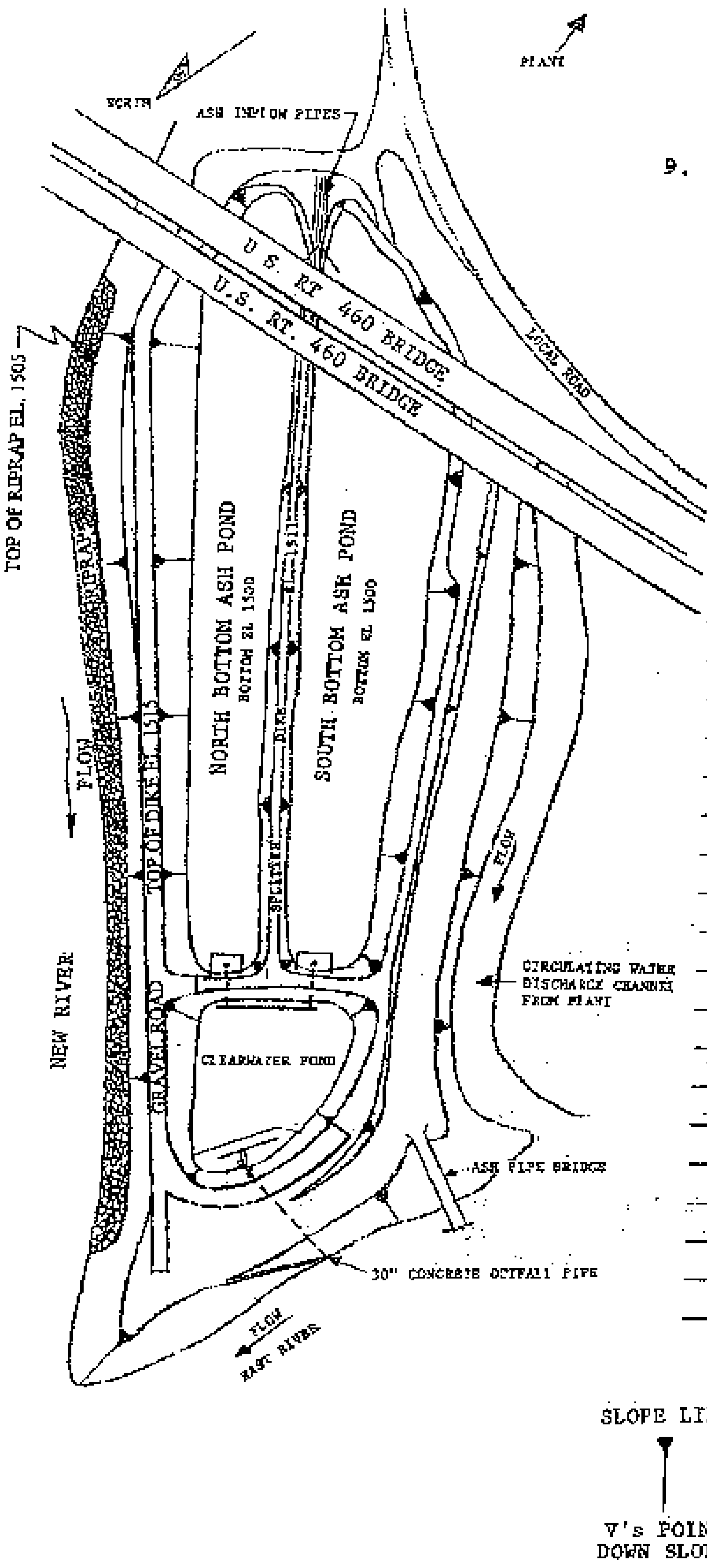
C. Was there any apparent damage to the dikes when the river level receded? If so, please indicate below what the damage was (erosion, slides, etc.) and show its location on the location plan.

____

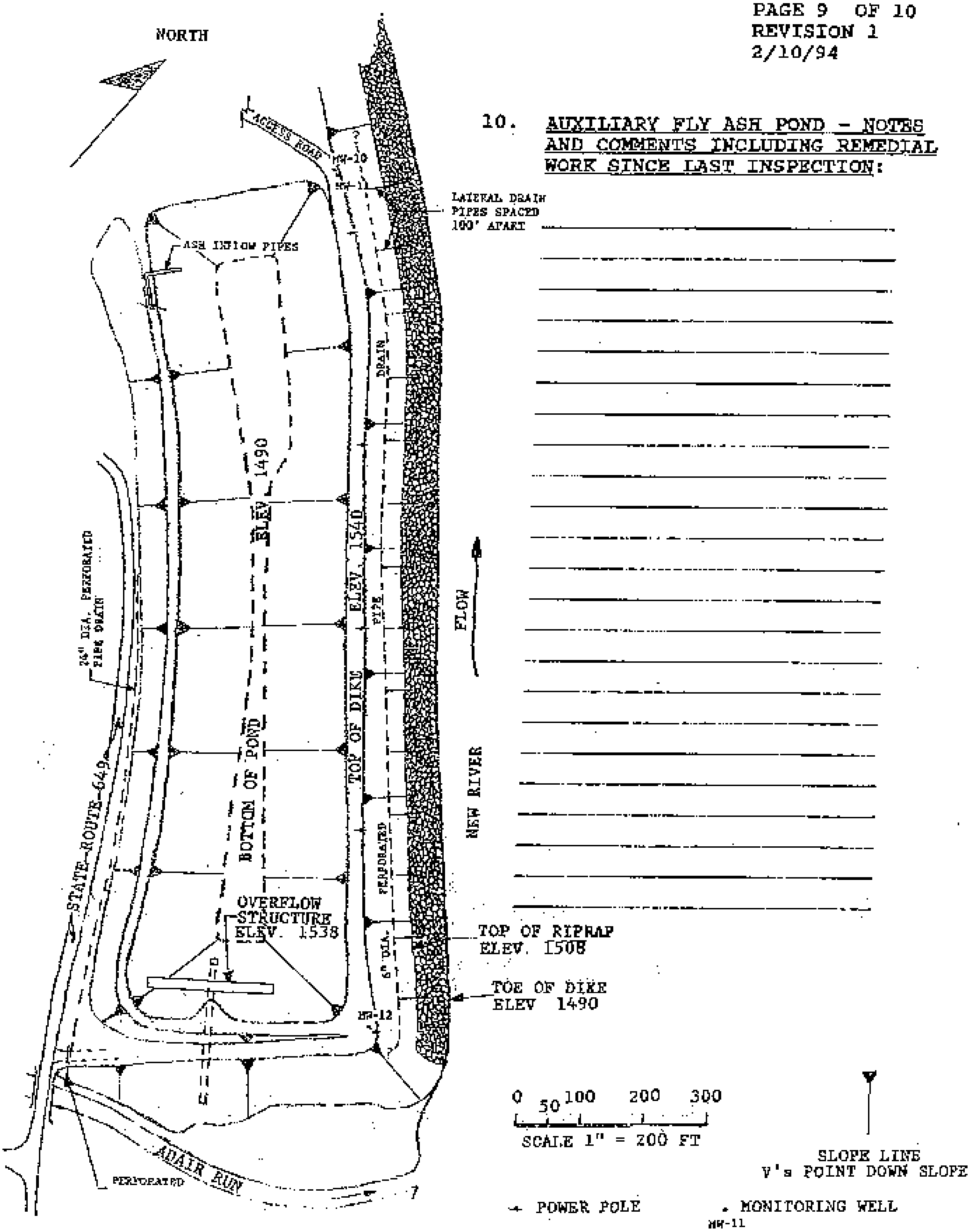
____

____

9. BOTTOM ASH AND CLEARWATER PONDS - NOTES AND COMMENTS INCLUDING REMEDIAL MEASURES SINCE LAST INSPECTION:



GLEN LYN PLANT: BOTTOM ASH POND INSPECTION LOCATION PLAN



10. AUXILIARY FLY ASH POND - NOTES AND COMMENTS INCLUDING REMEDIAL WORK SINCE LAST INSPECTION:

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

Report On
Dam Safety Inspection
GLEN LYN FLY ASH & 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

TABLE OF CONTENTS

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 Pond

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. We 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 pond, 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 pond 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 2.5H: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:1V. 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 el 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 Hinton 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 B (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 toe. 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.

2. Considerable sloughing of the dike separating the two portions of the pond was noted.

3. There was no evidence of seepage 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

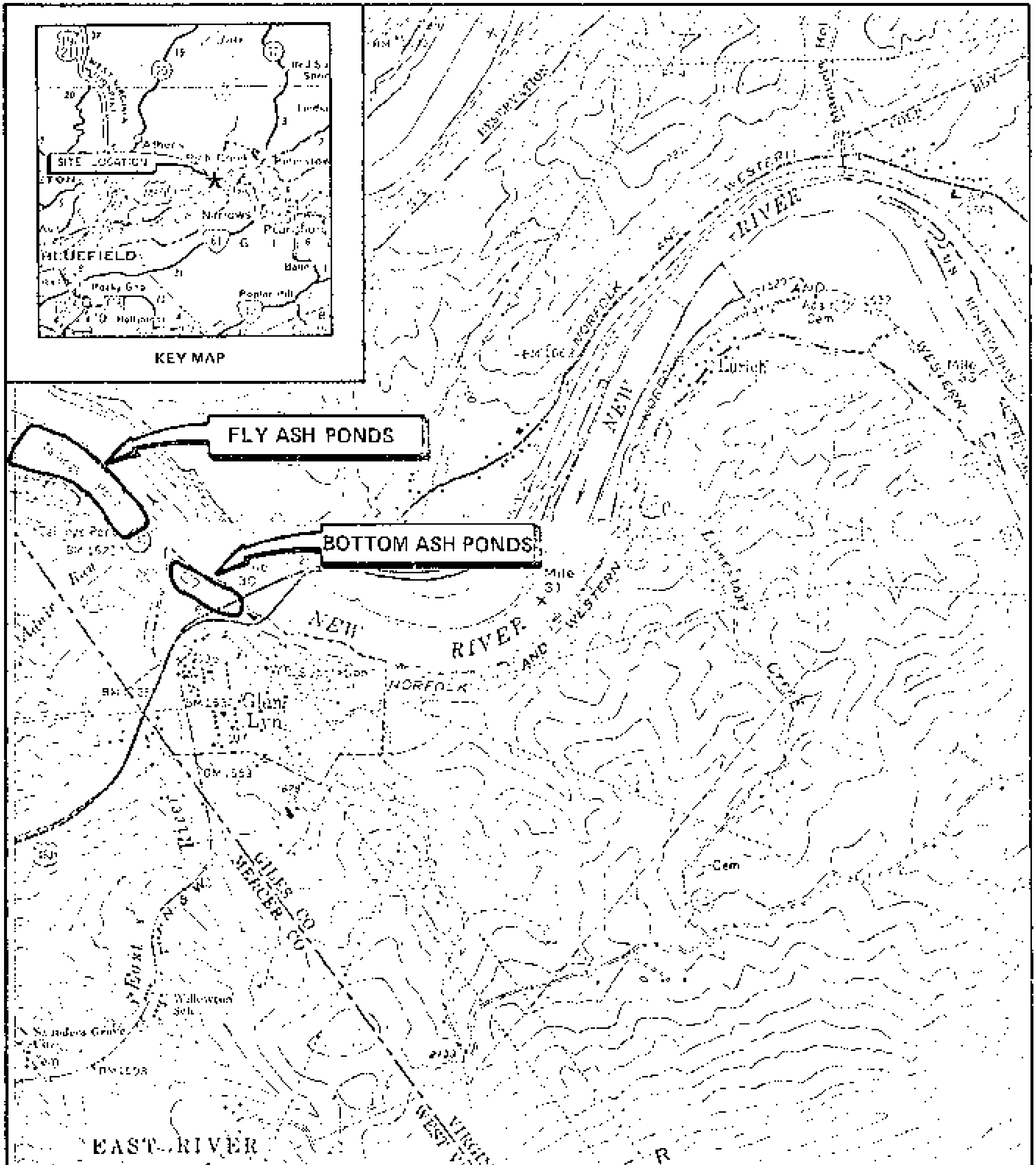
The field inspection disclosed significant differences between inventoried and actual dimensions of this facility. Although construction was started several years ago to raise the level of the dikes and overflow structure to the inventoried heights, this work was never completed. As currently operated, 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.	Date	Date of Last Revision	Title
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	Fly Ash Storage Area-Modification of Overflow Structure
16-3544	10/2/73	none	Fly Ash Storage Area-Dike Sections



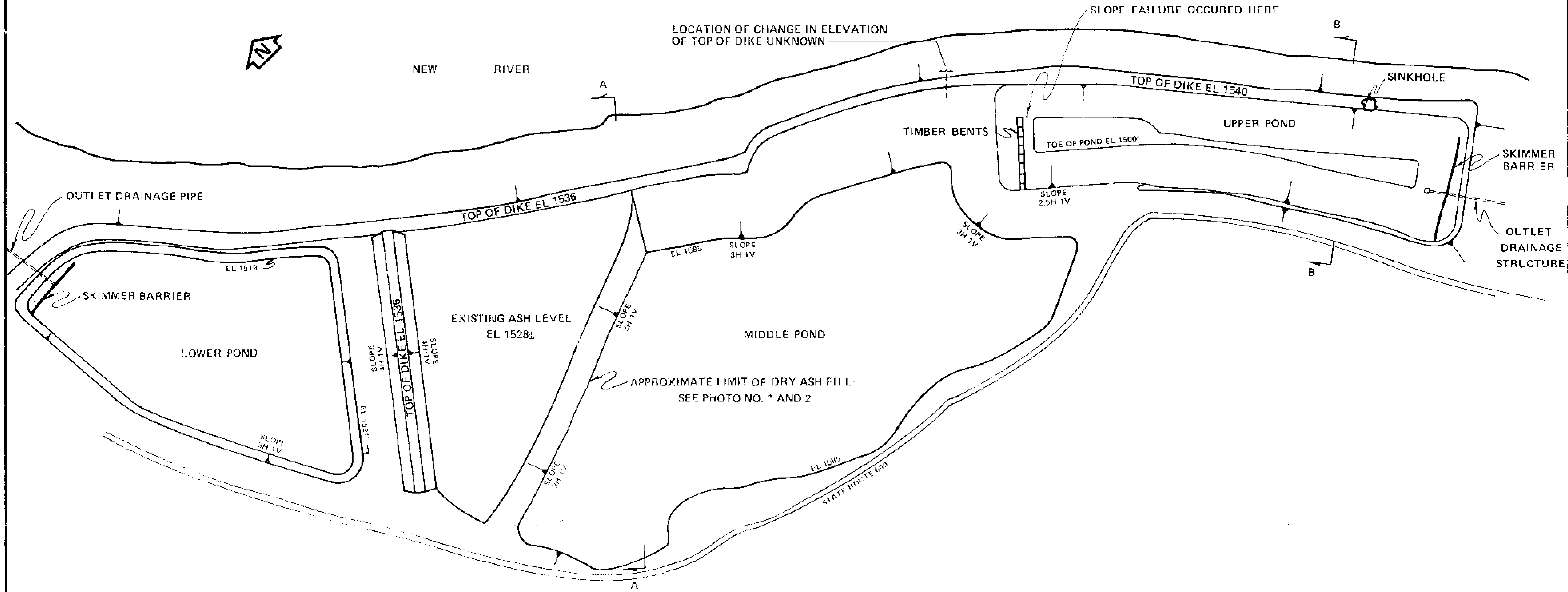
REFERENCE DRAWINGS

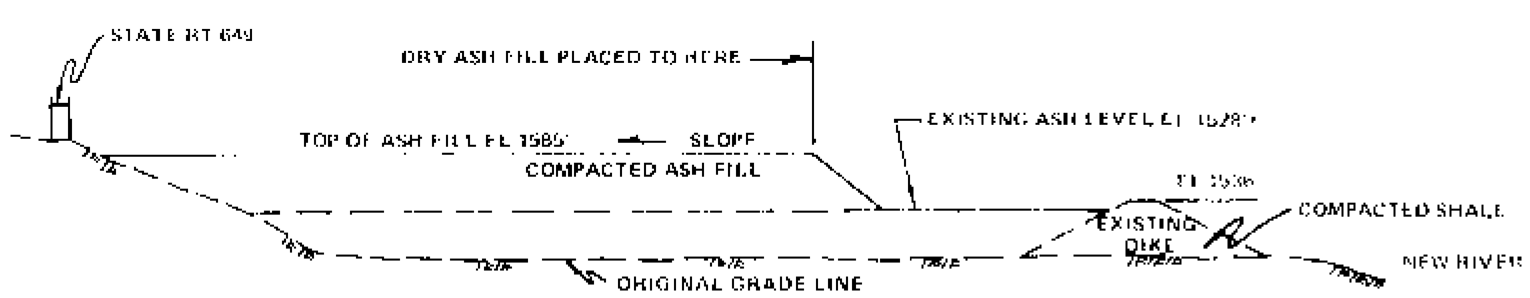
1. MAP SOURCE FOR KEY MAP IS COMMONWEALTH OF VIRGINIA HIGHWAY MAP, DATED 1975
2. MAP SOURCES FOR SITE MAP ARE USGS 7.5 MINUTE SERIES (TOPOGRAPHIC) NARROWS QUADRANGLE, NARROWS, VA. – W. VA., 1976 EDITION AND PETTERSTOWN QUADRANGLE, PETTERSTOWN, W. VA. – VA., 1965 EDITION

SITE LOCATION PLAN
GLEN LYN POWER PLANT
FLY ASH AND BOTTOM ASH PONDS

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
CLIFTON, NEW JERSEY

DR. BY:	DRS	SCALE:	1" = 2000'	PROJ. NO.:	77C110
CK'D. BY:	SAL	DATE:	5 JULY 1978	FIG. NO.:	1

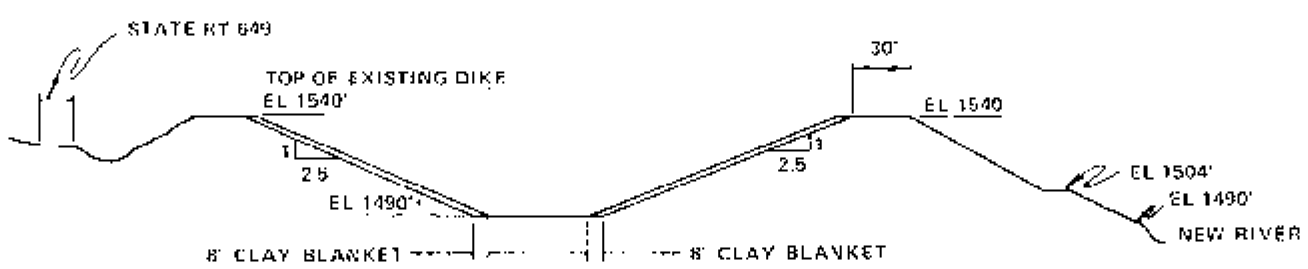




MIDDLE POND

SECTION A–A

0 100 200 FT
SCALE



UPPER POND

SECTION B–B

0 50 100 FT
SCALE

NOTE:
LAYOUT OF DIKES AND DIKE CROSS SECTIONS BASED ON AEP DRAWING NO. 16–3540–2, DATED 10-2-73 AND DWG NO. 16–3544 DATED 10-2-73 AND ON OBSERVATIONS MADE DURING THE SITE INSPECTION

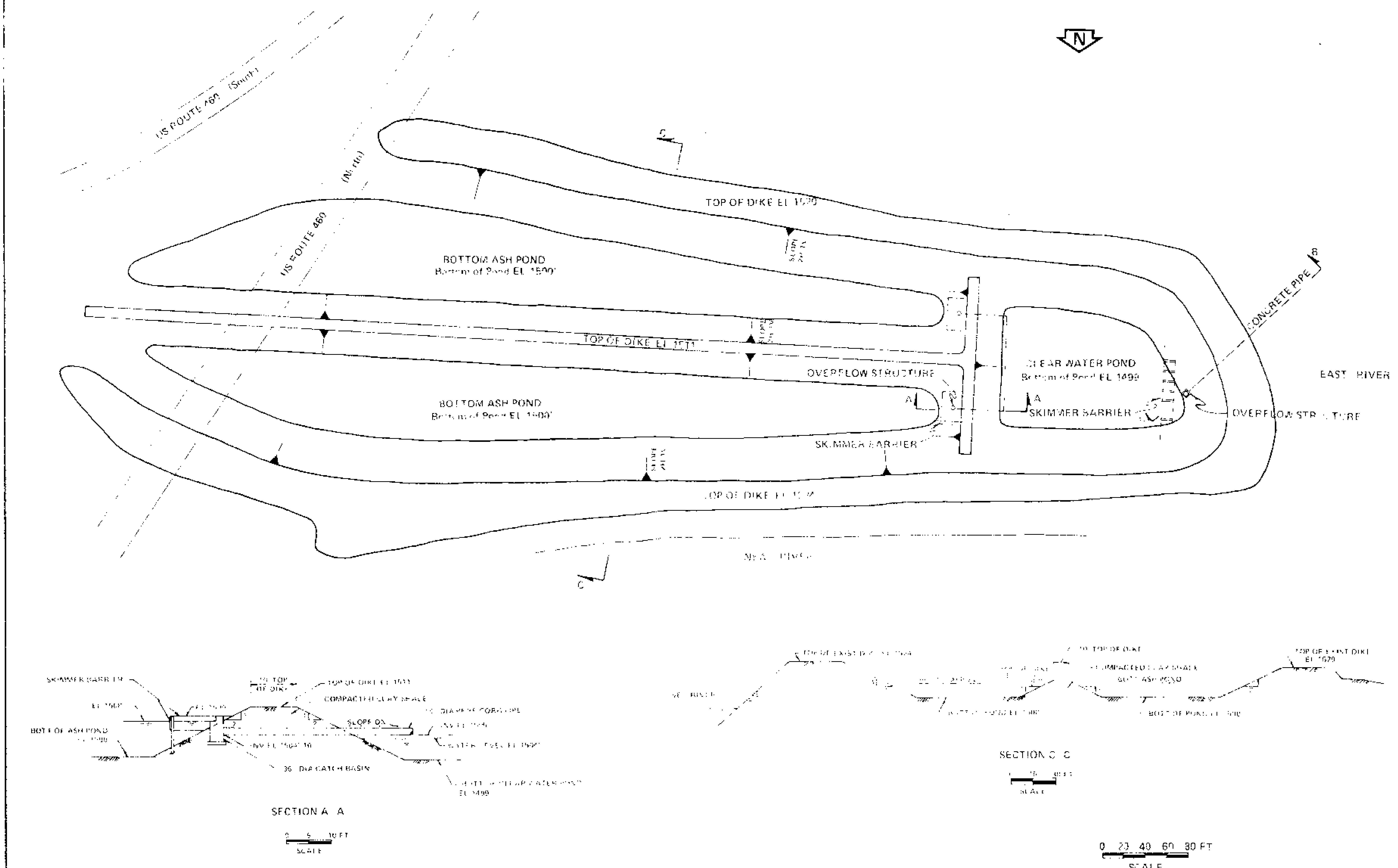
1531.50 10/19/93
1527.00 12/22/93
3.50

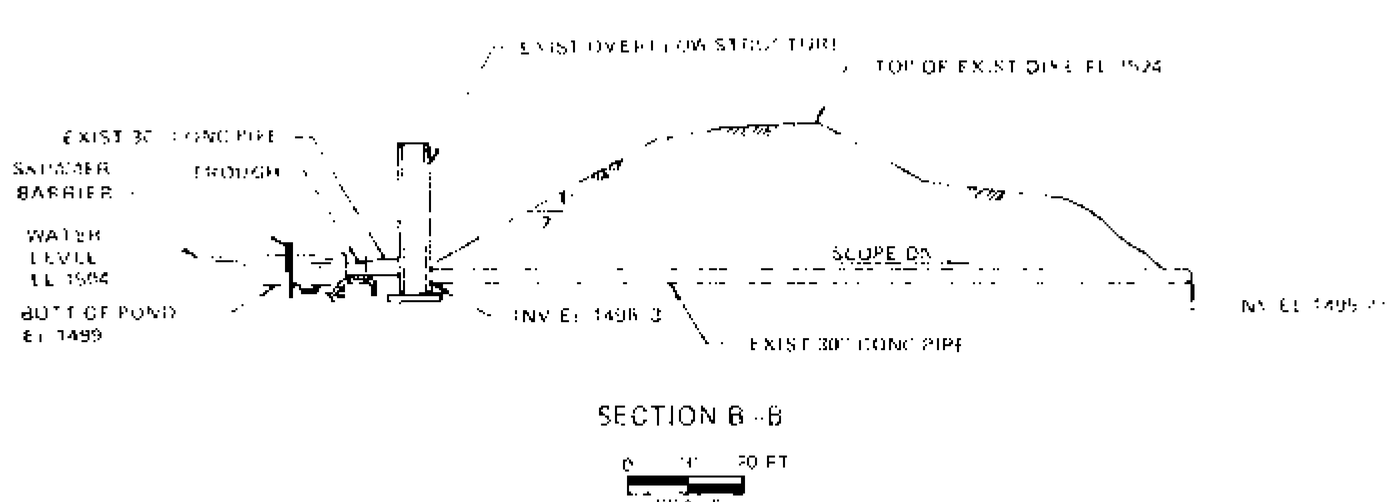
0 100 200 300 FT
SCALE

FLYASH PONDS
GLEN LYN POWER PLANT

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
CLIFTON, NEW JERSEY

DR. BY:	DRS	SCALE:	AS SHOWN	PROJ. NO:	77C110
CK'D BY:	SAL	DATE:	18 JULY 1978	FIG. NO:	2





NOTE
DIKE LAYOUT AND CROSS SECTIONS OBTAINED FROM AEP DRAWING NO. 16 11249 3564 1, DATED 7/15/76

BOTTOM ASH POND
GLEN LYN POWER PLANT

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
CLIFTON, NEW JERSEY

DR BY	DRS	SCALE	AS SHOWN	PROJ NO	77C110
CK'D BY	SAL	DATE	18 JULY 1978	FIG NO	3

APPENDIX A

PHOTOGRAPHS

Photo I. Middle Fly Ash Pond, Looking North

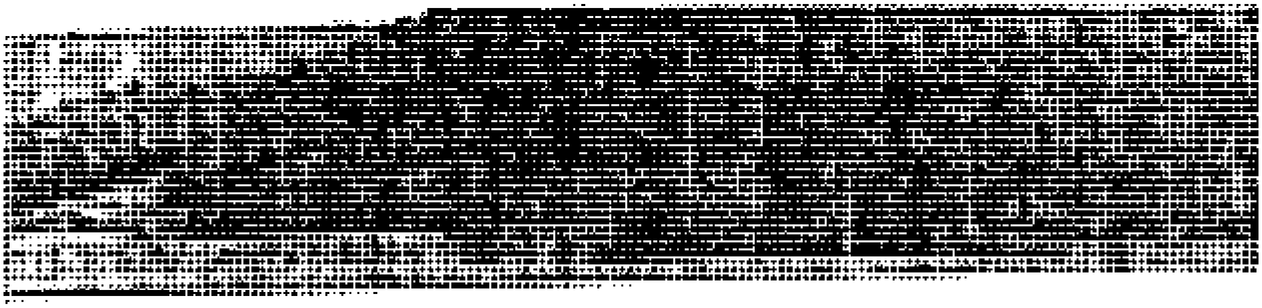


Photo 2. Lower Fly Ash Pond, Looking East

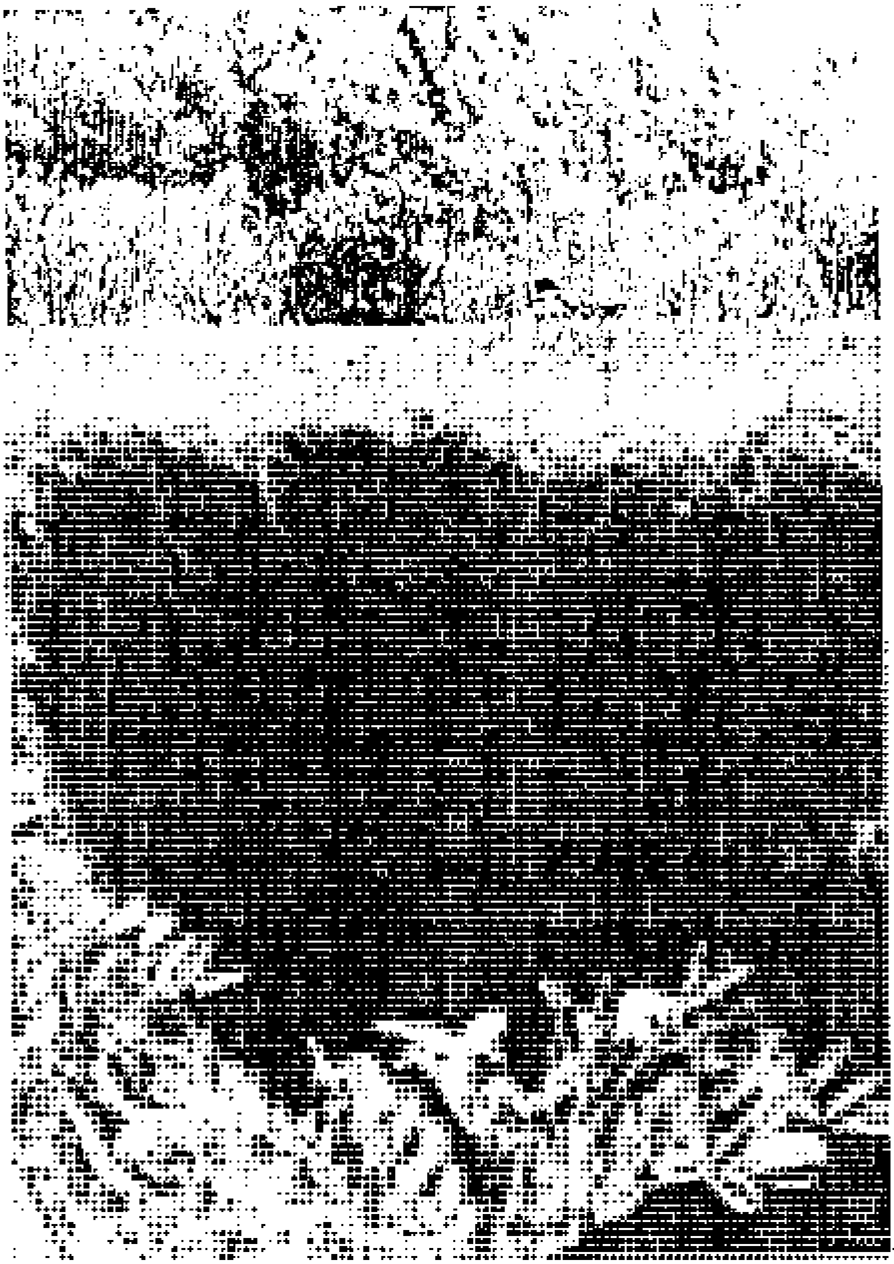


Photo 3. Upper Fly Ash Pond, Sinkhole on NE Crest of Dike

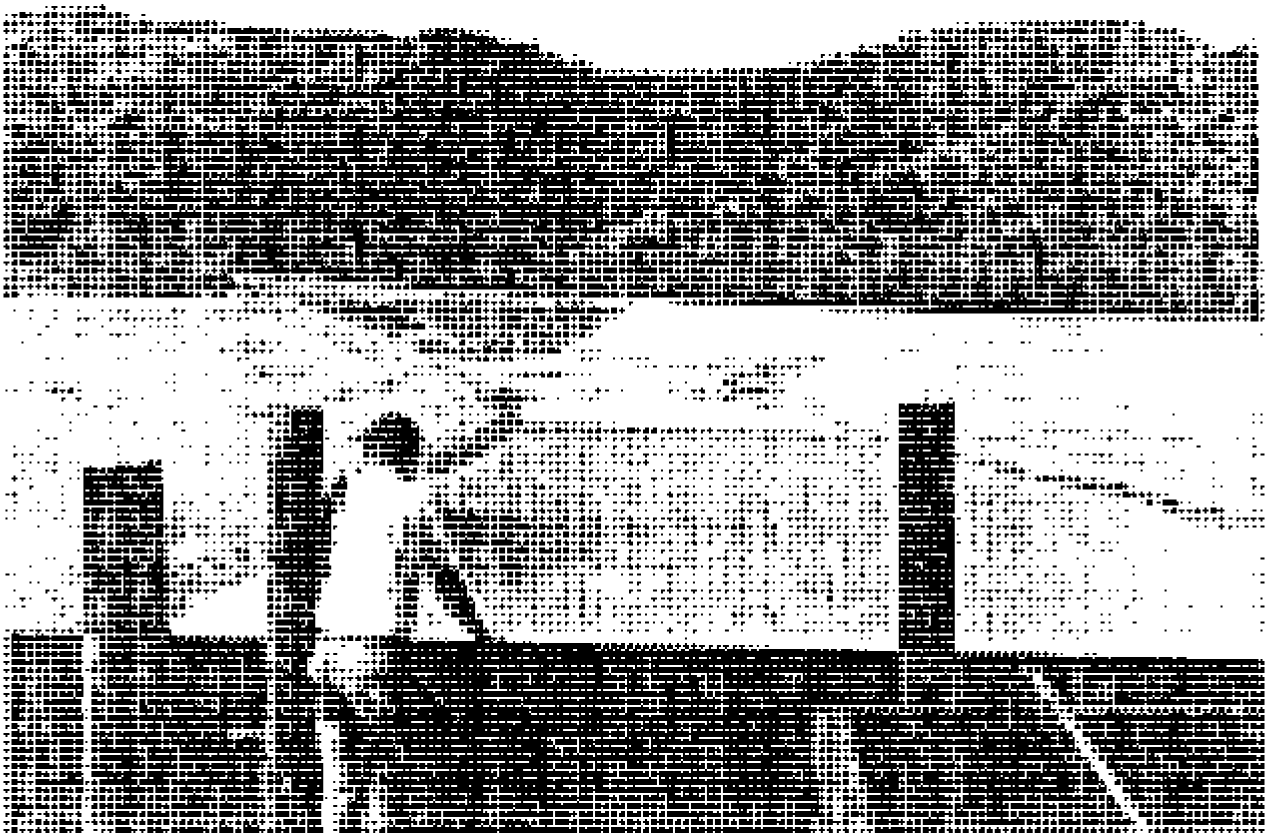


Photo 4. Upper Fly Ash Pond, Looking West

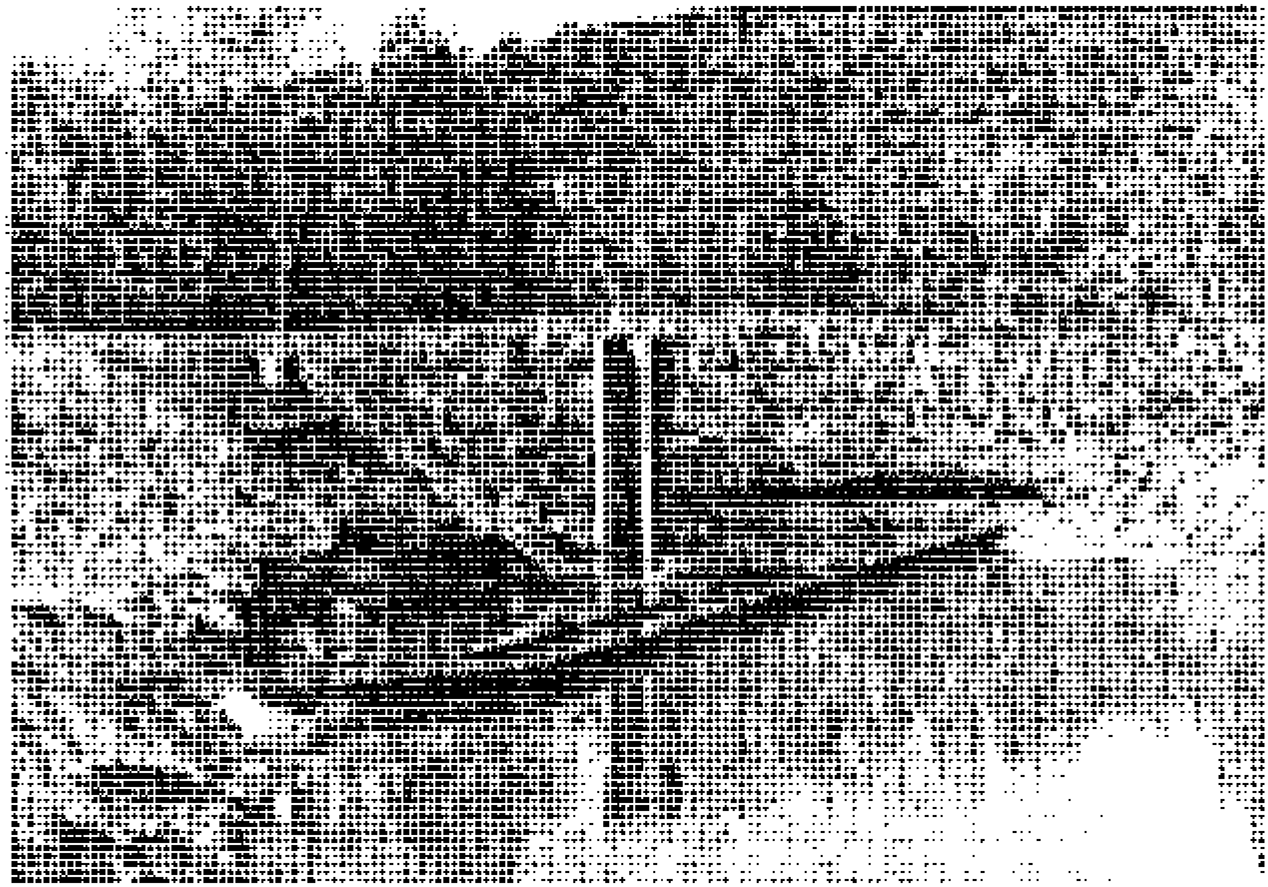


Photo 5. Bottom Ash Pond, Showing Skimmer
Barrier of Clear Water Pond

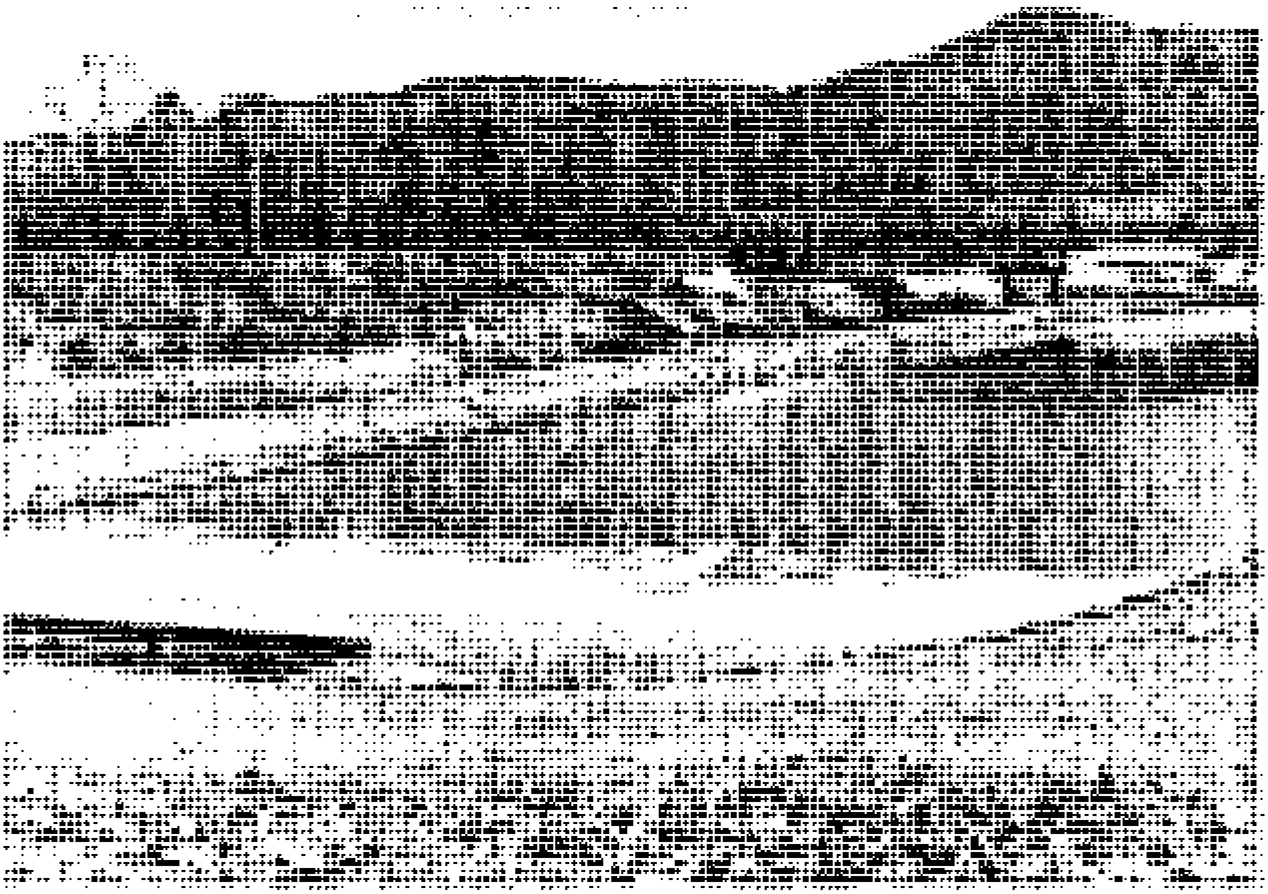


Photo 6. West Half of Bottom Ash Pond

APPENDIX B

VISUAL INSPECTION CHECKLIST

GLEN LYN

FLY ASH POND

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

Name Dam Upper and Lower Flyash Pond County Giles State VA.

Type of Dam Homogeneous Clay Hazard Category+ High

Date(s) Inspection 5/11/78 Weather Clear Temperature ± 75

+ From U.S. Army Corps of Engineers' National Inventory of Dams

Pool Elevation at Time of Inspection 1527 M.S.L. Tailwater at Time of Inspection 1494 M.S.L.

Inspection Personnel:

Noel Rameberg

Jack Frederick

Jack Frederick Recorder

Remarks:

Glen Lyn Flyash dam actually three separate systems of dikes enclosing upper, middle and lower ponds.

At time of inspection middle pond full and out of service. Upper pond dry and lower pond in full service.

Unless otherwise noted, remarks pertain to both upper and lower pond dikes.

CONCRETE/MASONRY DAMS

Not Applicable

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE (faces, abutments, toe , etc...) N/A		
STRUCTURE TO ABUTEMENT/EMBANKMENT JUNCTIONS		
DRAINS, 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 settlements, heaving, deflections etc...)		
MONOLITH AND CONSTRUCTION JOINTS (filler material movement, leakage, etc...)		
ABUTMENTS (instability, excessive weathering, etc...)		

EMBANKMENT

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

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RIPRAP FAILURES	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 erosion at toe of slope.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM (erosion, leakage etc...)	None noted	
ANY NOTICEABLE SEEPAGE (embankment and abutment downstream slopes, toe, etc...)	No seepage noted	
DRAINS, CHARACTERISTICS OF DISCHARGE	Not applicable	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable	
INTAKE STRUCTURE	Upper pond: not in service Lower pond: appeared normal	
OUTLET STRUCTURE	Upper Pond: not in service Lower pond: no evidence of seepage around outside of pipe	
EMERGENCY GATE	Not applicable	
STILLING BASIN	Not applicable	

UNGATED SPILLWAY

Not Applicable

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

GATED SPILLWAY

Not applicable

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		
STILLING BASIN		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Upper pond slopes were completely exposed (pond empty). Northwest slope had failed on first filling with resulting collapse of discharge header pipe pile foundations. Because of this, pond was emptied and placed out of service. Some erosion of southwest slope was also noted at point where it appeared that inflow pipe was once located. Otherwise all slopes appeared to be stable and free of displacements.	
SEDIMENTATION	Purpose of reservoirs is to collect flyash sediments. At time of inspection middle pond was full of sediment with no free water on surface, upper pond was completely empty and dry, and lower pond was in active service. Soundings were being made by others to determine depth of sediment in lower pond. Estimated life of lower pond at present rate of filling reported to be an additional 12 to 18 months.	
POTENTIAL UPSTREAM HAZARD AREAS	No natural drainage into reservoir. All flow is piped in under controlled conditions. Limited watershed (less than 1.0 MI^2) from natural side hill, west of the lower pond, is diverted through side channel ditch boarding easternmost dike of lower pond. Natural springs and erosion in this area have caused some blockage along diversion ditch. This ditch should be cleared and regraded to prevent run off from entering flyash pond. Runoff from the hill located west of the upper pond is picked up by storm sewer facilities adjacent to Route 649. There is virtually no watershed between Route 649 and the Upper Pond.	

DOWNSTREAM CHANNEL

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	
POTENTIAL DOWNSTREAM HAZARD AREAS (No. of homes, population, etc...)	None. 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.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURVEY MONUMENT	No formal instrumentation installed. However, daily inspection is made by plant personnel to ascertain condition of piping system and ponds. At time of visit, others were making a field survey to determine the extent of siltation in lower pond. This included determination of depth of water at fixed grid locations over entire area of pond.	
SETTLEMENT PLATES, INCLINOMETERS		
OBSERVATIONS WELLS, PIEZOMETERS		
WEIRS/FLOW MEASURING DEVICES		
HEADWATER, TAIL WATER GAGES		
OTHER		

GLEN LYN

BOTTOM ASH POND

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

Name Dam Glen Lyn Bottom Ash Dam County Giles State Virginia

Type of Dam Earth Embankment Hazard Category+ High

Date(s) Inspection 11 May 1978 Weather Clear Temperature ± 75° F

+ From U.S. Army Corps of Engineers' National Inventory of Dams

Pool Elevation at Time of Inspection N/A M.S.L. Tailwater at Time of Inspection ______ M.S.L.

Inspection Personnel:

Noel Ravneberg

Jack Frederick

Jack Frederick Recorder

Remarks:

At time of inspection operators were converting from operation of the south half to operation of the north half of pond.

CONCRETE/MASONRY DAMS N/A

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE (faces, abutments, toe , etc...)		
STRUCTURE TO ABUTEMENT/EMBANKMENT JUNCTIONS		
DRAINS, CHARACTERISTICS OF DISCHARGE		
WATER PASSAGES (Erosion, cavitation, obstructions, cracks, etc...)		
FOUNDATION (possible damage or undermining of downstream toe)		

CONCRETE/MASONRY DAMS N/A

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

EMBANKMENT

VISUAL EXAMINATIONS OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None Noted	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted	
SLOUGHING SLIDING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Considerable sloughing of partition dike which separates the pond in half. No displacement of perimeter dike which contains the impoundment.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Normal	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RIPRAP FAILURES	Large (1-2 $yard^3$) stone and riprap on lower half of downstream slope to protect embankment from high river flow. No displacement failures noted.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM (erosion, leakage etc...)	Closed perimeter dike with no natural abutments.	
ANY NOTICEABLE SEEPAGE (embankment and abutment downstream slopes, toe, etc...)	None noted.	
DRAINS, 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 clear and less turbid than flow in river.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Concrete surfaces appear fresh with no significant cracking or spalling.	
INTAKE STRUCTURE	Rectangular concrete intake tower extends about 15 feet above pond level of stilling basin. Provision to place stop logs in open slot of one wall to raise pond level has never been used. Overflow remains fixed at present level 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 East 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 ponds. This water undergoes a second settling process before passing over the lip of the skimmer troughs connected to the intake/outlet structure.	

UNGATED SPILLWAY NONE

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

GATED SPILLWAY NONE

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL		
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT		
STILLING BASIN		

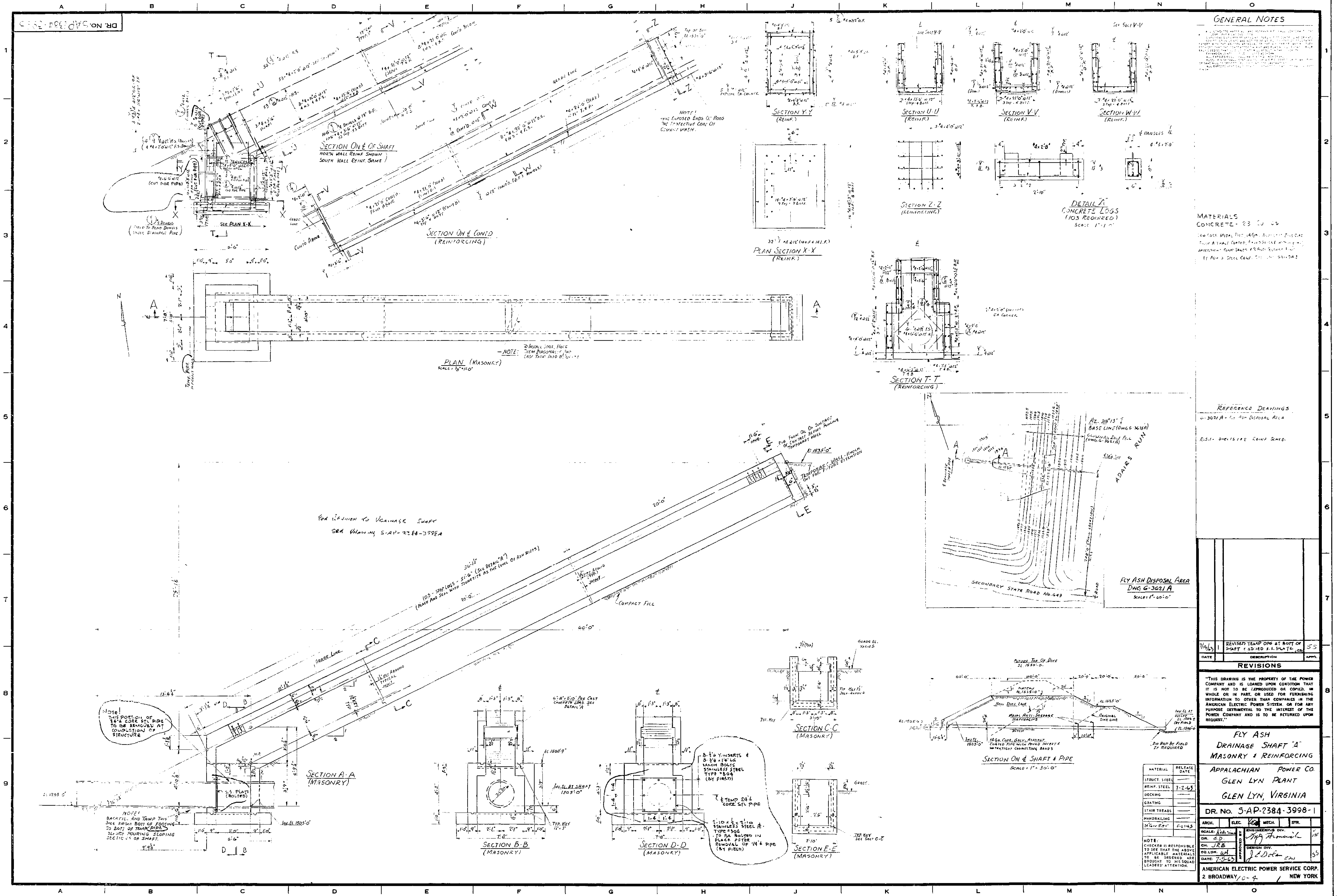
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Severe sloughing of partitional dike between separate halves of bottom ash pond. No significant slouging of upstream slopes of main dikes.	
SEDIMENTATION	Used for purposes of sedimentation. Left half full of sediment. Right half recently 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 reservoir is the stilling basin which is estimated to contain less than 10 acre-ft. of water.	

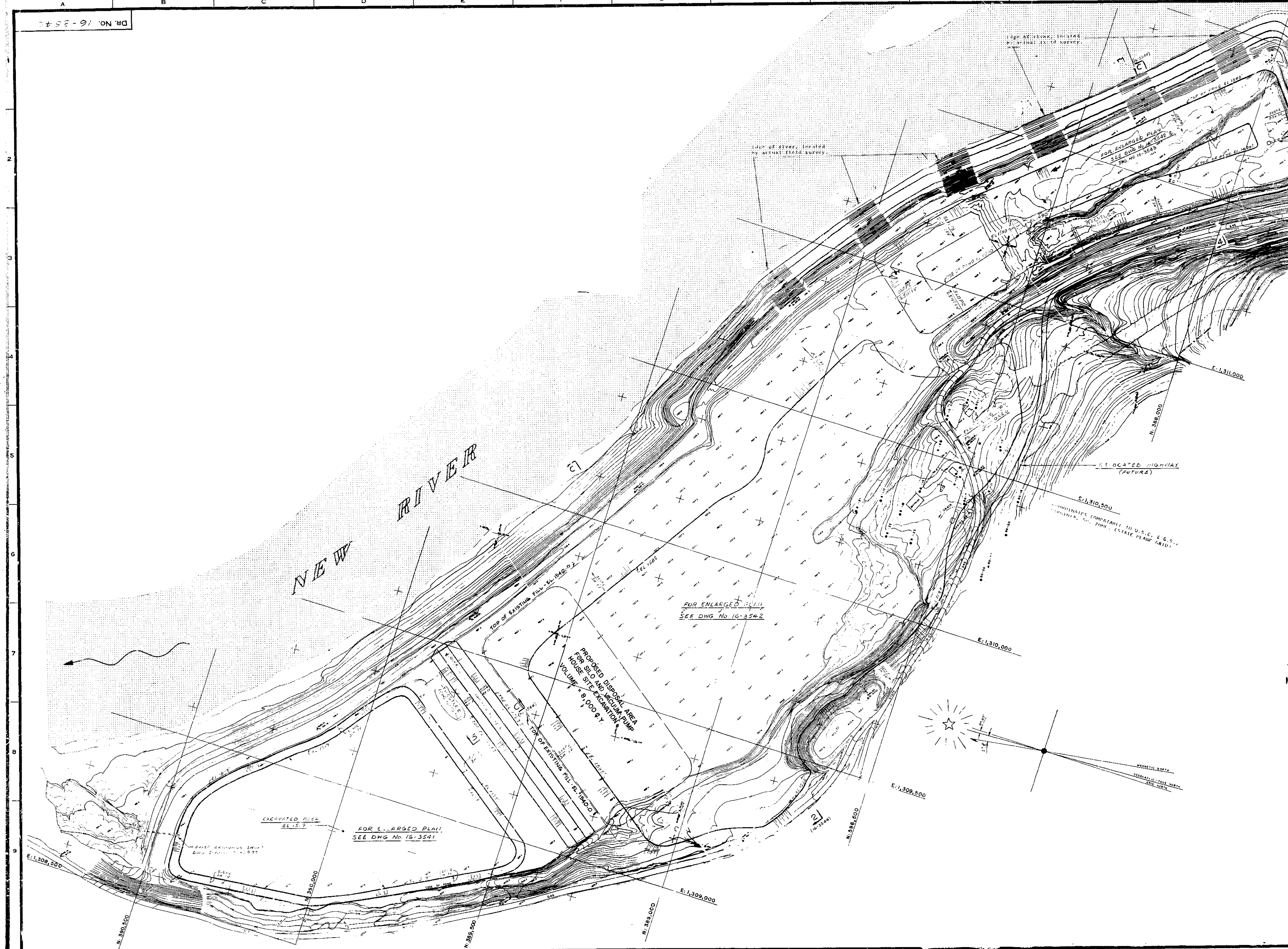
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (Obstruction, debris, etc...)	The outlet works connect directly to East River which is a natural water course.	
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.	

INSTRUMENTATION NONE

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURVEY MONUMENT		
SETTLEMENT PLATES, INCLINOMETERS		
OBSERVATIONS WELLS, PIEZOMETERS		
WEIRS/FLOW MEASURING DEVICES		
HEADWATER, TAIL WATER GAGES		
OTHER		


DR. No. S-AP-2384-3998-1
GENERAL NOTES
SECTION ON ℄ OF SHAFT
NORTH WALL REINF. SHOWN
SOUTH WALL REINF. SAME
SECTION ON ℄ CONT'D (REINFORCING)
SECTION Y-Y (REINF.)
SECTION U-U (REINF.)
SECTION V-V (REINF.)
SECTION W-W (REINF.)
SECTION Z-Z (REINFORCING)
DETAIL "A" CONCRETE LOGS (103 REQUIRED)
PLAN SECTION X-X (REINF.)
SECTION T-T (REINFORCING)
MATERIALS
PLAN (MASONRY)
REFERENCE DRAWINGS
ADAIRS RUN
SECONDARY STATE ROAD No. 649
FLY ASH DISPOSAL AREA DWG. G-3621 A
COMPACT FILL
GRADE LINE
SECTION A-A (MASONRY)
SECTION B-B (MASONRY)
SECTION D-D (MASONRY)
SECTION C-C (MASONRY)
SECTION E-E (MASONRY)
SECTION ON ℄ SHAFT & PIPE
7/15/63 1. REVISED TEMP OPG AT BOTT OF SHAFT & ADDED S.S. PLATE JRB 55
DATE DESCRIPTION APPD.
REVISIONS
"THIS DRAWING IS THE PROPERTY OF THE POWER COMPANY AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED, IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHER THAN COMPANIES IN THE AMERICAN ELECTRIC POWER SYSTEM, OR FOR ANY PURPOSE DETRIMENTAL TO THE INTEREST OF THE POWER COMPANY AND IS TO BE RETURNED UPON REQUEST."
FLY ASH
DRAINAGE SHAFT "A"
MASONRY & REINFORCING
APPALACHIAN POWER CO.
GLEN LYN PLANT
GLEN LYN, VIRGINIA
DR. No. S-AP-2384-3998-1
ARCH. ELEC. MECH. STR.
ENGINEERING DIV.
DESIGN DIV.
DR. G.D.
CH. JRB
DATE: 7-5-63
APPROVED BY
AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



DATE	No	DESCRIPTION	
9/4/79	3	ADDED DISPOSAL AREA FOR SILO & VAC. PUMP HSE. SITE EXC.	
12/6/76	2	[illegible]	
11/9/73	1	ADDED PIPE TRESTLES	

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN VIRGINIA

FLYASH STORAGE AREA GENERAL PLAN

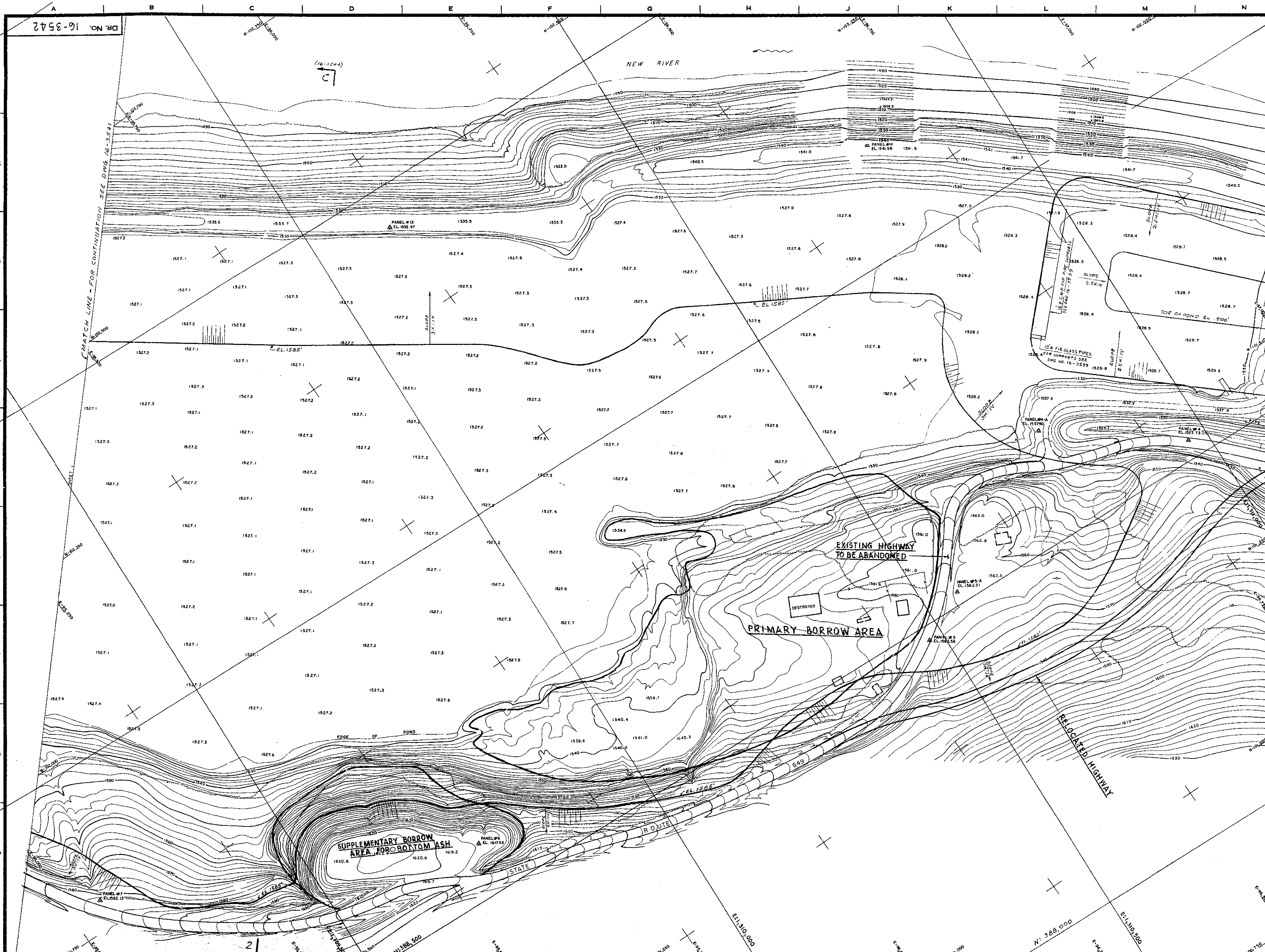
DR. NO. 16-3540-3

ARCH. | ELEC. | MECH. | STR.

SCALE 1" = 100'
DR J.M.
CH D.P.C.
SQ. LDR. M.E.
DATE: 10/4/73

APPROVED BY: ENGINEERING DIV. / DESIGN DIV.

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



SHEET 2 OF 3

SCALE: 1" = 50'

50 0 50 100

CONTOUR INTERVAL: 2'

AERIAL SURVEYS, INC
CLEVELAND, OHIO
ASI 613

PREPARED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY TAKEN 12-22-71 & 3-6-72

VERTICAL AND HORIZONTAL CONTROL FURNISHED BY APPALACHIAN POWER CO.

DATE	No.	DESCRIPTION	APPD.
12/6/76	1	INCREASED CAPACITY OF UPSTREAM STORAGE AREA.	W.I.

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN · VIRGINIA

FLYASH STORAGE AREA
DIKES

SHEET 2 OF 3

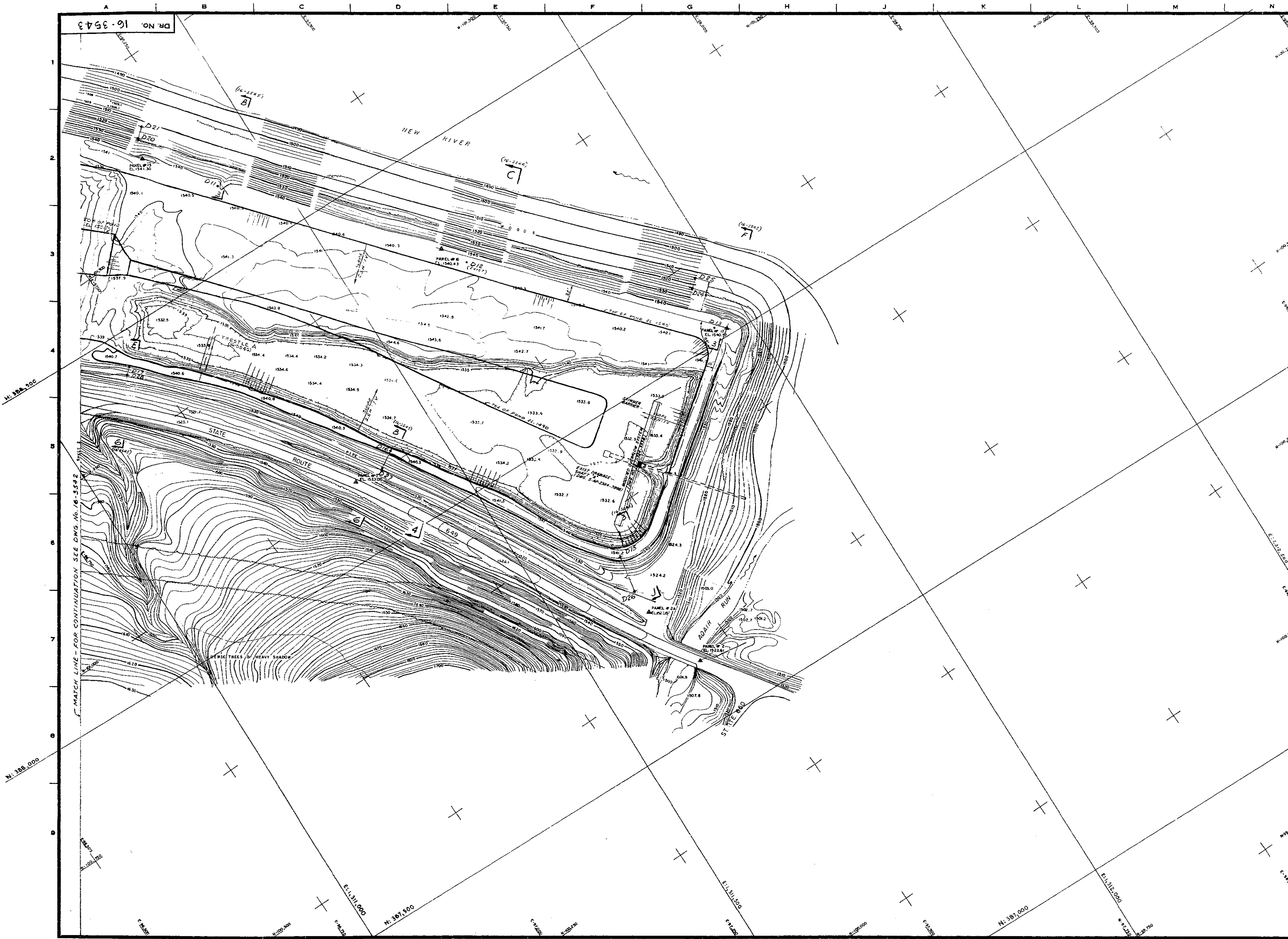
DR. No. 16-3542-1

ARCH. | ELEC. | MECH. | STR.

SCALE: 1" = 50'
DR. J. M.
CH. D.P.C.
SQ. LDR. M. G.
DATE: 10/2/73

APPROVED BY
ENGINEERING DIV.
DESIGN DIV.

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



SHEET 3 OF 3
SCALE: 1" = 50'
50 0 50 100
CONTOUR INTERVAL: 2'

AERIAL SURVEYS, INC.
CLEVELAND, OHIO
ASI 613

PREPARED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY TAKEN 12-23-71 & 3-6-72.

VERTICAL AND HORIZONTAL CONTROL FURNISHED BY APPALACHIAN POWER CO.

DATE	No.	DESCRIPTION	APPD.
12/4/72	1	INCREASED CAPACITY OF STORAGE AREA.	

REVISIONS

APPALACHIAN POWER CO
GLEN LYN POWER PLANT
GLEN LYN · VIRGINIA

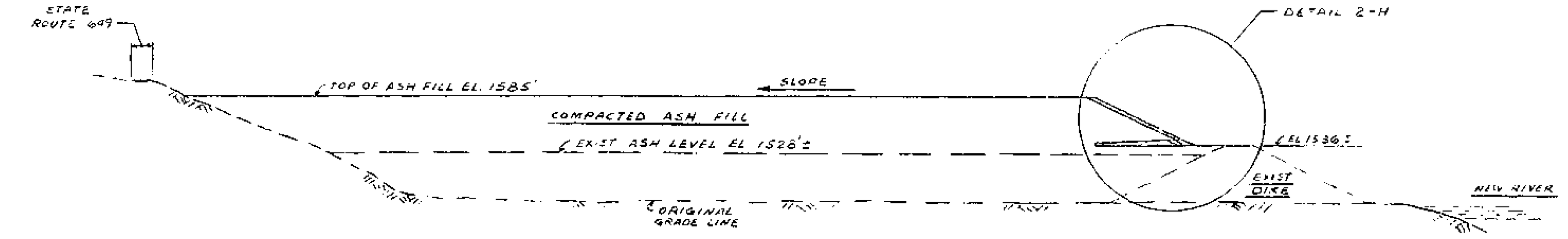
FLYASH STORAGE AREA
DIKES
SHEET 3 OF 3

DR. NO. 16-3543-1

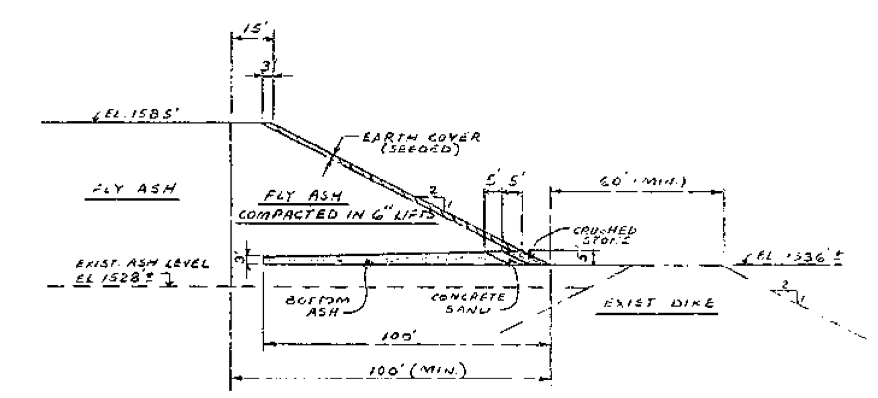
ARCH. | ELEC. | MECH. | STR.

SCALE: 1" = 50'
DR. J.M.
CH. D.P.C.
SQ. LDR. M.A.
DATE: 10/2/72
APPROVED BY — ENGINEERING DIV. / DESIGN DIV.

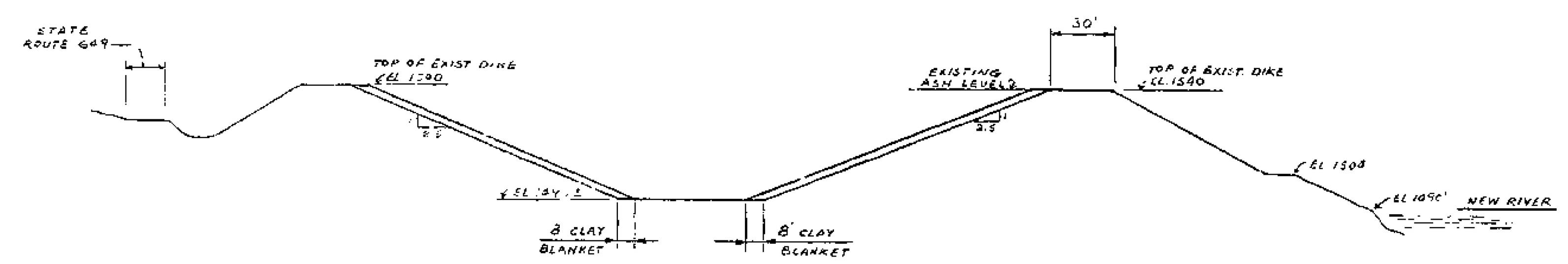
AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK



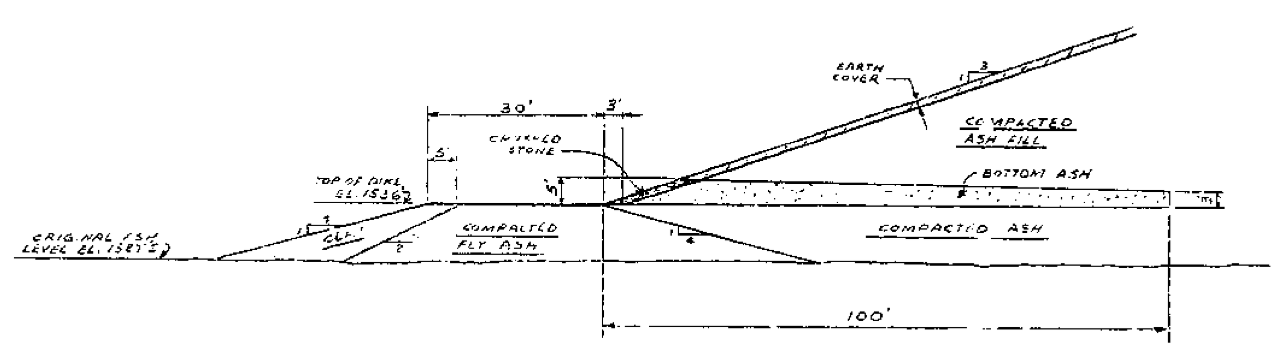
SECTION 2-C
1" = 100' (16-3548)



DETAIL 2-H
1" = 40' (16-3544)



SECTION 4-C
1" = 50' (16-3543)



SECTION E-C
1" = 20' (16-3541)

DATE	No.	DESCRIPTION	APPD.

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN VIRGINIA

FLYASH STORAGE AREA
DIKE SECTIONS
SH. 1 OF 2

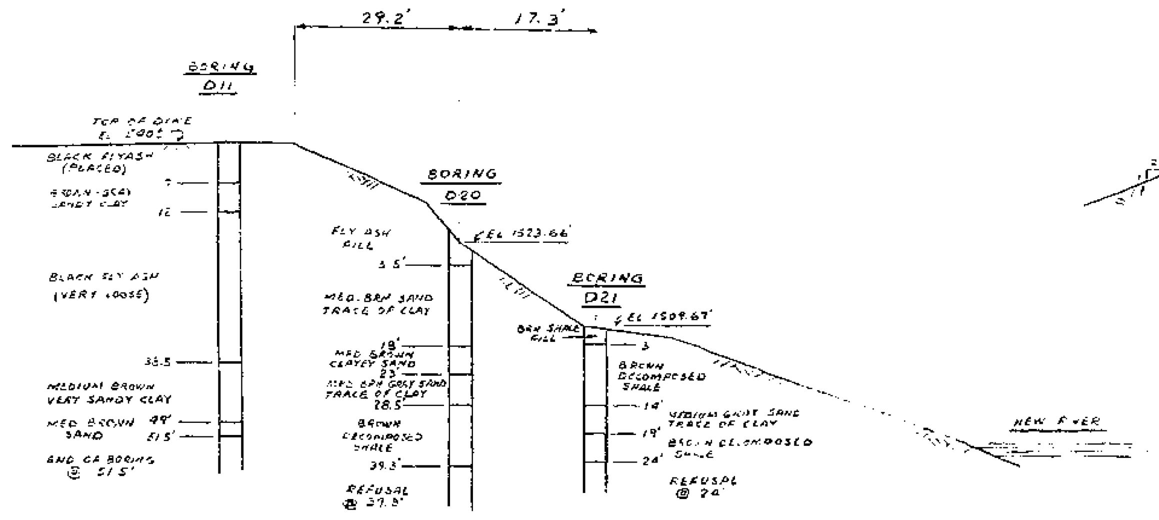
DR. No. 16-3544

ARCH.		ELEC.		MECH.		STR.	

SCALE: AS NOTED
DR. J.M.
CH. D.P.C.
SQ. LDR. HK
DATE: 10/2/73
APPROVED BY: ENGINEERING DIV. [signature]; DESIGN DIV. [signature]

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK

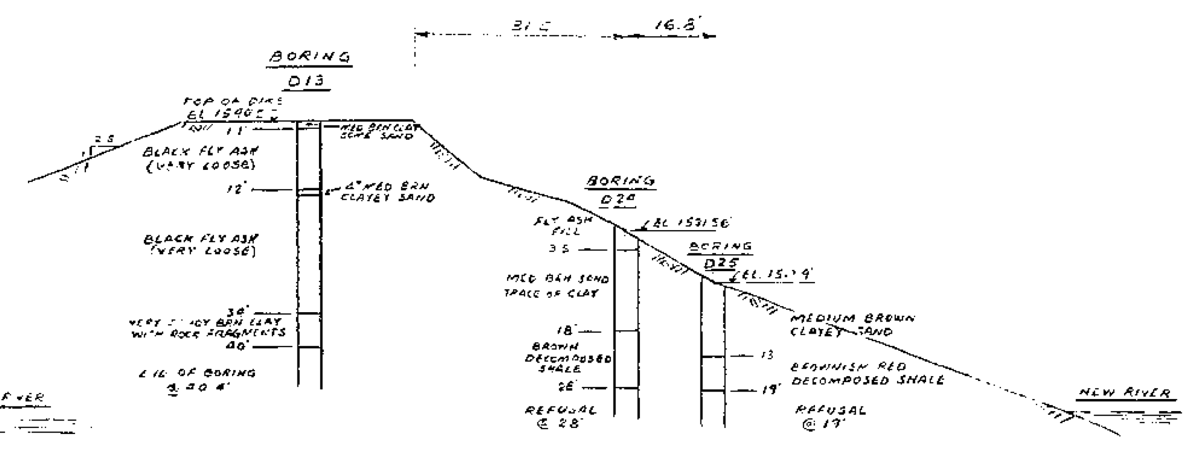
GENERAL NOTES



SECTION 3-B

BORINGS D11, D20 & D21

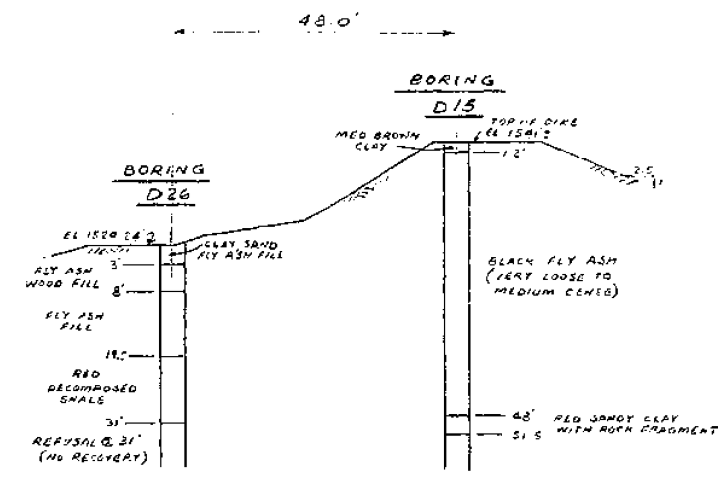
1"=20'   DWG. 16-3543



SECTION 3-F

BORINGS D13, D24 & D25

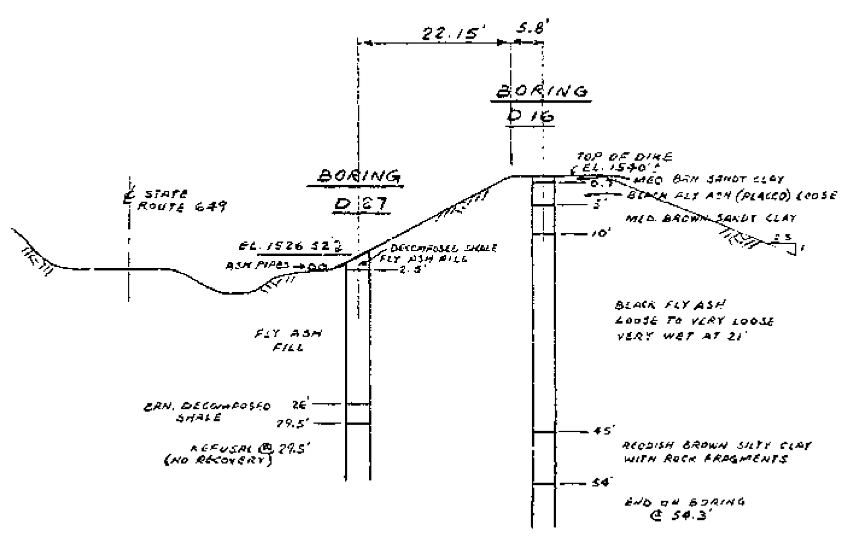
1"=20'   DWG. 16-3543



SECTION 3-J

BORINGS D15 & D26

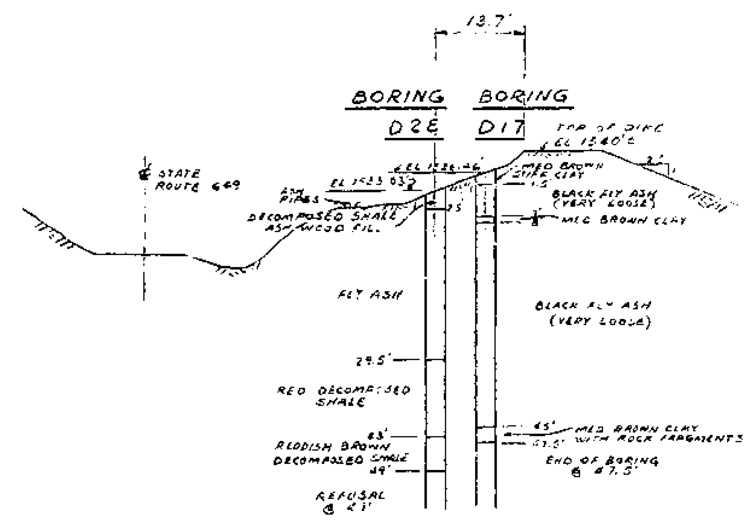
1"=20'   DWG. 16-3543



SECTION 6-B

BORINGS D16 & D27

1"=20'   DWG. 16-3543



SECTION 6-E

BORINGS D17 & D28

1"=20'   DWG. 16-3543

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN   VIRGINIA

FLYASH STORAGE AREA
DIKE SECTIONS
SH. 2 OF 2

DR. NO. 16-3545

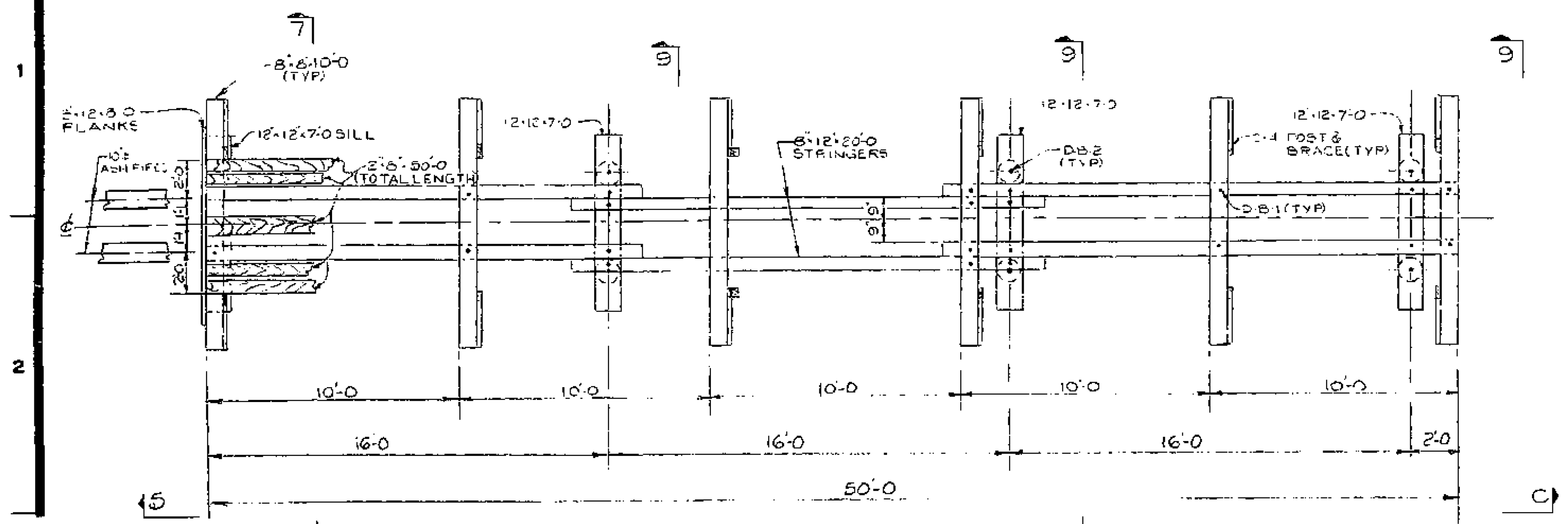
ARCH. | ELEC. | MECH. | STR.

SCALE: AS NOTED
DR. J.M.
CH. D.P.C.
SQ. LDR. M.E.
DATE 10/2/73

APPROVED BY
ENGINEERING DIV.
DESIGN DIV.

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY   NEW YORK

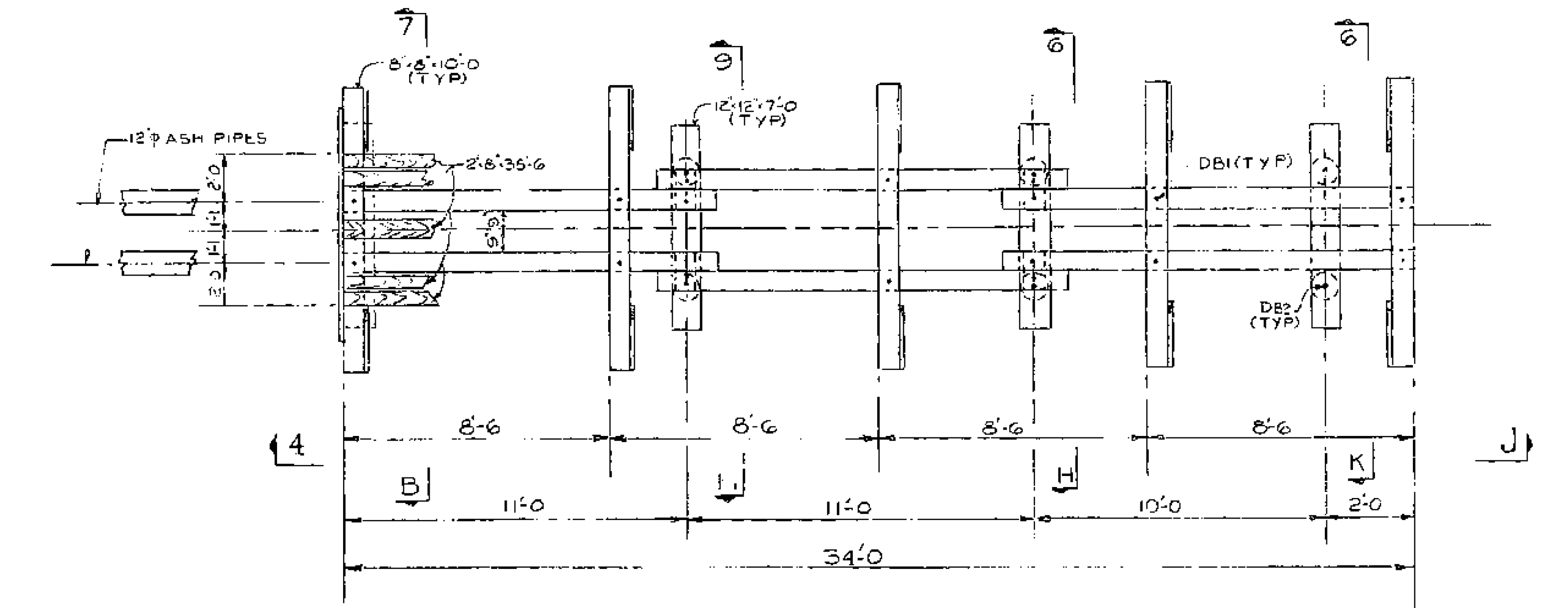
DR. NO. 16-3546



PLAN

TOP OF PIPES SUPPORTS EL.1540'-7½

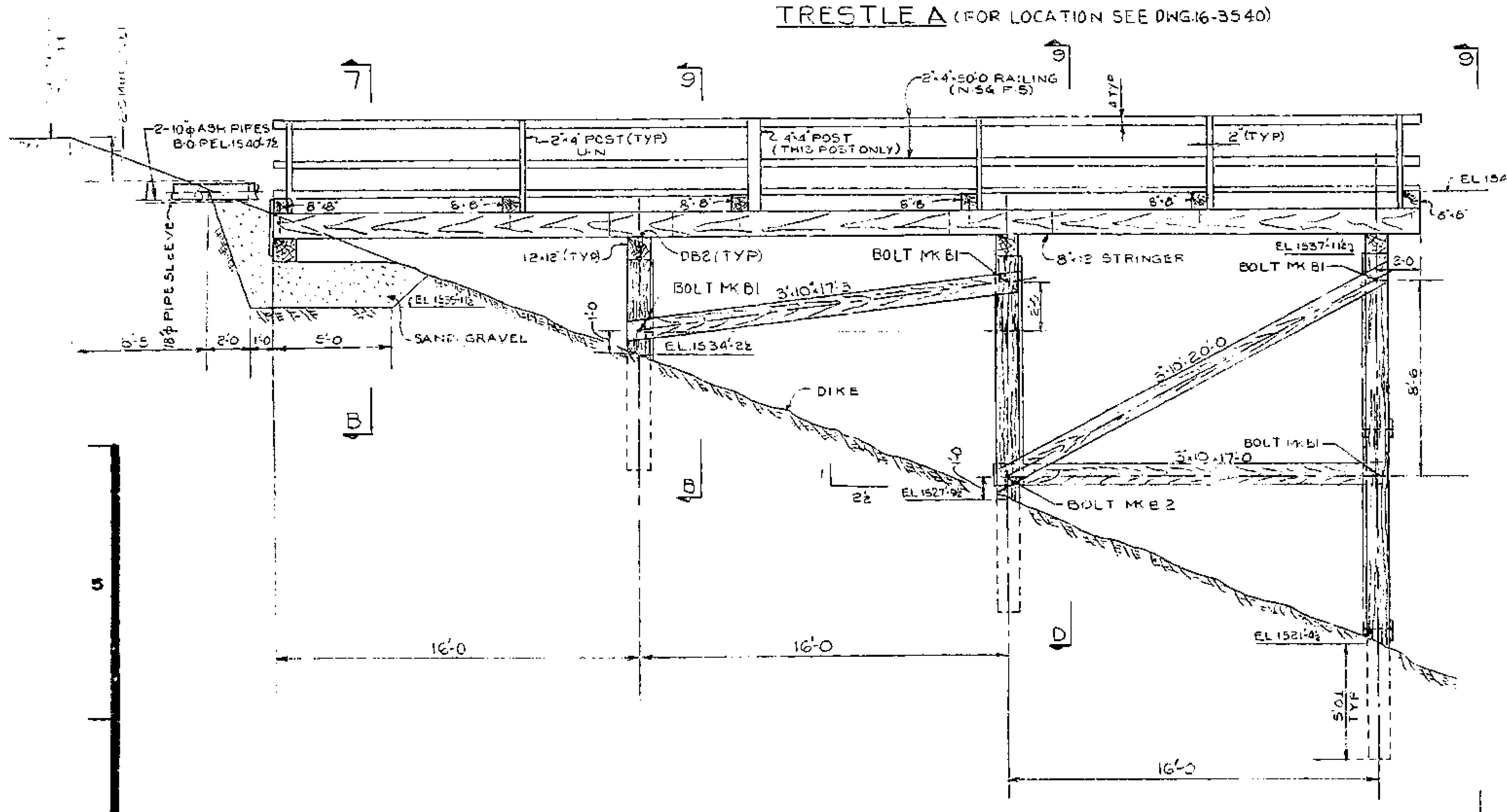
TRESTLE A (FOR LOCATION SEE DWG.16-3540)



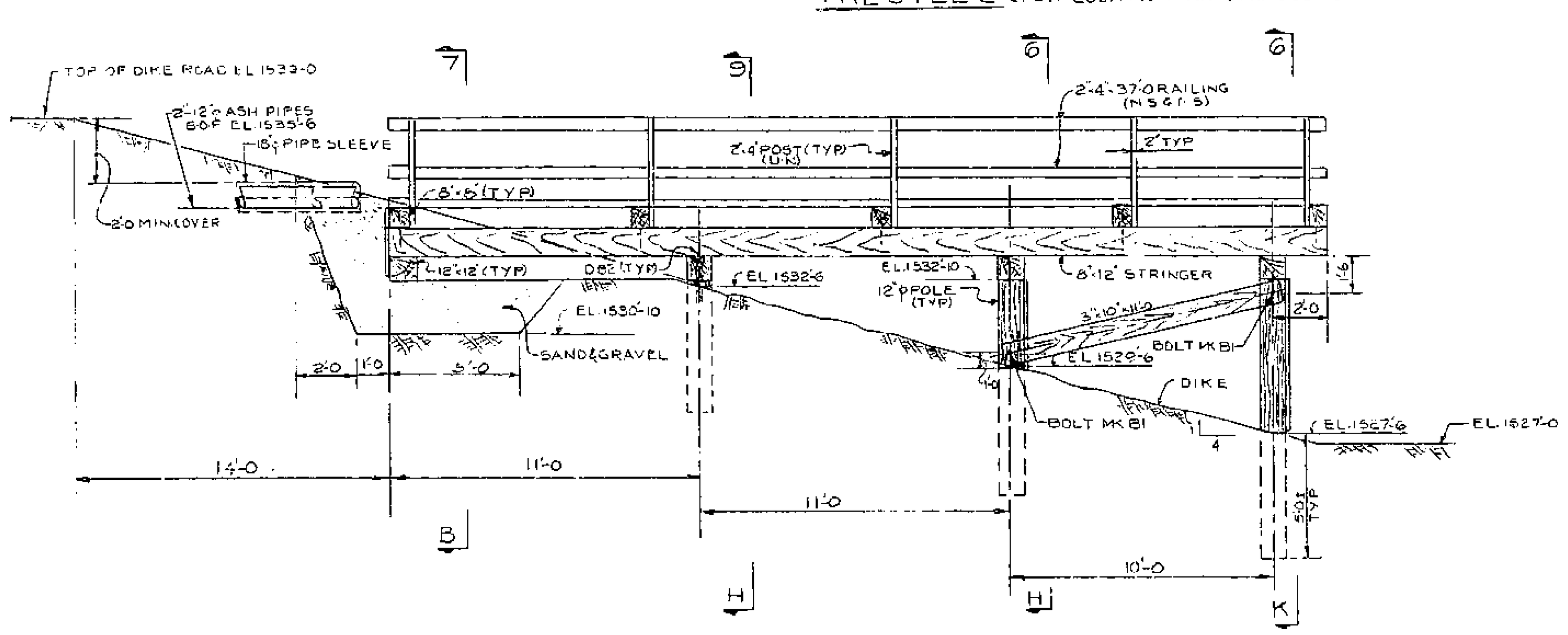
PLAN

TOP OF PIPES SUPPORT EL.1535'-6

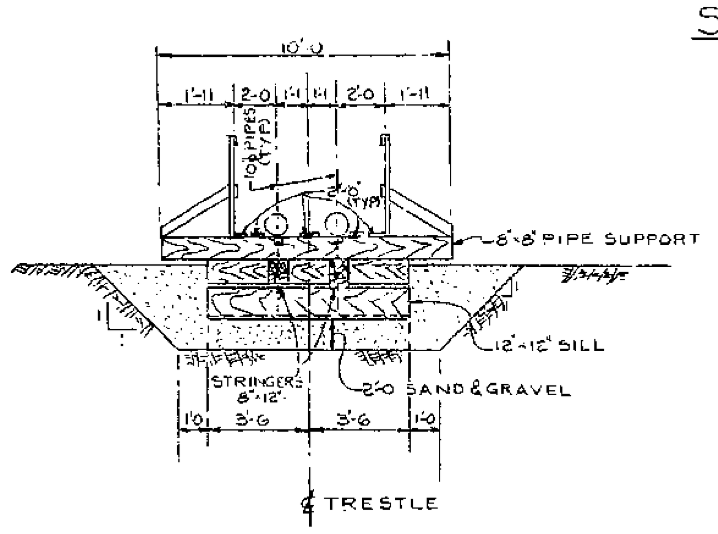
TRESTLE B (FOR LOCATION SEE DWG.16-3540)



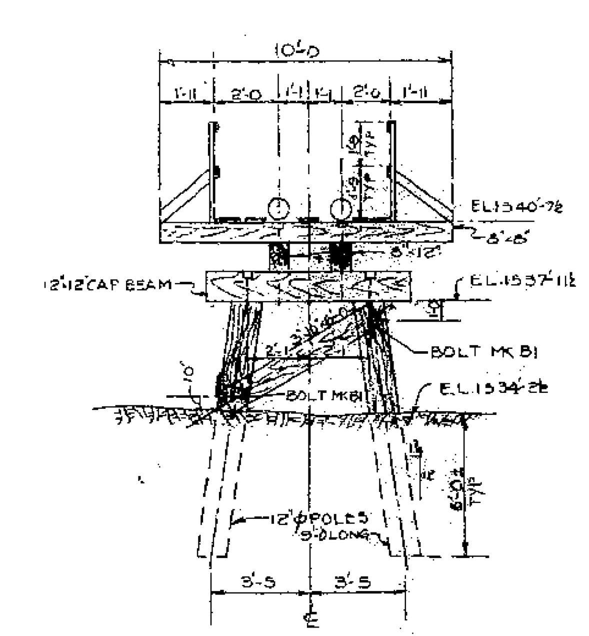
SECTION 5-C



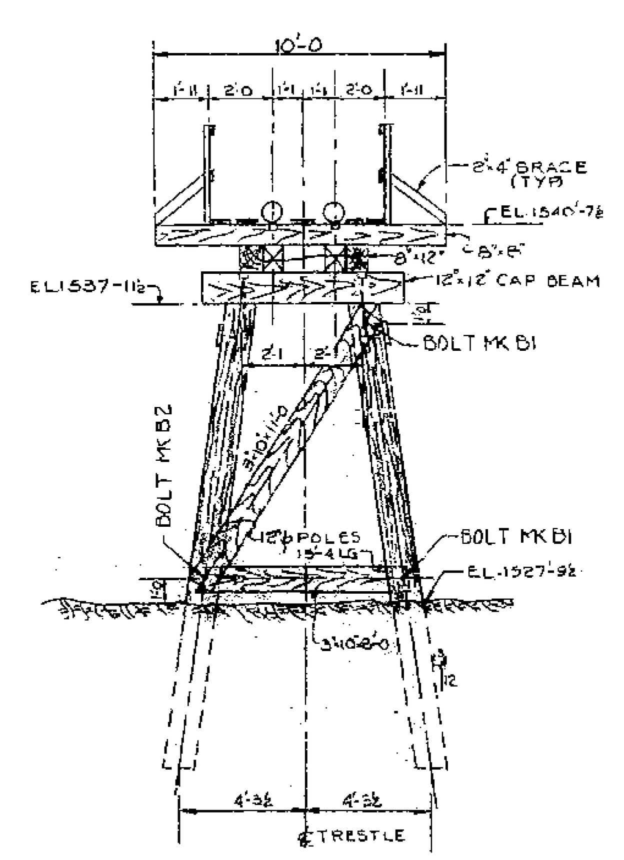
SECTION 4-J



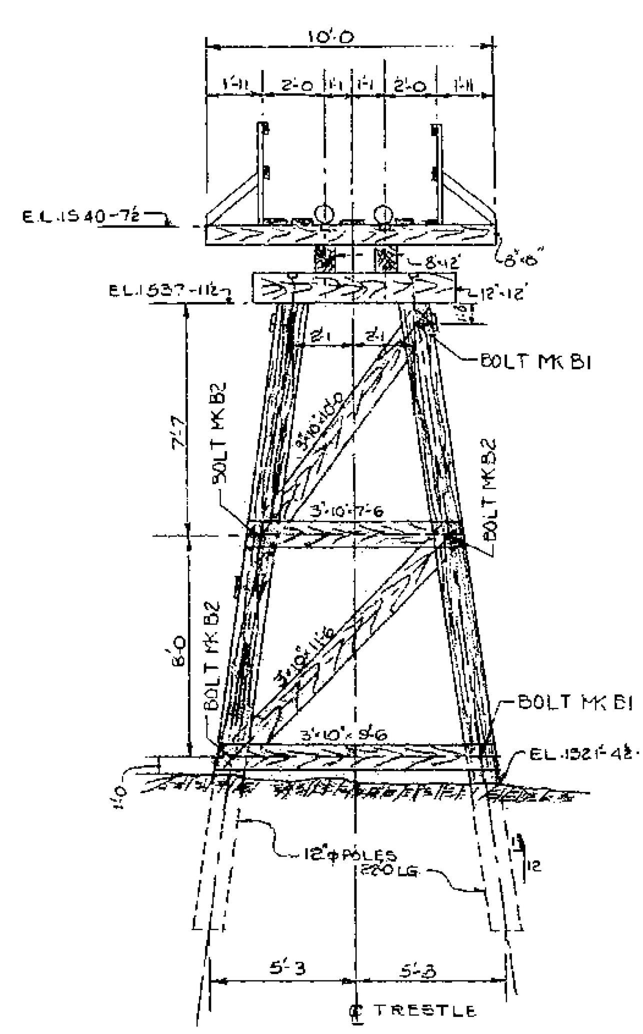
SECTION 7-B



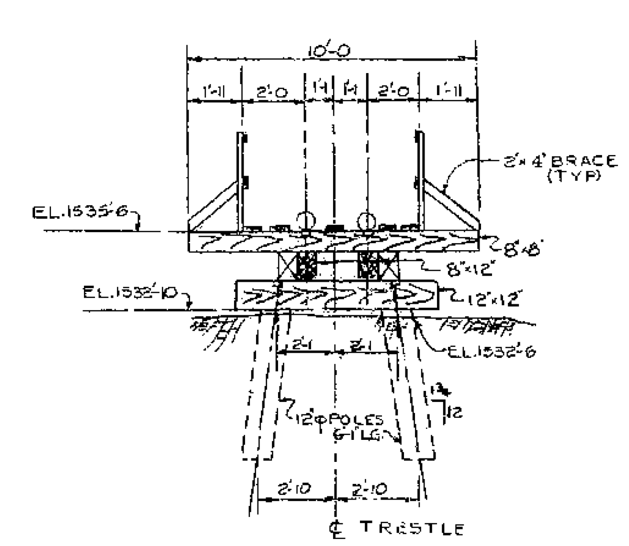
SECTION 9-B



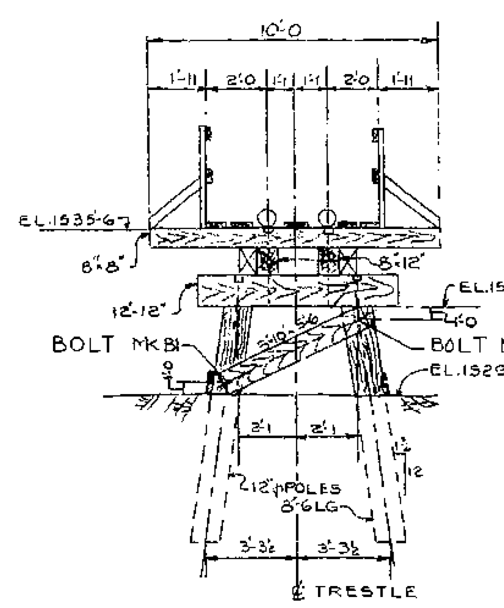
SECTION 9-D



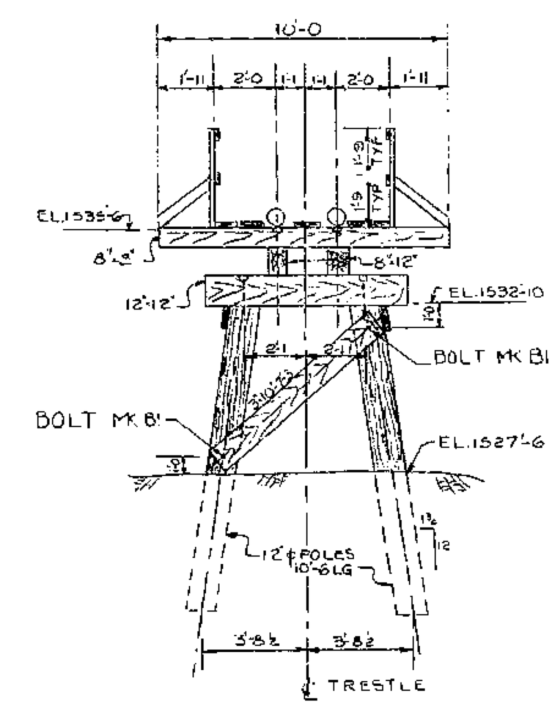
SECTION 9-F



SECTION 9-H



SECTION 6-H



SECTION 6-K

TIMBER SCHEDULE

QUANTITIES	SIZE	LENGTH	TOTAL LENGTH	NO OF BOARD FT	REMARKS
TRESTLE-A					
10	2"×4"	3'-8	36'-0	23	RAIL POST
4	2"×4"	50'-0	200'-0	134	RAILING
12	2"×4	5'-4	60'-0	27	RAIL BRACES
2	3"×10	20'-0	40'-0	100	BRACE
2	3"×10	17'-3	34'-6	86	"
2	3"×10	17'-0	34'-0	85	"
1	3×10"	11'-6	11'-6	29	"
1	3"×10"	11'-0	11'-0	28	"
1	3"×10	10'-0	10'-0	25	"
1	3"×10	9'-6	9'-6	24	"
1	3"×10"	8'-0	8'-0	20	"
1	3"×10"	7'-6	7'-6	19	"
1	3"×10"	6'-0	6'-0	15	"
2	4"×4"	3'-8	7'-0	9	RAIL POST
6	8"×8"	10'-0	60'-0	320	PIPE SUPPORT
6	6"×12"	20'-0	120'-0	360	STRINGERS
4	12"×12"	7'-0	28'-0	336	CAP BEAM
5 / 5	2"×8 / 2"×8	29'-8 / 20'-4	148 / 103	200 / 138	DECK PLANKS (STAGGER PLANK SPLICES)
					TOTAL BOARD FT.=2275
TRESTLE-B					
10	2"×4"	3'-8	36'-8	25	RAIL POST
10	2"×4"	3'-4	33'-4	22	RAIL BRACE
4	2"×4	37'-0	148'-0	100	RAILING
2	3"×10"	11'-0	22'-0	55	BRACE
1	3"×10"	7'-3	7'-3	18	"
1	3"×10"	5'-6	5'-6	14	"
5	8"×8"	10'-0	50'-0	267	PIPE SUPPORT
6	8"×12"	14'-0	84'-0	672	STRINGERS
4	12"×12"	7'-0	28'-0	336	CAP BEAM
5	2"×8"	35'-6	177'-6	240	DECK PLANKS
					TOTAL BOARD FT.=1750

CREOSOTED DISTRIBUTION POLES

TRESTLE-A QTY	TYPE	DIA	LENGTH	TRESTLE-B QTY	TYPE	DIA	LENGTH
2	BATTER	12"	9'-0	2	BATTER	12"	6'-1
2	BATTER	12"	15'-4	2	BATTER	12"	8'-6
2	BATTER	12"	22'-0	2	BATTER	12"φ	10'-6

BOLT SCHEDULE

TRESTLE-A MARK	QTY	SIZE	LENGTH	TYPE	REMARKS	TRESTLE-B MARK	QTY	SIZE	LENGTH	TYPE	REMARKS
B1	9	7/8"φ	1'-6	SQ HD SQ NUT	2 WASHERS 2"THREAD	B1	6	7/8"φ	1'-6	SQ HD SQ NUT	2 WASHERS 2"THREAD
B2	5	7/8"φ	1'-9	SQ. HD SQ. NUT	2 WASHERS 2"THREAD	B2	NIL	—	—	—	—
DB1	22	7/8"φ	1'-8	DRIFT BOLT	WEDGE PT BUTTON HD.	DB1	16	7/8"φ	1'-8	DRIFT BOLT	WEDGE PT BUTTON HD
DB2	8	7/8"φ	1'-10	DRIFT BOLT	WEDGE PT BUTTON HD	DB2	8	7/8"φ	1'-10	DRIFT BOLT	"

GENERAL NOTES

DO NOT SCALE THIS DRAWING.
ALL TIMBER TO RECEIVE TWO COATS OF CREOSOTE WHICH IS TO BE FURNISHED BY FIELD

ALL TIMBER TO BE STRUCTURAL DOUGLAS FIR

POLES ARE TO BE STRUCTURAL SOUTHERN PINE

ALLOWABLE STRESSES:

BENDING	2150 PSI
HORIZONT SHEAR	145 "
COMPRESSION ⊥ TO GRAIN	455 "
COMPRESSION ∥ TO GRAIN	1500 "
SOIL PRESSURE	3000 PSF

MATERIAL

ALL MATERIAL TIMBER BOLTS ETC TO BE FURNISHED BY FIELD

REFERENCE DWGS

16-3540–EXTENSION OF FLY ASH PIPING

6-5278A–FLY ASH STORAGE AREA–GENERAL PLAN

MATERIAL	RELEASE DATE
STRUCT. STEEL	—
REINF. STEEL	—
DECKING	—
GRATING	—
STAIR TREADS	—
HANDRAILING	—
TRESTLE	FIELD

NOTE: CHECKER IS RESPONSIBLE TO SEE THAT THE ABOVE APPLICABLE MATERIALS TO BE ORDERED ARE BROUGHT TO HIS SQUAD LEADERS' ATTENTION.

DATE	NO.	DESCRIPTION	APPD

REVISIONS

APPALACHIAN POWER CO
GLEN LYN POWER PLANT
GLEN LYN VIRGINIA
FLY ASH STORAGE AREA

TRESTLES

DR. No. 16-3546

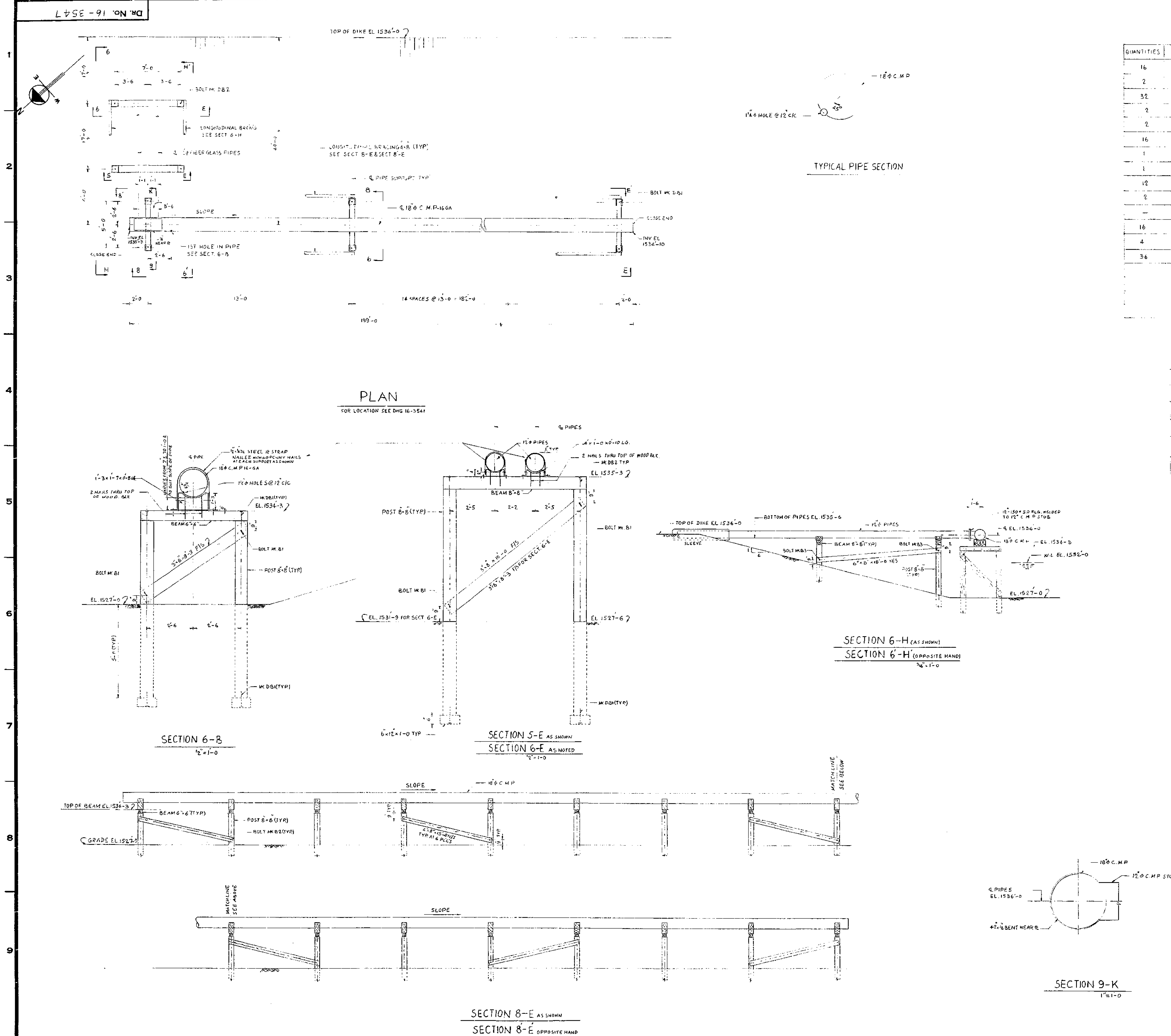
ARCH. | ELEC. | MECH. | STR.

SCALE: 1/4"=1'-0
DR. V.K.G.
CH. S.S.
SQ. LDR M.E.
DATE: 11/2/73

APPROVED BY
ENGINEERING DIV
DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.
2 BROADWAY NEW YORK

DR. No. 16-3547



TIMBER SCHEDULE

QUANTITIES	SIZE	LENGTH	TOTAL LENGTH	REMARKS
16	6"×6"	5'-8	90'-8	BEAMS
2	8"×8"	7'-8	15'-4	
32	8"×8"	11'-9	376'-0	
2	8"×8"	12'-1	24'-2	VERTICAL POSTS
2	8"×8"	7'-10	15'-8	
16	3"×8"	8'-3	132'-0	
1	3"×8"	10'-0	10'-0	
1	3"×8"	8'-3	8'-3	BRACINGS
12	4"×8"	15'-0	180'-0	
2	6"×8"	18'-0	36'-0	
—	—	—	—	
16	1'-7×1'-3	0'-8	10'-8	BLOCKS
4	1'-0×0'-4	0'-10	3'-4	
36	6"×12"	1'-0	36'-0	

BOLT SCHED

MARK	QTY	SIZE	LENGTH	TYPE	REMARKS
B1	36	7/8"Ø	1'-0	SQ HEAD SQ NUT	2 WASHERS & 5" THREADS
DB1	68	7/8"Ø	1'-6	DRIFT BOLT	WEDGE PT BUTTON HD
DB2	4	7/8"Ø	1'-8	DRIFT BOLT	DO
B2	24	7/8"Ø	1'-1	SQ HEAD SQ NUT	2 WASHERS & 5" THREADS
B3	4	7/8"Ø	1'-3	DO	DO

GENERAL NOTES

DO NOT SCALE THIS DRAWING
ALL TIMBER TO BE [illegible]

ALL TIMBER TO BE DOUGLAS FIR SELECT [illegible]
ALLOWABLE SOIL BEARING PRESSURE = [illegible] P.S.F.

MATERIAL

ALL MATERIAL TIMBER, BOLTS, ETC. TO BE FURNISHED BY FIELD

REFERENCE DWGS

16-3541 FLY ASH STORAGE AREA DIKES

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

MATERIAL	RELEASE DATE
STRUCT. STEEL	FIELD
REINF. STEEL	—
DECKING	—
~~GRATING~~ TIMBER	FIELD
STAIR TREADS	—
HANDRAILING	—
Bolts	FIELD
Pipe	FIELD

NOTE: CHECKER IS RESPONSIBLE TO SEE THAT THE ABOVE APPLICABLE MATERIALS TO BE ORDERED ARE BROUGHT TO HIS SQUAD LEADERS' ATTENTION.

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN VIRGINIA

FLYASH STORAGE AREA
SUPPORTS FOR FLY ASH
DISCHARGE PIPE LINES

DR. NO. 16—3547

ARCH. | ELEC | MECH. | STR.

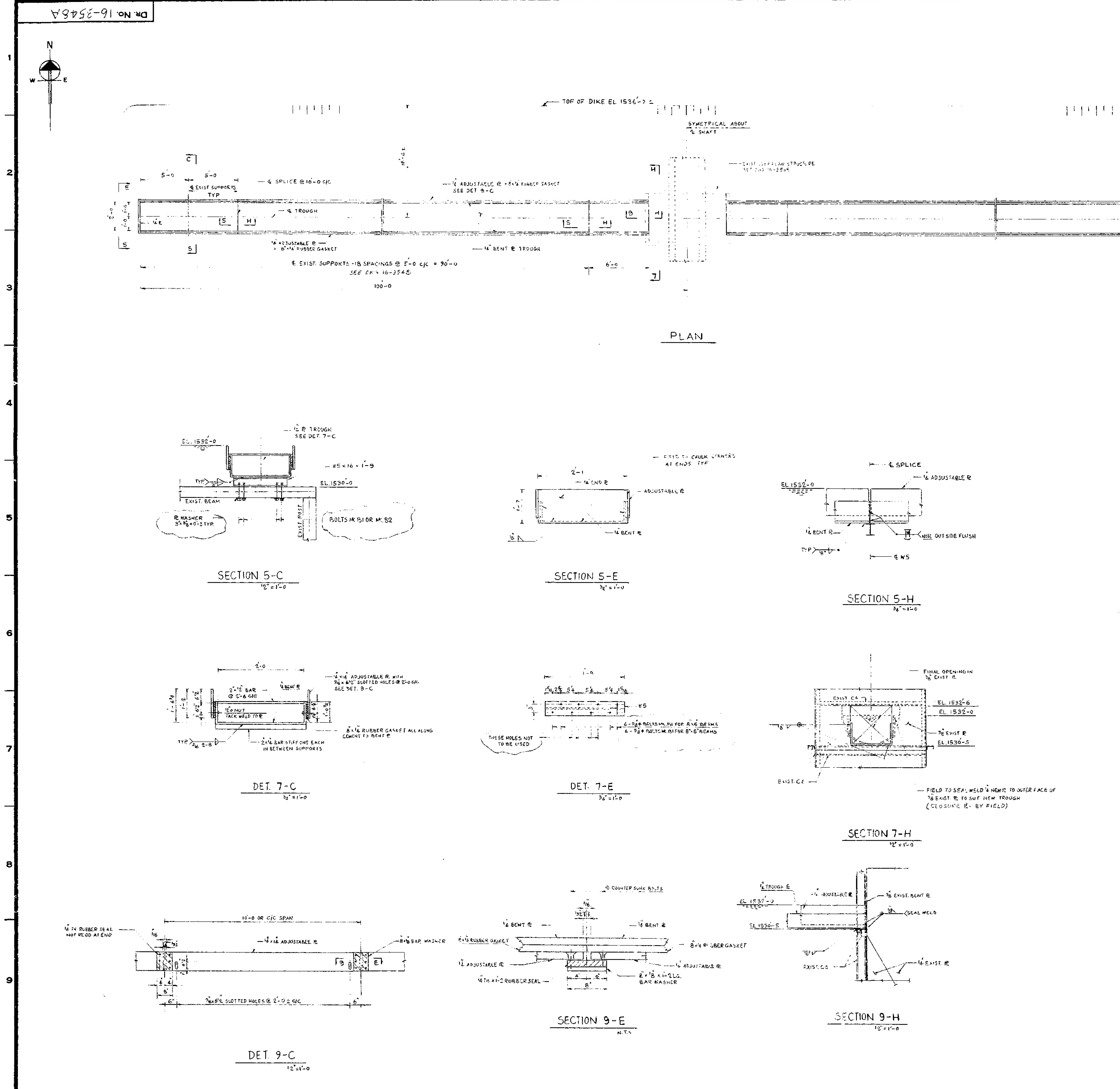
SCALE: 1/4"=1'-0
DR. V. AIRI
CH.
SQ. LDR M.E.
DATE: 10/21/71

APPROVED BY
ENGINEERING DIV
DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

AEPGL000214

DR. NO. 16-3548A



BOLT SCHEDULE

MK.	QTY.	SIZE	LENGTH	TYPE	REMARKS
B1	72	5/8" φ	0'-10	HEX. HEAD & 2 HEX. NUTS	1-3"x3/8"x0'-3 ℄ WASHER & 5 THREADS
B2	80	5/8	1'-0	DO	DO

WORK THIS DWG. WITH DWG. 16-3548

GENERAL NOTES

DO NOT SCALE THIS DRAWING

ALL STEEL TO BE A-36 U.N.

MATERIAL

STEEL & RUBBER GASKETS
BY :— DAVE STEEL CORP
ORDER NO. :— 05662-021-6
BOLTS :— BY FIELD
CLOSURE ℄ (SECT. 7-H) BY FIELD

REFERENCE DWGS

16-3541 FLY ASH STORAGE AREA DIKES
16-3548 SUPPORTS FOR OVERFLOW STRUCTURE

DATE	NO.	DESCRIPTION	APPD.
1/17/77	1	DELETED LAG SCREWS & ADDED BOLTS	

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN VIRGINIA

FLY ASH STORAGE AREA
MODIFICATION OF
OVERFLOW STRUCTURE

DR. NO. 16-3548 A-1

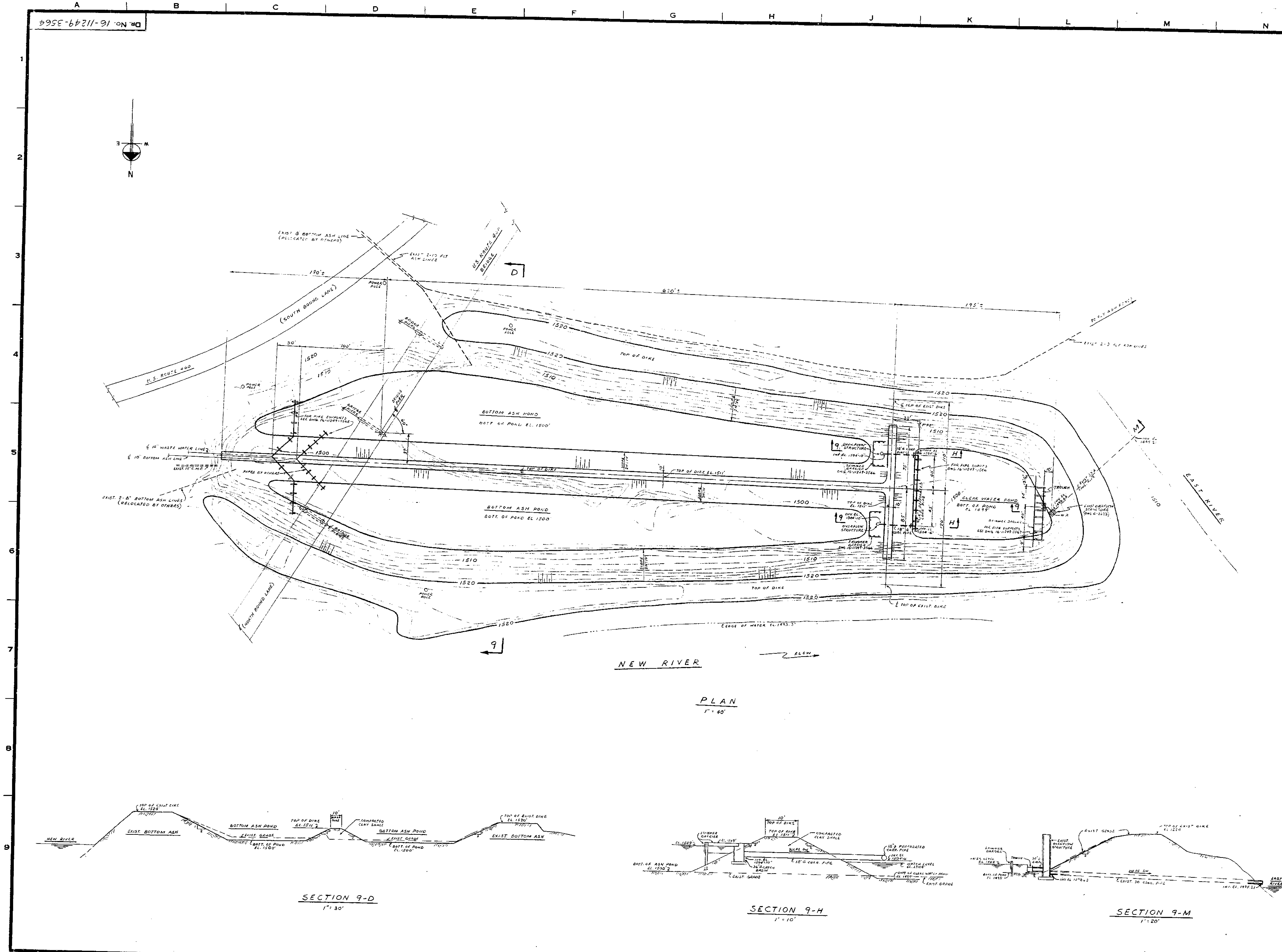
MATERIAL	RELEASE DATE
STRUCT. STEEL	8/31/76
REINF. STEEL	—
DECKING	—
GRATING	—
STAIR TREADS	—
HANDRAILING	—

NOTE: CHECKER IS RESPONSIBLE TO SEE THAT THE ABOVE APPLICABLE MATERIALS TO BE ORDERED ARE BROUGHT TO HIS SQUAD LEADERS' ATTENTION.

ARCH. ELEC MECH. STR.
SCALE: 1/4"=1'-0
DR. V.A
SQ. LDR ME
DATE: 9/14/76
APPROVED BY: ENGINEERING DIV / DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

DOWNSTREAM



PLAN

1" = 40'

GENERAL NOTES

REFERENCE DRAWINGS

DATE	NO.	DESCRIPTION	APPD.
8/14/70	1	EXTENDED SKIMMER BARRIER	J.W.S.

REVISIONS

APPALACHIAN POWER CO.
GLEN LYN POWER PLANT
GLEN LYN, VIRGINIA

BOTTOM ASH STORAGE AREA MODIFICATION

DR. NO. 16-11249-3564-1

ARCH. | ELEC | MECH. | STR.

SCALE AS NOTED
DR. J.M.
CH.
SQ. LDR. M.C.
DATE: 7/15/70

APPROVED BY
ENGINEERING DIV
DESIGN DIV

AMERICAN ELECTRIC POWER SERVICE CORP.

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

Subject: Dam and Dike Inspection and Maintenance Program

Category: CIVIL (Maintenance)

CL # CIM CL 010C

Revision:
[illegible]

Purpose:
To describe the inspection, documentation and routine maintenance duties and responsibilities of Plant, Region Engineering, Environmental Services and Engineering Services under the AEP Dam Inspection and Maintenance Program. The program applies to all earthen dams and dikes used for ash or FGD sludge storage and disposal, waste water ponds and large cooling water storage facilities on the AEP System. Section IV of this letter briefly discusses Emergency Action Plans (EAP) but does not address actions to be taken under emergency conditions. For response to emergency conditions refer to the facility's Emergency Action Plan if applicable or contact AEPSC Geotechnical Engineering Section.

Background:

From the 1940's through the 1970's, as the AEP System was expanding, AEP consulted extensively on its dams and dikes with one of the pioneers of geotechnical engineering, Professor Arthur Casagrande of Harvard University. If a dam or dike exhibited problems, AEP would monitor and repair it under his guidance. In the 1960's and 1970's large consulting companies engineered major dam construction projects with Casagrande Consultants acting as the owner's reviewer.

In the 1970s, AEP began to perform dam inspections with internal staff. In addition, the U.S. Army Corps of Engineers inspected several AEP dams in the late 1970's as part of a national program in response to the Buffalo Creek disaster in West Virginia. In 1979, AEP contracted with Woodward Clyde Consultants to begin inspecting existing ash disposal dams and dikes on the AEP System every two years. In 1983 AEP Civil Engineering initiated the Dam Inspection and Maintenance Program. Its purpose was to provide for systematic inspection, follow-up on significant inspection findings and to establish a contact point for plant concerns. Inspection checklists were created, and the plants were asked to perform periodic inspections.

Through the 1990's to the present, the program has been uniform and consistent. The purpose of this revision is to further strengthen the program throughout the entire AEP System and to reinforce the need to perform and document routine and formal inspections, collect instrumentation data where applicable and implement maintenance and remedial activities to assure the facilities are operated and maintained in a condition consistent with their design basis.

The Geotechnical Engineering Section (GES) of AEPSC Engineering Services coordinates the overall program, which is largely based on state regulations, Federal Emergency Management Agency guidelines, and sound engineering practice.

The inspection component of the program consists of four levels of inspection: (1) routine surveillance inspections by Plant personnel looking for changes in conditions (slips along dam face, erosion gullies, excessive settlement, malfunctioning drains, new seepage areas, etc.), (2) formal checklist type inspections by Plant or Region Engineering staff performed on a scheduled basis, (3) engineering inspections performed under the direction of a P.E. at a frequency determined by the dam's risk classification (1, 2, or 3 year intervals), and (4) non-routine plant inspections after unusual events such as heavy rains, seismic events, or other events that could cause a change in the condition of the facility.

Inspection Schedule for Plant Formal (checklist) Inspections

VA	
Clinch River FAP 1A/1B	Inspect Quarterly
Clinch River FAP 2	Inspect Quarterly
Glen Lyn FAP	Inspect Quarterly
Glen Lyn SAP	Inspect Quarterly
Glen Lyn West Pond	Inspect Quarterly

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 Gary F. Zych
Gary F. Zych, P.E. **DATE** 2/16/09

REVIEWED BY Behrad Zand
Behrad Zand **DATE** 2-16-2009

APPROVED BY Pedro J. Amaya
Pedro J. Amaya, P.E.
Manager – Geotechnical Engineering **DATE** 2-16-2009

QA/QC DOCUMENT NO.
GERS - 09 - 003

COMMONWEALTH OF VIRGINIA
PEDRO JOSE AMAYA-TRUJILLO
NO. 036174
PROFESSIONAL ENGINEER
2/16/09
Pedro J. Amaya

PROFESSIONAL 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

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 Satisfactory:	A condition or activity that generally meets what is minimally 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.

7. Visible 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.

Auxiliary Fly Ash Pond (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. Ft.	Pond Elev. Ft.	Pond Elev. Ft.	Pond Elev. Ft.	Pond Elev. 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

1. 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).

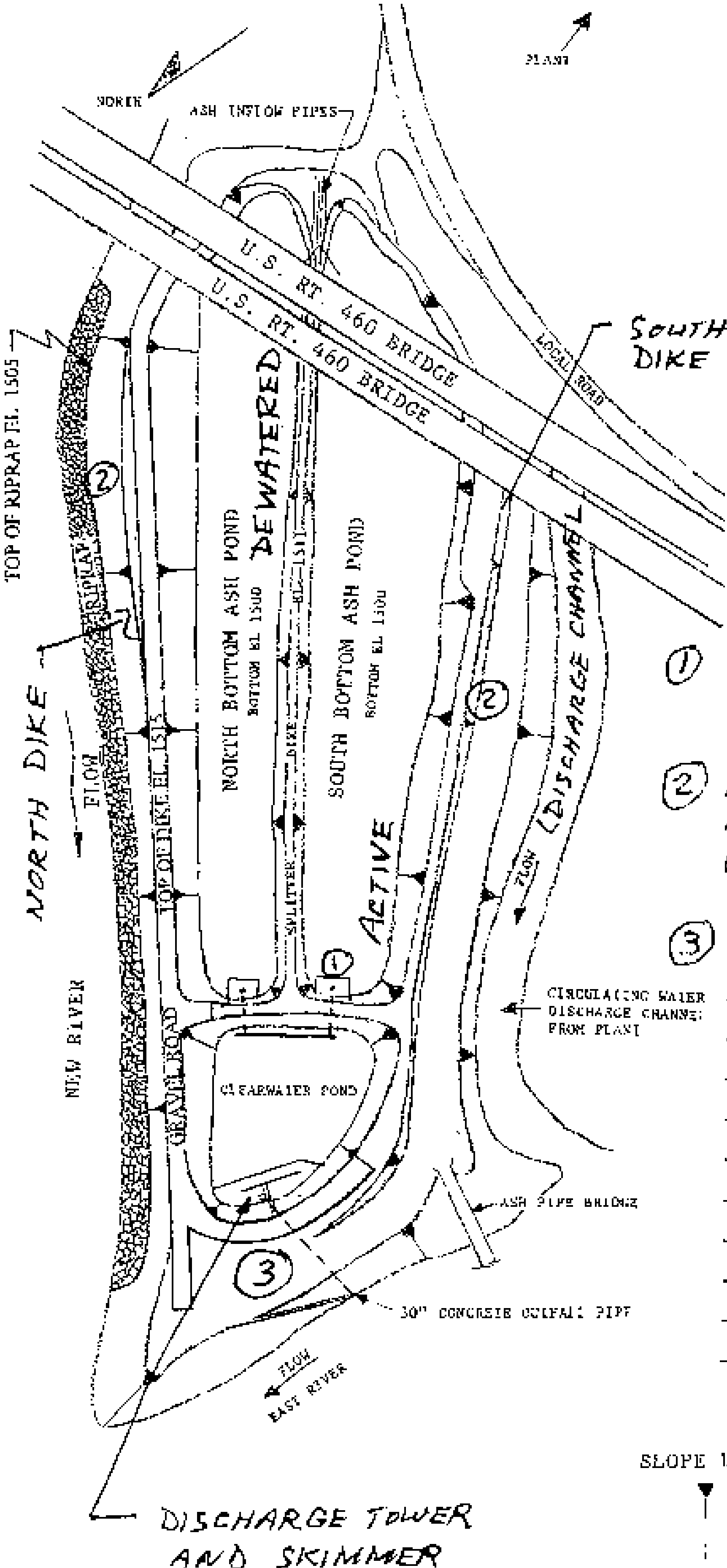


FIGURE 1

Date: JAN 13, 2009
Weather: SUNNY, COOL

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

(1) OUTLET STRUCTURES REPAIRED IN SUMMER DB

(2) EXTERIOR SLOPES NEATLY MOWED WITH NO WOODY VEGETATION

(3) RISER TOWER AND DISCHARGE PIPE IN GOOD CONDITION

SLOPE LINE

V's POINT DOWN SLOPE

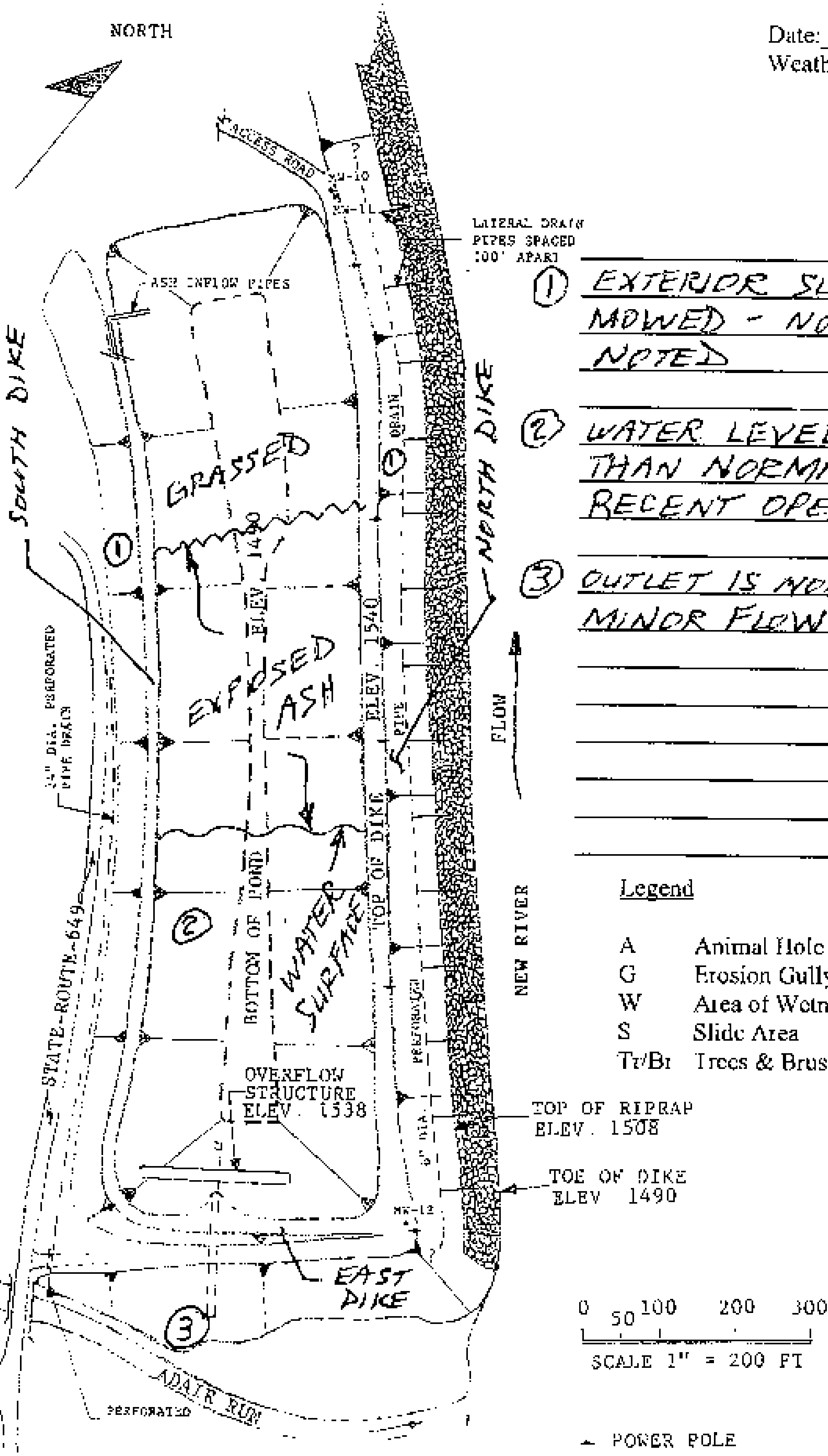
0 50 100 200 300

APPROXIMATE SCALE 1"=167 FT.

GLEN LYN PLANT: BOTTOM ASH POND
INSPECTION LOCATION PLAN

FIGURE 2

Date: JAN 13, 2009
Weather: SUNNY, COOL

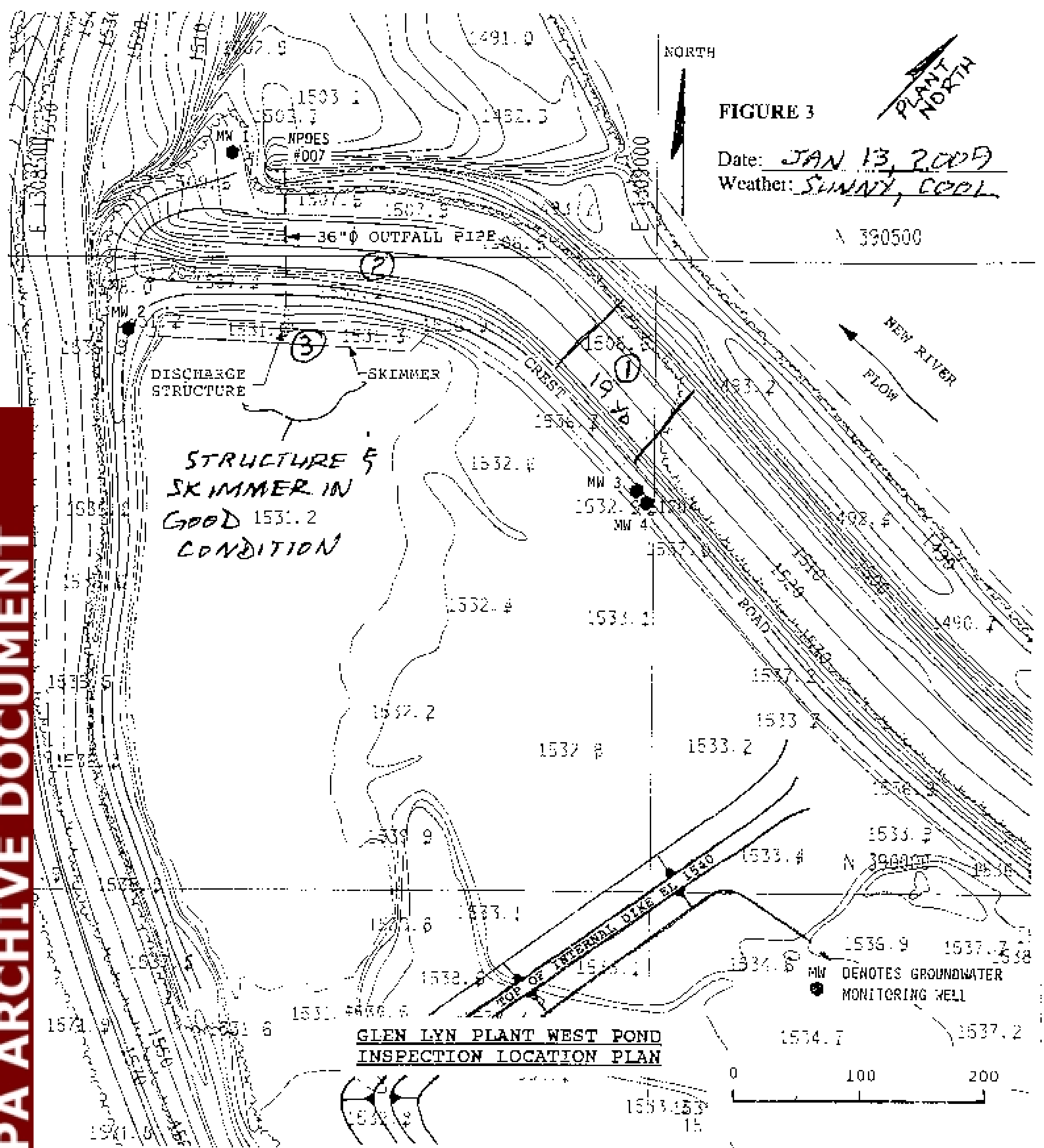


1. EXTERIOR SLOPES NEATLY MOWED - NO CONDITIONS NOTED
2. WATER LEVEL HIGHER THAN NORMAL DUE TO RECENT OPERATIONS
3. OUTLET IS NORMAL WITH MINOR FLOW -

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN



GLEN LYN PLANT WEST POND INSPECTION LOCATION PLAN

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

(1) MOIST AREA ALONG LOWER 1/3 SLOPE
(2) EXTERIOR SLOPE NEATLY MOWED
(3) FLOW ≈ 2-3 INCH OVER WEIR CREST

APPENDIX A: BOTTOM ASH BOTTOM PHOTOGRAPHS

Photo #1 – Active south pond; excavated north pond

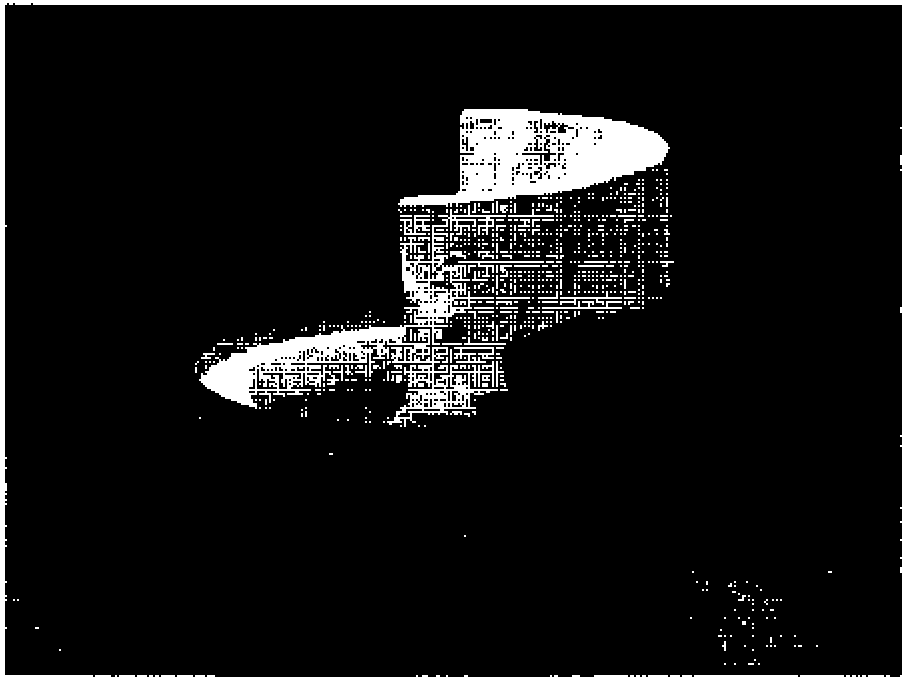


Photo #2 – Improvement to discharge structure

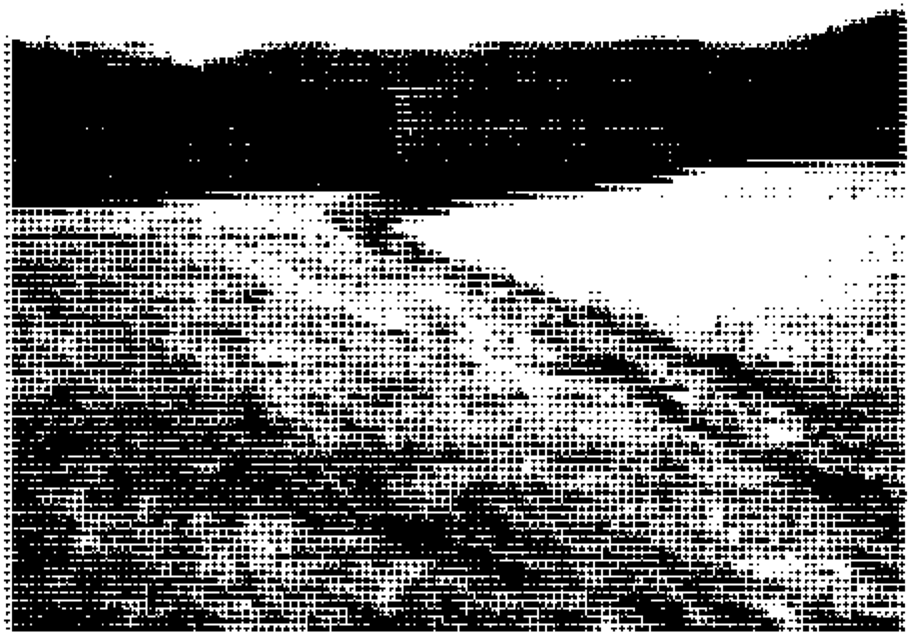


Photo #3 – Exterior slope of north dike

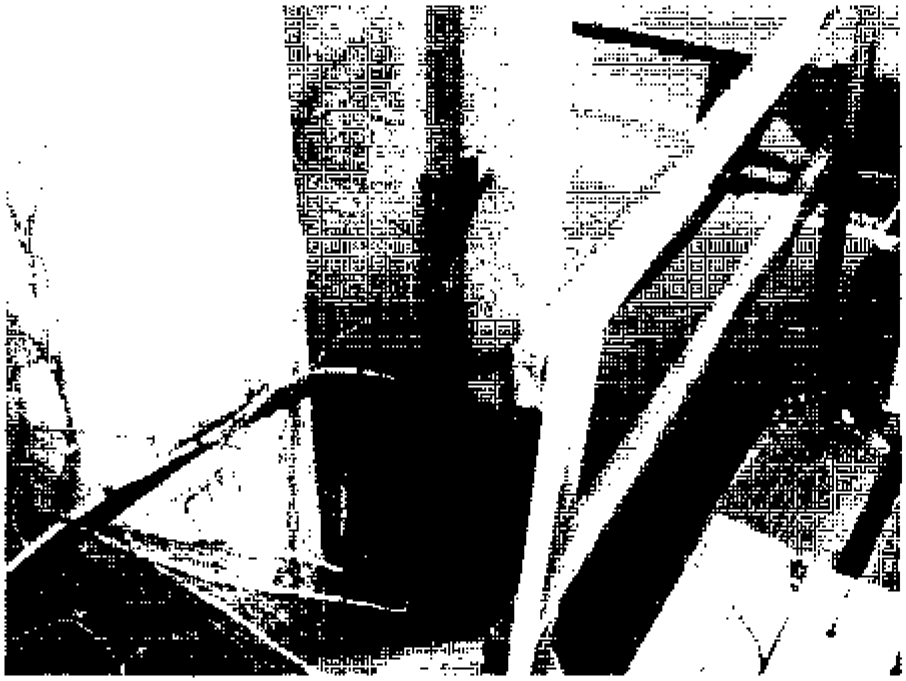


Photo #4 – Discharge tower with vegetation removed

APPENDIX B: AUXILIARY FLY ASH POND PHOTOGRAPHS

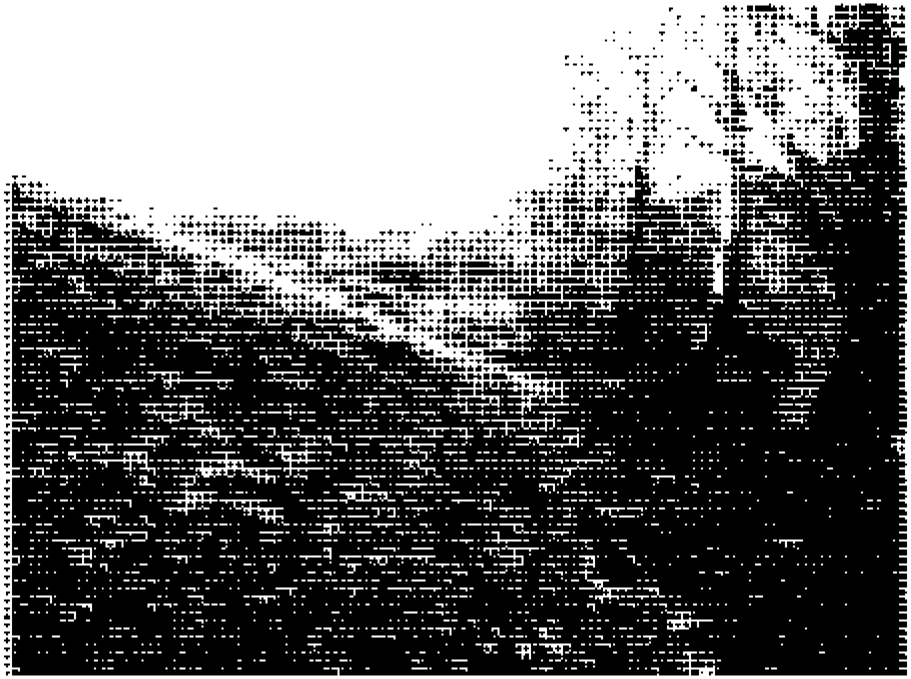


Photo #1 – Exterior slope of north dike, looking west


Photo #2 – View of east dike, looking south


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


Photo #4 – View of interior slopes and water level

APPENDIX C: WEST POND PHOTOGRAPHS

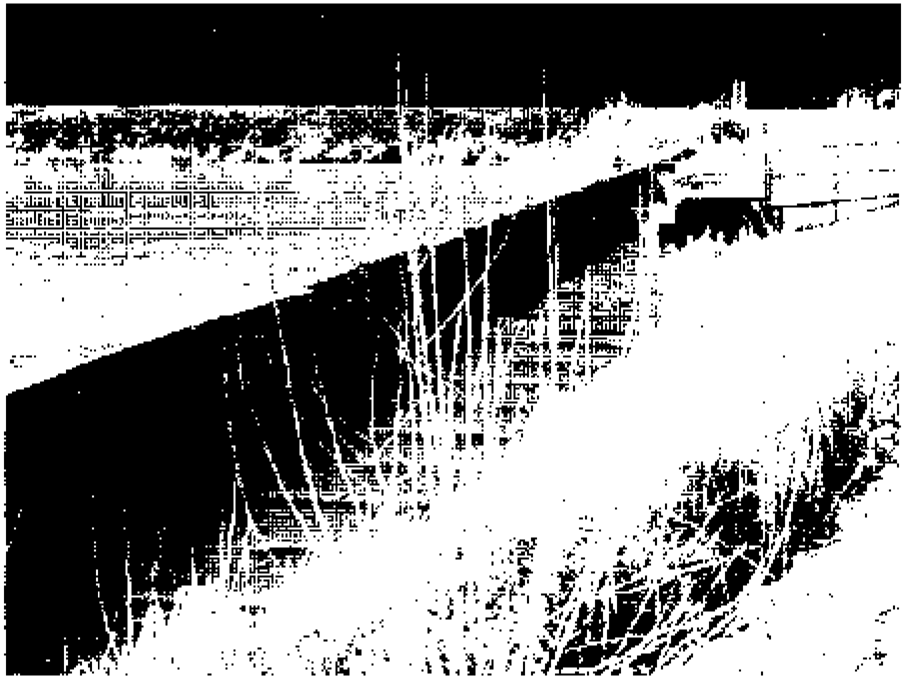


Photo #1 – View of outlet structure and skimmer


Photo #2 – Exterior slope of western portion


Photo #3 – Exterior slope of eastern portion

1) MFZ 3/18/09
2) WR SMITH 3-19-09
3) File

GLEN LYN PLANT
DIKE INSPECTION CHECKLIST

1. GENERAL INFORMATION

Date of Inspection	3/11/09
Inspected by	Joe Ryder, Jr., P.E.
Weather	CLDY Light intermit. rain
Temperature	60°
Rainfall (inches) since 6" (date)	about + 1" above normal
Pond levels:	
North Bottom Ash Pond (1505.5*)	DEWATERED - Clean out in progress
South Bottom Ash Pond (1506.3*)	Full
Clearwater Pond (1501.3*)	Full
Auxiliary Fly Ash Pond	~1513
West Pond	Full Pond-outfall + 0.05'

2. EMBANKMENT CONDITION AT BOTTOM ASH AND CLEARWATER PONDS

A. Please refer to the Bottom Ash Pond Inspection Location Plan which is found on Page 8. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	

* Approximate normal pool levels when in service.

DESCRIPTION	LOCATION CODE
Leaking Ash Pipe	✓
Seepage/Wetness	✓
Trees on Slope	✓ all
Vegetation condition	✓ Good
Cracks/Bulges/Slides	✓
Other (Please specify)	✓

B. Has there been any significant deterioration, erosion or displacement of the riprap at the river shoreline since the last inspection? If so, please describe condition and the river flow event which caused it. Good Shape

C. Has there been erosion of the shoreline inside the bottom ash ponds because of the ash inflow pipes?

Good Shape

3. <u>OUTLET WORKS AT BOTTOM ASH AND CLEARWATER PONDS</u>

A. Please inspect the following drainage structures and check the appropriate space below:

	GOOD CONDITION	PROBLEM
North B. A. Pond Skimmer	✓	
North B. A. Pond Overflow Lip & Pipe	✓	
South B. A. Pond Skimmer	✓	
South B. A. Pond Overflow Lip & Pipe	✓	
Perforated Water Distribution Pipe	✓	
Clearwater Pond Skimmer	✓	

	GOOD CONDITION	PROBLEM
Clearwater Pond Overlow Lip & Chute	✓	
Clearwater Pond Spillway Tower	✓	
Access Steps to Spillway Tower	✓	
Outfall Pipe to East River	✓	
Access Path to Outfall Pipe	✓	

B. Please describe problems below:

Good Shape all

4. <u>EMBANKMENT CONDITION AT AUXILIARY FLY ASH POND</u>

A. Please refer to the Auxiliary Fly Ash Pond Inspection Location Plan which is found on Page 9. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	A
Leaking Ash Pipe	
Leaking Embankment Drain Pipe	
Seepage/Wetness	
Trees on Slope	

Exposed Ash on Slope ____________

Cracks/Bulges/Slides ____________

Sinkhole ____________

Other (Please specify) ____________

B. Has this pond been used since the previous inspection? If so, when and for approximately what duration?

N/O

C. Has the water level in the pond been high enough to cause the embankment drains to become active?

N/O

5. OUTLET WORKS AT AUXILIARY FLY ASH POND

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel Trough	NA	
Wooden Skimmer	NA	to be removed
Trough or Skimmer supports	NA	
Concrete structure		
Other (Please specify)		

B. Please describe problems below: Area dormant

C. Please observe the outlet end of the 24"ϕ discharge pipe. If water is issuing from the pipe, please determine and record the flow rate:

only trickle

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

—

6. <u>EMBANKMENT CONDITION AT WEST POND</u>

A. Please refer to the West Pond Inspection Location Plan which is found on Page 10. Place a number or letter and, if appropriate, a descriptive sketch on the location plan at each problem area. Then place the same number(s) or letter(s) next to the appropriate descriptions below.

DESCRIPTION	LOCATION CODE
Erosion	
Ruts in Crest Road	
Animal Burrows	
Seepage/Wetness	A
Woody Vegetation on Dikes	
Cracks/Bulges/Slides	
Sediment Buildup in Inlet Ditches	

B. Has there been significant runoff from the landfill since the last inspection?

NO

C. Has the water level reached the steel overflow ~~trough~~ since the last inspection? yes . Please record the current water level relative to the overflow trough full pond + 0.05'

D. Other problems (please describe): NONE
Will Need some painting this Summer on Discharge Box

7. OUTLET WORKS AT WEST POND

A. Please observe the features listed below and check the appropriate space:

	GOOD CONDITION	PROBLEM
Steel ~~Trough~~ Box		Need some Paint
Wooden Skimmer	✓	
Inlet Structure		same
Pipe Problems	✓	
Other (please specify)		

B. Please describe observed problems below:
Overall Good Shape

C. Please observe the outlet end of the 36"ϕ discharge pipe. If water is issuing from the pipe, please determine and record the flow rate, in gollons per minute:
~ 4gpm

D. Are there any other noteworthy conditions, such as water seeping around the outside of the pipe? If so, please describe:

No

8. <u>GENERAL EMBANKMENT CONDITIONS - ALL PONDS</u>

A. Has any mowing, brush and tree cutting or spraying been done since the previous inspection? If so, please state below what was done, when and by whom, and show the area on the location plan.

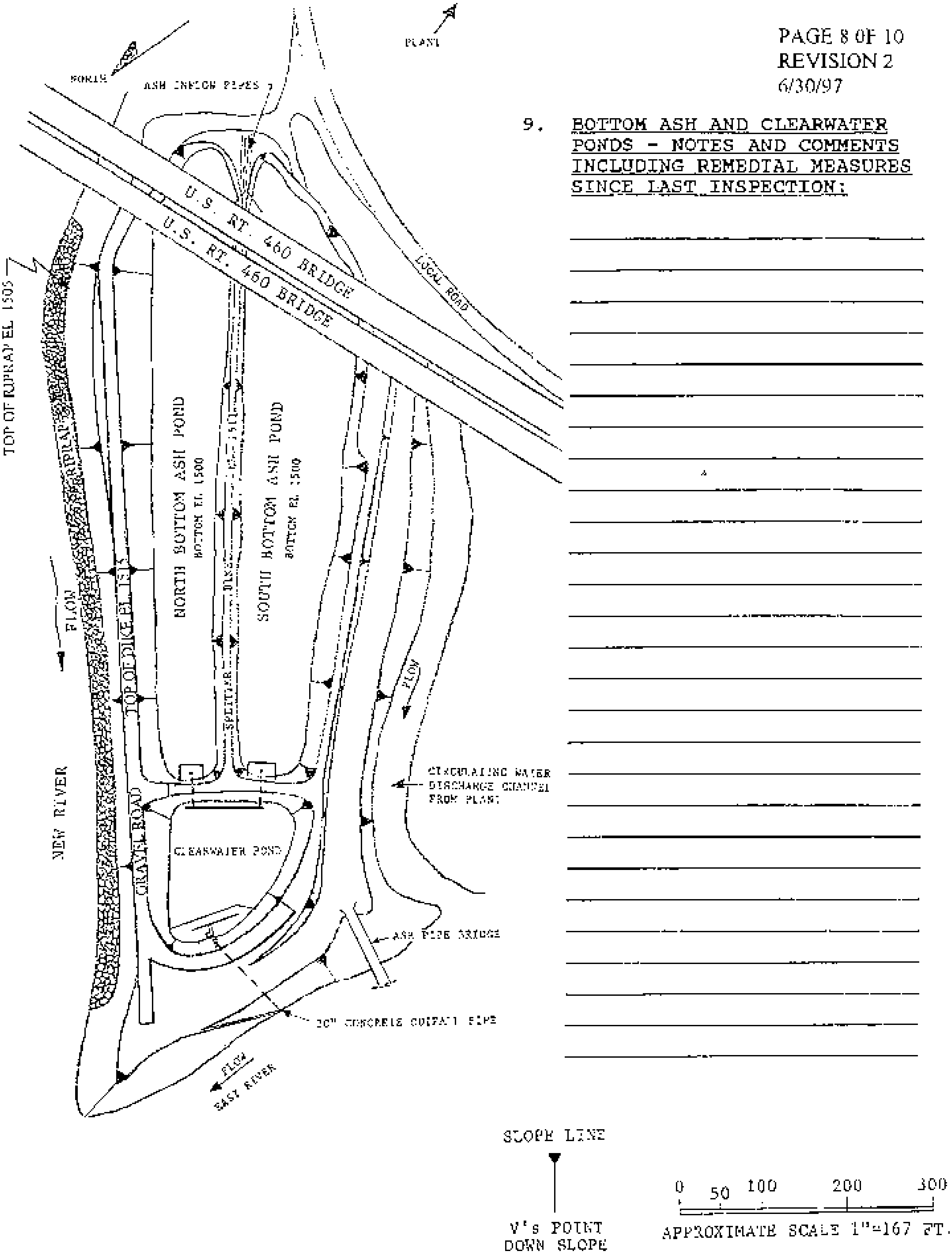
Dormant
Some Yucca Plants to spray Aux Pond
Dike

B. Has the river level come up significantly since the last inspection, and if so, approximately what elevation was it and when?

No

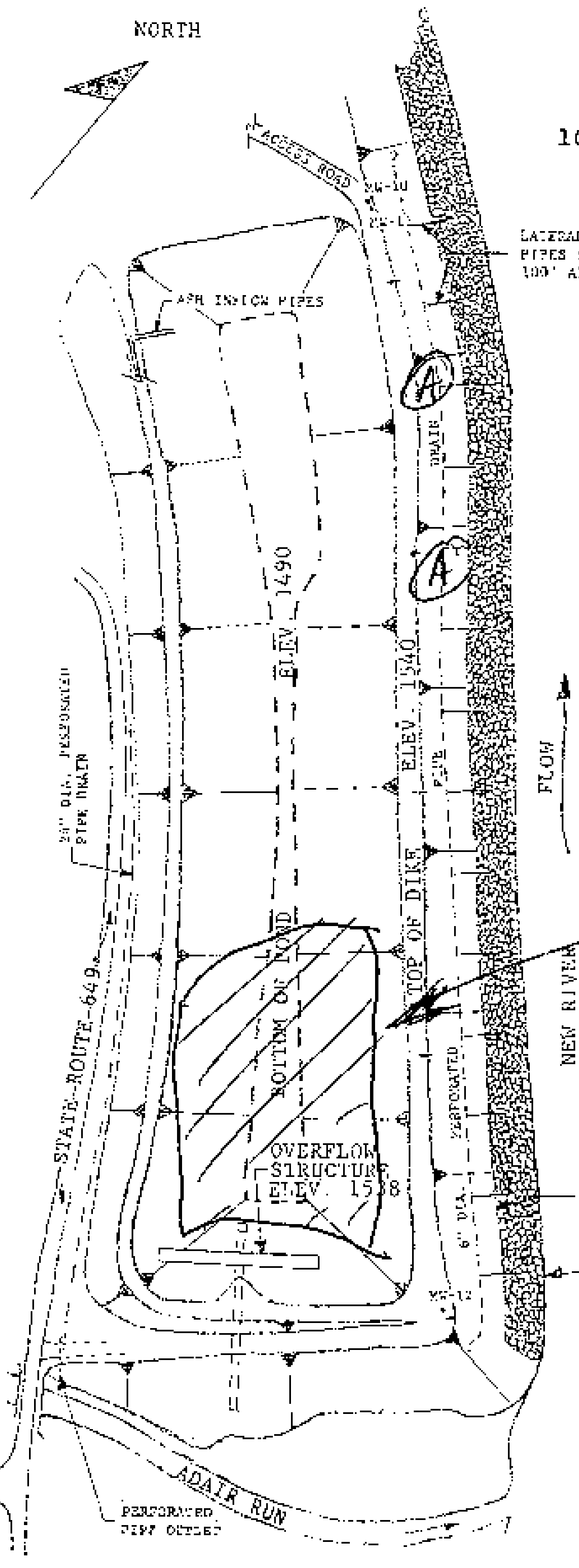
C. Was there any apparent damage to the dikes when the river level receded? If so, please indicate below what the damage was (erosion, slides, etc.) and show its location on the location plan.

N/A



9. <u>BOTTOM ASH AND CLEARWATER PONDS - NOTES AND COMMENTS INCLUDING REMEDIAL MEASURES SINCE LAST INSPECTION:</u>

<u>GLEN LYN PLANT: BOTTOM ASH POND INSPECTION LOCATION PLAN</u>

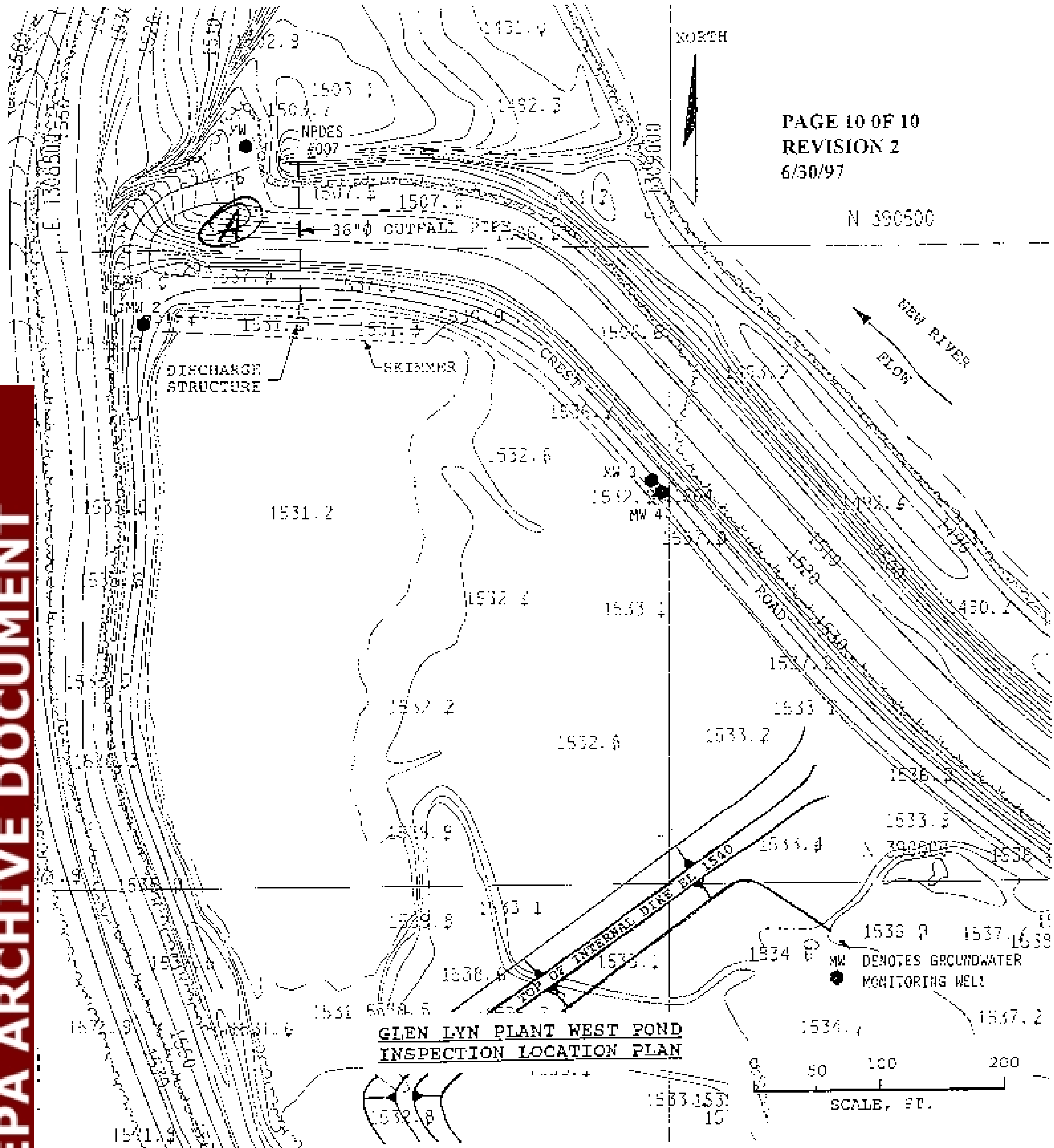


10. AUXILIARY FLY ASH POND - NOTES AND COMMENTS INCLUDING REMEDIAL WORK SINCE LAST INSPECTION:

A Ground Hog Den
Put out Bait

Only Water

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN



GLEN LYN PLANT WEST POND INSPECTION LOCATION PLAN

11. WEST POND NOTES AND COMMENTS INCLUDING JOB ORDERS WRITTEN AND REMEDIAL WORK DONE SINCE LAST INSPECTION

A Wet area as usual, spongy

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 3 JULY 2009

~~August 2007~~

(TR 2 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

AEP

. . . transforming ideas into reality

PART 7

SLOPE STABILITY ANALYSIS

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.

2. Hynes-Griffin, Mary, E , Arley, Franklin, G , Rationalizing the Seismic Coefficient Method, [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 GAI 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 bedrock surface. This surface elevation varied from elevation 1481 4 to 1494 1 feet above mean sea level

ANALYSIS:

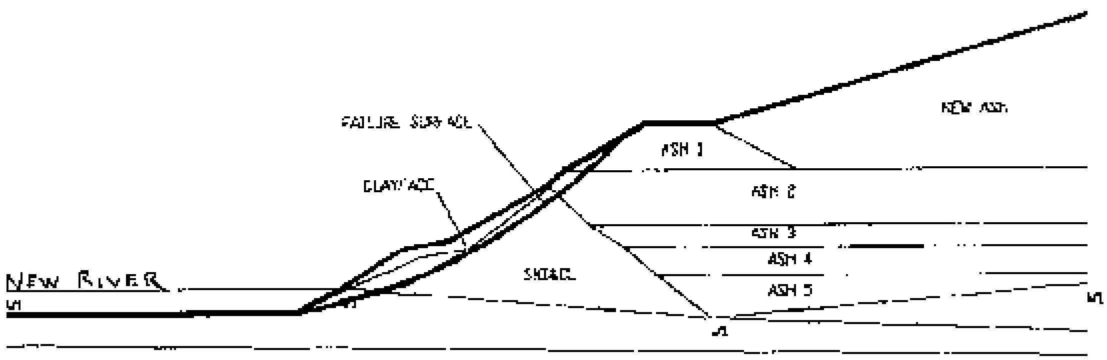
In order to determine the factor of safety against sliding failure, overall thickness of each soil layer across the site, and engineering properties of each soil layer were determined To conservatively estimate minimum factor of safety, the steepest slope was used for the dike analysis Based on inspection 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

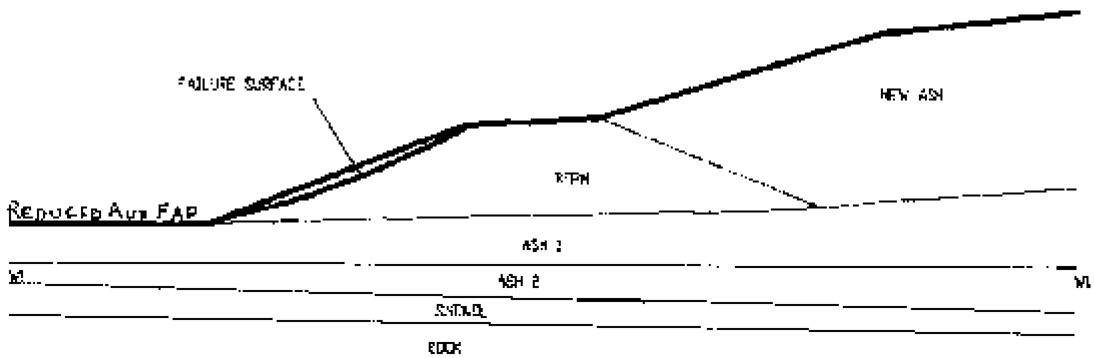
SUBJECT: AEP GLEN LYN PLANT – LANDFILL AMENDMENT

DEEP-SEATED STABILITY ANALYSES

BY SDA DATE 03/23/2007 PROJ NO C050540.20

CHKD BY BLR DATE 4/2/07 SHEET NO 3 OF 6

gai consultants



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 dewatered 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:

Top of Rock – 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.

Temporal High Phreatic and Piezometric Surfaces – 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 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

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

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

Soil and CCB Properties – 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.	γ_T (pcf)	γ_{Sat} (pcf)	$\phi=\phi'$ (Degrees)	c=c' (psf)
New Ash	1	80	85	32	0
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	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

Soil Type	STEDWin Soil No.	γ_T (pcf)	γ_{Sat} (pcf)	$\phi=\phi'$ (Degrees)	c=c' (psf)
New Ash	1	80	85	32	0
Berm-New Ash	2	80	85	32	0
Ash No1	3	65	70	32	0
Ash No 2	4	65	70	28	0
Snd&cl	5	110	115	28	0
Rock	6	150	155	30	1500

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-seated stability analyses are summarized on the next page:

SUBJECT: AEP GLEN LYN PLANT –LANDFILL AMENDMENT

DEEP-SEATED STABILITY ANALYSES

BY SDA DATE 03/23/2007 PROJ NO C050540.20

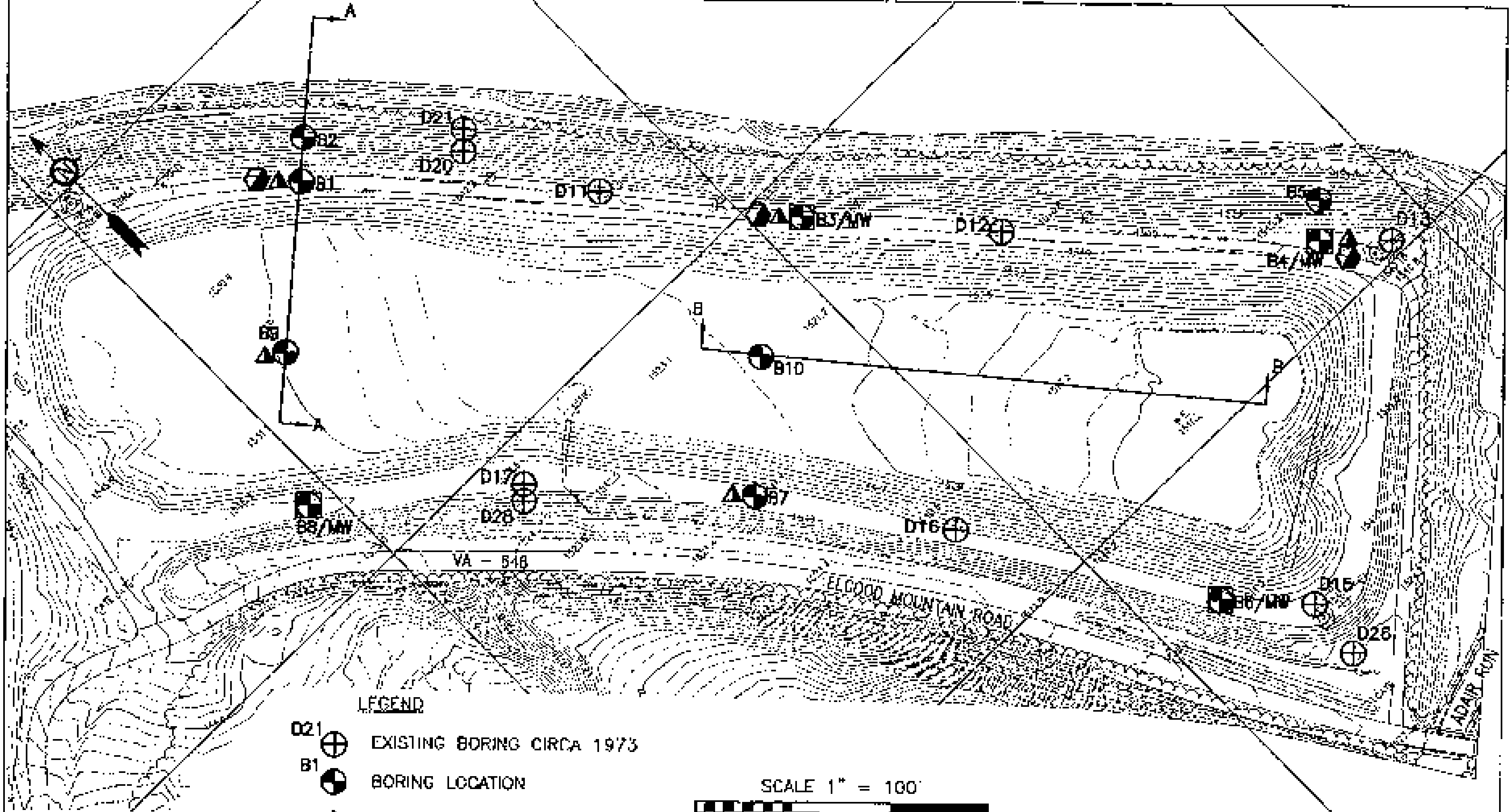
CHKD BY B.R. DATE 4/2/07 SHEET NO 6 OF 6

gai consultants

DEEP-SEATED FAILURE ANALYSIS				
Cross-Section	File Name	Analysis Condition	Analysis Zone	FSmin
BB	GLYNB8 PL2-Toe Failure Analysis	STATIC	BERM	1 90
	GLYNB7 PL2-Slope Length Analysis	SEISMIC	BERM	1 92
	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	1 01

PART 8

STABILITY CROSS-SECTION LOCATIONS



MAP REFERENCE:
MAPPING PROVIDED BY AIR SURVEY PHOTOGRAMMETRIC MAPPING SERVICES.
DATE OF PHOTOGRAPHY: 3-13-04.
COORDINATE SYSTEM SOUTH ZONE NAD 1927 VERTICAL DATUM BASED ON NGVD 1929.

LEGEND

- D21 ⊕ EXISTING BORING CIRCA 1973
- B1 BORING LOCATION
- DMT AND/OR BOREHOLE SHEAR
- B3/MW BORING AND MONITORING WELL
- CPT LOCATION

SCALE 1" = 100'

100 0 100 200

GAI consultants

PROPOSED SUBSURFACE INVESTIGATION PLAN
GLEN LYN LANDFILL MODIFICATION
GLEN LYN, VA

AMERICAN ELECTRIC POWER
COLUMBUS, OHIO

STABILITY CROSS SECTION LOCATIONS

DWN. JCN	CHKD. SPA	APPD.	DATE 04/2/07
SCALE 1"=100'			TASK NO. 00
PROJECT NO./DASH NO. 2005-540-10			
DRAWING NO. E-B002			REV

PART 9

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

1/2

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

Depth (m)	Depth (ft)	Boring 06-GLLE-01 Lab	Boring 06-GLLE-01 DMT	Boring 06-GLLE-01 BST	Boring 06-GLLE-03 Lab	Boring 06-GLLE-03 DMT	Boring 06-GLLE-03 BST	Boring 06-GLLE-04 Lab	Boring 06-GLLE-04 DMT	Boring 06-GLLE-04 BST	Boring 06-GLLE-07 Lab	Boring 06-GLLE-07 DMT	Boring 06-GLLE-07 BST	Boring 06-GLLE-09 Lab	Boring 06-GLLE-09 DMT	Boring 06-GLLE-09 BST
1.2	3.9		41			39			41			42			38	
1.4	4.6		40			40			40			42			36	
1.6	5.2		40			40			39			41			34	
1.8	5.9					39			38			41			31	
2	6.5		42			41			43			39			30	
2.2	7.2		40			41			42			39			30	
2.4	7.9		37						42			37			28	
2.6	8.5		35			47			43			36			28	
2.8	9.2		38						40			34			28	
3	9.8								39			34			27	
3.2	10.5		39	37		38			38			33			29	
3.4	11.2					40			38			34			34	
3.6	11.8		36			40			38			34			32	
3.8	12.5		35			38			39			32			33	
4	13.1		36			38			38			32			37	
4.2	13.8		36			37			37			34			35	
4.4	14.4		34			38			35			35			37	
4.6	15.1		33			39			33			34			34	
4.8	15.7		35			37			33			34			33	
5	16.4		35			36			33	28		33			31	
5.2	17.1		35			35			33		33	33	31		31	
5.4	17.7		37			34			34			32			31	
5.6	18.4		37			33			37			33			32	
5.8	19.0		36			33			28			33			30	
6	19.7		33			33			39			34			30	
6.2	20.3		35			33			34			36			29	
6.4	21.0		35			32			34			38			29	
6.6	21.6	36	34	35		35						38			28	
6.8	22.3		34			33						38			26	
7	23.0		33			32			34			38			23	
7.2	23.6		33			34			33			38			23	
7.4	24.3		35			30			33			36			27	
7.6	24.9		34			33			34			36			33	
7.8	25.6		33			32			32			36			32	
8	26.2		30			32			33			35			31	
8.2	26.9		31			33			32			33			31	
8.4	27.6		31			31			31			34			23	
8.6	28.2		31			33			31			35			23	
8.8	28.9		31			30			31			33			27	
9	29.5		31			30			31			31			28	
9.2	30.2		35			29			31			29			28	
9.4	30.8		31			30			31			27			28	
9.6	31.5	30	30	27		33			31	29		27			29	
9.8	32.2		30			31			29			26			29	
10	32.8		30			30			29			26			25	
10.2	33.5		31			28			29			26			26	
10.4	34.1		29			27			29			26			25	
10.6	34.8		29			25			30			26			25	
10.8	35.4		28			25			28			25			25	
11	36.1		29			30			29			24			25	
11.2	36.7		29			29			30			24			24	
11.4	37.4		29						31			25			23	
11.6	38.0		28			35						26				
11.8	38.7		28			36						24			21	
12	39.4		26			35						26			22	
12.2	40.0		24			36						26				
12.4	40.7	32		38								28			22	
12.6	41.3		24			32						30			23	
12.8	42.0		25									25				

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

Depth	Depth	Boring 06-GLLE-01			Boring 06-GLLE-03			Boring 06-GLLE-04			Boring 06-GLLE-07			Boring 06-GLLE-09		
(m)	(ft)	Lab	DMT	BST	Lab	DMT	BST	Lab	DMT	BST	Lab	DMT	BST	Lab	DMT	BST
13	42.6		26			36						27				
13.2	43.3		29									26			34	
13.4	44.0		30									26				
13.6	44.6		30									27				
13.8	45.3		25									25				
14	45.9		24									25				
14.2	46.6		24									25				
14.4	47.2		23									26				
14.6	47.9											26				
14.8	48.5		37									26				
15	49.2															
15.2	49.9															
15.4	50.5															
15.6	51.2															
15.8	51.8															
16	52.5															
16.2	53.1															
16.4	53.8															
16.6	54.4															
16.8	55.1															

Notes

Lab = Laboratory Test Result (ASTM D3080-04)

DMT = Dilatometer Test Result

BST = Borehole Shear Test

indicates soil. All other are fly ash materials

PART 10

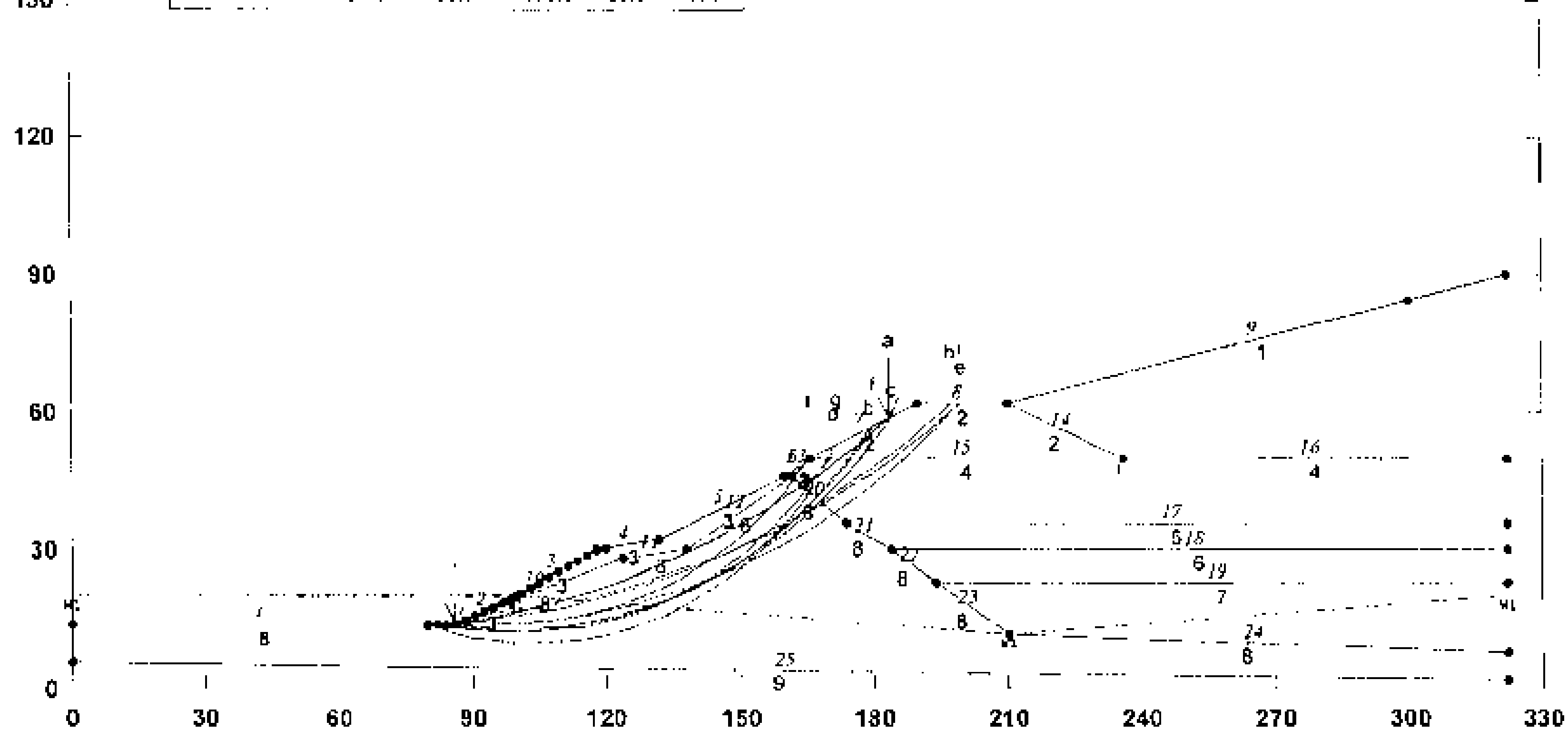
STABILITY ANALYSIS RESULTS

Glen Lyn Landfill Modification Section AA

p:\2005\2005-540\d20\engineering\stability runs\glyna2.pl2 Run By: Simon D Armstrong, GAI Consultants 4/2/2007 10:26AM CK: BLR 4/5/07

#	FS
a	**1.29**
b	1.36
c	1.37
d	1.37
e	1.38
f	1.38
g	1.40
h	1.42
i	1.42
j	1.42

Soil Desc.	Soil Type No.	Total Unit Wt (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No.
new ash	1	80.0	85.0	0.0	32.0	W1
ash1	2	65.0	70.0	0.0	35.0	W1
clayface	3	120.0	125.0	1000.0	0.0	W1
ash2	4	65.0	70.0	0.0	32.0	W1
ash3	5	65.0	70.0	0.0	30.0	W1
ash4	6	65.0	70.0	0.0	28.0	W1
ash5	7	65.0	70.0	0.0	24.0	W1
snd&cl	8	110.0	115.0	0.0	28.0	W1
rock	9	150.0	155.0	1500.0	30.0	W1



PCSTABL5M/si FSmin=1.29
Safety Factors Are Calculated By The Modified Bishop Method

STED

1/8

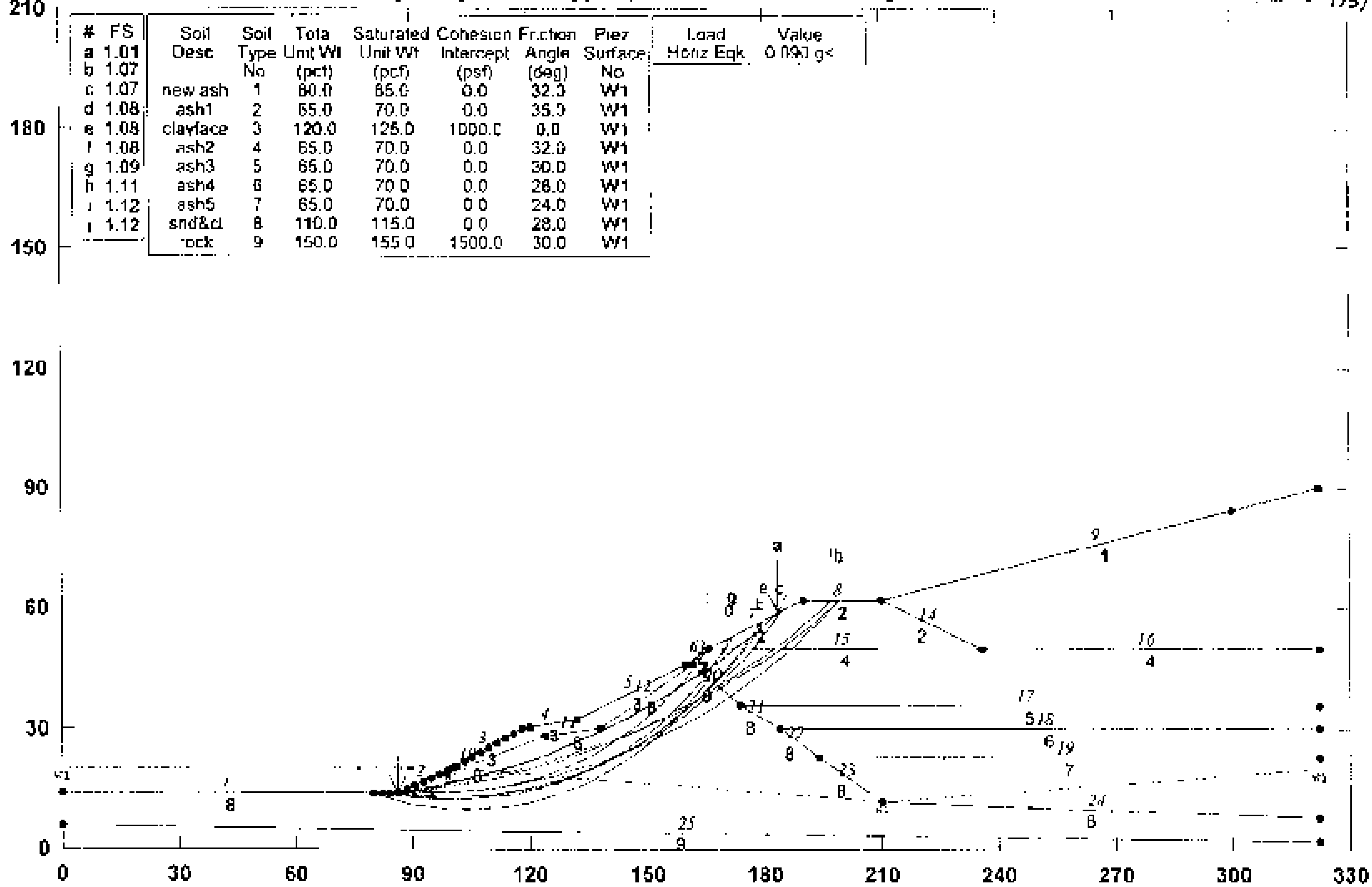
Glen Lyn Landfill Modification Section AA

p:\2005\2005-540\d20\engineering\stabilityruns\glyna5.pl2 Run By: Simon D. Armstrong, GAI Consultants 4/2/2007 10:28AM CK: BLR 4/5/07

#	FS
a	1.01
b	1.07
c	1.07
d	1.08
e	1.08
f	1.08
g	1.09
h	1.11
i	1.12
i	1.12

Soil Desc	Soil Type No	Tota Unit Wt (pcf)	Saturated Unit Wt (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez Surface No
new ash	1	60.0	65.0	0.0	32.0	W1
ash1	2	65.0	70.0	0.0	35.0	W1
clayface	3	120.0	125.0	1000.0	0.0	W1
ash2	4	65.0	70.0	0.0	32.0	W1
ash3	5	65.0	70.0	0.0	30.0	W1
ash4	6	65.0	70.0	0.0	28.0	W1
ash5	7	65.0	70.0	0.0	24.0	W1
snd&cl	8	110.0	115.0	0.0	28.0	W1
rock	9	150.0	155.0	1500.0	30.0	W1

Load	Value
Horiz Eqk	0.090 g<

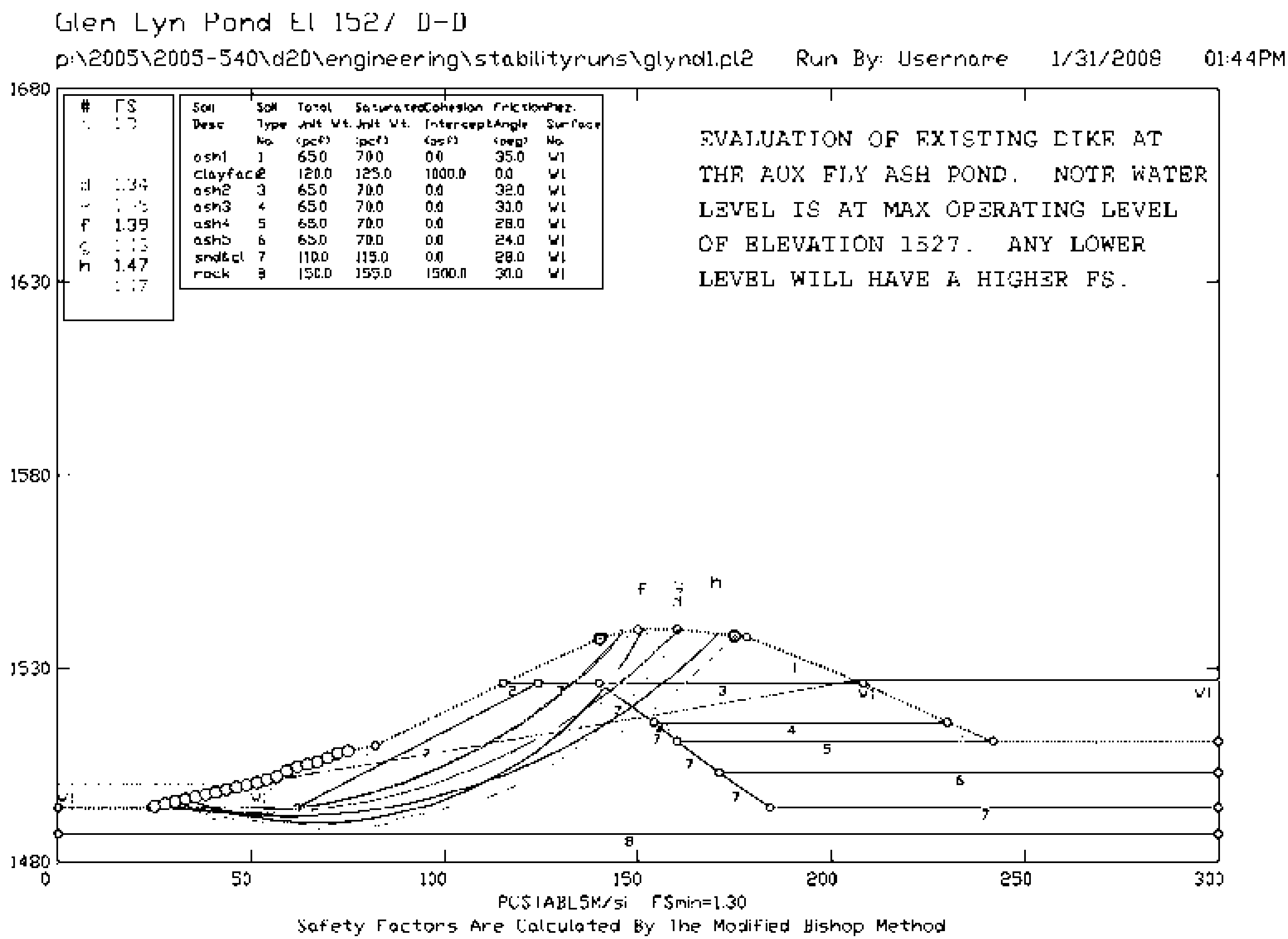


PCSTABL5M/si FSmin=1.01
Safety Factors Are Calculated By The Modified Bishop Method

STED

2/9

AEPGL000147



...\stabilityruns\glynd1.dgn 2/1/2008 10:30:20 AM

AEPGL000148

Appendix X

Boring Logs, Construction Diagrams and Certification

gai consultants
transforming ideas into reality

PROJECT A.E.P.-GLEN LYN LANDFILL MODIFICATIONS, GLEN LYN, VA BORING NO 06-GLLF-01
ELEVATION 1542.97 GWL 0 HRS 12.8 PROJECT NO C050540.20
24 HRS 47.4'
DATE 12-17 JUL 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	4 10 6	S-1 REC 1.5			M. DENSE	BROWN	SILT AND SHALE FRAGMENTS, SOME CLAY	ML-GM	DRY
3.0	5 12 10	S-2 REC 1.5		2.0	M. DENSE	DARK GRAY	FLYASH	ML	DRY
4.5	5 4 3	S-3 REC 1.5			LOOSE				
6.0	2 6 7	S-4 REC 1.5		5.0	M. DENSE	BROWN + GRAY	SANDY SILT, ROCK FRAGMENTS, FLYASH SHALE FRAGS 6.0-6.3	ML	DRY
7.5	17 5 2	S-5 REC 1.5		7.0	LOOSE				
9.0	2 1 2	S-6 REC 1.5			V. LOOSE	DARK GRAY	FLYASH		
10.5	1 2 2	S-7 REC 1.5							
12.0	3 3 4	S-8 REC 1.5		12.0					
13.5	1 2 1	S-9 REC 1.5		13.5		BROWN	SANDY SILT, SOME CLAY	ML	DRY
15.0	2 1 1	S-10 REC 1.5				DARK GRAY AND GRAY	FLYASH	ML	DRY
16.5	1 1	S-11 REC 1.5							
18.0	2 4 4	S-12 REC 1.5			LOOSE				
19.5	4 4 3	S-13 REC 1.5							
21.0	3 4 4	S-14 REC 1.5							
22.5	1 1 5	S-15 REC 1.5							
24.0	2 3 4	S-16 REC 1.5							
25.5	3 3 2	S-17 REC 1.5							
27.0	2 2 2	S-18 REC 1.5							
28.5	1 1 2	S-19 REC 1.5			V. LOOSE				
30.0	2 1 2	S-20 REC. 1.5							

REMARKS** DRILLED BY TERRA TESTING, INC. OF WASHINGTON, PA USING A C.M.E. 45-C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 3¼" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/AUTOMATIC HAMMER, NQ-2 CORING TOOLS

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLF-01 (B-1)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA BORING NO 06-GLLE-01

ELEVATION 1542.97 GWL 0 HRS 12.8 PROJECT NO C050540.10

24 HRS 47.4'

DATE 12-17 JULY 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY-CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 2	S-21			LOOSE	DARK GRAY	FLY ASH (CONT)	ML	DRY
31.5	3	REC 1.5				AND GRAY			
	2	S-22							
33.0	3 3	REC 1.5							
	1 1	S-23			V. LOOSE				
34.5	2	REC 1.5							
	2	S-24							
36.0	2 2	REC 1.5							
	1 1	S-25							SLIGHTLY MOIST
37.5	1	REC 1.5							
	2	S-26							
39.0	2 2	REC 1.5							
	W.O.H. WOR	S-27					- NO RECOVERY -		
40.5	1	REC 0.0							
	1	S-28							
42.0	1 1	REC 0.7							WET
	1 1	S-29							MOIST
43.5	1	REC 1.5							
	2	S-30							
45.0	2 2	REC 1.5							MOIST
	W.O.H. W.O.H.	S-31							WET
46.5	W.O.H.	REC 1.5							
	W.O.H.	S-32							
48.0	W.O.H. W.O.H.	REC 1.5							
	W.O.H. W.O.H.	S-33							
49.5	W.O.H.	REC 1.5							
	3	S-34		50.0					
51.0	5 4	REC 1.5			LOOSE	BROWN	SILTY SAND	SM	MOIST
	1 3	S-35							
52.5	5	REC 1.5							
	3	S-36							
54.0	5 7	REC 1.5							
	6 3	S-37							
55.5	4	REC 1.5							
	1	S-38							
57.0	4 4	REC 1.5							
	3 5	S-39							
58.5	6	REC							
	10	S-40		58.1					
58.9	41 50/0.4	REC			V. DENSE	GRAY	SHALE FRAGMENTS	[illegible]	[illegible]

REMARKS** DRILLER ROB LAWRENCE HELPER: LARRY THORPE

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-01 (B-1)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA

BORING NO 06-GLLG-01

ELEVATION 1542.92 GWL 0 HRS 12.8

24 HRS 47.4 , 4

PROJECT NO C050540.20

DATE 12-17 JUL 2006 CLASSIFIED BY DAN SANGER

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
60.5	50/0.5	S-41 R6							
				61.7	HARD	LIGHT GRAY	SANDSTONE - THINLY BEDDED	BR	20° FRAC 60.5, 60.8, 61.1
					M. SOFT	DARK	SHALE, W/ SILTY SHALE ZONES,	VB	30° FRAC 61.4
	4.3/5.0	86%	0			GRAY	V. THINLY BEDDED		
65.5				65.5					
							BOTTOM of BORING: 65.5'		

REMARKS **

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLG-01
(B-1)

gai consultants
transforming ideas into reality

PROJECT: A.E.P : GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA
BORING NO. 06-GLLF-03
ELEVATION 1540.07 GWL 0 HRS 53.8
PROJECT NO. C050540.20
24 HRS 50.1
DATE 17-18 JULY 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY, CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	2 4 3	S-1 REC 1.1		1.5	LOOSE	RED-BROWN	CLAYEY SILT, MICACEOUS, SOME SAND	ML	DRY
3.0	4 4 2	S-2 REC 1.0			LOOSE	GRAY TO DARK GRAY	FLYASH	ML	DRY
4.5	1 2 2	S-3 REC 1.1			V-LOOSE				
6.0	2 1 2	S-4 REC 1.1							
7.5	3 3 4	S-5 REC 1.3		8.0	LOOSE				
9.0	4 12 12	S-6 REC 1.5			M.DENSE	RED-BROWN + GRAY	INTERBEDDED CLAYEY TO SANDY SILT AND FLYASH	ML	
10.5	9 9 7	S-7 REC 1.5							
12.0	8 8 8	S-8 REC 1.6		11.0	M. DENSE	DARK GRAY	FLYASH	ML	DRY
13.5	1 3 3	S-9 REC 1.5			LOOSE				
15.0	4 4 4	S-10 REC 1.2							
16.5	1 3 3	S-11 REC 1.1							
18.0	2 3 2	S-12 REC 1.4							
19.5	1 1 1	S-13 REC 1.5			V. LOOSE				
21.0	2 1 2	S-14 REC 1.3							
22.5	2 2 2	S-15 REC 1.5							
24.0	3 5 3	S-16 REC 1.3			LOOSE				
25.5	WOH 1 2	S-17 REC 1.0			V. LOOSE				
27.0	1 1 2	S-18 REC 1.5							
28.5	1 2 3	S-19 REC 1.5			LOOSE				
30.0	1 2 2	S-20 REC 1.5			V. LOOSE				

REMARKS** DRILLED BY TERRA TESTING in WASHINGTON, PA using A CME-55C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 4 1/4" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/ AUTOMATIC HAMMER, 4" Ø AIR HAMMER IN ROCK

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLF-03
(B-3)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO 06-GLLE-03
ELEVATION 1540.07 GWL 0 HRS 53.8 PROJECT NO C050549.20
24HRS 50.1
DATE 17-18 JULY 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER 6 X INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
	1 1	S-31			V. LOOSE	DARK GRAY TO GRAY	FLYASH (CONT)	ML	
31.5	2	REC 1.4							
	1	S-32							
33.0	1 2	REC 1.5							
	W.O.H. W.O.H.	S-33							WET
34.5	W.O.H.	REC 1.5							
	W.O.H.	S-34							
36.0	W.O.H. W.O.H.	REC 1.5							
	W.O.H. W.O.H.	S-35		37.0					
37.5	1	REC 1.1							
	3	S-36			LOOSE	BROWN	SILTY SAND, MEDIUM GRAINED	SM	MOIST
39.0	4 2	REC 1.2			M. DENSE				
	2 7	S-37							
40.5	5	REC 1.2							
	2	S-38							
42.0	5 9	REC 1.5			M. DENSE	BROWN & GRAY	CLAYEY SAND	SC	MOIST
	3 5	S-39				BROWN	SILTY SAND	SM	MOIST TO WET
43.5	8	REC 1.5							
	7	S-40							
45.0	9 7	REC 1.5							
	2 5	S-41							
46.5	3	REC 1.2							
	7	S-42							
48.0	7 10	REC 1.5		48.0					WET
	1 2	S-43			LOOSE	BROWN	COARSE SAND, TRACE GRAVEL	SP	WET
49.5	3	REC 1.1							
	1	S-44							
51.0	1 2	REC 1.5			V. LOOSE				
	W.O.H. W.O.H.	S-45							
52.5	W.O.H.	REC 1.4							
	1	S-46							
53.4	50/0.4	REC 0.7		53.4 [illegible]	V. DENSE				
							AIR HAMMER w/o SAMPLING		PRE-AIR HAMMER WATER LEVEL: 49..

REMARKS** DRILLER: BOB LAWRENCE, HELPER: DOUG NOVOTNY

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-03
(9-3)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA
BORING NO 06-GLLE-03
ELEVATION 1598.07 GWL 0 HRS 53.8'
24 HRS 53.1
PROJECT NO C050540.20
DATE 17-19 JULY 2006 CLASSIFIED BY DAN SANGER
PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							AIR HAMMER W/ SAMPLING		ROCK CHIPS ARE SHALE AND FINE TO MEDIUM GRAINED SANDSTONE
				80.0					
							BOTTOM OF BORING: 80.0'		
							2"Ø MONITORING WELL INSTALLED		
							GROUT 0.0-64'		
							PELLETS 64-67'		
							SAND 67-80'		
							SCREEN 70-80'		
							TIP 80'		

REMARKS **

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-03
(B-?)

gai consultants
transforming ideas into reality

PROJECT A.E.P.: GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA BORING NO 06-GLLE-04
ELEVATION 1539.73 GW: 0 HRS 54.4 PROJECT NO C050540.20
24 HRS 54.4
DATE 31 JUL - 09 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	2 4 4	S-1 REC 1.3		3.0	LOOSE	GRAY + BROWN	FLYASH AND SANDY SILT	ML	DRY
3.0	3 3 3	S-2 REC 1.2				BROWN	SANDY SILT	ML	DRY
4.5	1 1 2	S-3 REC 1.5			V. LOOSE				
6.0	2 2 2	S-4 REC 1.2							
7.5	1 1 1	S-5 REC 1.5			V. LOOSE	BROWN	SANDY SILT	ML	DRY
9.0	3 5 5	S-6 REC 1.5		9.0	LOOSE				
10.5	3 2 4	S-7 REC 1.5			LOOSE	GRAY	FLYASH	ML/SM	DRY
12.0	3 3 5	S-8 REC 1.3							
13.5	2 3 3	S-9 REC 1.5							
15.0	2 2 2	S-10 REC 1.4			V. LOOSE				
16.5	1 1 1	S-11 REC 1.5							
18.0	3 2 3	S-12 REC 1.5			LOOSE				
19.5	1 4 6	S-13 REC 1.5							
21.0	1 8 9	S-14 REC 1.5			M. DENSE				
22.5	3 2 3	S-15 REC 1.5			LOOSE				
24.0	3 3 4	S-16 REC 1.5							
25.5	2 1 3	S-17 REC 1.3			V. LOOSE				
27.0	1 2 3	S-18 REC 1.5			LOOSE				
28.5	1 1 2	S-19 REC 1.5			V. LOOSE				
30.0	1 2 2	S-20 REC 1.0							

REMARKS** DRILLED BY TERRA TESTING INC. OF WASHINGTON, PA USING A CME-45C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 4¼" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/ AUTO. HAMMER, 4" AIR HAMMER

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-04
(B-4)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATIONS GLEN LYN VA BORING NO 06-GLLE-04
ELEVATION 1539.73 GWL 0 HRS 54.4 PROJECT NO C050540.20
24 HRS 54.4
DATE 31 JUL-09 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
31.5	2 2 2	S-21 REC 1.1			V. LOOSE	GRAY	FLYASH (CONT)	ML-NP	DRY
33.0	2 2 2	S-22 REC 1.5							
34.5	1 2 1	S-23 REC 1.2							
36.0	1 2 2	S-24 REC 1.2							MOIST TO WET
37.5	1 1 2	S-25 REC 1.5		37.0					
39.0	2 2 3	S-26 REC 1.4			LOOSE	BROWN RED	SILTY SAND AND SMALL ROCK FRAGMENTS AND GRAVEL, SOME CLAY	SM	MOIST
40.5	3 3 3	S-27 REC 1.5							
42.0	1 2 3	S-28 REC 1.2							
43.5	4 8 7	S-29 REC 1.5			M. DENSE				
45.0	5 2 8	S-30 REC 1.2			LOOSE				WET
46.5	4 5 8	S-31 REC 1.5			M. DENSE				MOIST
48.0	6 14 22	S-32 REC 1.3		48.0	DENSE				MOIST
49.5	12 10 15	S-33 REC 1.1					SANDY SILT AND ROCK FRAGMENTS	ML-SM	WET
51.0	2 12 12	S-34 REC 1.5			M. DENSE				
52.5	6 7 18	S-35 REC 1.5							
52.9	50/0.4	S-36 REC 0.1		52.9 REFUSAL	V. DENSE				TOP OF ROCK 52.9

BORING DRILLED W/ SAMPLING TO A DEPTH OF 121.0 FT

REMARKS** DRILLER: ED WITKOWSKI, HELPER: LARRY THORPE

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-04

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATION GLEN LYN VA BORING NO 06-GLLE-04
ELEVATION 1539.73 GWL 0 HRS 54.4 PROJECT NO C050540.20
24 HRS 54.4
DATE 31 JUL - 01 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 3 of 7

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							2" ϕ MONITORING WELL INSTALLED		
							GROUT 0.0 - 104		
							PELLETS 104 - 107		
							SAND 107 - 121		
							SCREEN 110 - 120		
							TIP 120'		

REMARKS **

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-04
(8-4)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA BORING NO 06-GLLE-06
ELEVATION 1540.62 GWL 0 HRS 56.05 PROJECT NO C050540.10
24 HRS 56.1
DATE 02-07 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	5 5 3	S-1 REC 1.1		2.0	LOOSE	BROWN	SANDY SILT, TRACE CLAY	ML	DRY
3.0	2 2	S-2 REC 1.1			V. LOOSE	GRAY	FLYASH	ML-SM	DRY
4.5	1 2 1	S-3 REC 1.5							
6.0	1 1	S-4 REC 1.5							
7.5	1 2 1	S-5 REC 1.5		8.0					
9.0	2 4 4	S-6 REC 1.5			LOOSE	RED-BROWN	SILTY FINE SAND	SM	DRY
10.5	5 4 4	S-7 REC 1.5		10.0					
12.0	2 2 3	S-8 REC 1.5			LOOSE	GRAY	FLYASH	ML-SM	DRY
13.5	1 2 3	S-9 REC 1.5							
15.0	1 2 1	S-10 REC 1.5			V. LOOSE				
16.5	1 1 1	S-11 REC 1.5							
18.0	1 1	S-12 REC 1.5							
19.5	1 1 1	S-13 REC 1.5							
21.0	1 1	S-14 REC 1.2							
22.5	1 1 1	S-15 REC 1.1							
24.0	1 1 2	S-16 REC 1.3							
25.5	1 2 2	S-17 REC 1.5							
27.0	1 3 3	S-18 REC 1.2			LOOSE				
28.5	2 3 5	S-19 REC 1.5							
30.0	1 2 1	S-20 REC 1.5			V. LOOSE				

REMARKS ** DRILLED BY TRI-STATE TESTING INC. OF WASHINGTON PA USING A CME-45C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 4 1/4" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/AUTO HAMMER, 4" Ø AIR HAMMER

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-06
(A-6)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO 06-GLLE-06
ELEVATION 1542.62 GWL 0 HRS 56.25 PROJECT NO C050540.20
24 HRS 56.1
DATE 02-07 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY, CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
30.0	1 1	S-21			V. LOOSE	GRAY	FLYASH	ML-SM	
31.5	1	REC 1.5							
		S-22							
33.0	2 3	REC 1.5			LOOSE				
	WOH	S-23			V. LOOSE				SLIGHTLY MOIST
34.5	1	REC 1.5							
	1	S-24							
36.0	W.O.H. W.O.H.	REC 1.0							MOIST
	W.O.R. W.O.R.	S-25							WET
37.5	W.O.R.	REC 1.5							
		S-26							
39.0	1 7	REC 1.0			LOOSE				
	6 4	S-27			M. DENSE				
40.5	8	REC 1.5							
	4	S-28							
42.0	4 5	REC 1.5			LOOSE				
	2 1	S-29			V. LOOSE				
43.5	2	REC 1.5							
	1	S-30							
45.0	1 1	REC 1.5							
	W.O.R. W.O.R.	S-31							
46.5	W.O.R.	REC 1.5		46.5					
	6	S-32				RED-BROWN	SILTY FINE SAND, FEW ROCK FRAGMENTS / GRAVEL	SM	
48.0	8 10	REC 1.5			M. DENSE				
	2 12	S-33							
49.5	8	REC 1.5							
	2	S-34							
51.0	4 4	REC 1.1			LOOSE				
	4 1	S-35			V. LOOSE				
52.5	1	REC 1.5							
	1	S-36		53.5					
54.0	2 50/0.5	REC 1.1		54.0 TOR	V. DENSE	GRAY	SHALE FRAGMENTS	SM	
									TOP OF ROCK: 54.0'
							DRILLED W/O SAMPLING TO A DEPTH OF 121 FT		

REMARKS** DRILLER: ED WITKOWSKI, HELPER: LARRY THORPE

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-06
(3.6)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO 06-GLLE-06
ELEVATION 1540.62 GWL 0 HRS 56.05 PROJECT NO C050540.20
24 HRS 56.10
DATE 02-07 AUG 2006 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY, CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							2" ⌀ MONITORING WELL		
							INSTALLED		
							GROUT 0.0 - 104'		
							PELLETS 104 - 107'		
							SAND 107 - 121'		
							SCREEN 110 - 120'		
							TIP 120'		

REMARKS **

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-06
(B-6)

gai consultants
transforming ideas into reality

PROJECT A.E.P.: GLEN LYN LANDFILL MODIFICATIONS GLEN LYN, VA

BORING NO 06-GLLE-07

ELEVATION 1540.98 GWL 0 HRS 26.6

24 HRS 33.8

PROJECT NO C050540.20

DATE 27-31 JUL 2006 CLASSIFIED BY DAN SANGER

PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY · CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	2 4 1	S-1 REC 1.4		2.0	LOOSE – M-DENSE	RED-BROWN	SILTY SAND, FEW ROCK FRAGMENTS	SM	DRY
3.0	2 4 4	S-2 REC 1.5			LOOSE	DARK GRAY TO GRAY	FLY ASH	ML-SM	DRY
4.5	3 3 3	S-3 REC 1.5							
6.0	4 4 4	S-4 REC 1.5							
7.5	2 1 1	S-5 REC 1.5			V. LOOSE				
9.0	1 2 2	S-6 REC 1.5							
10.5	2 1 2	S-7 REC 1.5							
12.0	1 1 2	S-8 REC 1.4							
13.5	1 1 1	S-9 REC 1.4							
15.0	1 1 2	S-10 REC 1.5							
16.5	1 1 1	S-11 REC 1.2							
18.0	1 2 2	S-12 REC 1.5							
19.5	1 1 1	S-13 REC 1.5							
21.0	1 2 4	S-14 REC 1.4			LOOSE				
22.5	2 4 5	S-15 REC 1.3							
24.0	5 4 7	S-16 REC 1.5			M. DENSE				
25.5	3 3 3	S-17 REC 1.5			LOOSE				
27.0	3 5 4	S-18 REC 1.5							
28.5	1 2 4	S-19 REC 1.5							
30.0	5 4 2	S-20 REC 1.4							

REMARKS** DRILLED BY TERRA TESTING INC. OF WASHINGTON PA USING A CME-45C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 3¼" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/ AUTOMATIC HAMMER, NX CORING [illegible]

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-07

(87)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATIONS , GLEN LYN, VA BORING NO 06-GLLE-07
ELEVATION 1540.98 GWL 0 HRS 26.6
24 HRS 33.8 PROJECT NO C050543.20
DATE 27-31 JUL 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
30.0 1	2	3	4	5	6	7	8	9	10
	1	S-21			V. LOOSE	GRAY	FLYASH		
31.5	W.O.H.	REC 0.3							
	1	S-22							WATER @ 32'
33.0	1 1	REC 1.5							WET
	1 1	S-23							
34.5	1	REC 1.5							
	1	S-24							
36.0	1 W.O.H.	REC 1.5							
	W.O.H. W.O.H.	S-25							
37.5	W.O.H.	REC 1.5							
	W.O.H.	S-26							
39.0	W.O.H. W.O.H.	REC 1.5							
	W.O.H. 1	S-27							
40.5	1	REC 1.5							
	W.O.H.	S-28							
42.0	W.O.H. 1	REC 1.5							
	W.O.H. 1	S-29							
43.5	1	REC 1.5							
	1	S-30							
45.0	1 1	REC 1.5							
	W.O.H. W.O.H.	S-31							
46.5	W.O.H.	REC 1.1							
	W.O.H.	S-32							
48.0	W.O.H. W.O.H.	REC 1.1							
	W.O.H. 2	S-33		48.6	LOOSE	BROWN	CLAYEY SAND	SC	MOIST
49.5	4	REC 1.5							
	4	S-34							
51.0	7 8	REC 1.5			M. DENSE				
	W.O.H. W.O.H.	S-35			V. LOOSE				WET
52.5	W.O.H.	REC 1.1							
	2	S-36							
53.8	4 50/.3	REC 1.3		53.8 (Approx)	V. DENSE	RED	SHALE FRAGMENTS		TOP OF ROCK: 53.8'
					SOFT	RED	SILTY SHALE : SOME MODERATELY STAINED FRACTURES (0-45°)	VBR	CORE LOSS IN THIS INTERVAL
	3.5 5.0	70%	10	50%					
				58.0	M. SOFT	GRAY	SANDY SHALE	VBR	
58.8				58.8	M. HARD	GRAY	SANDSTONE : FINE GRAINED	BR	
							BOTTOM OF BORING : 58.8'		

REMARKS **

W.O.H. = WEIGHT OF HAMMER ; W.O.R. = WEIGHT OF ROD

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-07
(07)

gai consultants
transforming ideas into reality

PROJECT A.E.P.: GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO. 06-GLLG-08
ELEVATION 1543.46 GWL 0 HRS 54.2 PROJECT NO. C050540.20
24 HRS 55.5
DATE 19-20 JULY 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	3 4 9	S-1 REC 1.5			LOOSE	RED-BROWN	CLAYEY SILT/SILTY CLAY, TRACE TO SOME FINE SAND	ML-CL	DRY
3.0	2 4 5	S-2 REC 1.5							
4.5	4 8 8	S-3 REC 0.3			M. DENSE				
6.0	10 10 7	S-4 REC 0.0		6.0			— NO RECOVERY —		
7.5	2 2 2	S-5 REC 1.1			V. LOOSE	DARK GRAY	FLY ASH	ML	DRY
9.0	5 8 6	S-6 REC 1.5		8.0 / 9.0	M. DENSE	RED-BROWN	CLAYEY SILT/SILTY CLAY, TRACE FINE SAND	ML-CL	
10.5	3 3 2	S-7 REC 1.3							
12.0	2 2 1	S-8 REC 1.1			LOOSE / V. LOOSE	DARK GRAY	FLY ASH	ML	DRY
13.5	1 1 1	S-9 REC 1.5							
15.0	1 2 2	S-10 REC 0.9							
16.5	1 1 2	S-11 REC [illegible]							
18.0	2 2 2	S-12 REC 1.5							DRY TO SLIGHTLY MOIST
19.5	1 1 1	S-13 REC 1.1							
21.0	1 1 2	S-14 REC 1.1							
22.5	1 1 3	S-15 REC 1.5							
24.0	4 4 4	S-16 REC 1.5			LOOSE				
25.5	1 3 2	S-17 REC 1.1							
27.0	5 4 5	S-18 REC 1.3			LOOSE				
28.5	3 4 4	S-19 REC 1.5							
30.0	3 4 3	S-20 REC 1.1							

REMARKS** DRILLED BY TERRA TESTING, INC. OF WASHINGTON, PA USING A CME 45C RUBBER TRACK MOUNTED DRILL. BORING ADVANCED USING 4 1/4" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT W/ AUTOMATIC HAMMER, 140# AUTO HAMMER

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-08
(0-8)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO. 06-GLLE-08

ELEVATION 1543.46 GWL 0 HRS 54.2 PROJECT NO. C050540.20

24 HRS 53.5

DATE 19-20 JULY 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	DESCRIPTION: PROFILE	DESCRIPTION: SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	DESCRIPTION: COLOR	DESCRIPTION: MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
30.0 1	2	3	4	5	6	7	8	9	10
	1 1	S-21			V. LOOSE	DARK GRAY TO GRAY	FLYASH (CON'T)	ML-SM	WET
31.5	2	REC. 1.4							
	3	S-22							
33.0	4 4	REC 1.5			LOOSE				MOIST
	1 1	S-23			V. LOOSE				
34.5	1	REC. 1.1							
	7	S-24							
36.0	2 2	REC 1.5							MOIST TO WET
	1 1	S-25							
37.5	1	REC 1.5							
	1	S-26							
39.0	1 1	REC 1.5							WET
	1 1	S-27							
40.5	2	REC 1.5							
	1	S-28							
42.0	2 1	REC 1.5							
	1 2	S-29							
43.5	1	REC 1.5							
	1	S-30							
45.0	2 2	REC 1.5							
	1 1	S-31							
46.5	2	REC 1.5		46.3					
	3	S-32			STIFF	BROWN	SILTY CLAY, TRACE SAND	CL	* 1.0 TSF, MOIST
48.0	3 2	REC 1.5							* 1.25 TSF, MOIST
	1 2	S-33							* 1.25 TSF MOIST
49.5	4	REC 1.5							
	1	S-34							
51.0	4 4	REC. 1.5			M. STIFF TO STIFF	RED-BROWN	SANDY CLAY	CL	* 1.0 TSF MOIST TO WET
	1 2	S-35							* 1.0 TSF MOIST
52.5	4	REC. 1.5							
	1	S-36							
54.0	8 8	REC. 1.2					(SOME ROCK FRAGMENTS		* 1.25 TSF MOIST
	2 4	S-37							* 1.25 TSF MOIST
55.5	5	REC. 1.4							
	10	S-38							
	11			56.4					* 1.25 TSF MOIST
57.0	50	REC. 1.1		57.0	SOFT	RED	DECOMPOSED SHALE	SH	
				[illegible]			(BORING DRILLED W/O SAMPLING		TOP OF ROCK: 57.0'
							TO A DEPTH OF 80.0 FT		

REMARKS ** DRILLER: BOB LAWRENCE, HELPER: DOUG NOVOTNY

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-08
(B-8)

gai consultants
transforming ideas into reality

PROJECT A. E. P. : GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA BORING NO. 06-GLLE-08
ELEVATION 1543.46 GWL 0 HRS 54.2
24 HRS 55.5
PROJECT NO. C050540.20
DATE 19-20 JUL 2006 CLASSIFIED BY DAN SANGER PAGE 3 of 3

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
							2" Ø MONITORING WELL INSTALLED		
							GROUT 0-64.5'		
							PELLETS 64.5-67.5'		
							SAND 67.5-80.0'		
							SCREEN 70.0-80.0'		
							TIP 80.0'		

REMARKS **

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-08
(6-8)

gai consultants
transforming ideas into reality

PROJECT A.E.P. : GLEN LYN LANDFILL MODIFICATION GLEN LYN, VA

BORING NO. 06-GLLE-09

ELEVATION 1529.84 GWL 0 HRS 37.4

24 HRS 31.4

PROJECT NO. C050540.10

DATE 12 JUL 2006 CLASSIFIED BY DAN SANGER

PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	3 4 7	S-1 REC 1.2		D.S.	LOOSE / LOOSE	BROWN / DK GRAY	CLAYEY SILT and some/ry shale frags / FLY ASH	ML / ML	DRY / DRY
3.0	3 3 4	S-2 REC 1.5							
4.5	1 1 1	S-3 REC 1.5			V. LOOSE				
6.0	1 1 1	S-4 REC 1.5							
7.5	W.O.H. W.O.H. W.O.H.	S-5 REC 1.2							
9.0	W.O.H. W.O.H. W.O.H.	S-6 REC 1.1							
10.5	W.O.H. 1 W.O.H.	S-7 REC 1.3							
11.0	1 1 2	S-8 REC 1.4							
13.5	1 1 1	S-9 REC 1.5							
15.0	1 1 1	S-10 REC 1.5							
16.5	1 1 1	S-11 REC 1.5							
18.0	1 1 1	S-12 REC 1.5							
19.5	1 1 1	S-13 REC 1.5							
21.0	1 1 1	S-14 REC 1.5							
22.5	W.O.H. W.O.H. W.O.H.	S-15 REC 0.0					— NO RECOVERY —		
24.0	1 1 1	S-16 REC 1.5							WET @ 23
25.5	1 1 2	S-17 REC 1.5							
27.0	W.O.H. 1 1	S-18 REC 1.5							
28.5	1 1 1	S-19 REC 1.5							
30.0	W.O.H. W.O.H. W.O.H.	S-20 REC 1.5							

REMARKS** DRILLED BY TERRA TESTING, INC. OF WASHINGTON, PA USING A CME-45C RUBBER TRACK DRILL. BORING ADVANCED USING 3¼" I.D. HOLLOW STEM AUGERS, CONTINUOUS SPT w/AUTOMATIC HAMMER.

* POCKET PENETROMETER READINGS

** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-09

(64)

gai consultants
transforming ideas into reality

PROJECT A.E.P. - GLEN LYN LANDFILL MODIFICATION, GLEN LYN, VA BORING NO. 06-GLLE-01
ELEVATION 1529.84 GWL 0 HRS 32.4 PROJECT NO. C050540.10
24 HRS 31.4
DATE 12 JUL 2006 CLASSIFIED BY DAN SANGER PAGE 2 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
31.5	W.O.H. W.O.H. W.O.H.	S-21 REC 1.5			V. SOFT	DARK GRAY	FLYASH (CON'T)	ML	WET
33.0	W.O.H. W.O.H. W.O.H.	S-22 REC 1.5							
34.5	W.O.H. W.O.H. W.O.H.	S-23 REC 1.5							
36.0	W.O.H. W.O.H. W.O.H.	S-24 REC 1.5							
37.5	W.O.H. W.O.H. W.O.H.	S 24 REC 1.5							
39.0	W.O.H. W.O.H. W.O.H.	S-25 REC 1.5							
40.5	W.O.H. W.O.H. W.O.H.	S-26 REC 1.5							
42.0	W.O.H. W.O.H. 1	S-27 REC 1.5		41.1					
43.5	3 5 7	S-28 REC 1.5			STIFF	BROWN	SILTY CLAY, TRACE TO SOME SAND	CL	* 1.5 TSF, MOIST
45.0	5 11 17	S-29 REC 1.5		44.0	M. DENSE	BROWN	CLAYEY SILT AND DECOMPOSED SHALE FRAGMENTS	ML-GM	WET
46.5	12 20 41	S-30 REC 1.5			V. DENSE	GRAY			
48.0	22 20 36	S-31 REC 1.5		48.0	V. DENSE	RED + BROWN	SHALE FRAGMENTS AND SILTY SAND	SM	WET
48.4	50/0.4	S-32 REC 0.4		48.4	V. DENSE	RED + BROWN	SHALE FRAGMENTS	GM	DRY
							BOTTOM OF BORING = 48.4'		

REMARKS ** DRILLER: BOB LAURENCE

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-01
(3-4)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATION BORING NO 06-GLLE-10
ELEVATION 1521.23 GWL 0 HRS 23.0 PROJECT NO C050540.20
15HRS 21.9'
DATE 10-11 JUL 2006 CLASSIFIED BY DAN SANGER PAGE 1 of 2

DEPTH (FT.)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY-CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
1.5	W.O.H. W.O.H. W.O.H.	S-1 REC. 1.2			VERY LOOSE	GRAY	FLYASH	ML-SM	
3.0	W.O.H. W.O.H.	S-2 REC. 1.2							
4.5	1 W.O.H. W.O.H.	S-3 REC. 1.5							
6.0	1 1 1	S-4 REC 1.3							WET ZONE 5.5-5.6
7.5	1 1 1	S-5 REC. 1.5							
9.0	1 1 1	S-6 REC.							
10.5	W.O.H. W.O.H.	S-7 REC 1.0							
12.0	1 1 2	S-8 REC 1.4							
13.5	1 1 W.O.H.	S-9 REC. 1.0							
15.0	W.O.H. W.O.H. W.O.H.	S-10 REC. 1.3				DARK GRAY			WET @ ~15'
16.5	W.O.H. W.O.H. W.O.H.	S-11 REC. 1.5							BROWN SILTY SAND 16.3-16.4
18.0	W.O.H. 7 11	S-12 REC 1.5			M. DENSE				
19.5	4 10 13	S-13 REC 1.3							SLIGHTLY MOIST TO MOIST
21.0	5 12 10	S-14 REC. 1.5							
22.5	4 5 4	S-15 REC.			LOOSE				
24.0	2 1 1	S-16 REC. 1.5			V. LOOSE				WET
25.5	1 1 W.O.H.	S-17 REC.							
27.0	W.O.H. W.O.H. W.O.H.	S-18 REC 1.5							
28.5	1 1 5	S-19 REC 1.5		28.25					BRN SILTY SAND 28.25-28.5
30.0	2 5 4	S-20 REC 1.5				BROWN	SILTY FINE SAND, MICACEOUS	SM	

REMARKS** DRILLED BY TERRA TESTING, INC. OF WASHINGTON, PA USING A CME-45C RUBBER TRACK MOUNTED DRILL
BORING ADVANCED USING 3¼ I.D. HOLLOW STEM AUGERS AND CONTINUOUS SPT WITH AUTOMATIC HAMMER

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-10
(B-13)

gai consultants
transforming ideas into reality

PROJECT A.E.P. GLEN LYN LANDFILL MODIFICATION — BORING NO. 06-GLLE-10
ELEVATION 1522.23 GWL 0 HRS 23.0 — PROJECT NO. C050540.10
24 HRS 21.7
DATE 11 JUL 2006 CLASSIFIED BY DAN SANGER — PAGE 2 of 2

DEPTH (FT)	BLOWS PER SIX INCHES OR CORE RECOVERY/RUN	SAMPLE NO., TYPE & RECOVERY OR % ROCK RECOVERY	RQD (%) OR TORVANE	PROFILE	SOIL DENSITY - CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION	USCS OR ROCK BROKENNESS	REMARKS*
1	2	3	4	5	6	7	8	9	10
31.5	4 5 4	S-21 REC 1.5		31.7	LOOSE	TAN	SILTY SAND (CONT)	SM	MOIST TO WET
33.0	4 3 2	S-22 REC 1.5				BROWN	COARSE SAND	SP	WET
34.5	8 16 15	S-23 REC 1.5			DENSE				
35.3	21 50/0.3	S-24 REC		35.3	V. DENSE				
							BOTTOM OF BORING: 35.3'		

REMARKS** DRILLER: ROB LAWRENCE

* POCKET PENETROMETER READINGS
** METHOD OF ADVANCING AND CLEANING BORING

BORING 06-GLLE-10
(370)

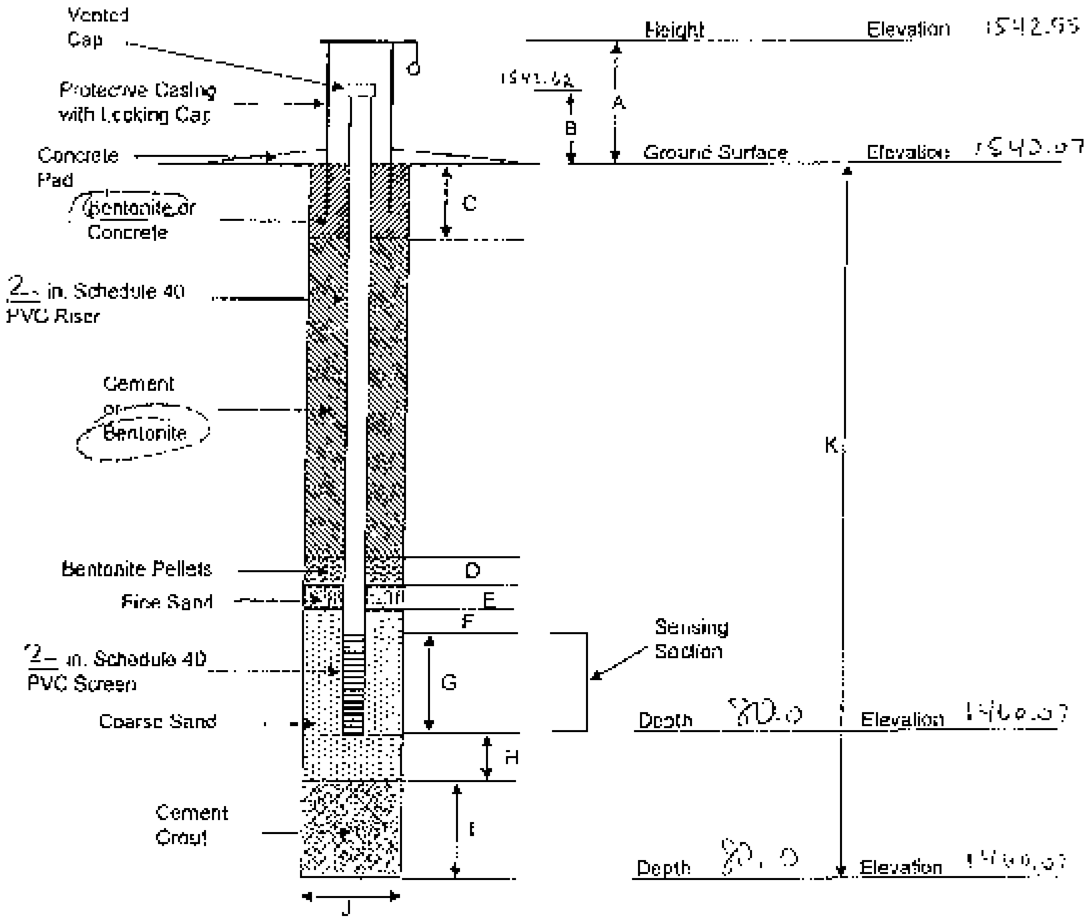
gai consultants

MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project AEP: GLEN LYN Project No C050540.20

Date 18-JUL 2006 Engineer/Geologist DBS Well No 06-GLLE-03

Drilling Company TERRA TESTING, INC. Driller: BOB LAWRENCE



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.88	2.55	3.0	3.0	N/A	3.0
G	H	I	J	K	
10.0	2.5	N/A	0.33	80.0	

Remarks K= 1.995 x 10^-5 cm/sec

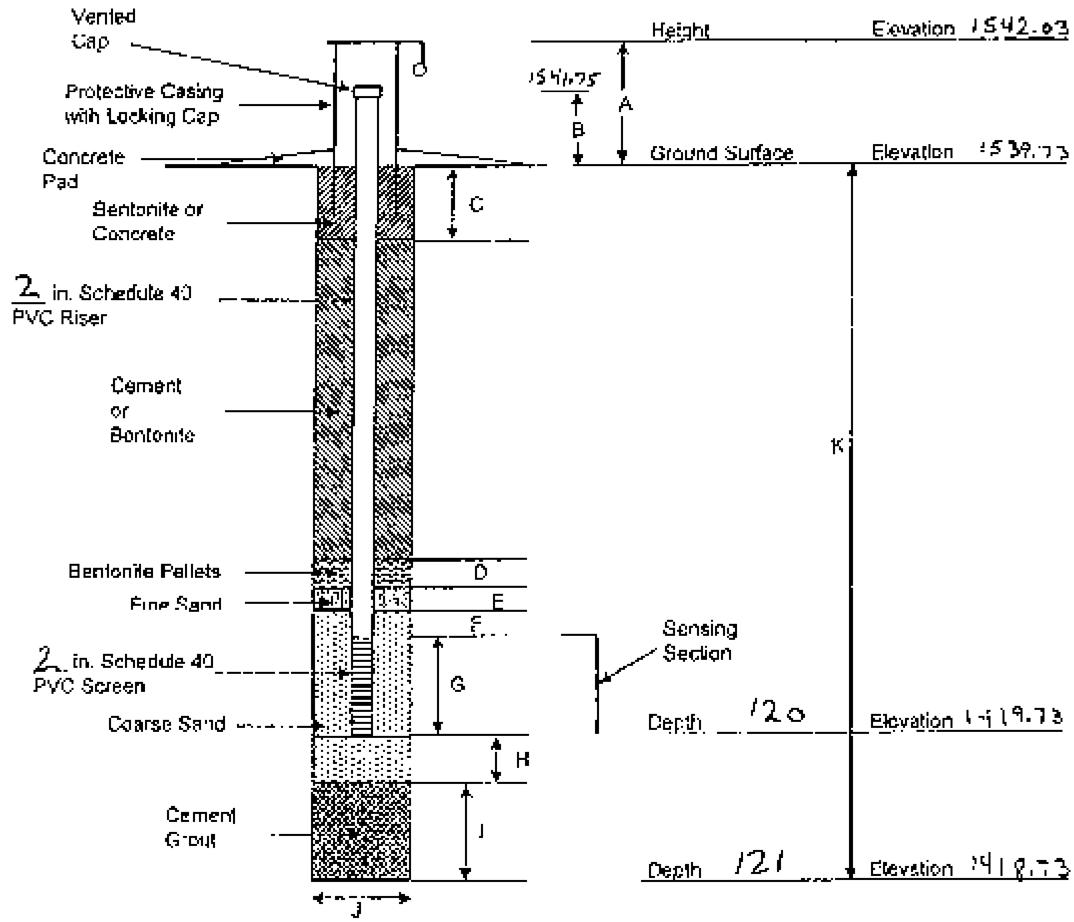
gai consultants

MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project A.E.P. : GLEN LYN   Project No C050540.20

Date 09AUG 2006   Engineer/Geologist DBS   Well No 06-GLLE-04

Drilling Company TERRA TESTING   Driller: BOB LAWRENCE



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.30	2.02	3.0	3.0	N/A	3.0
G	H	I	J	K	
10.0	~10	N/A	0.33	121.0	

Remarks $K > 1.228 \times 10^{-4}$ cm/sec

NOTE: BAILED 3.37 GALLONS WITH

NO DROP IN INITIAL WATERLEVEL

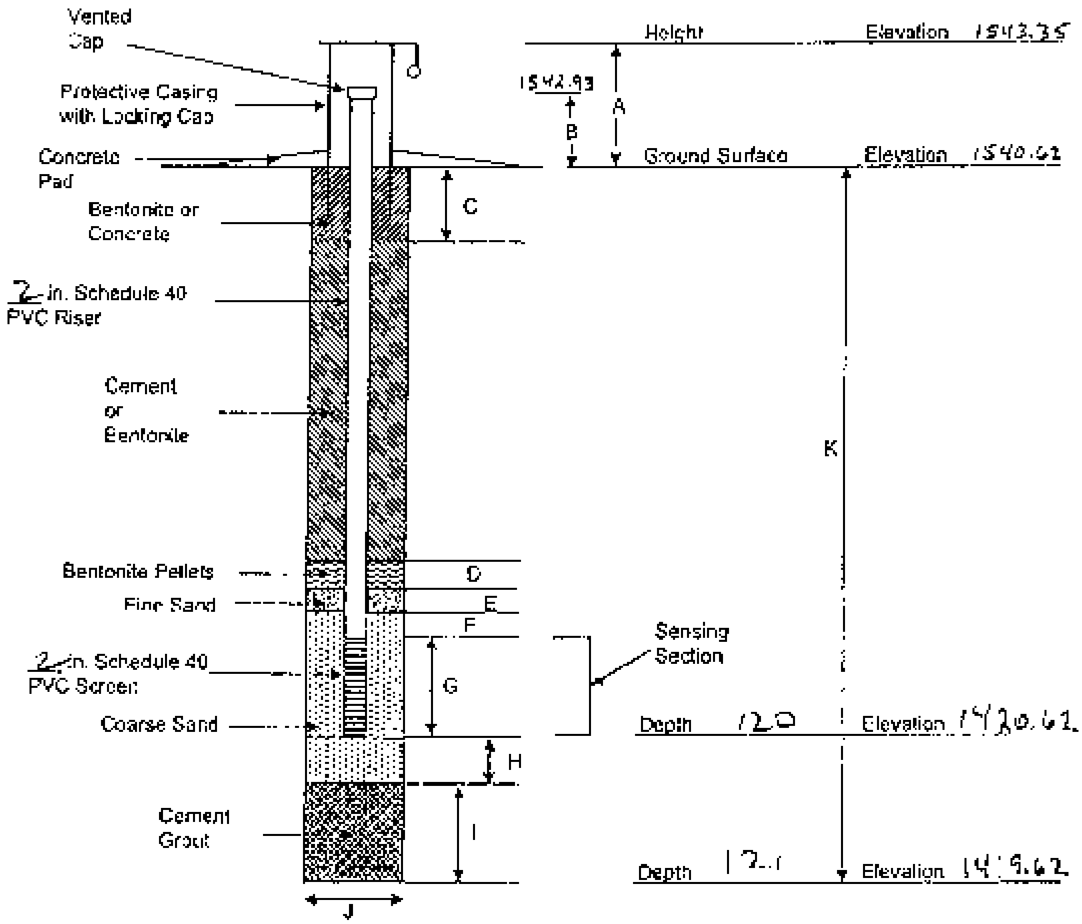
gai consultants

MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project A.E.P. GLEN LYN Project No C050540.20

Date 07AUG2006 Engineer/Geologist DBS Well No 06-GLLE-06

Drilling Company TERRA TESTING Driller: BOB LAWRENCE



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.73	2.31	3.0	3.0	N/A	3.0
G	H	I	J	K	
10.0	1.0	N/A	0.33	121	

Remarks $K = 1.228 \times 10^{-4}$ cm/sec.

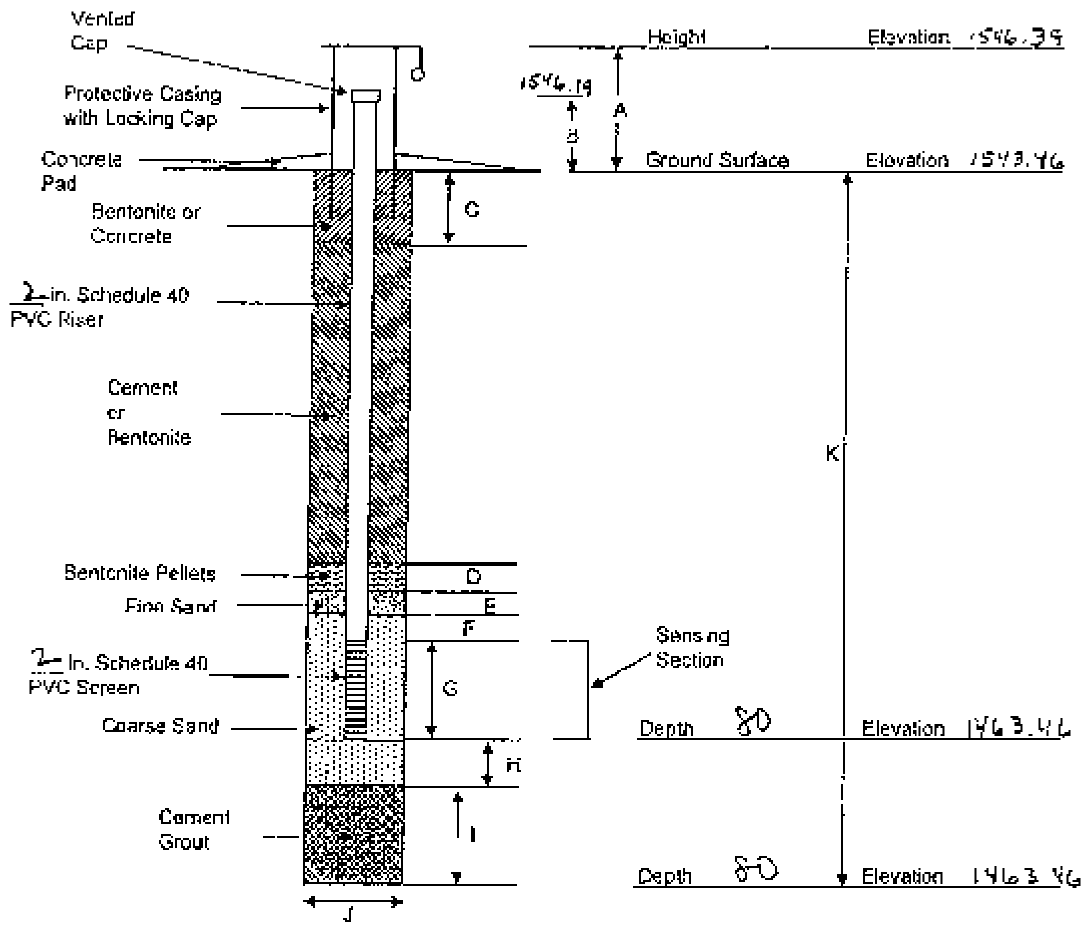
gai consultants

MONITORING WELL CONSTRUCTION DIAGRAM
(Not to Scale)

Project A.E.P. GLEN LYN Project No C050540.20

Date 20 JUL 2006 Engineer/Geologist DBS Well No 06-GLLE-08

Drilling Company TERRA TESTING Driller BOB LAWRENCE



STANDPIPE PIEZOMETER INSTALLATION SKETCH

DIMENSIONS (Feet)					
A	B	C	D	E	F
2.93	2.73	3.0	3.0	N/A	2.5
G	H	I	J	K	
10.0	N/A	N/A	0.33	80.0	

Remarks $K = 1.344 \times 10^{-6}$ cm/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).

Robert J Turka

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

gai consultants
transforming ideas into reality

* FOR INFORMATIONAL PURPOSES ONLY*

COMPANY	Appalachian Power Company	Appalachian Power Company
PLANT	Glen Lyn	Glen Lyn
ASH MANAGEMENT UNIT	Bottom Ash Pond	Fly Ash Pond
QUESTION 1		
Dam Hazard Rating	Low	Low
Who Established Rating	VA DCR	VA DCR
Basis for Rating	Health Hazard	Health Hazard
No Rating Assigned	N/A	N/A
QUESTION 2		
Year Commissioned	1963	1965
Year(s) Expanded	N/A	N/A
QUESTION 3 - Mark all that apply		
Fly Ash		X
Bottom Ash	X	
Boiler Slag		
Flue Gas Emission Control Residuals		
Other (Specify)		
QUESTION 4		
Designed by P.E.	Not Available	Not Available
Constructed under P.E. Supervision	Not Available	Not Available
Inspection/monitoring under P.E. Supervision	Yes	Yes
QUESTION 5		
Date of Last Company Safety Assessment	1/13/2009	1/13/2009
Describe Evaluator's Credentials	VA P.E.	VA P.E.
Describe Past Followup Corrective Actions	Routine maintenance	Routine maintenance
Describe Credentials of Corrective Action Implementers	Under plant supervision	Under plant supervision
Describe Planned Followup Actions	Routine maintenance	Routine maintenance
Date of Next Safety Assessment	2010	2010
QUESTION 6		
Date of Last Regulatory Safety Inspection	3/18/2008	3/18/2008
Agency Name	Va DCR	Va DCR
Date of Planned Regulatory Safety Inspection	N/A	N/A
Agency Name	N/A	N/A
Copy of Most Recent Regulatory Inspection Included	Yes	Yes
QUESTION 7		
Safety Issues from Regulatory Inspections w/in Past Year	None	None
Corrective Actions	N/A	N/A
Documentation Included	N/A	N/A
QUESTION 8		
Surface Area (acres)	5.1 acres - The bottom ash pond complex is a multi-pond system where other wastewaters are separately treated in contiguous cells. These pond complexes typically also include secondary (and in 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.	7.6 acres
Total Storage Capacity	90 acre-ft	185 acre-ft
Volume Currently Stored	Variable - ash is routinely removed for beneficial use	Unable to be determined in the time alloted to complete this survey
Date of Volume Measurement	N/A	N/A
Maximum Height (feet)	35	43
QUESTION 9		
Spills or Unpermitted Release History (10 Years)	No	No
QUESTION 10		
All legal owner(s) and operator(s)	Appalachian Power Company	Appalachian Power Company

"Thomas Roberts" <Thomas.Roberts@dcr.virginia.gov>

03/18/2008 05:38 PM

To <wrsmith@aep.com>

cc

bcc

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 http://www.dcr.virginia.gov

* FOR INFORMATIONAL PURPOSES ONLY*

AMERICAN ELECTRIC POWER

American Electric Power
1 Riverside Plaza
Columbus OH 43215 2373
www.aep.com

Thomas J. 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 Fly Ash Dike No. 1 (16701)
Clinch River Fly Ash Dike No. 2 (16702)
Glen Lyn Fly Ash Dam (07101)
Glen Lyn Bottom Ash Dam (07102)

Dear Mr. Roberts:

Enclosed please find the completed Annual Inspection Report forms the Clinch River facility, Ash Ponds 1A and 1B (Fly Ash Dike No 1), and the Glen Lyn 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
AEP Service Corp., Civil Engineering
wrsmith@aep.com

Attachments: 1. 2009 Annual Dam Inspection Report Clinch River Plant
2. 2009 Annual Dam Inspection Report Glen Lyn Plant

cc: L. Saunders – Clinch River (w/ Clinch River attachments)
J. Ryder – Glen Lyn (w/ Glen Lyn attachments)
P. J. Amaya – AEP Service Corp., Geotechnical Engineering (w/o attachments)
File

DCR
Virginia Department of Conservation & Recreation

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

Name of Dam: Fly ash pond
Inventory Number: 07101
Owner's Name: Glen Lyn Plant, Appalachian Power company
Location-County/City: Giles county
Contact Person (if different from above):
Owner's Address: 40 Franklin Road
Hazard Classification: Class III
Name of reservoir:
Purpose of reservoir: Settling pond
Telephone No.: (Residential) (Business) 800-956-4237
Other means of communication:

Owner's Engineer

Name of Engineering Firm and Engineer: **American Electric Power Service Corporation**
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

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**

c. Remedial work performed? **No remedial was previously recommended or required**

3 INTAKE STRUCTURE

a. Deterioration of concrete? **Structure does not normally impound any more than 3 feet of water which is 15**

b. Exposure of rebar reinforcement? **Feet or so below spillway crest.**

c. Is there a need to repair or replace the trash rack?

d. Any problems with debris?

e. Was the drawdown valve operated? **No applicable since it is a settling pond**

AEPGL000002

4. **ABUTMENT CONTACTS**
   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 mowed
   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. **OUTLET PIPE**
   a. Any water flowing outside of discharge pipe through the Impounding Structure? none
   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 or repairs? Not applicable
   b. Corrosion or 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:

12. INSTRUMENTS

a. List all instruments none

b. Any readings of instruments?

c. Any installation of new instruments?

13. DOWNSTREAM/HAZARD ISSUES

a. New development in downstream inundation zone? **No new development**

b. Note the maximum storm water discharge or peak elevation during the previous year **Not applicable – no discharge**

c. Was general maintenance performed on dam? If so, when? Yes, mowing was performed

d. List actions that need to be accomplished before the next inspection: **Continue mowing**

14. OVERALL EVALUATION OF IMPOUNDING STRUCTURE AND APPURTENANCES

(Check one) ☐ **EXCELLENT** ☒ **GOOD** ☐ **POOR**

General Comments:

Recommendations:

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

I hereby certify that the information provided in this report has been examined by me and found to be true and correct in my professional judgment

Signed: ______________ Professional Engineer's Signature ______________ Print Name ______________ Virginia Number: ______________

This ______________ day of ______________ , 20 ____ .

Engineer's Virginia Seal:

CERTIFICATION BY OWNER

I hereby certify that the information provided in this report has been examined by me

Signed: ______________ Owner's Signature BRAD JONES Print Name

This 23 day of Feb , 20 09 .

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

DCR
Virginia Department of Conservation & Recreation
State Parks • Soil & Water Conservation • Natural Heritage
Chesapeake Bay Local Assistance • Land Conservation
Outdoor Recreation Planning • Dam Safety & Floodplains

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

Name of Dam: Bottom ash pond
Inventory Number: 07102
Owner's Name: Glen Lyn Plant, Appalachian Power company
Location-County/City: Giles county
Contact Person (if different from above):
Owner's Address: 40 Franklin Road
Hazard Classification: Class III
Name of reservoir:
Purpose of reservoir: Settling pond
Telephone No.: (Residential) (Business) 800-956-4237
Other means of communication:

Owner's Engineer

Name of Engineering Firm and Engineer: **American Electric Power Service Corporation**
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

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**
c. Remedial work performed? **No remedial was previously recommended or required**

3. INTAKE STRUCTURE

a. Deterioration of concrete? **Concrete of discharge tower was OK and no deterioration observed.**
b. Exposure of rebar reinforcement? **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 debris? **None – this is an upground reservoir**
e. Was the drawdown valve operated? **No applicable since it is a settling pond**

4. **ABUTMENT CONTACTS**
   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 mowed**
   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. **OUTLET PIPE**
   a. Any water flowing outside of discharge pipe through the Impounding Structure? **none**
   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 or repairs? **Not applicable**
    b. Corrosion or 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:

12. INSTRUMENTS

a. List all instruments none

b. Any readings of instruments?

c. Any installation of new instruments?

13. DOWNSTREAM/HAZARD ISSUES

a. New development in downstream inundation zone? **No new development**

b. Note the maximum storm water discharge or peak elevation during the previous year **Not applicable – no discharge**

c. Was general maintenance performed on dam? If so, when? Yes, mowing was performed

d. List actions that need to be accomplished before the next inspection: **Continue mowing**

14. OVERALL EVALUATION OF IMPOUNDING STRUCTURE AND APPURTENANCES

(Check one) [ ] **EXCELLENT** [X] **GOOD** [ ] **POOR**

General Comments:

Recommendations:

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

I hereby certify that the information provided in this report has been examined by me and found to be true and correct in my professional judgment

Signed: ______________________________ ____________________ Virginia Number: ____________
Professional Engineer's Signature Print Name

This __________ day of ______________, 20 ____

Engineer's Virginia Seal:

CERTIFICATION BY OWNER

I hereby certify that the information provided in this report has been examined by me

Signed: Brad Jones ______________ Brad Jones
Owner's Signature Print Name

This 23 day of Feb, 20 09

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

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

GERS - 09-015

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 Gary F. Zych **DATE** 12-8-2009
Gary F. Zych, P.E.

REVIEWED BY **DATE** 12/10/2009
Behrad Zand

APPROVED BY Pedro J. Amaya **DATE** 12-15-2009
Pedro J. Amaya, P.E. No. 036174
Manager – Geotechnical Engineering

QA/QC DOCUMENT NO.
GERS - 09 - 045

COMMONWEALTH OF VIRGINIA
PEDRO JOSE A YA-TRUJILLO
NO. 0 174
PROFESSIONAL ENGINEER

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

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 (Photo 1).
2. The North Bottom Ash Pond was inactive. It was completely drained and all bottom ash was excavated. Cohesive fill was recently placed on a portion of the bottom and interior slopes. (Photo 2)

3. 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 Pond 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)

5. 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).

7. 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 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. (Photo 7)

9. 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 NPDES Outfall 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.

3. 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 was moist to wet. The previous inspection noted the area as dry. There was no visual seepage 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.

7. The top of dike road was in good condition with no evidence of significant dike settlement or misalignment.

8. 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 Name	Pond Elev. Ft. 28Oct2009	Pond Elev. Ft. 13Jan2009	Pond Elev. Ft. 30Oct 2007	Pond Elev. Ft. 1Nov 2005	Pond Elev. Ft. 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

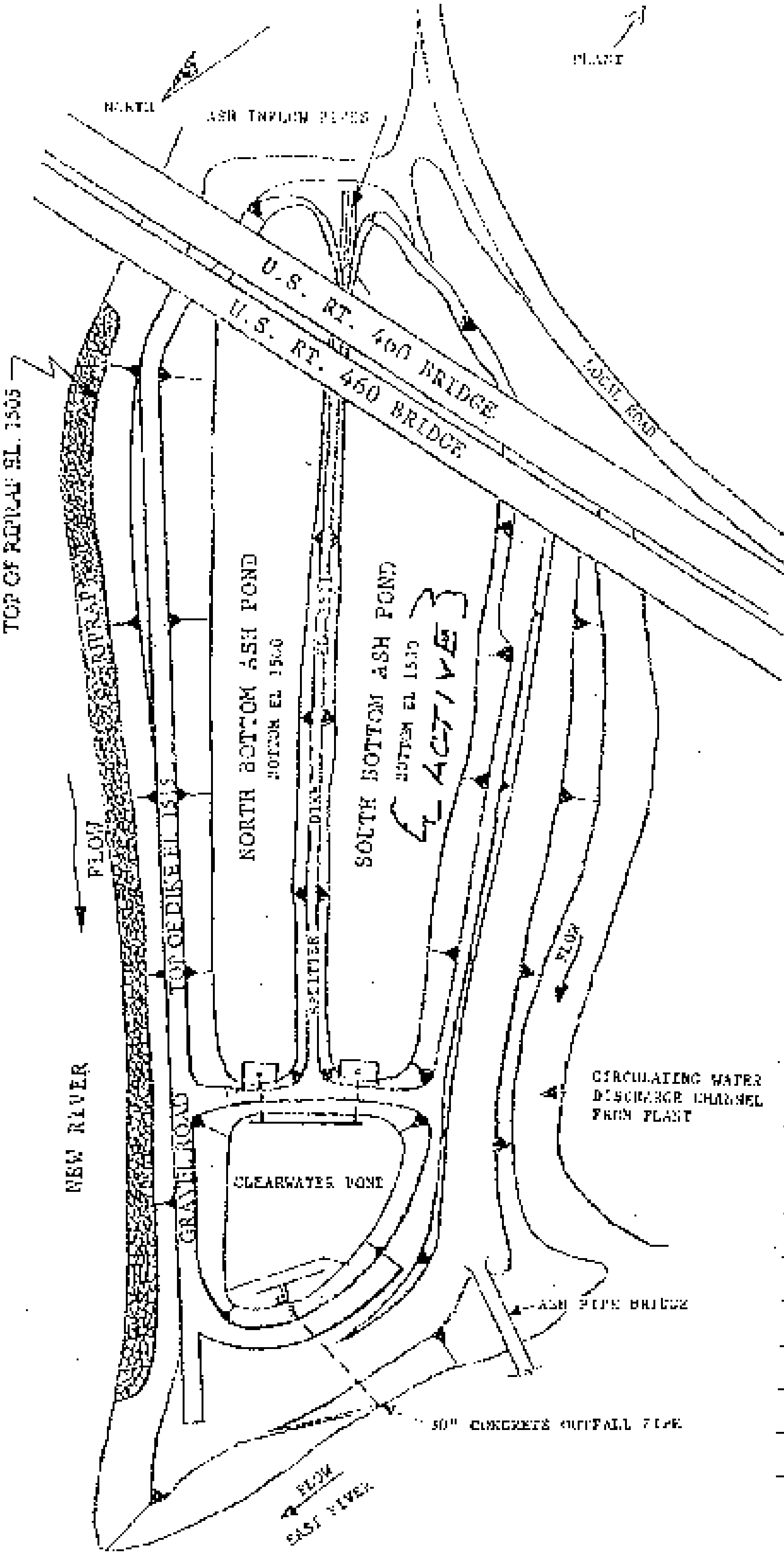


FIGURE 1

Date: DCT 28, 2009
Weather: CLOUDY, MILD

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

NO ITEMS TO NOTE.
SEE COMMENTS IN
THE REPORT.

SLOPE LINE

V's POINT
DOWN SLOPE

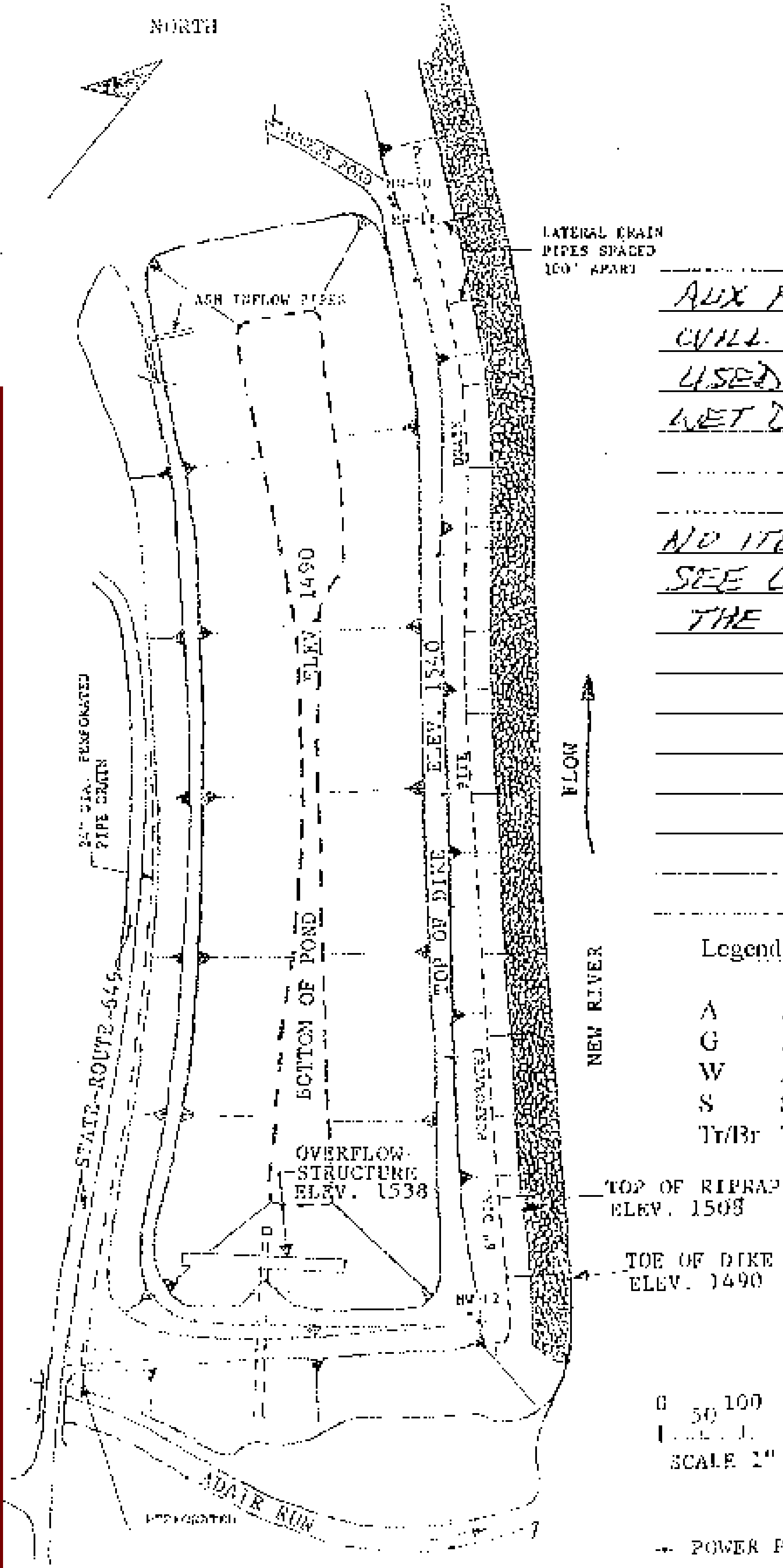
0 50 100 200 300

APPROXIMATE SCALE 1"=167 FT.

GLEN LYN PLANT: BOTTOM ASH POND
INSPECTION LOCATION PLAN

FIGURE 2

Date: OCT 28, 2009
Weather: CLOUDY, MILD



AUX FLY ASH DAM
WILL NO LONGER BE
USED FOR EMERGENCY
WET DISPOSAL.

NO ITEMS TO NOTE.
SEE COMMENTS IN
THE REPORT.

Legend

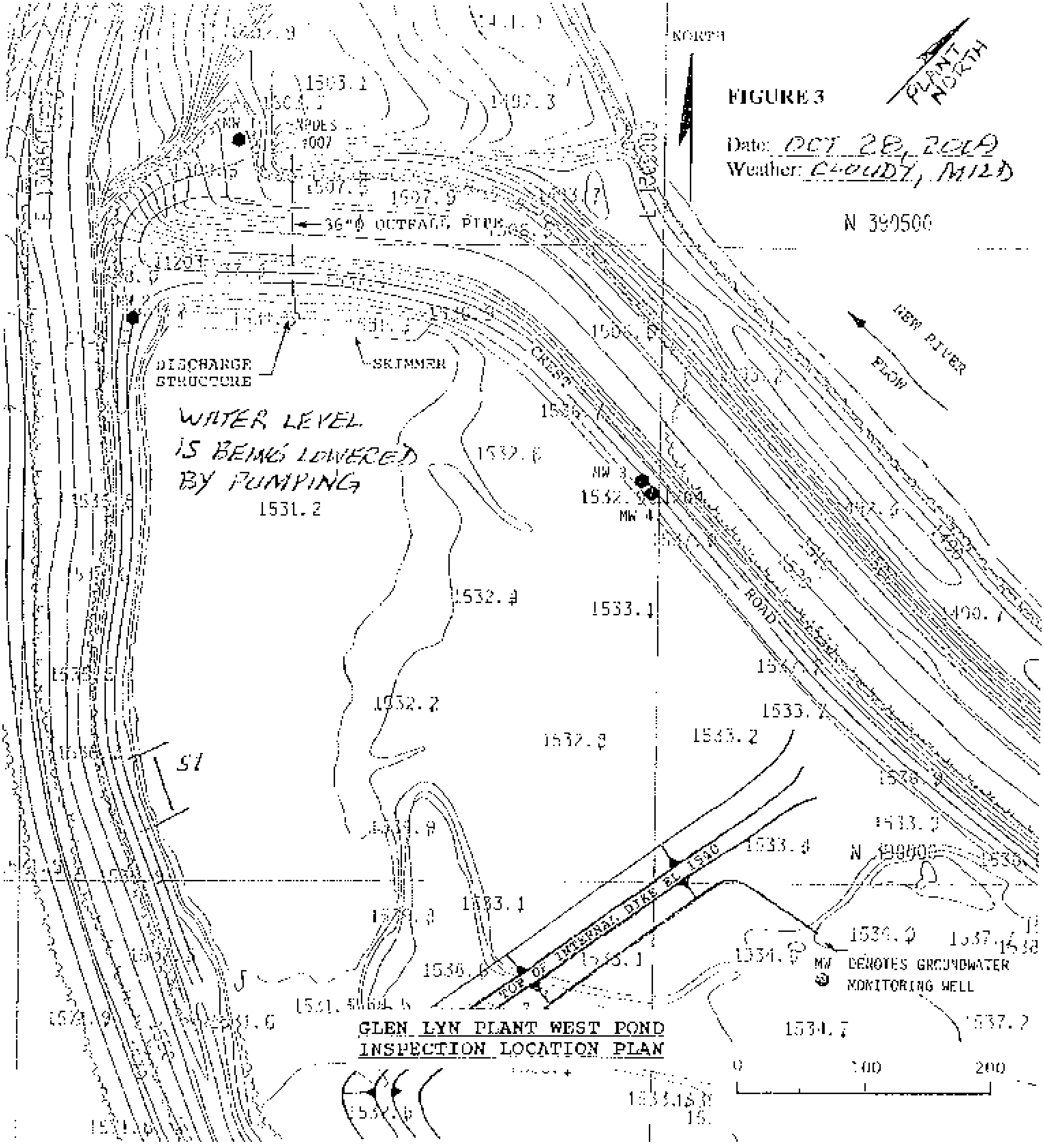
A Animal Hole
G Erosion Gully
W Area of Wetness or Seepage
S Slide Area
Tr/Br Trees & Brush

0 50 100 200 300
SCALE 1" = 200 FT

SLOPE LINE
V's POINT DOWN SLOPE

POWER POLE
MONITORING WELL
MW-00

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN



S1- SLIDE OF INTERIOR SLOPE 15YD LONG - (BEING REPAIRED BY PLANT).

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

APPENDIX A: BOTTOM ASH POND COMPLEX PHOTOGRAPHS

Photo #1 – Active south pond

Photo #2 – Inactive north pond; interior slopes

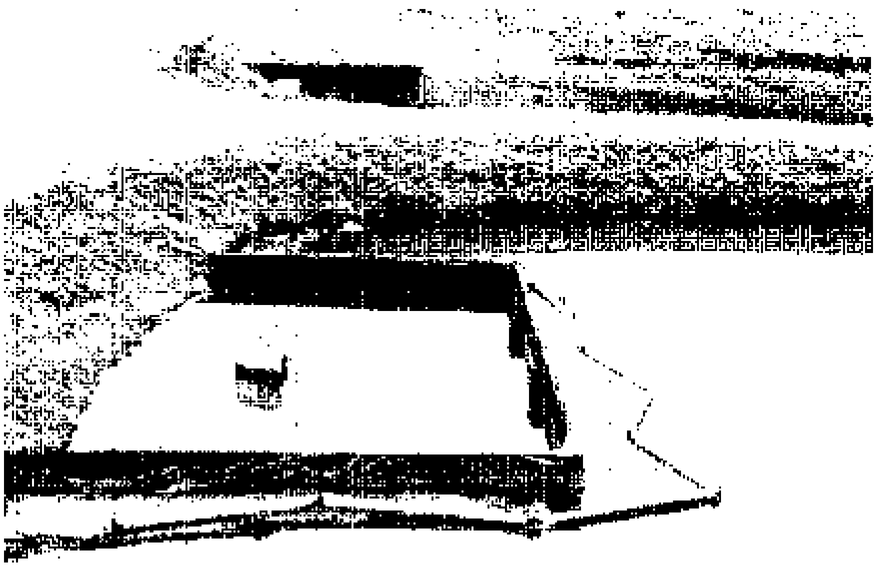


Photo #3 – South pond discharge structure

Photo #4 – Exterior dike of South pond

Photo #9 –Exterior slope of North dike

Photo #10 – Exterior slope of North dike

Photo #11 – Exterior slope of North dike

APPENDIX B: AUXILIARY FLY ASH POND PHOTOGRAPHS

Photo #1 – North dike, looking east

Photo #2 --East dike, looking north

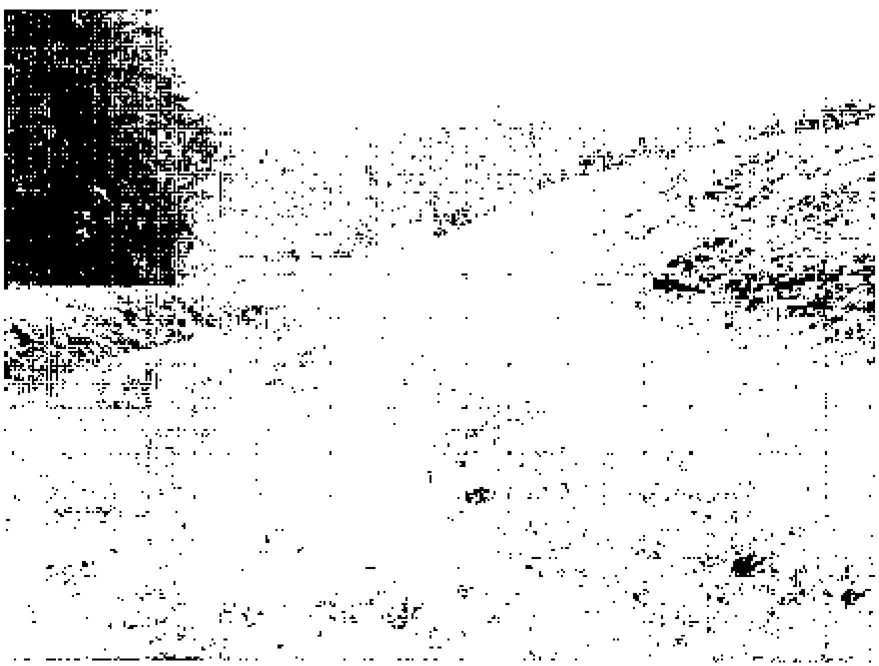


Photo #3 – Exterior slope of south dike, looking west

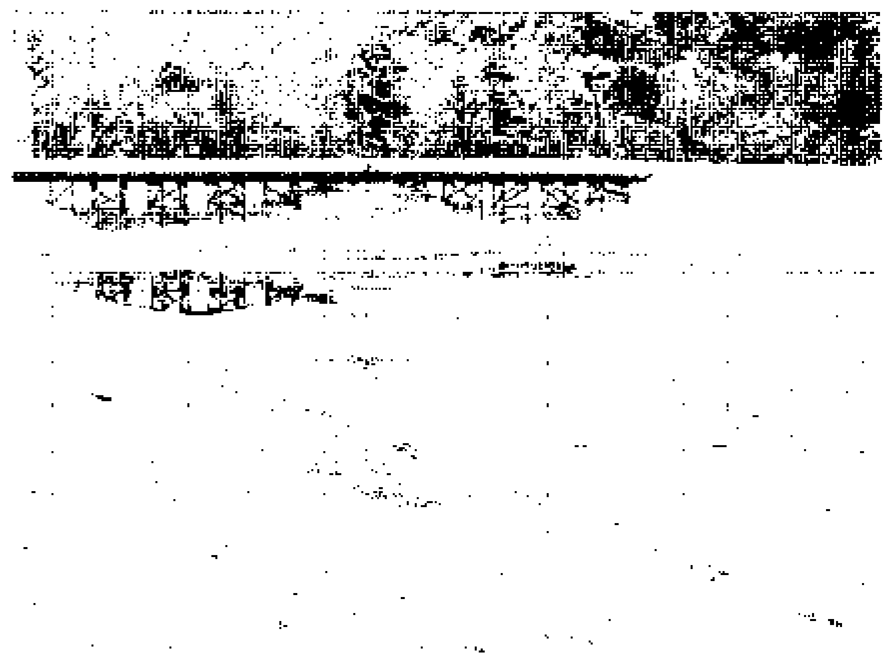


Photo #4 – Interior of Aux fly ash pond

US EPA ARCHIVE DOCUMENT

APPENDIX C: WEST POND PHOTOGRAPHS

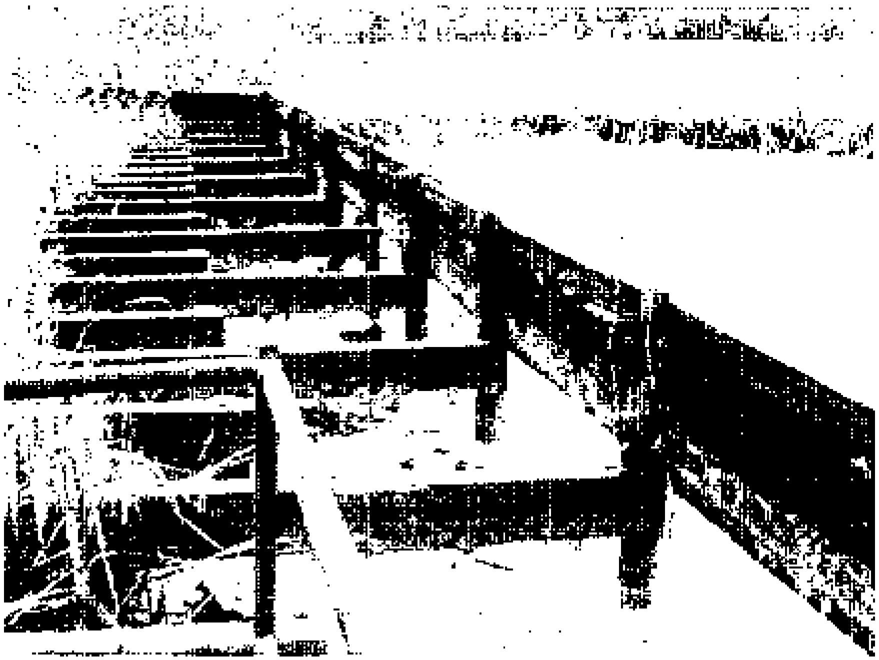


Photo #1 – Skimmer structure/water level

Photo #2 – Exterior slope main dke

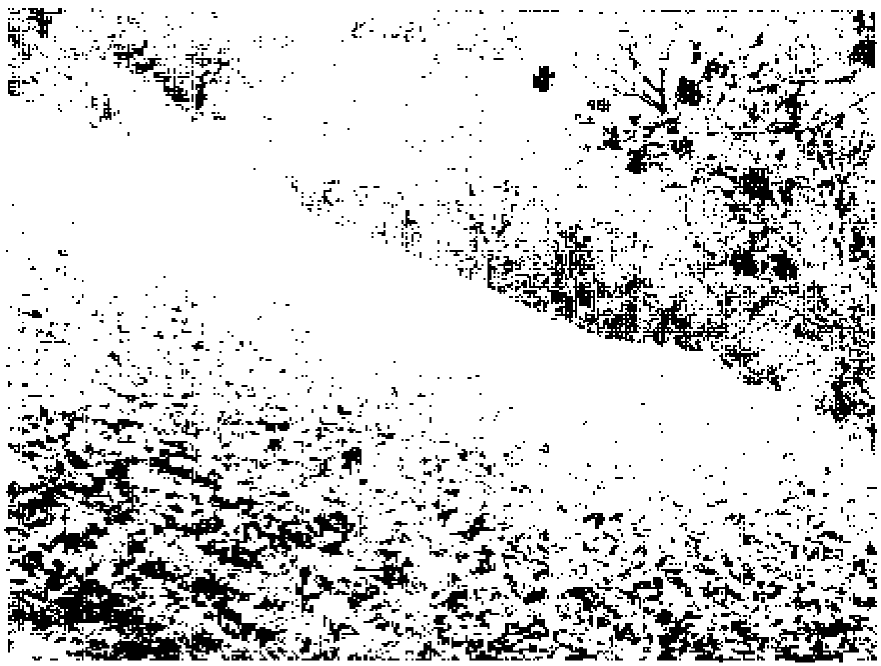


Photo #3 – Exterior slope of main dike

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 Gary F. Zych, P.E. **DATE**

REVIEWED BY Behrad Zand, P.E. **DATE** 12/6/2010

APPROVED BY Pedro Amaya, P.E.
Director, Civil Engineering **DATE** 12/7/2010

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

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 Satisfactory:	A condition or activity that generally meets what is minimally 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 North Bottom Ash Pond was the active pond for receiving ash sluice water and other waste water streams. (Photo 1).

2. The South Bottom Ash Pond was inactive. It was completely drained and all bottom ash was excavated. (Photo 2)

3. 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 Pond 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)

5. 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 seepage from around the outside of the pipe. (Photo 7)

9. The inlet structure and distribution pipe at the Clearwater Pond was in good condition.

10. The dike roads are in good condition. There is no rutting along the surface.

11. 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 8)

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

1. 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)

3. 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 erosion 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 rodent holes or erosion gullies.

7. 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.

8. 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.

9. The interior slopes of all three dikes appeared stable and well vegetated. The slopes had a stand of tall grass. (Photo 3)

<u>**West Pond**</u> (refer to Figure 3)

1. 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 NPDES 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.

3. 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)

6. The drainage ditch along the exterior slope of the western road dike was unobstructed and protected from erosion with riprap.

7. The top of dike road was in good condition with no evidence of significant dike settlement or misalignment.

8. 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 Name	Pond Elev. Ft. 18Nov2010	Pond Elev. Ft. 22Oct2009	Pond Elev. Ft. 13Jan2009	Pond Elev. Ft. 30Oct 2007	Pond Elev. Ft. 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
Aux FAP	dry	1515	~1511	1510	1513
New River	1493.1				

The water level in the New River was based on the USGS gage data. 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 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 Pond

Overall, the earthen embankments forming the Auxiliary 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

1. Continue routine maintenance items as necessary.

Auxiliary Pond

1. 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).

FIGURES

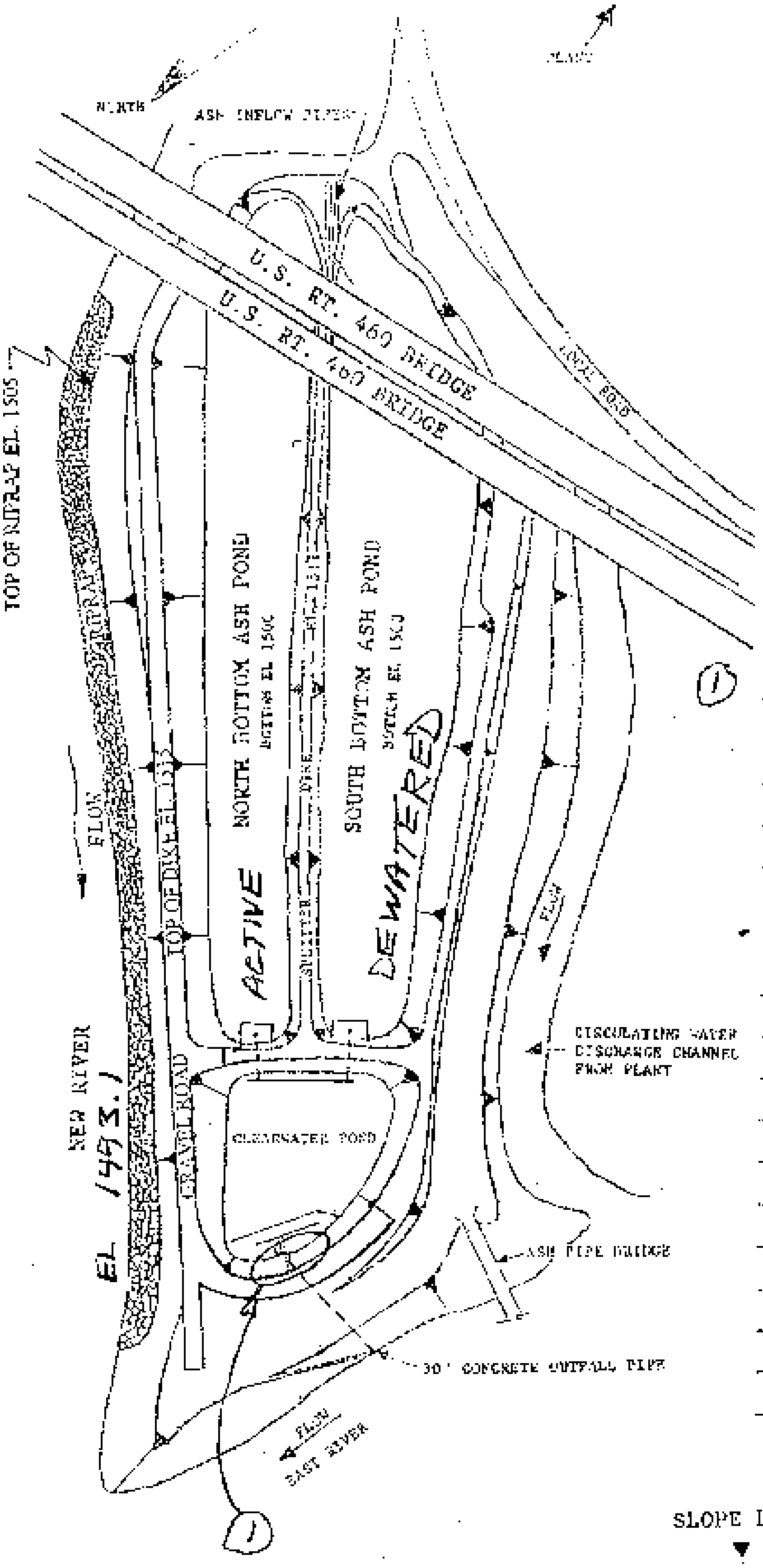


FIGURE 1

Date: 11/18/2010
Weather: CLOUDY - 40°F

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

(1) INTERIOR SLOPES HAVE BEEN SLIGHTLY ERODED AT WATER LEVEL AND HAVE STEEPEND OVER THE YEARS.

- NO OTHER CONDITIONS TO REPORT

SLOPE LINE ▼

V's POINT DOWN SLOPE

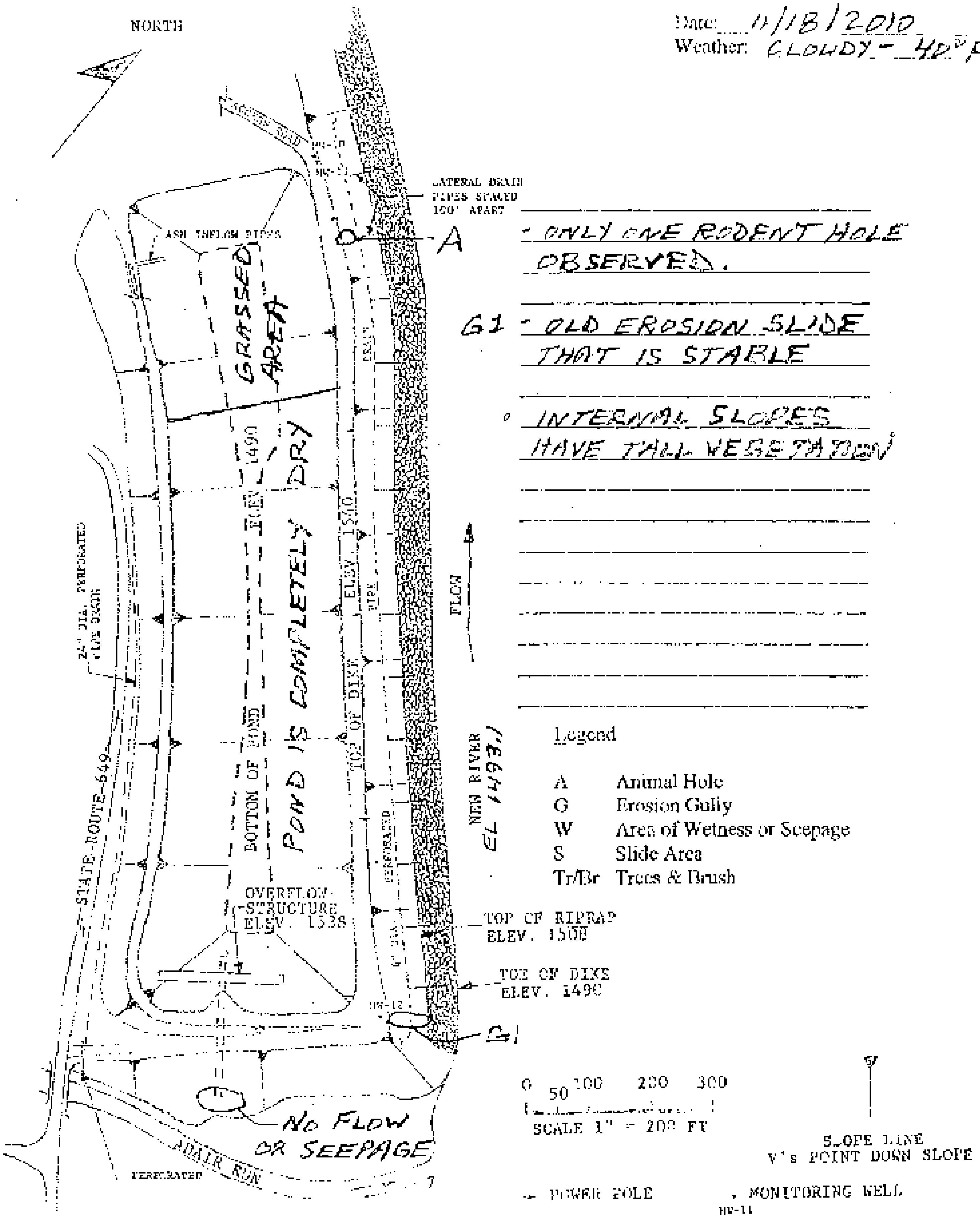
0 50 100 200 300

APPROXIMATE SCALE 1"=167 FT.

GLEN LYN PLANT: BOTTOM ASH POND
INSPECTION LOCATION PLAN

FIGURE 2

Date: 11/18/2010
Weather: CLOWDY - 40° F



A - ONLY ONE RODENT HOLE OBSERVED.

G1 - OLD EROSION SLIDE THAT IS STABLE

° INTERNAL SLOPES HAVE TALL VEGETATION

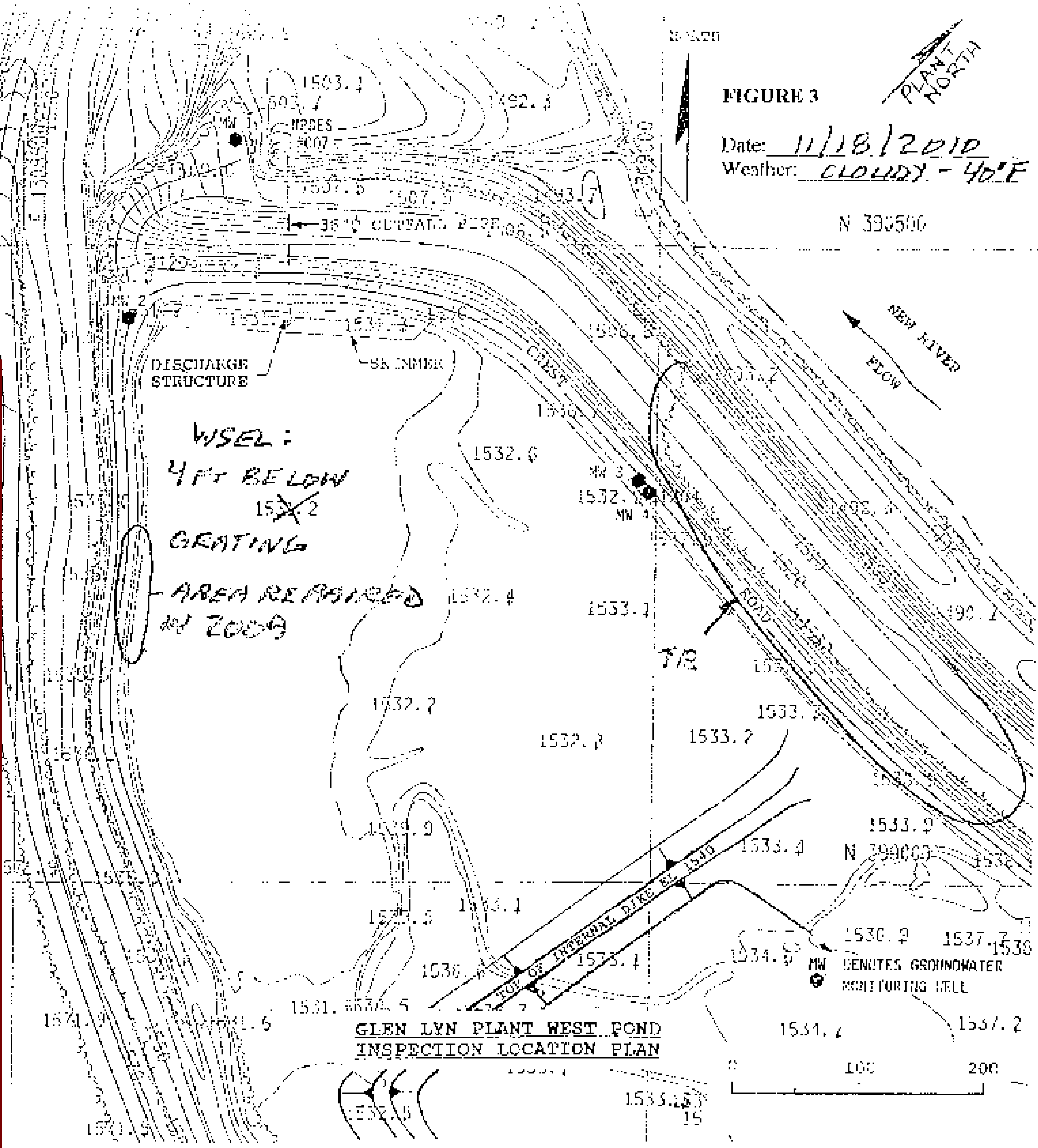
Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

GLEN LYN PLANT: AUXILIARY FLY ASH POND INSPECTION LOCATION PLAN

FIGURE 3

Date: 11/18/2010
Weather: CLOUDY - 40°F



GLEN LYN PLANT WEST POND INSPECTION LOCATION PLAN

Legend

A	Animal Hole
G	Erosion Gully
W	Area of Wetness or Seepage
S	Slide Area
Tr/Br	Trees & Brush

TR- ALL TREES ALONG THIS SECTION OF BERM WERE REMOVED IN 2009

APPENDIX A: BOTTOM ASH POND PHOTOGRAPHS

Photo # 1

North pond - active.

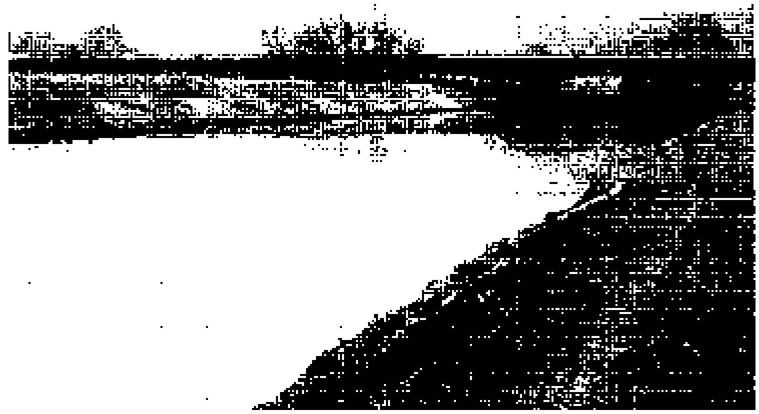


Photo # 2

South pond - dewatered.

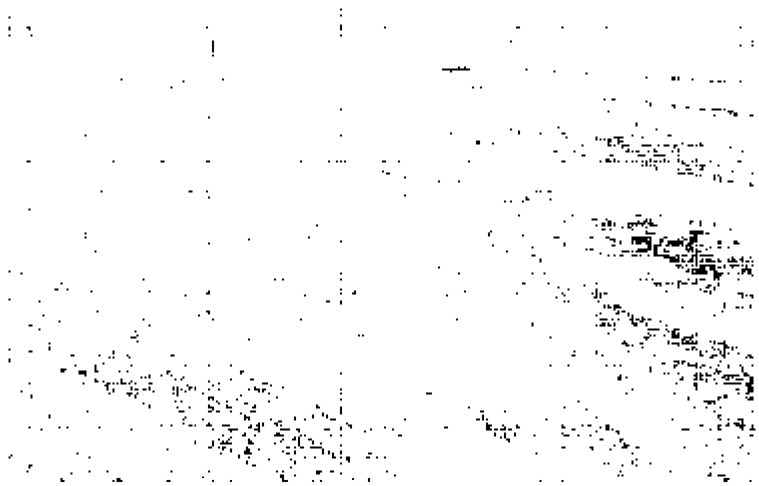


Photo # 3

Discharge structure from North pond to Clearwater pond.

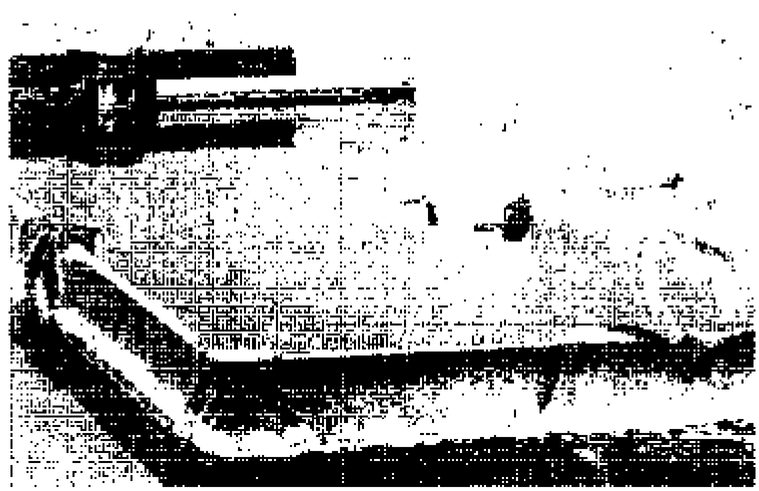


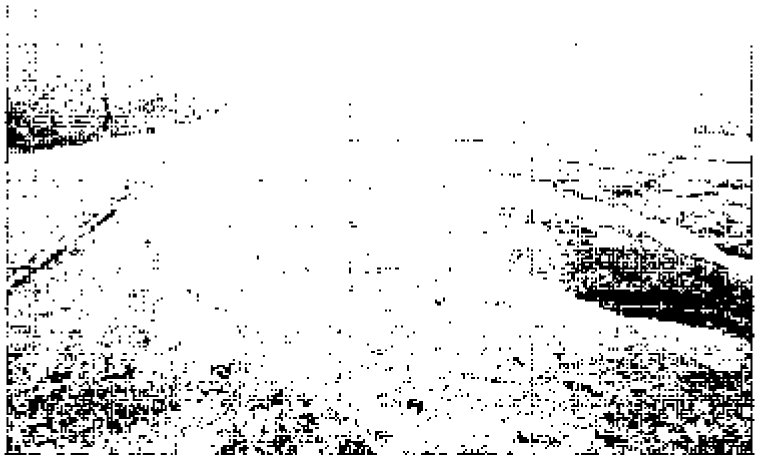
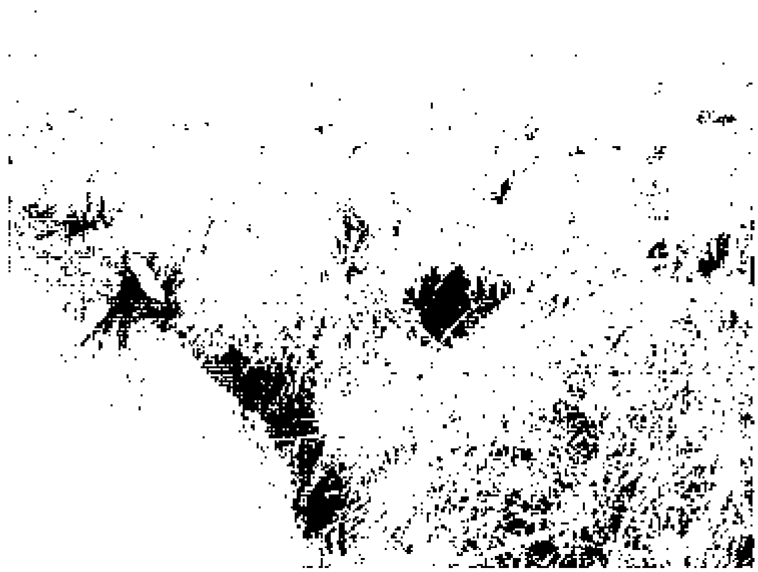
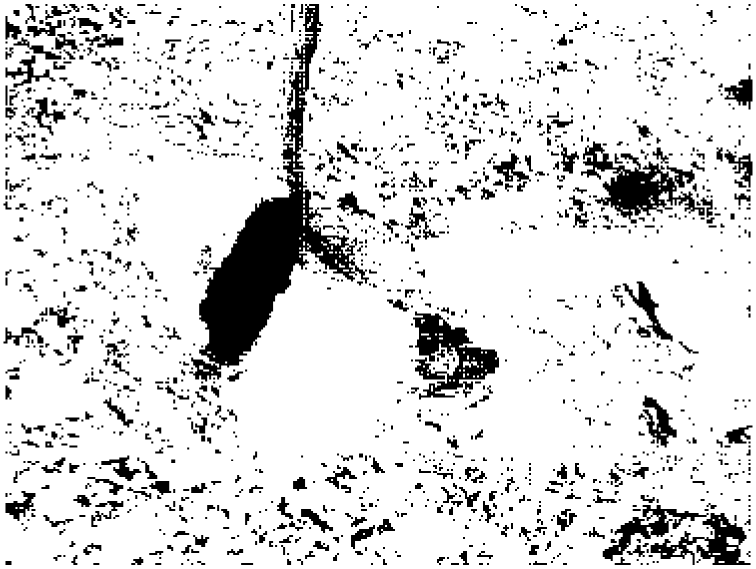
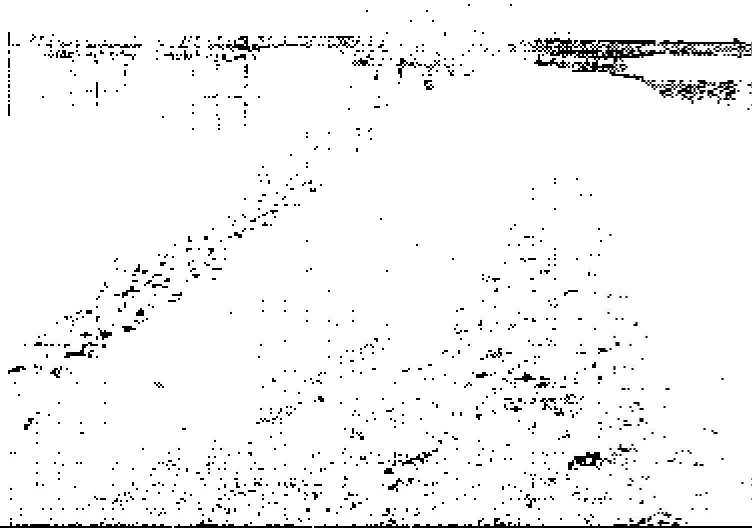
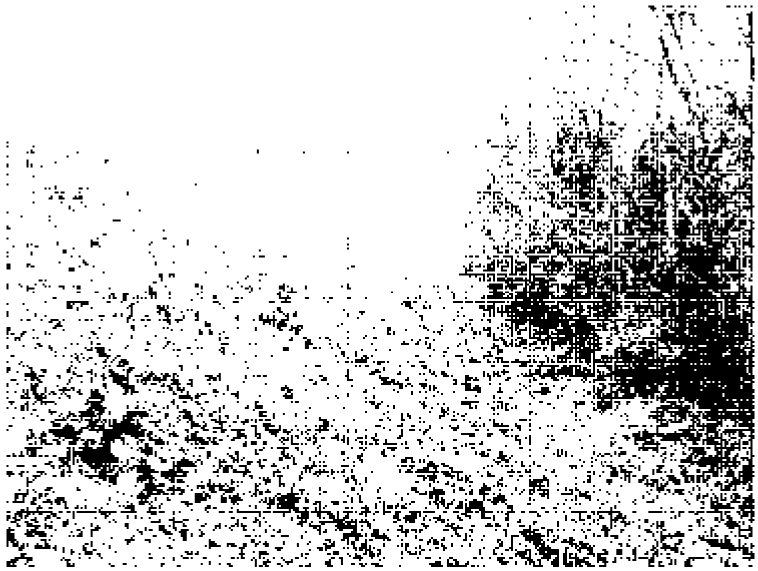
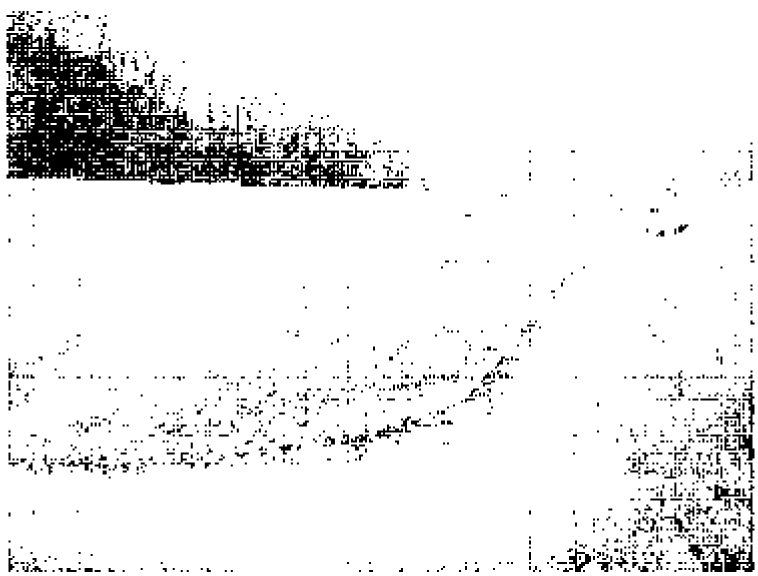
Photo # 4 Exterior slope of South pond dike along the discharge canal.	
Photo # 5 Interior slopes of Clearwater Pond and distribution pipe	
Photo # 6 Steep internal slopes of Clearwater Pond near the outlet structure.	

Photo # 7 Discharge from Clearwater Pond into the East River.	
Photo # 8 Exterior slope of North bottom ash pond along the New River.	

APPENDIX B: AUXILIARY FLY ASH POND PHOTOGRAPHS

Photo # 1 Overview of Aux fly ash pond. Pond is dry with some area of exposed fly ash.	
Photo # 2 Exterior slope along the New River	
Photo # 3 Interior slopes.	

APPENDIX C: WEST POND PHOTOGRAPHS

Photo # 1

Pond outlet structure, skimmer and low water level.

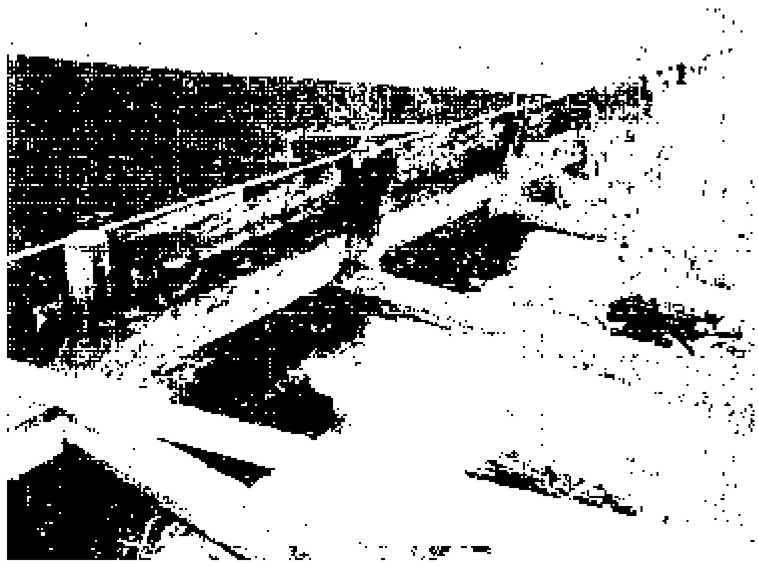


Photo # 2

Exterior slope of dike, looking east.

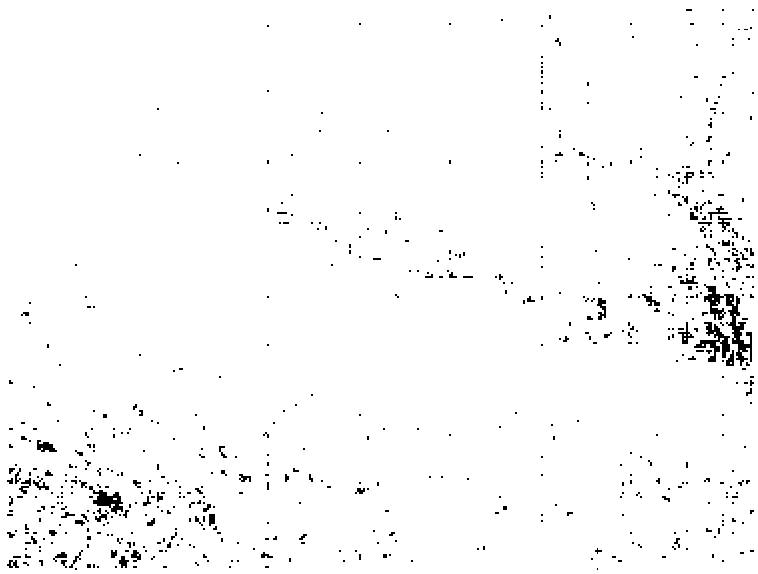


Photo # 3

Exterior slope of dike, looking west.

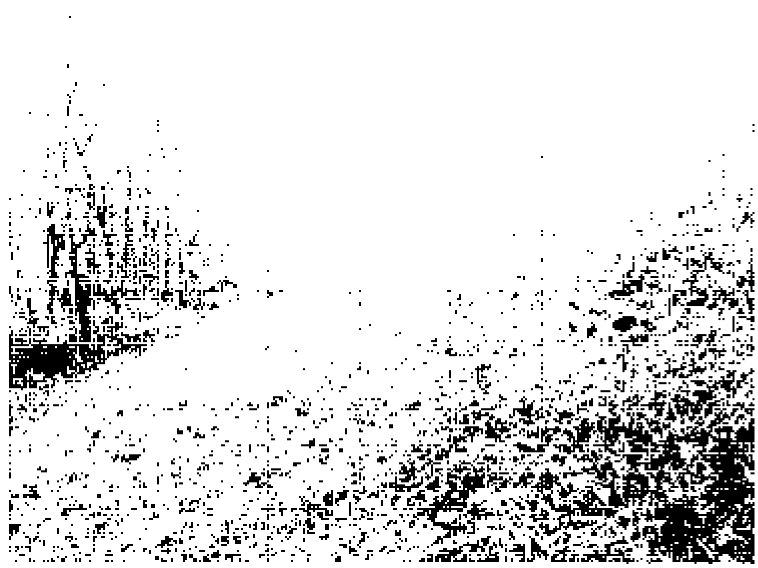
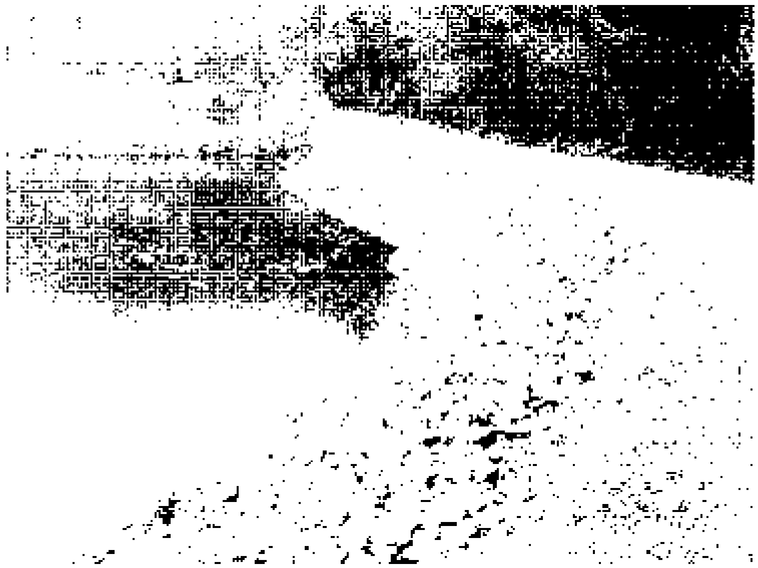
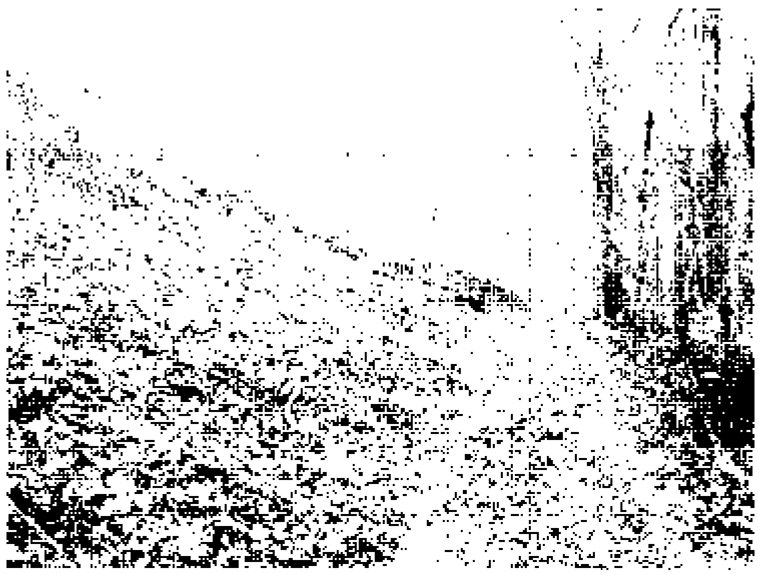
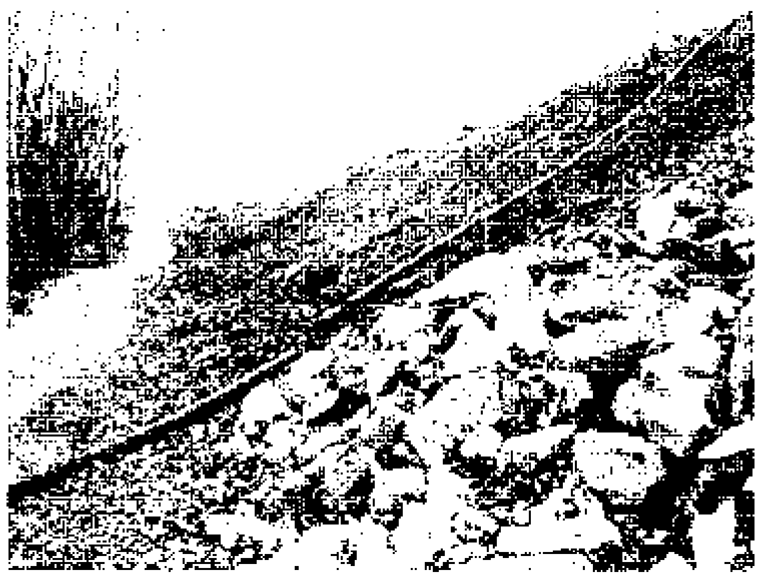
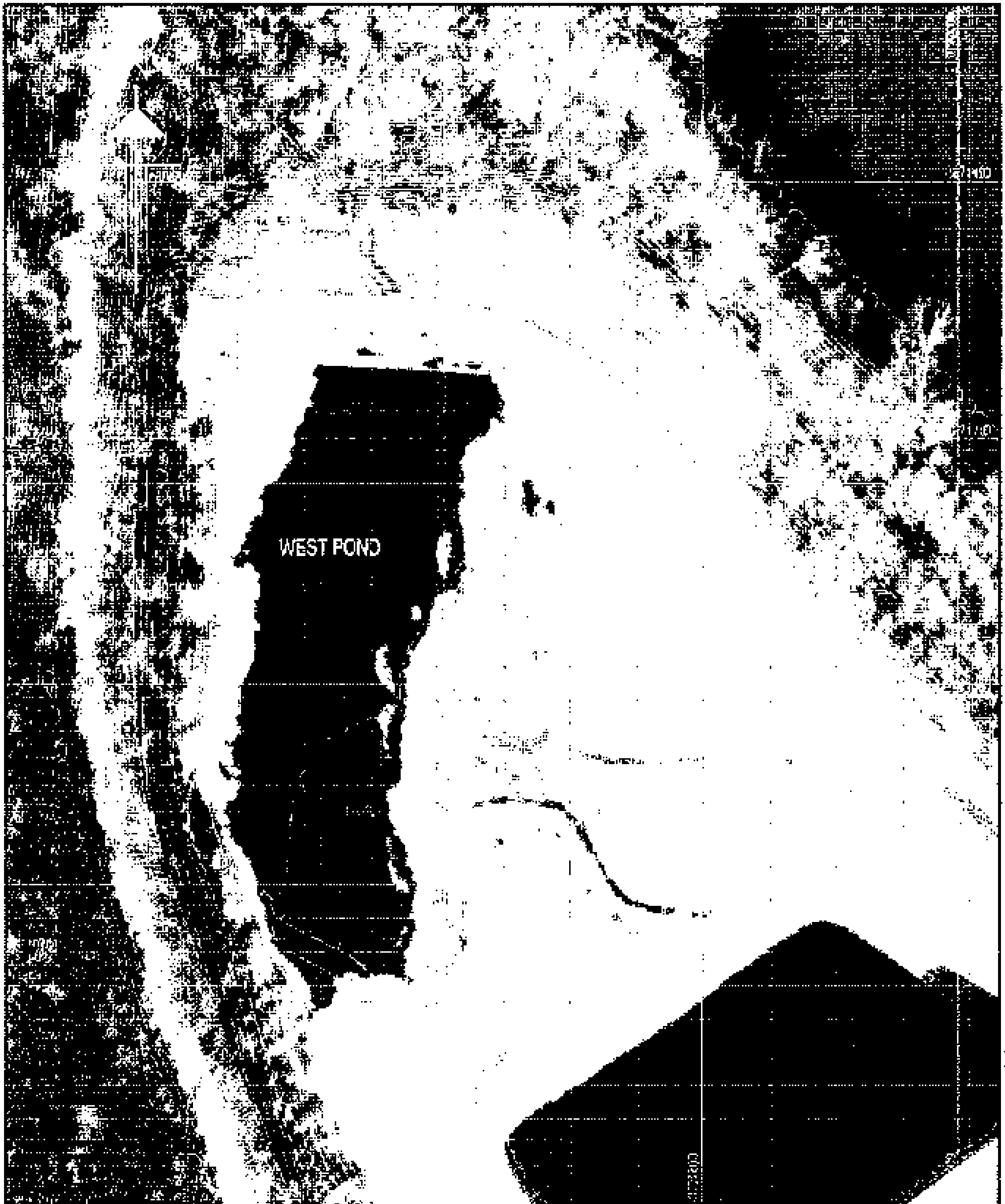
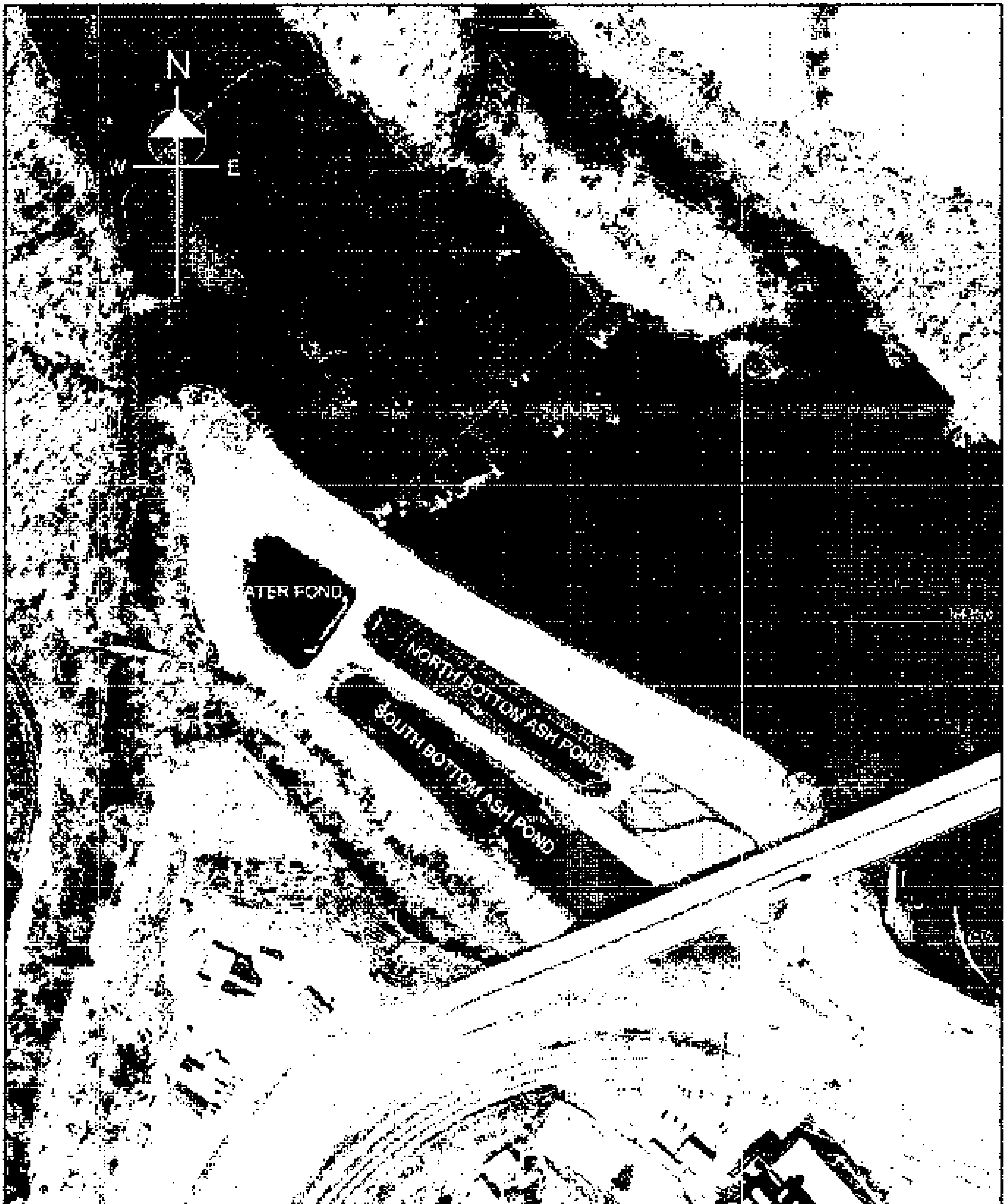


Photo # 4 Interior slope showing the 2009 repaired area.	
Photo # 5 Exterior slope of berm for the ash landfill. Berm was cleared in 2009	
Photo # 6 Exterior slope of berm for the ash landfill. Berm was cleared in 2009	



	GLEN LYN POWER STATION	DWG NO: FIGURE 2	
	SHEET 2 of 4	AMERICAN ELECTRIC POWER	AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215
	WEST POND		

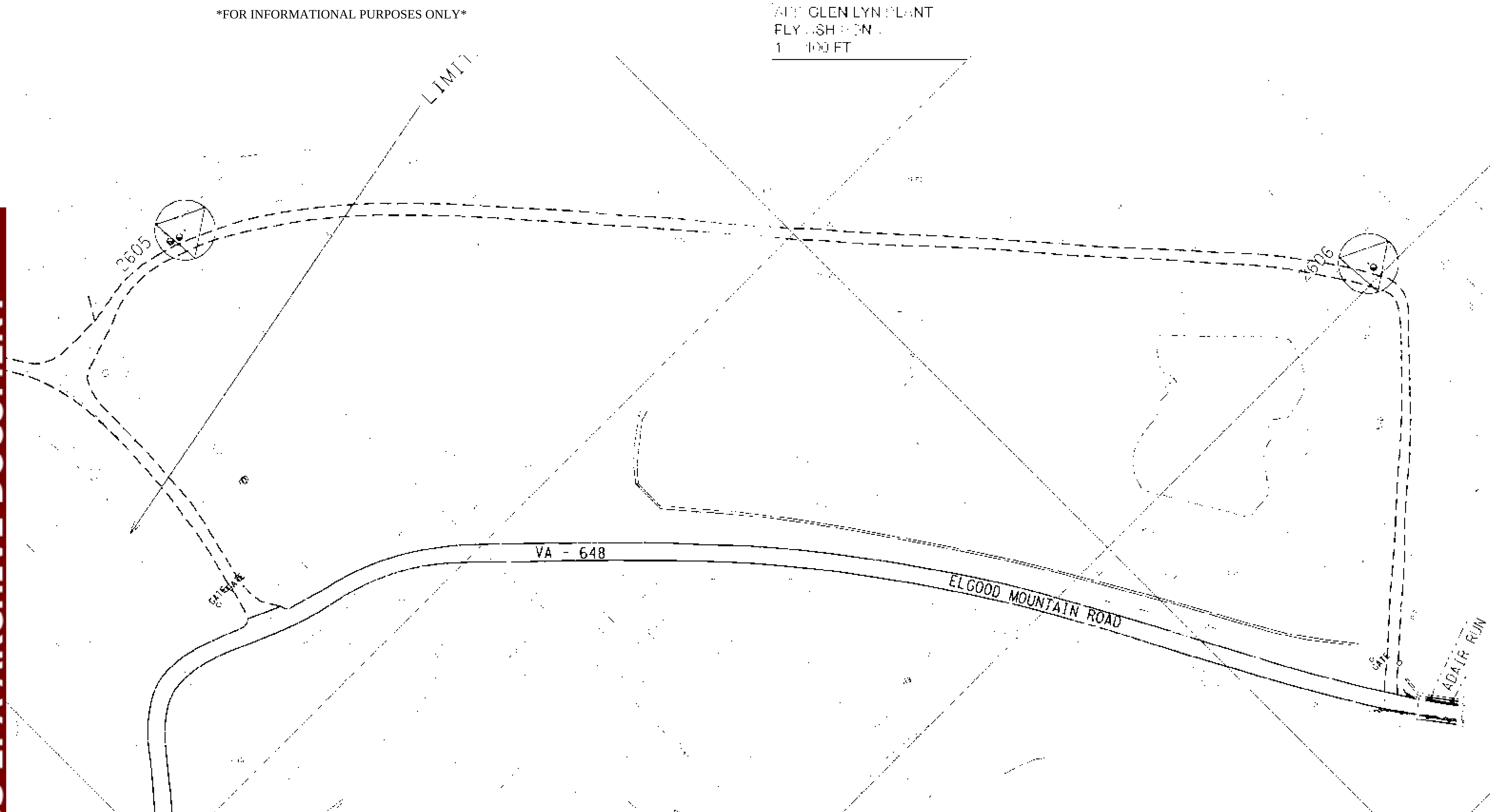
	GLEN LYN POWER STATION SHEET 3 of 4 AUXILIARY FLY ASH POND	DWG NO: FIGURE 3	
		AMERICAN ELECTRIC POWER	AEP SERVICE CORP. 1 RIVERSIDE PLAZA COLUMBUS, OH 43215



	GLEN LYN POWER STATION	DWG NO: FIGURE 4	
	SHEET 4 of 4	AMERICAN ELECTRIC POWER	AEP SERVICE CORP 1 RIVERSIDE PLAZA COLUMBUS, OH 43215
	BOTTOM ASH COMPLEX		

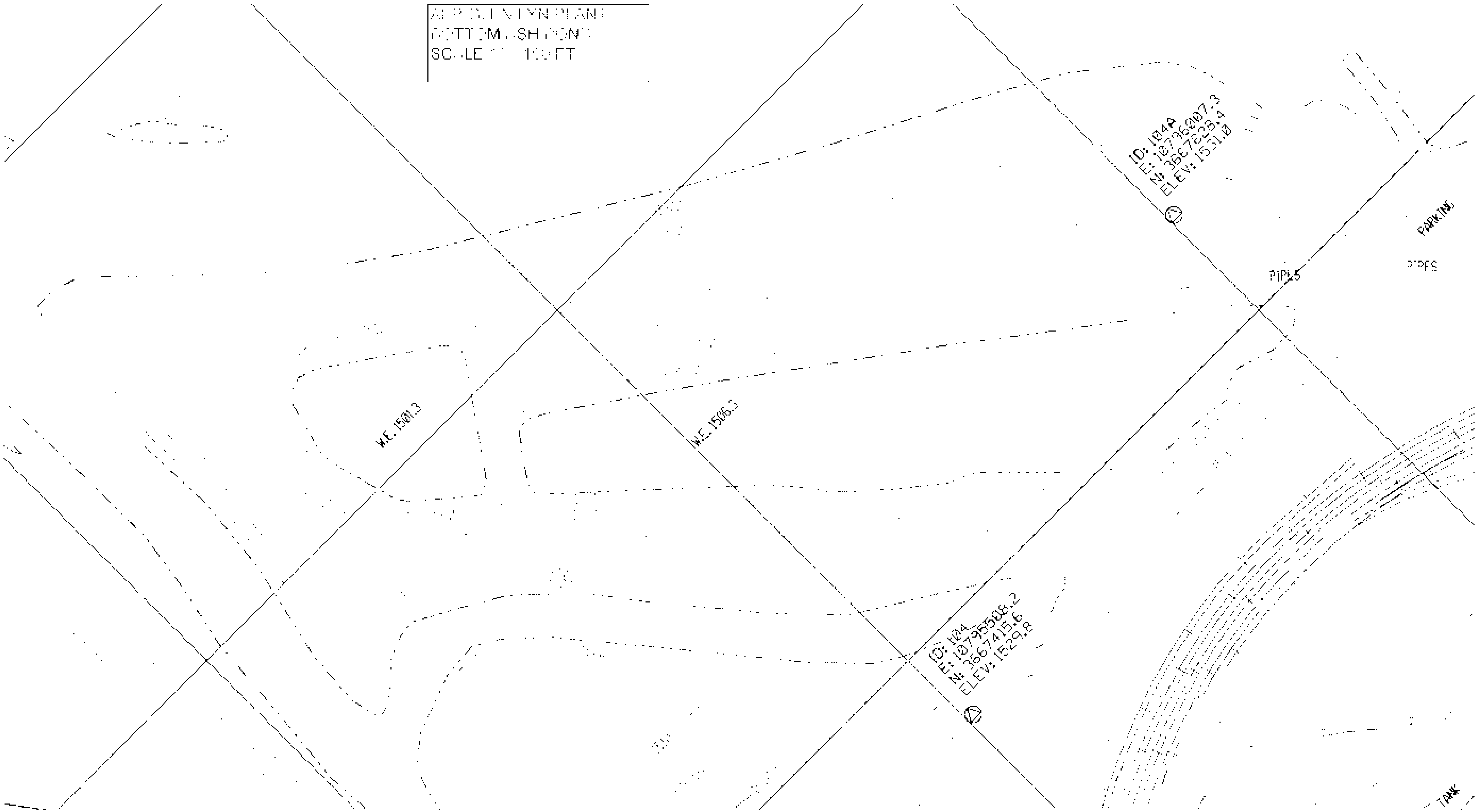
DOCUMENT 13: GLEN LYN PLANT AERIAL SURVEY, AUXILIARY FLY ASH POND

FOR INFORMATIONAL PURPOSES ONLY



DOCUMENT 14: GLEN LYN PLANT AERIAL SURVEY, BOTTOM ASH POND

FOR INFORMATIONAL PURPOSES ONLY



STABILITY ASSESSMENT REPORT

BOTTOM ASH POND

GLEN LYN POWER STATION
GLEN LYN, VA

PREPARED BY Behrad Zand, Engineer **Date** 03/16/2011

REVIEWED BY Gary F. Zych, Section Manager, Geotechnical Engineering **Date** 3/16/2011

APPROVED BY Pedro J. Amaya, P.E. Director, Civil Engineering **Date**

QA/QC DOCUMENT NO.
GERS-11-006

COMMONWEALTH OF VIRGINIA
PEDRO JOSE AMAYA
NO. 0...

PROFESSIONAL ENGINEER

SEAL & SIGNATURE

(This Page Intentionally Left Blank)

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 inactive. 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 1515 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

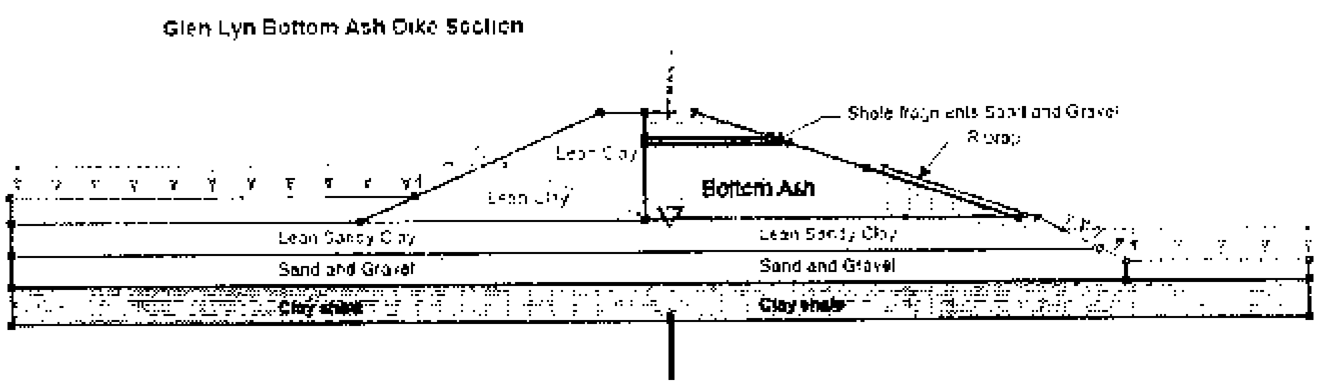


Figure 1. Idealized dike section

AEPGL000280

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

Table 1. Material properties

Stability Analysis

Stability factors of safety for the outboard and inboard 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 0.12*g* 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 hazard 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	Calculated Safety Factor	Location of the critical failure surface
Downstream	Steady-state seepage, drained	1.73	Outboard slope near toe El 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 seepage, 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

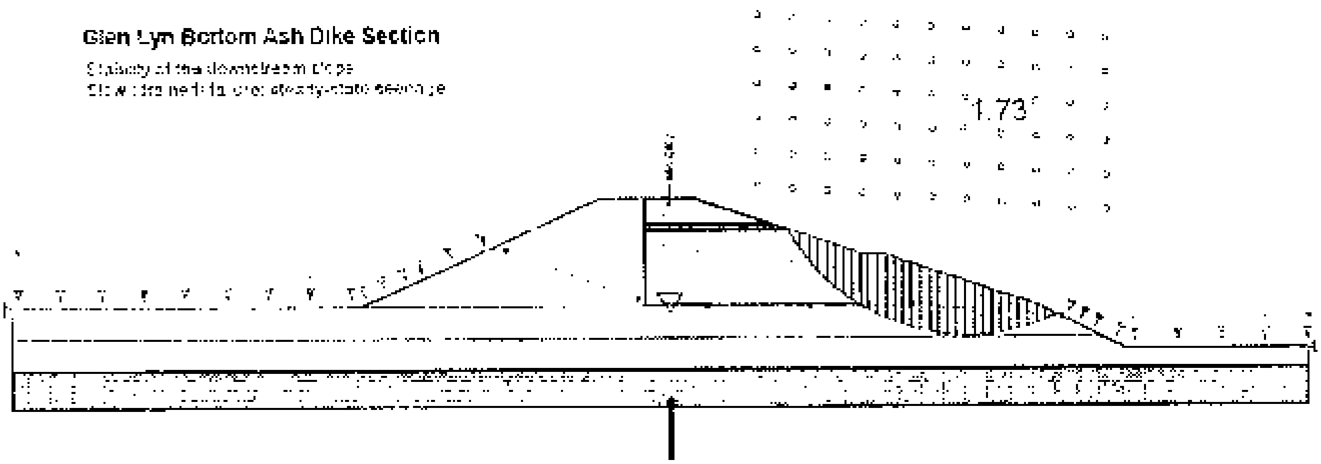


Figure 2. Stability analysis of the outboard slope under steady-state condition.

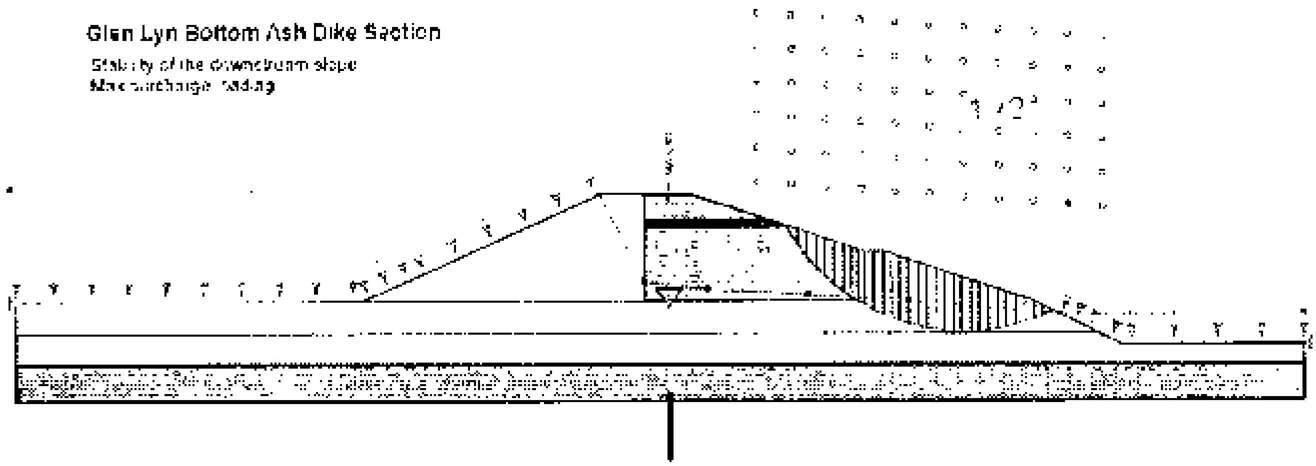


Figure 3. Stability analysis of the outboard slope under maximum surcharge pool level

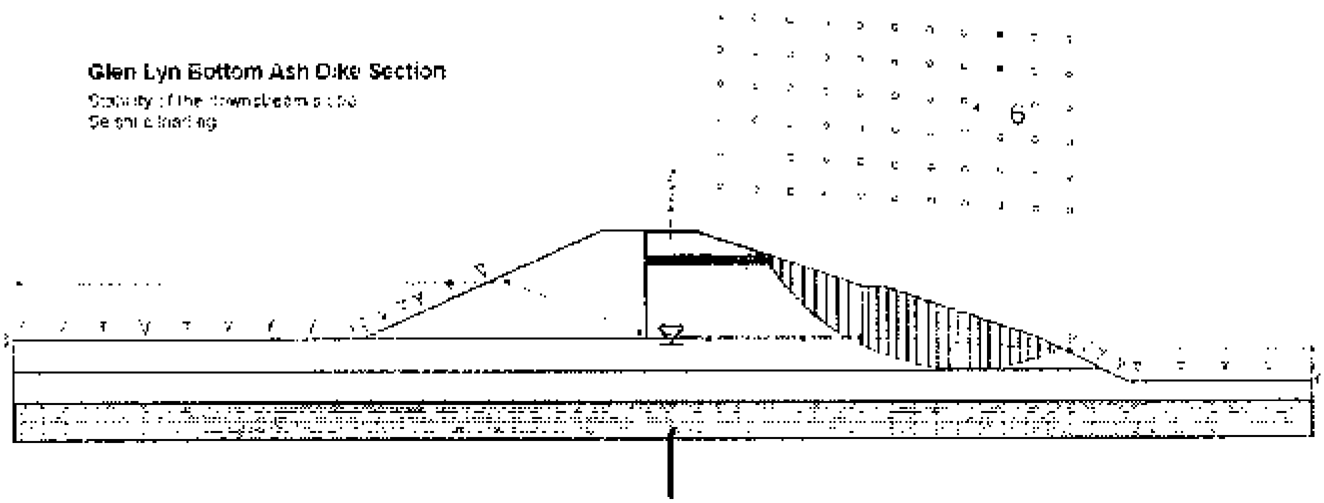


Figure 4. Stability analysis of the outboard slope under seismic loading

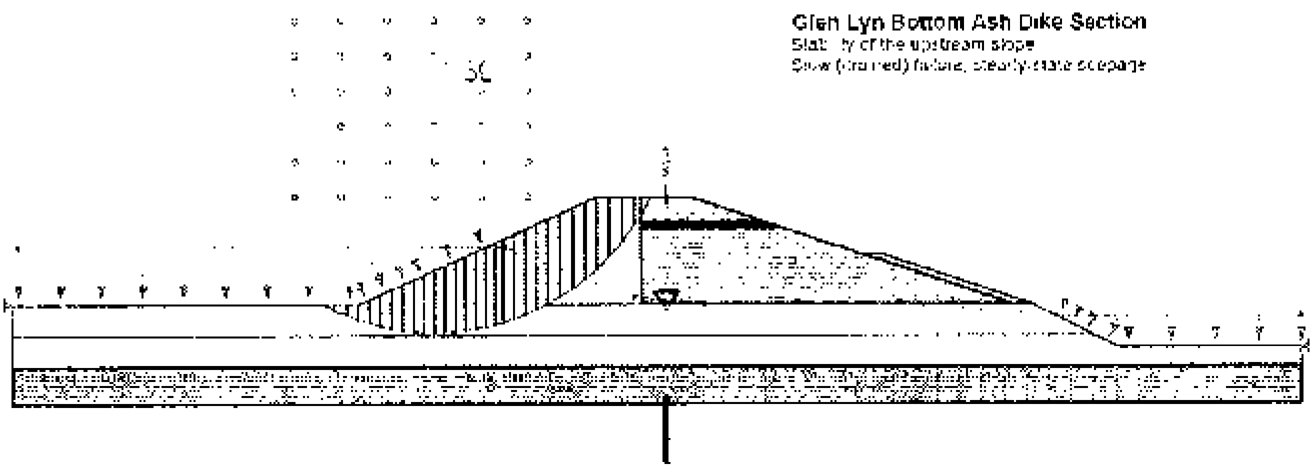


Figure 5. Stability analysis of the inboard slope under steady-state condition.

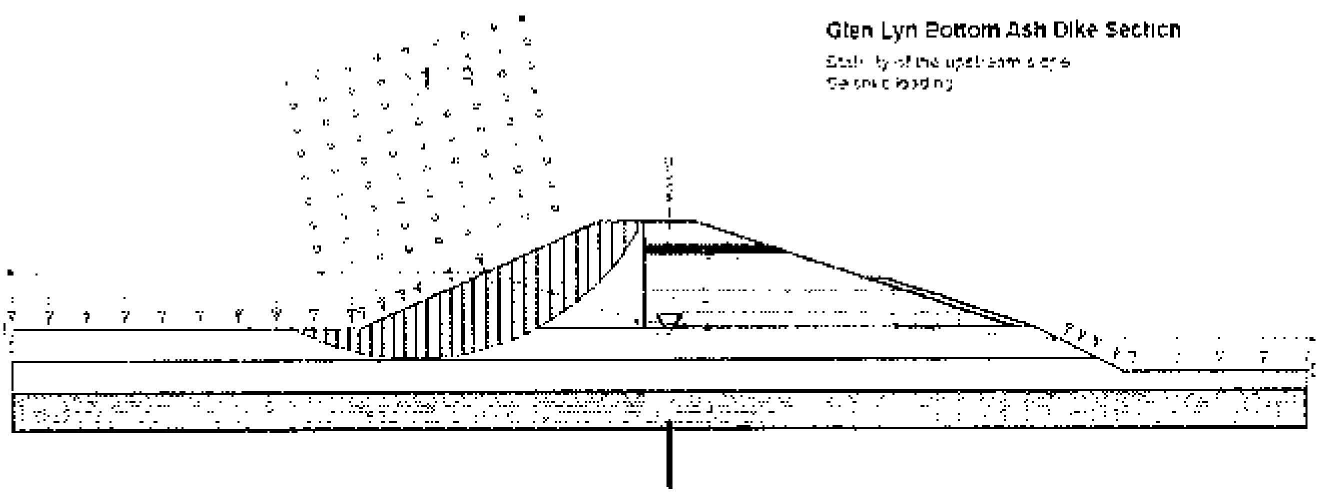


Figure 6. Stability analysis of the inboard slope under seismic loading

GFZ

NAVFAC DM-7.2
MAY 1982

APPROVED FOR PUBLIC RELEASE

FOUNDATIONS AND EARTH STRUCTURES

DESIGN MANUAL 7.2

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
200 STOVALL STREET
ALEXANDRIA, VA. 22332

TABLE 1

Typical Properties of Compacted Soils

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression: At 1.4 tsf (20 psi) — Percent of Original Height	Typical Value of Compression: At 3.6 tsf (50 psi) — Percent of Original Height	Typical Strength Characteristics: Cohesion (as compacted) psf	Typical Strength Characteristics: Cohesion (saturated) psf	Typical Strength Characteristics: ϕ (Effective Stress Envelope degrees)	Typical Strength Characteristics: Tan ϕ	Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix.	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	5×10^{-5}	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	2×10^{-6}	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	5×10^{-7}	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	10^{-5}	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	5×10^{-7}	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	5×10^{-7}	10 or less	50 - 100
CH	Inorganic clays of high plasticity.	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	10^{-7}	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Notes:

1. All properties are for condition of "Standard Proctor" maximum density, except values of k and CBR which are for "modified Proctor" maximum density.
2. Typical strength characteristics are for effective strength envelopes and are obtained from USBR data.
3. Compression values are for vertical loading with complete lateral confinement.
4. (>) Indicates that typical property is greater than the value shown. (....) Indicates insufficient data available for an estimate.

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES
GROUND ELEVATION SYSTEM STATE PLANE
Water Level, ft DRY
TIME
DATE 2-1-95

BORING NO. 0501 DATE 2/7/11 SHEET 1 OF 2
BORING START 2/1/95 BORING FINISH 2/1/95
PIEZOMETER TYPE WELL TYPE
HGT. RISER ABOVE GROUND DIA
DEPTH TO TOP OF WELL SCREEN BOTTOM
WELL DEVELOPMENT BACKFILL CEMENT/BENTONITE
FIELD PARTY TJH=RLY RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	SS	0.0	1.5	4-4-4	1.1					**BROWN CLAYEY SAND** Moist, 100% v-fine grain.		
2	SS	1.5	3.0	3-3-2	.7					**BLACK ASH** Dry to moist with fine limestone gravel.		
3	SS	3.0	4.5	2-3-3	1.1							
4	SS	4.5	6.0	5-6-5	1.2		5					
5	SS	6.0	7.5	3-4-5	1.1							
6	SS	7.5	9.0	5-9-9	.8							
7	SS	9.0	10.5	5-5-3	1.2							
							10					
8	SS	10.5	12.0	6-7-9	1.1							
9	SS	12.3	13.8	6-8-10	.7							
							15					
10	SS	17.3	18.8	12-16-18	.7					**REDDISH BROWN CLAYEY SANDY GRAVEL** Moist, 1/2" max size, angular		17.3 DRILLING THROUGH AREAS.

Continued Next Page

TYPE OF CASING USED

	NQ-2 ROCK CORE	
X	6" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	8"

PIEZOMETER TYPE PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER RLY

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY | BORING NO 9501 | DATE 2/7/11 | SHEET 2 OF 2

PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 2/1/95 | BORING FINISH 2/1/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U.S.C.S.	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	SS	22.2	23.6	3-3-3	2							

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES
GROUND ELEVATION SYSTEM STATE PLANE

BORING NO. 9502 DATE 2/7/11 SHEET 1 OF 2
BORING START 2/1/95 BORING FINISH 2/1/95
PIEZOMETER TYPE WELL TYPE
HGT. RISER ABOVE GROUND DIA
DEPTH TO TOP OF WELL SCREEN BOTTOM
WELL DEVELOPMENT BACKFILL CEMENT/BENTONITE
FIELD PARTY TJH=RLY RIG CME-75

Water Level, ft	DRY		
TIME			
DATE	2-1-95		

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	SS	0.0	1.5	12-13-13	1.3					BLACK ASH, LIMESTONE ROAD BASE		
										BROWN CLAYEY SAND Dry		
										BLACK ASH Moist to dry		
3	SS	3.0	4.5	3-3-3	1.2							
4	SS	4.5	6.0	4-6-6	1.1		5					
5	SS	6.0	7.5	2-2-2	1.2							
6	SS	7.5	9.0	2-2-4	1.1							
7	SS	9.0	10.5	2-3-4	1.3		10					
8	SS	10.5	12.0	4-7-8	1.1					TRACE OF LIMESTONE GRAVEL		
										BROWN SANDY CLAY Dry.		
9	SS	12.5	14.0	9-25-20	1.1							
2	SS	15.0	16.5	4-5-5	1.1		15					
10	SS	17.5	18.5	17-50	1.0					RED BRICKS GRAY SANDY CLAY BLACK COAL AND WOOD FRAGMENTS		17.3 DRILLING THROUGH AREAS

Continued Next Page

TYPE OF CASING USED

	NQ 2 ROCK CORE	
X	6" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	6"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER RLY

AMERICAN ELECTRIC POWER SERVICE CORPORATION

AEP CIVIL ENGINEERING LABORATORY

LOG OF BORING

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY

PROJECT GLEN LYN BOTTOM ASH DIKE

BORING NO. 9502 DATE 2/7/11 SHEET 2 OF 2

BORING START 2/1/95 BORING FINISH 2/1/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	ROD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	SS	22.5	24.0	13 7 7	.8					BROWN SAND Dry with trace of limestone gravel size material		

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY | BORING NO. 9503 | DATE 2/7/11 | SHEET 1 OF 2
PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 2/1/95 | BORING FINISH 2/1/95
COORDINATES | PIEZOMETER TYPE | WELL TYPE
GROUND ELEVATION | SYSTEM STATE PLANE | HGT. RISER ABOVE GROUND | DIA
Water Level, ft DRY | DEPTH TO TOP OF WELL SCREEN | BOTTOM
TIME | WELL DEVELOPMENT | BACKFILL CEMENT/BENTONITE
DATE 2-1-95 | FIELD PARTY TJH=RLY | RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	ROD %	DEPTH IN FEET	GRAPHIC LOG	U.S.C.S.	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	SS	0.0	1.5	13-13-16	1.2					LIMESTONE GRAVEL ROAD BASE BROWN CLAYEY SAND Moist BLACK ASH Dry to moist		
2	SS	1.5	3.0	4-4-4	1.1							
3	SS	3.0	4.5	4-4-3	.9							
4	SS	4.5	6.0	4-3-3	1.2		5					
5	SS	6.0	7.5	2-2-3	1.3							
6	SS	7.5	9.0	2-2-2	.3							
7	SS	9.0	10.5	2-1-1	.3		10					
8	SS	10.5	12.0	2-2-1	.2							
9	SS	12.6	14.1	14-14-12	1.3		15					DRILLED THROUGH INTERMITTANT BOULDERS, COBBLES TO 22.6
10	SS	17.6	18.6	16-50	1.0					BLUE GRAY SHALEY SANDSTONE angular appears to be broken fragments of cobble.		

TYPE OF CASING USED

Continued Next Page

	NO.2 ROCK CORE	
X	6" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	8"

PIEZOMETER TYPE PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER RLY

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE

BORING NO. 9503 DATE 2/7/11 SHEET 2 OF 2
BORING START 2/1/95 BORING FINISH 2/1/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	ROD %	DEPTH IN FEET	GRAPHIC LOG	U.S.C.S.	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	SS	22.6	22.7	50	.1							

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

AEP

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES
GROUND ELEVATION SYSTEM STATE PLANE

Water Level, ft	DRY		
TIME			
DATE	2-1-95		

BORING NO. 9504 DATE 2/7/11 SHEET 1 OF 2
BORING START 2/1/95 BORING FINISH 2/1/95
PIEZOMETER TYPE WELL TYPE
HGT. RISER ABOVE GROUND DIA
DEPTH TO TOP OF WELL SCREEN BOTTOM
WELL DEVELOPMENT BACKFILL CEMENT\BENTONITE
FIELD PARTY TJH=RLY RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS/6"	CORE LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
1	SS	0.0	1.5	6-6-7	1.5					BROWN CLAYEY SAND Moist, 100% v-fine grain		
2	SS	1.5	3.0	3-3-3	.8					BLACK ASH Dry to moist		
3	SS	3.0	4.5	2-2-2	1.1							
4	SS	4.5	6.0	2-2-1	1.1		5					
5	SS	6.0	7.5	1-2-1	1.2							
6	SS	7.5	9.0	2-2-2	1.1							
7	SS	9.0	10.5	2-2-3	1.3		10					
8	SS	10.5	12.0	20-20-21	1.2					LIGHT BROWN SANDY SHALE Broken into gravel and sand size material		
9	SS	12.5	14.0	7-5-3	1.'					BLACK ASH Dry to moist.		
							15					
10	SS	17.5	19.0	6-5-4	1.1							17.3 DRILLING THROUGH AREAS.

Continued Next Page

TYPE OF CASING USED

	NQ 2 ROCK CORE	
X	6" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	8"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER RLY

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

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY | BORING NO 9504 | DATE 2/7/11 | SHEET 2 OF 2

PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 2/1/95 | BORING FINISH 2/1/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
11	SS	22.5	24.0	9-13-4	7					**BROWN SANDY CLAY** Moist, 100% v-fine grain with gravel and sand size fragments		

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

AEP

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY | BORING NO HP-9524 DATE 2/7/11 SHEET 1 OF 3
PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 11/7/95 BORING FINISH 11/8/95
COORDINATES N 387,329.6 E 1,312,372.4 | PIEZOMETER TYPE N\A WELL TYPE N\A
GROUND ELEVATION 1524.0 SYSTEM STATE PLANE | HOT. RISER ABOVE GROUND N\A DIA
Water Level, ft 34.0 | DEPTH TO TOP OF WELL SCREEN N\A BOTTOM N\A
TIME | WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT
DATE 11-7-95 | FIELD PARTY TJH-REB RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										TIME PH COND. REDOX TEMP. 12:46 4.15 222 281 16.15C 12:53 7.20 227 258 16.62C 12:57 7.24 231 261 16.72C 1:02 7.21 234 233 16.98C 1:06 7.23 237 214 16.98C 1:08 SAMPLE TAKEN 1:13 7.18 238 206 17.25C		Pump test one hour a approximately 5 GPM prior to test by plant personal. Packer set between 36.5 and 40.0'
1	SS	2.6	4.1	9-9-11	2				CL	BLACK SILTY CLAY Roots, moist.		
							5					Water return at all times.
2	SS	7.6	9.1	2-3-3	1.1					BOTTOM ASH Dry.		
							10					
3	SS	12.6	14.1	1-2-2	1.2							Intermittent bolders till further noted.
							15					
4	SS	17.6	19.1	7-9-15	1.2				CL	BROWN SILTY CLAY Moist.		
									GW	BROKEN FRAGMENT OF GRAVEL DARK GRAY May be concrete		

Continued Next Page

TYPE OF CASING USED

X NQ-2 ROCK CORE
X 6" x 3.25 HSA
9" x 6.25 HSA
HW CASING ADVANCER 4"
NW CASING 3"
SW CASING 6"
AIR HAMMER 6"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER REB

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY BORING NO. HP-9524 DATE 2/7/11 SHEET 2 OF 3
PROJECT GLEN LYN BOTTOM ASH DIKE BORING START 11/7/95 BORING FINISH 11/8/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	SS	22.6	24.1	5-7-9	1.1				GP	BROKEN SAND AND GRAVEL SIZE FRAGMENT OF SANDSTONE AND SHALE		
							25					
6	SS	27.6	29.1	2-3-3	1.2				CL	BROWN SANDY CLAY Moist, low plasticity.		Approximately 27.0 natural material
							30					
7	SS	32.6	34.1	7-15-26	1.0					GRAY BROWN SAND AND GRAVEL Wet to saturated, 20% fines, 1 3/8" max size, rounded to sub-rounded	∇	
							35					
8	SS	36.5	36.9	79/.4	.4				GP	SAME AS SAMPLE NO.7 SATURATED, ANGULAR, 40% FINES		
9	NQ	35.0	40.0		3.0	48				GRAY SANDSTONE Hard, well cemented, fine grain with shale laminations		
		40.0	40.5				40					Used 2 15/16 roller bit to advance hole Augers in a bind.
							45					

Continued Next Page

AEP

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY | BORING NO. HP-9524 | DATE 2/7/11 | SHEET 3 OF 3
PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 11/7/95 | BORING FINISH 11/8/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH	RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES

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

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES N 385,935.3 E 1,313,076.3
GROUND ELEVATION 1525.5 SYSTEM STATE PLANE

Water Level, ft	∇ 32.5	▼	▼
TIME			
DATE	11-14-95		

BORING NO HP-9525 DATE 2/7/11 SHEET 1 OF 3
BORING START 11/14/95 BORING FINISH 11/14/95
PIEZOMETER TYPE N\A WELL TYPE N\A
HGT. RISER ABOVE GROUND N\A DIA
DEPTH TO TOP OF WELL SCREEN N\A BOTTOM N\A
WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT
FIELD PARTY TJH-REB RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										11-14-95 TIME Ph COND. REDOX TEMP. 3:34 7.31 234 323 18.26c 3:38 7.60 244 287 17.82C 3:41 7.60 247 255 17.95C 3:44 7.60 249 232 17.99C 3:46 7.61 252 218 17.94C 3:48 SAMPLE TAKEN. 3:50 7.60 266 199 18.02C		Pump test o/a hour at approximately 5 GPM prior to test by plant persona . Packer set between 39.5 and 50'.
1	SS	2.5	4.0	3-3-3	1.2					BLACK BOTTOM ASH Dry		
							5					Water return at all times.
2	SS	7.5	9.0	2-2-1	1.1							
							10					
3	SS	12.5	14.0	25 27 21	1.2				GP	GRAY CLAY SHALE SAND AND GRAVEL FRAGMENTS Dry		12.5 augered throu bolders, cobbles until further notes
							15					
4	SS	17.5	19.0	4-4-4	.6					BLACK BOTTOM ASH Wet to saturated		

Continued Next Page

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
X	6" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	8"

PIEZOMETER TYPE PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER REB

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
BORING NO. HP-9626 DATE 2/7/11 SHEET 3 OF 3
BORING START 11/14/95 BORING FINISH 11/14/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	ROD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
							50					

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

AEP

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE

BORING NO HP-9526 DATE 2/7/11 SHEET 2 OF 3
BORING START 11/14/95 BORING FINISH 11/14/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	SS	22.5	24.0	2-1-1	4							
							25					
6	SS	27.5	29.0	2-1-1	1.2				CL	DARK BROWN SANDY CLAY Wet, low plasticity.		Approximately 27.5 natural material
							30					
7	SS	32.5	34.0	10-15-21	1.0				GP	BROWN SAND AND GRAVEL Saturated 1" max size, angular to sub angular 20% fine material.	V	
							35					
8	NQ	37.0	39.8		1.2	0				RED AND GRAY CLAYSHALE Hard, broken with calcite lens.		
9	NQ	39.8	43.0		3.2	0	40					
10	NQ	43.0	45.2		2.1	50				GRAY SANDSTONE Hard, very fine grain well cemented		
							45					
11	NQ	45.2	50.2		5.0	32				GRAY CLAY SHALE Hard, calcite lens, iron stain on joints with high angle fracture		

Continued Next Page

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
BORING NO HP-9628 DATE 2/7/11 SHEET 2 OF 2
BORING START 11/15/95 BORING FINISH 11/15/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS/6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	USCS	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	SS	22.5	24.0	7-15-17	1.1				GC	**BROWN CLAYEY SAND AND GRAVEL** Saturated, 30% fines, 1 3/8" max size, rounded to sub-rounded.		
							25					
6	NQ	27.0	28.8		1.6	56				**GRAY SHALE** Calcite lens, calcareous, hard		
7	NQ	28.9	33.9		5.0	52						
							30			**VUGS, WATER SOLUTION DETERIORATION THROUGHOUT**		
8	NQ	33.5	38.9		5.0	94						
							35					
9	NQ	38.9	40.0		9	89						
							40					

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

JOB NUMBER 3031
COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES N 386,682.4 E 1,313,336.1
GROUND ELEVATION 1515.3 SYSTEM STATE PLANE

BORING NO. HP-9528 DATE 2/7/11 SHEET 1 OF 2
BORING START 11/15/95 BORING FINISH 11/15/95
PIEZOMETER TYPE N\A WELL TYPE N\A
HGT. RISER ABOVE GROUND N\A DIA
DEPTH TO TOP OF WELL SCREEN N\A BOTTOM N\A
WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT
FIELD PARTY TJH-REB RIG CME-75

Water Level, ft			
TIME			
DATE			

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	ROD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										11-16-95 TIME Ph COND. REDOX TEMP. 9:42 7.42 276 318 19.81C 9:46 7.57 ? 293 19.67C 9:48 7.60 278 283 19.83C 9:51 7.59 280 270 19.83C 9:54 SAMPLE TAKEN 9:56 7.66 279 260 19.69		Pump test one hour at approximately 5 GPM prior to test by plant personal. Packers set between 29.5 and 40'.
1	SS	2.5	4.0		1.0				CL	DARK BROWN SANDY CLAY Moist to wet with trace of pea size gravel.		
							5					Water return at all times
2	SS	7.5	9.0	2-3-5	1.1					BLACK MIXTURE OF CLAY AND BOTTOM ASH Moist		
							10					
3	SS	12.5	14.0	4-5-5	.9					BLACK BOTTOM ASH Moist		
							15					
4	SS	17.5	19.0	4-4-6	1.1				SC	BROWN CLAYEY SAND Moist to wet, slight to non plasticity.		Approximately 17.5 natural material

Continued Next Page

TYPE OF CASING USED

X	NQ 2 ROCK CORE	
X	6" x 3.25 HSA	
	8" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	8"

PIEZOMETER TYPE PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER REB

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

JOB NUMBER 3031

COMPANY **APPALACHIAN POWER COMPANY** BORING NO. **HP-9527** DATE **2/7/11** SHEET **2** OF **2**

PROJECT **GLEN LYN BOTTOM ASH DIKE** BORING START **11/15/95** BORING FINISH **11/15/95**

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS/6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U.S.C.S.	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
											∇	
5	SS	23.0	24.5	15-23-31	1.4				GP	**BROWN SILTY SAND AND GRAVEL** 3/4" max size, saturated, rounded to sub rounded.		
							25					
6	NQ	25.6	31.7		4.8	74				**BLACK SHALE** Hard, calcareous, calcite lens, iron stain on joints,high angle fracture, vertical fracture 28.4 to 30.8'.		
							30					
7	NQ	31.7	38.5		6.3	76						
							35					
										Vertical fracture 36'		
8	NQ	38.5	39.3		.1	0						
9	NQ	39.3	40.0		1	0						
							40					

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

AEP

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY
PROJECT GLEN LYN BOTTOM ASH DIKE
COORDINATES N 386,671.1 E 1,313,251.0
GROUND ELEVATION 1515.7 SYSTEM STATE PLANE

BORING NO. HP-9527 DATE 2/7/11 SHEET 1 OF 2
BORING START 11/15/95 BORING FINISH 11/15/95
PIEZOMETER TYPE N/A WELL TYPE N/A
HGT. RISER ABOVE GROUND N/A DIA
DEPTH TO TOP OF WELL SCREEN N/A BOTTOM N/A
WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT
FIELD PARTY TJH-REB RIG CME-75

Water Level, ft	22.5		
TIME			
DATE	11-15-95		

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
										11-15-95 TIME Ph COND. REDOX TEMP. 1:45 6.65 200 360 16.72C 1:49 7.52 207 328 16.36C 1:52 7.70 207 310 16.26 1:54 7.79 207 298 16.36 1:57 SAMPLE TAKEN		Pump test one hour a approximately 5 GPM prior to test by plant personal. Packers set between 29.5 and 40.0'
1	SS	3.0	4.5	5-6-7	1.1					1:59 7.82 211 290 16.33C BLACK BOTTOM ASH Dry		
							5					Water return at all times
2	SS	8.0	9.5	3-4-4	1.0							
							10					
3	SS	13.0	14.5	7-7-7	1.1							
							15					
4	SS	18.0	19.5	8-8-8	1.0				GP	DARK BROWN SILTY SAND AND GRAVEL Saturated, 1 3/8" max size, angular to sub-angular, 20% fines.		Approximately 18.0' natural material

Continued Next Page

TYPE OF CASING USED

X	NQ-2 ROCK CORE	
X	5" x 3.25 HSA	
	9" x 6.25 HSA	
	HW CASING ADVANCER	4"
	NW CASING	3"
	SW CASING	6"
	AIR HAMMER	5"

PIEZOMETER TYPE PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, G = GEONOR, P = PNEUMATIC

WELL TYPE OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

RECORDER REB

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

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY | BORING NO. HP-9526 | DATE 2/7/11 | SHEET 2 OF 2

PROJECT GLEN LYN BOTTOM ASH DIKE | BORING START 11/8/95 | BORING FINISH 11/9/95

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U.S.C.S.	SOIL / ROCK IDENTIFICATION	WELL	DRILLER'S NOTES
5	NQ	21.1	25.0		3.8	48				GRAY SANDSTONE With shale lens, hard, well cemented, iron stain on joints		
6	NQ	25.0	30.0		4.9	54	25					
7	NQ	30.0	34.0		3.9	63	30					

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

AEP

JOB NUMBER 3031

COMPANY APPALACHIAN POWER COMPANY — BORING NO HP-9526 DATE 2/7/11 SHEET 1 OF 2

PROJECT GLEN LYN BOTTOM ASH DIKE — BORING START 11/8/95 BORING FINISH 11/9/95

COORDINATES N 367,441.9 E 1,312,324.2 — PIEZOMETER TYPE N/A WELL TYPE N/A

GROUND ELEVATION 1508.9 SYSTEM STATE PLANE — HGT. RISER ABOVE GROUND N/A DIA

Water Level ft	17.9 ▼	
TIME	7:00	
DATE	11-9-95	

DEPTH TO TOP OF WELL SCREEN N/A BOTTOM N/A

WELL DEVELOPMENT SEE NOTE BACKFILL QUICK GROUT

FIELD PARTY TJH-REB RIG CME-75

SAMPLE NUMBER	SAMPLE	SAMPLE DEPTH IN FEET FROM	TO	STANDARD PENETRATION RESISTANCE BLOWS / 6"	TOTAL LENGTH RECOVERY	RQD %	DEPTH IN FEET	GRAPHIC LOG	U S C S	SOIL / ROCK IDENTIFICATION	WTR	DRILLER'S NOTES
										11-9-95 TIME Ph COND. REDOX TEMP 11:35 6.66 278 330 17.36C 11:40 6.95 287 285 16.53C 11:42 7.02 286 262 15.45C 11:45 7.03 286 249 16.45C 11:47 SAMPLE TAKEN 11:50 7.03 285 227 16.49C		Pump test one hour at approximately 5 GPM prior to test by plant personal. Packer set between 23.5 and 34.3'
1	SS	2.5	4.0	7-9-15	1.0				CL	BROWN SANDY CLAY Trace of gravel and brick dry		
							5					Water return at all times.
2	SS	7.5	9.0	15-22-26	1.1				CL	MULTI-COLORED SANDY CLAY Dry, with some sandstone and shale gravel size material		Augered through bolders and hard pan area
							10					
3	SS	12.5	14.0	5-8-10	1.1				CL	BROWN SANDY CLAY Moist, low plasticity with trace of wood		Approximately 12.5 natural material
							15					
4	SS	17.5	19.0	10-15-19	1.0				GP	BROWN SILTY SAND AND GRAVEL Wet to saturated, rounded to sub rounded, 30% fines	▽	

TYPE OF CASING USED

Continued Next Page

- X NQ 2 ROCK CORE
- X 6" x 3.25 HSA
- 9" x 6.25 HSA
- HW CASING ADVANCER 4"
- NW CASING 3"
- SW CASING 5"
- AIR HAMMER 5"

PIEZOMETER TYPE: PT = OPEN TUBE POROUS TIP, SS = OPEN TUBE SLOTTED SCREEN, C = GEONOR, P = PNEUMATIC

WELL TYPE: OW = OPEN TUBE SLOTTED SCREEN, GM = GEOMON

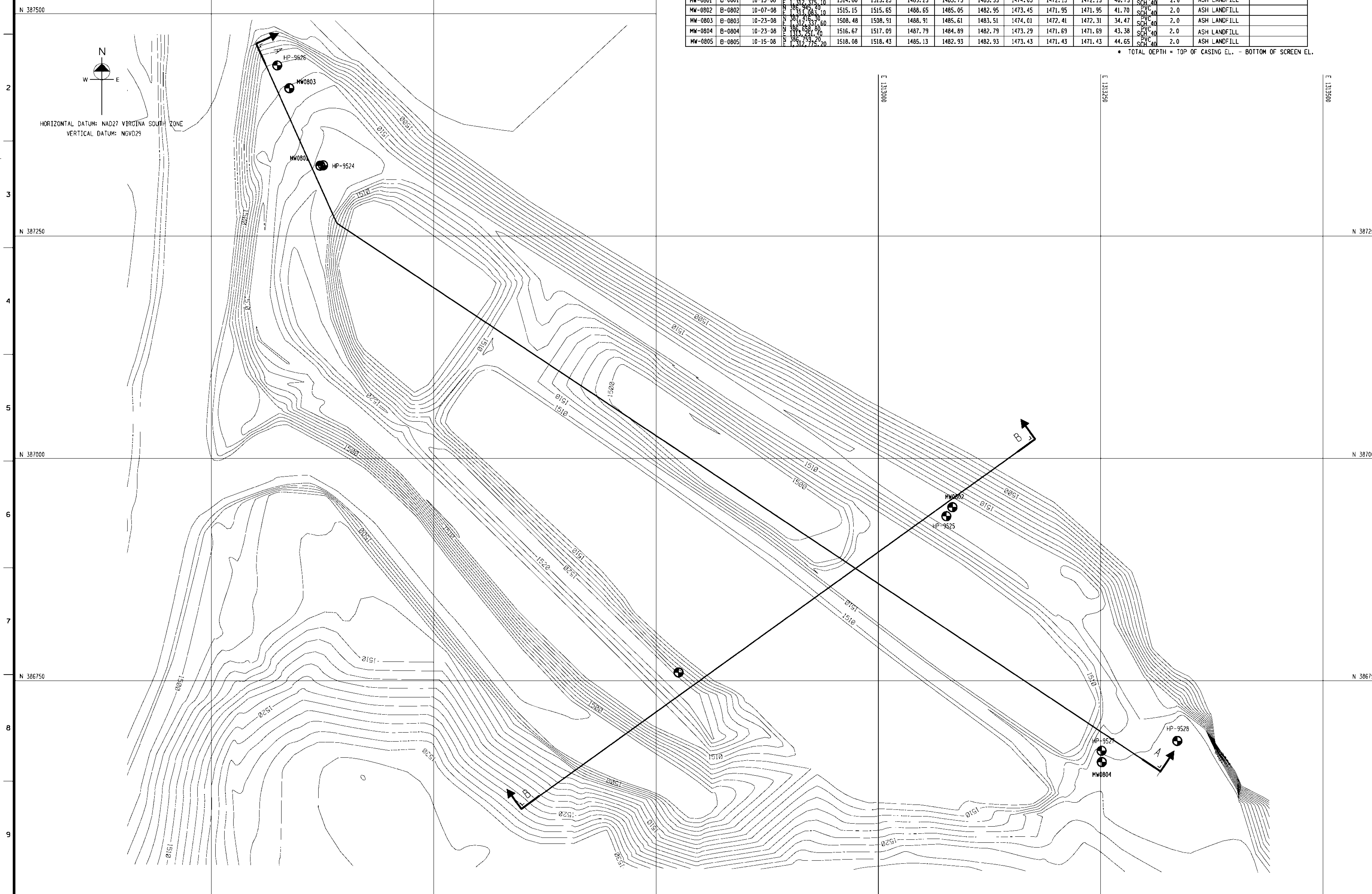
RECORDER REB

DWG NO: GSK-GL-56-012009

MONITORING WELL CONSTRUCTION DETAILS

MONITOR WELL NO.	BORING NO.	DATE OF INSTALLATION	STATE PLANE COORDINATES	TOP OF CASING	GROUND ELEVATION	TOP OF BENTONITE SEAL	TOP OF GRAVEL PACK	TOP OF SCREEN	BOTTOM OF SCREEN	BOTTOM OF GRAVEL PACK	BOTTOM OF BORE HOLE	TOTAL* DEPTH	CASING TYPE	CASING DIA. (IN.)	COMMENTS	DATE OF ABANDONMENT
MW-0801	B-0801	10-13-08	N 387,330.00 E 1,312,375.10	1514.80	1515.25	1489.25	1485.75	1483.55	1474.05	1472.15	1472.15	40.75	PVC SCH 40	2.0	ASH LANDFILL	
MW-0802	B-0802	10-07-08	N 386,945.40 E 1,313,083.10	1515.15	1515.65	1488.65	1485.05	1482.95	1473.45	1471.95	1471.95	41.70	PVC SCH 40	2.0	ASH LANDFILL	
MW-0803	B-0803	10-23-08	N 387,416.30 E 1,312,337.60	1508.48	1508.91	1488.91	1485.61	1483.51	1474.01	1472.41	1472.31	34.47	PVC SCH 40	2.0	ASH LANDFILL	
MW-0804	B-0804	10-23-08	N 386,658.80 E 1,313,251.40	1516.67	1517.09	1487.79	1484.89	1482.79	1473.29	1471.69	1471.69	43.38	PVC SCH 40	2.0	ASH LANDFILL	
MW-0805	B-0805	10-15-08	N 386,759.20 E 1,312,775.20	1518.08	1518.43	1485.13	1482.93	1482.93	1473.43	1471.43	1471.43	44.65	PVC SCH 40	2.0	ASH LANDFILL	

* TOTAL DEPTH = TOP OF CASING EL. - BOTTOM OF SCREEN EL.



GENERAL NOTES

LEGEND

- x509.5 SPOT ELEVATION
- INTERMEDIATE CONTOUR
- 500 INDEX CONTOUR
- DEPRESSION CONTOUR
- TREES AND TREELINE
- STRUCTURE AND BUILDING
- FENCE
- POLE
- ROADS
- EDGE OF WATER
- MANHOLES / CATCH BASIN
- POWER POLE
- PIPES
- TOWER
- MW0802 NEW WELL LOCATION
- HP-9525 OLD WELL LOCATION

REFERENCES

DATE	NO.	DESCRIPTION	APPD.

REVISIONS

s:/GL/56/CIVIL_SKETCH/SK012009.DGN

APPALACHIAN POWER COMPANY

GLEN LYN PLANT

GLEN LYN VIRGINIA

BOTTOM ASH POND WELL LOCATION

DWG NO: GSK-GL-56-012009

SCALE: 1" = 40'
DR:
CH:
SUP:
ENG:
DATE:
APPROVED BY X.X. XXXXXXX

AEP AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

PLOT DATE: 3/17/2011
PLOT TIME: 9:36:00 AM
BY: s145543

APPENDIX B

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 Lorainne 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.

Issue #	Yes	No	Issue #	Yes	No
1. Frequency of Company's Dam Inspections?	✓		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?		✓	19. Major erosion or slope deterioration?		✓
3. 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
6. If instrumentation is present, are readings recorded (operator records)?	✓		Is water exiting outlet flowing clear?		N/A
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		✓	From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)	✓		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?		✓	"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 $^{\pm}$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.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit	VA 0000370 / Outfall 006	**INSPECTOR**	Scott Clarke, P.E. and Lorainne Ramos Nieves, P.E., CFM

Date February 16, 2011
Impoundment Name Auxiliary Fly Ash Pond (Inactive)

Impoundment Company AEP, Appalachian Power
EPA Region 3

State Agency (Field Office) Address Virginia Department of Conservation & Recreation, Division of Dam Safety and Floodplain Management; 8 Radford St., Suite 201 Christiansburg, VA 24073
Name of Impoundment Auxiliary Fly Ash Pond (Inactive)

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

New ☒ **Update** ☐

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☐	☒

IMPOUNDMENT FUNCTION: Settling pond for fly ash disposal.

Nearest Downstream Town Name: Hinton, West Virginia.

Distance from the impoundment: 20.5 mi.

Location:

Latitude	37	Degrees	22	Minutes	42.8	Seconds	**N**
Longitude	80	Degrees	52	Minutes	32.1	Seconds	**W**

State Virginia **County** Giles

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Virginia DCR, Division of Dam Safety and Floodplain Management / Virginia DEQ

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

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

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

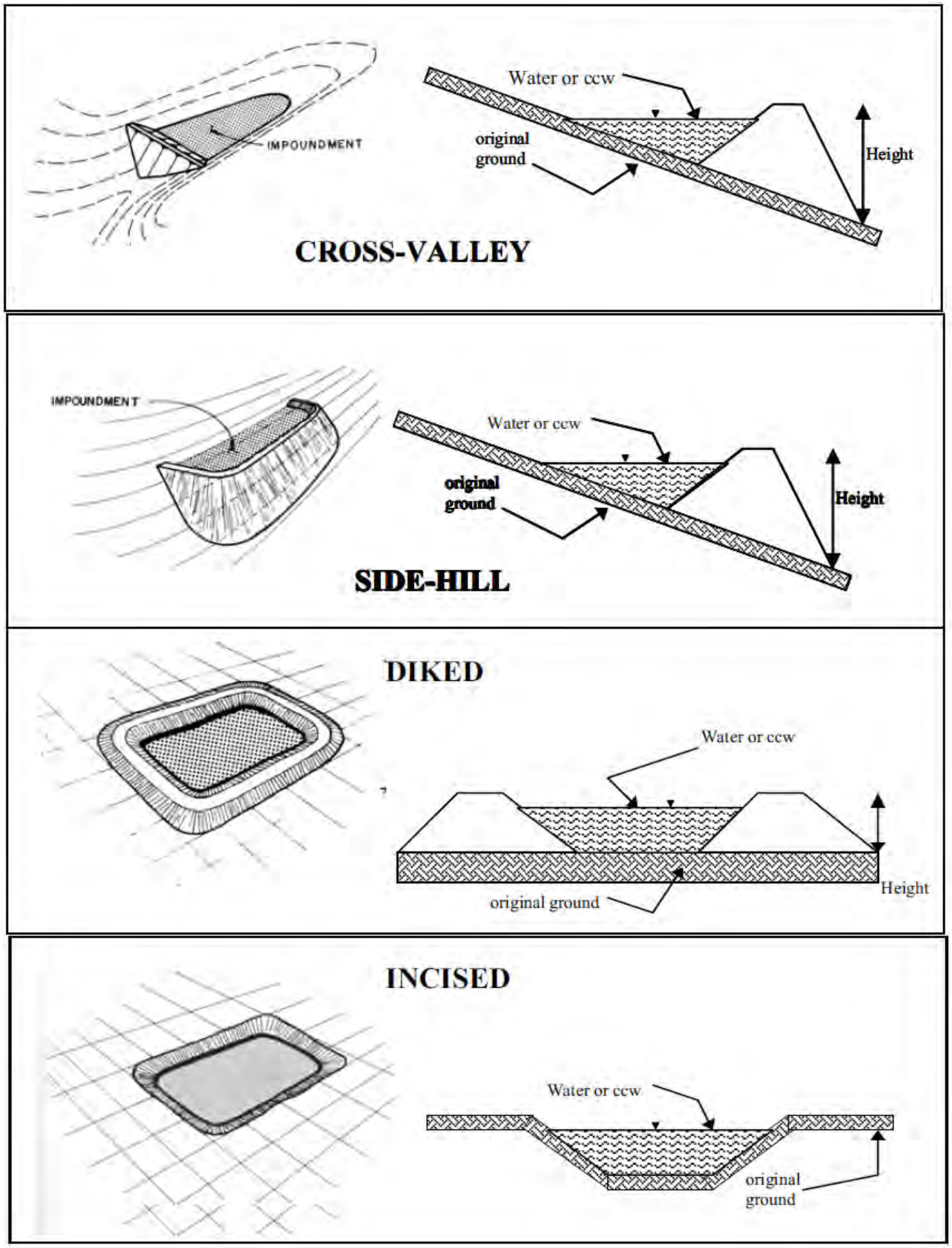
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

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.

CONFIGURATION:



☐	Cross-Valley	☐	Side-Hill	☐	Diked
☐	Incised (form completion optional)			☒	Combination Incised/Diked

Embankment Height (ft)	43 ft	**Embankment Material**	Sand, clay and fly ash.
Pool Area (ac)	10 acre-ft	**Liner**	1”-3” thick
Current Freeboard (ft)	N/A	**Liner Permeability**	Clay

TYPE OF OUTLET (Mark all that apply)

☐ **Open Channel Spillway**

☐ Trapezoidal

☐ Triangular

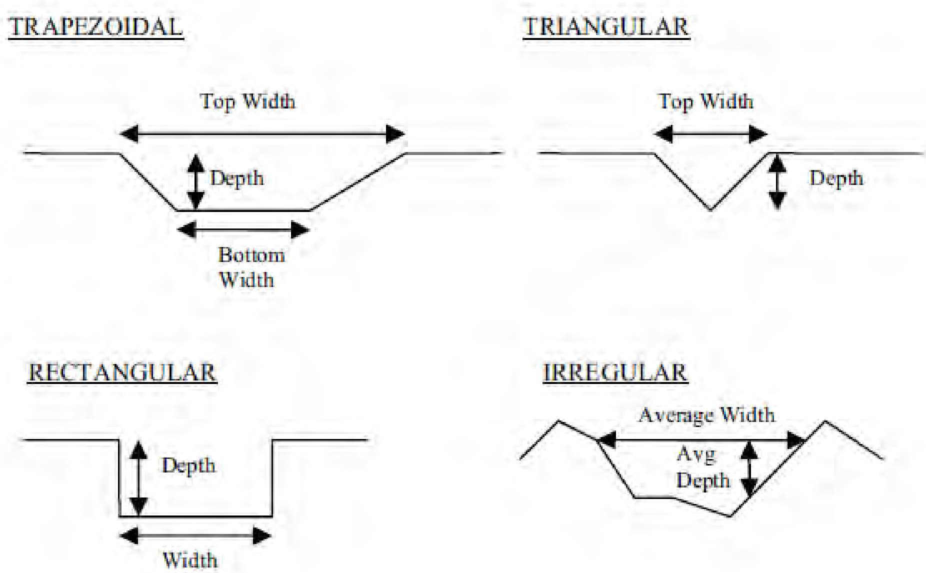
☐ Rectangular

☐ Irregular

depth (ft)

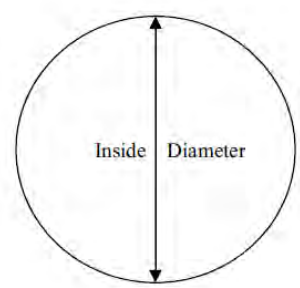
average bottom width (ft)

top width (ft)



☒ **Outlet (Inactive)**

24" inside diameter



Material

☒ corrugated metal

☐ welded steel

☐ concrete

☐ plastic (hdpe, pvc, etc.)

☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☐	☒

☐ **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 :

Has there ever been significant seepages at this site?	Yes	No
	☐	☒

If So When?

If So Please Describe :

	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 o f prior releases, failures, or patchwork on dikes could be noted at the time of the site visit.

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 Lorainne 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.

Issue #	Yes	No	Issue #	Yes	No
1. Frequency of Company's Dam Inspections?	✓		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	✓		19. Major erosion or slope deterioration?	✓	
3. 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?		✓
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):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?		✓	From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)	✓		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?	✓		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?	✓	
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.	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.

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit VA 0000370/ Outfall 004

INSPECTOR Scott Clarke, P.E. and Lorainne Ramos Nieves, P.E., CFM

Date February 16, 2011

Impoundment Name Bottom Ash Pond

Impoundment Company AEP, Appalachian Power

EPA Region 3

State Agency (Field Office) Address Virginia Department of Conservation & Recreation, Division of Dam Safety and Floodplain Management; 8 Radford St., Suite 201 Christiansburg, VA 24073

Name of Impoundment Bottom Ash Pond

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

New ☒ **Update** ☐

	Yes	**No**
Is impoundment currently under construction?	☐	☒
Is water or ccw currently being pumped into the impoundment?	☒	☐

IMPOUNDMENT FUNCTION: Settling pond for bottom ash disposal.

Nearest Downstream Town Name: Hinton, West Virginia.

Distance from the impoundment: 20.5 mi.

Location:

Latitude	37	Degrees	22	Minutes	21.4	Seconds	**N**
Longitude	80	Degrees	51	Minutes	55.6	Seconds	**W**

State Virginia **County** Giles

	Yes	No
Does a state agency regulate this impoundment?	☒	☐

If So Which State Agency? Virginia DCR, Division of Dam Safety and Floodplain Management / Virginia DEQ

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

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

☒ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

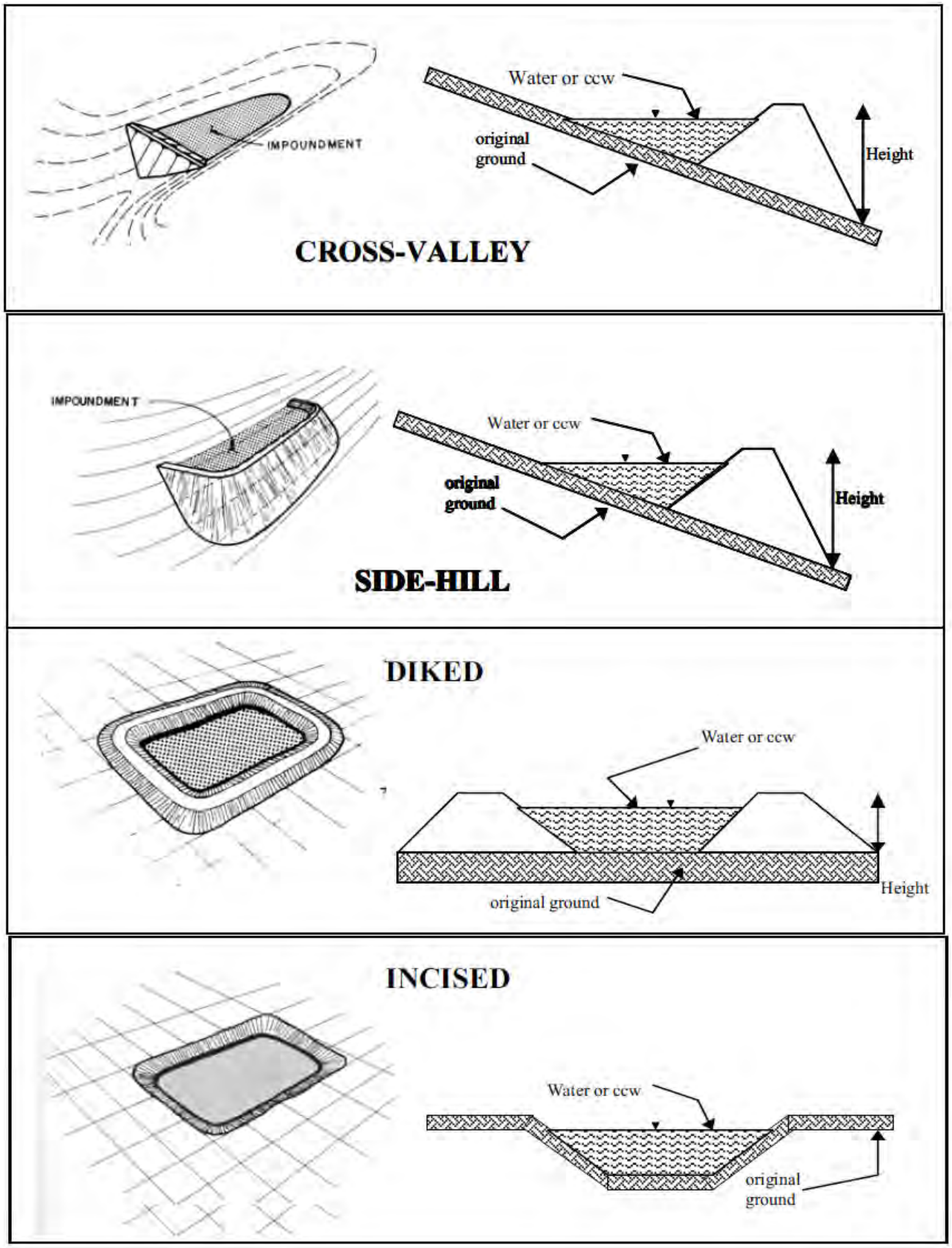
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

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

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

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)

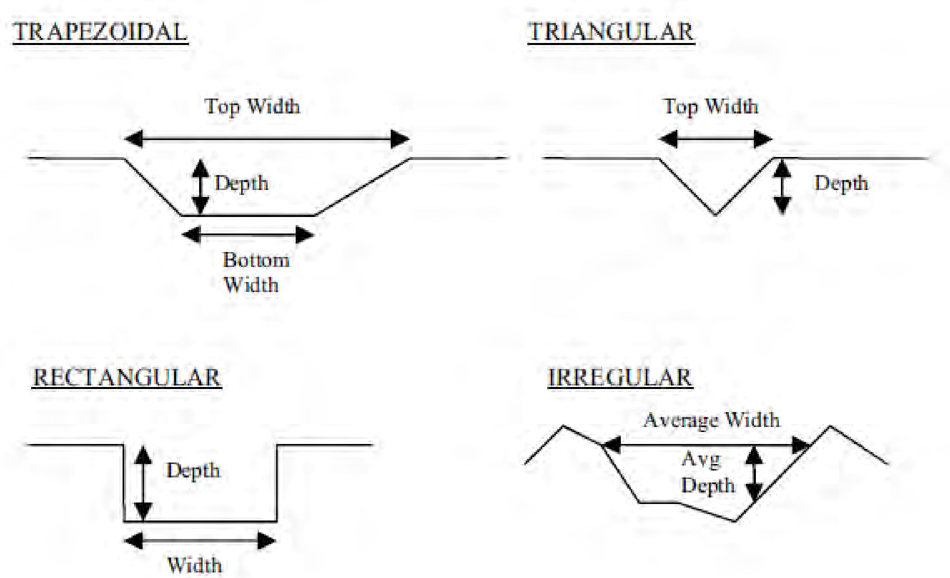
☐ **Open Channel Spillway**

- ☐ Trapezoidal
- ☐ Triangular
- ☐ Rectangular
- ☐ Irregular

depth (ft)

average bottom width (ft)

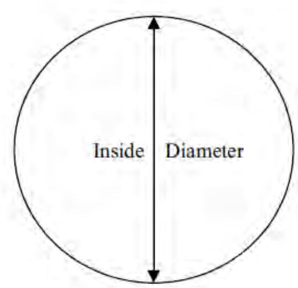
top width (ft)



☒ **Outlet**

30” 30” inside diameter (Clearwater Pond)

18” inside diameter (North/South Pond)



Material

- ☒ corrugated metal (North/South Pond)
- ☐ welded steel
- ☒ Concrete (Cleanwater Pond)
- ☐ plastic (hdpe, pvc, etc.)
- ☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **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
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 o f prior releases, failures, or patchwork on dikes could be noted at the time of the site visit.