

US EPA ARCHIVE DOCUMENT

**DRAFT**

**Coal Combustion Residue Impoundment**

**Round 12 - Dam Assessment Report**

**Keystone Generating Station**

**Ash Filter Ponds & Thermal Pond**

**GenOn Energy**

**Shelocta, PA**

**Prepared for:**

United States Environmental Protection Agency  
Office of Resource Conservation and Recovery

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## INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

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

This assessment of the stability and functionality of the CCR management units, Ash Filter Ponds and Thermal Pond (aka Cooling Pond "A") at the Keystone Generating Station is based on a review of available documents and on the site assessment conducted by Dewberry personnel on September 13, 2012. We found the supporting documentation, supplemented with simple calculations by Dewberry, to be generally adequate for making assessments, but some formal technical documentation should be prepared for one of the management units, and a discrepancy in slope geometry needs to be resolved for the other management unit (Subsections 1.1.3 and 1.2.3). The maintenance and operating procedures appear to be adequate. As detailed in Subsection 1.2.5, there are a few minor maintenance recommendations based on field observations that may help to maintain a safe and trouble-free operation. The surveillance program was found to be generally adequate, although inspections at one of the management units should be formalized (Subsections 1.1.7 and 1.2.7). The source of a seep area at one of the management units should be investigated to verify that it is not due to a liner failure (Subsections 1.1.7 and 1.2.7).

In summary, both of the CCR management units at the Keystone Generating Station are **FAIR** for continued safe and reliable operation, with no recognized existing or potential management unit safety deficiencies. The rating is influenced by the lack of some formal documentation of engineering analyses and the discrepancy in slope geometry that needs to be resolved.

### 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 unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by

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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 February 2009, the EPA sent letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or 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 and to determine the 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. Also, after the field visit, additional information was received by Dewberry & Davis LLC about the facility that were reviewed and 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).

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## LIMITATIONS

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

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## APPENDIX A

Doc 01:	April 1993 Dam Permit Application for the Thermal Pond
Doc 02:	Part D – Pond/Impoundment Systems and Other Wastewater Treatment Operations
Doc 03:	24 October 2011 Dam Inspection
Doc 04:	23 February 2012 Dam Inspection
Doc 05:	6 June Dam Inspection
Doc 06:	20 August Dam Inspection
Doc 07:	Keystone Thermal Dam Permit D03-044
Doc 08:	Part A Keystone Steam Electric Power Plant Operations
Doc 09:	Keystone Ash Filter Ponds O and M Manual
Doc 10:	Design Engineer’s report Keystone Station Feb 1993

## APPENDIX B

Doc 11:	Dam Inspection Check List Form Ash Ponds
Doc 12:	Dam Inspection Check List Form Thermal Pond

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## 1.0 CONCLUSIONS AND RECOMMENDATIONS

### 1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit on September 13, 2012, and review of technical documentation provided by GenOn Energy.

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

The Ash Filter Ponds dike, Thermal Pond dam, and the associated outlet structures appear to be structurally sound, based on a review of the engineering data provided by GenOn's technical staff and Dewberry engineers' observations during the site visit, as well as their conservative simple calculations to check stability of the Ash Filter Ponds dike. The assessment of the Thermal Pond dam is dependent on verification that the slope geometry analyzed is at least as steep as what actually exists in the field. The assessment of the Ash Filter Ponds dike is considered preliminary until GenOn provides formal documentation of its slope stability (see discussion in Section 7.2 and recommendation in Subsection 1.2.3).

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

The Ash Filter Ponds and the Thermal Pond, which do not receive off-site runoff, appear to have adequate hydrologic/hydraulic safety against design rainfall events. This conclusion is based on review of furnished technical information for the Thermal Pond and Dewberry engineers' simple calculations to check capacity of the Ash Filter Ponds to safely contain design rainfall over the area of the ponds.

#### 1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The furnished supporting technical documentation for the Thermal Pond is generally adequate. However, there appears to be a discrepancy in the Thermal Pond dam downstream slope geometry between what was analyzed for slope stability, what is shown on a furnished drawing, and what was observed in the field. This discrepancy should be resolved (see discussion in Section 7.2 and recommendation in Subsection 1.2.3). The

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furnished project documentation for the Ash Filter Ponds is generally inadequate, although the project documentation, together with Dewberry engineers' simple calculations described in this report, is generally adequate for making a preliminary assessment. Although Dewberry performed simple calculations for purposes of assessing the hydrologic/hydraulic safety and structural stability of the Ash Filter Ponds dike, formal documentation of hydrologic/hydraulic safety and structural stability of the Ash Filter Ponds should be prepared and maintained on file for record purposes (see recommendation in Subsection 1.2.3).

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

Overall, the descriptions of the subject management units provided by GenOn are generally accurate representations of what Dewberry observed in the field. As noted above, there appears to be a discrepancy in the downstream slope geometry that needs to be resolved (see recommendation in Subsection 1.2.3).

## 1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the subject management units required to conduct a thorough field observation. The visible parts of the impounding embankments and outlet structures were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability although visual observations were hampered by the presence of thick vegetation in some areas, particularly on the outside slope of the highest dike embankment at the Ash Filter Ponds. The embankments appeared structurally sound. There were no apparent indications of unsafe conditions or conditions needing emergency remedial action. Based on the field observations, minor maintenance items are recommended (see Subsection 1.2.4).

## 1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation for both the Ash Filter Ponds and the Thermal Pond appear to be adequate. There was no evidence of significant embankment repairs or prior releases observed during the field inspection. (See Subsection 1.2.4 for minor maintenance recommendations.)

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## 1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program for the Ash Filter Ponds is not formal but apparently has been sufficient. Nevertheless, it would be prudent to formalize the inspection program to include documented quarterly inspections performed by station personnel, as is done at the Thermal Pond (see Subsection 1.2.6). The surveillance program for the Thermal Pond appears to be adequate.

There is no dam performance monitoring instrumentation in place at either the Ash Filter Ponds or the Thermal Pond. No problem or suspect condition, such as excessive settlement, significant flowing seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation for long-term performance monitoring. Therefore, there is no need for performance monitoring instrumentation at this time. However, it may be desirable to install temporary observation wells to verify/confirm that the source of the apparent seep area observed along the access road berm ditch on the downstream side of the main dam at the Thermal Pond is from the adjacent railroad/roadway embankment and not due to seepage through the dam, which would imply that the liner is compromised (see discussion in Subsection 9.3.2 and recommendation in Subsection 1.2.6).

## 1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

**Both the Ash Filter Ponds and the Thermal Pond are rated FAIR for continued safe and reliable operation. No existing or potential management unit safety deficiencies are recognized. Acceptable performance is expected under all applicable loading conditions (static, hydrologic, seismic) in accordance with the applicable criteria. The rating is influenced by the lack of some formal documentation of hydrologic/hydraulic safety and slope stability for the Ash Filter Ponds dike and the discrepancy in the downstream slope geometry of the Thermal Pond dam that needs to be resolved. Implementation of recommendations as presented below would help improve the rating.**

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## 1.2 RECOMMENDATIONS

### 1.2.1 Recommendations Regarding the Structural Stability

No recommendations for remedial work to ensure structural stability appear warranted at this time (see recommendation in Subsection 1.2.3).

### 1.2.2 Recommendations Regarding the Hydrologic/Hydraulic Safety

No recommendations for remedial work to ensure hydrologic/hydraulic safety appear warranted at this time (see recommendation in Subsection 1.2.3).

### 1.2.3 Recommendations Regarding the Supporting Technical Documentation

Ash Filter Ponds:

- 1) Prepare and maintain on file formal documentation of slope stability analyses. (This need not be a rigorous analysis.)
- 2) Prepare and maintain on file formal documentation of hydrologic/hydraulic safety. (This need not be a rigorous analysis.)

Thermal Pond:

- 1) Provide PE or RLS certified documentation of the actual downstream slope geometry.
- 2) If the actual slope geometry is found to be steeper or more critical than what was assumed in slope stability analyses, re-calculate the slope stability analyses to verify that acceptable safety margins exist.

### 1.2.4 Recommendations Regarding the Field Observations

Ash Filter Ponds and Thermal Pond:

Based on the field observations, some minor maintenance recommendations are provided as follows:

- 1) Control burrowing animals (e.g. ground hogs) and appropriately fill-in burrows in the embankments around the ponds.

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- 2) Schedule and complete mowing of the embankments just before the quarterly inspections that are conducted during the growing season; in particular, ensure that tall weeds/grass are not present on the outside slope of the Ash Filter Ponds dike during the inspections.
- 3) Paint corroded metal parts and hardware at the discharge structures, particularly at the discharge structure for the Thermal Pond.

## 1.2.5 Recommendations Regarding the Maintenance and Methods of Operation

No recommendations appear warranted at this time for maintenance procedures and methods of operation (see Subsection 1.2.4 above for minor maintenance recommendations).

## 1.2.6 Recommendations Regarding the Surveillance and Monitoring Program

Ash Filter Ponds:

Formalize the inspection program for the Ash Filter Ponds by implementing documented quarterly inspections performed by station personnel using a checklist form similar to that used for the Thermal Pond quarterly inspections. This inspection could be done on the same dates as Thermal Pond inspections.

Thermal Pond:

Investigate and provide documented field evidence that the source of the seep area observed along the access road berm ditch on the downstream right side of the main dam is not seepage through the embankment due to liner failure. It is suggested that this investigation include at least two temporary observation wells, with one of these installed on the dam crest above the seep area to check for a phreatic surface or line of seepage through the dam embankment. The other observation well would preferably be installed on the railroad embankment, if feasible, or on the berm next to the seep area.

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## 1.2.7 Recommendations Regarding Continued Safe and Reliable Operation

No additional recommendations appear warranted at this time. Implementation of the above recommendations will help ensure continued safe and reliable operation of the Keystone CCR management units and upgraded rating.

## 1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

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*Senior Project Manager*

### 1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on September 13, 2012.

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Fred C. Tucker, P.E.

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Edward A. Farquhar

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

### 2.1 LOCATION AND PROJECT DESCRIPTION

The Keystone Generating Station is located in the southeast section of Armstrong County at 313 Keystone Drive, Shelocta, PA on 1,459-acres. The town of Shelocta is located approximately 2.5 miles east of the Keystone facility. Crooked Creek borders the facility to the south. See Figure 2.1-1 for the location of the Keystone Generating Station on a USGS topographic map. Keystone is a coal-fired electric generating station featuring two pulverized coal, supercritical boilers (1,700 MW) and four diesel units (12 MW) with total generating capacity of 1,712 megawatts.

Keystone Generating Station is jointly owned by a group of seven co-owners. GenOn has a 16 percent interest in Keystone and operates the facility for the owners group. The two units were originally commissioned in the summers of 1967 and 1968.

The generating facility maintains a relatively small complex of Ash Filter Ponds that consist of three contiguous clay-lined cells (Ponds A, B and C) that receive water produced from dewatering of bottom ash. See Figure 2.1-2 for an aerial view of the Ash Filter Ponds. The water originates at the Bottom Ash Dewatering Bins located southeast of the Ash Filter Ponds; it consists of decant water from dewatering of the bottom ash and dewatering bin overflow of the water used to sluice bottom ash from the Ash Hoppers to the Dewatering Bins. The water is piped from the Dewatering Bins to a distribution box that controls flow to the individual cells. The water contains some fine suspended ash particles, which are removed by sedimentation in the Ash Filter Ponds. The multiple cells allow two cells to remain in operation while a third cell is dewatered and cleaned out, when needed, by excavation and removal of settled ash to an on-site landfill. The individual cells receive the water at the southeast end of the cells. Each individual cell is nominally 82 ft wide by 386 ft long at the normal water surface elevation of 1018.5 ft. The clarified water exits each cell on the northwest end via saw tooth weirs on each side of metal weir troughs that discharge into a concrete riser structure that has bottom discharge to a pump station via an 18-inch diameter vitrified clay pipe (VTC). The pump station pumps the water collected from the cells via a 24-inch diameter polyethylene pipe (PE) to the Thermal Pond located 2,000 ft northwest of the Ash Filter Ponds.

The pumped water is received at a distribution box located at the west end of the Thermal Pond. The distribution box evenly divides the flow among a series of small pipes, which are spaced at intervals of approximately twenty feet and discharge into

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the geomembrane-lined Thermal Pond. The Thermal Pond has a storage volume of approximately 5.6 million cubic feet at normal operating level. See Figure 2.1-3 for an aerial view of the Thermal Pond. The available surface area for cooling is approximately 310,000 square feet. Cooled water leaves the pond through a concrete overflow structure at the east end, which has bottom discharge through an 18-inch diameter HDPE pipe that passes through the embankment dam and ultimately discharges into a stream channel at the toe of the dam. The original discharge pipe was a 21-inch diameter corrugated metal pipe (CMP), but it had been retrofitted with the HDPE pipe sleeved through it. Water discharged into the stream channel follows the channel to a 13 ft by 7 ft precast concrete culvert that passes through a high embankment that supports railroad tracks and a road; the water continues to a long lagoon on the other (south) side of the railroad embankment and ultimately discharges through a permitted outfall at Crooked Creek farther south. Upgradient (north) of the discharge location in the stream channel below the Thermal Pond dam, a small dam across the channel diverts natural stream flow into an 18-inch diameter spiral polyethylene (SPE) pipe that carries the natural stream flow all the way to Crooked Creek, separating it from the flow of water discharging from the Thermal Pond.

A number of emission control systems have either been upgraded or installed since the plant was first commissioned. The flue gas desulfurization (FGD) system, upgraded in 2007, uses state-of-the-art technology designed to remove 98 percent of the sulfur dioxide (SO<sub>2</sub>) emitted at Keystone, lowering SO<sub>2</sub> emissions by 173,000 tons per year, in addition to approximately 80 percent of the mercury and other emissions. Other upgrades include modifications to the electrostatic precipitators, the addition of a flue-gas conditioning system to improve precipitator performance, a low-nitrogen oxide burner system to reduce NO<sub>x</sub> emissions and installation of a selective catalytic reduction system to further reduce NO<sub>x</sub> emissions.

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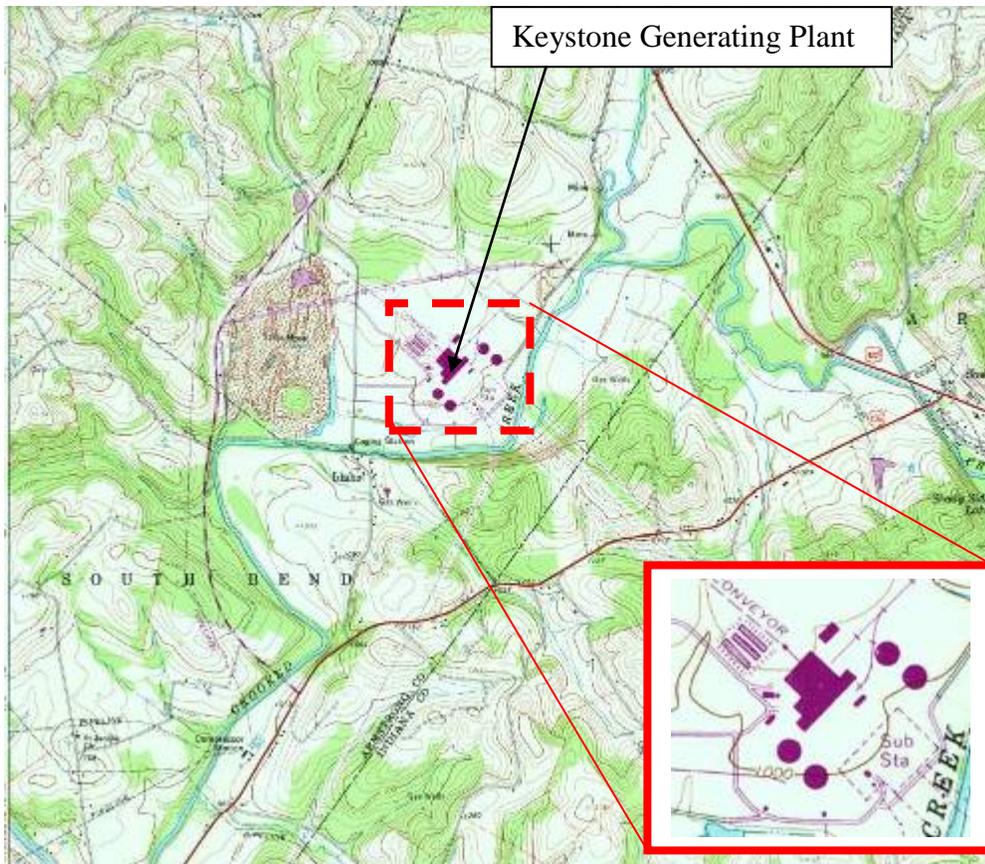


Figure 2.1-1: Keystone Generating Plant Location Plan

Table 2.1 shows a summary of the size and dimensions of the Ash Filter Ponds perimeter dike and Thermal Pond dam.

Table 2.1: Summary of Dam Dimensions and Size		
	Ash Filter Ponds	Thermal Pond
<b>Dam Height (ft)</b>	Varies 0 to 10.5 ft	48 ft
<b>Crest Width (ft)</b>	25 ft	20 ft
<b>Length (ft)</b>	1,420 ft	2,700 ft
<b>Side Slopes (upstream) H:V</b>	2:1	2.5:1
<b>Side Slopes (downstream) H:V</b>	2:1 to 2.5:1 (Typ.) 1.5:1 (Locally)	2:1 Above Berm 1.75:1 Below Berm



Figure 2.1-2: CCR Impoundment (Ash Filter Ponds) on Keystone Generating Plant

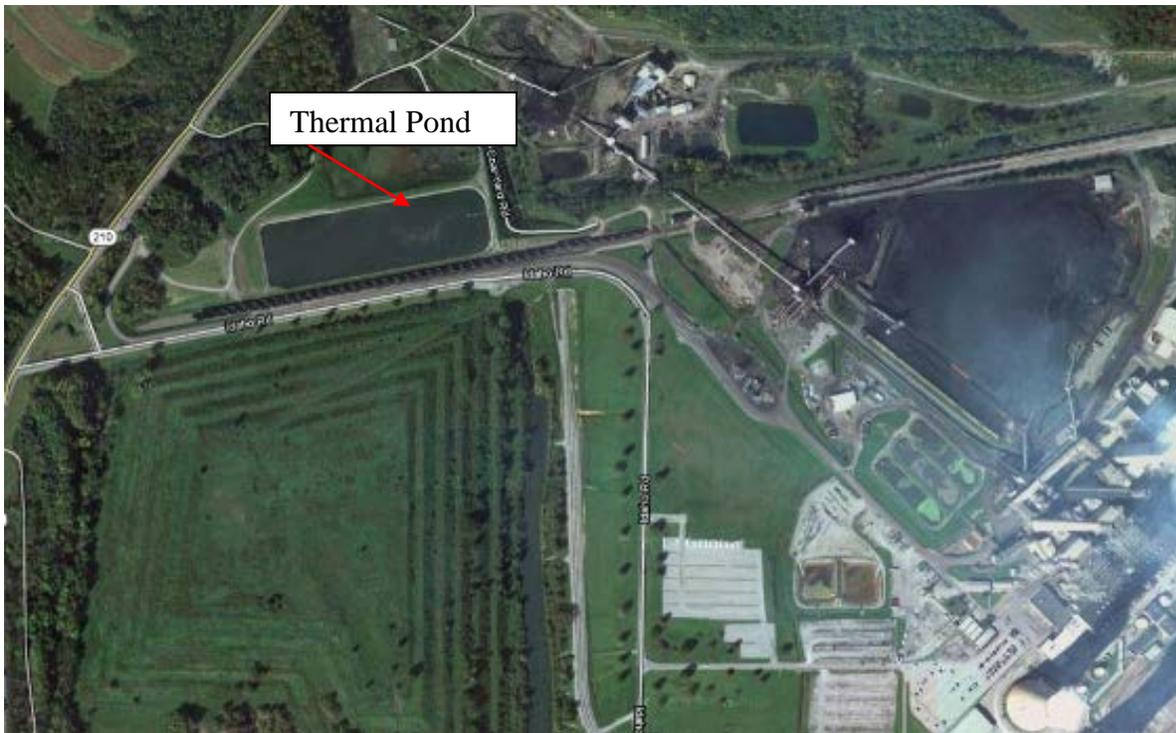


Figure 2.1-3 Thermal Pond location on Keystone Generating Station

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## 2.2 COAL COMBUSTION RESIDUE HANDLING

### 2.2.1 Fly Ash

Fly ash generated through the coal combustion process is collected at the precipitator hoppers and pneumatically conveyed in the dry to storage/load-out bins. After conditioning with some moisture to control dust and to facilitate handling, the fly ash is loaded onto trucks and taken to a landfill on site.

### 2.2.2 Bottom Ash

The bottom ash is sluiced from the four ash hoppers in each of Units 1 and 2 to one of four dewatering bins using 2,600 gpm ash sluice pumps. The dewatering bin overflow and periodic decant water then flows by gravity to the bottom ash filter ponds. The three cells comprising the Ash Filter Ponds are each sized for 50 percent of the bottom ash transport water design flow. Normal operation is two ponds in service at all times, with the third pond being drained, cleaned, and prepared for return to service.

### 2.2.3 Boiler Slag

Boiler slag is not handled separately but included in the bottom ash and therefore treated as bottom ash, which is dewatered in the dewatering bins, loaded onto trucks, and hauled to the on-site landfill for disposal.

### 2.2.4 Flue Gas Desulfurization Sludge

Gypsum produced from the flue gas desulfurization system, which uses wet scrubbers, is dewatered and transported through an enclosed tubular gallery conveyor to a dome covered storage pad. The filtrate from dewatering is sent to the waste water treatment plant. Depending on market conditions and quality, the gypsum is sold to an off-site third party for beneficial reuse or transported and disposed in the on-site landfill.

## 2.3 SIZE AND HAZARD CLASSIFICATION

Size classification per U.S. Army Corps of Engineers (USACE) criteria (ER 1110-2-106) is based on maximum potential storage capacity (of water) or maximum dam height, as shown in Table 2.2a. Either dam height or storage capacity may determine the size classification, whichever gives the larger size. See Tables 2.1 and 2.3 for embankment height and estimated pond storage capacity.

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**Table 2.2a: Size Classification (USACE ER 1110-2-106)**

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

According to the information GenOn provided and the field inspection, the Ash Filter Ponds complex has a maximum storage capacity of 7.3 acre-ft total for the three cells with a maximum dike height of 10.5 ft. In accordance with the USACE ER 1110-2-106 criteria (Table 2.2a), the Ash Filter Ponds complex actually has less than Small size classification considering either dam height or storage capacity, but Small is assumed for purposes of this assessment. The Ash Filter Ponds embankments are not regulated for dam safety by a federal or state agency. Therefore, the Ash Filter Ponds complex does not have federal or state hazard classifications.

The Thermal Pond is regulated for dam safety and permitted with the PA Department of Environmental Resources Bureau of Dams, Waterways and Wetlands Division of Dam Safety (Permit No. D03-044). The Thermal Pond has a maximum storage capacity of 137 acre-ft with a maximum height of 48 ft. In accordance with USACE ER 1110-2-106, the Thermal Pond has an Intermediate size classification on the basis of dam height, and category B size, in accordance with PA dam safety criteria. The impoundment was assigned a hazard potential classification of 3 (equivalent to Low hazard potential) in accordance with PA dam safety criteria in the April 1993 Dam Permit Application for the Thermal Pond (see Appendix A – Doc 2). (Note: It appears that the PA classification of B-3, which was made in 1993, would today be B-4 in accordance with current PA dam safety criteria, which were amended in 2011.)

Hazard potential classification per the FEMA Federal Guidelines for Dam Safety is based on the criteria shown in Table 2.2b.

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Table 2.2b: Hazard Potential Classification (FEMA Federal Guidelines for Dam Safety)		
Hazard Potential 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)

For both the Ash Filter Ponds and the Thermal Pond, loss of human life is not expected, and economic and environmental losses are expected to be minimal or low. If failure occurred, ash residuals would remain on GenOn property. Therefore, in accordance with the Federal Guidelines (Table 2.2b), a **Low** hazard potential classification is given for both the Ash Filter Ponds and the Thermal Pond.

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

Each cell of the Ash Filter Ponds is cleaned out when the ash residuals (sediment) accumulates to a thickness of 4 ft, which is the design allowance. The clean out is done once or twice a year on a rotating basis, with two cells remaining in operation while the third is cleaned out. Thus, the maximum amount of residuals in the Ash Filter Ponds never reaches the value shown for current storage capacity (12.9 acre-ft or 20,796 cubic yards) in Table 2.3 below, or the value shown for maximum storage capacity (the total volume of all three cells from original bottoms to the top of the perimeter dike embankment).

The Thermal Pond receives practically no ash residuals, but it is still checked and cleaned periodically by divers using a suction hose. It is understood that during the last cleaning the divers reported an ash sediment layer on the bottom only 1/16 inch thick.

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**Table 2.3: Estimated Capacity and Other Data for the Unit(s)**

	<b>Ash Filter Ponds</b>	<b>Thermal Pond</b>
<b>Surface Area (acre)<sup>1, 2, 3</sup></b>	2.2	7.12
<b>Current Storage Capacity (cubic yards)<sup>1, 2, 3</sup></b>	20,796	207,407
<b>Current Storage Capacity (acre-feet)</b>	12.9	128.6
<b>Max. Storage Capacity (cubic yards)<sup>1, 2, 4</sup></b>	27,907	221,027
<b>Max. Storage Capacity (acre-feet)</b>	17.3 (Est.)	137
<b>Crest Elevation (feet)<sup>1</sup></b>	1020.5	1020
<b>Normal Pond Level (feet)<sup>1</sup></b>	1018.5	1017

<sup>1</sup>See Appendix A - Doc 1: Part D-Pond/Impoundment Systems and other wastewater treatment operations

<sup>2</sup>See Appendix A – Doc 2: Thermal Pond Dam Permit Application

<sup>3</sup>Water surface area and storage capacity at normal pond level, including volume in incised part of filter ponds

<sup>4</sup>Storage capacity at top of dam level, including volume in incised part of filter ponds

## 2.5 PRINCIPAL PROJECT STRUCTURES

### 2.5.1 Earth Embankments/Ponds

#### Ash Filter Ponds

The Ash Filter Ponds consist of three contiguous cells surrounded by a perimeter dike and separated by two interior divider dikes. Each cell is approximately 90 ft by 410 ft at top of dike embankment elevation, with the long dimension of the cells oriented generally northwest-southeast. The top of embankment elevation (inside edge) varies from 1020.5 ft on the northwest side to 1022.5 ft on the southeast side. The normal water elevation in the cells is 1018.5 ft. The interior side slopes of the cells are 2 horizontal (H) to 1 vertical (V). The perimeter dike embankment is highest at 10.5 ft above the outside toe on the southwest side and has an exterior slope that typically varies from 2H: 1V to 2.5H: 1V but locally is as steep as 1.5H: 1V. The northeast side is fully incised so that there is practically no dike on that side. The height of the perimeter dike embankment on the northwest and southeast sides varies from about 1 ft (northeast end) to 10.5 ft (southwest end). The perimeter dike crest width around the pond is approximately 25 ft, and the typical crest width of the divider dikes is 23 ft.

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As previously mentioned, the Ash Filter Pond cells are clay lined. The permeability of the liner is indicated to be  $1 \times 10^{-7}$  cm/sec. They also include an underdrain system. On the bottom the liner is indicated to consist of the following, in descending order:

1. 18-inch thick on-site clay fill;
2. 8-inch thick bentonite treated ( $2.4 \text{ lb/ft}^2$ ) clay (compacted); and
3. 16-inch thick on-site clay fill.

On the side slopes the liner is indicated to consist of:

1. 24-inch thick (perpendicular to slope) bentonite treated ( $1.8 \text{ lb/ft}^2$ ) clay (compacted in 6-inch thick horizontal lifts).

The liner on the side slopes is protected with an 18-inch thick blanket of small riprap ("R-3 rock").

The underdrain system is indicated to consist of two runs of perforated Schedule 80 PVC pipes, 8-inch diameter increasing to 12-inch in each run, laid just above the 8-inch thick bentonite-treated clay layer along the length of each cell and connecting to 12-inch diameter solid wall Schedule 80 PVC header pipes on the northwest side that drain to the discharge structure in each cell. The perforated pipes are indicated to be encased within No. 57 stone in 2 ft wide trenches extending most of the way through the upper clay fill layer of the liner system, with the stone a minimum of 4 inches thick under the pipe and mounded 6 inches over the pipe. Above the No. 57 stone encased pipes, the bottom is indicated to be covered with 18-inch thick blanket of No. 8 coarse aggregate, in turn covered with a 30-inch thick layer of bottom ash incorporated as the primary filter media.

## Thermal Pond

The Thermal Pond is approximately 328.5 ft wide by 1060 ft long at the top of dam embankment (rim) elevation, with the long dimension oriented generally east-west. The top of embankment (crest) elevation is 1020 ft, and the typical crest width is 20 ft. The normal water surface elevation is 1017 ft. The main embankment section is on the east side of the pond, with a maximum height of 48 feet above the outside toe. The west side is incised and there is essentially no dam embankment height above the outside toe, although the rim is 16 feet above the inside toe. The wide embankment supporting the plant railroad and coal truck road lies

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immediately along the south side of the Thermal Pond and has surface elevations near that of the pond dam embankment crest. The pond embankment crest typically is only 3 to 4 feet above the outside toe ditch between the crest and the adjacent railroad siding but is 16 to 38 ft above the inside toe, due to the sloping bottom of the pond that ranges from elevation 1004 ft at the west end to 982 ft at the east end. Approximately 1/3 of the north side of the pond is much like the west side of the pond. The dam along the remaining part of the north side ranges in height up to a maximum of 38 ft above both the inside and outside toes. This section of dam embankment actually divides a former ash basin into two areas. The south area now comprises the Thermal Pond. The north area was originally planned to be another cooling pond, but the basin was never completely developed for use as a cooling pond and was retired. The retired basin does not now contain CCR.

The interior side slopes of the Thermal Pond are 2.5H: 1V. The main embankment section on the east side has a 12 ft wide berm (access road) on the outside slope between elevation 998 ft and 999 ft. The slope below the berm is 1.75H: 1V. The slope above the berm is shown at 1.75: 1V above the berm on a furnished drawing (D-739-5019) dated January 28, 1993. However, slope stability analysis in the dam permit application dated April 1993 shows the slope above the berm to be at 2H: 1V on the lower part and 3.5H: 1V on the upper part of the section analyzed. The low outside slope above the ditch along the south side is generally 2H: 1V but locally steeper. The outside slope of the embankment on the north side (i.e., inside slope of retired basin) is 2.5H: 1V.

The Thermal Pond has a 50-mil thick high density polyethylene (HDPE) synthetic liner. To protect the liner, a 3-inch thick concrete erosion control revetment is installed on top of the liner on the side slopes and a minimum of two feet of bottom ash is placed on top of the liner on the pond bottom. A nonwoven geotextile and 2-inch thick layer of sand is installed below the liner.

## 2.5.2 Outlet Structures

### Ash Filter Ponds

The outlet for each cell at the Ash Filter Pond complex consists of a 6 ft by 8 ft (plan inside dimensions) by 17.5 ft high concrete riser (discharge structure) and two approximately 38 ft long coated metal weir troughs that

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discharge into the riser from the northeast and southwest sides of the riser. The troughs are fitted with “saw tooth” weirs on each side with notches set at elevation 1018.5 ft. Turbidity curtains are arranged along the upstream (southeast) side of the weir troughs. Water discharges from the bottom of the riser through an 18-inch diameter VTC pipe to a pump station that pumps the water to the Thermal Pond. The discharge structure also receives flow from the underdrain, which is controlled through two 12-inch knife gates mounted to the discharge structure. An adjustable weir gate at the discharge structure allows removal of the pond water when the cell is dewatered for excavation and removal of settled ash.

## Thermal Pond

The outlet for the Thermal Pond consists of a dual chamber riser structure with bottom discharge through an 18-inch diameter HDPE pipe with inlet invert elevation 978.25 ft, which passes through the embankment to a manhole near the toe of the dam. As previously mentioned, the HDPE is sleeved through the original 21-inch diameter CMP. From the manhole the flow passes through a Parshall flume with invert elevation 974 ft before discharging into a creek channel.

The riser structure is 46 ft high from top to foundation level. The original (larger) chamber has plan inside dimensions of 6 ft by 8 ft. The west side of the structure was originally designed for use of stop logs. When the pond was retrofitted for use as a thermal pond, the stop log opening on the west side was filled with concrete to elevation 1016.5 ft, and a smaller chamber with inside dimensions of 3 ft by 4 ft (according to drawings) and an emergency overflow elevation of 1017 ft was constructed on the west side, along with a submerged “launder” that connects to the smaller chamber and draws water from near the bottom of the pond. (Note: In the field the long dimension of the smaller chamber appeared to match that of the larger chamber, so that its inside dimensions appeared to be more on the order of 3 ft by 8 ft.) The launder consists of a 42-inch diameter pipe approximately 60 feet long located 3 feet above the bottom of the pond. On the underside of the launder are a series of orifices that draw the coldest water off the pond bottom into the submerged launder. Water from the launder fills the smaller chamber and overflows into the larger chamber and out the bottom discharge pipe.

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The larger chamber also receives water through the north wall from the 12-inch diameter pipe from the underdrain system, which is controlled with a valve that is operated with a hand wheel on the top of the riser. In addition, there are three drawdown ports at elevations 1006 ft, 995.5 ft, and 985 ft through the south wall of the larger chamber controlled with 8-inch valves operated by hand wheels on the top of the riser. The essential features of the Thermal Pond outlet are shown in the following Figure 2.5.2-1.

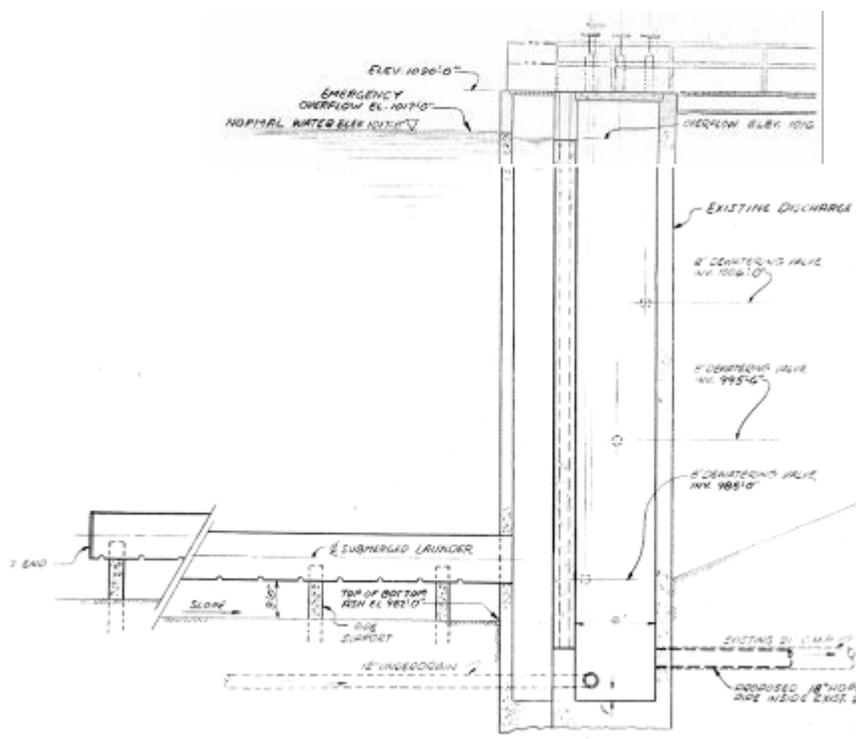


Figure 2.5.2-1 Section view of Thermal Pond outlet.

## 2.6 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

“Critical” infrastructure includes facilities such as schools, hospitals, fire stations, police stations, etc. There appears that one such facility (Pump Station) may be considered critical or potentially critical infrastructure located within a 5-mile radius of the plant (down gradient). The facility is noted on the 5-mile radius map (see Figure 2.6-1). It does not appear that the facility would be threatened or directly impacted by failure of the dikes at the Keystone plant. In general the land use around Keystone is rural. Flood waters and CCR released from a postulated failure of the Ash Ponds perimeter dike and the Thermal Pond would primarily impact GenOn property and not impact the Crooked Creek or the surrounding area.

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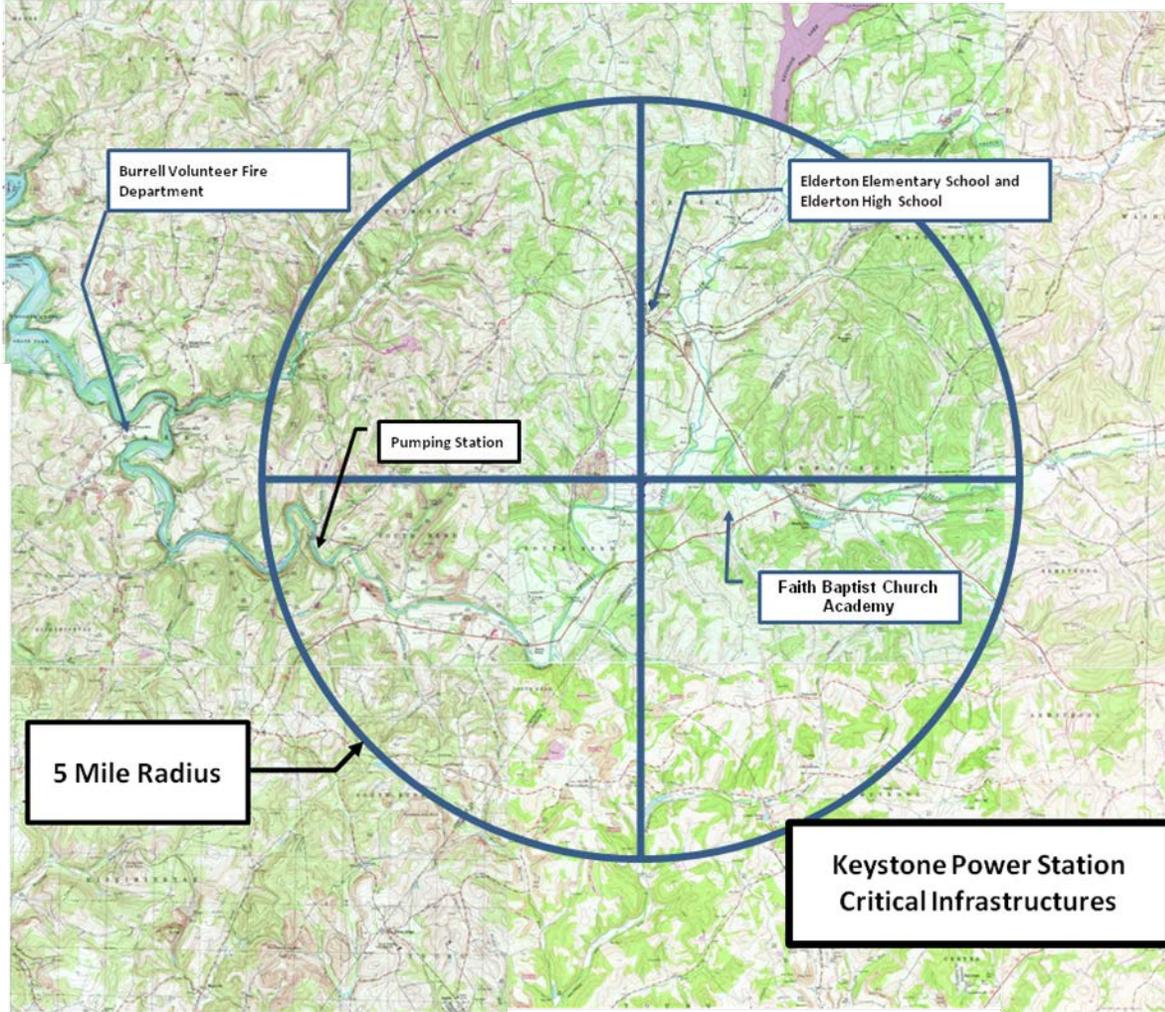


Figure 2.6-1: Critical Infrastructures within a 5 mile radius of the facility.

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## 3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

### 3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

No reports on the safety of the Ash Filter Ponds are available. For the Thermal Pond GenOn provided four Quarterly Dam Inspection Checklist reports that provide documentation of recent inspections performed by station personnel (see Appendix A – Docs 03, 04, 05 and 06).

The reports for the Thermal Pond (aka Cooling Pond “A”) indicate that the dam and associated works appeared overall to be in good condition with only visual monitoring required. Items requiring monitoring are: minor deterioration of concrete revetment; revetment geotextile deterioration; and flowing water observed on the access road bench at right (south) groin area. It was noted that the flow originates along the railroad embankment on the south side.

### 3.2 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

The Thermal Pond dam is permitted by the PA Department of Environmental Protection [known as Department of Environmental Resources (DER) before July 1, 1995], Bureau of Dams, Waterways and Wetlands, Division of Dam Safety, and the dam has been issued a permit. Dam Permit No. D03-044 was issued May 6, 1994 for construction of modifications, and the as-built drawings were accepted by the DER in a letter dated May 3, 1995 (see Appendix A—Doc 07).

Discharge from the impoundment is regulated by the Pennsylvania Department of Environmental Protection (DEP), Bureau of Waste Management, and the impoundment has been issued a National Pollutant Discharge Elimination System Permit. Permit No. PA0002062 was issued February 2008 (see Appendix A – Doc 08).

### 3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

US EPA ARCHIVE DOCUMENT

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## 4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

### 4.1 SUMMARY OF CONSTRUCTION HISTORY

#### 4.1.1 Original Construction

The Keystone Generating Station began commercial operation in 1967 and 1968. Bottom ash was originally sluiced to a large ash disposal basin located northwest of the main plant structures. This basin is now occupied by the Thermal Pond (Cooling Pond A) in the south part and the retired basin (uncompleted Cooling Pond B that was never put into service) in the north part.

#### 4.1.2 Significant Changes/Modifications in Design since Original Construction

The Ash Filter Ponds went into service in 1989 and presumably eliminated the need for sluicing bottom ash to the former ash disposal basin. The overflow from the three cells originally went to an 18-inch diameter header pipe that discharged by gravity flow to the Keystone lagoon.

In 1992 the owner of the power plant entered into a Consent Order and Agreement (COA) with the PA Department of Environmental Resources to establish a schedule for design and construction of facilities necessary to meet effluent thermal limitations. This required re-routing the bottom ash filter pond discharge from the Keystone lagoon by pumping the discharge from the Ash Filter Ponds to a new Thermal Pond constructed in the south part of the former bottom ash disposal basin. The Thermal Pond retrofit construction was completed in December 1994, and the pond went into service shortly thereafter (see Appendix A - Doc 02 Dam Permit Application). Prior to retrofit construction, ash in the old ash disposal basin had been excavated and removed. The new design allows the Thermal Pond to normally discharge the coldest water from near the bottom of the pond through a new submerged launder that is integrated into the existing discharge structure as previously described (see Subsection 2.5.2).

#### 4.1.3 Significant Repairs/Rehabilitation since Original Construction

No documentation was provided to indicate any significant repair/rehabilitation has taken place since the original construction.

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## 4.2 SUMMARY OF OPERATIONAL PROCEDURES

### 4.2.1 Original Operational Procedures

Furnished documents do not include the original operational procedures related to wet disposal or storage of CCR when the plant was first commissioned. However, the original bottom ash disposal basin presumably was designed and operated for bottom ash sedimentation and control. The basin received coal combustion waste slurry and plant process waste water. The water was treated via sedimentation and discharged through overflow outlet structures (decant towers) fitted with stop logs to control the water level as the basin filled with bottom ash (and boiler slag) sediment. Fly ash has been handled in a dry state since original startup (see Subsection 2.2.1).

### 4.2.2 Significant Changes in Operational Procedures since Original Startup

Operational procedures have changed in that bottom ash is no longer sluiced to a large ash disposal basin for sedimentation. Since 1989 the bottom ash has been dewatered in dewatering bins and landfilled. Filtrate from the dewatering operation is sent to the Ash Filter Ponds for treatment by sedimentation. Since 1994 the discharge from the Ash Filter Ponds has received thermal treatment by pumping it to the Thermal Pond and allowing the water to cool to an acceptable temperature before discharging it to the Keystone lagoon. Another change is the relatively recent addition of the FGD system, which became operational in 2009. However, no wet ponds are associated the handling or disposition of CCR (Gypsum) from this system (see Subsection 2.2.4).

### 4.2.3 Current Operational Procedures

Current operations related to handling of CCR at the Keystone plant are briefly described in Section 2.2, and current general operations related to the ponds are inherent in the changes in operations described above (Subsection 4.2.2). Additional information on current operations is included in the project description in Section 2.1.

### 4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry concerning notable events impacting the operation of ash disposal activities.

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## 5.0 FIELD OBSERVATIONS

### 5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Fred Tucker, P.E. and Edward Farquhar performed a site visit on September 13, 2012 in company with the participants listed in Section 1.3.

The site visit began at 9:00 AM. The weather was sunny with temperatures in the high 70's. Photographs were taken of conditions observed. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit. Please refer to the Dam Inspection Checklists in Appendix B.

The overall visual assessment of the Ash Filter Pond dikes and the Thermal Pond dam is that they were in satisfactory condition and no significant findings were noted.

### 5.2 EARTH EMBANKMENT 1 (ASH FILTER POND)

#### 5.2.1 Crest

The gravel-surfaced crest of the embankment was observed to have no significant 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 most significant section of the perimeter dike embankment.



Figure 5.2.1-1 Crest and outside slope of Ash Filter Ponds – southwest side viewed northwest (highest embankment, next to Pond A).

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Figure 5.2.1-2 Crest and inside slope of Ash Filter Ponds – southwest side viewed southeast (highest embankment, next to Pond A).

## 5.2.2 Upstream/Inside Slope

The visible parts of the inside slopes of all the cells within the Ash Filter Pond complex above the waterline appeared stable with no signs of significant erosion. The R-3 rock covering the clay liner on the slopes was observed to have some grass and weed growth and grass was observed to cover the upper slope near the crest. There were no observed scarps, sloughs, bulges, cracks, depressions or other indications of slope instability. Typical views of the inside slopes are shown in the following Figure 5.2.2-1 and Figure 5.2.1-2 above.



Figure 5.2.2-1 Typical inside slope – northwest side of Ash Filter Ponds viewed northeast (next to Pond A).

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## 5.2.3 Downstream/Outside Slope and Toe

The outside slope of the dike embankment was observed to have a well-established cover of grasses/weeds, which were quite tall on the most significant section of the perimeter dike embankment. No obvious scarps, sloughs, bulges, cracks, depressions or other indications of slope instability were observed along the slope, although the tall growth on the main slope obscured observations for these conditions. There were no signs of significant erosion and no signs of seepage. Figures 5.2.3-1 and 5.2.3-2, as well as Figure 5.2.1-1, show representative views of the outside slope of the most significant embankment sections of the dike embankment.



Figure 5.2.3-1 Outside slope and toe of highest embankment – southwest side of Ash Filter Ponds viewed southeast (next to Pond A).

Two animal holes were observed in the outside slope. One hole was observed on the lower part of the main dike embankment slope (southwest side), as shown in Figure 5.2.3-3. The other was observed near the top of the outside slope on the southeast side of the ash Filter Ponds, approximately in line with the divider dike between Ponds A and B.

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Figure 5.2.3-2 Outside slope and paved ditch below the toe of the perimeter dike embankment – southeast side viewed northeast (next to Pond A).



Figure 5.2.3-3 Animal hole in lower part of outside slope of perimeter dike embankment on southwest side of Ash Filter Ponds (next to Pond A).

## 5.2.4 Abutments and Groin Areas

Because the ponds are contained within a perimeter dike system, there are no real groins on the exterior sides, although there is a slight groin at the west corner, where the exterior grade drops down from the northwest side to the southwest side, as shown in Figure 5.2.4-1. There were no signs of instability, erosion, or seepage in this groin area.



Figure 5.2.4-1 Groin area at the west corner of the Ash Filter Ponds

## 5.3 EARTH EMBANKMENT 2 (THERMAL POND)

### 5.3.1 Crest

The gravel-surfaced crest of the main dam embankment that occurs on the east side of the Thermal Pond was observed to have no significant depressions, tension cracks or other indications of settlement or shear failure. Figure 5.3.1-1 shows the typical crest conditions along the main dike embankment.



Figure 5.3.1-1 Crest of the Thermal Pond – viewed north.

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## 5.3.2 Upstream/Inside Slope

The visible parts of the inside slopes of the Thermal Pond appeared stable and well maintained. The three-inch thick concrete erosion control revetment that protects the underlying HDPE liner system appeared to be in overall satisfactory condition with only minor deterioration and minor growth of vegetation in the revetment. The pool was at the normal operating elevation 1017 ft, consequently only 3 ft (vertically) of the inside was visible during the site visit. There were no observed scarps, sloughs, bulging, cracks, depressions or other indications of slope instability. Figure 5.3.2-1 shows a typical view of the Thermal Pond inside slope. Black pipes observed sticking up through the revetment at regular intervals appeared to be pressure relief vents.



Figure 5.3.2-1 Typical upstream (inside) slope of Thermal Pond – north side viewed east.

## 5.3.3 Downstream/Outside Slope and Toe

The outside slope of the Thermal Pond main dam embankment appeared to have a satisfactory cover of grasses/weeds. Figure 5.3.3-1 shows an overall view of this slope. No significant erosion was observed. A gravel-surfaced access road extends along a berm at approximately mid-height of the slope. The cover of grasses/weeds on the slope above the access road is relatively well maintained, as shown in Figure 5.3.3-2. The cover of grasses/weeds on the slope below the access road was observed to be higher, suggesting less maintenance. A minor apparent seep area was noted along the edge of the access road and in the ditch at the base of the

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slope above the south part of the access road (see Figure 5.3.3-1). Dam inspection reports have reported the seep. No scarps, sloughs, significant bulges, cracks, depressions or other indications of slope instability were observed along the slope. The outside slope of the dam embankment on the north side of the Thermal Pond was observed to have a tall thick growth of grasses/weeds, as shown in Figure 5.3.3-3. Although the grasses/weeds did not appear to be as well maintained as on the main embankment section on the east side, this slope also appeared stable and free of significant erosion. It is noted that this slope forms the south inside slope of the retired basin on the north side of the Thermal Pond. Several animal holes were noted all along the upper part of the outside slope of the low embankment on the south side of the Thermal Pond. A view of one animal hole shown in Figure 5.3.3-4 is typical.

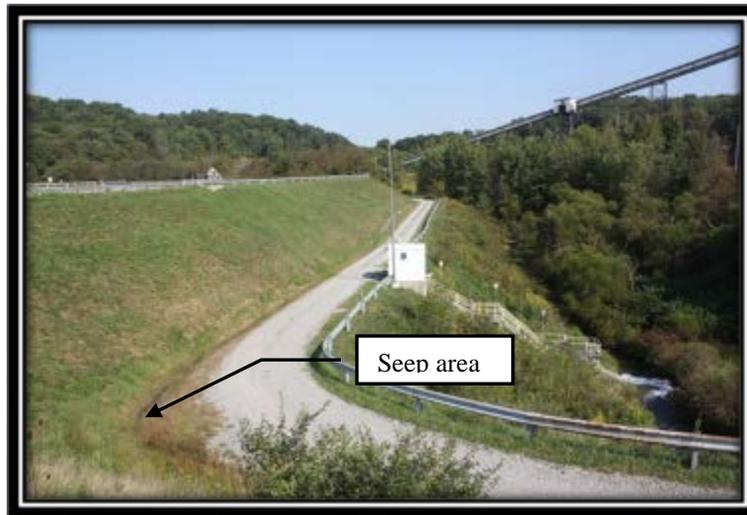


Figure 5.3.3-1 Outside slope and seep area of main embankment dam impounding the Thermal Pond – east side viewed north.

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Figure 5.3.3-2 Outside slope above access road berm – viewed north.



Figure 5.3.3-3 Outside slope of embankment dam on north side of Thermal Pond, which forms south inside slope of retired basin on the north side of the Thermal Pond– viewed east.

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Figure 5.3.3-4 One of several animal holes observed at top of outside slope of low embankment on south side of Thermal Pond – viewed north.

## 5.3.4 Abutments and Groin Areas

There were no obvious scarps, sloughs, bulges, cracks, depressions or other indications of slope instability at the principal dam abutment and groin areas located at the south end of the main (east) dam embankment of the Thermal Pond, although tall vegetation obscured observation for these conditions just beyond the abutment contact. No erosion was observed. The previously noted seep area extends to the abutment contact and base of the groin above the access road.



Figure 5.3.4-1 Groin area at south end of the east side main embankment dam above access road berm – viewed west.

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## 5.4 OUTLET STRUCTURES

### 5.4.1 Outlet Structures (Ash Filter Ponds)

The visible parts of the outlet structures for the Ash Filter Ponds (all three Cells) above waterline were observed to be in generally satisfactory condition. A view of the Pond B outlet structure shown in Figure 5.4.1-1 is typical. The metal skimmers located in front of the weir troughs appeared to be functioning properly in keeping floating matter from entering the weirs and discharge structures. It was observed that grass and weeds tend to encroach into the weir troughs, most significantly at the Pond C outlet.



Figure 5.4.1-1 Typical outlet structure for Ash Filter Ponds – Pond B outlet viewed southwest.

### 5.4.2 Outlet Structure (Thermal Pond)

The visible part of the outlet structure above the waterline at the Thermal Pond was observed to be in generally satisfactory condition, although the gate operator stands and handwheels for the 8-inch drawdown valves and the 12-inch valve for the underdrain discharge pipe appeared to be in need of maintenance. An overall view of the top of the outlet structure and the access footbridge is shown in Figure 5.4.2-1. The footbridge appeared to be in satisfactory condition. The corroded operators for the drawdown valves are shown in Figure 5.4.2-2. The operator for the underdrain discharge pipe valve has a similar appearance. The discharge from the Thermal Pond appeared to be clear flowing, as shown in Figure 5.4.2-3.

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The water in the stream channel below the discharge point was observed to flow into a large concrete culvert under the high fill embankment that supports the plant railroad tracks and haul road, as shown in Figure 5.4.2-4. A view of the old decant tower in the adjacent retired basin is shown in Figure 5.4.2-5; this is the type of outlet structure that was modified into the dual chamber outlet structure for the Thermal Pond.



Figure 5.4.2-1 Thermal Pond outlet structure – viewed southwest from main embankment dam on east side of Thermal Pond.



Figure 5.4.2-2 Surface corrosion on gate operators for the three drawdown valves on the south side of the Thermal Pond outlet structure.

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Figure 5.4.2-3 Thermal Pond discharge from Parshall flume at end of outlet pipe.



Figure 5.4.2-4 Stream channel flow between discharge point and large culvert through high railroad/roadway embankment a short distance downstream (south).



Figure 5.4.2-5 View of decant tower (outlet structure) in retired basin adjacent to the north side of the Thermal Pond.

#### 5.4.3 Emergency Spillway

Not applicable; no emergency spillway exists at this facility.

#### 5.4.4 Low Level Outlet

As previously noted, the Thermal Pond water surface can be drawn down to three different levels, the lowest being elevation 985 ft (3 ft above the bottom at the outlet structure), by means of 8-inch valves actuated by rising stems controlled by handwheels at the operator stands on the top deck of the outlet structure. The valves, stems, stem guides, etc. are located on the inside of the structure but could not be easily accessed for observation. As previously described, the operator stands and handwheels were observed to be corroded (see Figure 5.4.2-2).

## 6.0 HYDROLOGIC/HYDRAULIC SAFETY

### 6.1 SUPPORTING TECHNICAL DOCUMENTATION

#### 6.1.1 Flood of Record

No documentation has been provided about the flood of record. However, neither the Ash Filter Ponds nor the Thermal Pond receives off-site drainage. The water levels in the ponds are controlled more by plant process than by flood events. Thus, a flood of record for the ponds is not applicable.

In addition, there are no reported instances of plant operational problems that would have caused the pond water levels to significantly exceed the normal water levels.

#### 6.1.2 Inflow Design Flood

The Ash Filter Ponds and the Thermal Pond at the Keystone Generating Station do not receive uncontrolled inflows from off-site. For such ponds that are totally contained within a perimeter dike system, safe containment of water within the ponds is provided by maintaining sufficient freeboard to contain 100 percent of design precipitation over the pond areas. The design precipitation amounts may be determined as discussed below for each pond facility.

Ash Filter Ponds – For the “small” size and “low” hazard potential classification assigned to the Ash Filter Pond dike, the USACE hydrologic evaluation guidelines (ER-1110-2-106 26 Sept 1979 “Recommended Guidelines for the Safety Inspection of Dams”) recommend a spillway design flood (SDF) of 50-year to 100-year frequency, where the magnitude selected most closely relates to the involved risk. For comparison, the Pennsylvania Dam Safety Regulations (amended 2011) require the same SDF (50-year to 100-year frequency) for dams classified C-4, which is equivalent to the small size, low hazard potential classification. The precipitation depths for 24-hour duration at the Ash Filter Ponds coordinates are 4.64 inches and 5.19 inches for 50-year frequency and 100-year frequency, respectively, from the National Weather Service’s on-line Precipitation Frequency Data Server, which gives point precipitation frequency estimates from “Precipitation-Frequency Atlas of the United States” NOAA Atlas 14, Volume 2, Version 3.

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Thermal Pond – For the “intermediate” size and “low” hazard potential classification assigned to the Thermal Pond dam, the USACE hydrologic evaluation guidelines recommend a SDF of 100-year frequency to 1/2 probable maximum flood (1/2 PMF). For comparison, the Pennsylvania Dam Safety Regulations require the same SDF (100-year frequency to 1/2 PMF) for dams classified B-4, which is equivalent to the intermediate size, low hazard potential classification. The precipitation depth for 24-hour duration at the Thermal Pond coordinates is 5.17 inches for the 100-year frequency from the National Weather Service’s on-line Precipitation Frequency Data Server; the 24-hour duration probable maximum precipitation (PMP) from Hydrometeorological Report No. 51 (HMR-51) is 32 inches, and 1/2 PMP is 16 inches.

### 6.1.3 Spillway Rating

No spillway rating was provided for the outlet structures at the Ash Filter Ponds and the Thermal Pond. However, no outfall is assumed in the assessment in Section 6.3

### 6.1.4 Downstream Flood Analysis

Ash Filter Ponds – No downstream flood analysis has been provided for the Ash Filter Ponds. A qualitative analysis based on field observations and review of available data is as follows:

Failure of the low perimeter dike impounding the 2.2-acre Ash Filter Ponds would discharge coal combustion residue onto surrounding plant property. A failure would most likely be of only one cell, which contains only a third of the total volume of the Ash Filter Pond complex or less than 4.3 acre-ft. The failure would not be expected to cause loss of life but would cause minor onsite environmental damage. Due to the low head above outside grade and low volume of water and coal combustion residue, the water and material released would most likely be entirely contained within the plant boundaries and likely would not reach Crooked Creek located 0.4 mile away. Any ash sediment that is carried with the water would mostly be deposited in the immediately adjacent areas, especially a low area on the southeast side. The preferential direction of flow of water leaving the vicinity of the Ash Filter Ponds would be toward lowest ground to the southwest. If the water flows far enough before being diminished by the increasing overland flow distance, entrapment in local surface depressions, and infiltration, it would be intercepted by

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drainage ditches that lead to the Keystone Lagoon, which is the final holding area for all plant site drainage before water is discharged to Crooked Creek.

Thermal Pond – In the April 1993 Dam Permit Application prepared by Gilbert/Commonwealth, Inc. for the Thermal Pond dam, a conservative dam break analysis was provided (see Appendix A – Doc 2). In that analysis it was assumed that 5.6 million cubic feet of water stored at normal operating level in the Thermal Pond (Cooling Pond “A”) would be released due to instantaneous dam failure, causing water to pond behind the culvert through the high railroad/roadway embankment (see photograph in Figure 5.4.2-4). Using the average end area method the elevation to which the water would rise along the confined reach of the stream channel was determined to be approximately elevation 1012 ft, which is below the top of the railroad/roadway embankment (by some 7 ft) and below the elevation of State Route 210 located upgradient along the stream channel. A map showing the inundation area was provided, and it was noted that there are “no inhabitants residing in the proposed area of inundation.” Presumably this conservative analysis assumed no flow through the culvert. Actually, water would flow through the 13 ft wide by 7 ft high culvert and the extent of inundation would not reach even the relatively small limits shown on the inundation map. Also, the culvert would serve to attenuate flow downstream, so that there would be no flood wave. Since there essentially is only trace amounts of CCR in the Thermal Pond, no significant environmental damage would be expected, other than perhaps bank erosion along the on-site stream channel to the Keystone Lagoon on the other side of the railroad/roadway embankment.

## 6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

No rigorous or even simple hydrologic/hydraulic analyses have been provided for the Ash Filter Ponds, but simple hydrologic/hydraulic analyses have been provided for the Thermal Pond. For ponds that are totally contained within perimeter dike systems and do not receive uncontrolled off-site drainage, rigorous analyses of natural flooding events are not warranted. In the April 1993 Dam Permit Application for the Thermal Pond dam a simple hydrologic/hydraulic analysis, which examined the ability of the pond to safely contain 100 percent of the design precipitation depth over the pond area, was provided. This simple analysis is discussed in the following assessment, along with a similar simple analysis of the Ash Filter Ponds, which was made for purposes of this assessment. Since rigorous

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analyses are not warranted and simple analyses provide sufficient information for assessment, the supporting technical documentation is generally adequate for the Thermal Pond but inadequate for the Ash Filter Ponds. Although Dewberry has provided a simple analysis for assessing the hydrologic safety of the Ash Filter Ponds, formal documentation of the hydrologic/hydraulic safety of the Ash Filter Ponds should be developed by GenOn and maintained on file for record purposes.

## 6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Ash Filter Ponds – By inspection, the Ash Filter Ponds appear to have adequate hydrologic safety for the design precipitation depths given in Subsection 6.1.2, since there currently is more than sufficient flood storage volume available between the normal operating water level and the crest elevation of the impounding perimeter dike. That is, the normal freeboard is maintained at 2 ft in the ponds and the design precipitation depth at the high end of the design range (100-year frequency) is 5.19 inches or 0.43 ft, which is much less than the available freeboard, indicating there is ample available surcharge storage for safe containment of the design precipitation over the pond area, including runoff from the crest areas (which are graded to drain into the ponds) and conservatively assuming no outflow. The Ash Filter Ponds should continue to have adequate hydrologic safety unless the average surface elevation of ash sediment is allowed to build up to approximately the design precipitation depth below the crest elevation; however, because of the periodic maintenance cleaning of the ash sediment in the ponds, the sediment level should never reach such a high level and most likely would never be allowed to build up above the normal operating level.

Thermal Pond – The hydrologic/hydraulic analysis given in the April 1993 Dam Permit Application for the Thermal Pond dam (see Appendix A – Doc 2) is similar to the analysis described above and demonstrates that the Thermal Pond has adequate hydrologic safety for the design precipitation depth, taken as the upper limit of the design range (1/2 PMP), i.e., 16 inches. It was noted, “The only stormwater that enters the cooling ponds is the precipitation that falls directly on the ponds’ surface area.” (Note: At the time it was anticipated that the adjacent basin, now retired, would be developed as a second cooling pond.) It was further noted, “The ponds are designed for three feet of freeboard and therefore, easily accommodate the recommended design flood.”

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## 7.0 STRUCTURAL STABILITY

### 7.1 SUPPORTING TECHNICAL DOCUMENTATION

#### 7.1.1 Stability Analyses and Load Cases Analyzed

Ash Filter Ponds – No slope stability analyses were provided for the 10.5 ft maximum height dike embankment impounding the Ash Filter Ponds.

Thermal Pond – Slope stability analyses of the Thermal Pond dam are briefly discussed in the April 1993 Dam Permit Application prepared by Gilbert/Commonwealth, Inc. (see Appendix A – Doc 2). The maximum height section, represented by the east side dam, was analyzed by both the sliding block method and the slip circle method. It was indicated that the critical circle was determined by computer using the Modified Bishop method of analysis.

Only the downstream slope was analyzed, apparently because it is higher and steeper than the upstream slope and because the rapid drawdown case is not applicable, since the pond is lined and there should be no drawdown effects on the upstream slope if the liner functions properly. In addition, no flood case was analyzed, again probably because the pond is lined and the elevated water level would have no potential impact on the phreatic surface in the dam embankment. The cases analyzed were:

1. Static loading with normal pond water surface at El. 1017 ft; and
2. Seismic loading with maximum horizontal acceleration ( $a_{\max} = 0.1g$ ).

The source document (1993 Dam Permit Application) does not provide a description of the seismic analysis or the basis of the horizontal acceleration, other than it was assumed “conservatively.” It is presumed that the seismic stability was analyzed by the pseudo-static method<sup>1</sup> using a seismic coefficient ( $k_h$ ) =  $a_{\max}/g = 0.1g/g = 0.1$ , to determine the equivalent static force on the slope.

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<sup>1</sup> The pseudo-static method is a simplified method for determining seismic slope stability that is based on the same approach (i.e., limit equilibrium) used in analyzing static slope stability. In current practice, the pseudo-static method of analysis is used primarily as a screening tool to help assess whether an embankment dam or slope requires a more detailed seismic slope analysis. The pseudo-static method ignores cyclic loading of the earthquake, but accounts for the seismic force by applying an equivalent static force on the slope. In the limit equilibrium approach the stress-strain relationship of the soil is not considered, so the method should not be used for sensitive clays and other materials that lose shear strength during an earthquake or loose soils located below the groundwater table subject to liquefaction.

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The embankment geometry analyzed was as follows:

1. 2.5H: 1V slope up from U/S toe at El. 982 ft to crest at E. 1020 ft;
2. 20 ft wide crest at El.1020 ft;
3. 3.5H: 1V slope down to El. 1014 ft;
4. 2H: 1V slope down to 12 ft wide berm at El. 1000 ft; and
5. 1.75H: 1V slope down to D/S toe at El. 973 ft.

## 7.1.2 Design Parameters and Dam Materials

The design properties and parameters used in the slope stability analyses for the Thermal Pond dam are shown in Table 7.1. The embankment fill is indicated to consist of predominantly clayey sand with rock fragments (Unified Soil Classification of SC). It appears that the strength parameters used for the embankment fill were taken between tested values of the drained and undrained strength parameters, whereas the strength parameters for the foundation materials were taken as the estimated undrained strength parameters. The upper, relatively thin foundation layer was indicated to be sandy clay (CL), and the lower foundation layer was indicated to be weathered rock.

<b>Table 7.1: Design Properties and Parameters of Materials used in the Slope Stability Analyses</b>			
<b>Material</b>	<b>Effective Unit Wt. (pcf)</b>	<b>Shear Strength Parameters</b>	
		<b>C (psf)</b>	<b>Ø (deg)</b>
Embankment (SC)	125	240	28
Foundation (CL)	72	1,250	0
Foundation (Weath. Rock)	85	8,000	0

*See Appendix A - Doc 02 for source of information in this table.*

A total of 12 borings and 9 test pits had been made in the area of the then proposed cooling ponds. Four borings were drilled in or near the dam embankment on the east side of the Thermal Pond (Cooling Pond A). The results of these borings were used to develop the model profile for the slope stability analyses. The borings indicate that the embankments consist of typically firm clayey sand with rock fragments and stiff to very stiff sandy silt and clay with rock fragments. The top of rock was encountered at elevations ranging from 971.5 ft to 962 ft. The rock is indicated to slope at a 20H: 1V grade toward the stream at the toe of the dam.

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## 7.1.3 Uplift and/or Phreatic Surface Assumptions

Since the Thermal Pond is lined, no phreatic surface was assumed to develop in the dam embankment. However, the design groundwater level was assumed to occur along the top of the upper foundation soil layer that consists of sandy clay.

## 7.1.4 Factors of Safety and Base Stresses

The computed factors of safety for the static and seismic load cases analyzed for the outside slope of the critical section of the main dam embankment on the east side of the Thermal Pond are shown in the Table 7.3 below. The analyses did not indicate what factor of safety (FS) criteria were adopted for design. Conventional minimum FS criteria are 1.5 for static long-term stability and 1.0 for earthquake (seismic) stability (by pseudo-static method). As shown in Table 7.3, the results of both the sliding block and slip circle methods of analyses exceed these minimum FS criteria.

<b>Table 7.3: Slope Stability Factors of Safety (Outside Slope) – Most Critical Section</b>		
<b>Load Case</b>	<b>Calculated Minimum Factor of Safety (FS)</b>	
	<b>Sliding Block Method</b>	<b>Slip Circle Method</b>
1. Static	3.63	1.79
2. Seismic – 0.1g Horiz Acceleration	1.74	1.35

*See Appendix A - Doc 02 for source of information in this table.*

## 7.1.5 Liquefaction Potential

There was no documentation provided to Dewberry that included an evaluation of potential liquefaction at either the Ash Filter Ponds or the Thermal Pond. However, analyses of potential liquefaction do not appear to be warranted. The subsurface information available for the Thermal Pond dam indicates that the foundation soils typically consist of stiff to very stiff silty clay with shale fragments, underlain by weathered shale; these materials would not be susceptible to liquefaction. Furthermore, the borings indicate that the overlying dam embankment typically consists of well compacted clayey sand with rock fragments, which also would not be susceptible to liquefaction. Specific boring information was not provided

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for the Ash Filter Ponds. However, since these ponds are located outside the floodplain of Crooked Creek, it is expected that the subsurface conditions at the Ash Filter Ponds are similar to those at the Thermal Pond dam and would likewise not be susceptible to liquefaction.

## 7.1.6 Critical Geological Conditions

Geology and Soil Survey information are briefly discussed in the 1993 Dam Permit Application for the Thermal Pond dam (see Appendix A – Doc 2). The permit application references the “Geologic Map of Pennsylvania,” prepared by the Pennsylvania Topographic and Geologic Survey (1980), which indicates that the formation underlying the area of the Thermal Pond site is the Glenshaw Formation of Pennsylvanian Age. “The Glenshaw Formation is described as cyclic sequences of shale, sandstone, red beds, and then limestone and coal. It also includes four marine limestone or shale horizons. The red beds are involved in landslides and the base is at the top of Upper Freeport Coal.”

The permit application also references the “Soil Survey of Armstrong County, Pennsylvania,” Sheet Numbers 68 and 73, which maps the area with the symbol Sm, denoting strip mines. “Strip mines consist of sandstone, boulders, fractured shale, and some soil material that has been disturbed by mining operations. Slopes range from nearly level to very steep.”

As previously mentioned, borings drilled at the main dam on the east side of the Thermal Pond encountered silty clay foundation soils over weathered shale. The weathered shale could be penetrated only approximately 3 to 5 feet before encountering auger refusal. Some of the weathered shale was indicated to be wet or saturated.

Hazards associated with the geology of the region include the potential presence of old mine tunnels in former coal seams or possibly solution voids in the limestone layers and risk of landslides in redbeds exposed in natural slopes or in manmade cut slopes.

Seismicity – The Keystone Generation Station is located in a region of relatively low seismic hazard, based on internet review of published information concerning seismicity in this part of Pennsylvania. From the USGS Interactive Deaggregation website, based on the USGS Seismic-Hazard Maps for Central and Eastern United States, dated 2008, the Ash Filter Ponds and the Thermal Pond are at locations anticipated to

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experience 0.051g peak (horizontal) ground acceleration (PGA) with a 2-percent probability of exceedance in 50 years (2,475-year exceedance return time), assuming uniform firm-rock site conditions, i.e., a site with average shear wave velocity of 2,500 feet per second (fps) in the upper 100 feet below the ground surface.

## 7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Ash Filter Ponds – No structural stability documentation has been provided for the Ash Filter Ponds dike. Therefore, the supporting technical documentation for slope stability is inadequate. However, rigorous analyses of slope stability for the low (10.5 ft maximum height) dike with low hazard potential are not warranted. Simple analysis of slope stability through conservative use of slope stability charts and by analogy, as discussed in the following Section 7.3, should be sufficient for making a preliminary assessment of the structural stability of the Ash Filter Ponds containment dike. Formal documentation of stability of the Ash Filter Ponds dike should be developed and maintained on file for record purposes.

Thermal Pond – The provided structural stability documentation for the Thermal Pond dam is limited in explanation of the rationale of the analyses and the source of some information used in the analyses but is generally adequate for this low hazard dam impounding a lined pond. However, it is noted that the slope geometry analyzed is not the same as that (Section 4-4) shown in a drawing (D-739-5019, Rev 0) submitted with the “Initial Issue” drawings “for PADER Permit Only 01-28-93.” Section 4-4 represents the maximum height section of the Thermal Pond dam, and it shows a 1.75H: 1V slope above the access road berm, rather than the 3.5H: 1V/ 2H: 1V broken-back slope shown in the analysis section for slope stability. Since the analyses were submitted in the permit application dated April 1993, after the “Initial Issue” drawings, the analysis section possibly was based on an actual field survey, rather than what was shown in old drawings, but there is no explanation of the source of the analysis section in the permit application. In the field, the upper part of the slope did not appear to be as flat as the 3.5H: 1V section shown on the analysis section; the slope above the berm appeared to be on the order of 2H: 1V and only slightly flatter near the top. Because of the discrepancy, the actual slope geometry should be verified and, if the actual slope geometry is steeper than analyzed in the existing slope stability documentation, a revised slope stability analysis should be performed to verify that acceptable safety margins exist.

The design strength parameters used for the dam embankment are reasonable for the clayey sand used in the embankment construction. It is noted that the computed minimum factors of safety shown in Table 7.3 are based on “undrained” strength

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parameters for the silty clay foundation soil immediately underlying the embankment, which would be appropriate for “end of construction” conditions. However, the provided documentation noted that the analyses were re-run using effective (“drained”) strength parameters, which would be appropriate for long-term “steady state” conditions, and the computed factors of safety were noted to be higher than reported in the table, but the actual values were not given.

Based on the previous review of seismicity of the area (see Subsection 7.1.6), the seismic coefficient assumed in the seismic (pseudo-static) stability analysis is considered conservative and appears to represent an event greater than 2,475-year event.

## 7.3 ASSESSMENT OF STRUCTURAL STABILITY

Ash Filter Ponds – Structural stability of the Ash Filter Ponds containment dike appears satisfactory based on the simple stability evaluation described below and the absence of visual evidence of stability problems in the field.

The Ash Filter Ponds are located outside the floodplain of Crooked Creek in geology similar to that at the Thermal Pond. The Thermal Pond dam embankment soils have unit weight and shear strength parameters as follows: unit weight ( $\gamma$ ) of 125 pcf, cohesion (C) of 280 psf and internal friction angle ( $\phi$ ) of 28 degrees. The Ash Filter Ponds dike embankment soils could reasonably be expected to have similar unit weight and strength parameters. However, for conservatism it is assumed that the Ash Filter Ponds dike embankment only has C = 280 psf and no friction ( $\phi = 0$ ). From a stability chart for cohesive soils in NAVFAC DM-7.1, a Soil Mechanics Design Manual, Department of the Navy, Naval Facilities Engineering Command (1982), a FS = 1.56 is computed for a 10.5 ft high slope on a firm base and assuming 1.5H: 1V slope, the steepest slope, which occurs only locally along the dike (2H: 1V is more typical). A similar exercise using a stability chart for soils having both  $\phi$  & C in the original NAVFAC DM-7 (1971) yields a FS = 1.60, conservatively assuming the shear strength parameters for the Ash Filter Ponds dike are 2/3 of the values for the Thermal Pond dam. Furthermore, since the Thermal Pond dam appears to have acceptable static and seismic stability, based on existing stability documentation, by comparison, the much lower Ash Filter Ponds dike, assuming no unobservable problem conditions, should also have acceptable static and seismic stability.

The outflow structures at the Ash Filter Ponds appeared to be in satisfactory condition and stable.

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Thermal Pond – Structural stability of the Thermal Pond dam appears satisfactory, based on the provided documentation of static and seismic slope stability and the absence of visual evidence of significant stability problems in the field. This assessment is dependent on verification that the slope geometry analyzed is at least as steep as what actually exists in the field (see discussion in Section 7.2).

The outflow structure at the Thermal Pond appeared to be in satisfactory condition and stable.

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## 8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

### 8.1 OPERATING PROCEDURES

The Ash Filter Ponds and the Thermal Pond are the only CCR surface impoundments at the Keystone Generating Station. Both are related to the bottom ash operations. Boiler slag is not distinguished from the bottom ash. As previously described in this report, fly ash is dry handled and disposed in an on-site landfill. FGD sludge (gypsum) is dewatered, temporarily stored on a dome-covered pad, and either sold for beneficial reuse or trucked to the on-site landfill. The water removed from the FGD sludge is sent to the wastewater treatment plant and reused after treatment.

Operation of the Ash Filter Ponds and the Thermal Pond has been previously described in this report (see Sections 2.1, 2.2, and 4.2). The primary source of operating information for the Ash Filter Ponds is its Operation and Maintenance Manual (see Appendix A – Doc 09); for the Thermal Pond the primary sources of operating information are the Design Engineer’s Report (see Appendix A – Doc 10) and the Dam Permit Application (see Appendix A – Doc 07).

The Ash Filter Pond complex is operated for treating water removed from the bottom ash at the dewatering bins by settling residual suspended ash particles in the water and temporarily storing the ash sediment until the sediment has built up to the allowed level; then the cell is dewatered and the ash sediment drained, so that the ash can be removed dry and disposed in the on-site landfill. When a cell is dewatered for removal of the ash sediment, valves for the two (per cell) underdrain pipes are opened to allow drainage of the ash sediment; the water in the sediment drains into the discharge structure, where the valves are located. The valves are closed before placing the cell back into service after removal of the ash sediment.

The Thermal Pond is operated for cooling treated water from the Ash Filter Ponds. Originally, there were to be two cooling ponds, so that one could remain in operation while the other was drained and cleaned out, at expected time intervals of five years. As at the Ash Filter Ponds, the valve that controls underdrain flow into the discharge structure was to be opened during the cleaning operation to allow drainage of the ash sediment accumulation, so ash could be excavated and removed in the dry. However, it was found that very little ash sediment accumulates in the Thermal Pond. What little accumulates is now removed by divers using suction hoses, still at 5-year intervals. Apparently it was determined that the second cooling pond was not needed, and the adjacent basin, which had not yet been lined,

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was retired. Discharge from the Thermal Pond is monitored at Monitoring Station Point 503.

## 8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

Station personnel are present daily at both the Ash Filter Ponds and the Thermal Pond to check proper functioning of structures, piping, and equipment. Maintenance is performed as required.

## 8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

### 8.3.1 Adequacy of Operating Procedures

Based on field observations and review of operations pertaining to CCR containment at the Ash Filter Ponds and the Thermal Pond, operating procedures appear to be adequate.

### 8.3.2 Adequacy of Maintenance

Maintenance of the impounding embankments and outlet works of the Ash Filter Ponds and the Thermal Pond appears to be generally adequate. No major maintenance issues were noted from review of the inspection reports for the Thermal Pond dam. Based on the field observations, some minor maintenance is recommended (see Subsection 1.2.5).

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## 9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

### 9.1 SURVEILLANCE PROCEDURES

Ash Filter Ponds – Since the impounding perimeter dike embankment for the Ash Filter Ponds is not regulated for dam safety, there is no formal inspection program for this small dike. However, daily observations are made by station personnel, and appropriate maintenance and any needed corrective actions are performed as required.

Thermal Pond – The Thermal Pond dam is regulated by the state, but based on its size and hazard potential classification, the state does not require annual inspections performed by a registered professional engineer. However, according to the 1993 Dam Permit Application (see Appendix A – Doc 2), “an annual inspection will be performed by Penelec (now GenOn) Design Engineering.” In addition, “A walkdown of the cooling ponds (Thermal Pond) and appurtenant works will be conducted at least once every three months by station personnel.” As previously mentioned, these inspections are documented in Quarterly Dam Inspection Checklist reports (see Appendix A – Docs 03, 04, 05 and 06 for the most recent inspections). Any observations requiring monitoring, investigation, or repair are noted in the reports as requiring action.

### 9.2 INSTRUMENTATION MONITORING

There is no dam performance monitoring instrumentation in place in the impounding embankments of the Ash Filter Ponds or the Thermal Pond.

### 9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

#### 9.3.1 Adequacy of Inspection Program

Although there is no formal inspection program for the Ash Filter Ponds, the level of observations by station personnel, which are made daily, appears to have been generally sufficient, since the ponds have performed satisfactorily without significant problems. However, it would be prudent to formalize the inspection program to include documented quarterly inspections performed by station personnel, as is done at the Thermal Pond.

The inspection program for the Thermal Pond is appropriate and adequate, provided it is carried out; quarterly inspection checklist reports were provided for review, but no reports documenting annual inspections by

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design engineers were included. No major safety issues were noted in any of the quarterly inspection checklist reports reviewed.

## 9.3.2 Adequacy of Instrumentation Monitoring Program

There is no dam performance monitoring instrumentation in place at either the Ash Filter Ponds or the Thermal Pond. No problem or suspect condition, such as excessive settlement, significant flowing seepage, shear failure, or displacement was observed in the field that might be reason for installation of instrumentation for long-term performance monitoring. In the absence of stability problems or significant seepage issues, there is no need for performance monitoring instrumentation at this time.

However, it may be desirable to install two or three temporary observation wells to verify the source of the apparent seep area observed along the access road berm ditch on the downstream side of the main dam at the Thermal Pond. Algae was observed along the wet area, suggesting that it may be a long-term persistent condition not related to poor drainage of surface runoff received from the railroad tracks on the adjacent embankment to the south. One of the observation wells should be installed on the dam crest above the wet area to a depth near the bottom of the embankment, to verify that a phreatic surface has not developed through the embankment. Such a development would suggest that the liner is substantially leaking, which would be a concern. However, since the wet area occurs on the south part of the access road berm next to and near the embankment that supports the railroad tracks, it is possible or even likely that the source of water is rainfall absorbed in the thick ballast of the double railroad tracks, which may have infiltrated the underlying embankment soil and re-emerged as seepage at the berm ditch at the base of the groin; this would be of less concern.

# *APPENDIX A*

## *Document 1*

### *April 1993 Dam Permit Application for the Thermal Pond*

DAM PERMIT APPLICATIONS

PENNSYLVANIA ELECTRIC COMPANY

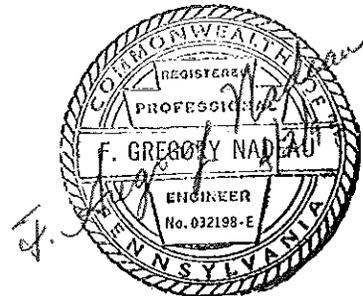
KEYSTONE STATION

INDUSTRIAL WASTE TREATMENT MODIFICATIONS:

THERMAL DISCHARGE ABATEMENT PROJECT

COOLING PONDS

APRIL 1993



Gilbert/Commonwealth, Inc.  
P. O. Box 1498  
Reading, PA 19603

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Environmental Assessment Form (including Impacts Analysis and Alternatives Analysis)

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APPENDIX D -Soil Laboratory Data

APPENDIX E -Wastewater Characteristics

APPENDIX F -Construction Specification and Liner QA/QC Plan

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- Figure 2 Flood Hazard Boundary Map
- Figure 3 Slope Stability Analysis for Translational Failure
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S-739-5015		12-15-92	Soil Survey
D-739-5009	1	04-01-93	Cooling Ponds "A" and "B" - Plan
D-739-5012	0	01-28-93	Cooling Ponds "A" and "B" - Liner Details
D-739-5016	1	04-01-93	Cooling Ponds "A" and "B" - Details for Submerged Launder
D-739-5018	0	01-28-93	Cooling Ponds "A" and "B" - Sections 2-2 and 3-3
D-739-5019	0	01-28-93	Cooling Ponds "A" and "B" - Sections 4-4 and 5-5
E-781-084	4	01-28-93	Location Plan
E-781-091	4	01-28-93	Boring Plan

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES

APPLICATION FOR DAM PERMIT

April 2, 1993

In compliance with the provisions of the Act of November 26, 1978, P.L. 1375, as amended (32 P.S. §693.1 et seq.) known as the "Dam Safety and Encroachments Act"; Act of October 4, 1978, P.L. 851 (32 P.S. §679.101 et seq.), known as the "Flood Plain Management Act"; and the Administrative Code, Act of April 9, 1929, P.L. 177, as amended, which empowers the Department of Environmental Resources to exercise certain powers and perform certain duties by law vested in and imposed upon the Water Supply Commission of Pennsylvania, and the Water and Power Resources Board.

Pennsylvania Electric Company, 1001 Broad Street, Johnstown, PA 15907  
(Applicant)

hereby makes application for the consent or permit of the Department of Environmental Resources to  construct,  modify,  enlarge,  operate and maintain,  breach and abandon

existing old bottom ash disposal pond (proposed cooling pond "A")  
(State the name of the dam or reservoir if known)

adjacent to ~~in along or across~~ an unnamed tributary of Crooked Creek  
(State name of stream or other body of water.)

at a point located approximately 3,100 feet north of the confluence of the  
(Give location, by distance from mouth of stream, county, township, or municipal boundary; also give city, town or township and county in which located)

station lagoon and Crooked Creek in Plumcreek Township, Armstrong County

for the purpose of  
(State fully the purpose, necessity, and description of the dam.)

cooling effluent from bottom ash filter ponds to improve thermal discharge characteristics.

in accordance with the complete maps, plans, profiles, and specifications filed with this application and made a part hereof

MUST BE COMPLETED BY APPLICANT

Drainage Area <u>7.4</u> acres or square miles	Maximum Depth to Top of Dam <u>49 feet</u>
Surface Area: at normal pool <u>7.1</u> acres	Crest Length <u>325 feet</u>
at top of dam <u>7.5</u> acres	Storage Volume: at normal pool <u>129 acre-feet</u>
Size and Hazard Classification <u>B-3</u>	at top of dam <u>137 acre-feet</u>
Justification for Hazard Classification <u>No loss of life is expected in the event of an embankment failure. There are no permanent structures for human habitation downstream of the dam to the station lagoons confluence with Crooked Creek. Minimal economic loss is expected in the event of dam failure.</u>	

FOR DEPARTMENT USE ONLY

Application Fee _____	Application No. _____
Check No. _____	Date Received _____
Amount _____	Municipal Notification _____
Check Date _____	County Notification _____

(Continued on other side)

TYPE OF OWNERSHIP (Check one)

Privately Owned    Partnership    Corporation    Government Agency/Political Subdivision

If privately owned, the individual owner(s) must sign. One or more members authorized to sign on behalf of an entire partnership must sign. For a corporation, the president, vice president or other responsible official is required to sign. For a Government Agency/Political Subdivision, we require signatures of the chief officer or other responsible official empowered to sign with the seal affixed and attested by the clerk.

J. G. Herbein, Vice President, Generation

(Print Name)

*J. G. Herbein*

(Signature and Title)

SEAL

1001 Broad Street

(Address)

Johnstown, PA 15907

(814) 533-8600

(Telephone Number)

Attest:

*J. M. Murray*

Assistant Secretary

If a fictitious name entity, are you registered with the Pennsylvania Department of State?    Yes    No

All applications for permits, except those submitted by federal, state, county or municipal agencies, must be accompanied by a check payable to "Commonwealth of Pennsylvania" in accordance with the following schedule:  
\* Class A dams - \$3000, Class B dams - \$2500, Class C dams - \$1500.

A single application may be submitted or a single permit may be issued for multiple structures and activities which are part of a single project or facility or part of related projects and facilities, located in a single county, constructed, operated, or maintained by the same persons. When a single application covers multiple structures or activities other than a single structure and related maintenance dredging, the application fee shall be the sum of fees set forth above for the applicable structures and activities.

Each application for a permit shall be accompanied by a completed Application checklist and Environmental Assessment Form and such information, maps, plans, specifications, design analyses, test reports, and other data as may be specifically required by the provisions of Chapter 105 and such additional information as may be required by the Department to determine compliance with the provisions of Chapter 105.

All applications for permits pursuant to Chapter 105 shall be accompanied by proof of an application for an Earth Disturbance Permit or an erosion and sedimentation control plan for all activities in the stream and all earthmoving activities, which plan shall conform to the requirements contained in Chapter 102 of this title (relating to erosion control) and shall include a copy of a letter from the conservation district in the county where the project is located indicating that the district has reviewed the applicant's erosion and sedimentation control plan and considers it to be satisfactory.

All plans, specifications and reports accompanying applications for dams shall be affixed with the seal of a registered professional engineer and a certification signed by the registered professional engineer, which shall read as follows:

"I (name) do hereby certify pursuant to the penalties of 18 Pa. C.S.A. Sec. 4904 to the best of my knowledge, information and belief, that the information contained in the accompanying plans, specifications, and reports has been prepared in accordance with accepted engineering practice, is true and correct, and is in conformance with Chapter 105 of the rules and regulations of the Department of Environmental Resources."

Duplicate applications with duplicate set of plans shall be submitted to Department of Environmental Resources, Bureau of Dams and Waterway Management, P. O. Box 8554, Harrisburg, PA 17105-8554.

This application, together with all maps, plans, profiles and specifications, and all papers, information and data filed in connection therewith, will remain on file in the Department.

<sup>1</sup>Based on size classification as defined in § 105.91 of Chapter 105, Rules and Regulations.

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES

APPLICATION FOR DAM PERMIT

.....April 2,....., 19 93.

In compliance with the provisions of the Act of November 26, 1978, P.L. 1375, as amended (32 P.S. §693.1 et seq.) known as the "Dam Safety and Encroachments Act"; Act of October 4, 1978, P.L. 851 (32 P.S. §679.101 et seq.), known as the "Flood Plain Management Act"; and the Administrative Code, Act of April 9, 1929, P.L. 177, as amended, which empowers the Department of Environmental Resources to exercise certain powers and perform certain duties by law vested in and imposed upon the Water Supply Commission of Pennsylvania, and the Water and Power Resources Board.

.....Pennsylvania Electric Company, 1001 Broad Street, Johnstown, PA 15907.....  
(Applicant)

hereby makes application for the consent or permit of the Department of Environmental Resources to  construct,  modify,  enlarge,  operate and maintain,  breach and abandon .....

.....existing bottom ash disposal pond (proposed cooling pond "B").....  
(State the name of the dam or reservoir if known)

adjacent to ~~in along or across~~ an unnamed tributary of Crooked Creek.....  
(State name of stream or other body of water.)

at a point ..located approximately 3,500 feet north of the confluence of the.....  
(Give location, by distance from mouth of stream, county, township, or municipal boundary; also give city, town or township and county in which located)

.....station lagoon and Crooked Creek in Plumcreek Township, Armstrong County.....

for the purpose of ..cooling effluent from bottom ash filter ponds to.....  
(State fully the purpose, necessity, and description of the dam.)

.....improve thermal discharge characteristics.....

in accordance with the complete maps, plans, profiles, and specifications filed with this application and made a part of.....

MUST BE COMPLETED BY APPLICANT

Drainage Area <u>6.0</u> acres or square miles	Maximum Depth to Top of Dam <u>47 feet</u>
Surface Area: at normal pool <u>5.7</u> acres	Crest Length <u>625 feet</u>
at top of dam <u>6.0</u> acres	Storage Volume: at normal pool <u>110 acre feet</u>
Size and Hazard Classification <u>B-3</u>	at top of dam <u>118 acre feet</u>
Justification for Hazard Classification <u>No loss of life is expected in the event of an embankment failure. There are no permanent structures for human habitation downstream of the dam to the station lagoon's confluence with Crooked Creek. Minimal economic loss is expected in the event of dam failure.</u>	

FOR DEPARTMENT USE ONLY

Application Fee _____	Application No. _____
Check No. _____	Date Received _____
Amount _____	Municipal Notification _____
Check Date _____	County Notification _____

(Continued on other side)

TYPE OF OWNERSHIP (Check one)

Privately Owned     Partnership     Corporation     Government Agency/Political Subdivision

If privately owned, the individual owner(s) must sign. One or more members authorized to sign on behalf of an entire partnership must sign. For a corporation, the president, vice president or other responsible official is required to sign. For a Government Agency/Political Subdivision, we require signatures of the chief officer or other responsible official empowered to sign with the seal affixed and attested by the clerk.

J. G. Herbein, Vice President, Generation

(Print Name)

*J. G. Herbein*

(Signature and Title)

SEAL

1001 Broad Street

(Address)

Johnstown, PA 15907

(814) 533-8600

(Telephone Number)

Attest: *[Signature]*

Assistant Secretary

If a fictitious name entity, are you registered with the Pennsylvania Department of State?     Yes     No

All applications for permits, except those submitted by federal, state, county or municipal agencies, must be accompanied by a check payable to "Commonwealth of Pennsylvania" in accordance with the following schedule:  
\* Class A dams - \$3000, Class B dams - \$2500, Class C dams - \$1500.

A single application may be submitted or a single permit may be issued for multiple structures and activities which are part of a single project or facility or part of related projects and facilities, located in a single county, constructed, operated, or maintained by the same persons. When a single application covers multiple structures or activities other than a single structure and related maintenance dredging, the application fee shall be the sum of fees set forth above for the applicable structures and activities.

Each application for a permit shall be accompanied by a completed Application checklist and Environmental Assessment Form and such information, maps, plans, specifications, design analyses, test reports, and other data as may be specifically required by the provisions of Chapter 105 and such additional information as may be required by the Department to determine compliance with the provisions of Chapter 105.

All applications for permits pursuant to Chapter 105 shall be accompanied by proof of an application for an Earth Disturbance Permit or an erosion and sedimentation control plan for all activities in the stream and all earthmoving activities which plan shall conform to the requirements contained in Chapter 102 of this title (relating to erosion control) and shall include a copy of a letter from the conservation district in the county where the project is located indicating that the district has reviewed the applicant's erosion and sedimentation control plan and considers it to be satisfactory.

All plans, specifications and reports accompanying applications for dams shall be affixed with the seal of a registered professional engineer and a certification signed by the registered professional engineer, which shall read as follows:

"I (name) do hereby certify pursuant to the penalties of 18 Pa. C.S.A. Sec. 4904 to the best of my knowledge, information and belief, that the information contained in the accompanying plans, specifications, and reports has been prepared in accordance with accepted engineering practice, is true and correct, and is in conformance with Chapter 105 of the rules and regulations of the Department of Environmental Resources."

Duplicate applications with duplicate set of plans shall be submitted to Department of Environmental Resources, Bureau of Dams and Waterway Management, P. O. Box 8554, Harrisburg, PA 17105-8554.

This application, together with all maps, plans, profiles and specifications, and all papers, information and data filed in connection therewith, will remain on file in the Department.

\*Based on size classification as defined in § 105.91 of Chapter 105, Rules and Regulations.

APPLICATION CHECKLIST FOR DAM PERMIT

Instructions: Applicant or engineer should place a check in the left column for all items provided, sign on the reverse side and return with the Dam Permit Application. Section references are to Chapter 105 of the Department's Rules and Regulations as revised October 12, 1991.

DER USE ONLY	
FILE NO.	_____
DATE SENT	_____
DATE REC'D	_____

- Permit application properly signed, sealed and witnessed in accordance with Section 105.13(g).
- Application fee in accordance with Section 105.13(b).
- Evidence of County and Municipal notification. (See reverse side.)
- A Site Plan including information in accordance with Section 105.13(d)(1).
- A Location Map of a scale factor of 1:24,000 (standard 7.5 Minute Series U. S. Geological Survey Topographic Map).
- A Project Description which includes a description of the proposed/existing structure or activity, purpose of the project, the effect of the project on public health, safety or environment and a statement of water dependency of the project.
- Color Photographs of the proposed site or project area with location and orientation map.
- Storm Water Management Analysis in accordance with Section 105.13(d)(5).
- Floodplain Management Analysis in accordance with Section 105.13(d)(6).
- N/A A Risk Assessment if the Storm Water Management Analysis or the Floodplain Management Analysis indicates increases in peak rates of runoff or flood elevations in accordance with Section 105.13(d)(7).
- A completed Environmental Assessment Form and attachments, including Impacts Analysis and Alternatives Analysis.
- N/A A Mitigation Plan of actions to be taken in accordance with the definition of mitigation in Chapter 105.
- Proof of title or adequate flowage easements for all land area below the top of the dam elevation that is subject to inundation.
- Data concerning subsoil and rock foundation conditions and the physical properties of the materials entering into the construction of the dam in accordance with Section 105.81(c).
- Design drawings, technical construction specifications and design report in sufficient detail that a determination of the adequacy of the proposed facility can be made.
- A Registered Professional Engineer's seal and certification affixed to all plans, specifications and design reports accompanying the application in accordance with Section 105.13(h).
- Proof of an application for an Earth Disturbance Permit or an Erosion and Sedimentation Control Plan and a copy of a letter of approval from the appropriate County Conservation District(s).
- A hydrologic and hydraulic analysis for the appropriate design storm in accordance with Section 105.98.
- An Operation and Maintenance Manual/Document indicating normal operation and maintenance procedures and parties responsible for these procedures.

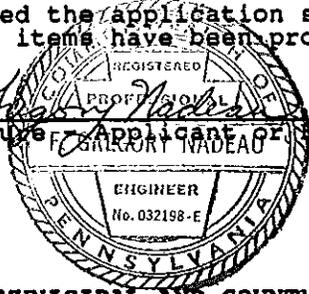
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DER  
USE  
ONLY

- An Emergency Action Plan in accordance with Section 105.134. (If required.)
- A plan for monitoring performance of the dam by instrument installations in accordance with Section 105.81(a)(5). (If required.)
- N/A Proof of financial responsibility in accordance with Section 105.20. (If required.)
- N/A For projects involving storage of fluids or semifluids other than water, information concerning the chemical content, viscosity and other pertinent physical characteristic of the fluid or semifluid.
- The proposed time for commencement and anticipated start of construction.
- The most recent inspection reports if the application pertains to an existing dam.

I have reviewed the application submission material and confirm that the above checked items have been provided.

J. Albert Madala  
(Signature of Applicant or Engineer)



April 2, 1993  
(Date)

**MUNICIPAL AND COUNTY NOTIFICATION OF PERMIT APPLICATION**

Act 14, P.L. 834, enacted February 17, 1984, requires that each applicant for a permit under the Dam Safety and Encroachments Act must give written notice to the municipality(ies) and the county(ies) in which the permitted activity is located. The written notice shall be received by the municipality(ies) and the county(ies) at least 30 days before the Department of Environmental Resources may issue or deny the permit.

You may notify the municipality(ies) and the county(ies) by providing a copy of the application to each municipality and county by CERTIFIED MAIL, RETURN RECEIPT REQUESTED, or by personally delivering a copy to and obtaining a written acknowledgment of receipt from each municipality and county. Letters should be addressed to the office of the Secretary or the Clerk of the municipality and county OR to the Supervisors, Manager or Commissioners as appropriate.

The submission of your application to the Department must include evidence that municipal and county notification has occurred. Acceptable forms of evidence include:

- (1) Certified mail receipt and copy of letter sent to each municipality and county, OR
- (2) Written acknowledgment from each municipality and county.

Failure to provide evidence of municipal and county notification will delay processing of your application.

**401 WATER QUALITY CERTIFICATION**

Applications submitted to the Bureau of Dams and Waterway Management for projects requiring a Dam Permit will also be considered a request for Water Quality Certification under Section 401 of the Federal Water Pollution Control Act (33 U.S.C.A. 1341(a)) for either a U.S. Army Corps of Engineers' (ACOE) individual permit or nationwide permit. The applicant is responsible to provide necessary information to the U.S. Army Corps of Engineers for the termination of what type, if any, federal permit is required.

Certified Mail

Armstrong County Commissioners  
Armstrong County Courthouse  
Kittanning, PA 16201

RE: Act 14 Notification

Dear County Commissioners:

In accordance with Act 14 notification requirements, this is to inform you that Penelec plans to apply to PaDER for two dam permits.

Pennsylvania Electric Company (Penelec) operates the Keystone Generating Station, located along Crooked Creek in Plumcreek Township, Armstrong County, Pennsylvania. Treated effluent discharges from Keystone Station have occasionally exceeded the permitted thermal discharge limits for the lagoon outfall (NPDES Outfall 003) into Crooked Creek. Penelec has entered into a Consent Order and Agreement with Pennsylvania Department of Environmental Resources for implementation of this project. It has been determined that the exceedances of the Station's thermal discharge limitations can be corrected through rerouting the Station's ash sluice water, replacing the fill material in the four cooling towers, and using the former bottom ash ponds as cooling ponds for the hot wastewater from the station. The use of the cooling ponds is the only modification applicable to the Dam Permits.

Should you have any questions or comments, please contact me at (814) 533-8567.

Sincerely,

Floyd R. Duncan  
Environmental Scientist Sr.

Certified Mail

Plumcreek Township Supervisors  
R.D. 1, Box 77-C  
Shelocta, PA 15774

RE: Act 14 Notification

Dear Township Supervisors:

In accordance with Act 14 notification requirements, this is to inform you that Penelec plans to apply to PaDER for two Dam Permits.

Pennsylvania Electric Company (Penelec) operates the Keystone Generating Station, located along Crooked Creek in Plumcreek Township, Armstrong County, Pennsylvania. Treated effluent discharges from Keystone Station have occasionally exceeded the permitted thermal discharge limits for the lagoon outfall (NPDES Outfall 003) into Crooked Creek. Penelec has entered into a Consent Order and Agreement with Pennsylvania Department of Environmental Resources for implementation of this project. It has been determined that the exceedances of the Station's thermal discharge limitations can be corrected through rerouting the Station's ash sluice water, replacing the fill material in the four cooling towers, and using the former bottom ash ponds as cooling ponds for the hot wastewater from the station. The use of the cooling ponds is the only modification that is applicable to the Dam Permits.

Should you have any questions or comments, please contact me at (814) 533-8567.

Sincerely,

Floyd R. Duncan  
Environmental Scientist Sr.

1.0 SUPPLEMENTAL INFORMATION FOR PERMIT APPLICATIONS

1.1 PROJECT DESCRIPTION

Pennsylvania Electric Company (Penelec) operates the Keystone Generating Station, located along Crooked Creek in Plumcreek Township, Armstrong County, Pennsylvania. Treated effluent discharges from Keystone Station have occasionally exceeded the permitted thermal discharge limits for the lagoon outfall (NPDES Outfall 003) into Crooked Creek. Penelec entered into a Consent Order and Agreement (COA) with the Pennsylvania Department of Environmental Resources in September 1992 to establish a schedule for design and construction of facilities necessary to meet effluent thermal limitations. Re-routing the bottom ash filter pond discharge to the former bottom ash disposal ponds (proposed cooling ponds) is scheduled to be complete by September 30, 1994. The Part II Water Quality Management Permit Application for the Thermal Discharge Abatement Project was submitted in February 1993. Sanitary Water Board Permit No. 0369203 for the existing bottom ash disposal ponds was issued on September 10, 1969.

Two additional permits for structures in the area of the cooling ponds were issued to Penelec. Dam and Water Obstruction Permit No. RM-DWM-D3-35 for the stream diversion project, located on the unnamed stream below the cooling ponds, was issued in December 1984. Also, a Joint 105/404 Permit for the entrance road culvert replacement/stream enclosure was issued to Penelec in August 1991.

Four modifications have been or are being implemented to achieve compliance with thermal limitations. One of these modifications consists of re-routing the effluent from the bottom ash filter ponds to the existing "old bottom ash disposal ponds", which will be re-named "cooling ponds". These large ponds provide additional evaporative cooling surface to improve thermal discharge characteristics. The project

is not expected to have any effect on public health, safety, or the environment per the Environmental Assessment form (EAF). There are no wetlands regulated by the Commonwealth that exist within the project boundaries (See Attachments). The construction of either cooling pond is not water dependent. The project utilizes the existing old bottom ash disposal ponds and therefore, does not require access or proximity to water to fulfill the basic purposes of the project. Location of the proposed cooling ponds is shown on Drawing S-739-5014.

## 1.2 DESIGN REPORT

### 1.2.1 Pond Size and Capacity

The location and preliminary design for the cooling ponds are shown on Drawing D-739-5009. The ponds are designed to maximize available surface area for evaporative cooling. The bottom ash ponds are not currently in use and previously have been cleaned of bottom ash.

Cooling Pond "A" has a storage volume of approximately 5.6 million cubic feet at normal operating level. The available surface area for cooling is approximately 310,000 square feet. Cooling Pond "B" has a storage volume of approximately 4.8 million cubic feet at normal operating level. The available surface area for cooling is approximately 247,000 square feet. The ponds normally operate in parallel, with Pond "A" receiving approximately 54 percent of the flow and Pond "B" receiving 46 percent of the flow. The detention time for the wastewater in the cooling ponds with average flow conditions is approximately 18.5 days. This long detention time mitigates the effects of short spells of very hot weather and daily maximum flow rates.

### 1.2.2 Pond Inlet Piping

Water pumped from the bottom ash filter ponds is first channeled into a flow division

box as shown on Drawing No. D-739-5009. The pumped flow rate is divided at the division box and piped to a distribution box located at the west end of each of the cooling ponds. The discharge lines from the distribution box are valved, so that the flow can be shut-off to one of the ponds, if necessary. At each distribution box the wastewater is evenly divided among a series of smaller pipes spaced at intervals of approximately twenty feet and discharges into the lagoon. The number of inlet pipes per pond varies due to the geometry of the ponds. By utilizing a distribution box with the given pipe configuration, the flow is gently and evenly distributed over a large surface area in order to attain the best heat exchange rates.

### 1.2.3 Pond Lining

To prevent water from seeping out of the cooling ponds, a synthetic liner is installed beneath each pond. The synthetic liner is a 50-mil thick HDPE liner or equal. The liner is textured on the side slopes to ensure stability of the liner and cover material. To protect the liner from damage, a three-inch thick concrete erosion control revetment is installed on top of the liner on the side slopes and a minimum of two feet of bottom ash is placed on top of the liner on the pond bottom. A nonwoven geotextile and a two-inch layer of sand is installed below the liner. The sand and geotextile prevent the liner from being punctured by the subgrade soils.

Pond and liner construction details are provided on Drawings D-739-5012, -5018, and -5019. Product information on the liner and concrete erosion control revetment is located in Appendix A.

### 1.2.4 Pond Discharge Piping

The ponds normally discharge through submerged launders which are integrated into the existing discharge structures, as shown on Drawing C-739-5016. The submerged

launder consists of a 42-inch diameter pipe, approximately 60 feet long, that runs parallel with and three feet above the pond bottom, and connects to a concrete box adjacent to the existing discharge structure. On the underside of the submerged launder are a series of orifices that draw the coldest water off the pond bottom into the submerged launder. The water entering into the concrete box then overflows into the existing discharge structure and discharges via an 18-inch diameter high density polyethylene pipe that is installed inside the existing 21-inch diameter corrugated metal pipe. The two flows are then combined and discharge through a flume below the diversion dam.

#### 1.2.5 Pond Access and Cleaning

To provide access to the ponds for cleaning and maintenance, a 20-foot wide gravel roadway is provided to and around the pond, along with a 25-foot wide ramp into each of the ponds. The sediment is removed from the pond with front end-loaders and then trucked to the existing permitted coal refuse/ash disposal site. To drain the ponds, each discharge structure has four dewatering pipes and valves that are positioned at different elevations. An underdrain system is provided to dewater the sediment. This underdrain system consists of approximately two feet of bottom ash on the pond bottom and a twelve-inch diameter perforated PVC pipe surrounded by coarse aggregate. The underdrain pipe for each pond flows into the discharge structure.

### 1.3 DAM CLASSIFICATION

The proposed cooling ponds are Type B-3 dams in accordance with Chapter 105 of the rules and regulations of the Pennsylvania Department of Environmental Resources. The maximum impoundment storage (elev. 1020 feet) of cooling pond "A" is approximately 129 acre-feet and the maximum dam height is 49 feet. The

maximum impoundment storage (elev. 1020 feet) of cooling pond "B" is approximately 110 acre-feet and the maximum dam height is 47 feet. Because both ponds hold less than 1,000 acre-feet but are greater than 40 feet in height, their size classifications are B. Additionally, no loss of life is expected in the event of an embankment failure. There are no permanent structures for human habitation downstream of the cooling ponds to the station lagoon's confluence with Crooked Creek. Minimal economic loss is expected in the event of a dam failure. The power plant is of sufficient distance away so that it would not be affected. Minimal damage to the earthen fill embankment supporting the main access road is possible. Because there is no expected loss of life and minimal economic loss in the event of a dam failure, the hazard potential classification for the ponds is 3.

#### 1.4 COLOR PHOTOGRAPHS

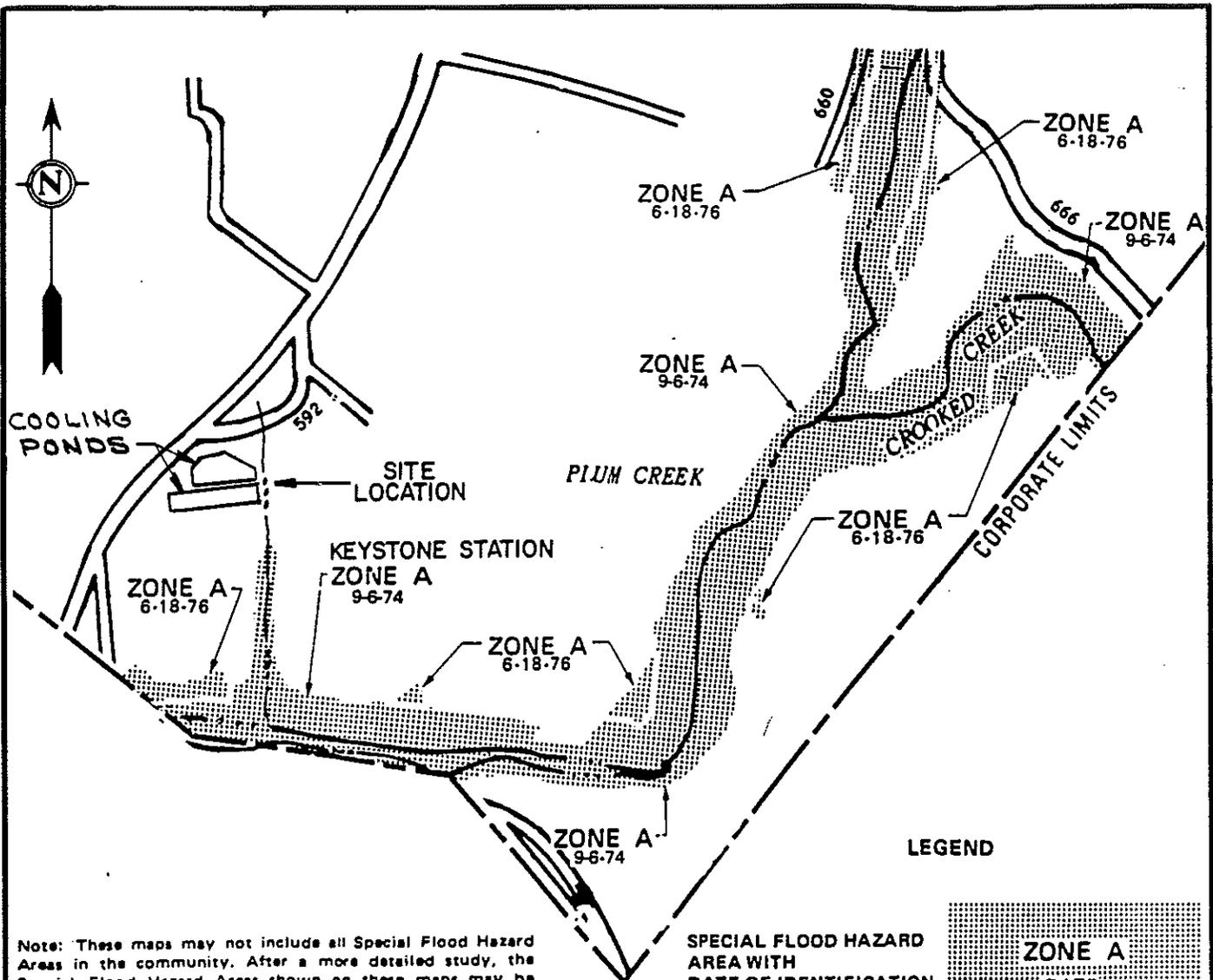
Color photographs of the site and photograph orientation map (Figure 1) are located in Appendix B.

#### 1.5 STORM WATER MANAGEMENT ANALYSIS

The project is not expected to impact the existing storm water drainage on site. Because the cooling ponds utilize the existing bottom ash disposal ponds, the storm water runoff after development is equal to or less than that before development. Permanent erosion control measures are used to ensure that peak runoff rates do not increase after project completion. All existing drainage structures that currently exist on site are unaffected by the development of the cooling ponds.

#### 1.6 FLOODPLAIN MANAGEMENT ANALYSIS

The proposed cooling ponds are not located within the 100-year floodway, as delineated on the FEMA map (Figure 2). The cooling ponds utilize the existing



Note: These maps may not include all Special Flood Hazard Areas in the community. After a more detailed study, the Special Flood Hazard Areas shown on these maps may be modified, and other areas added.

SPECIAL FLOOD HAZARD AREA WITH DATE OF IDENTIFICATION



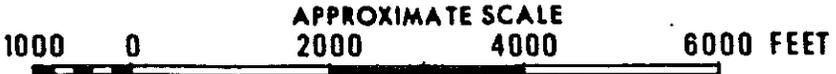
CONSULT NFIA SERVICING COMPANY OR LOCAL INSURANCE AGENT OR BROKER TO DETERMINE IF PROPERTIES IN THIS COMMUNITY ARE ELIGIBLE FOR FLOOD INSURANCE.

INITIAL IDENTIFICATION DATE:

SEPTEMBER 6, 1974

REVISION DATES:

6-18-76 :ADD S.F.H.A., REDUCE S.F.H.A., SHOW CURVILINEAR BOUNDARIES



PENNSYLVANIA ELECTRIC COMPANY  
 KEYSTONE GENERATING STATION  
 THERMAL MODIFICATIONS  
 FLOOD HAZARD BOUNDARY MAP  
 FIGURE 2

bottom ash disposal ponds, and thus do not impact the floodway delineation and water surface profiles.

The 100-year flood level upstream of the entrance road culvert, which is located adjacent to the cooling ponds, is elevation 980.7 feet. (This figure was taken from the Joint 105/104 Permit Application for the Proposed Entrance Road Culvert Replacement, prepared by GAI Consultants, Inc. in August, 1991.) This flood level is approximately 40 feet below the top of the cooling pond embankments and the main plant access road, and thus will not impact either the ponds or the road.

#### 1.7 RISK ASSESSMENT

No risk assessment is necessary for this project. The proposed cooling ponds utilize the existing bottom ash disposal ponds, and thereby do not alter peak runoff rates or flood elevations. The ponds represent no increased risk to life, property, or the environment.

#### 1.8 PROOF OF TITLE AND FLOWAGE EASEMENTS

The two cooling ponds and appurtenant works are all located within the lands of Pennsylvania Electric Company as shown on Drawing E-781-084.

#### 1.9 MITIGATION PLAN

No mitigation plan is required for the construction of the cooling ponds. The project will not impact the environment and therefore, reparations, rehabilitation, and restoration of any project areas will not be necessary.

#### 1.10 GROUNDWATER, SOILS, AND GEOLOGY INFORMATION

The "Geological Map of Pennsylvania," as prepared by the Pennsylvania Topographic

and Geological Survey in 1980, indicates that the geological formation underlying the site is the Glenshaw Formation of the Pennsylvania Age. The Glenshaw Formation is described as cyclic sequences of shale, sandstone, red beds, and then limestone and coal. It also includes four marine limestone or shale horizons. The red beds are involved in landslides and the base is at the top of Upper Freeport Coal.

The "Soil Survey of Armstrong County, Pennsylvania," Sheet Numbers 68 and 73, indicates that the site soil is Sm, which denotes strip mines. Strip mines consist of sandstone, boulders, fractured shale, and some soil material that has been distributed by mining operations. Slopes range from nearly level to very steep.

A total of twelve borings (Monitoring Well #3A, SD-1 through SD-5, SD-5A, and 92-1 through 92-5) and nine test pits (TP 93-1 through TP 93-9) have been drilled or excavated in the area of the proposed cooling ponds. Logs for the borings and test pits are located in Appendix C.

Four of the borings (92-1, 92-2, 92-4, and 92-5) were drilled recently in the eastern embankment of the cooling ponds. The borings indicate that the embankments are constructed of stiff to very stiff sandy silt and clay with rock fragments. Top of rock encountered in the borings varies from approximately elevation 971.5 feet to elevation 962 feet. The rock appears to be sloped at approximately a 20:1 (horizontal:vertical) grade towards the stream.

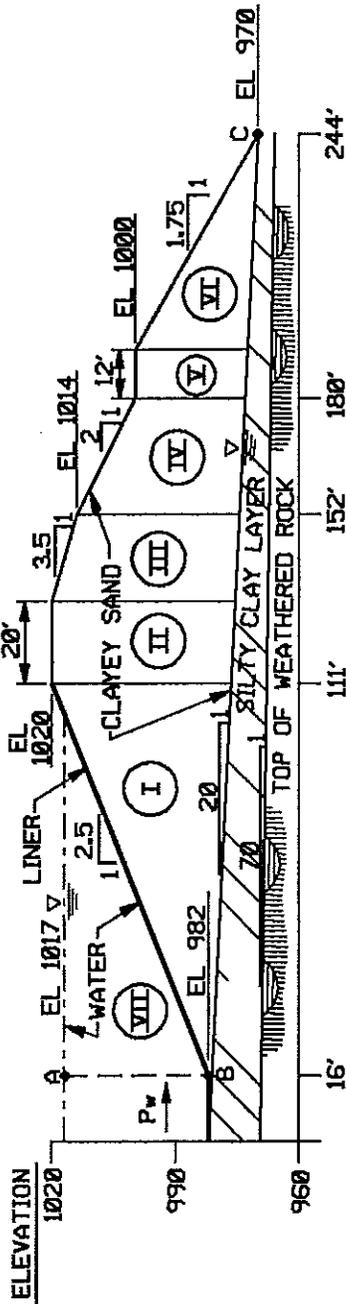
The pond embankments are stable for all anticipated loading conditions. A slope stability analysis was performed for the critical section of the eastern embankment of the cooling ponds. The minimum factor of safety against embankment failure using Bishop's Method of Slices is 1.74 for static conditions and 1.35 for dynamic conditions. (See Section 1.11)

Groundwater data obtained indicates that the groundwater is below the bottom of the proposed liner system for the cooling ponds. The groundwater elevation appears to vary from approximately elevation 984 feet at Monitoring Well #3A (located west of the ponds) to approximately elevation 972 feet at the unnamed stream (located east of the ponds). No groundwater seepage or springs have been observed in any of the embankments for the existing ponds. The liner system for the proposed cooling ponds is placed on top of the existing subgrade of the ponds. For the bottom of Cooling Pond "A", the liner varies from approximately elevation 1002 feet at the western end to elevation 980 feet at the eastern end. For the bottom of Cooling Pond "B", the liner varies from approximately elevation 988 feet at the western end to elevation 980 feet at the eastern end.

#### 1.11 SLOPE STABILITY ANALYSIS

The cooling pond embankment slopes are safe and stable as designed. The east-side embankment of cooling pond "A", being the tallest embankment, is most critical for stability. As this is an existing embankment, its future settlement after the pond construction will be negligible. Two analysis methods are used to determine the factors of safety against sliding: sliding block and slip circle. The minimum factors of safety against sliding with the normal operating water level (elev. 1017 feet) in the pond during static and seismic conditions, using conservative soil parameters, are as follows:

<u>ANALYSIS METHOD</u>	<u>FACTOR OF SAFETY</u>	
	<u>Static</u>	<u>Seismic</u> *
SLIDING BLOCK	3.63	1.79
SLIP CIRCLE	1.74	1.35



F.S. AGAINST SLIDING = (RESISTING FORCES/SLIDING FORCES) ALONG SURFACE BC

$$= (cA + Wn \tan \beta) / (P_{wp} + W_p + W_{p \text{ seismic}})$$

$$= \begin{cases} 3.63 \dots \text{STATIC} \\ 1.79 \dots \text{SEISMIC } (a_{\text{max}} = 0.1g) \end{cases}$$

WHERE,  $P_{wp}$  = COMPONENT OF HYDROSTATIC PRESS.  $P_w$  // TO BC = 38.3 KIPS/FOOT

$W_p$  = COMPONENT OF TOTAL WT. (I + II + III + IV + V + VI + VII) // TO BC = 40.4 KIPS/FOOT

$W_{p \text{ seismic}}$  = COMPONENT OF TOTAL WT. (I + II + III + IV + V + VI + VII)  $\perp$  TO BC = 80.5 KIPS/FOOT

$W_{p \text{ seismic}}$  = COMPONENT OF HORIZ SEISMIC FORCE // TO BC = 80.5 KIPS/FOOT

A = SURFACE AREA BC = 229 SQ. FT./FOOT

c = COHESION OF SOIL ALONG BC = 1.25 KSF

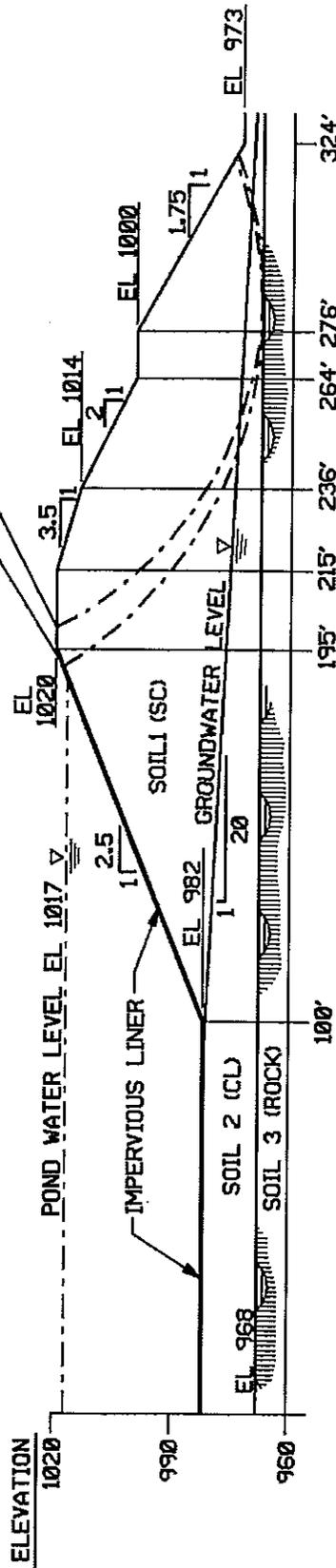
$\beta$  = FRICTION ANGLE OF SOIL ALONG BC = 0

NOTE: ANALYSIS USING ZERO COHESION AND 20° FRICTION ALONG BC YIELDS GREATER FACTOR OF SAFETY THAN STATED ABOVE.

NOTES:

1. CRITICAL CIRCLE WAS DETERMINED BY THE MODIFIED BISHOP METHOD WITH THE AID OF A COMPUTER PROGRAM.
2. SOIL PROPERTIES WERE DETERMINED BY LABORATORY TESTS AND/OR BASED ON FIELD TEST DATA FROM EXPLORATORY BORINGS. FOR ROCK, THE PROPERTIES WERE ASSUMED CONSERVATIVELY.
3. THE ACTUAL GROUNDWATER LEVEL BASED ON OBSERVATIONS IN THE BORINGS IS AT OR BELOW TOP OF ROCK, BUT WAS ASSUMED CONSERVATIVELY TO BE AT TOP OF SOIL 2.
4. ANALYSIS USING EFFECTIVE PARAMETERS (ZERO COHESION AND 34° PHD FOR SOIL 2 YIELDS HIGHER FACTOR OF SAFETY THAN WITH PARAMETERS TABULATED HERE IN.

⊙ DYNAMIC MIN. F.S. = 1.35 ( $\sigma_{max} = 0.1g$ )  
 ⊙ STATIC MIN. F.S. = 1.74



SOIL DATA:			
LAYER	EFFECTIVE UNIT WEIGHT (pcf)	COHESION (psf)	PHI (deg)
SOIL 1	125	240	28
SOIL 2	72	1,250	0
SOIL 3	85	8,000	0

PENNSYLVANIA ELECTRIC COMPANY  
 KEYSTONE GENERATING STATION  
 DAM PERMIT  
 SLOPE STABILITY ANALYSIS  
 BISHOP'S METHOD  
 FIGURE 4

\*Maximum horizontal acceleration = 0.1 g, conservatively

The ponds are lined with a 50-mil thick impervious geomembrane that will not allow water to seep and saturate the embankment soil. The embankment is an existing embankment and has been stable in the past. There are no visible signs of stress or cracking on the embankment.

Soil parameters, criteria, and results of both analysis methods are shown in Figures 3 and 4. Soil laboratory data obtained from borings and test pits that are used in the slope stability analyses are located in Appendix D.

1.12 REGISTERED PROFESSIONAL ENGINEER'S CERTIFICATION

I F. Gregory Nadeau do hereby certify to the best of my knowledge, information, and belief, that the information contained in the accompanying plans, specifications, and reports has been prepared in accordance with accepted engineering practice, is true and correct, and is in conformance with Chapter 105 of the rules and regulations of the Pennsylvania Department of Environmental Resources.



Dam Permit Applications, Proposed Cooling Ponds, Keystone Generating Station, Plumcreek Township, Armstrong County, Pennsylvania, Gilbert/Commonwealth, Inc., Rt. 10 and Pheasant Road, Reading, PA 19603, W.O. 04-4267-230, April 1993.

### 1.13 PROOF OF APPLICATION FOR EROSION AND SEDIMENTATION PLAN

A soil erosion and sedimentation control plan will be prepared in accordance with the PaDER Erosion and Sediment Pollution Control Manual. The plan will first be submitted to the Armstrong County Conservation District, where it will be reviewed. Upon approval from the Conservation District, the plan will be forwarded to PaDER.

### 1.14 HYDROLOGIC AND HYDRAULIC ANALYSIS

The storage capacity of the cooling ponds safely accommodates the recommended design flood. The upper limit of the design flood range for a B-3 dam is 1/2 PMF. The only stormwater that enters the cooling ponds is the precipitation that falls directly on the ponds' surface area. Therefore, it can be assumed conservatively that 1/2 PMF is equal to the 24-hr 10 mi<sup>2</sup> PMP. The 24-hr 10-mi<sup>2</sup> PMP for the Keystone Station is 32 inches; therefore, 1/2 PMF or 16 inches, is added to the normal operating water levels of the ponds. The ponds are designed for three feet of freeboard and therefore, easily accommodate the recommended design flood.

### 1.15 OPERATION AND MAINTENANCE DOCUMENT

This section provides maintenance guidelines which should result in proper operation of the cooling ponds and related equipment. Station personnel are present in the area of the cooling ponds daily, ensuring the proper functioning of piping, monitoring equipment, and inspecting the dam embankments for any seepage.

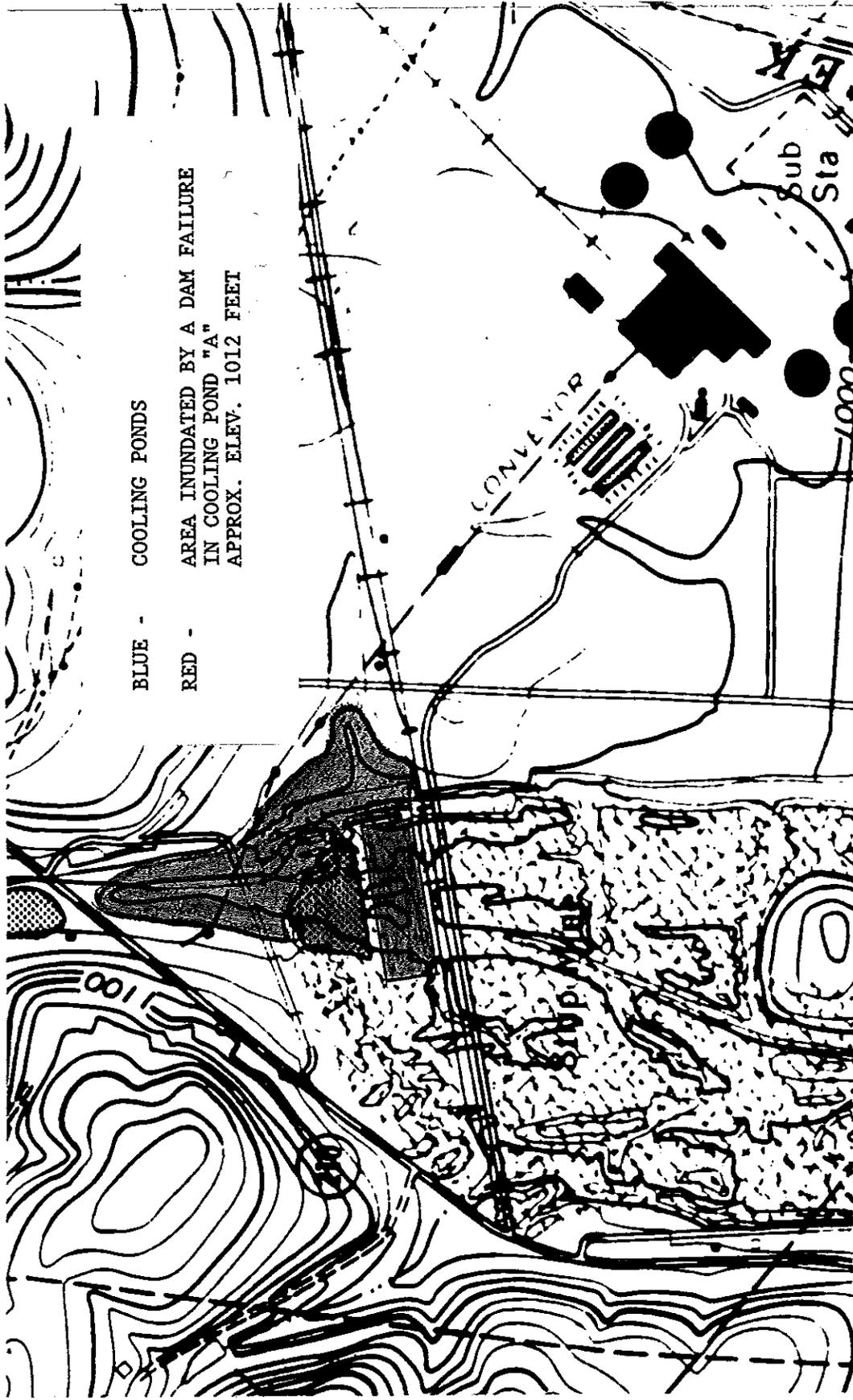
Cleaning of the cooling ponds is expected to take place approximately once every five years, due to the precipitation of a small amount of solids. The majority of the solids is removed at the bottom ash filter ponds. During normal operation, cooling pond "A" receives approximately 54 percent and cooling pond "B" approximately 46 percent of the flow discharged from the bottom ash filter ponds. When it is determined that a

pond requires cleaning, flow to one pond will be valved off at the flow division box (see Drawing D-739-5009), while the other pond receives 100 percent of the flow. The pond to be cleaned is dewatered by opening three 8-inch dewatering valves contained in the existing discharge structure, to approximately elevation 985 feet. At this point, the pond's underdrain system dewateres the sediment. The underdrain system consists of two feet of bottom ash and a 12-inch diameter perforated PVC pipe surrounded by coarse aggregate. The valve for the underdrain system, located in the discharge structure, is closed during normal operation of the pond and opened when the pond level has been drawn down and dewatering of the sediment is required. A front-end loader removes the dried sediment from the pond and a truck transports it to the existing permitted coal refuse/ash disposal site. The front-end loader operator will exercise care when removing sediment so as not to damage the concrete erosion control revetment on the side slopes or unnecessarily remove bottom ash from the pond bottom. Any bottom ash removed during the cleaning operation will be replaced. Following this, the valves in the discharge structure are closed, and the valve at the division box is opened to resume flow to the newly cleaned pond. The pond then assumes its normal operating level.

#### 1.16 EMERGENCY ACTION PLAN/DAM BREAK ANALYSIS

No emergency action plan is required for the proposed cooling ponds, since no loss of life or serious property damage is anticipated in the event of a dam failure. This is supported by the following dam break analysis.

For a conservative analysis, it is assumed that the dam break will occur in cooling pond "A", which has the larger volume and tallest embankment of the two ponds. The volume of cooling pond "A" is approximately 5.6 million cubic feet at normal operating level. Conservatively, the dam failure is instantaneous and causes water to



FROM ELDERTON, PA USGS QUADRANGLE  
 APPROXIMATE SCALE 1"=830'

pond behind the entrance road culvert. The average end area method is used to determine the level to which the water upstream of the culvert will rise. This water level is approximately elevation 1012 feet, so there is no threat of overtopping the main plant access road or State Route 210. Figure 5 shows the outline of the area subject to inundation in the event of a dam break. There are no inhabitants residing in the proposed area of inundation. Station personnel enter the area of the cooling ponds daily to monitor the performance of the dams and related equipment.

#### 1.17 DAM PERFORMANCE MONITORING

No dam performance monitoring instrumentation is necessary for the proposed cooling ponds. In accordance with Section 1.11 of this dam permit application, the cooling pond embankments have adequate sliding stability and have negligible future settlement. Additionally, the pond embankments will be observed on a daily basis by station personnel and dam inspections will be conducted annually.

#### 1.18 WATER QUALITY

The water entering the two cooling ponds will be treated bottom ash transport water, ash hopper overflow, and seal trough overflow. This water is treated at the bottom ash filter ponds for removal of residual suspended solids, before being pumped to the cooling ponds. Some additional settling of suspended solids may occur in the cooling ponds, requiring periodic cleaning of the ponds. Characteristics for the treated effluent leaving the bottom ash filter ponds are located in Appendix E.

#### 1.19 CONSTRUCTION SPECIFICATIONS AND LINER QA/QC PLAN

The Construction Specifications and Liner QA/QC Plan for the project are located in Appendix F.

1.20           COMMENCEMENT AND ANTICIPATED COMPLETION OF  
CONSTRUCTION

Construction of the cooling ponds is expected to commence in May 1994 and end in September 1994.

1.21           DAM INSPECTION REPORTS

Attached in Appendix G are PaDER requirements for "Operation, Maintenance, and Inspection" and "Investigation and Correction of Unsafe Conditions--Emergency Procedures" for permitted dams. A comprehensive annual inspection report certified by a registered professional engineer is not required for a B-3 dam, however, an annual inspection will be performed for the cooling ponds, by Penelec Design Engineering. A walkdown of the cooling ponds and appurtenant works will be conducted at least once every three months by station personnel. A check list for a typical annual inspection report for PaDER is also included in Appendix G. This check list will be used as a guideline for the inspections.

**APPENDIX D**

**SOIL LABORATORY DATA**

## LABORATORY TEST RESULTS

THERMAL DISCHARGE PROJECT  
PENELEC KEYSTONE STATION

FOR  
GILBERT/COMMONWEALTH, INC.

Prepared By:



Kin Y C Chung, Ph.D., P.E.  
Managing Director

BY

AMERICAN GEOTECH, INC.

MOISTURE CONTENT

CLIENT G/C PROJECT PENFLEC DATE 12/21/92  
 JOB NUMBER 57-1080 BORING NUMBER        SAMPLE NUMBER         
Keystone Station Thermal Discharge

BORING NUMBER	SAMPLE NO. / DEPTH	DISH NUMBER	WET WT. SAMPLE AND DISH (A)	DRY WT. SAMPLE AND DISH (B)	WATER LOSS (C)	WEIGHT DISH (D)	DRY WT. SAMPLE (E)	MOISTURE CONTENT % (F)
92-2	1 / 0-1.5'	42	87.8	82.2	5.6	31.5	50.7	11.0
92-2	2 / 1.5-6.5	87	76.0	71.5	4.5	30.8	40.7	11.1
92-2	3 / 6.5-10	88	86.3	81.4	4.9	30.6	50.8	9.6
92-2	4 / 10-15	91	77.3	72.8	4.5	30.9	41.9	10.7
92-2	5 / 15-20	93	146.3	140.4	5.9	31.1	109.3	5.4
92-2	6 / 20-25	94	156.9	155.8	1.1	30.9	124.9	0.9
92-2	7 / 25-30	95	92.8	83.6	9.2	31.1	52.5	17.5
92-2	8 / 30-35	96	91.2	89.3	1.9	30.8	58.5	3.2
92-5	1 / 0-1.5	99	111.8	104.5	7.3	30.8	73.7	9.9
92-5	2 / 1.5-6.5	100	102.6	96.2	6.4	30.9	65.3	9.8
92-5	3 / 6.5-10	101	74.2	67.6	6.6	30.6	37.0	17.8
92-5	4 / 10-15	104	89.5	82.0	7.5	30.2	51.8	14.5
92-5	5 / 15-20	106	85.1	78.6	6.5	31.9	46.7	13.9
92-5	6 / 20-25	109	79.8	72.7	7.1	32.0	40.7	17.4
92-5	7 / 25-30	111	139.6	133.0	6.6	31.8	101.2	6.5
92-3	3-1 / 0-6.5	114	125.3	119.8	5.5	30.5	89.3	6.2
92-3	5-2 / 6.5-10	115	90.7	81.6	9.1	32.3	49.3	18.5
92-3	5-3 / 10-15	116	111.0	93.8	17.2	32.2	61.6	27.9

CALCULATIONS: C = A - B, E = B - D, F = C/D

TECHNICIAN EB COMPUTED BY EB CHECKED BY KC

REMARKS \_\_\_\_\_

American Geotech, Inc.  
 1801 Penn Avenue, Wyom. Hills,  
 Reading, PA 19609

AMERICAN GEOTECH, INC.

TEST RESULTS

CLIENT : GILBERT/COMMONWEALTH  
 PROJECT : KEYSTONE STATION  
 JOB NUMBER: ST-1080  
 DATE : 12/21/92

ATTERBERG LIMITS (ASTM D 4318)

BORING NUMBER	B92-1	B92-1	B92-4	B92-4
SAMPLE NUMBER	BAG 1	BAG 2	BAG 3	BAG 4
DISH NUMBER	93	111	109	114
WT. DIST AND WET SOIL IN g	58.2	71.8	62.85	51.7
WT. DISH AND DRY SOIL IN g	52.7	63.55	56.5	46.7
WT. WATER LOSS (Ww) IN g	5.5	8.25	6.35	5
WT. DISH IN g	31.1	31.9	32.1	30.4
WT. DRY SOIL, (Ws) IN g	21.6	31.65	24.4	16.3
WATER CONTENT % (w)	25.46	26.07	26.02	30.67
NUMBER OF BLOWS, N	23	22	25	20
LIQUID LIMIT, LL	25.21	25.67	26.02	29.86

LL = w \* (N/25) \*\* 0.121

DISH NUMBER	42	96	104	101
WT. DIST AND WET SOIL IN g	40	46.6	51.2	38.8
WT. DISH AND DRY SOIL IN g	38.9	44.1	47.9	37.6
WT. WATER LOSS (Ww) IN g	1.1	2.5	3.3	1.2
WT. DISH IN g	31.3	30.8	30.3	30.5
WT. DRY SOIL, (Ws) IN g	7.6	13.3	17.6	7.1
WATER CONTENT % (w)	14.47	18.80	18.75	16.90
PLASTIC LIMIT, PL	14.47	18.80	18.75	16.90
PLASTICITY INDEX, PI	10.73	6.87	7.27	12.96

CL CL-ML CL CL

PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D 422)

CLIENT : GILBERT/Commonwealth PROJECT :  
 JOB NO.: ST-1080 BORING NO.: B92-1 SAMPLE NO. BAG 1  
 DEPTH OR ELEVATION: 10' - 15'

SIEVE ANALYSIS

SIEVE OPENING		U.S. STANDARD	WEIGHT	CULUMATIV	PERCENT	PERCENT	REMARKS:	
INCHES	MILLI-METER	SIEVE SIZE OR NUMBER	RETAINED IN GRAMS	WEIGHT RETAINED	RETAINED	FINER BY WEIGHT		
3.00		3"	0		0.000	100.00		
1.50		1 1/2"	0	0	0.000	100.00	0	0
0.75	19.1	3/4"	0	0	0.000	100.00	568.5	568.5
0.375	9.52	3/8"	73.5	73.5	0.089	91.08	592	518.5
0.187	4.76	No. 4	88.5	162	0.197	80.34	594	505.5
0.079	2.00	No. 10	99.6	261.6	0.318	68.25	545	445.4
0.033	0.84	No.20	68.2	329.8	0.400	59.97	497.2	429
0.0165	0.42	No.40	40.98	370.78	0.450	55.00	434.48	393.5
0.0098	0.25	No. 60	34.6	405.38	0.492	50.80	377.7	343.1
0.0059	0.149	No. 100	37.6	442.98	0.538	46.24	396.5	358.9
0.0029	0.074	No. 200	41.95	484.93	0.589	41.14	337.45	295.5
PAN			339		0.411		686.4	347.4
TOTAL WEIGHT IN GRAMS			823.93					

HYDROMETER ANALYSIS

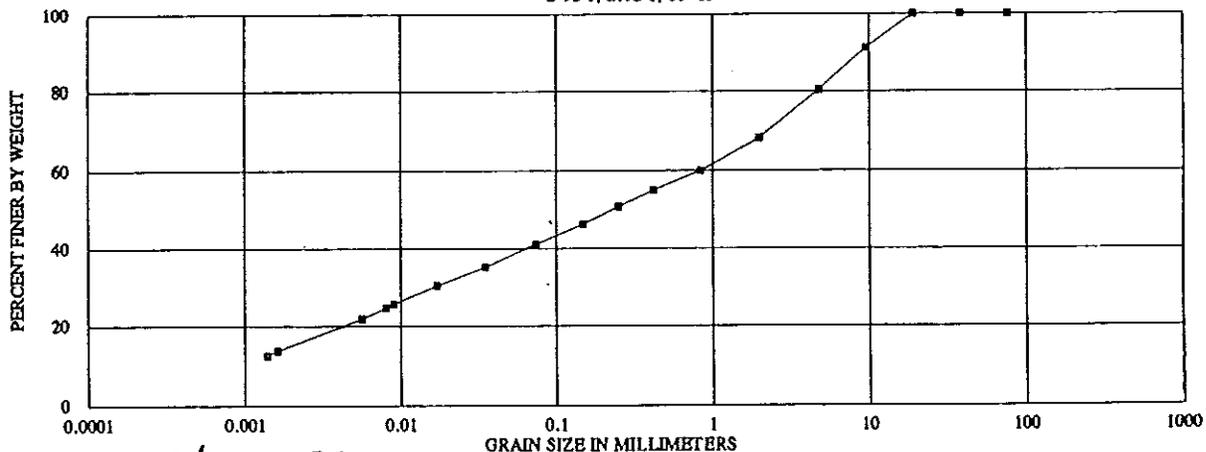
DISH No.	GRADUATE No.	HYDROMETER No. 152H
DISPERSING AGENT: SODIUM HEXAMETAPHOSPHATE		QUANTITY: 5g
DISPERSING AGENT CORRECTION, Cd: 6.5		MENISCUS CORRECTION, Cs: 0.5

ELAPSED TIME (min.)	TEMP (C)	HYDRO READING (R')	CORR'D READING (R)	TEMP CORR. (m)	R - (Cd + m)	PERCENT FINER		PARTICLE DIAMETER (mm)
						PARTIAL	TOTAL	
1	19	65	65.5	-0.2	59.2	51.48	35.13	0.034832
5	19	57	57.5	-0.2	51.2	44.52	30.39	0.017086
21	19	49	49.5	-0.2	43.2	37.57	25.64	0.008994
27	19	47.2	47.7	-0.2	41.4	36.00	24.57	0.00809
60	19	42.5	43	-0.2	36.7	31.91	21.78	0.005653
887	19	29	29.5	-0.2	23.2	20.17	13.77	0.001614
1271	19	27	27.5	-0.2	21.2	18.43	12.58	0.001391

Wt. of Sample for Hydrometer Analysis 115 Gs = 2.7  
 K = 0.01361

GRADATION CURVE

B-92-1, BAG 1, 10'-15'



REMARKS: Clayey SAND w' gravel

PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D 422)

CLIENT : GILBERT/COMMONWEALTH PROJECT :  
 JOB NO.: ST-1080 BORING NO.: B92-1 SAMPLE NO. BAG 2  
 DEPTH OR ELEVATION: 25'-30'

SIEVE ANALYSIS

SIEVE OPENING		U.S. STANDARD SIEVE SIZE OR NUMBER	WEIGHT RETAINED IN GRAMS	CULUMATIV WEIGHT RETAINED	PERCENT RETAINED	PERCENT FINER BY WEIGHT	REMARKS:	
INCHES	MILLI-METER							
3.00		3"	0	0	0.000	100.00		
1.50		1 1/2"	0	0	0.000	100.00	0	0
0.75	19.1	3/4"	29	29	0.037	96.35	597.5	568.5
0.375	9.52	3/8"	69	98	0.123	87.65	587.5	518.5
0.187	4.76	No. 4	63.6	161.6	0.204	79.64	569.1	505.5
0.079	2.00	No. 10	65.2	226.8	0.286	71.43	510.6	445.4
0.033	0.84	No.20	56.6	283.4	0.357	64.30	485.6	429
0.0165	0.42	No.40	41.35	324.75	0.409	59.09	434.85	393.5
0.0098	0.25	No. 60	30.02	354.77	0.447	55.31	373.12	343.1
0.0059	0.149	No. 100	29	383.77	0.483	51.66	387.9	358.9
0.0029	0.074	No. 200	39.4	423.17	0.533	46.69	334.9	295.5
PAN			370.67		0.467		718.07	347.4
TOTAL WEIGHT IN GRAMS			793.84					

HYDROMETER ANALYSIS

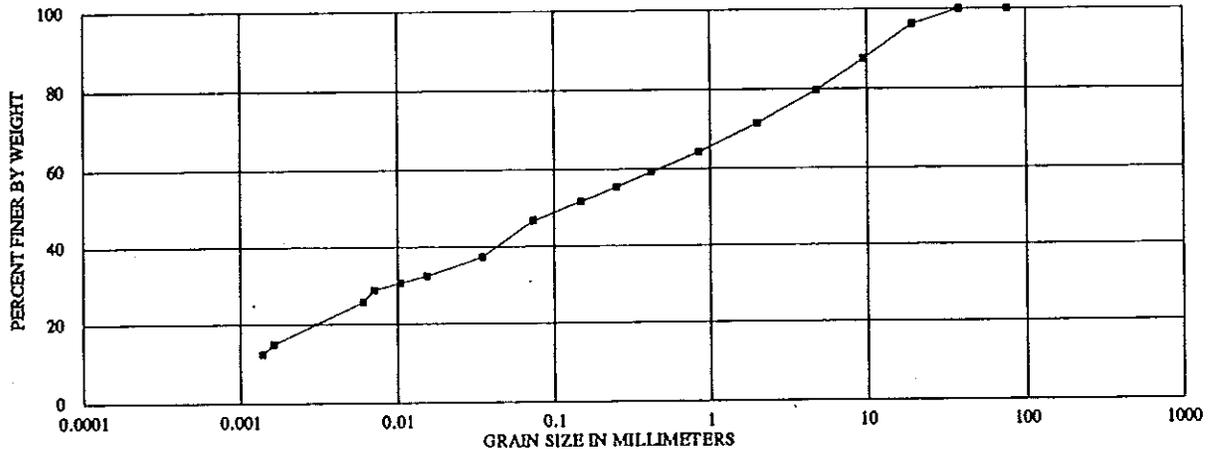
DISH No.	GRADUATE No.	HYDROMETER No. 152H
DISPERSING AGENT: SODIUM HEXAMETAPHOSPHATE		QUANTITY: 50
DISPERSING AGENT CORRECTION, Cd: 6.5		MENISCUS CORRECTION, C: 0.5

ELAPSED TIME (min.)	TEMP (C)	HYDRO READING (R')	CORR'D READING (R)	TEMP CORR. (m)	R (Cd + m)	PERCENT FINER		PARTICLE DIAMETER (mm)
						PARTIAL	TOTAL	
1	19	66	66.5	-0.2	60.2	52.35	37.39	0.034645
6	19	58	58.5	-0.2	52.2	45.39	32.42	0.015498
14	19	55	55.5	-0.2	49.2	42.78	30.56	0.010467
32	19	52	52.5	-0.2	46.2	40.17	28.70	0.007129
48	19	47	47.5	-0.2	41.2	35.83	25.59	0.00608
878	19	30	30.5	-0.2	24.2	21.04	15.03	0.001616
1260	19	26	26.5	-0.2	20.2	17.57	12.55	0.001381

Wt. of Sample for Hydrometer Analysis 115 Gs = 2.7  
 K = 0.01361

GRADATION CURVE

B-92-1, BAG 2, 25'-30'



REMARKS: clayey SAND w/ gravel

PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D 422)

CLIENT : GILBERT/Commonwealth PROJECT :  
 JOB NO.: ST-1080 BORING NO.: B92-4 SAMPLE NO. BAG 3  
 DEPTH OR ELEVATION: 15'-20'

SIEVE ANALYSIS

SIEVE OPENING		U.S. STANDARD	WEIGHT	CULUMATIV	PERCENT	PERCENT	REMARKS:	
INCHES	MILLI-METER	SIEVE SIZE OR NUMBER	RETAINED IN GRAMS	WEIGHT RETAINED	RETAINED	FINER BY WEIGHT		
3.00		3"	0		0.000	100.00		
1.50		1 1/2"	0	0	0.000	100.00	0	0
0.75	19.1	3/4"	0	0	0.000	100.00	568.5	568.5
0.375	9.52	3/8"	76.8	76.8	0.102	89.79	595.3	518.5
0.187	4.76	No. 4	116.7	193.5	0.257	74.27	622.2	505.5
0.079	2.00	No. 10	110.6	304.1	0.404	59.56	556	445.4
0.033	0.84	No. 20	62.7	366.8	0.488	51.22	491.7	429
0.0165	0.42	No. 40	28.4	395.2	0.526	47.44	421.9	393.5
0.0098	0.25	No. 60	24.1	419.3	0.558	44.24	367.2	343.1
0.0059	0.149	No. 100	27.3	446.6	0.594	40.61	386.2	358.9
0.0029	0.074	No. 200	35.05	481.65	0.641	35.95	330.55	295.5
PAN			270.3		0.359		617.7	347.4
TOTAL WEIGHT IN GRAMS			751.95					

HYDROMETER ANALYSIS

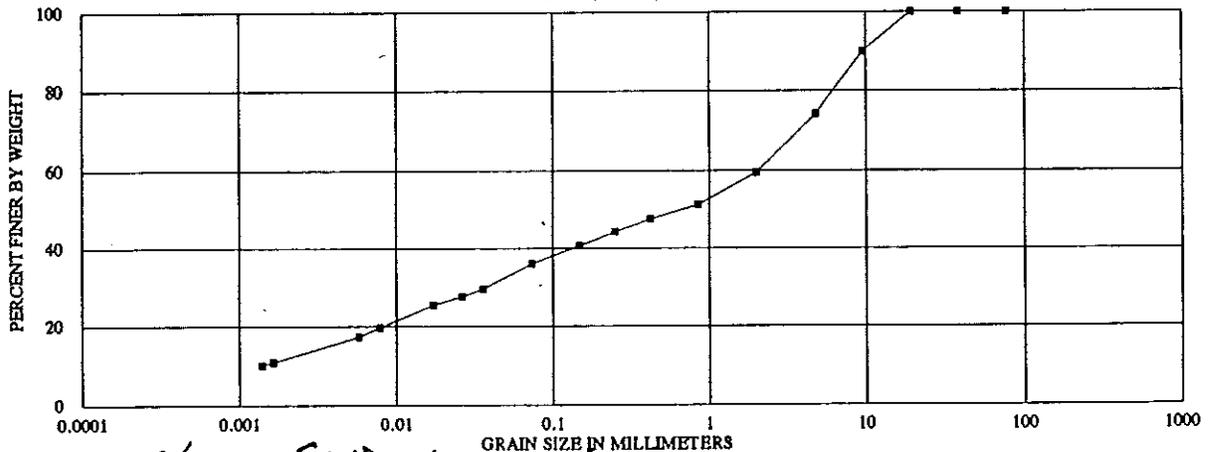
DISH No. GRADUATE No. HYDROMETER No. 152H  
 DISPERSING AGENT: SODIUM HEXAMETAPHOSPHATE QUANTITY: 5g  
 DISPERSING AGENT CORRECTION, Cd: 6.5 MENISCUS CORRECTION, Cm: 0.5

ELAPSED TIME (min.)	TEMP (C)	HYDRO READING (R')	CORR'D READING (R)	TEMP CORR. (m)	R - (Cd + m)	PERCENT FINER		PARTICLE DIAMETER (mm)
						PARTIAL	TOTAL	
1	19	63	63.5	-0.2	57.2	49.74	29.62	0.035957
2	19	59	59.5	-0.2	53.2	46.26	27.55	0.026496
5	19	55	55.5	-0.2	49.2	42.78	25.48	0.017301
30	19	44	44.5	-0.2	38.2	33.22	19.78	0.007889
60	19	39.5	40	-0.2	33.7	29.30	17.45	0.005793
891	19	27	27.5	-0.2	21.2	18.43	10.98	0.001636
1277	19	25.5	26	-0.2	19.7	17.13	10.20	0.001382

Wt. of Sample for Hydrometer Analysis 115 Gs = 2.7  
 K = 0.01361

GRADATION CURVE

B-92-4, BAG 3, 15'-20'



REMARKS: clayey SAND w/ gravel

PARTICLE-SIZE ANALYSIS OF SOILS (ASTM D 422)

CLIENT : GILBERT/Commonwealth PROJECT :  
 JOB NO.: ST-1080 BORING NO.: B92-4 SAMPLE NO. BAG 4  
 DEPTH OR ELEVATION: 35'-40'

SIEVE ANALYSIS

SIEVE OPENING		U.S. STANDARD SIEVE SIZE OR NUMBER	WEIGHT RETAINED IN GRAMS	CULUMATIV WEIGHT RETAINED	PERCENT RETAINED	PERCENT FINER BY WEIGHT	REMARKS:	
INCHES	MILLI-METER							
3.00		3"	0		0.000	100.00		
1.50		1 1/2"	0	0	0.000	100.00	0	0
0.75	19.1	3/4"	0	0	0.000	100.00	568.5	568.5
0.375	9.52	3/8"	0	0	0.000	100.00	518.5	518.5
0.187	4.76	No. 4	6.7	6.7	0.043	95.69	512.2	505.5
0.079	2.00	No. 10	13.2	19.9	0.128	87.19	458.6	445.4
0.033	0.84	No.20	7	26.9	0.173	82.68	436	429
0.0165	0.42	No.40	4.6	31.5	0.203	79.72	360.6	356
0.0098	0.25	No. 60	5.1	36.6	0.236	76.43	348.2	343.1
0.0059	0.149	No. 100	7.1	43.7	0.281	71.86	366	358.9
0.0029	0.074	No. 200	9.7	53.4	0.344	65.61	305.2	295.5
PAN			101.9		0.656		449.3	347.4
TOTAL WEIGHT IN GRAMS			155.3					

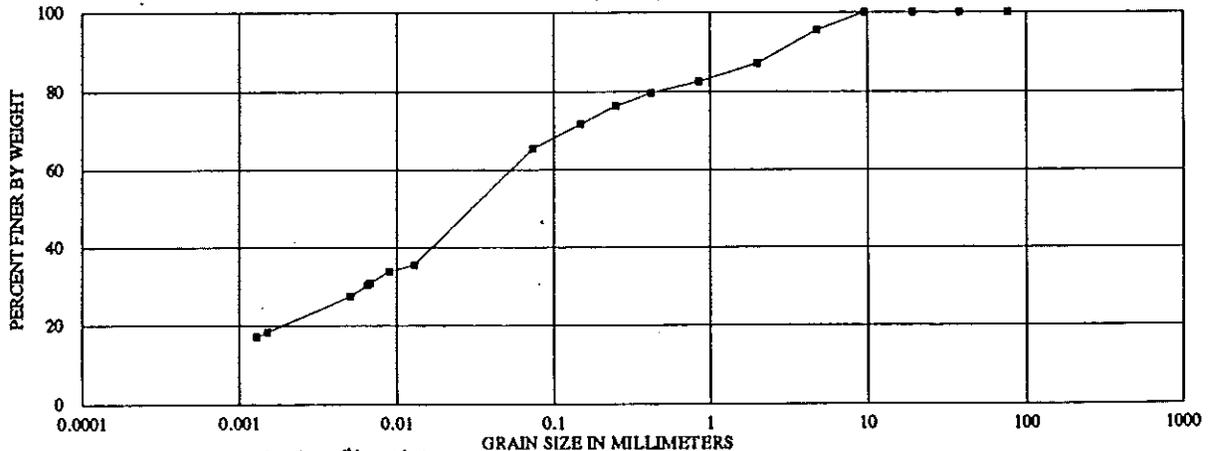
HYDROMETER ANALYSIS

DISH No.	GRADUATE No.	HYDROMETER No. 152H						
DISPERSING AGENT: SODIUM HEXAMETAPHOSPHATE		QUANTITY: 5g						
DISPERSING AGENT CORRECTION, Cd: 6.5		MENISCUS CORRECTION, Cm: 0.5						
ELAPSED TIME (min.)	TEMP (C)	HYDRO READING (R')	CORR'D READING (R)	TEMP CORR. (m)	R - (Cd + m)	PERCENT FINER		PARTICLE DIAMETER (mm)
						PARTIAL	TOTAL	
7	19	68	68.5	-0.2	62.2	54.09	35.49	0.012912
15	19	65	65.5	-0.2	59.2	51.48	33.78	0.009014
30	19	60	60.5	-0.2	54.2	47.13	30.92	0.00675
33	19	59	59.5	-0.2	53.2	46.26	30.35	0.006523
60	19	54	54.5	-0.2	48.2	41.91	27.50	0.005086
893	19	38	38.5	-0.2	32.2	28.00	18.37	0.001511
1280	19	36	36.5	-0.2	30.2	26.26	17.23	0.001283

Wt. of Sample for Hydrometer Analysis 115 Gs = 2.7  
 K = 0.01361

GRADATION CURVE

B-92-4, BAG 4, 35'-40'



REMARKS: LL = 29.9 PL = 16.9 PI = 13  
 sandy lean CLAY

DENSITY DETERMINATIONS

CLIENT: G/C  
 JOB NUMBER: ST-1080

PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT

DISH #	BORING #	SAMPLE #	DRY WEIGHT OF SAMPLE GM	WEIGHT OF SAND GM	VOLUME OF SOIL CU FT	DRY DENSITY OF SOIL PSF
42	92-2	1	50.3	40.3	0.000927503	119.31
101	92-5	3	28.8	27.7	0.000637514	99.39
104	92-5	4	42.4	41.9	0.000984327	96.73
115	92-3	S-2	49.0	42.7	0.000982739	109.69
116	92-3	S-2	18.5	20.1	0.000462601	87.98
95	92-2	SS-7	25.1	20.2	0.000464902	118.78
	92-1	S-11				121.60

DRY DENSITY OF SAND = 95.59 PCF

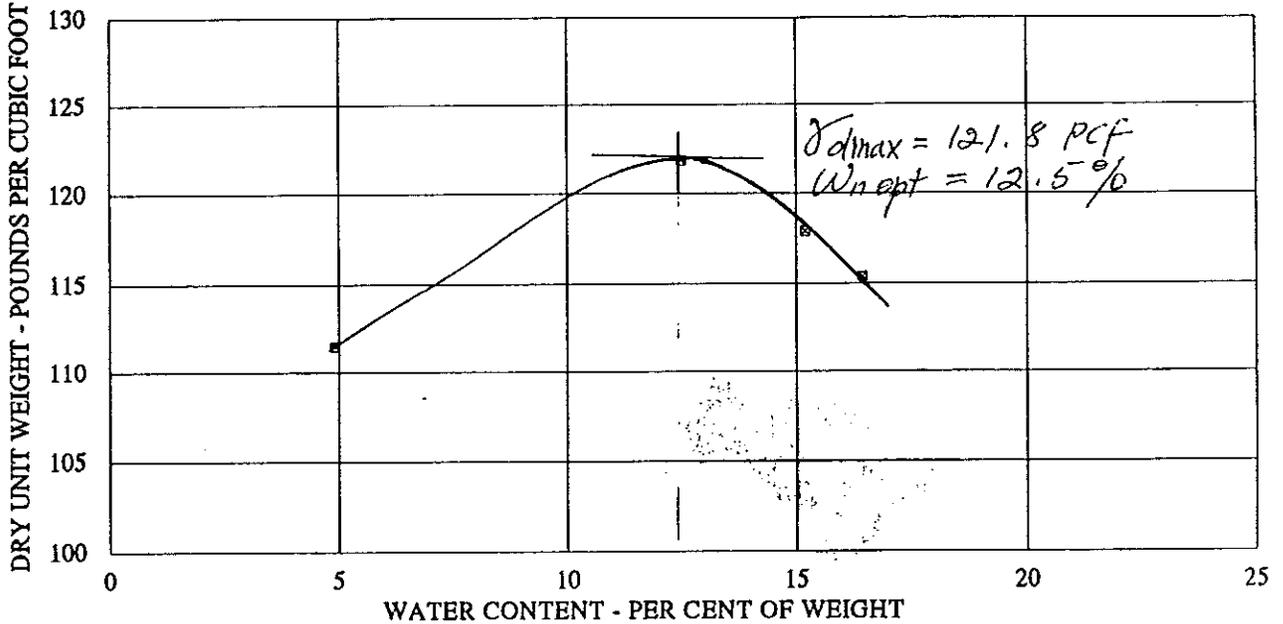
TEST RESULTS

CLIENT : GILBERT/COMMONWEALTH  
 PROJECT KEYSTONE STATION  
 JOB NUMB ST-1080  
 DATE : 1/4/93

BORING NO.: B92-4  
 SAMPLE NO.: BAG # 4

# COMPACTION TEST

IN ACCORDANCE WITH ASTM D698



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STANDARD PROCTOR DENSITY (ASTM D698)

FOR BAG SAMPLE #4

SAMPLE NUMBER	TEST 1	TEST 2	TEST 3	TEST 4
DISH NUMBER	80	53	122	61
WT. DIST AND WET SOIL IN g	330.5	325.1	269.9	275.2
WT. DISH AND DRY SOIL IN g	293.7	286.9	245.6	264.7
WT. WATER LOSS (W <sub>w</sub> ) IN g	36.8	38.2	24.3	10.5
WT. DISH IN g	51.6	54.4	51.3	51.4
WT. DRY SOIL, (W <sub>s</sub> ) IN g	242.1	232.5	194.3	213.3
WATER CONTENT % (w)	15.20	16.43	12.51	4.92

SAMPLE NUMBER	TEST 1	TEST 2	TEST 3	TEST 4
WT. OF SOIL AND MOLD, LBS	24.73	24.62	24.82	23.314
WT. OF MOLD, LBS	14.54	14.54	14.54	14.54
NET WT. WET SOIL., LBS	10.19	10.08	10.28	8.774
NET WT. DRY SOIL, LBS	8.845461	8.657554	9.137255	8.362351
DRY DENSITY LBS/CU FT	117.91	115.4052	121.7996	111.4701

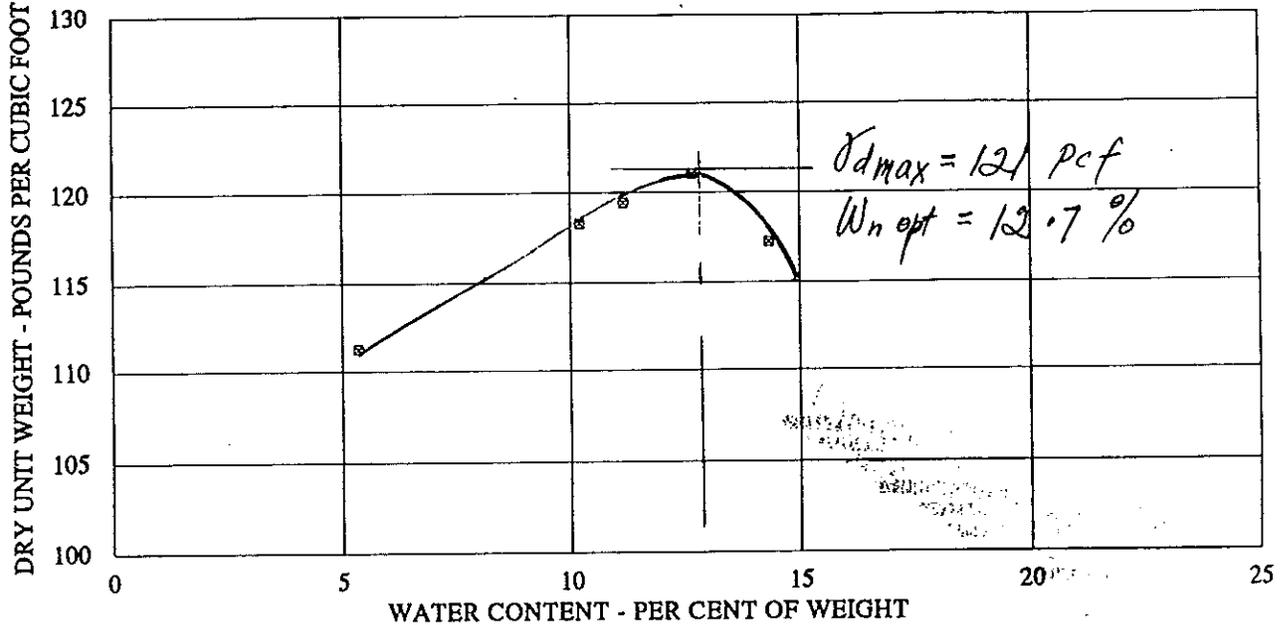
TEST RESULTS

CLIENT : GILBERT/COMMONWEALTH  
 PROJECT : KEYSTONE STATION  
 JOB NUMB ST-1080  
 DATE : 1/4/93

BORING NO.: B92-1  
 SAMPLE NO.: BAG # 2

# COMPACTION TEST

IN ACCORDANCE WITH ASTM D698



BAG #2 - B92-1

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STANDARD PROCTOR DENSITY (ASTM D698)

FOR BAG SAMPLE #2

SAMPLE NUMBER	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5
DISH NUMBER	78	128	64	85	60
WT. DIST AND WET SOIL IN g	394.6	345.9	302.52	145.12	289.8
WT. DISH AND DRY SOIL IN g	377.2	318.9	277.4	132.25	260
WT. WATER LOSS (Ww) IN g	17.4	27	25.12	12.87	29.8
WT. DISH IN g	52.2	54.18	52.31	30.67	52.1
WT. DRY SOIL, (Ws) IN g	325	264.72	225.09	101.58	207.9
WATER CONTENT % (w)	5.35	10.20	11.16	12.67	14.33

SAMPLE NUMBER	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5
WT. OF SOIL AND MOLD, LBS	23.33	24.32	24.5	24.77	24.6
WT. OF MOLD, LBS	14.54	14.54	14.54	14.54	14.54
NET WT. WET SOIL, LBS	8.79	9.78	9.96	10.23	10.06
NET WT. DRY SOIL, LBS	8.343312	8.874817	8.960059	9.079628	8.798797
DRY DENSITY LBS/CU FT	111.2163	118.3013	119.4376	121.0314	117.288

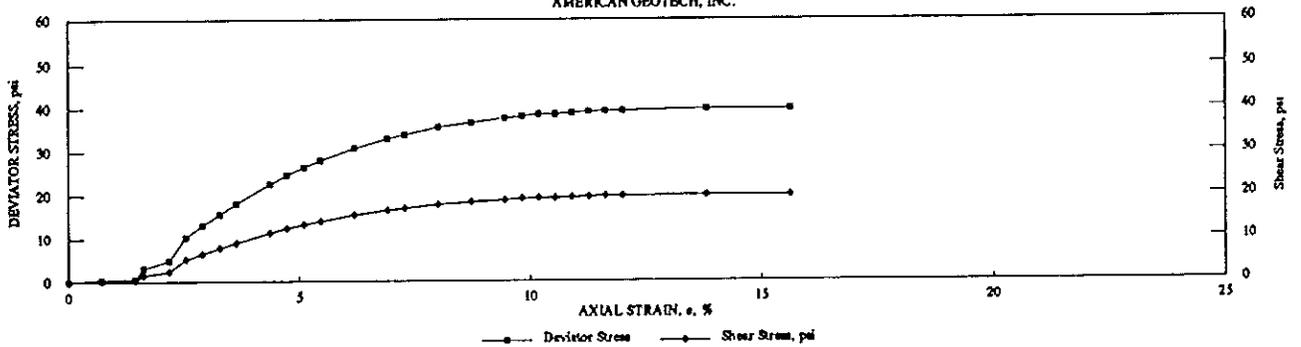
TRIAxIAL COMPRESSION (UU) TEST  
AXIAL LOADING DATA  
ASTM D 2850

AGENT: G/C PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT  
 NUMBER: ST-1080 BORING NO.: B92-1 SAMPLE NO.: BAG #2 SAMPLE DEPTH: -  
 TEST TYPE: UNCONSOLIDATED-UNDRAINED TRIAXIAL  
 SAMPLE HEIGHT, HI = 13.97 cm MOISTURE CONTENT, W<sub>nl</sub> = 9.51%  
 SAMPLE AREA, A = 40.98 sq.cm  
 CONFINING PRES. = 10 PSI

ELAPSED TIME MIN.	MANOMET READING PSI	PORE PRESSURE PSI	CUMULATI CHANGE (dH) IN E-3	P LOAD DIAL READING LB	P AXIAL LOAD LB	AXIAL STRAIN ε dH/H %	1 - ε	DEVIATOR STRESS SIM1-SIM3 P(1-ε)/A PSI	EFFECTIVE SIMA3 PSI	SIMA1 PSI	SIMA1/ SIMA3	(S1 + S3)/2 PSI	(S1 - S3)/2 PSI
11:30AM			0	0	0	0.00	1	0.000	10	10.00	1.00	10.00	0.00
1/8/1993			0	40	4	0.73	0.9927	0.522	10	10.52	1.05	10.26	0.26
			0	80	5	1.45	0.9855	0.648	10	10.65	1.06	10.32	0.32
			0	90	25	20.875	1.64	0.9836	10	13.23	1.32	11.62	1.62
			0	120	38	31.73	2.18	0.9782	10	14.89	1.49	12.44	2.44
			0	140	81	67.635	2.55	0.9745	10	20.37	2.04	15.19	5.19
			0	160	103	86.005	2.91	0.9709	10	23.14	2.31	16.57	6.57
			0	180	123	102.705	3.27	0.9673	10	25.64	2.56	17.82	7.82
			0	200	142	118.57	3.64	0.9636	10	27.98	2.80	18.99	8.99
			0	240	180	150.3	4.38	0.9564	10	32.62	3.26	21.31	11.31
			0	260	197	164.495	4.73	0.9527	10	34.67	3.47	22.33	12.33
			0	280	212	177.02	5.09	0.9491	10	36.44	3.64	23.22	13.22
			0	300	225	187.875	5.45	0.9455	10	37.98	3.80	23.98	13.98
			0	340	250	208.75	6.18	0.9382	10	40.82	4.08	25.41	15.41
			0	380	269	224.615	6.91	0.9309	10	42.91	4.29	26.46	16.46
			0	400	278	232.13	7.27	0.9273	10	43.88	4.39	26.94	16.94
			0	440	294	245.49	8.00	0.9200	10	45.55	4.55	27.77	17.77
			0	480	306	255.51	8.73	0.9127	10	46.71	4.67	28.35	18.35
			0	520	316	263.86	9.45	0.9055	10	47.60	4.76	28.80	18.80
			0	640	321	268.035	9.82	0.9018	10	48.05	4.80	29.02	19.02
			0	560	326	272.21	10.18	0.8982	10	48.48	4.85	29.24	19.24
			0	580	328	273.88	10.55	0.8945	10	48.58	4.86	29.28	19.28
			0	600	332	277.22	10.91	0.8909	10	48.87	4.89	29.44	19.44
			0	620	335	279.725	11.27	0.8873	10	49.06	4.91	29.53	19.53
			0	640	338	282.23	11.64	0.8838	10	49.25	4.93	29.63	19.63
			0	660	340	283.9	12.00	0.8800	10	49.32	4.93	29.66	19.66
			0	760	350	292.25	13.82	0.8618	10	49.64	4.96	29.82	19.82
			0	860	358	298.83	15.64	0.8436	10	49.69	4.97	29.85	19.85

TRIAxIAL COMPRESSION TEST (UU) REPORT

AMERICAN GEOTECH, INC.



95% Proctor Density & 9.51% Moisture  
 Confining Pressure = 10 psi

TEST TIME TO FAILURE 150 MIN. STRAIN RATE .2MM/MIN. TYPE OF FAILURE BULGING

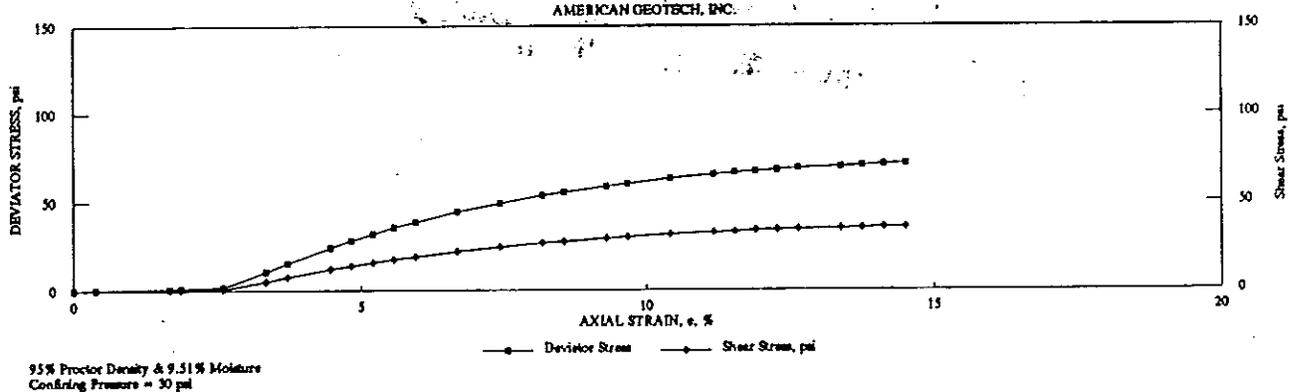
TECHNICIAN GB/KC COMPUTED BY \_\_\_\_\_ DATE 1/8 CHECKED BY KC DATE 1/15/93

TRIAXIAL COMPRESSION (UU) TEST  
AXIAL LOADING DATA  
ASTM D 2850

AGENT: G/C PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT  
 B NUMBER: ST-1080 BORING NO.: B92-1 SAMPLE NO.: #2 SAMPLE DEPTH: -  
 TEST TYPE: UNCONSOLIDATED-UNDRAINED TRIAXIAL  
 SAMPLE HEIGHT, H<sub>i</sub> = 13.653 cm MOISTURE CONTENT, W<sub>ni</sub> = 9.51%  
 SAMPLE AREA, A = 40.98 sq.cm  
 CONFINING PRES. = 30 PSI

ELAPSED TIME MIN.	MANOMET READING PSI	PORE PRESSURE PSI	CUMULATI VE CHANGE (dH) IN E-3	P LOAD DIAL READING LB	P AXIAL LOAD LB	AXIAL STRAIN e dH/H %	1 - e	DEVIATOR STRESS SIM1-SIM3 P(1-e)/A PSI	EFFECTIVE			SHEAR	
									SIMA3 PSI	SIMA1 PSI	SIMA1/ SIMA3	(S1 + S3)/2 PSI	(S1 - S3)/2 PSI
8:35 PM			0	0	0	0.00	1	0.000	30	30.00	1.00	30.00	0.00
1/8/1993			0	20	5	4.175	0.9963	0.655	30	30.85	1.02	30.33	0.33
			0	90	8	8.88	0.9833	1.034	30	31.03	1.03	30.52	0.52
			0	100	10	8.35	0.9814	1.290	30	31.29	1.04	30.64	0.64
			0	140	15	12.525	0.9740	1.920	30	31.92	1.06	30.86	0.86
			0	180	85	70.975	0.9886	10.797	30	40.80	1.36	35.40	5.40
			0	200	122	101.87	0.9828	15.437	30	45.44	1.51	37.72	7.72
			0	240	194	161.99	0.9554	24.358	30	54.38	1.81	42.18	12.18
			0	260	228	190.38	0.9516	28.515	30	58.52	1.85	44.26	14.26
			0	280	258	215.43	0.9479	32.141	30	62.14	2.07	46.07	16.07
			0	300	287	239.645	0.9442	35.613	30	65.61	2.19	47.81	17.81
			0	320	312	260.52	0.9405	38.563	30	68.56	2.29	49.28	19.28
			0	360	383	303.105	0.9330	44.512	30	74.51	2.48	52.26	22.26
			0	400	405	338.175	0.9256	49.268	30	79.27	2.64	54.63	24.63
			0	440	443	369.905	0.9181	53.455	30	83.45	2.78	56.73	26.73
			0	460	460	384.1	0.9144	55.281	30	85.28	2.84	57.64	27.64
			0	500	493	411.655	0.9070	58.765	30	88.77	2.96	59.38	29.38
			0	520	508	424.18	0.9033	60.305	30	90.30	3.01	60.15	30.15
			0	560	535	446.725	0.8958	62.987	30	92.99	3.10	61.49	31.49
			0	600	559	466.765	0.8884	65.265	30	95.27	3.18	62.63	32.63
			0	620	571	478.785	0.8847	66.387	30	96.39	3.21	63.19	33.19
			0	640	581	485.135	0.8809	67.266	30	97.27	3.24	63.63	33.63
			0	660	590	492.65	0.8772	68.019	30	98.02	3.27	64.01	34.01
			0	680	599	500.165	0.8735	68.764	30	98.78	3.29	64.38	34.38
			0	720	612	511.02	0.8661	69.658	30	99.66	3.32	64.83	34.83
			0	740	621	518.535	0.8623	70.378	30	100.38	3.35	65.19	35.19
			0	760	629	525.215	0.8586	70.978	30	100.98	3.37	65.49	35.49
			0	780	635	530.225	0.8549	71.344	30	101.34	3.38	65.67	35.67

TRIAXIAL COMPRESSION TEST (UU) REPORT



TEST TIME TO FAILURE 150 MIN. STRAIN RATE .2MM/MIN. TYPE OF FAILURE BULGING

TECHNICIAN EB/icc COMPUTED BY \_\_\_\_\_ DATE 1/8 CHECKED BY icc DATE 1/13/93

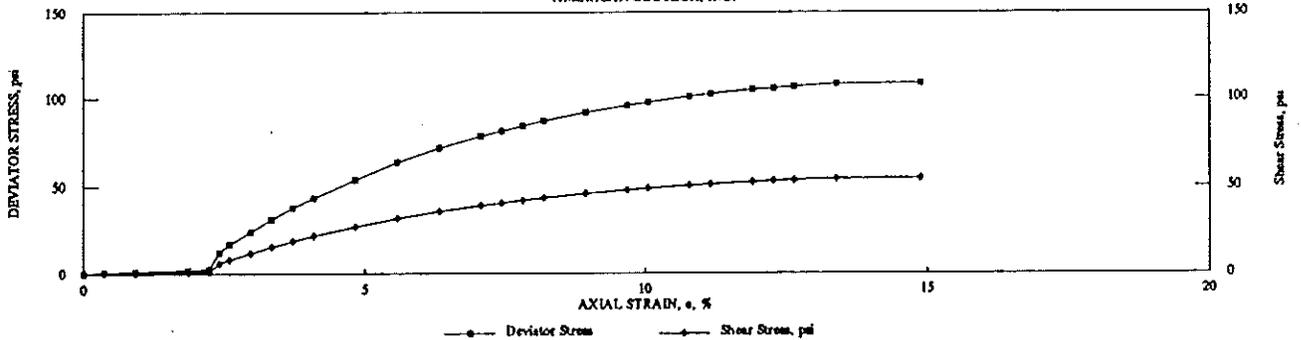
TRIAxIAL COMPRESSION (UU) TEST  
 AXIAL LOADING DATA  
 ASTM D 2850

AGENT: G/C PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT  
 JOB NUMBER: ST-1080 BORING NO.: B92-1 SAMPLE NO.: #3 SAMPLE DEPTH: -  
 TEST TYPE: UNCONSOLIDATED-UNDRAINED TRIAXIAL  
 SAMPLE HEIGHT, H<sub>i</sub> = 13.653 cm MOISTURE CONTENT, W<sub>nl</sub> = 9.51%  
 SAMPLE AREA, A = 40.98 sq.cm  
 CONFINING PRES. = 50 PSI

ELAPSED TIME MIN.	MANOMET READING PSI	PORE PRESSURE PSI	CUMULATI VE CHANGE (dH) IN E-3	P LOAD DIAL READING LB	P AXIAL LOAD LB	AXIAL STRAIN $\epsilon$ dH/H %	1 - $\nu$	DEVIATOR STRESS SIM1-SIM3 P(1- $\nu$ )/A PSI	EFFECTIVE SIMA3 PSI	SIMA1 PSI	SIMA1/ SIMA3	(S1 + S3)/2 PSI	SHEAR (S1-S3)/2 PSI
9:45PM			0	0	0	0.00	1	0.000	50	50.00	1.00	50.00	0.00
1/8/1993			0	20	8	6.88	0.37	0.9983	50	51.05	1.02	50.52	0.52
			0	50	10	8.35	0.93	0.9907	50	51.30	1.03	50.65	0.65
			0	100	16	13.36	1.86	0.9814	50	52.06	1.04	51.03	1.03
			0	120	21	17.535	2.23	0.9777	50	52.70	1.05	51.35	1.35
			0	130	85	79.325	2.42	0.9758	50	62.18	1.24	56.09	6.09
			0	140	132	110.22	2.60	0.9740	50	66.90	1.34	58.45	8.45
			0	160	189	157.815	2.98	0.9702	50	74.10	1.48	62.05	12.05
			0	180	245	204.575	3.35	0.9665	50	81.12	1.62	65.56	15.56
			0	200	298	248.83	3.72	0.9628	50	87.71	1.75	68.85	18.85
			0	220	345	288.075	4.09	0.9591	50	93.49	1.87	71.74	21.74
			0	260	428	357.38	4.84	0.9516	50	103.53	2.07	76.76	26.76
			0	300	510	425.85	5.68	0.9442	50	113.29	2.27	81.64	31.64
			0	340	578	483.465	6.33	0.9367	50	121.28	2.43	85.64	35.64
			0	380	638	532.73	7.07	0.9293	50	127.92	2.56	88.96	38.96
			0	400	666	556.11	7.44	0.9256	50	131.01	2.62	90.51	40.51
			0	420	693	578.655	7.81	0.9219	50	133.96	2.68	91.98	41.98
			0	440	718	599.53	8.19	0.9181	50	136.64	2.73	93.32	43.32
			0	480	764	637.94	8.93	0.9107	50	141.44	2.83	95.72	45.72
			0	520	804	671.34	9.67	0.9033	50	145.44	2.91	97.72	47.72
			0	540	823	687.205	10.05	0.8995	50	147.30	2.95	98.65	48.65
			0	580	858	716.43	10.79	0.8921	50	150.59	3.01	100.30	50.30
			0	600	874	729.79	11.16	0.8884	50	152.04	3.04	101.02	51.02
			0	640	903	754.005	11.91	0.8809	50	154.55	3.09	102.27	52.27
			0	660	915	764.025	12.28	0.8772	50	155.49	3.11	102.74	52.74
			0	680	927	774.045	12.65	0.8735	50	156.42	3.13	103.21	53.21
			0	720	949	792.415	13.39	0.8661	50	158.02	3.16	104.01	54.01
			0	800	970	809.95	14.88	0.8512	50	158.51	3.17	104.25	54.25

TRIAxIAL COMPRESSION TEST (UU) REPORT

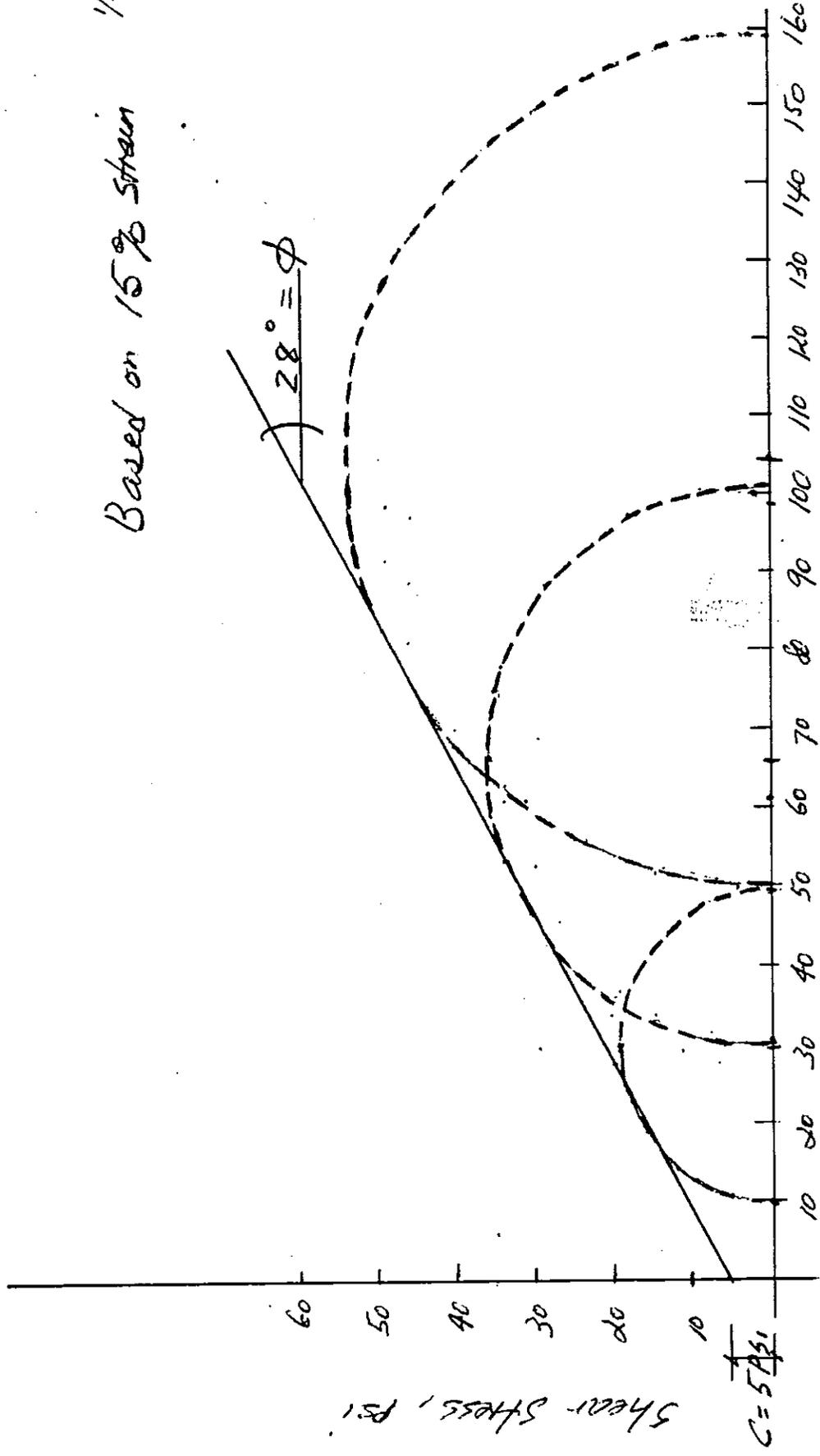
AMERICAN GEOTECH. INC.



TEST TIME TO FAILURE 150 MIN. STRAIN RATE .2MM/MIN. TYPE OF FAILURE BULGING

TECHNICIAN GB/KC COMPUTED BY - DATE 1/8 CHECKED BY KC DATE 1/15/93

Based on 15% strain 1/11/93



Normal Stress, PSI

AMERICAN GEOTECH INC  
1801 PENN AVE  
WYOMING HILLS, READING,  
PA 19609, 215-670-9055

Client: G/C  
PROJECT: PENELEC  
TECHNICIAN: ETS  
CHECK: KC

LL

THERMAL DISCHARGE PROJECT

Bag # 2, 892-1  
95% Standard Proctor  
9.5% = W<sub>n</sub>i

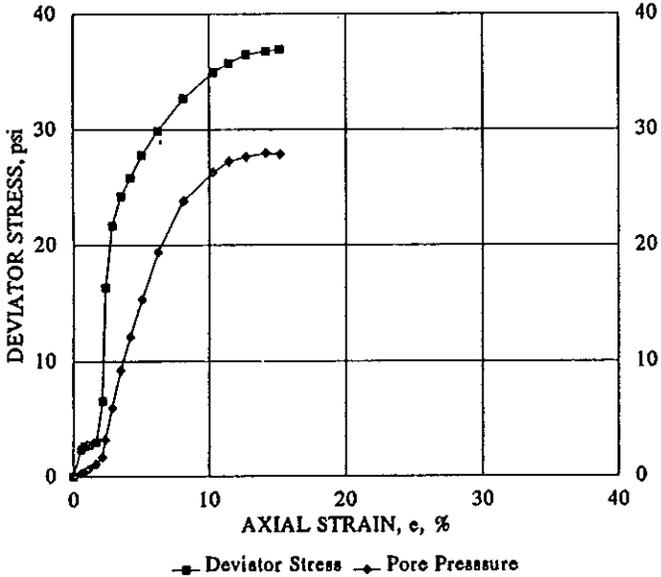
1/11/93

TRIAxIAL COMPRESSION (Q AND R) TEST  
AXIAL LOADING DATA

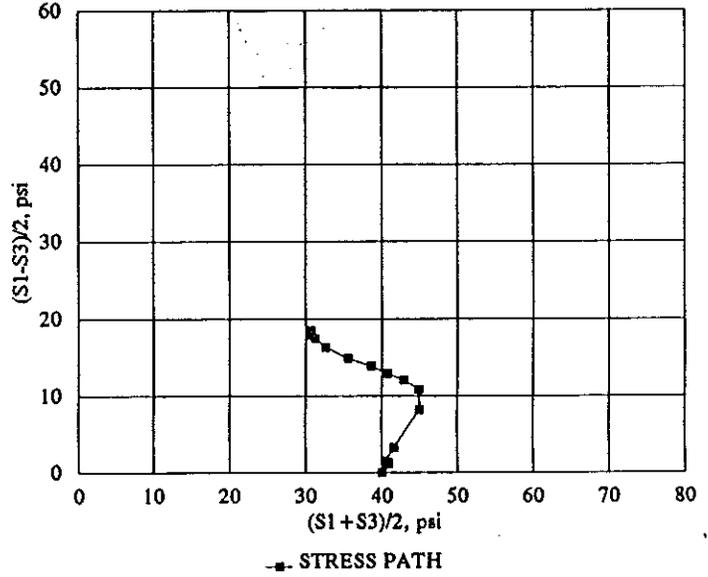
CLIENT: G/C PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT  
 JOB NUMBER: ST-1080 BORING NO.: B-92-1, B92-2, B92-4 SAMPLE NO.: MIXED SAMPLE DEPTH: -  
 TEST TYPE: CONSOLIDATED-UNDRAINED  
 SAMPLE HEIGHT, H = 15.081 cm (use Ho for Q tests and Hc for R tests)  
 SAMPLE AREA, A = 40.88 SQ.cm (use Ao for Q tests and Ac for R tests)  
 CONFINING PRES. = 40 PSI  
 SATURATION PRESSURE = 60 PSI

ELAPSED TIME MIN.	MANOMET READING PSI	PORE PRESSURE PSI	CUMULATI CHANGE (dH) IN E-3	P LOAD DIAL READING LB	P AXIAL LOAD LB	AXIAL STRAIN e dH/H %	1 - e	DEVIATOR STRESS SIM1-SIM3 P(1-e)/A PSI	EFFECTIVE SIMA3 PSI	SIMA1 PSI	SIMA1/ SIMA3	EFFECTIVE (S1 + S3)/2 PSI	(S1-S3)/2 PSI
5:00PM	21.00	0.00	0	0	0	0.00	1	0.000	40	40.00	1.00	40.00	0.00
1/14/93	21.27	0.27	34	18	16	0.57	0.9943	2.347	39.73	42.08	1.06	40.90	1.17
	21.41	0.41	50	20	16.66667	0.84	0.9916	2.601	39.59	42.19	1.07	40.89	1.30
	21.68	0.68	70	21	17.5	1.18	0.9882	2.722	39.32	42.04	1.07	40.68	1.36
	22.08	1.08	100	23	19.16667	1.68	0.9832	2.868	38.94	41.91	1.08	40.42	1.48
	22.89	1.69	130	51	42.5	2.19	0.9781	6.543	38.31	44.85	1.17	41.58	3.27
	24.17	3.17	140	128	106.6667	2.36	0.9764	16.393	36.83	53.22	1.45	45.03	8.20
	26.94	5.94	170	170	141.6667	2.86	0.9714	21.859	34.06	55.72	1.64	44.89	10.83
	30.23	9.23	210	191	159.1667	3.54	0.9646	24.166	30.77	54.94	1.79	42.85	12.08
	33.10	12.10	250	205	170.8333	4.21	0.9579	25.756	27.9	53.66	1.92	40.78	12.88
	36.33	15.33	300	223	185.8333	5.05	0.9495	27.771	24.67	52.44	2.13	38.56	13.89
	40.36	19.36	370	243	202.5	6.23	0.9377	29.886	20.64	50.53	2.45	35.58	14.94
	44.74	23.74	480	271	225.8333	8.08	0.9192	32.671	16.26	48.93	3.01	32.60	16.34
	47.25	26.25	610	297	247.5	10.27	0.8973	34.853	13.75	48.70	3.54	31.23	17.48
	48.22	27.22	680	308	256.6667	11.45	0.8855	35.771	12.78	48.55	3.80	30.67	17.89
	48.59	27.59	755	319	265.8333	12.72	0.8728	36.520	12.41	48.93	3.94	30.67	18.26
	48.90	27.90	840	327	272.5	14.15	0.8585	36.822	12.1	48.92	4.04	30.51	18.41
	48.80	27.80	900	332	276.6667	15.16	0.8484	36.945	12.2	49.14	4.03	30.67	18.47

TRIAxIAL COMPRESSION TEST REPORT  
AMERICAN GEOTECH, INC.



TRIAxIAL COMPRESSION TEST REPORT  
STRESS PATH CURVE



CONFINING PRESSURE = 40 PSI

CONFINING PRESSURE 40 PSI

INITIAL MOISTURE CONTENT, W<sub>ni</sub> = 18.1%  
 SAMPLE COMPACTED TO 95.7% STANDARD PROCTOR  
 SAMPLE CONSOLIDATED UNDER 40 psi FROM 1/13/93 (3:30 P.M.) TO 1/14/93 (4:35 P.M.)  
 FINAL MOISTURE CONTENT, W<sub>nf</sub> =  
 FINAL HEIGHT = 12.4619 CM

TEST TIME TO FAILURE 120 MIN. STRAIN RATE .2MM/MIN TYPE OF FAILURE BULGING

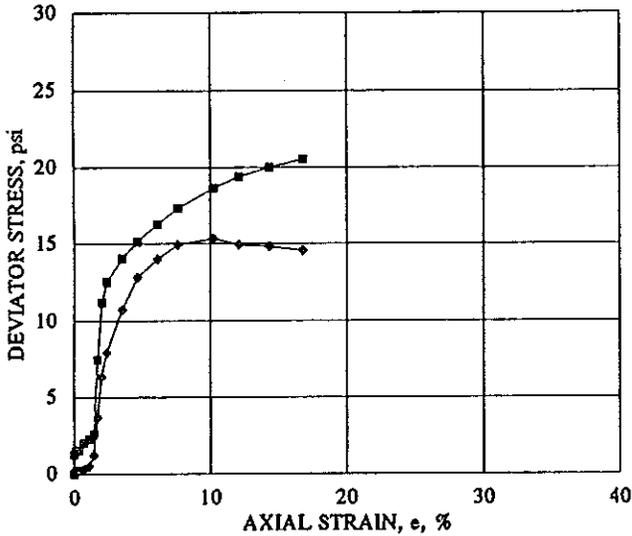
TECHNICIAN GA/R COMPUTED BY - DATE 1/11/93 CHECKED BY KCC DATE 1/15/93

TRIAxIAL COMPRESSION (Q AND R) TEST  
AXIAL LOADING DATA

CLIENT: G/C PROJECT: PENELEC KEYSTONE STATION, THERMAL DISCHARGE PROJECT  
 JOB NUMBER: ST-1080 BORING NO.: B-92-1, B92-2, B92-4 SAMPLE NO.: MIXED SAMPLE DEPTH: -  
 TEST TYPE: CONSOLIDATED-UNDRAINED  
 SAMPLE HEIGHT, H = 13.653 cm (use H<sub>o</sub> for Q tests and H<sub>c</sub> for R tests)  
 SAMPLE AREA, A = 40.98 sq.cm (use A<sub>o</sub> for Q tests and A<sub>c</sub> for R tests)  
 CONFINING PRES. = 20 PSI  
 SATURATION PRESSURE = 80 PSI

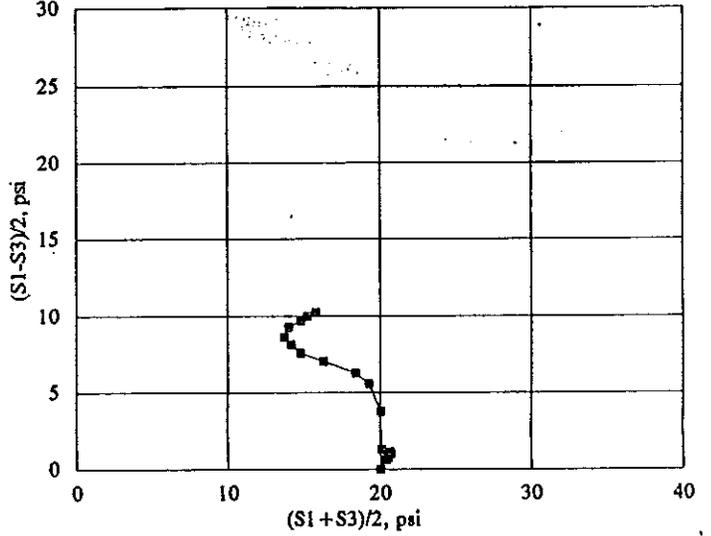
ELAPSED TIME MIN.	MANOMET READING PSI	PORE PRESSURE PSI	CUMULATI V CHANGE IN E-3	P LOAD DIAL READING LB	P AXIAL LOAD LB	AXIAL STRAIN e %	1 - e	DEVIATOR STRESS	EFFECTIVE			EFFECTIVE	
								SIM1-SIM3 P(1-e)/A PSI	SIMA3 PSI	SIMA1 PSI	SIMA1/SIMA3	(S1+S3)/2 PSI	(S1-S3)/2 PSI
8:40AM	41.62	0	0	0	0	0.00	1	0.000	20	20.00	1.00	20.00	0.00
1/11/93	41.84	0.22	1	9.5	7.916667	0.02	0.9998	1.246	19.78	21.03	1.08	20.40	0.62
	41.84	0.22	10	11.5	9.583333	0.19	0.9981	1.506	19.78	21.29	1.08	20.53	0.75
	41.83	0.21	20	11.8	9.833333	0.37	0.9963	1.542	19.79	21.33	1.08	20.56	0.77
	41.91	0.29	40	15.5	12.91667	0.74	0.9926	2.018	19.71	21.73	1.10	20.72	1.01
	42.12	0.5	60	17.5	14.58333	1.12	0.9888	2.270	19.5	21.77	1.12	20.83	1.13
	42.84	1.22	80	20	16.66667	1.49	0.9851	2.584	18.78	21.36	1.14	20.07	1.29
	45.3	3.68	95	58	48.33333	1.77	0.9823	7.473	18.32	23.79	1.46	20.08	3.74
	47.97	6.35	110	87	72.5	2.05	0.9795	11.178	13.65	24.83	1.82	19.24	5.59
	49.54	7.92	130	98	81.66667	2.42	0.9758	12.543	12.08	24.62	2.04	18.35	6.27
	52.38	10.76	190	111	92.5	3.53	0.9647	14.044	9.24	23.28	2.52	16.26	7.02
	54.45	12.83	250	121	100.8333	4.65	0.9535	15.132	7.17	22.30	3.11	14.74	7.57
	55.61	13.99	330	132	110	6.14	0.9386	16.250	6.01	22.28	3.70	14.14	8.13
	56.55	14.93	410	142.5	118.75	7.63	0.9237	17.265	5.07	22.33	4.41	13.70	8.63
	56.93	15.31	550	158	131.6667	10.23	0.8977	18.603	4.69	23.29	4.97	13.99	9.30
	56.53	14.91	650	168	140	12.09	0.8791	19.371	5.09	24.46	4.81	14.78	9.69
	56.41	14.79	770	178	148.3333	14.33	0.8567	20.002	5.21	25.21	4.84	15.21	10.00
	56.15	14.53	900	188	156.6667	16.74	0.8326	20.530	5.47	26.00	4.75	15.73	10.26

TRIAxIAL COMPRESSION TEST REPORT  
AMERICAN GEOTECH, INC.



— Deviator Stress — Pore Pressure

TRIAxIAL COMPRESSION TEST REPORT  
STRESS PATH CURVE



— STRESS PATH

CONFINING PRESSURE = 20 PSI

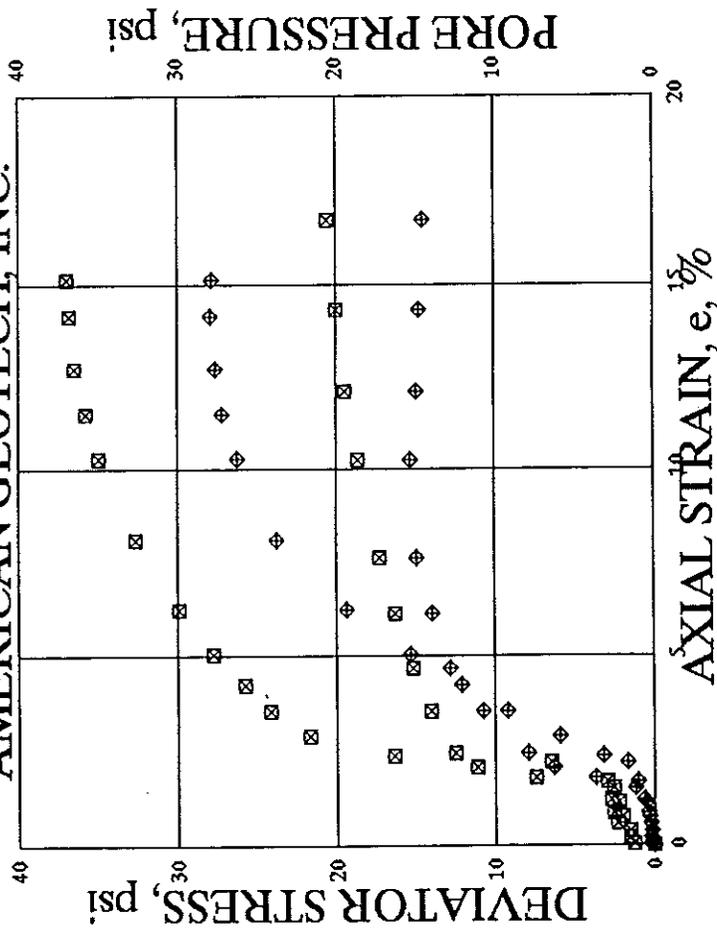
CONFINING PRESSURE 20 PSI

INITIAL MOISTURE CONTENT, W<sub>nl</sub> = 18.1%  
 SAMPLE COMPACTED TO 95.7% STANDARD PROCTOR  
 SAMPLE CONSOLIDATED UNDER 20 psi FROM 1/10/93 (10:10 A.M.) TO 1/11/93 (8:25 A.M.)  
 FINAL MOISTURE CONTENT, W<sub>nl</sub> =  
 FINAL HEIGHT = 11.1125 CM

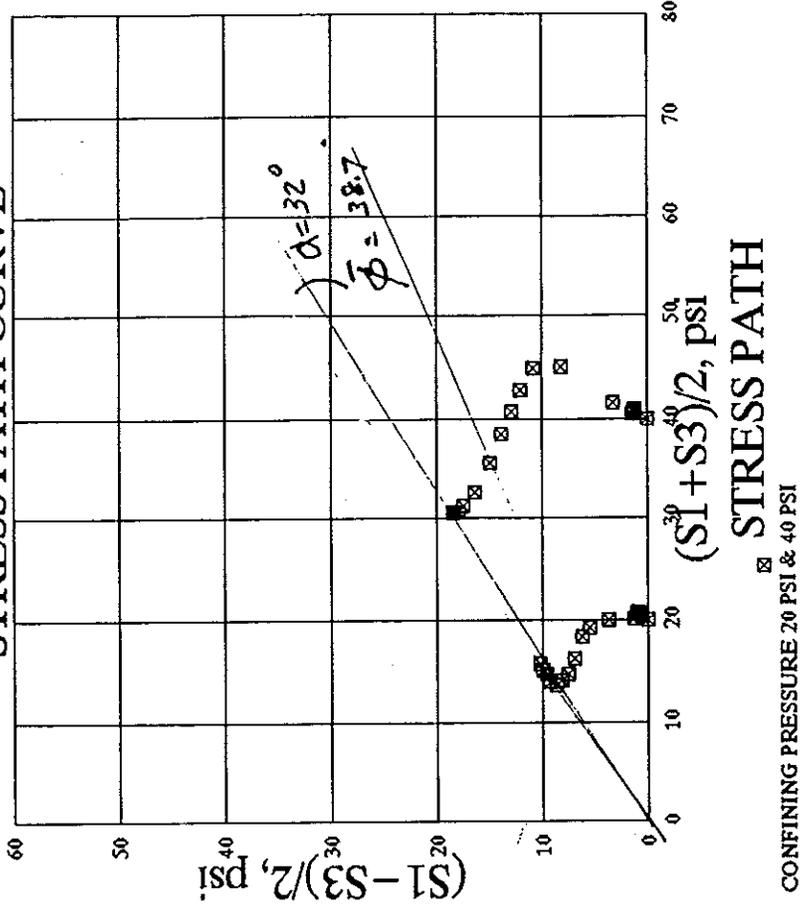
TEST TIME TO FAILURE 150 MIN. STRAIN RATE 2MM/MIN TYPE OF FAILURE BULGING

TECHNICIAN EA/KC COMPUTED BY DATE 1/11/93 CHECKED BY KC DATE 1/15/93

TRIAXIAL COMPRESSION TEST REPORT  
 AMERICAN GEOTECH, INC.



TRIAXIAL COMPRESSION TEST REPORT  
 STRESS PATH CURVE



**APPENDIX G**

**DAM INSPECTION REQUIREMENTS**

ENVIRONMENTAL RESOURCES

Pt. I

25 § 105.51

(b) Prior to discontinuing use or abandonment, the owner of a structure covered by this chapter, regardless of whether or not it was constructed under a permit from this Department or its predecessors, shall remove all or part of the facility and take other actions as are necessary to protect safety and the environment in accordance with a permit issued by the Department.

Source

The provisions of this § 105.47 adopted September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843.

OPERATION, MAINTENANCE AND INSPECTION

§ 105.51. Operation and maintenance.

The permittee or owner of a dam, water obstruction or encroachment shall operate and maintain the facility and appurtenant structures in a safe condition in accordance with permit terms and conditions and the provisions of this chapter so that the facility cannot imperil life, health, safety or property located above or below the facility.

Source

The provisions of this § 105.51 adopted September 10, 1971, effective September 11, 1971, 1 Pa.B. 1804; amended August 11, 1978, effective August 28, 1978, 8 Pa.B. 2229; amended September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843. Immediately preceding text appears at serial page (38858).

Cross References

This section cited in 25 Pa. Code § 105.131 (relating to operation and monitoring plans).

§ 105.52. Inspection.

Regardless of the date of construction of a dam, water obstruction or encroachment or whether or not it was permitted by the Department or its predecessors, it shall be the duty of the permittee or owner of a dam, water obstruction or encroachment to evaluate the safety of the facility and appurtenant structures and to modify the facility in accordance with the permit requirements of § 105.11 (relating to permit requirements) to ensure protection of life and property in accordance with changed conditions and current safety criteria.

Source

The provisions of this § 105.52 adopted September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843.

Cross References

This section cited in 25 Pa. Code § 105.131 (relating to operation and monitoring plans).

§ 105.53. Inspections by owners and inspection reports.

The permittee or owner of a dam, water obstruction or encroachment shall inspect the facility and appurtenant works according to the following schedule:

- (1) Dams, reservoirs and their appurtenant works shall be inspected at least once every 3 months.
- (2) For Category 1 dams and Category 2 dams as classified in § 105.91 (relating to classification of dams and reservoirs), which are defined as high hazard dams in § 105.1 (relating to definitions), annual reports regarding the condition of the dam, certified by a registered professional engineer, shall be submitted to the Department on or before December 31 of each year. More frequent reports of dam conditions may be required by the Department if in its discretion conditions indicate the reports are necessary to assure adequate protection of health, safety and property.

(3) For local flood protection projects, annual reports regarding the condition of the flood protection facility shall be submitted to the Department on or before December 31 of each year.

(4) The owner of a water obstruction or encroachment shall conduct periodic inspections to ensure the safe operation, monitoring and maintenance of the facility in accordance with this title, terms and conditions of the permit and approved operating or monitoring plans

(5) The owner shall retain records of the inspections, including records of actions taken to correct conditions found in the inspections. Copies of the records shall be provided to the Department on request

(6) The Department may, through terms and conditions of the permit or by request at any time, require the owner to submit certificate reports regarding the condition of the facility to the Department.

(7) In lieu of inspections conducted by the owner and certificate reports submitted by the owner, the Department may accept reports or equivalent inspections conducted and prepared by governmental agencies. In addition, the Department may accept equivalent inspection reports certified by the owner and submitted to other government agencies.

Authority

The provisions of this § 105.53 amended under the act of November 26, 1978 (P. L. 137 No. 325) (32 P. S. §§ 693.1-693.27); the act of June 22, 1937 (P. L. 1987, No. 394) (P. S. §§ 691.1-691.1001); section 7 of the act of June 14, 1923 (P. L. 704, No. 294) (P. S. § 597); sections 514, 1901-A, 1908-A, 1917-A and 1920-A of the act of April 9, 19 (P. L. 177, No. 175) (71 P. S. §§ 194, 510-1, 510-8, 510-17 and 510-20); and the act October 4, 1978 (P. L. 851, No. 166) (32 P. S. §§ 679.101-679.601).

**Source**

The provisions of this § 105.53 adopted September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843; amended October 11, 1991, effective October 12, 1991, 21 Pa.B. 4911. Immediately preceding text appears at serial pages (117668) to (117669).

**Cross References**

This section cited in 25 Pa. Code § 105.131 (relating to operation and monitoring plans); 25 Pa. Code § 105.132 (relating to inspection); 25 Pa. Code § 105.281 (relating to maintenance and repair of levees or floodwalls); and 25 Pa. Code § 105.445 (relating to waiver of certain requirements).

**§ 105.54. Monitoring systems.**

The permittee or owner of a dam, water obstruction or encroachment shall set up and implement monitoring systems that are required by the Department in the terms and conditions of the permit.

**Source**

The provisions of this § 105.54 adopted September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843.

**Cross References**

This section cited in 25 Pa. Code § 105.131 (relating to operation and monitoring plans).

## INVESTIGATION AND CORRECTION OF UNSAFE CONDITIONS—EMERGENCY PROCEDURES

**§ 105.61. Procedures for investigations.**

The Department may, if it finds there is reasonable cause to suspect the existence of conditions adversely affecting the safety of a dam, water obstruction or encroachment, order the owner to conduct investigations, studies, tests and analyses that may be required to properly evaluate the safety of the structure. The investigations, studies, tests and analyses shall be accomplished under the supervision of a registered professional engineer, experienced in the design, construction, operation and maintenance of the facilities and approved by the Department, and shall be accomplished in accordance with methods the Department may prescribe. Failure to provide the investigation results to the Department on request will constitute adequate grounds for revocation or suspension of a permit.

**Source**

The provisions of this § 105.61 adopted September 10, 1971, effective September 11, 1971, 1 Pa.B. 1804; amended August 11, 1978, effective August 28, 1978, 8 Pa.B. 2229; amended September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843. Immediately preceding text appears at serial pages (38858) to (38860) and (47990).

**§ 105.62. Correction of unsafe conditions.**

(a) If the Department determines that a dam, water obstruction or encroachment is unsafe or adversely affects property or the environment or has not been properly constructed, operated, monitored or maintained in compliance with legal requirements, it may require the owner of the facility to repair, alter, maintain or remove the facility or take other actions necessary to carry out the purposes of this chapter within the time prescribed by the Department.

(b) The Department or its authorized agents may enter and conduct investigations, tests and analyses and take corrective action required to carry out the purposes of this chapter if one or more of the following conditions exist:

(1) The owner cannot be ascertained or found.

(2) The owner refuses or fails to comply with an order issued by the Department under section 14 of the act (32 P. S. § 693.14) or this section.

(3) The condition of the facility is so dangerous as to require immediate remedial action.

(c) The Department may recover from the owner, in the name of the Commonwealth, the expenses incurred in taking the action described in subsection (b) in the same manner as debts are recoverable by law.

**Source**

The provisions of this § 105.62 adopted September 10, 1971, effective September 11, 1971, 1 Pa.B. 1804; reserved August 11, 1978, effective August 28, 1978, 8 Pa.B. 222 added September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843. Immediately preceding text appears at serial page (4584).

**§ 105.63. Emergency procedures.**

(a) The permittee or owner of a dam, water obstruction or encroachment shall immediately notify the Department and responsible authorities in adjacent and downstream communities, including emergency management authorities, of a condition which may threaten the safety of the facility and take necessary actions to protect life and property, including action required under an emergency plan or Department order issued under the act.

(b) The permittee or owner of a dam or reservoir shall immediately notify the Department and responsible emergency management authorities in adjacent and downstream communities of conditions which may indicate a potential dam hazard emergency including, but not limited to one or more of the following conditions:

(1) Sliding of upstream or downstream slopes or abutments contiguous to the dam.

- (2) Sudden subsidence of the crest of the dam.
- (3) Longitudinal or transverse cracking of the crest of the dam.
- (4) Unusual release of water from the downstream face or toe of the dam.
- (5) Other unusual conditions at the downstream slope of the dam.
- (6) Significant landslides in the reservoir area.
- (c) In case of emergency, telephone calls should be directed to the Pennsylvania Emergency Management Agency at (717) 783-8150 or the Department's emergency number at (717) 787-4343.

**Authority**

The provisions of this § 105.63 amended under the act of November 26, 1978 (P. L. 1375, No. 325) (32 P. S. §§ 693.1-693.27); the act of June 22, 1937 (P. L. 1987, No. 394) (35 P. S. §§ 691.1-691.1001); section 7 of the act of June 14, 1923 (P. L. 704, No. 294) (32 P. S. § 597); sections 514, 1901-A, 1908-A, 1917-A and 1920-A of the act of April 9, 1929 (P. L. 177, No. 175) (71 P. S. §§ 194, 510-1, 510-8, 510-17 and 510-20); and the act of October 4, 1978 (P. L. 851, No. 166) (32 P. S. §§ 679.101-679.601).

**Source**

The provisions of this § 105.63 adopted September 10, 1971, effective September 11, 1971, 1 Pa.B. 1804; reserved August 11, 1978, effective August 28, 1978, 8 Pa.B. 2229; amended September 26, 1980, effective September 27, 1980, 10 Pa.B. 3843; amended October 11, 1991, effective October 12, 1991, 21 Pa.B. 4911. Immediately preceding text appears at serial pages (117671) to (117672).

**Cross References**

This section cited in 25 Pa. Code § 105.135 (relating to dam hazard emergencies).

**§ 105.64. Emergency permit.**

The Department may issue emergency permits if it finds that immediate remedial action is necessary to alleviate an imminent threat to life, property or the environment.

- (1) The emergency permit will be provided in writing, on a form developed for this purpose.
- (2) The emergency permit will contain conditions as the Department determines appropriate.
- (3) The Department may institute proceedings, legal or administrative, that it deems appropriate for violations of the emergency permit or conditions of the emergency permit.
- (4) If the municipality in which the emergency occurs has waived notice, the emergency permit is effective immediately. If notice has not been waived by the municipality, the emergency permit is effective 30 days after notice is sent to the municipality in which the emergency occurred. The emergency permit will expire in 30 days unless extended in writing by the Department.

*(Editor's Note: The act of August 14, 1991 (P. L. —, No. —) amends the first two sentences of § 105.64(4).)*

**Authority**

The provisions of this § 105.64 issued under the act of November 26, 1978 (P. L. 1375, No. 325) (32 P. S. §§ 693.1-693.27); the act of June 22, 1937 (P. L. 1987, No. 394) (35 P. S. §§ 691.1-691.1001); section 7 of the act of June 14, 1923 (P. L. 704, No. 294) (32 P. S. § 597); sections 514, 1901-A, 1908-A, 1917-A and 1920-A of the act of April 9, 1929 (P. L. 177, No. 175) (71 P. S. §§ 194, 510-1, 510-8, 510-17 and 510-20); and the act of October 4, 1978 (P. L. 851, No. 166) (32 P. S. §§ 679.101-679.601).

**Source**

The provisions of this § 105.64 adopted October 11, 1991, effective October 12, 1991, 21 Pa.B. 4911.

**Cross References**

This section cited in 25 Pa. Code § 105.21a (relating to public notice).

**Subchapter B. DAMS AND RESERVOIRS**

**GENERAL PROVISIONS**

Sec.	Scope.
105.71.	[Reserved].
105.72.	[Reserved].
105.73.	[Reserved].
105.74.	[Reserved].
105.75.	[Reserved].
105.76.	[Reserved].
105.77.	[Reserved].
105.78.	[Reserved].
105.79.	[Reserved].

**PERMITS**

- |         |  |
|---------|--|
| 105.81. | Permit applications for construction and modification of dams and reservoirs.      |
| 105.82. | Permit applications for operation and maintenance of existing dams and reservoirs. |

**CLASSIFICATION AND DESIGN CRITERIA**

- |         |  |
|---------|--|
| 105.91. | Classification of dams and reservoirs. |
| 105.92. | Foundations.                           |
| 105.93. | Design stress.                         |
| 105.94. | Spillways.                             |
| 105.95. | Frecboard.                             |
| 105.96. | Outlet works.                          |
| 105.97. | Stability of structure.                |

**APPENDIX G**

**DAM INSPECTION REQUIREMENTS**

**PaDER Requirements for "Operation, Maintenance, and Inspection"**

**PaDER Requirements for "Investigation and Correction of Unsafe Conditions -  
Emergency Procedures"**

**Annual Inspection Check List**

accordance with Chapter 102 of this title and submitted with and approved as part of his application.

(b) Construction shall be done in a manner so as to minimize erosion of banks and bed of the stream and disturbance of the regimen of the stream.

§ 105.47. Removal of structures.

(a) If all construction work has not been completed within the time specified in the permit and the time limit specified in the permit has not been extended in writing by the Department or if a permit has been revoked for any reason, the permittee shall, at his own expense and in such manner as the Department may prescribe, remove all or any portion of the work as the Department requires and restore the water course and floodplain to their former condition.

(b) Prior to discontinuing use or abandonment, the owner of any structure covered by this chapter, regardless of whether or not it was constructed under a permit from this Department or its predecessors, shall remove all or part of the facility and take other actions as are necessary to protect safety and the environment in accordance with a permit issued by the Department.

#### OPERATION, MAINTENANCE, AND INSPECTION

§ 105.51. Operation and maintenance.

(a) The permittee or owner of any dam, water obstruction, or encroachment shall at all times operate and maintain the facility and all appurtenant structures in a safe condition in accordance with all permit terms and conditions and the provisions of this chapter so that the facility cannot imperil life, health, safety, or property located above or below the facility.

§ 105.52. Inspection.

Regardless of the date of construction of a dam, water obstruction, or encroachment or whether or not it was permitted by the Department or its predecessors, it shall be the duty of the permittee or owner of a dam, water obstruction, or encroachment to evaluate the safety of the facility and all appurtenant structures and to modify the facility in accordance with the permit requirements of § 105.11 of this title (relating to permit requirements) to ensure protection of life and property in accordance with changed conditions and current safety criteria.

§ 105.53. Inspections by owners and inspection reports.

The permittee or owner of any dam, water obstruction, or encroachment shall inspect the facility and all appurtenant works according to the following schedule:

(1) All dams, reservoirs, and their appurtenant works shall be inspected at least once every three months.

(2) For all Category 1 or Category 2 dams – Hazard Potential Classification as defined in § 105.91 of this title (relating to classifications of dams and reservoirs) – annual reports regarding the condition of the dam, certified by a registered professional engineer, shall be submitted to the Department on or before October 1 of each year. More frequent reports of dam conditions may be required by the Department if in its discretion conditions indicate such reports are necessary to assure adequate protection of health, safety, and property.

(3) For all local flood protection projects, annual reports regarding the condition of the flood protection facility shall be submitted to the Department on or before October 1 of each year.

(4) The owner of any water obstruction or encroachment shall conduct periodic inspections to ensure the safe operation, monitoring, and maintenance of the facility in accordance with the provisions of this title, terms and conditions of the permit, and approved operating or monitoring plans.

(5) The owner shall retain records of such inspections, including records of actions taken to correct conditions found in such inspections. Copies of such records shall be provided to the Department on request.

(6) The Department may, through terms and conditions of the permit or by request at any time, require the owner to submit certified reports regarding the condition of the facility to the Department.

(7) In lieu of inspections conducted by the owner and certified reports submitted by the owner, the Department may accept reports of equivalent inspections conducted and prepared by governmental agencies. In addition, the Department may accept equivalent inspection reports certified by the owner and submitted to other governmental agencies.

#### § 105.54. Monitoring systems.

The permittee or owner of any dam, water obstruction, or encroachment shall set up and implement such monitoring systems as are required by the Department in the terms and conditions of the permit.

### INVESTIGATION AND CORRECTION OF UNSAFE CONDITIONS—EMERGENCY PROCEDURES

#### § 105.61. Procedures for investigations.

The Department may, if it finds there is reasonable cause to suspect the existence of conditions adversely affecting the safety of a dam, water obstruction, or encroachment, order the owner to conduct such investigations, studies, tests, and analyses as may be required to properly evaluate the safety of the structure. Such investigations, studies, tests, and analyses shall be accomplished under the supervision of a registered professional engineer, experienced in the design, construction, operation, and maintenance of such facilities and approved by the Department, and shall be accomplished in accordance with such methods as the Department may prescribe. Failure to provide such investigation results to the Department on request will constitute adequate grounds for revocation or suspension of a permit.

#### § 105.62. Correction of unsafe conditions.

(a) If the Department determines that any dam, water obstruction, or encroachment is unsafe or adversely affects property or the environment or has not been properly constructed, operated, monitored, or maintained in compliance with all legal requirements, it may require the owner of the facility to repair, alter, maintain, or remove the facility or take such other action as necessary to carry out the purposes of this chapter within such time as prescribed by the Department.

(b) The Department or its authorized agents may enter and conduct such investigations, tests, and analyses and take such corrective action as required to carry out the purposes of this chapter if one or more of the following conditions exist:

- (1) The owner cannot be ascertained or found.
  - (2) The owner refuses or fails to comply with an order issued by the Department pursuant to section 14 of the act (32 P.S. §697.14) or this section.
  - (3) The condition of the facility is so dangerous as to require immediate remedial action.
- (c) The Department may recover from the owner, in the name of the Commonwealth, the expenses incurred in taking the action described in subsection (b) of this section in the same manner as debts are recoverable by law.

§ 105.63. Emergency procedures.

(a) The permittee or owner of any dam, water obstruction, or encroachment shall immediately notify the Department and responsible authorities in adjacent and downstream communities, including emergency management authorities, of any condition which may threaten the safety of the facility and take all necessary actions to protect life and property, including any action required under an emergency plan or Department order issued pursuant to the act.

(b) The permittee or owner of any dam or reservoir shall immediately notify the Department and responsible Emergency Management authorities in adjacent and downstream communities of any conditions which may indicate a potential dam hazard emergency including, but not limited to, any of the following conditions:

- (1) Sliding of upstream or downstream slopes or abutments contiguous to the dam.
- (2) Sudden subsidence of the crest of the dam.
- (3) Longitudinal or transverse cracking of the crest of the dam.
- (4) Unusual release of water from the downstream face or toe of the dam.
- (5) Any other unusual conditions at the downstream slope of the dam.
- (6) Significant landslides in the reservoir area.

(c) Telephone calls to the Department pursuant to this section should be directed to the following numbers:

*Norristown Region -- (215) 631-2422*

For the following counties:

Berks	Delaware	Northampton
Bucks	Lehigh	Philadelphia
Carbon	Monroe	Pike
Chester	Montgomery	Schuylkill

*Carnegie Region -- (412) 276-1111*

For the following counties:

Allegheny	Crawford	Lawrence
Armstrong	Elk	McKean
Beaver	Erie	Mercer
Butler	Fayette	Potter
Cambria	Forest	Somerset
Cameron	Greene	Venango
Clarion	Indiana	Warren
Clearfield	Jefferson	Washington
		Westmoreland

**Harrisburg Region - (717) 783-9726**  
For the following counties:

Adams	Franklin	Lancaster
Bedford	Fulton	Lebanon
Blair	Huntingdon	Mifflin
Cumberland	Juniata	Perry
Dauphin		York

**Wilkes-Barre Region - (717) 826-2371**  
For the following counties:

Bradford	Luzerne	Sullivan
Centre	Lycoming	Susquehanna
Clinton	Montour	Tioga
Columbia	Northumberland	Union
Lackawanna	Snyder	Wayne
		Wyoming

(d) In the event that no contact is made with the Regional Office, calls should be directed to the Harrisburg Central Office at (717) 787-4467 or (717) 783-1384 or to the Pennsylvania Emergency Management Agency at the following number: (717) 783-8150.

## Subchapter B. DAMS AND RESERVOIRS

### GENERAL PROVISIONS

#### § 105.71. Scope.

Except as provided in §§ 105.3 and 105.12 of this title (relating to scope and waiver of permit regulations), provisions of this subchapter shall govern the construction, alteration, enlargement, repair, maintenance, operation, and removal of any dam or reservoir regulated under the Dam Safety and Encroachments Act.

### PERMITS

#### § 105.81. Permit applications for construction and modification of dams and reservoirs.

(a) In addition to the information required by § 105.13 of this title (relating to permit applications - information and fees), all permit applications pursuant to this subchapter for the construction or modification of dams and reservoirs shall give the following information:

- (1) The name and address of the applicant.
- (2) The location, type, size, height, and purpose of the proposed dam and reservoir and appurtenant works.
- (3) For projects involving storage of fluids or semifluids other than water, information concerning the chemical content, viscosity, and other pertinent physical characteristics of the fluid or semifluid impounded.
- (4) The storage capacity and reservoir surface areas for normal pool and maximum high water.

## ANNUAL INSPECTION BY OWNER

This annual inspection is intended to be a follow-up of the Phase I inspection report and any other detailed studies which have been brought about by the Phase I inspection. The intent is that the owner perform a comprehensive visual inspection, accompanied by photographs, which informs the Department of conditions prevailing at the dam. A check list for this inspection is attached. This check list should be supplemented by additional sheets giving detailed descriptions, stations, elevations, dimensions, etc. where necessary. The inspection report should also give plans for correcting any deficiencies disclosed by the inspection and schedule for doing the work.

DAM INSPECTION CHECKLIST  
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES  
DIVISION OF DAM SAFETY

NAME OF DAM: \_\_\_\_\_ DER I.D. NO.: \_\_\_\_\_

LOCATION: \_\_\_\_\_ township \_\_\_\_\_ county \_\_\_\_\_

DER CLASSIFICATION DATA: \_\_\_\_\_ size \_\_\_\_\_ hazard \_\_\_\_\_

PHYSICAL DATA: \_\_\_\_\_ type of dam \_\_\_\_\_ height of dam \_\_\_\_\_ normal pool storage capacity \_\_\_\_\_

ELEVATIONS: \_\_\_\_\_ normal pool \_\_\_\_\_ pool at inspection \_\_\_\_\_ tailwater at inspection \_\_\_\_\_

PERSONS PRESENT AT INSPECTION NAME	TITLE/POSITION	REPRESENTING
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

DATE OF INSPECTION: \_\_\_\_\_

WEATHER: \_\_\_\_\_

TEMPERATURE: \_\_\_\_\_

This is to certify that the above dam has been inspected  
and the following are the results of this inspection.

\_\_\_\_\_  
SIGNATURE OF REGISTERED PROFESSIONAL ENGINEER

NAME OF DAM: \_\_\_\_\_ INSPECTION DATE: \_\_\_\_\_

DER I.D. NO.: \_\_\_\_\_

# EMBANKMENT

1 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
CREST	1	SURFACE CRACKING				
	2	SINKHOLE, ANIMAL BURROW				
	3	LOW AREA(S)				
	4	HORIZONTAL ALIGNMENT				
	5	RUTS AND/OR PUDDLES				
	6	VEGETATION CONDITION				
UPSTREAM SLOPE	7					
	8					
	9	SLIDE, SLOUGH, SCARP				
	10	SLOPE PROTECTION				
	11	SINKHOLE, ANIMAL BURROW				
	12	EMB.-ABUT. CONTACT				
	13	EROSION				
	14	VEGETATION CONDITION				
	15					
	16					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

# EMBANKMENT

2 of 2

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INSTR. - GATE	REPAIR
DOWNSTREAM SLOPE	17	WET AREA(S) (NO FLOW)				
	18	SEEPAGE				
	19	SLIDE, SLOUGH, SCARP				
	20	EMB.-ABUT. CONTACT				
	21	SINKHOLE, ANIMAL BURROW				
	22	EROSION				
	23	UNUSUAL MOVEMENT				
	24	VEGETATION CONTROL				
	25					
	26					
INSTRUMENTATION	27	PIEZOMETERS/OBSERV. WELLS				
	28	STAFF GAUGE AND RECORDER				
	29	WEIRS				
	30	SURVEY MONUMENTS				
	31	DRAINS				
	32	FREQUENCY OF READINGS				
	33	LOCATION OF RECORDS				
	34					
	35					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

NAME OF DAM:

DER I.D. N. :

INSPECTION DATE:

# DOWNSTREAM AREA AND MISC.

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INVESTI-GATE	REPAIR
DOWNSTREAM AREA	36	ABUTMENT LEAKAGE				
	37	FOUNDATION SEEPAGE				
	38	SLIDE, SLOUGH, SCARP				
	39	DRAINAGE SYSTEM				
	40					
DOWNSTREAM AREA	41					
	42	DOWNSTREAM HAZARD DESCRIPTION				
MISCELLANEOUS	43	DATE OF LAST UPDATE OF EMERGENCY PLAN				
	44	RESERVOIR SLOPES				
	45	ACCESS ROADS				
	46	SECURITY DEVICES				
	47					
	48					
	49					
	50					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

NAME OF DAM: \_\_\_\_\_

DER I.D. NO.: \_\_\_\_\_

INSPECTION DATE: \_\_\_\_\_

# SPILLWAYS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INVESTI-GATE	REPAIR
ERODIBLE CHANNEL	51	SLIDE, SLOUGH, SCARP				
	52	EROSION				
	53	VEGETATION CONDITION				
	54	DEBRIS				
	55					
	56					
NON-ERODIBLE CHANNEL	57	SIDEWALLS				
	58	CHANNEL FLOOR				
	59	UNUSUAL MOVEMENT				
	60	APPROACH AREA				
	61	WEIR OR CONTROL				
	62	DISCHARGE AREA				
DROP INLET	63					
	64					
	65	INTAKE STRUCTURE				
	66	TRASHRACK				
	67	STILLING BASIN				
	68					
	69					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

NAME OF DAM: \_\_\_\_\_

DER I.D. NO.: \_\_\_\_\_

INSPECTION DATE: \_\_\_\_\_

# OUTLET WORKS

1 of 1

AREA INSPECTED	ITEM NO	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INVESTI-GATE	REPAIR
OUTLET WORKS	70	INTAKE STRUCTURE				
	71	TRASURACK				
	72	STILLING BASIN				
	73	PRIMARY CLOSURE				
	74	SECONDARY CLOSURE				
	75	CONTROL MECHANISM				
	76	OUTLET PIPE				
	77	OUTLET TOWER				
	78	EROSION ALONG DAM TOE				
	79	SEEPAGE				
	80	UNUSUAL MOVEMENT				
	81					
	82					
	83					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE

NAME OF DAM:

DER I.D. NO.:

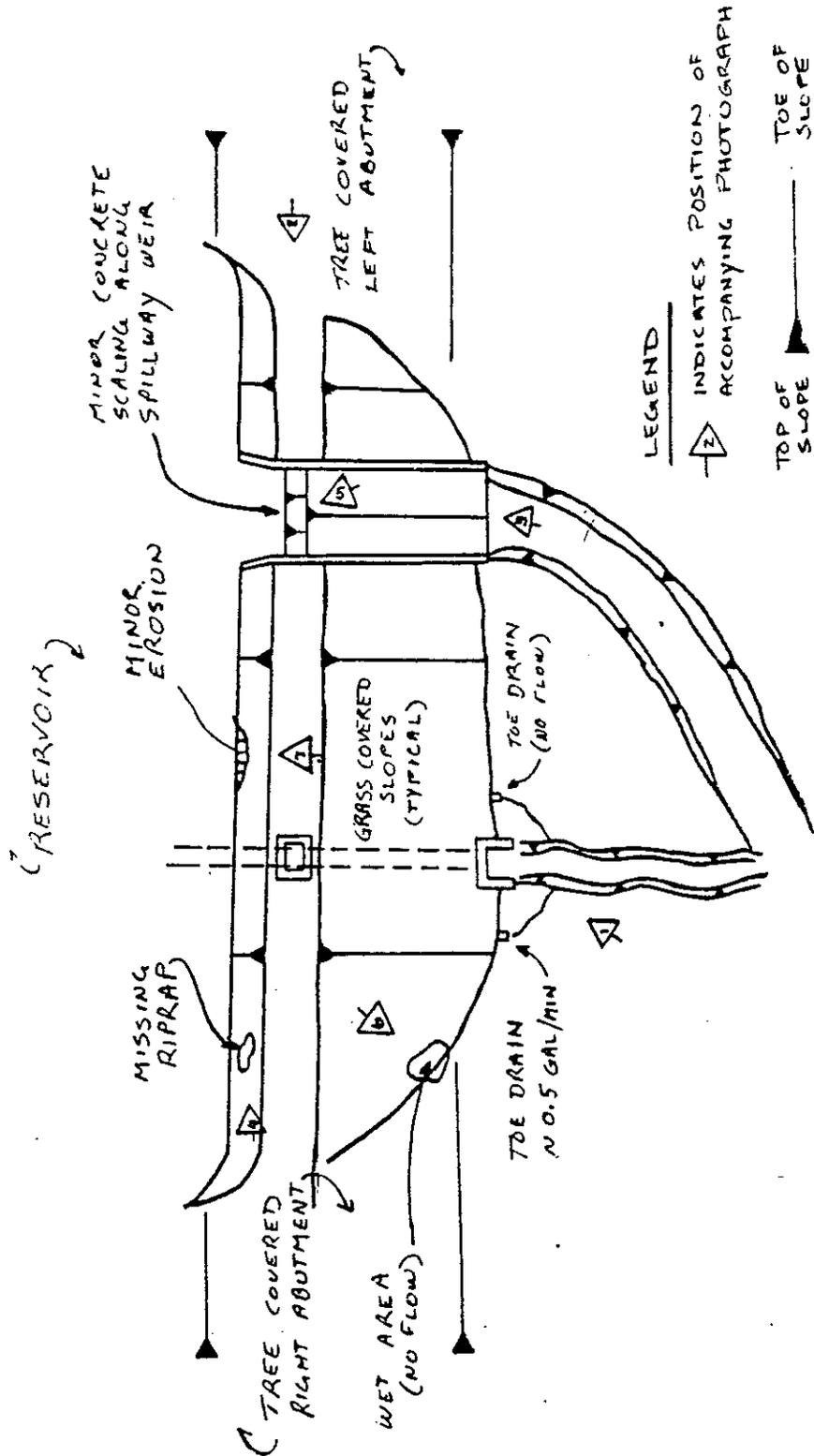
INSPECTION DATE:

# CONCRETE/MASONRY DAMS

1 of 1

AREA INSPECTED	ITEM NO.	CONDITION	OBSERVATIONS	CHECK ( ) ACTION NEEDED		
				MONITOR	INVESTIGATE	REPAIR
UPSTREAM FACE	84	SURFACE CONDITIONS				
	85	CONDITION OF JOINTS				
	86	UNUSUAL MOVEMENT				
	87	ABUTMENT-DAM CONTACTS				
	88					
DOWNSTREAM FACE	89					
	90	SURFACE CONDITIONS				
	91	CONDITION OF JOINTS				
	92	UNUSUAL MOVEMENT				
	93	ABUTMENT-DAM CONTACTS				
CREST	94	DRAINS				
	95	LEAKAGE				
	96					
	97					
	98	SURFACE CONDITIONS				
	99	HORIZONTAL ALIGNMENT				
	100	VERTICAL ALIGNMENT				
	101	CONDITION OF JOINTS				
	102	UNUSUAL MOVEMENTS				
	103					
	104					

ADDITIONAL COMMENTS: REFER TO ITEM NO. IF APPLICABLE



TYPICAL FIELD SKETCH

# *APPENDIX A*

## *Document 2*

### *Part D – Pond/Impoundment Systems and Other Wastewater Treatment Operations*

OMB Control Number: 2040-0281  
Approval Expires: 05/31/2013

Plant ID: 03831  
Plant Name: Keystone



### Steam Electric Questionnaire

## PART D - POND/IMPOUNDMENT SYSTEMS AND OTHER WASTEWATER TREATMENT OPERATIONS

### Table of Contents

<b>Section Title</b>	<b>Tab Name</b>
Part D Instructions	Part D Instructions
Plant Pond/Impoundment Systems and Wastewater Treatment Systems	Part D Section 1
Pond/Impoundment System and Wastewater Treatment System Identification	Part D Section 2
Wastewater Treatment Diagram	Part D Section 3.1
Wastewater Treatment Wastewater Flows	Part D Section 3.2
Active/Inactive/Open and Planned Pond/Impoundment Unit Information	Part D Section 4.1
Closed Pond/Impoundment Unit Information	Part D Section 4.2
Wastewater Treatment Unit Information - System Level	Part D Section 5.1
Wastewater Treatment System Chemical Addition	Part D Section 5.2
Pond/Impoundment System and Wastewater Treatment System Costs	Part D Section 6.1
Pond/Impoundment System and Wastewater Treatment System Equipment	Part D Section 6.2
Part D Comments	Part D Comments
Steam Electric Questionnaire Code Tables	Code Tables

Plant ID: 03831

Plant Name: Keystone

**Part: D**

**Section Title: 1. Plant Pond/Impoundment Systems and Wastewater Treatment Systems**

**CBI?**  
 Yes

**D1-1.** Have you used, do you use, OR do you plan to use (or begin construction/installation of) by December 31, 2020 any ponds/impoundments for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues?

Note: This includes ponds/impoundments located on non-adjointing property that are under the operational control of the plant.

- Yes
- No

**CBI?**  
 Yes

**D1-2.** Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any wastewater treatment systems, other than pond/impoundment systems, for the treatment of process wastewaters from ash handling or FGD operations?

Note: This includes systems located on non-adjointing property that are under the operational control of the plant.

- Yes
- No

**STOP!**

If you answered "No" to both Questions D1-1 and D1-2, do NOT complete the remainder of Part D. Skip to the next Questionnaire Part. Otherwise, continue to Part D Section 2.

Plant ID: 03831

Plant Name: Keystone

**Part: D**

**Section Title: 2. Pond/Impoundment System and Wastewater Treatment System Identification**

**Instructions:** Complete Section 2 (Questions D2-1 through D2-7) for pond/impoundment systems and/or wastewater treatment systems that the plant operates and/or plans to operate (or begin construction/installation of) by December 31, 2020, including those located on non-adjointing property, for the treatment of process wastewaters from ash handling or FGD operations. Please provide all free response answers in the highlighted yellow areas.

**CBI?**  
 Yes

**D2-1.** Has the plant been involved with any ash or FGD wastewater treatment studies (pilot- or full-scale), including studies on pond/impoundment systems, since 2000?

- Yes (Continue)
- No (Skip to Question D2-4)

**CBI?**  
 Yes

**D2-2.** Are any of these studies ongoing?

- Yes
- No

**CBI?**  
 Yes

**D2-3.** Was a summary and/or report describing/documenting the pilot- or full-scale study prepared (including internal and published reports)?

- Yes (Provide a copy of the summary/report)
- No (Continue)

Provide a description of the pilot- or full-scale study. Note the types of treatment technologies studied and the analytes measured in influent to and/or effluents from the wastewater treatment system.

**CBI?**  
 Yes

**D2-4.** List any ash or FGD wastewater treatment technologies that have been studied by the plant that are not covered by Questions D2-1 through D2-3 (e.g., those that have been studied in bench-scale studies).

None

**CBI?**  
 Yes

**D2-5.** Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any systems, including those located on non-adjointing property, for the treatment of process wastewaters from ash handling or FGD operations?

- Yes (Continue)
- No (Skip to Section 4.1)

**CBI?**  
 Yes

**D2-6.** Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any pond/impoundment systems, including those located on non-adjointing property, for the treatment of process wastewaters from ash handling or FGD operations?

- Yes (Continue)
- No (Skip to Question D2-7)

List these pond/impoundment systems in Table D-1. For each pond/impoundment system, EPA assigned a number (e.g., POND-1, POND-2) in Table D-1, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each pond/impoundment system. In the "Individual Ponds/Impoundments Included in the Pond System" column, identify all pond/impoundment units from Table A-4 that are included in the pond system.

**NOTE: Do NOT include a pond/impoundment unit in Table D-1 if the pond/impoundment unit is or is planned to be part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., pond/impoundment unit in a biological wastewater treatment system).**

Table D-1. Plant Pond/Impoundment Systems

Pond/ Impoundment System ID	Year Initially Brought Online	Plant Designation	Individual Pond/Impoundments (Identified in Table A-4) Included in the Pond/Impoundment System													
			Active/Inactive/Open Pond/Impoundment Systems													
POND-1	1994	Bottom Ash Pond System	<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input checked="" type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-2			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-3			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-4			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-5			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-6			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-7			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-8			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-9			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27
POND-10			<input type="checkbox"/> SPD-1	<input type="checkbox"/> SPD-2	<input type="checkbox"/> SPD-3	<input type="checkbox"/> SPD-4	<input type="checkbox"/> SPD-5	<input type="checkbox"/> SPD-6	<input type="checkbox"/> SPD-7	<input type="checkbox"/> SPD-8	<input type="checkbox"/> SPD-9	<input type="checkbox"/> SPD-10	<input type="checkbox"/> SPD-11	<input type="checkbox"/> SPD-12	<input type="checkbox"/> SPD-13	
			<input type="checkbox"/> SPD-14	<input type="checkbox"/> SPD-15	<input type="checkbox"/> SPD-16	<input type="checkbox"/> SPD-17	<input type="checkbox"/> SPD-18	<input type="checkbox"/> SPD-19	<input type="checkbox"/> SPD-20	<input type="checkbox"/> SPD-21	<input type="checkbox"/> SPD-22	<input type="checkbox"/> SPD-23	<input type="checkbox"/> SPD-24	<input type="checkbox"/> SPD-25	<input type="checkbox"/> SPD-26	<input type="checkbox"/> SPD-27



Plant ID: 03831

Plant Name: Keystone

Pond/Impoundment System ID or Wastewater Treatment System ID: POND-1

**Part: D**

**Section Title: 3.1. Wastewater Treatment Diagram**

**Instructions:** Complete Section 3.1 (Question D3-1) for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2, including planned systems, systems under construction/installation, or planned to be under construction/installation by December 31, 2020. Enter the pond/impoundment system ID or wastewater treatment system ID in the yellow highlighted space provided above (use the pond/impoundment system ID or wastewater treatment system ID assigned in Table D-1 and Table D-2).

Make a copy of Section 3.1 for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2 using the "Copy Section 3.1" button below.

**Copy Section 3.1**

**CBI?**  
 Yes

**D3-1.** Attach a block diagram that shows the pond/impoundment system or wastewater treatment system operations, the process wastewaters that currently enter or are planned to enter the pond/impoundment system or wastewater treatment system, and the ultimate destinations of the pond/impoundment system or wastewater treatment system effluent(s). Specific instructions for the diagram are provided in the checklist below. The diagram should have a similar level of detail as EPA's example diagrams, EPA\_D-1 and EPA\_D-2.

**NOTE: You may use an existing diagram, such as a water balance diagram included in the plant's NPDES Form 2C, and mark the additional required information on the diagram by hand.**

Provide as many diagrams as necessary to convey the information requested in the checklist below. Number each block diagram in the upper right corner; the first block diagram should be numbered D-1, the second D-2, etc. Include the plant name, plant ID, and pond/impoundment system ID or wastewater treatment system ID in the upper right hand corner of the diagram.

Diagram attached.

### Block Diagram Checklist

Mark the boxes below to verify that you have completed each checklist item...

- Include the block diagram number, plant name, plant ID, and pond/impoundment system ID or wastewater treatment system ID on the diagram.
- Include each pond/impoundment or wastewater treatment unit operation. Show all influent and effluent streams from the units and label all influent and effluent streams from the pond/impoundment system or wastewater treatment system using the code tables on the "Code Tables" tab provided at the end of this workbook. Note that the "Code Tables" tab provides codes for wastewater treatment units that are operated in series and/or in parallel (e.g., in EPA\_D-1, Chemical Precipitation Reaction Tank 1-1 and Chemical Precipitation Reaction Tank 2-1 are in series). Effluent streams may include *process wastewater* and *sludges*.
- If applicable, use EPA-assigned numbers from Part A or B (e.g., FGD-1) to label *process operations*. If a process operation does not have an EPA-assigned number (e.g., boiler, air preheater), use the plant-designated name for the process operation. When sources or destinations are not shown on the diagram (i.e., the stream is entering from a location not shown on the diagram), describe the source or destination and add the block diagram number, when appropriate, where the stream's previous location can be seen. Use codes from the code tables on the "Code Tables" tab provided at the end of this workbook.
- Indicate where chemical addition occurs (i.e., into or between which wastewater treatment units). For pond/impoundment wastewater treatment units, indicate and note on the diagram where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). The chemicals indicated should correspond to the chemicals listed in Table D-7 and Table D-13.
- Identify the final, general destination of the *treated* process wastewater and waste streams (e.g., treated process wastewater effluent to *POTW* or surface waters; solid wastes to on- or off-site destinations). Use codes from code tables on the "Code Tables" tab provided at the end of this workbook, when applicable.
- Indicate, as appropriate, where treated process wastewater is *reused* or *recycled* within the plant (e.g., reuse of setting pond/impoundment water as fly ash sludge).
- Include the average annual (2009) flow rates for influent and effluent streams from the wastewater treatment system on the diagram (in gpm or gpd). For planned pond/impoundment systems and wastewater treatment systems, provide the design flow rates for the system. Note that these should be the same flow rates that are entered into Tables D-3 and D-4 in Questions D3-2 and D3-3. If the actual number of days of operation for 2009 is not known, the total annual flow may be divided by 365 days and a comment added to the Comments page. If the process wastewater stream is intermittent, provide amount and frequency; for example "100 gal, twice/day, 100 dpy" or "1000 gpm, 4 hpd, 365 dpy". For sludges, provide amount in tpd.
- Include *NPDES permit* outfall numbers, if applicable.

Plant ID: 03831

Plant Name: Keystone

Pond/Impoundment System ID or Wastewater Treatment System ID: POND-1

**Part: D**  
**Section Title: 3.2. Wastewater Treatment Wastewater Flows**

**Instructions:** Complete Section 3.2 (Question D3-2 and D3-3) for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2, including planned systems, systems under construction/installation, or planned to be under construction/installation by December 31, 2020. Enter the pond/impoundment system ID or wastewater treatment system ID in the yellow highlighted space provided above (use the pond/impoundment system ID or wastewater treatment system ID assigned in Table D-1 and Table D-2).

Make a copy of Section 3.2 for each pond/impoundment system or wastewater treatment system identified in Table D-1 and Table D-2 using the "Copy Section 3.2" button below.

**Copy Section 3.2**

CBI?  Yes

**D3-2.** Complete a row in Table D-3 for each process wastewater stream or treated wastewater stream that enters this pond/impoundment system or wastewater treatment system. For planned pond/impoundment systems and wastewater treatment systems, provide the design flow rates for the system. Use the process and treated wastewater terms provided in the drop down menus. Note that these terms originated from the "Code Tables" tab provided at the end of this workbook.

Note: The examples in Tables D-3 and D-4 are derived from the EPA examples diagrams, EPA\_D-1 and EPA\_D-2, provided at the bottom of Part D Section 3.1.

**Table D-3. Pond/Impoundment System or Wastewater Treatment System Influent Flows in 2009**

Process or Treated Wastewater (from EPA_D-1):	Average Annual (2009) Wastewater Flow Rate	Wastewater Treatment Unit ID
Example (from EPA_D-1): FGO scrubber purge	200 gpm    10 hpd    365 dpy	Equation, Primary
Other:	OR	Other:
Example (from EPA_D-2): WWT-1 Effluent	175 gpm    24 hpd    365 dpy	Pond Unit - 1
Other:	OR	Other:
Bottom airt saline	3166 gpm    24 hpd    365 dpy	Pond Unit - 1
Other:	OR	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:
Select	gpm    hpd    dpy	Select
Other:	gpm    hpd    dpy	Other:



Plant ID: 03831  
 Plant Name: Keystone  
 Pond/Impoundment Unit ID: SPD-7

**Part: D**

**Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information**

**Instructions:** Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open pond/impoundment unit used OR planned to be used (or constructed/installed), including those located on non-adjointing property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

**CBI?**  
 Yes

**D4-1.** Do you use OR plan to use (or begin construction/installation of) by December 31, 2020, any active/inactive/open ponds/impoundments, including those located on non-adjointing property, for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues?

- Yes (Continue)
- No (Skip to Section 4.2)

**Copy Section 4.1**

**CBI?**  
 Yes

**D4-2.** Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

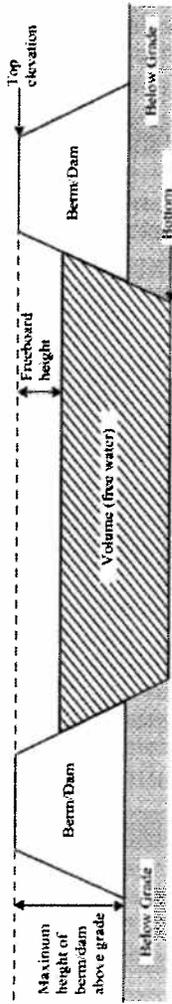
21.4 \_\_\_\_\_ Residence time, hours (as currently operated)  
 48 \_\_\_\_\_ Life of pond/impoundment unit, years (based on current estimation)  
 1 \_\_\_\_\_ Number of cells in pond/impoundment unit

**CBI?**  
 Yes

**D4-3.** Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

Original Pond/Impoundment Dimensions



Current Pond/Impoundment Dimensions

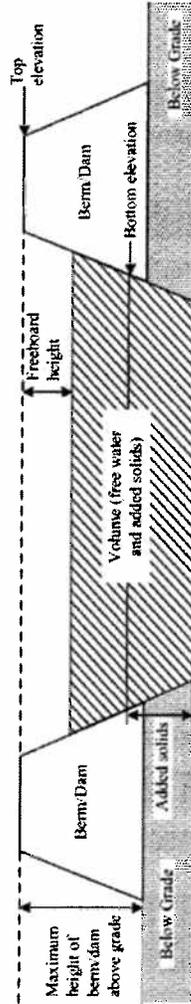


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft <sup>3</sup>	187,166	187,166	2035
Surface area, ft <sup>2</sup>	31,980	31,980	2035
Bottom elevation, ft	1014	1014	2035
Top elevation, ft	1020.5	1020.5	2035
Freeboard height, ft	2	2	2035
Maximum height of berms/dams above grade, ft	10.5	10.5	2035
Total solids placed in the pond/impoundment, tons		455	2035
Expected year of closure/retirement			2035

CBI?  Yes

D4-4. Does the pond/impoundment unit have a liner?

- Yes (Complete Table D-6)
- No (Skip to Question D4-5)
- NA (Pond/impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (Number from liner to sub-layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):	107	1.00E-07
	<b>Compacted Clay</b> <input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		

CBI?  Yes

D4-5. Has the pond/impoundment unit ever been dredged?

- Yes (Provide following information)
- 2010 Year of last dredging
- 3 Frequency of dredging that year, dpy
- 735 Amount of material removed that year, tons
- 5 Number of times dredged in the last five years
- 15 Number of days dredged in the last five years
- 9095 Amount of material removed in the last five years, tons
- No (Skip to Question D4-7)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

**CBI?**  
 Yes

**D4-6.** Indicate where the dredged solids are transferred or are planned to be transferred.

- Dredged solids used in embankment construction.
- Dredged solids transferred to landfill.
- Dredged solids marketed/sold for reuse.
- Other (Explain): \_\_\_\_\_

**CBI?**  
 Yes

**D4-7.** Has the pond/impoundment unit been expanded since the date it was built?

- Yes (Continue)
- No (Skip to Question D4-10)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

**CBI?**  
 Yes

**D4-8.** Identify the type of expansion.

- Lateral expansion
- Vertical expansion
- Both lateral and vertical expansion

**CBI?**  
 Yes

**D4-9.** Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

\$ \_\_\_\_\_ Total cost of expansion

**CBI?**  
 Yes

**D4-10.** Indicate the pollutants targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

- Metals (specify): \_\_\_\_\_
  - TSS
  - Nitrogen compounds (ammonia, nitrate, nitrite)
  - Organic Acids
  - Chlorine or other oxidizing agents
  - Oil and grease
  - Other: \_\_\_\_\_
  - NA
- (Skip to Question D4-12)

**D4-11.** Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS  
 Limitation: 30 mg/L  
 Pollutant: \_\_\_\_\_  
 Limitation: \_\_\_\_\_  
 Pollutant: \_\_\_\_\_  
 Limitation: \_\_\_\_\_

**D4-12.** Did the plant add chemicals to this pond/impoundment unit in 2009?

- Yes (Complete Table D-7)
- No (Skip to Section 4.2)
- NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)	Frequency of Addition (dpy)
none						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid

Plant ID: 03831

Plant Name: Keystone

Pond/Impoundment Unit ID: SPD-8

Part: D

Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information

Instructions: Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open pond/impoundment unit used OR planned to be used (or constructed/installed), including those located on non-adjointing property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?

D4-2. Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

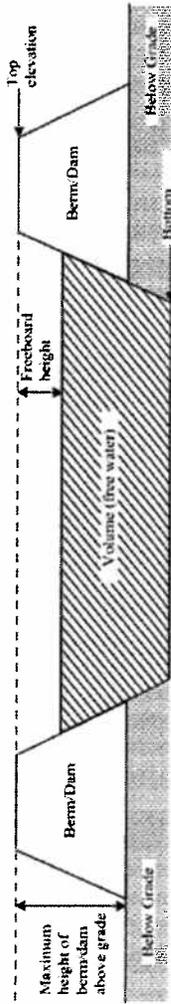
21.4	Residence time, hours (as currently operated)
48	Life of pond/impoundment unit, years (based on current estimation)
1	Number of cells in pond/impoundment unit

CBI?

D4-3. Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

Original Pond/Impoundment Dimensions



Current Pond/Impoundment Dimensions

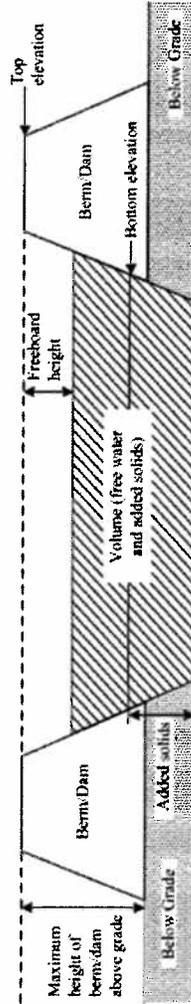


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft <sup>3</sup>	187,166	187,166	2035
Surface area, ft <sup>2</sup>	31,980	31,980	2035
Bottom elevation, ft	1014	1014	2035
Top elevation, ft	1020.5	1020.5	2035
Freeboard height, ft	2	2	2035
Maximum height of berms/dams above grade, ft	10.5	10.5	2035
Total solids placed in the pond/impoundment, tons		339	2035
Expected year of closure/retirement			2035

CBI?  Yes

D4-4. Does the pond/impoundment unit have a liner?

Yes (Complete Table D-6)

No (Skip to Question D4-5)

NA (Pond/impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from liner to final layer)	Type of Liner	Thickness of Liner Layer (in)	Permeability of Liner Layer (cm/sec)
1	<input checked="" type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below: _____)	107	1.00E-07
	<b>Compacted Clay</b> <input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below: _____)		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below: _____)		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below: _____)		

CBI?  Yes

D4-5. Has the pond/impoundment unit ever been dredged?

Yes (Provide following information)

2010 \_\_\_\_\_ Year of last dredging

3 \_\_\_\_\_ Frequency of dredging that year, dpy

1155 \_\_\_\_\_ Amount of material removed that year, tons

5 \_\_\_\_\_ Number of times dredged in the last five years

15 \_\_\_\_\_ Number of days dredged in the last five years

10170 \_\_\_\_\_ Amount of material removed in the last five years, tons

No (Skip to Question D4-7)

NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

CBI?  Yes  No

- Dredged solids used in embankment construction.
- Dredged solids transferred to landfill.
- Dredged solids marketed/sold for reuse.
- Other (Explain): \_\_\_\_\_

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

CBI?  Yes  No

- Yes (Continue)
- No (Skip to Question D4-10)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-8. Identify the type of expansion.

CBI?  Yes  No

- Lateral expansion
- Vertical expansion
- Both lateral and vertical expansion

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

CBI?  Yes  No

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

\$ \_\_\_\_\_ Total cost of expansion

D4-10. Indicate the pollutants targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

CBI?  Yes  No

- Metals (specify): \_\_\_\_\_
- TSS
- Inorganic compounds (ammonia, nitrate, nitrite, nitrite)
- Organic Acids
- Chlorine or other oxidizing agents
- Oil and grease
- Other: \_\_\_\_\_
- NA (Skip to Question D4-12)

**D4-11.** Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS \_\_\_\_\_ mg/L

Limitation: 30 \_\_\_\_\_ mg/L

Pollutant: \_\_\_\_\_ mg/L

Limitation: \_\_\_\_\_ mg/L

Pollutant: \_\_\_\_\_ mg/L

Limitation: \_\_\_\_\_ mg/L

**D4-12.** Did the plant add chemicals to this pond/impoundment unit in 2009?

- Yes (Complete Table D-7)
- No (Skip to Section 4.2)
- NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)	Frequency of Addition (gdy)
none						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid

Plant ID: 03831

Plant Name: Keystone

Pond/Impoundment Unit ID: SPD-9

**Part D**

**Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information**

**Instructions:** Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open pond/impoundment unit used OR planned to be used (or constructed/installed), including those located on non-adjointing property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?

**D4-2.** Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

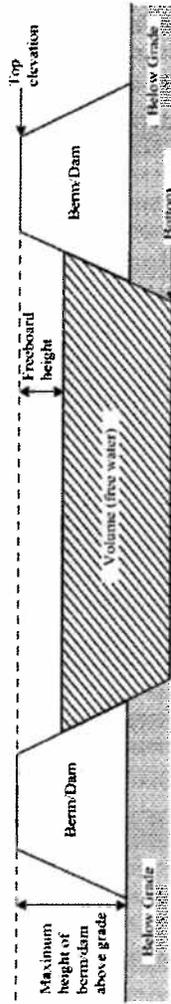
21.4	Residence time, hours (as currently operated)
48	Life of pond/impoundment unit, years (based on current estimation)
1	Number of cells in pond/impoundment unit

CBI?

**D4-3.** Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/installed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

Original Pond/Impoundment Dimensions



Current Pond/Impoundment Dimensions

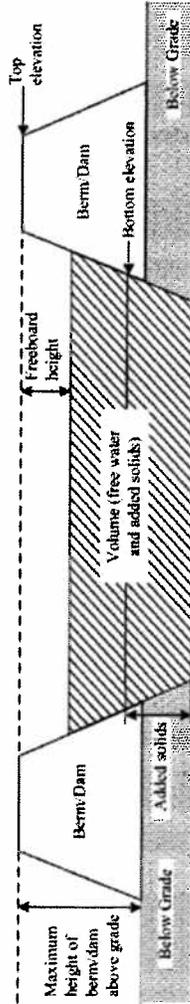


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft <sup>3</sup>	187,166	187,166	2035
Surface area, ft <sup>2</sup>	31,980	31,980	2035
Bottom elevation, ft	1014	1014	2035
Top elevation, ft	1020.5	1020.5	2035
Freeboard height, ft	2	2	2035
Maximum height of berms/dams above grade, ft	10.5	10.5	2035
Total solids placed in the pond/impoundment, tons		618	2035
Expected year of closure/retirement			2035

CBI?  Yes

D4-4. Does the pond/impoundment unit have a liner?

- Yes (Complete Table D-6)
- No (Skip to Question D4-5)
- NA (Pond/impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (number from inner to outer layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (cm/sec)
1	<input checked="" type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):	107	1.00E-07
	<b>Compacted Clay</b> <input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		

CBI?  Yes

D4-5. Has the pond/impoundment unit ever been dredged?

- Yes (Provide following information)
  - 2010 \_\_\_\_\_ Year of last dredging
  - 3 \_\_\_\_\_ Frequency of dredging that year, dpy
  - 840 \_\_\_\_\_ Amount of material removed that year, tons
  - 5 \_\_\_\_\_ Number of times dredged in the last five years
  - 15 \_\_\_\_\_ Number of days dredged in the last five years
  - 9095 \_\_\_\_\_ Amount of material removed in the last five years, tons
- No (Skip to Question D4-7)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

CB17  
 Yes

- Dredged solids used in embankment construction.
- Dredged solids transferred to landfill.
- Dredged solids marketed/sold for reuse.
- Other (Explain): \_\_\_\_\_

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

CB17  
 Yes

- Yes (Continue)
- No (Skip to Question D4-10)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-8. Identify the type of expansion.

CB17  
 Yes

- Lateral expansion
- Vertical expansion
- Both lateral and vertical expansion

D4-9. Describe any expansion(s), since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

CB17  
 Yes

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

\$ \_\_\_\_\_ Total cost of expansion

D4-10. Indicate the pollutants targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals). [Check all boxes that apply.]

CB17  
 Yes

- Metals (specify): \_\_\_\_\_
- TSS
- Nitrogen compounds (ammonia, nitrate, nitrite)
- Organic Acids
- Chlorine or other oxidizing agents
- Oil and grease
- Other: \_\_\_\_\_
- NA (Skip to Question D4-12)

CBI?  Yes

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS \_\_\_\_\_ mg/L

Limitation: 30 \_\_\_\_\_

Pollutant: \_\_\_\_\_

Limitation: Select \_\_\_\_\_

Pollutant: \_\_\_\_\_

Limitation: Select \_\_\_\_\_

CBI?  Yes

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

- Yes (Complete Table D-7)
- No (Skip to Section 4.2)
- NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (g/L)	Average Addition Rate (gpd or lb/day)	Frequency of Addition (dy)
none						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid

Plant ID: 03831  
Plant Name: Keystone  
Pond/Impoundment Unit ID: SPD-10

**Part D**

**Section Title: 4.1. Active/Inactive/Open and Planned Pond/Impoundment Unit Information**

**Instructions:** Complete Section 4.1 (Questions D4-1 through D4-12) for each active/inactive/open pond/impoundment unit used OR planned to be used (or constructed/installed), including those located on non-adjointing property, by December 31, 2020 for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues. Use the pond/impoundment unit IDs assigned in Table A-4.

Make a copy of Section 4.1 for each active/inactive/open and planned pond/impoundment units used (or planned to be used) for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (or sludges or water streams containing the residues or by-products) from the combustion of coal, petroleum coke, or oil, including but not limited to fly ash, bottom ash, boiler slag, or flue gas emission control residues using the "Copy Section 4.1" button below.

NOTE: If a pond/impoundment unit is part of a broader wastewater treatment system containing non-pond wastewater treatment units (e.g., a pond/impoundment unit in a biological wastewater treatment system), complete questions in this section for the pond/impoundment unit.

CBI?

**D4-2.** Provide the residence time of the process wastewater in the pond/impoundment unit, the life of the pond/impoundment unit (based on the current estimation), and the number of cells in the pond/impoundment unit.

213.9	Residence time, hours (as currently operated)
41	Life of pond/impoundment unit, years (based on current estimation)
1	Number of cells in pond/impoundment unit

CBI?

**D4-3.** Complete Table D-5. Provide the pond/impoundment unit's volume, surface area, bottom and top elevation, freeboard height, maximum height of berms and dams above the surrounding grade, and the total quantity of solids placed in the pond/impoundment when it was originally built or planned/designed, at its current status, and at its expected end of life. Additionally, provide the expected year of closure/retirement in the "Expected End of Life" column. Volume should reflect the free water volume, including the stored solids. For planned pond/impoundment units, enter "NA" in all fields in the "Current" column. Figure D-1 presents an illustration of pond/impoundment dimensions.

Note: Respondents are not required to take new measurements to provide this data; however, best available information should be used to complete Table D-5.

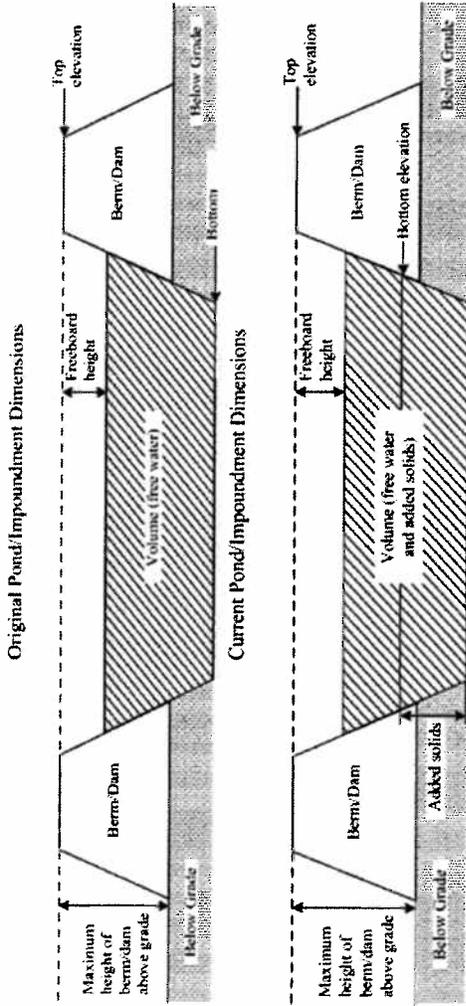


Figure D-1. Pond/Impoundment Dimensions

Table D-5. Active/Inactive/Open and Planned Pond/Impoundment Information

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft <sup>3</sup>	5,600,000	5,600,000	2035
Surface area, ft <sup>2</sup>	310,000	310,000	2035
Bottom elevation, ft	983	983.5	2035
Top elevation, ft	1020.5	1020.5	2035
Freeboard height, ft	3.5	3.5	2035
Maximum height of berms/dams above grade, ft	44.5	44.5	2035
Total solids placed in the pond/impoundment, tons		916	2035
Expected year of closure/retirement			2035

D4-4. Does the pond/impoundment unit have a liner?

CBI?  Yes

- Yes (Complete Table D-6)
- No (Skip to Question D4-5)
- NA (Pond/impoundment is planned to be constructed. Information is currently unavailable. Skip to Question D4-10).

Table D-6. Pond/Impoundment Unit Liner

Liner Layer Number (Number from liner to bottom layer)	Type of Liner	Thickness of Liner Layer (cm)	Permeability of Liner Layer (m/sec)
1	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input checked="" type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):	0.1968	0.00E+00
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		
	<input type="radio"/> Compacted clay <input type="radio"/> Geosynthetic clay <input type="radio"/> High density polyethylene (HDPE) <input type="radio"/> Other (provide below):		

D4-5. Has the pond/impoundment unit ever been dredged?

CBI?  Yes

- Yes (Provide following information)
  - Year of last dredging \_\_\_\_\_
  - Frequency of dredging that year, dpy \_\_\_\_\_
  - Amount of material removed that year, tons \_\_\_\_\_
  - Number of times dredged in the last five years \_\_\_\_\_
  - Number of days dredged in the last five years \_\_\_\_\_
  - Amount of material removed in the last five years, tons \_\_\_\_\_
- No (Skip to Question D4-7)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-6. Indicate where the dredged solids are transferred or are planned to be transferred.

CBI?  Yes

- Dredged solids used in embankment construction.
- Dredged solids transferred to landfill.
- Dredged solids marketed/sold for reuse.
- Other (Explain): \_\_\_\_\_

D4-7. Has the pond/impoundment unit been expanded since the date it was built?

CBI?  Yes

- Yes (Continue)
- No (Skip to Question D4-10)
- NA (Pond/impoundment is planned to be constructed. Skip to Question D4-10)

D4-8. Identify the type of expansion.

CBI?  Yes

- Lateral expansion
- Vertical expansion
- Both lateral and vertical expansion

D4-9. Describe any expansion(s) since January 1, 2000, to the pond/impoundment unit, including the starting and ending dimensions.

CBI?  Yes

Provide the total cost associated with the expansion(s). Total costs should include labor, materials, energy, hazardous and nonhazardous waste disposal, purchased equipment, installation, buildings, site preparation, land, engineering costs, construction expenses, and any other costs available.

\$ \_\_\_\_\_ Total cost of expansion

D4-10. Indicate the pollutants targeted for removal by this pond/impoundment unit using techniques other than solely settling (e.g., adding chemicals to remove certain metals) [Check all boxes that apply.]

CBI?  Yes

- Metals (specify): \_\_\_\_\_
- YES
- Nitrogen compounds (ammonia, nitrate, nitrite)
- Organic Acids
- Chlorine or other oxidizing agents
- Oil and grease
- Other: \_\_\_\_\_
- NA (Skip to Question D4-12)

D4-11. Of the pollutants listed in D4-10, which effluent limitation(s) drives/will drive the operation of this pond/impoundment unit? Provide the pollutant and the limitation (mg/L or ug/L).

Pollutant: TSS  
 Limitation: 30 mg/L  
 Pollutant: \_\_\_\_\_  
 Limitation: \_\_\_\_\_  
 Pollutant: \_\_\_\_\_  
 Limitation: \_\_\_\_\_

D4-12. Did the plant add chemicals to this pond/impoundment unit in 2009?

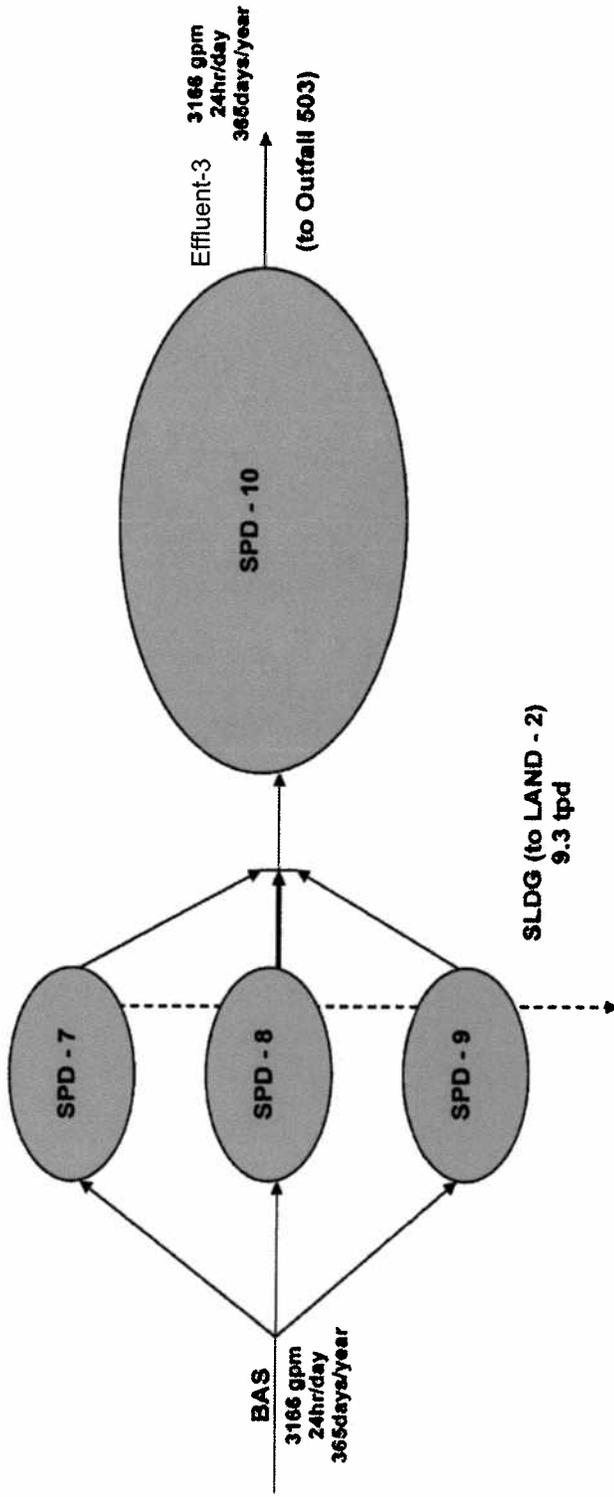
- Yes (Complete Table D-7)
- No (Skip to Section 4.2)
- NA (Pond/impoundment is planned to be constructed. Provide information in Table D-7 to the extent possible based on plans.)

Note that "Chemical Type" refers to the generic name of the chemical added to the pond/impoundment (e.g., lime, sodium hydroxide, alum, polymer). "Average Dose Concentration" refers to the average concentration of the chemical within the pond/impoundment unit just after it is added to the unit. In the "Location of Chemical Addition" column, indicate where within or near the pond/impoundment the chemical is added (e.g., within the pond/impoundment near the process wastewater influent point, within the pond/impoundment near the effluent, in the effluent/discharge canal). If chemical addition is known only on a yearly basis, divide the yearly value by the approximate number of days the plant added chemicals (which should be the same estimate for the "Frequency of Addition" column).

Table D-7. Chemicals Used in Pond/Impoundment Unit Operations

Chemical Type	Trade Name	Manufacturer	Purpose	Location of Chemical Addition	Average Dose Concentration (ug/L)	Average Addition Rate (gpd or lb/day)	Frequency of Addition (dyr)
none						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid
						<input type="radio"/> gpd <input type="radio"/> lb/day	<input type="radio"/> Solid <input type="radio"/> Liquid

**POND - 1**  
Plant: Keystone  
Plant ID: 03831



# *APPENDIX A*

## *Document 3*

### *24 October 2011 Dam Inspection*

**QUARTERLY DAM INSPECTION CHECKLIST  
RRI ENERGY - OPERATIONS TECHNICAL SUPPORT  
KEYSTONE STATION**

**NAME OF DAM:** Cooling Pond "A"      **DER I.D. NO:** 03-044

**LOCATION:** Plumcreek Township, Armstrong County

**DER CLASSIFICATION:** B (size)      3 (hazard)

**PHYSICAL DATA:**

Type of dam: Earthen  
 Height of dam: 49 feet  
 Normal pool storage capacity: 129 acre feet  
 Normal pool elevation: 1017.0 feet  
 Pool elevation at inspection: 1017.0'  
 Elevation in discharge structure:

**PERSONS PRESENT AT INSPECTION:**

<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
John Callihan		GenOn Energy

**DATE OF INSPECTION:** 10/24/2011      9:45 AM

**WEATHER:** light rain - overcast

**TEMPERATURE:** ~ 44°

This is to certify that the above dam has been inspected and the following are the results of this inspection.

<b>EMBANKMENT</b>				
<b>CREST AND UPSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SURFACE CRACKING</b>	Minor deterioration of concrete revetment	X		
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>LOW AREA(S)</b>	None Observed			
<b>HORIZONTAL ALIGNMENT</b>	Good Condition			
<b>RUTS AND/OR PUDDLES</b>	None Observed			
<b>VEGETATION GROWTH</b>	Good Condition	X		
<b>CONCRETE REVETMENT</b>	Revetment geotextile is deteriorating	X		
<b>ADDITIONAL COMMENTS:</b>				

<b>EMBANKMENT</b>				
<b>DOWNSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>WET AREA(S)</b>	Flowing water at roadway bench at right groin area. Flow originates along RR embankment.	X		
<b>SEEPAGE</b>	Minor seepage observed on access road bench	X		
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>EROSION</b>	None Observed			
<b>UNUSUAL MOVEMENT</b>	None Observed			
<b>VEGETATION CONDITION</b>	Vegetation on downstream slope needs mowed			X
<b>ADDITIONAL COMMENTS:</b>				

<b>DOWNSTREAM AREA AND MISCELLANEOUS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>DRAINAGE SYSTEM</b>	Good Condition			
<b>DOWNSTREAM HAZARD DESCRIPTION</b>	None Observed			
<b>DATE OF LAST UPDATE OF EMERGENCY PLAN</b>	N/A EAP not required			
<b>ACCESS ROADS</b>	Good Condition			
<b>SECURITY DEVICES</b>	Good Condition			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

<b>OUTLET WORKS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>MONITORING BUILDING</b>	Good Condition			
<b>PARSHALL FLUME</b>	Good Condition - 3504 gpm instrument readout			
<b>DISCHARGE STRUCTURE</b>	Good Condition			
<b>OUTLET PIPE</b>	Good Condition - unobstructed			
<b>EROSION ALONG DAM TOE</b>	None Observed			
<b>SEEPAGE</b>	None Observed			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

# *APPENDIX A*

## *Document 4*

### *23 February 2012 Dam Inspection*

**QUARTERLY DAM INSPECTION CHECKLIST  
GENON ENERGY - OPERATIONS TECHNICAL SUPPORT  
KEYSTONE STATION**

**NAME OF DAM:** Cooling Pond "A"      **DER I.D. NO:** 03-044

**LOCATION:** Plumcreek Township, Armstrong County

**DER CLASSIFICATION:** B (size)      3 (hazard)

**PHYSICAL DATA:**

Type of dam: Earthen  
 Height of dam: 49 feet  
 Normal pool storage capacity: 129 acre feet  
 Normal pool elevation: 1017.0 feet  
 Pool elevation at inspection: 1017.0'  
 Elevation in discharge structure:

**PERSONS PRESENT AT INSPECTION:**

<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
John Callihan		GenOn Energy

**DATE OF INSPECTION:** 2/23/2012      10:15 AM

**WEATHER:** Partly Sunny

**TEMPERATURE:** ~ 44°

This is to certify that the above dam has been inspected and the following are the results of this inspection.

<b>EMBANKMENT</b>				
<b>CREST AND UPSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SURFACE CRACKING</b>	Minor deterioration of concrete revetment	X		
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>LOW AREA(S)</b>	None Observed			
<b>HORIZONTAL ALIGNMENT</b>	Good Condition			
<b>RUTS AND/OR PUDDLES</b>	None Observed			
<b>VEGETATION GROWTH</b>	Good Condition	X		
<b>CONCRETE REVETMENT</b>	Revetment geotextile is deteriorating	X		
<b>ADDITIONAL COMMENTS:</b>				

<b>EMBANKMENT</b>				
<b>DOWNSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>WET AREA(S)</b>	Flowing water at roadway bench at right groin area. Flow originates along RR embankment.	X		
<b>SEEPAGE</b>	Minor seepage observed on access road bench	X		
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>EROSION</b>	None Observed			
<b>UNUSUAL MOVEMENT</b>	None Observed			
<b>VEGETATION CONDITION</b>	Good Condition			
<b>ADDITIONAL COMMENTS:</b>				

<b>DOWNSTREAM AREA AND MISCELLANEOUS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>DRAINAGE SYSTEM</b>	Good Condition			
<b>DOWNSTREAM HAZARD DESCRIPTION</b>	None Observed			
<b>DATE OF LAST UPDATE OF EMERGENCY PLAN</b>	N/A EAP not required			
<b>ACCESS ROADS</b>	Good Condition			
<b>SECURITY DEVICES</b>	Good Condition			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

<b>OUTLET WORKS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>MONITORING BUILDING</b>	Good Condition			
<b>PARSHALL FLUME</b>	Good Condition - 3635 gpm instrument readout			
<b>DISCHARGE STRUCTURE</b>	Good Condition			
<b>OUTLET PIPE</b>	Good Condition - unobstructed			
<b>EROSION ALONG DAM TOE</b>	None Observed			
<b>SEEPAGE</b>	None Observed			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

# *APPENDIX A*

## *Document 5*

### *6 June Dam Inspection*

**QUARTERLY DAM INSPECTION CHECKLIST  
GENON ENERGY - OPERATIONS TECHNICAL SUPPORT  
KEYSTONE STATION**

**NAME OF DAM:** Cooling Pond "A"      **DER I.D. NO:** 03-044

**LOCATION:** Plumcreek Township, Armstrong County

**DER CLASSIFICATION:** B (size)      3 (hazard)

**PHYSICAL DATA:**

Type of dam: Earthen  
 Height of dam: 49 feet  
 Normal pool storage capacity: 129 acre feet  
 Normal pool elevation: 1017.0 feet  
 Pool elevation at inspection: 1017.0'  
 Elevation in discharge structure:

**PERSONS PRESENT AT INSPECTION:**

<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
John Callihan		GenOn Energy

**DATE OF INSPECTION:** 6/1/2012      11:40 AM

**WEATHER:** Overcast

**TEMPERATURE:** ~ 70°

This is to certify that the above dam has been inspected and the following are the results of this inspection.

<b>EMBANKMENT</b>				
<b>CREST AND UPSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SURFACE CRACKING</b>	Minor deterioration of concrete revetment	X		
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>LOW AREA(S)</b>	None Observed			
<b>HORIZONTAL ALIGNMENT</b>	Good Condition			
<b>RUTS AND/OR PUDDLES</b>	None Observed			
<b>VEGETATION GROWTH</b>	Good Condition	X		
<b>CONCRETE REVETMENT</b>	Revetment geotextile is deteriorating	X		
<b>ADDITIONAL COMMENTS:</b>				

<b>EMBANKMENT</b>				
<b>DOWNSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>WET AREA(S)</b>	Flowing water at roadway bench at right groin area. Flow originates along RR embankment.	X		
<b>SEEPAGE</b>	Minor seepage observed on access road bench	X		
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>EROSION</b>	None Observed			
<b>UNUSUAL MOVEMENT</b>	None Observed			
<b>VEGETATION CONDITION</b>	Good Condition			
<b>ADDITIONAL COMMENTS:</b>				

<b>DOWNSTREAM AREA AND MISCELLANEOUS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>DRAINAGE SYSTEM</b>	Good Condition			
<b>DOWNSTREAM HAZARD DESCRIPTION</b>	None Observed			
<b>DATE OF LAST UPDATE OF EMERGENCY PLAN</b>	N/A EAP not required			
<b>ACCESS ROADS</b>	Good Condition			
<b>SECURITY DEVICES</b>	Good Condition			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

<b>OUTLET WORKS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>MONITORING BUILDING</b>	Good Condition			
<b>PARSHALL FLUME</b>	Good Condition - 3680 gpm instrument readout			
<b>DISCHARGE STRUCTURE</b>	Good Condition			
<b>OUTLET PIPE</b>	Good Condition - unobstructed			
<b>EROSION ALONG DAM TOE</b>	None Observed			
<b>SEEPAGE</b>	None Observed			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

# *APPENDIX A*

## *Document 6*

### *20 August Dam Inspection*

**QUARTERLY DAM INSPECTION CHECKLIST  
GENON ENERGY - OPERATIONS TECHNICAL SUPPORT  
KEYSTONE STATION**

**NAME OF DAM:** Cooling Pond "A"      **DER I.D. NO:** 03-044

**LOCATION:** Plumcreek Township, Armstrong County

**DER CLASSIFICATION:** B (size)      3 (hazard)

**PHYSICAL DATA:**

Type of dam: Earthen  
 Height of dam: 49 feet  
 Normal pool storage capacity: 129 acre feet  
 Normal pool elevation: 1017.0 feet  
 Pool elevation at inspection: 1017.0'  
 Elevation in discharge structure:

**PERSONS PRESENT AT INSPECTION:**

<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
John Callihan		GenOn Energy

**DATE OF INSPECTION:** 8/20/2012      1:30 PM

**WEATHER:** Partly cloudy

**TEMPERATURE:** ~ 80°

This is to certify that the above dam has been inspected and the following are the results of this inspection.

<b>EMBANKMENT</b>				
<b>CREST AND UPSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SURFACE CRACKING</b>	Minor deterioration of concrete revetment	X		
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>LOW AREA(S)</b>	None Observed			
<b>HORIZONTAL ALIGNMENT</b>	Good Condition			
<b>RUTS AND/OR PUDDLES</b>	None Observed			
<b>VEGETATION GROWTH</b>	Good Condition	X		
<b>CONCRETE REVETMENT</b>	Revetment geotextile is deteriorating	X		
<b>ADDITIONAL COMMENTS:</b>				

<b>EMBANKMENT</b>				
<b>DOWNSTREAM SLOPE</b>		<b>CHECK ( ) ACTION NEEDED</b>		
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>WET AREA(S)</b>	Flowing water at roadway bench at right groin area. Flow originates along RR embankment.	X		
<b>SEEPAGE</b>	Minor seepage observed on access road bench	X		
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>SINKHOLE, ANIMAL BURROW</b>	None Observed			
<b>EROSION</b>	None Observed			
<b>UNUSUAL MOVEMENT</b>	None Observed			
<b>VEGETATION CONDITION</b>	Good Condition			
<b>ADDITIONAL COMMENTS:</b>				

<b>DOWNSTREAM AREA AND MISCELLANEOUS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>SLIDE, SLOUGH, SCARP</b>	None Observed			
<b>DRAINAGE SYSTEM</b>	Good Condition			
<b>DOWNSTREAM HAZARD DESCRIPTION</b>	None Observed			
<b>DATE OF LAST UPDATE OF EMERGENCY PLAN</b>	N/A EAP not required			
<b>ACCESS ROADS</b>	Good Condition			
<b>SECURITY DEVICES</b>	Good Condition			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

<b>OUTLET WORKS</b>				
<b>CONDITION/ITEMS</b>	<b>OBSERVATIONS</b>	<b>CHECK ( ) ACTION NEEDED</b>		
		<b>Monitor</b>	<b>Investigate</b>	<b>Repair</b>
<b>MONITORING BUILDING</b>	Good Condition			
<b>PARSHALL FLUME</b>	Good Condition - 3540 gpm instrument readout			
<b>DISCHARGE STRUCTURE</b>	Good Condition			
<b>OUTLET PIPE</b>	Good Condition - unobstructed			
<b>EROSION ALONG DAM TOE</b>	None Observed			
<b>SEEPAGE</b>	None Observed			
<b>MISCELLANEOUS</b>				
<b>ADDITIONAL COMMENTS:</b>				

# *APPENDIX A*

## *Document 7*

### *Keystone Thermal Dam Permit D03-044*

WR



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Rachel Carson State Office Building  
P.O. Box 8554  
Harrisburg, PA 17105-8554  
May 3, 1995

717-787-8568

Bureau of Dams, Waterways and Wetlands

Pennsylvania Electric Company  
1001 Broad Street  
Johnstown, PA 15907



RE: DER File No. D03-044

Gentlemen:

Receipt is acknowledged of the as-built drawings for the construction of Cooling Pond "A" Dam located across a tributary to Crooked Creek in Plumereek Township, Armstrong County.

We have reviewed the as-built drawings, and the previously submitted completion Certification, documenting the dam's construction in conformance with the approved plans and specifications. Based upon this information and our final project inspection, all construction requirements of the permit have been fulfilled. The Department considers the construction of the dam completed.

You are reminded that the proper operation and maintenance of the dam is PECO's continuing responsibility. To assist you in this endeavor, we have enclosed the Department's complimentary manual for "The Inspection, Maintenance and Operation of Dams in Pennsylvania." Please review this manual and pay particular attention to Section 2 - Dam Inspections, and Section 3 - Dam Maintenance. (IN EA LIBRARY, UNDER "ALL STATIONS" - AS-75)

The Department will conduct periodic inspections of the dam, and you will be apprised of our findings.

Also, we request that you notify our office of any future change of ownership of the dam.

Your cooperation and that of your engineer in the accomplishment of this work is appreciated. Should you have any question or need assistance regarding your dam, please feel free to call us at the above number.

Sincerely,

Norman S. Batcheler, P.E.  
Chief  
Project Inspection Section  
Division of Dam Safety

Enclosure

MEMORANDUM

October 21, 1999

TO: File

FROM: Patrick D. Traylor

RE: GPU/Sithe: Transfer of Water-related Permits at the  
Conemaugh and Keystone Stations

The water-related permits for the Conemaugh and Keystone Stations will be automatically transferred at closing in one of two manners.

First, and most easily, all water-related permits currently held by GPU Genco will be automatically transferred at closing to Sithe Northeast Management Company ("SNMC"). This transfer is automatic because all the stock of GPU Genco will be transferred to SNMC at closing. The permits currently held by GPU Genco will be held by the new stock owner, SNMC. We have confirmed the appropriateness of this approach with the legal staff of the Pennsylvania Department of Environmental Protection Southwest Region.

Second, in our review of GPU's permit files, we noted that many of the Conemaugh and Keystone water-related permits were not held by GPU Genco, but some other entity (e.g., Penelec, Met-Ed, etc.). These permits could not have been transferred automatically to SNMC at closing. Therefore, we transferred the permits from the various permit holders to GPU Genco. As a result these permits will now also be transferred automatically at closing from GPU Genco to SNMC.

In both cases, Sithe will need to file a notice after closing with Pennsylvania that notes the name of the new operator, and states that the new owner complied with the Pennsylvania Fictitious Name Act. Moreover, Sithe will be required to submit a copy of the new operating agreement between the owners of the facilities (e.g., Conemaugh Owners Group and Keystone Owners Group), and SNMC.

For closing, permits identified as "Transfer Approved" are those permits that were transferred from some other entity to GPU Genco. These permits will be automatically transferred to SNMC at closing. Permits identified as "Transfer After Closing" are those permits that were already in the name of GPU Genco, and will also be transferred automatically at closing.



COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES

P.O. Box 8554  
Harrisburg, PA 17105-8554  
April 25, 1995

717-787-8568

**Bureau of Dams, Waterways and Wetlands**

Mr. William B. Thomas  
Engineer Sr. II  
Metropolitan Edison Company  
Pennsylvania Electric Company  
1001 Broad Street  
P.O. Box 539  
Johnstown, PA 15907-0539

RE: DER File No. D03-044

Dear Mr. Thomas:

Receipt is acknowledged of the Dam Completion Certification for the construction of Cooling Pond "A" Dam located across a Tributary to Crooked Creek in Plumcreek Township, Armstrong County. We have reviewed the Certification form and consider it to be acceptable. However, until the as-built drawings are submitted to us and found to be acceptable, the permitted construction of this dam is not considered complete by the Department.

Your cooperation in providing the as-built plans will be appreciated. Should you have any question or need assistance regarding your dam, please feel free to call us at the above number.

Sincerely,

Norman S. Batcheler, P.E.  
Chief  
Project Inspection Section  
Division of Dam Safety

Note:

see

MAY 3, 1995 LETTER

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES

ACKNOWLEDGMENT OF APPRISAL OF PERMIT CONDITIONS

Project Location:

County Armstrong

Township Plumcreek

Gentlemen:

Acknowledgment is made that I, J. G. Herbein  
(Permittee Name)

and Khalid H. Khilji, P.E.  
(Name, address and telephone of engineer responsible for supervision of work)

570 Beatty Road, Monroeville, PA 15146 412-856-6400

have been apprised of and are familiar with the terms and conditions of Permit No. D03-044

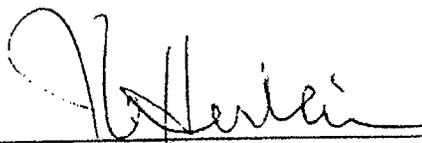
issued to Pennsylvania Electric Company  
(Permittee)

giving its consent to modify, operate and maintain a dam (Cooling Pond "A") across  
(Work authorized as stated on permit)

a tributary to Crooked Creek in Plumcreek Township, Armstrong County.

Return to:

Department of Environmental Resources  
Bureau of Dams, Waterways and Wetlands  
Division of Dam Safety  
P. O. Box 8554  
Harrisburg, PA 17105-8554

  
(Permittee signature)

5/17/94  
Date

Khalid H. Khilji P.E. 061311  
(Signature of engineer responsible for supervision of work)

MAY 17, 1994.  
Date

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 BUREAU OF WATER QUALITY PROTECTION  
 BUREAU OF WATERWAYS ENGINEERING

FOR DEPARTMENT USE ONLY

DEC 13 1999

Date Received  
*Monica L. Miley*  
 Approved by Department  
 JAN 19 2000  
 Approval Date

APPLICATION FOR TRANSFER OF PERMIT  
 AND SUBMERGED LANDS LICENSE AGREEMENT

Return 4 executed copies each with original signatures to the appropriate office on the attached list.

TO BE COMPLETED BY PRESENT PERMITTEE

Name of Present Permittee GPU Generation, Inc. (Keystone Generating Station)		Telephone Number (817) 533-8111	
Mailing Address 1001 Broad Street		City Johnstown	State PA
		Zip 15907	
<input type="checkbox"/> A Private Individual <input checked="" type="checkbox"/> A Corporation <input type="checkbox"/> A Partnership <input type="checkbox"/> A Government Agency			
Type of Permit: GP <input checked="" type="checkbox"/>	Permit Number D-03-044	Date Issued 5/8/1994	Stream Tributary of Crooked Creek
Obstruction <input type="checkbox"/> Dam <input checked="" type="checkbox"/>		Municipality Plumcreek Tship	County Armstrong
The Original (or a copy) of permit is <input checked="" type="checkbox"/> Attached <input type="checkbox"/> Cannot be produced Has a bond been posted in connection with this project? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Do you presently hold a submerged lands license agreement? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, please fill out the reverse side also)			
<b>AFFIDAVIT</b>			
I <del>N/A (name change only)</del> being duly sworn according to law depose and say that I <del>(am the permittee)</del> (am an officer of the permittee) <del>(have the authority to make this application for the permittee)</del> named above as the present permittee, that said permittee relinquishes all right, title and interest in said permit, and that the information included in the foregoing application is true to the best of my knowledge and belief. (Inapplicable portions should be crossed out).			
Signature of present permittee		Date	
Title		Corporate or Government Seal	
Witness Signature			

TO BE COMPLETED BY NEW APPLICANT

Name of New Applicant Sithe Northeast Management Company		Telephone Number (817) 533-8111	
Mailing Address 1001 Broad Street		City Johnstown	State PA
		Zip 15907	
Federal ID/Social Security No. 25-1763949	<input type="checkbox"/> A Private Individual <input checked="" type="checkbox"/> A Corporation <input type="checkbox"/> A Partnership <input type="checkbox"/> A Government Agency		
Statement of Acceptance of Permit: I/We hereby accept the permit herein referred to and agree to be bound by all terms and conditions of said permit.			
<b>AFFIDAVIT</b>			
I <del>(am the applicant)</del> being duly sworn according to law depose and say that I <del>(am the applicant)</del> (am an officer or official of the applicant) <del>(have the authority to make this application for the applicant)</del> named above as the new applicant, and that the information included in the foregoing statement is true to the best of my knowledge and belief. (Inapplicable portions should be crossed out).			
Signature of new applicant <i>Londa M. Mault</i>		Date 11/24/1999	
Title VICE-PRESIDENT, SITHE NE MGMT CO.		Corporate or Government Seal	
Witness Signature			



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
PITTSBURGH DISTRICT, CORPS OF ENGINEERS  
WILLIAM S. MOORHEAD FEDERAL BUILDING  
1000 LIBERTY AVENUE, PITTSBURGH, PA 15222

July 16, 1993



Regulatory Branch

Mr. J. G. Herbein  
Vice President  
Pennsylvania Electric Company  
1001 Broad Street  
Johnstown, Pennsylvania 15907

Dear Mr. Herbein:

I refer to a letter from the Pennsylvania Department of Environmental Resources, received in this office July 2, 1993, regarding your application for authorization to modify two existing bottom ash disposal ponds in Plumcreek Township, Armstrong County, Pennsylvania (DER File Nos. D03-044 and D03-045.)

A Department of the Army Permit is not required for the proposed modifications.

You may begin the work after you have obtained any required State and local permits.

Sincerely,

E. Raymond Beringer  
Chief, Regulatory Branch

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF WATER QUALITY PROTECTION  
BUREAU OF WATERWAYS ENGINEERING

FOR DEPARTMENT USE ONLY

AUG 26 1999

Date Received  
*[Signature]*  
Approved by Department  
OCT 7 1999  
Approval Date

APPLICATION FOR TRANSFER OF PERMIT  
AND SUBMERGED LANDS LICENSE AGREEMENT

Return 4 executed copies each with original signatures to the appropriate office on the attached list.

TO BE COMPLETED BY PRESENT PERMITTEE

Name of Present Permittee Pennsylvania Electric Company (Keystone Generating Station)		Telephone Number (817) 533-8111	
Mailing Address 1001 Broad Street	City Johnstown	State PA	Zip 15907
<input type="checkbox"/> A Private Individual <input checked="" type="checkbox"/> A Corporation <input type="checkbox"/> A Partnership <input type="checkbox"/> A Government Agency			
Type of Permit: GP <input type="checkbox"/>	Permit Number D-03-044	Date Issued 5/6/94	Stream Tributary to Crooked Creek
Obstruction <input type="checkbox"/> Dam <input checked="" type="checkbox"/>		Municipality Plumcreek Tship	County Armstrong
The Original (or a copy) of permit is <input checked="" type="checkbox"/> Attached <input type="checkbox"/> Cannot be produced Has a bond been posted in connection with this project? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Do you presently hold a submerged lands license agreement? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, please fill out the reverse side also)			
<b>AFFIDAVIT</b>			
I, <u>R. J. Toole</u> being duly sworn according to law depose and say that I ( <del>am the permittee</del> ) (am an officer of the permittee) ( <del>have the authority to make this application for the permittee</del> ) named above as the present permittee, that said permittee relinquishes all right, title and interest in said permit, and that the information included in the foregoing application is true to the best of my knowledge and belief. (Inapplicable portions should be crossed out).			
<i>[Signature]</i> Signature of present permittee		7-28-99 Date	
Vice-President, Pennsylvania Electric Company			
Title			
Corporate or Government Seal			
Witness Signature			

TO BE COMPLETED BY NEW APPLICANT

Name of New Applicant GPU Generation, Inc.		Telephone Number (817) 533-8111	
Mailing Address 1001 Broad Street	City Johnstown	State PA	Zip 15907
<input type="checkbox"/> A Private Individual <input checked="" type="checkbox"/> A Corporation <input type="checkbox"/> A Partnership <input type="checkbox"/> A Government Agency			
Federal ID/Social Security No. 26-1753949	Statement of Acceptance of Permit: I/We hereby accept the permit herein referred to and agree to be bound by all terms and conditions of said permit.		
<b>AFFIDAVIT</b>			
I, <u>R. J. Toole</u> being duly sworn according to law depose and say that I ( <del>am the applicant</del> ) (am an officer or official of the applicant) ( <del>have the authority to make this application for the applicant</del> ) named above as the new applicant, and that the information included in the foregoing statement is true to the best of my knowledge and belief. (Inapplicable portions should be crossed out).			
<i>[Signature]</i> Signature of new applicant		7-28-99 Date	
Vice-President, GPU Generation, Inc.			
Title			
Corporate or Government Seal			
Witness Signature			

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES  
BUREAU OF DAMS AND WATERWAY MANAGEMENT

Dam Permit No. D03-044

Plum Creek Township, PA

Date: JANUARY 30, 1995

DAM COMPLETION REPORT

Department of Environmental Resources  
Bureau of Dams and Waterway Management  
Division of Dam Safety  
P. O. Box ~~2007~~ 8554  
Harrisburg, PA ~~17107~~ 17105

Gentlemen:

(WE) hereby certify that the dam across a tributary to Crooked Creek  
(Stream)  
in Plum Creek Township, Armstrong County, PA, was completed on December 22<sup>ND</sup>,  
19 94 in accordance with the plans and specifications approved by the Department.

Yours very truly,

Signature of Supervising Engineer:

F. Augry Nadeau

Title: Chief Civil/Geotechnical Engineer

Firm or Agency: Gilbert/Commonwealth, Inc.

Signature of Permittee: J. Herli

Title: Vice President-Generation

Firm or Agency: Pennsylvania Electric Company

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES  
BUREAU OF DAMS, WATERWAYS AND WETLANDS

**DAM PERMIT**

The Department of Environmental Resources "Department", established by the Act of December 3, 1970, (71 P.S. §510-1 et seq.) and empowered to exercise certain powers and perform certain duties under and by virtue of the Act of November 26, 1978, P.L. 1375, No. 325, as amended by the Act of October 23, 1979, No. 70, known as the "Dam Safety and Encroachments Act"; and the Administrative Code, Act of April 9, 1929, P.L. 177, as amended, which empowers the Department to exercise certain powers and perform certain duties by law vested in and imposed upon the Water Supply Commission of Pennsylvania and the Water and Power Resources Board, hereby issues this permit to:

PENNSYLVANIA ELECTRIC COMPANY  
1001 Broad Street, Johnstown, PA 15907

giving its consent to modify, operate and maintain a dam (Cooling Pond "A") across  
a tributary to Crooked Creek in Plumcreek Township, Armstrong County.

The issuance of this permit also constitutes approval of a Water Quality Certification under Section 401 of the Federal Water Pollution Control Act (33 U.S.C.A. 1341(a)).

This permit is issued in response to an application filed with the Department of Environmental Resources on the 19th day of April A.D. 19 93, and with the understanding that the work shall be performed in accordance with the maps, plans, profiles and specifications filed with and made a part of the application January 10, 1994. Subject, however, to the provisions of the Dam Safety and Encroachments Act, the Administrative Code, and the following conditions, regulations, and restrictions (**YOUR ATTENTION IS DRAWN TO CONDITION NUMBER 12**).

1. This permit does not give any property rights, either in real estate or material, nor any exclusive privileges, nor shall it be construed to grant or confer any right, title, easement, or interest in, to, or over any land belonging to the Commonwealth of Pennsylvania; neither does it authorize any injury to private property or invasion of private rights, nor any infringement of Federal, State, or local laws or regulations; nor does it obviate the necessity of obtaining Federal assent when necessary;

2. The work shall at all times be subject to supervision and inspection by representatives of the Department, and no changes in the maps, plans, profiles and specifications as approved shall be made except with the written consent of the Department. The Department, however, reserves the right to require such changes or modifications in the maps, plans, profiles, and specifications as may be considered necessary. The Department further reserves the right to suspend or revoke this permit if in its opinion the best interest of the Commonwealth will be subserved thereby;

3. All work shall be conducted under the oversight and supervision of a competent engineer approved by the Department, and such engineer or a competent representative shall be on the work site at all times during significant construction activities until completion of the dam;

4. At least 15 days prior to commencement of construction, the permittee shall notify the Department, in writing, of the proposed time of commencement of this work, and a detailed report upon the status of the construction shall be mailed to the "Division of Dam Safety, P.O. Box 8554, Harrisburg, Pennsylvania 17105-8554" monthly until work upon the dam has been completed. Within thirty (30) days after the completion of the work authorized in this permit, the permittee shall file with the Division of Dam Safety, a certified statement signed by the supervising engineer and by the permittee that the work has been performed in accordance with this permit and the approved maps, plans, profiles and specifications. Further, the permittee shall submit to the Division of Dam Safety, within ninety (90) days after the date of completion of the work authorized by this permit, a set of final "as built" plans for the project, showing changes from the original plans and specifications;

5. If this work is not completed on or before the 31st day of December A.D. 19 95, this permit, if not previously revoked or specifically extended by the Department in writing, shall become void without further notification. If construction work has not been completed within the time specified in the permit and the time limit specified in the permit has not been extended in writing by the Department or if a permit has been revoked for any reason, the permittee shall, at his own expense and in a manner that the Department requires and restore the water course and floodplain to their former condition;

6. No material shall be placed on any portion of the foundation until such portion of the foundation has been approved, in writing, by a representative of the Department; no earth or other embankment material which is in a frozen condition shall be covered or placed in embankments; concrete shall not be placed in freezing weather except under conditions approved by the Department;

7. The Department shall be notified at least one week in advance of the time when it is proposed to begin to store water in the reservoir or pond created by the dam for which this permit is issued. The Department will require the permittee to allow a portion of the natural stream flow to pass the dam while the reservoir or pond is being filled, and this notice is required in order that arrangements may be made to have a representative on the grounds before or during the filling if the Department considers it desirable. Sufficient water to support fish life shall be allowed to flow into the stream below the dam, during the period of its construction or repair and while the reservoir is being filled. The permittee agrees to abide by such rules and regulations as to the storage and discharge of water, and as to the level of the reservoir created by said dam, as may be prescribed from time to time by the Department;

8. All trees of no value and brush cleared from the area under this permit shall be burned at such time and under such conditions as to prevent the fire from spreading to adjoining timber land; provided, however, that before such burning is begun, the Regional Air Pollution Control Engineer of the Department of Environmental Resources in charge of the Region in which the area is located shall be notified;

9. The permittee agrees in accepting this permit, to install, upon the request of the Pennsylvania Fish and Boat Commission, such fishway or fishways as the said Commission may require. (See Section 185, of the Act of May 2, 1925, P.L. 448, as amended by the Act of April 22, 1929, P.L. 621.) Attention is also called to Section 191 of the Act of May 2, 1925, P.L. 448, as amended by Act No. 113, approved May 25, 1935, which provides that no person owning, leasing or maintaining a dam, holding back waters inhabited by fish, shall

draw off such waters without first receiving written permission from the Pennsylvania Fish and Boat Commission;

10. Performance of the work authorized shall constitute an acceptance of the various conditions contained in the permit; **provided** that if the permittee fails to file acceptance of the permit in accordance with Condition 12, the permit becomes null and void and the permittee shall remove all works constructed and restore the area in a manner specified by the Department;

11. The permittee shall fully inform the engineer or contractor, responsible for the supervision and conduct of work, of the terms, conditions, restrictions and covenants of this permit. Prior to the commencement of construction, the permittee shall file with the Department in writing, on a form provided by the Department, a statement signed by the permittee and an individual responsible for the supervision or conduct of the construction work acknowledging and accepting the general and special conditions contained in the permit. Unless the acknowledgment and acceptance have been filed, the permit is void. A copy of the permit and the acknowledgment shall be available at the work site for inspection upon request by an officer or agent of the Department or another Federal, State, County or Municipal Agency;

12. **The permittee shall sign the permit thereby expressly certifying the permittee's acceptance of, and agreement to comply with, the terms and conditions of the permit. The permittee shall return a signed copy of the permit to the Department. The permit will not be effective until the signed copy of the permit is received by the Department;**

13. The permittee agrees to operate and maintain the dam embankment, upstream and downstream groin areas, upstream and downstream toe areas and spillway approach channels, control sections and outlet channels free of all trees, shrubs and woody vines. These areas shall be maintained with a perennial sod forming ground cover. Vegetative cover seed mixes must be approved by the Department;

14. The permittee agrees to notify the Department of any future changes in the ownership of the dam, or the lake formed by the dam, or of any portion of the dam or lake, and shall furnish the Division of Dam Safety with the name(s) and address(es), and further agrees to execute an assignment of this permit to the new owner(s);

15. This permit authorizes the construction and/or operation, maintenance and normal repair of the permitted structures conducted within the original specifications for the dam and in accordance with the regulations of the Department and terms and conditions of this permit. Any repairs or maintenance involving modifications of the dam from its original specifications, and any repairs or reconstruction involving a substantial portion of the structure as defined by regulations of the Department shall require the prior written approval and permit of the Department;

16. The permittee shall operate and maintain the structure or work authorized herein in a safe condition in accordance with the permit terms and conditions and the approved maps, plans, profiles and specifications;

17. The permittee is directed to furnish the Department of Environmental Resources, Division of Dam Safety with the names, qualifications and employer of the personnel responsible for the supervision of construction. In addition, the name of the contractor is also required. The permittee is further advised that the Department reserves the right to approve the personnel who will be in charge of supervision of construction. This information is to be submitted to the Division of Dam Safety 15 days in advance of the anticipated start of construction;

18. If the use of explosives in any waterways is required, the permittee shall secure the prior written permit from the Pennsylvania Fish and Boat Commission, pursuant to the Pennsylvania Fish and Boat Code, Act 1980-175 Title 30 Pennsylvania Consolidated Statutes, Section 2906. Requests should be directed to the Pennsylvania Fish and Boat Commission, Division of Environmental Services, 450 Robinson Lane, Bellefonte, PA 16823, 814-359-5147;

19. The permittee shall implement and monitor the Erosion and Sedimentation Control Plan prepared in accordance with Chapter 102 so as to minimize erosion and prevent excessive sedimentation into the receiving watercourse or body of water;

20. The permittee is advised that this project may be subject to the regulation of Section 404 of the Federal Clean Water Act of 1977. The permittee is directed to immediately contact the following District Office of the U.S. Army Corps of Engineers for further information: Pittsburgh District, Room 1817, Federal Building, 1000 Liberty Avenue, Pittsburgh, PA 15222;

21. Prior to commencement of work, the permittee must schedule a pre-construction meeting to review the conditions of the permit and discuss details of the proposed construction. This meeting should be held at the dam site and include the engineer, contractor, permittee and a representative of the Department of Environmental Resources. To schedule this meeting, please contact: Larry Busack, Soils and Waterways Section, Southwest Regional Office, 400 Waterfront Drive, Pittsburgh, PA 15222-4745, Telephone 412-442-4000;

22. The project site shall at all times be available for inspection by authorized officers and employees of the Pennsylvania Fish and Boat Commission. Prior to commencement and upon completion of the work authorized by this permit, the permittee shall notify the Pennsylvania Fish and Boat Commission's Southwest Regional Office, RD 2, Box 39, Somerset, PA 15501-9311, Telephone 814-445-8974;

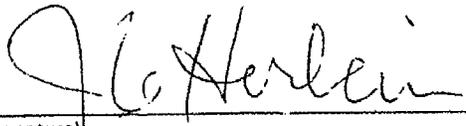
23. The project site shall at all times be available for inspection by authorized officers and employees of the County Conservation District. Prior to commencement and upon completion of the work authorized by this permit, the permittee shall notify the Armstrong County Conservation District, Armsdale Administration Building, RD 8, Box 294, Kittanning, PA 16201, Telephone 412-548-3425;

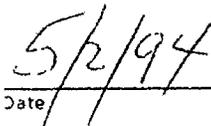
24. SEE SPECIAL CONDITIONS BEGINNING ON PAGE 5 OF THIS PERMIT.

SPECIAL CONDITIONS

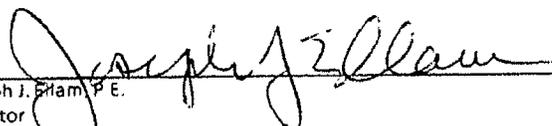
- A. The permittee and his agents will be watchful for archaeological artifacts and will assure that ground disturbance activities will cease immediately upon discovery of archaeological artifacts and immediately notify the Department of Environmental Resources and the Pennsylvania Historical and Museum Commission by phone and in writing.

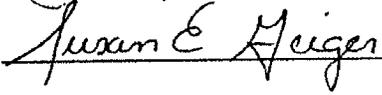
Permittee hereby accepts and agrees to comply with the terms and conditions of this permit.

  
\_\_\_\_\_  
Permittee (signature)

  
\_\_\_\_\_  
Date

DEPARTMENT OF ENVIRONMENTAL RESOURCES

  
\_\_\_\_\_  
Joseph J. Blam, P.E.  
Director  
Bureau of Dams, Waterways and Wetlands

Attest:   
\_\_\_\_\_

**MAY -6 1994**  
\_\_\_\_\_  
Issue Date

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES  
BUREAU OF DAMS AND WATERWAY MANAGEMENT

Dam Permit No. D03-044

Plum Creek Township, PA

Date: JANUARY 30, 1995

DAM COMPLETION REPORT

Department of Environmental Resources  
Bureau of Dams and Waterway Management  
Division of Dam Safety  
P. O. Box ~~2344~~ 8554  
Harrisburg, PA ~~17105~~

Gentlemen:

(WE) hereby certify that the dam across a tributary to Crooked Creek  
(Stream)  
in Plum Creek Township, Armstrong County, PA, was completed on December 22<sup>nd</sup>,  
1994 in accordance with the plans and specifications approved by the Department.

Yours very truly,

Signature of Supervising Engineer:

F. August Madigan

Title: Chief (Civil/Geotechnical) Engineer

Firm or Agency: Gilbert/Commonwealth, Inc.

Signature of Permittee: J. Osterle

Title: Vice President-Generation

Firm or Agency: Pennsylvania Electric Company

# *APPENDIX A*

## *Document 8*

### *Part A Keystone Steam Electric Power Plant Operations*

OMB Control Number: 2040-0281  
Approval Expires: 05/31/2013

Plant ID: 03831  
Plant Name: Keystone



## Steam Electric Questionnaire

### PART A - STEAM ELECTRIC POWER PLANT OPERATIONS

#### Table of Contents

<b>Section Title</b>	<b>Tab Name</b>
Part A Instructions	Part A Instructions
Plant Contact Information	Part A Section 1.1
General Plant Operating Characteristics	Part A Section 1.2
Plant Identification and Information on Permits and Studies	Part A Section 2.1
Outfall Information	Part A Section 2.2
Ponds/Impoundments	Part A Section 3
Landfills	Part A Section 4
Plant Property and Water Balance	Part A Section 5
Steam Electric Generating Unit Information	Part A Section 6
Condenser Cooling Water Systems	Part A Section 7
Fuel Usage by Steam Electric Generating Unit	Part A Section 8
NOx Control Systems	Part A Section 9
Flue Gas Mercury Control Systems	Part A Section 10
Carbon Capture Systems	Part A Section 11
Wet Electrostatic Precipitator Systems	Part A Section 12
Coal Storage and Processing	Part A Section 13
Part A Comments	Part A Comments
Listing of Fossil-Type Fuels	Table A-17
Steam Electric Questionnaire Code Tables	Code Tables

Plant ID: 03831  
Plant Name: Keystone

## PART A. STEAM ELECTRIC POWER PLANT OPERATIONS

### INSTRUCTIONS

Complete Part A of the questionnaire for your plant. As you are completing the electronic form, note the following: When you enter your plant name and plant ID on the Part A Table of Contents tab, all name and ID fields throughout Part A will automatically populate. Refer to the overall questionnaire instructions, the glossary, and the acronym list for assistance with completing Part A.

Please provide all free response answers in the highlighted yellow areas. Throughout Part A, you may need to make copies of certain sections/questions. Instructions are provided throughout Part A regarding making copies. Note that outfall number or steam electric generating unit ID must be populated on the copied tab or section, located in the upper right corner under "Plant ID" and "Plant Name", in order to correlate the requested information with the correct outfall or steam electric generating unit.

Where the questionnaire indicates to provide an attachment, an electronic format (e.g., PDF) is preferred; however, hardcopies are also acceptable.

Use the Comments tab at the end of Part A to do the following: provide additional information as requested in certain questions within Part A; indicate atypical data (e.g., if 2009 information is not representative of normal operations); and note methods used to make best engineering estimates in the event that exact data are not available.

Plant ID: 03831

Plant Name: Keystone

**Part: A**

**Section Title: 1.1. Plant Contact Information**

**Instructions:** Throughout Section 1.1 (Questions A1-1 to A1-5), provide information requested on plant contacts. Please provide all free response answers in the highlighted yellow areas.

**CBI?**  
 Yes

**A1-1.** Provide the physical plant address in the yellow spaces provided below.

Plant Name: RRI Energy Keystone Generating Station  
 Street Address: 313 Keystone Dr.  
 City: Shelocta  
 State: PA Zip Code: 15774-7625

**CBI?**  
 Yes

**A1-2.** Provide the name, title, telephone and fax numbers, and e-mail address of the primary contact for technical information supplied in this questionnaire.

Primary Technical Contact Name: James K. LaFontaine  
 Primary Technical Contact Title: General Manager  
 Email: jlafontaine@rrienergy.com  
 Street Address: 313 Keystone Dr.  
 City: Shelocta  
 State: PA Zip Code: 15774-7625  
 Telephone Number: 724-354-5450  
 Fax Number: 724-354-5489  
 Convenient time to call between (Eastern Time): 8:00 AM to 4:00 PM

**CBI?**

Yes

**A1-3.** Provide the name, title, telephone and fax numbers, and e-mail address of the secondary contact for technical information supplied in this questionnaire.

Secondary Technical Contact Name: Steve Frank  
 Secondary Technical Contact Title: Senior Environmental Specialist  
 Email: sfrank@rrienergy.com  
 Street Address: 121 Champion Way, Suite 200  
 City: Canonsburg  
 State: PA Zip Code: 15317  
 Telephone Number: 724-597-8310  
 Fax Number: 724-597-8870  
 Convenient time to call between (Eastern Time): 8:00 AM to 4:00 PM

**CBI?**

Yes

**A1-4.** Provide the name, title, telephone and fax numbers, and e-mail address of the primary contact for economic/financial information supplied in this questionnaire.

Primary Economic/Financial Contact Name: James K. LaFontaine  
 Primary Economic/Financial Contact Title: General Manager  
 Email: jlafontaine@rrienergy.com  
 Street Address: 313 Keystone Dr.  
 City: Shelocta  
 State: PA Zip Code: 15774-7625  
 Telephone Number: 724-354-5450  
 Fax Number: 724-354-5489  
 Convenient time to call between (Eastern Time): 8:00 AM to 4:00 PM

**CBI?**

Yes

**A1-5.** Provide the name, title, telephone and fax numbers, and e-mail address of the secondary contact for economic/financial information supplied in this questionnaire.

Secondary Economic/Financial Contact Name:

Fran Macey

Secondary Economic/Financial Contact Title:

Accounts Manager

Email:

fmacey@rrenergy.com

Street Address:

121 Champion Way Suite 200

City:

Cannonsburg

State:

PA

Zip Code: 15317

Telephone Number:

724-597-8909

Fax Number:

724-597-8877

Convenient time to call between (Eastern Time):

8:00 AM

am

to 4:00 PM

pm

Plant ID: 03831

Plant Name: Keystone

**Part: A**

**Section Title: 1.2. General Plant Operating Characteristics**

**Instructions:** Throughout Section 1.2 (Questions A1-6 to A1-14), provide information requested on general *plant* operating characteristics. Please provide all free response answers in the highlighted yellow areas.

**CBI?**  
 Yes

**A1-6.** Is the plant permanently retired or will it be permanently retired by December 31, 2011?

- Yes (Stop)
- No (Continue)

**STOP**

**STOP! IF YOU ANSWERED YES TO QUESTION A1-6,  
DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**

**CBI?**  
 Yes

**A1-7.** Does the plant generate or have the potential to generate electricity from a steam electric generating unit (i.e., a generating unit that utilizes a thermal cycle employing the steam/water system as the thermodynamic medium (steam turbine))? [NOTE: Combined cycle systems with at least one associated steam turbine are considered steam electric generating units.]

- Yes (Continue)
- No, this plant does not generate or have the potential to generate electricity from a steam electric generating unit. (Stop)

**STOP**

**STOP! IF YOU ANSWERED NO TO QUESTION A1-7,  
DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**

**CBI?**  
 Yes

**A1-8.** Indicate all of the fossil or nuclear fuels that the plant used to generate electricity in 2009 (refer to Table A-17 for a further breakdown of fossil-type fuels in the "Type of Fuel" tab). [NOTE: Do **NOT** include fuels only used for start up or emergency generators when answering this question.]

- Coal
- Oil
- Gas
- Petroleum Coke
- Nuclear Fuel
- None (the plant did not use fossil or nuclear fuels other than for start up in 2009)



**STOP! IF YOU ANSWERED NONE IN QUESTION A1-8,  
DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**

**CBI?**  
 Yes

**A1-9.** Identify how the plant uses/handles the electricity generated and indicate the percent of electricity by end use/handling. [Check all boxes that apply.]

- Used on site 7.00% \_\_\_\_\_ %
- Distributed for sale 93.00% \_\_\_\_\_ %
- Other \_\_\_\_\_ %

If "Other" was selected, use the yellow space below to provide a description of electricity end use/handling.

**CBI?**  
 Yes

**A1-10.** Provide the primary, secondary, and tertiary six-digit North American Industry Classification System (NAICS) codes that best describe the plant's activities. Refer to the U.S. Census Bureau's website to identify appropriate NAICS codes (<http://www.census.gov/eos/www/naics/>).

Primary NAICS: 221112

Secondary NAICS: \_\_\_\_\_

Tertiary NAICS: \_\_\_\_\_

**CBI?**  
 Yes

**A1-11.** Is the generation of electricity the *primary purpose* (i.e., the predominant source of revenue and principal reason for operation) of the plant?

- Yes
- No, specify the primary purpose of the plant to the right: \_\_\_\_\_



**STOP! IF YOU ANSWERED NO IN QUESTION A1-11,  
DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**

**CBI?**  
 Yes

**A1-12.** Identify how the plant uses steam generated at the plant and indicate the percent of steam by use. [Check all boxes that apply.]

- Electricity Generation 100.00% %
- Heating and/or Cooling \_\_\_\_\_ %
- Other \_\_\_\_\_ %

If "Other" was selected, use the space below to provide a description of the use for steam.

**CBI?**  
 Yes

**A1-13.** Provide the total plant nameplate electric generating capacity, as reported in U.S. DOE/EIA Form 860, schedule 3, line 1, and the total electric net summer and winter capacities.

Nameplate capacity	<u>1872</u>	MW
Net summer capacity	<u>1700</u>	MW
Net winter capacity	<u>1700</u>	MW

**CBI?**  Yes **A1-14.** In Table A-1, provide the total net and gross electrical generation for all electric generating units at the plant during calendar years 2007 through 2009.

**Table A-1. Net and Gross Plant Electrical Generation for 2007-2009**

Calendar Year	Net Electrical Generation (MW-hrs)	Gross Electrical Generation (MW-hrs)
2007	12275348	12911644
2008	14144351	14854990
2009	10539111	11169961

Plant ID: 03831

Plant Name: Keystone

**Part: A**

**Section Title: 2.1. Plant Identification and Information on Permits and Studies**

**Instructions:** Throughout Section 2.1 (Question A2-1 to A2-4), provide information requested on plant identity, permits, and studies. Please provide all free response answers in the highlighted yellow areas.

**CBI?**  
 Yes

**A2-1.** Provide the identification code of this plant as reported on U.S. DOE/EIA Form-860, "Annual Electric Generator Report," schedule 2, line 1.

EIA Plant Identification Code: 3136

Check here if not applicable

**CBI?**  
 Yes

**A2-2.** Provide the identification code of this plant as used when reporting to the Rural Utilities Service (RUS).

RUS Plant Identification Code: \_\_\_\_\_

Check here if not applicable

**CBI?**  
 Yes

**A2-3.** Did the plant conduct any Environmental Assessment (EA) or Environmental Impact Statement (EIS) studies on receiving waters or pond/impoundments reported in Table A-4?

Yes (Continue)

No (Skip to Question A2-4)

If yes, please attach results from the study(ies).

I have attached the results from the study(ies)

I did not attach the results from the study(ies). Explain why:

**CBI?**  
 Yes

**A2-4.** In Table A-2, provide a list of the plant's most recently approved permits that are associated with industrial activities. If the plant has more than one ID for a permit type, list all IDs in the space provided. Also indicate if the plant has a new/pending permit under development.

Note: Do **NOT** include the following types of permits: permits required for construction of wastewater and/or sanitary sewage facilities, erosion and sediment control permits associated with construction activities, temporary and general permits for hydrostatic testing water, water obstruction and encroachment permits, and/or water allocation permits.

Table A-2. Permit Information

Permit Type	Permit ID(s)	Approval Date		Expiration Date		New/Pending Permit is Under Development
		Month	Year	Month	Year	
National Pollutant Discharge Elimination System (NPDES)	PA0002062	February	2008	March	2013	
		Select	Select	Select	Select	Select
		Select	Select	Select	Select	
Resource Conservation and Recovery Act (RCRA)	PAD086204245	Select	Select	Select	Select	
		Select	Select	Select	Select	Select
		Select	Select	Select	Select	
Stormwater		Select	Select	Select	Select	
		Select	Select	Select	Select	Select
		Select	Select	Select	Select	
Air Pollution Operating	03-00027	December	2006	December	2011	
		Select	Select	Select	Select	Select
		Select	Select	Select	Select	
Underground Injection Control (UIC)		Select	Select	Select	Select	
		Select	Select	Select	Select	Select
		Select	Select	Select	Select	

If the plant does not have an individual NPDES permit, skip to Section 3.

Plant ID: 03831

Plant Name: Keystone

Outfall Number: 003

Part: A

Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI?  Yes

**A2-5.** Provide the name, latitude/longitude, the typical volume of discharge in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Final Outfall to Crooked Creek

Coordinates	Degrees	Minutes	Seconds
Latitude	40	39	19
Longitude	79	21	6

Discharge Flow: \_\_\_\_\_ gpy and \_\_\_\_\_ gpd  
 \_\_\_\_\_ dpy OR 365 dpy OR \_\_\_\_\_ hpd and \_\_\_\_\_ dpy

CBI?  Yes

**A2-6.** Identify if the outfall is an internal or final outfall.

- Internal Outfall (Skip to Section 3)
- Final Outfall (Continue)

**A2-7.** Does the outfall release water to a discharge canal prior to discharging to surface water?

**CBI?**  
 Yes  
 No

Yes  
 No

**A2-8.** Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

**CBI?**  
 Yes  
 No

Receiving Surface Water Name: Crooked Creek

Type of Surface Water: River/Stream Other, specify: \_\_\_\_\_

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name. \_\_\_\_\_

**A2-9.** Has a mixing zone been applied to the outfall?

**CBI?**  
 Yes  
 No

Yes  
 No

**A2-10.** In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

**CBI?**  
 Yes  
 No

**Table A-3. Wastewaters Discharged Through Outfall**

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	0.00%
Fly Ash Sluice	0.00%
Bottom Ash Sluice	60.00%
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	0.00%
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	10.00%
Coal Pile Runoff	1.00%
Metal Cleaning Waste	0.00%
Storm Water	1.00%
Other	28.00%
Total	100%

Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)

Plant ID: 03831

Plant Name: Keystone

Outfall Number: 203

Part: A

Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI?  Yes

**A2-5.** Provide the name, latitude/longitude, the typical volume of discharge in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Emergency Overflow of Bottom Ash

Coordinates	Degrees	Minutes	Seconds
Latitude	40	39	32
Longitude	79	20	55

Discharge Flow: 0 gpy and gpd  
 0 dpy OR dpy  
 and hpd and dpy

CBI?  Yes

**A2-6.** Identify if the outfall is an internal or final outfall.

- Internal Outfall (Skip to Section 3)
- Final Outfall (Continue)

**A2-7.** Does the outfall release water to a discharge canal prior to discharging to surface water?

**CBI?**  
 Yes

- Yes  
 No

**A2-8.** Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

**CBI?**  
 Yes

Receiving Surface Water Name: \_\_\_\_\_

Type of Surface Water:  Other, specify: \_\_\_\_\_

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name. \_\_\_\_\_

**A2-9.** Has a mixing zone been applied to the outfall?

**CBI?**  
 Yes

- Yes  
 No

**A2-10.** In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

**CBI?**  
 Yes

**Table A-3. Wastewaters Discharged Through Outfall**

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	0.00%
Fly Ash Sluice	0.00%
Bottom Ash Sluice	0.00%
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	0.00%
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	0.00%
Coal Pile Runoff	0.00%
Metal Cleaning Waste	0.00%
Storm Water	0.00%
Other	0.00%
Total	100%

Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)

Plant ID: 03831

Plant Name: Keystone

Outfall Number: 503

Part: A

Section Title: 2.2. Outfall Information

Instructions: Throughout Section 2.2 (Questions A2-5 to A2-10), provide information for all internal and final outfalls designated in the plant's NPDES permit. Note: This section does not require information on stormwater outfalls, other than those storm water outfalls that may be identified in the NPDES permit itself. Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 2.2 for each outfall designated in the plant's NPDES permit using the "Copy Section 2.2" button below. Enter the outfall number in the space provided above.

CBI?  
 Yes

**A2-5.** Provide the name, latitude/longitude, the typical volume of discharge in 2009 (either gpd and gpy OR gpm and hpd if flow is intermittent), and the number of days of discharge in 2009 for the outfall.

Outfall Name: Bottom Ash Transport Water and

Coordinates	Degrees	Minutes	Seconds
Latitude	40	39	50
Longitude	79	21	0

Discharge Flow: \_\_\_\_\_ gpy \_\_\_\_\_ gpd \_\_\_\_\_ gpm  
 and \_\_\_\_\_ dpy \_\_\_\_\_ hpd \_\_\_\_\_ hpd  
 OR \_\_\_\_\_ dpy \_\_\_\_\_ dpy \_\_\_\_\_ dpy

CBI?  
 Yes

**A2-6.** Identify if the outfall is an internal or final outfall.

- Internal Outfall (Skip to Section 3)
- Final Outfall (Continue)

**A2-7.** Does the outfall release water to a discharge canal prior to discharging to surface water?

**CBI?**  
 Yes  
 No

Yes  
 No

**A2-8.** Provide the receiving surface water name and type of surface water. If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

**CBI?**  
 Yes  
 No

Receiving Surface Water Name: \_\_\_\_\_

Type of Surface Water:  Other, specify: \_\_\_\_\_

If the receiving surface water is unnamed, provide the name(s) of the next receiving water downstream with a designated name.

**A2-9.** Has a mixing zone been applied to the outfall?

**CBI?**  
 Yes  
 No

Yes  
 No

**A2-10.** In Table A-3, provide the percent contribution that each wastewater listed has to the total outfall flow.

**CBI?**  
 Yes  
 No

**Table A-3. Wastewaters Discharged Through Outfall**

Wastewater	Percent Contribution of Outfall Flow
Cooling Water	0.00%
Fly Ash Sluice	0.00%
Bottom Ash Sluice	0.00%
FGD Scrubber Wastewater (slurry blowdown or scrubber purge)	0.00%
Leachate from Coal Combustion Residue Landfills or Ponds/Impoundments	0.00%
Coal Pile Runoff	0.00%
Metal Cleaning Waste	0.00%
Storm Water	0.00%
Other	0.00%
Total	100%

Outfall is used for emergency discharges only. (Respondent still required to answer Table A-3.)

Plant ID: 03831

Plant Name: Keystone

**Part: A**

**Section Title: 3. Ponds/Impoundments**

**Instructions:** Throughout Section 3 (Questions A3-1 to A3-3), provide information for all ponds/impoundments the plant has or is currently constructing/installing or planning to construct/install by December 31, 2020.

**CBI?**  
 Yes

**A3-1.** Does the plant have or is the plant currently constructing/installing or planning to construct/install by December 31, 2020 any ponds/impoundments used for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (including sludge or water streams containing residues or by-products)?

Note: This includes ponds/impoundments located on non-adjointing property that are under the operational control of the plant.

- Yes (Continue)
- No (Skip to Section 4)

**CBI?**  
 Yes

**A3-2.** In Table A-4 below list all pond/impoundment units located at the plant, or pond/impoundments the plant is currently constructing/installing or planning to construct/install by December 31, 2020, including those located on non-adjointing property, used for storage, treatment, and/or disposal of process wastewater, residues, or by-products (including sludge or water streams containing residues or by-products). For each pond/impoundment unit, EPA assigned an ID number (e.g., SPD-1, SPD-2) in Table A-4, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each pond/impoundment unit.

Additionally, provide the latitude and longitude at the pond outlet (see glossary), the closest distance from the pond/impoundment unit to the nearest surface water, the year the pond/impoundment unit was brought online (or is planned to be brought online), and indicate whether the pond/impoundment is lined or unlined and whether leachate (see glossary) is collected from the pond/impoundment (e.g., the pond/impoundment has a leachate collection system or other means for collecting leaks or seepage, etc.). Note: If the pond/impoundment does not have a pond outlet, provide the latitude and longitude corresponding to the emergency outlet for the pond/impoundment.

**Table A-4. Identification of Plant Pond/Impoundment Units**

Pond/ Impoundment Unit ID	Plant Designation	Latitude and Longitude at Pond Outlet			Is the Pond Lined?	Is Leachate (including Leaks or Seepage) Collected?	Closest Distance to Nearest Surface Water (ft)	Year Initially Brought Online Or Planned to be Brought Online	Is the Pond/ Impoundment Inactive?
		deg	min	sec					
<b>Active/Inactive/Open Pond/Impoundment Units</b>									
SPD-1	Coal Pile Runoff Pond (East)	Lat:	40	39	554	Yes	1675	1988	No
		Long:	79	20	693				
SPD-2	Coal Pile Runoff Pond (B)	Lat:	40	39	554	Yes	1675	1988	No
		Long:	79	20	691				
SPD-3	Low Volume Waste Inlet Pond (A)	Lat:	40	39	377	Yes	440	1982	No
		Long:	79	20	496				
SPD-4	Low Volume Waste Inlet Pond (B)	Lat:	40	39	386	Yes	485	1982	No
		Long:	79	20	498				
SPD-5	Low Volume Waste Outlet Pond (A)	Lat:	40	39	395	Yes	455	1982	No
		Long:	79	20	565				
SPD-6	Low Volume Waste Outlet Pond (B)	Lat:	40	39	405	Yes	495	1982	No
		Long:	79	20	568				
SPD-7	Bottom Ash Settling Pond (A)	Lat:	40	39	653	Yes	2050	1989	No
		Long:	79	20	651				

SPD-8	Bottom Ash Settling Pond (B)	Lat: 40 39 669	Yes	No	2100	1989	No
		Long: 79 20 633					
SPD-9	Bottom Ash Settling Pond (C)	Lat: 40 39 663	Yes	No	2150	1989	No
		Long: 78 20 615					
SPD-10	Bottom Ash Thermal Pond	Lat: 40 39 842	Yes	No	2850	1994	No
		Long: 79 21 63					
SPD-11	Keystone Lagoon	Lat: 40 39 331	No	No	75	1967	No
		Long: 79 21 133					
SPD-12	Site Contact Stormwater /	Lat: 40 39 350	Yes	No	2450	2002	No
		Long: 79 21 199					
SPD-13	Site Storm Water Pond (A)	Lat: 40 40 468	Yes	Yes	750	1985	Yes
		Long: 79 19 721					
SPD-14	Site Storm Water Pond (B)	Lat: 40 40 463	Yes	Yes	750	1985	Yes
		Long: 79 19 695					
<b>Retired/Closed Pond/Impoundment Units</b>							
RET-SPD-1	Bottom Ash Cooling Pond (B)	Lat: 40 39 884	No	No	2925	1967	
		Long: 79 21 72					
RET-SPD-2	Tower Desilting Basin	Lat: 40 39 576	No	No	140	1967	
		Long: 79 20 125					
RET-SPD-3	Site Energy Dissipator Pond	Lat: 40 40 409	No	No	870	1985	
		Long: 79 19 770					
RET-SPD-4		Lat:	Select	Select			
		Long:					
<b>Planned Pond/Impoundment Units</b>							
SPD-A	Gypsum Storage Area SWRO Pond	Lat:	Select	Select		2010	
		Long:					
SPD-B	Limestone Pile SWRO Pond	Lat:	Select	Select		2010	
		Long:					
SPD-C	FGD WWT SWRO Pond	Lat:	Select	Select		2010	
		Long:					
SPD-D		Lat:	Select	Select			
		Long:					
SPD-E		Lat:	Select	Select			
		Long:					

**A3-3.** In Table A-5 below, indicate all process wastewater, residues, or by-products (or sludges or water streams containing the wastes, residues or by-products) that are stored, treated, and/or disposed of in each pond/impoundment unit identified in Table A-4. [Check all boxes that apply.] For solid waste and process wastewater not listed in the checkboxes or the drop down menu provide the name and description in the yellow box provided. Do not include treatment chemicals that are added to the pond/impoundment.

**CBI?**  
 Yes

**Table A-5. Wastes Stored or Disposed of in Plant Pond/Impoundment Units**

Pond/Impoundment Unit ID	Solid Waste	Process Wastewater
SPD-1	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  <input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  coal fines  Other, specify: Other, specify: Other, specify: Other, specify:	Coal pile runoff Select Select Select  Select Select Select
SPD-2	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  <input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  coal fines  Other, specify: Other, specify: Other, specify: Other, specify:	Coal pile runoff Select Select Select  Select Select Select
SPD-3	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input checked="" type="checkbox"/> Fly Ash  <input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  coal fines  Other, specify: Other, specify: Other, specify: Other, specify:	Air heater cleaning water Floor drain wastewater Coal pile runoff Select Select Select  Cooling tower blowdown Filter Backwash Boiler blowdown
SPD-4	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input checked="" type="checkbox"/> Fly Ash  <input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  coal fines  Other, specify: Other, specify: Other, specify: Other, specify:	Air heater cleaning water Floor drain wastewater Coal pile runoff Select Select Select  Cooling tower blowdown Filter Backwash Boiler blowdown

<p>SPD-5</p>	<p><input type="checkbox"/> Boiler Slag  <input type="checkbox"/> Bottom Ash  <input checked="" type="checkbox"/> Fly Ash</p> <p>Precipitated treatment sludge</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Air heater cleaning water          Floor drain wastewater          Coal pile runoff</p> <p>Landfill runoff-capped landfill          Landfill runoff-uncapped landfill</p>
<p>SPD-6</p>	<p><input type="checkbox"/> Boiler Slag  <input type="checkbox"/> Bottom Ash  <input type="checkbox"/> Fly Ash</p> <p>Precipitated treatment sludge</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input checked="" type="checkbox"/> Solids from Dry FGD</p>	<p>Air heater cleaning water          Floor drain wastewater          Coal pile runoff</p> <p>Landfill runoff-capped landfill          Landfill runoff-uncapped landfill</p>
<p>SPD-7</p>	<p><input type="checkbox"/> Boiler Slag  <input type="checkbox"/> Bottom Ash  <input checked="" type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Bottom ash sluice          Select          Select</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>
<p>SPD-8</p>	<p><input type="checkbox"/> Boiler Slag  <input checked="" type="checkbox"/> Bottom Ash  <input type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Bottom ash sluice          Select          Select</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>
<p>SPD-9</p>	<p><input type="checkbox"/> Boiler Slag  <input checked="" type="checkbox"/> Bottom Ash  <input type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Bottom ash sluice          Select          Select</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>
<p>SPD-10</p>	<p><input type="checkbox"/> Boiler Slag  <input checked="" type="checkbox"/> Bottom Ash  <input type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Bottom ash sluice          Select          Select</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>

<p>SPD-11</p>	<p><input type="checkbox"/> Boiler Slag  <input type="checkbox"/> Bottom Ash  <input type="checkbox"/> Fly Ash</p> <p>Other, specify: <u>silt</u>          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Air heater cleaning water          Boiler blowdown          Bottom ash sludge</p> <p>Coal pile runoff          Cooling tower blowdown          Gypsum pile runoff</p>
<p>SPD-12</p>	<p><input type="checkbox"/> Boiler Slag  <input checked="" type="checkbox"/> Bottom Ash  <input checked="" type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input checked="" type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p> <p><u>Waste Treatment Sludge</u></p>	<p>Landfill runoff - capped landfill          Landfill runoff - uncapped landfill          Leachate</p>
<p>SPD-13</p>	<p><input type="checkbox"/> Boiler Slag  <input type="checkbox"/> Bottom Ash  <input checked="" type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Landfill runoff - capped landfill          Leachate</p>
<p>SPD-14</p>	<p><input type="checkbox"/> Boiler Slag  <input checked="" type="checkbox"/> Bottom Ash  <input checked="" type="checkbox"/> Fly Ash</p> <p>Other, specify:          Other, specify:          Other, specify:          Other, specify:</p>	<p><input type="checkbox"/> FGD Calcium Sulfate (Gypsum)  <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic  <input type="checkbox"/> FGD Pozzolanic Material  <input type="checkbox"/> Solids from Dry FGD</p>	<p>Landfill runoff - capped landfill          Leachate</p>

Plant ID: Insert Plant ID  
 Plant Name: Insert Plant Name

**Part: A**

**Section Title: 3. Ponds/Impoundments**

**Instructions:** Throughout Section 3 (Questions A3-1 to A3-3), provide information for all ponds/impoundments the plant has or is currently constructing/installing or planning to construct/install by December 31, 2020.

**CBI?**  
 Yes

**A3-1.** Does the plant have or is the plant currently constructing/installing or planning to construct/install by December 31, 2020 any ponds/impoundments used for the storage, treatment, and/or disposal of process wastewater, residues, or by-products (including sludge or water streams containing residues or by-products)?

Note: This includes ponds/impoundments located on non-adjointing property that are under the operational control of the plant.

Yes (Continue)  
 No (Skip to Section 4)

**CBI?**  
 Yes

**A3-2.** In Table A-4 below list all pond/impoundment units located at the plant, or pond/impoundments the plant is currently constructing/installing or planning to construct/install by December 31, 2020, including those located on non-adjointing property, used for storage, treatment, and/or disposal of process wastewater, residues, or by-products (including sludge or water streams containing residues or by-products). For each pond/impoundment unit, EPA assigned an ID number (e.g., SPD-1, SPD-1, SPD-2) in Table A-4, which will be used throughout the remainder of the survey. In the "Plant Designation" column, provide the plant's name for each pond/impoundment unit.

Additionally, provide the latitude and longitude at the pond outlet (see glossary), the closest distance from the pond/impoundment unit to the nearest surface water, the year the pond/impoundment unit was brought online (or is planned to be brought online), and indicate whether the pond/impoundment is lined or unlined and whether leachate (see glossary) is collected from the pond/impoundment (e.g., the pond/impoundment has a leachate collection system or other means for collecting leaks or seepage, etc.). Note: If the pond/impoundment does not have a pond outlet, provide the latitude and longitude corresponding to the emergency outlet for the pond/impoundment.

**Table A-4. Identification of Plant Pond/Impoundment Units**

Pond/ Impoundment Unit ID	Plant Designation	Latitude and Longitude at Pond Outlet			Is the Pond Lined?	Is Leachate (including Leaks or Seepage) Collected?	Closest Distance to Nearest Surface Water (ft)	Year Initially Brought Online Or Planned to be Brought Online	Is the Pond/ Impoundment Inactive?
		deg	min	sec					
<b>Active/Inactive/Open Pond/Impoundment Units</b>									
SPD-1	Discharge Treatment Vertical	Lat: 40	39	950			50	2000	
		Long: 79	19	882					
SPD-2	Discharge Treatment	Lat: 40	39	921			30	2000	
		Long: 79	19	834					
SPD-3	Discharge Treatment	Lat: 40	39	350			80	1989	
		Long: 79	21	199					
SPD-4		Lat:							
		Long:							
SPD-5		Lat:							
		Long:							
SPD-6		Lat:							
		Long:							
SPD-7		Lat:							
		Long:							



**CBI?**  
 Yes

**A3-3.** In Table A-5 below, indicate all process wastewater, residues, or by-products (or sludges or water streams containing the wastes, residues or by-products) that are stored, treated, and/ or disposed of in each pond/impoundment unit identified in Table A-4. [Check all boxes that apply.] For solid waste and process wastewater not listed in the checkboxes or the drop down menu provide the name and description in the yellow box provided. Do not include treatment chemicals that are added to the pond/impoundment.

**Table A-5. Wastes Stored or Disposed of in Plant Pond/Impoundment Units**

Pond/ Impoundment Unit ID	Solid Waste	Process Wastewater
	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  Other, specify: Other, specify: Other, specify: Other, specify:	<input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  Acid Mine Drainage Precipitate  Other, specify: <u>Acid Mine Drainage</u> Other, specify: Other, specify: Other, specify:
	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  Other, specify: Other, specify: Other, specify: Other, specify:	<input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  Acid Mine Drainage Precipitate  Other, specify: <u>Acid Mine Drainage</u> Other, specify: Other, specify: Other, specify:
	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  Other, specify: Other, specify: Other, specify: Other, specify:	<input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  Acid Mine Drainage Precipitate  Other, specify: <u>Acid Mine Drainage</u> Other, specify: Other, specify: Other, specify:
	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  Other, specify: Other, specify: Other, specify: Other, specify:	<input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  Acid Mine Drainage Precipitate  Other, specify: <u>Acid Mine Drainage</u> Other, specify: Other, specify: Other, specify:
	<input type="checkbox"/> Boiler Slag <input type="checkbox"/> Bottom Ash <input type="checkbox"/> Fly Ash  Other, specify: Other, specify: Other, specify: Other, specify:	<input type="checkbox"/> FGD Calcium Sulfate (Gypsum) <input type="checkbox"/> FGD Calcium Sulfite - Not Pozzolanic <input type="checkbox"/> FGD Pozzolanic Material <input type="checkbox"/> Solids from Dry FGD  Acid Mine Drainage Precipitate  Other, specify: <u>Acid Mine Drainage</u> Other, specify: Other, specify: Other, specify:

Plant ID: 03831  
 Plant Name: Keystone

**Part A**  
**Section Title: 6. Steam Electric Generating Unit Information**  
**Instructions:** Throughout Section 6 (Questions A6-1 to A6-2), provide information requested on each steam electric generating unit that the plant has operated or any steam electric generating units the plant is currently constructing/installing or planning to construct/install by December 31, 2015. Plants do NOT need to include information on units retired before January 1, 2009. Please provide all free response answers in the highlighted yellow areas.

CBI?  
 Yes

**A6-1.** In Table A-8, provide information for each steam electric generating unit that commenced operating prior to January 1, 2010. Plants do NOT need to include information on units retired before January 1, 2009. For combined cycle systems, provide EIA Generator IDs for all steam and combustion turbines associated with the combined cycle system. Provide the electric generation for the entire combined cycle system in 2009. In the "Type of Unit" column, if you indicate "Other", provide an explanation in the Comments page. See the glossary for definitions of *base load*, *peaking*, *cycling*, and *intermediate*.

Table A-8. Steam Electric Units Operated Prior to January 1, 2010

Steam Electric Unit	EIA Generator ID	Operated in 2009 <input checked="" type="radio"/> Yes Calendar days of operation: 266 <input type="radio"/> No Was operated in previous years	Type of Steam Electric Prime Mover (or Turbine) Stand-Alone Steam Turbine	Total Unit Electric Generation in 2009 (MW-hrs)	Total Unit Nameplate Capacity		Type of Unit <input checked="" type="radio"/> Base load <input type="radio"/> Peaking <input type="radio"/> Cycling <input type="radio"/> Intermediate <input type="radio"/> Other, specify:	Is this Unit Now Retired? <input type="radio"/> Yes <input checked="" type="radio"/> No
					Steam Turbine Capacity (MW)	Combustion Turbine Capacity (MW)		
SE Unit-1	1							
				5257583	936			
			Was operated in previous years					
SE Unit-2	2							
				5912378	936			
			Was operated in previous years					
SE Unit-3								
			Was operated in previous years					

Plant ID: 03831  
 Plant Name: Keystone  
 SE Unit ID: SE-1

**Part: A**

**Section Title: 8. Fuel Usage by Steam Electric Generating Unit**

**Instructions:** In Section 8 (Questions A8-1 through A8-3), provide information for all steam electric generating units that were operated in 2009, including units that operated for only part of 2009 (i.e., those units for which you responded "Yes" in Question A6-1, Table A-8, "Operated in 2009" column). Please provide all free response answers in the highlighted yellow areas.

Make copies of Section 8 for each steam electric generating unit ID operated in 2009 using the "Copy Section 8" button below. Enter the steam electric generating unit ID (use unit IDs assigned in Table A-8) in the space above titled "SE Unit ID".

**Copy Section 8**

**CB1?**  
 Yes

**A8-1.** In Table A-11, provide the types and amounts of fuels used in 2009. [Check all boxes that apply.] Include fuels used for start up. Also provide the BTU generated by each general fuel type reported for the year 2009.

Note: EPA is requesting the BTUs actually generated by the fuel. Additionally, for reporting barrels of oil, use a conversion of one barrel is equal to 42 U.S. gallons, if needed.

**Table A-11. Fuel Usage for Steam Electric Power Generation in 2009**

Coal and Petroleum Coke		Gas		Fossil/Nuclear Fuels		Oil		Nuclear	
BTU Generated by Coal and/or Petroleum Coke 4.73E+13		BTU Generated by Gas		Amount (Million ft <sup>3</sup> )		BTU Generated by Oil		BTU Generated by Nuclear Fuels	
Type	Amount (tons)	Type	Amount (Million ft <sup>3</sup> )	Type	Amount (barrels)	Type	Amount	Type	Units (Specify)
<input type="checkbox"/> Anthracite		<input type="checkbox"/> Natural Gas		<input type="checkbox"/> No. 1 Fuel Oil		<input type="checkbox"/> Nuclear		<input type="checkbox"/> Nuclear	
<input checked="" type="checkbox"/> Bituminous	1868325	<input type="checkbox"/> Blast Furnace Gas		<input checked="" type="checkbox"/> No. 2 Fuel Oil	18980	<input type="checkbox"/> None		<input type="checkbox"/> None	
<input type="checkbox"/> Lignite		<input type="checkbox"/> Gaseous Propane		<input type="checkbox"/> No. 4 Fuel Oil					
<input type="checkbox"/> Subbituminous		<input type="checkbox"/> Other Gases (Provide Below)		<input type="checkbox"/> No. 5 Fuel Oil					
<input type="checkbox"/> Waste Coal		<input type="checkbox"/> None		<input type="checkbox"/> No. 6 Fuel Oil					
<input type="checkbox"/> Coal Syntfuel				<input type="checkbox"/> Diesel Fuel					
<input type="checkbox"/> Other Coal (Provide below)				<input type="checkbox"/> Jet Fuel					
<input type="checkbox"/> Petroleum Coke				<input type="checkbox"/> Kerosene					
<input type="checkbox"/> None				<input type="checkbox"/> Waste Oil					
				<input type="checkbox"/> Other Oil (Provide below)					
				<input type="checkbox"/> None					
<b>Total BTU Generated by Fossil/Nuclear Fuels</b> 4.74E+13		<b>Total BTU Generated by Fossil/Nuclear Fuels</b> 4.74E+13		<b>Total BTU Generated by Fossil/Nuclear Fuels</b> 4.74E+13		<b>Total BTU Generated by Fossil/Nuclear Fuels</b> 4.74E+13		<b>Total BTU Generated by Fossil/Nuclear Fuels</b> 4.74E+13	
Other Fuels (i.e., Fuels other than Fossil or Nuclear)		Other Fuels (i.e., Fuels other than Fossil or Nuclear)		Other Fuels (i.e., Fuels other than Fossil or Nuclear)		Other Fuels (i.e., Fuels other than Fossil or Nuclear)		Other Fuels (i.e., Fuels other than Fossil or Nuclear)	
Type	Amount	Type	Amount	Type	Amount	Type	Amount	Type	Amount
<input type="checkbox"/> Municipal Solid Waste		<input type="checkbox"/> Landfill Gas		<input type="checkbox"/> None		<input type="checkbox"/> None		<input type="checkbox"/> None	
<input type="checkbox"/> Wood		<input type="checkbox"/> Other Biomass		<input type="checkbox"/> Other (Provide below)		<input type="checkbox"/> Other (Provide below)		<input type="checkbox"/> Other (Provide below)	
<b>Total BTU Generated by Other Fuels</b>		<b>Total BTU Generated by Other Fuels</b>		<b>Total BTU Generated by Other Fuels</b>		<b>Total BTU Generated by Other Fuels</b>		<b>Total BTU Generated by Other Fuels</b>	
<b>Total BTU Generated by All Fuels</b> 4.74E+13		<b>Total BTU Generated by All Fuels</b> 4.74E+13		<b>Total BTU Generated by All Fuels</b> 4.74E+13		<b>Total BTU Generated by All Fuels</b> 4.74E+13		<b>Total BTU Generated by All Fuels</b> 4.74E+13	

CBI?  
 Yes

**A8-2.** Do the total BTUs generated by the fossil/nuclear fuels comprise 50 percent or more of the total BTUs generated by all fuels for the steam electric generating unit in 2009?

- Yes  
 No

CBI?  
 Yes

**A8-3.** Did the plant report a fossil or nuclear fuel as the predominant or second most predominant energy source for this generating unit on Form EIA-860 for reporting year 2009? NOTE: This information is reported in Schedule 3, Part B, lines 9 and 11.

- Yes  
 No

If the plant responded "Yes" to either Question A8-2 or A8-3, then this steam electric generating unit is classified as a "fossil/nuclear electric generating unit" for the purposes of this questionnaire. If the plant responded "No" to both Questions A8-2 and A8-3, then this electric generating unit is classified as an "other electric generating unit" for the purposes of this questionnaire.

**NOTE: IF ALL STEAM ELECTRIC GENERATING UNITS IDENTIFIED IN TABLE A-8 ARE CLASSIFIED AS "OTHER ELECTRIC GENERATING UNITS" (BASED ON THE CLASSIFICATION DETERMINED FROM QUESTIONS A8-2 AND A8-3), DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**



CBI?  
 Yes

**A8-2.** Do the total BTUs generated by the fossil/nuclear fuels comprise 50 percent or more of the total BTUs generated by all fuels for the steam electric generating unit in 2009?

- Yes  
 No

CBI?  
 Yes

**A8-3.** Did the plant report a fossil or nuclear fuel as the predominant or second most predominant energy source for this generating unit on Form EIA-860 for reporting year 2009? NOTE: This information is reported in Schedule 3, Part B, lines 9 and 11.

- Yes  
 No

If the plant responded "Yes" to either Question A8-2 or A8-3, then this steam electric generating unit is classified as a "fossil/nuclear electric generating unit" for the purposes of this questionnaire. If the plant responded "No" to both Questions A8-2 and A8-3, then this electric generating unit is classified as an "other electric generating unit" for the purposes of this questionnaire.

**NOTE: IF ALL STEAM ELECTRIC GENERATING UNITS IDENTIFIED IN TABLE A-8 ARE CLASSIFIED AS "OTHER ELECTRIC GENERATING UNITS" (BASED ON THE CLASSIFICATION DETERMINED FROM QUESTIONS A8-2 AND A8-3), DO NOT COMPLETE THE REMAINDER OF THIS QUESTIONNAIRE.**

Plant ID: 03831

Plant Name: Keystone

**Part: A**

**Section Title: 9. NOx Control Systems**

**Instructions:** Throughout Section 9 (Questions A9-1 to A9-11), provide information for all NOx control systems operated on fossil-fueled electric generating units on or after January 1, 2009 and all NOx control systems the plant is currently constructing/installing or planning to construct/install on fossil-fueled electric generating units by December 31, 2020. See Part A Section 8 for unit classifications. You will need to indicate the steam electric generating units that are serviced by these air pollution control systems. Use codes from Table A-8 or Table A-9 to designate the SE Unit ID.

**CBI?**  
 Yes

**A9-1.** Did the plant operate any NOx control systems on fossil-fueled electric generating units after January 1, 2009 or is the plant currently constructing/installing or planning to construct/install any NOx control system on fossil-fueled electric generating units by December 31, 2020? See Part A Section 8 for unit classifications.

- Yes (Complete Table A-12)
- No (Skip to Section 10)

In Table A-12, provide information for NOx control systems that the plant operated after January 1, 2009, is currently constructing/installing, or planning to construct/install by December 31, 2020 on each operating or planned fossil-fueled electric generating unit (identified in Table A-8 or Table A-9). Provide the steam electric generating unit ID (use codes from Table A-8 or Table A-9), the type of NOx control system(s) operating or planned for the steam electric generating unit, whether the NOx control system(s) are operating or planned, and the date the NOx control was/will be installed. In addition, for the steam electric generating units serviced by a SCR system, identify the date and location (i.e., on- or off-site) of the last and next SCR catalyst replacement/regeneration.

**Table A-12. NOx Control Systems**

SE Unit ID	Type of NOx Control System	Status of NOx Control System	Date of Installation, Previous or Planned		Date of Last SCR Catalyst Replacement or Regeneration		Where Last SCR Catalyst Regeneration Occurred	Date of Next Planned SCR Catalyst Replacement or Regeneration		Where Next SCR Catalyst Regeneration is Planned to Occur
			Month	Year	Month	Year		Month	Year	
SE Unit-1	<input checked="" type="checkbox"/> SCR	Operating	May	2003	April	2009	Offsite	September	2010	Offsite
	<input type="checkbox"/> SNCR	Select	Select					Regenerated		
	<input checked="" type="checkbox"/> Overfire Air	Operating	May	1997	Regenerated			Regenerated		
SE Unit-2	<input checked="" type="checkbox"/> Low NOx burners	Operating	May	1997	Regenerated			Regenerated		
	<input type="checkbox"/> Other:	Select	Select					Regenerated		
	<input checked="" type="checkbox"/> SCR	Operating	May	2003	November	2009	Offsite	September	2010	Offsite
SE Unit-1	<input type="checkbox"/> SNCR	Select	Select					Regenerated		
	<input checked="" type="checkbox"/> Overfire Air	Operating	May	1997	Regenerated			Regenerated		
	<input checked="" type="checkbox"/> Low NOx burners	Operating	May	1997	Regenerated			Regenerated		
SE Unit-2	<input type="checkbox"/> Other:	Select	Select					Regenerated		

Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							
Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							
Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							
Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							
Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							
Select	<input type="checkbox"/> SCR <input type="checkbox"/> SNCR <input type="checkbox"/> Overfire Air <input type="checkbox"/> Low NOx burners <input type="checkbox"/> Other:	Select							

CBI?  
 Yes

A9-2. If the plant has sent an SCR catalyst off site for regeneration, provide the company name, location, and phone number for the company(ies) that performed the last two SCR catalyst regenerations.

Plant did not send SCR catalyst offsite for regeneration.

Table A-13. Companies that performed the last two SCR catalyst regenerations

Company Name	City	State	Telephone Number
SCR Tech	Charlotte	NC	704-812-4068

**CBI?**  
 Yes

**A9-3.** If the SCR catalyst is regenerated on site, indicate whether process wastewater is generated from the regeneration process.

- Yes  
 No  
 NA: SCR catalyst is NOT regenerated on site

(Continue)

(Skip to Question A9-7)

(Skip to Question A9-7)

**CBI?**  
 Yes

**A9-4.** Provide the typical volume of SCR catalyst regeneration wastewater generated (gpy) and the frequency at which the process wastewater is generated.

\_\_\_\_\_ gpy \_\_\_\_\_ times every \_\_\_\_\_ year(s)

**CBI?**  
 Yes

**A9-5.** Is the SCR catalyst regeneration wastewater commingled with other wastewaters? If yes, indicate the wastewaters with which the SCR catalyst regeneration wastewater is commingled. [Check all boxes that apply.]

- Yes  
 Fly ash transport water  
 Bottom ash transport water  
 FGD scrubber purge  
 Cooling tower blowdown  
 Once-through cooling water  
 Cleaning wastes from cleaning metal process equipment  
 Other, specify: \_\_\_\_\_  
 No

**CBI?**  
 Yes

**A9-6.** Indicate all intermediate and final destination(s) of the SCR catalyst regeneration wastewater. If the plant recycles the SCR catalyst regeneration wastewater, indicate the plant process to which this water is recycled. [Check all that apply].

- Immediately recycled back to plant process. Please describe how the process wastewater is reused: \_\_\_\_\_

- Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]

- Settling pond  
 pH adjustment  
 Chemical precipitation  
 Constructed wetlands  
 Other, specify: \_\_\_\_\_

- Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2): \_\_\_\_\_  
 Indirect discharge to a publicly or privately owned treatment works  
 Other, explain: \_\_\_\_\_

**CBI?**  
 Yes

**A9-7.** Is the SCR catalyst washed on site?

- Yes  
 No  
 (Continue)  
 (Skip to Section 10)

**A9-8.** Is process wastewater generated from the SCR catalyst washing process?

Yes

Yes  
 No  
(Continue)  
(Skip to Section 10)

**A9-9.** Provide the typical volume of SCR catalyst washing wastewater generated (gpy) and the frequency at which the process wastewater is generated.

\_\_\_\_\_ gpy \_\_\_\_\_ times every \_\_\_\_\_ year(s)

**A9-10.** Is the SCR catalyst washing wastewater commingled with other wastewaters? If yes, indicate the wastewaters with which the SCR catalyst washing wastewater is commingled. [Check all boxes that apply.]

- Yes
  - Fly ash transport water
  - Bottom ash transport water
  - FGD scrubber purge
  - Cooling tower blowdown
  - Once-through cooling water
  - Cleaning wastes from cleaning metal process equipment
  - Other, specify: \_\_\_\_\_
- No

**A9-11.** Indicate all intermediate and final destination(s) of the SCR catalyst washing wastewater. If the plant recycles the SCR catalyst washing wastewater, indicate the plant process to which this water is recycled. [Check all that apply].

Immediately recycled back to plant process. Please describe how the process wastewater is reused:

Transferred to on-site treatment system. Identify the type of treatment system below. [Check all boxes that apply.]

- Settling pond
- pH adjustment
- Chemical precipitation
- Constructed wetlands
- Other, specify: \_\_\_\_\_

Discharged to surface water. Provide NPDES permitted outfall number (from Part A Section 2.2): \_\_\_\_\_

Indirect discharge to a publicly or privately owned treatment works

Other, explain: \_\_\_\_\_

**CBI?**  Yes  No **A13-11.** Was any water used in the coal pulverization process, other than that used for sluicing mill rejects?

- Yes (Continue)
- No (Skip to Question A13-12)

Provide the volume of coal pulverization process wastewater generated in 2009 (gpd OR gpy) and the frequency of this process wastewater generation (days).

\_\_\_\_\_  Over \_\_\_\_\_ days

**CBI?**  Yes  No **A13-12.** Were mill rejects sluiced in 2009?

- Yes (Continue)
- No (Skip to Question A13-14)

Provide the volume of mill rejects sluice water generated in 2009 (gpd OR gpy) and the frequency of sluice water generation (days).

364752  Over 365 \_\_\_\_\_ days

**CBI?**  Yes  No **A13-13.** Were the mill rejects sluiced separately or were they sluiced with fly and/or bottom ash?

Sluiced with bottom ash

**A13-14. Are the mill rejects pyritic?**

**CBI?**  
 Yes

- Yes
- No
- Unknown

**CBI?**  
 Yes

**A13-15. Indicate how mill rejects are disposed of and provide amount(s). If the mill rejects are sent to a pond/impoundment, indicate whether they are combined with fly and/or bottom ash. [Check all boxes that apply.]**

- Stored in/transferred to a pond/impoundment reported in Table A-4 \_\_\_\_\_ tpd
  - Combined with fly ash in pond/impoundment
  - Combined with bottom ash in pond/impoundment
  - Not combined with fly or bottom ash in pond/impoundment
- Stored in/transferred to a landfill reported in Table A-6 \_\_\_\_\_ tpd
- Hauled off site for disposal \_\_\_\_\_ tpd
- Other, explain: \_\_\_\_\_ tpd

**CBI?**  
 Yes

**A13-16. Did the plant gasify coal, petroleum coke, or oil to operate an IGCC generating unit during 2009?**

- Yes
- No

**CBI?**  
 Yes

**A13-17. Is the plant currently operating, currently constructing/installing, or planning to construct/install by December 31, 2015 an IGCC generating unit that was not in operation during 2009?**

- Yes
- No

Plant ID: 03831

Plant Name: Keystone

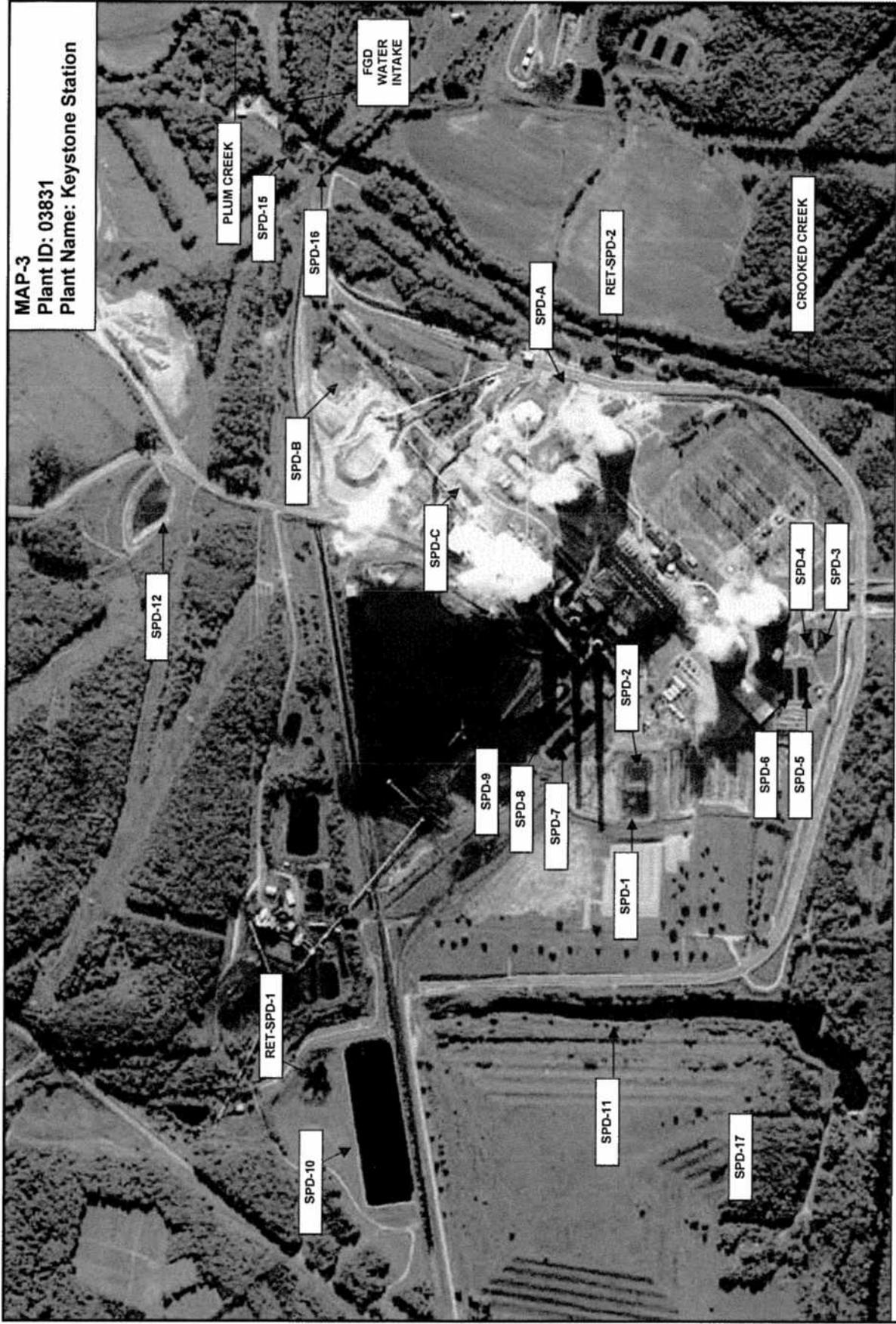
**Part: A**

**Section Title: Part A Comments**

**Instructions:** Cross reference your comments by question number and indicate the confidential status of your comment by checking the box next to "Yes" under "CBI?" (Confidential Business Information).

Question Number	Comment
<b>CBI?</b> <input type="checkbox"/> Yes	A13-12 Amount of mill reject pyrite sludge water was reported as amount of bottom ash sludge water
<b>CBI?</b> <input type="checkbox"/> Yes	A13-15 Tons per day of mill pyrite rejects reported as tons of bottom ash and pyrites reported on 2009 26R report
<b>CBI?</b> <input type="checkbox"/> Yes	A2-5 Flow data for Outfalls that have storm water contributions only were estimated from the following formula using precipitation data from the Indiana, PA Airport history for 2009. Q=Drainage Area (sq.ft.)x Runoff Coefficient (0.5) x rainfall (ft) / days of rainfall per year / 365 days >0.1" of rain). For 2009, there were 51 days that produced 1.7025 ft of precipitation
<b>CBI?</b> <input type="checkbox"/> Yes	A3-2 copy 2 Table A-4 copy 2 SPD -1 is SPD-14 clay lined leachate not collected, active impoundment. SPD-2 is SPD-15 clay lined, leachate not collected, active impoundment. SPD-3 is SPD-16 clay lined, leachate not collected, active impoundment.
<b>CBI?</b> <input type="checkbox"/> Yes	A2-4 RCRA Permit has no approval or expiration date. ID # only
<b>CBI?</b> <input type="checkbox"/> Yes	

MAP-3  
Plant ID: 03831  
Plant Name: Keystone Station



Keystone Generating Station  
Ponds / Impoundments 1

MAP-5  
Plant ID: 03831  
Plant Name: Keystone Station



Keystone Generating Station  
Buildings and Structures

# *APPENDIX A*

## *Document 9*

### *Keystone Ash Filter Ponds O and M Manual*

# **KEYSTONE STATION ASH FILTER PONDS**

## **OPERATION AND MAINTENANCE MANUAL**



**Prepared for**

**PENNSYLVANIA ELECTRIC COMPANY  
Johnstown, Pennsylvania  
June 1989**



**Gilbert/Commonwealth, Inc.**

engineers and consultants - Reading, Pennsylvania

## 1.0 INTRODUCTION

The purpose of this Operation and Maintenance Manual is to familiarize operating personnel with the improved ash filter pond treatment system at Keystone Station. The manual includes a system description, procedures and guidelines for operation, and maintenance requirements.

### 1.1 System Function

Bottom ash is sluiced from the ash hoppers to one of four dewatering bins. The dewatering bin overflow and decant water then flows by gravity to the ash filter ponds where the fine suspended solid particles settle to the pond bottom. The overflow from the ash filter ponds is discharged to the station lagoon through NPDES Outfall 503.

The ash filter pond treatment system at Keystone Station is designed to treat bottom ash sluice wastewater by providing sufficient detention time, surface settling area, and sludge storage volume to settle out the fine ash particles escaping the dewatering bins.

### 1.2 Design Criteria

The design basis for the ash filter pond treatment system is as follows:

(Flow rates and characteristics from dewatering bins)

Average bottom ash sluice flow rate	2,600 gpm
Average daily flow	2,496,000 gpd
Maximum flow rate	11,800 gpm
Bottom ash sluice pH, minimum	7.3 - 8.0
Bottom ash sluice suspended solids, range	500 - 1,000 ppm
Pond liner system permeability	$< 1 \times 10^{-7}$ cm/sec
Number of ponds in service at any time	2

Ponds to be cleaned by truck and front end loader.

Treated Effluent Requirements:

pH	6 - 9
Total suspended solids, average	30
Total suspended solids, maximum daily	100
Oil and grease, average	15
Oil and grease, maximum daily	20

1.3 Summary System Description

Bottom ash is sluiced from the four ash hoppers in each of Units 1 and 2 to one of four dewatering bins using 2,600 gpm ash sluice pumps. The dewatering bin overflow and periodic decant water then flows by gravity to the bottom ash filter ponds. Three ponds are provided, each sized for 50 percent of the bottom ash transport water design flow. Normal operation is two ponds in service at all times, with the third pond being drained, cleaned, and prepared for return to service.

Flow from the dewatering bins is distributed to the ponds through a series of 18-inch knife gate valves at a valving station located between the dewatering bins and the ash ponds.

The ash filter ponds are lined with approximately a two-foot thick bentonite treated clay liner which provides a permeability of less than  $1 \times 10^{-7}$  cm/sec. The clay liner is protected on the bottom by a four-foot layer of coarse aggregate and bottom ash and on the 2H:1V side slopes by an 18-inch layer of rip-rap. An underdrain and filter media is provided to drain the pond and filter out the ash particles during the drain cycle and consists of 1.5 feet of coarse aggregate and 2.5 feet of raw bottom ash. The underdrains above the liner consist of two 8 to 12-inch perforated pipe surrounded by one to two feet of coarse aggregate.

Discharge from the ash filter ponds is over a double-sided weir trough which discharges into a concrete discharge structure. The discharge structure also collects the underdrain flow and is provided with a weir gate for decanting the pond.

The discharge from the three ponds is collected in an 18-inch pipe which flows by gravity to the station lagoon.

The pond treatment facilities also include turbidity curtains which are hung across each pond at its third points to encourage the settlement of fine particles at the inlet end of the pond.

On each pond inlet pipe, a perforated stainless steel basket is provided to contain polymer logs which are used to promote flocculation of the fine ash particles.

## 2.0 DETAILED SYSTEM DESCRIPTION

### 2.1 Pond Inlet Distribution System

Overflow from the four dewatering bins is collected and piped through two 18-inch steel pipes. Flow is diverted to the ash filter ponds by operating 18-inch butterfly valves at a valve station located south of pond B. There are six valves, two for each pond as shown in Figure 2-1. The two 18-inch discharge lines for each pond are combined underground into a single 28-inch PE pipe which discharges into the center of each pond. The valve lineup for the inlet valves is presented in Table 3-1. Platforms are provided for valve access.

Design data for the inlet valves is as follows:

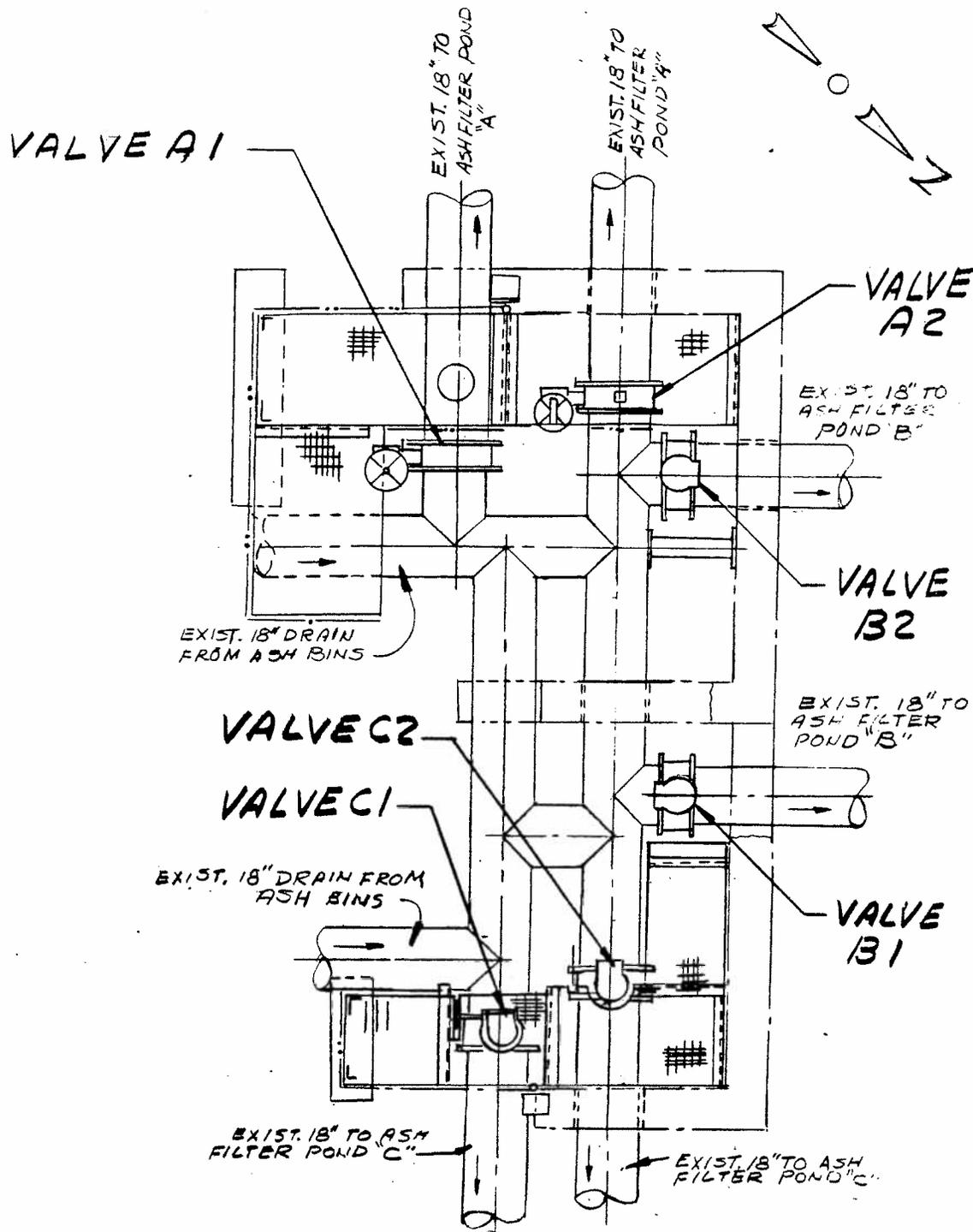
- Bill of Material BN-150
- Manufacturer Continental Equipment Co.
- Manufacturer Drawing No. G-12169
- Type Butterfly Valve
- Model No. 9170, Double R/C, bubble tight shutoff
- No. required Two for each pond
- Size 18-inch
- Valve operator #48 Thorn handwheel gear operator
- Materials of construction:
  - body Iron
  - shaft and disc 316 stainless steel
  - lining Hycar (bonded)

A protective splash pad consisting of grouted R-4 rock lining is provided beneath the inlet pipe to prevent erosion.

Each pond inlet pipe is provided with a 1/2-inch thick stainless steel baffle which is designed to dissipate the energy of the inlet flow for a more uniform distribution of wastewater into each pond. The baffle is attached to the inlet pipe. Details are shown on Drawing D-781-072.

KEYSTONE STATION OWNERS GROUP KEYSTONE STATION UNITS 1 & 2		MADE FAC 2-3-87	CHKD	DRAWING NO. FIGURE 2-1	SH. NO.	R					
CIVIL		PDS	ENG INTERF 1. _____ 2. _____		GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS READING, PA						
INLET DISTRIBUTION BOX		SCALE AS NOTED		W.O. 044267-182							
		ENGINEER APPROVAL		DEPT	DATE						
REV	MADE	CH	PDS	APP	DATE	REV	MADE	CH	PDS	APP	DATE

CONSTRUCTION	ENGR
BIDDING PURPOSES	
RELEASED FOR	
DATE	



PLAN - INLET DISTRIBUTION BOX  
SCALE: 1/4" = 1'-0"

- Dimensions at top of pond embankment (El. 1020.5 - 1022.5):
  - Width 90 ft
  - Length 410 ft
- Dimensions at normal water level (El. 1018.5):
  - Width 82 ft
  - Length 386 ft
- Dimensions at top of bottom ash (El. 1010.35 - 1012.14):
  - Width 53 ft
  - Length 370 ft
- Overall depth to top of bottom ash (El. 1020.5 - 1011.0) 9.5 ft
- Max. water depth above top of bottom ash (El. 1018.5 - 1010.25) 8.25 ft
- Allowance for sludge accumulation 4 ft
- Freeboard 2 ft minimum
- Surface area @ water el. 1018.5 31,652 ft<sup>2</sup>
- Surface settling rate at average flow rate of 1,300 gpm 0.041 gpm/ft<sup>2</sup>
- Maximum detention time at average flow rate (1,300 gpm) and at average sludge depth (2'-0") (El. 1018.5 - 1013.0) 13.8 hrs
- Minimum detention time at design flow rate (5,900 gpm) and at design sludge storage level (4 ft) 2 hrs
- Design sludge storage volume 79,000 ft<sup>3</sup>

A 15-foot wide, 12.5 percent grade sloped access ramp with 2 feet of crushed stone structural fill and bottom ash cover is provided on the



discharge end of each pond for use by front-end loaders and trucks for cleaning the ponds.

Two turbidity curtains are provided at the third-points of the pond to help settle the ash near the inlet of the pond and disperse flow. The turbidity curtains also provide a thermal advantage by eliminating channelization and allowing the pond surface to dissipate heat. The turbidity curtains are attached to posts on the pond embankment and are removed prior to cleaning the pond. Information on the turbidity curtains is as follows:

- Manufacturer Acme Products Co.
- Type, Model Acme "OK Corral"
- Materials of construction Jaton fabric, 22-ounce, 840 denier nylon, scrim control with PVC
- Length 120 feet w/10" dia. float
- Height 36 inches
- Weight 3/8" galvanized chain

#### 2.2.1 Pond Liner and Underdrain System

Each pond is lined with bentonite treated clay on the bottom and side slopes. The pond liner at the bottom consists of 1'-4" of on-site clay covered by an 8-inch layer of bentonite treated clay covered by 1'-6" of on-site clay. The application rate of bentonite for the 8-inch treated clay layer is 2.4 pounds/square foot.

The side slopes are lined with a 2-foot thick layer of clay and bentonite treated clay installed in 6-inch horizontal lifts with 1'-6" wide overlapping bentonite treated clay layers. The bentonite application rate in the 6-inch lifts is 1.8 pounds/square foot. Reference is made to Drawing D-781-072.

The underdrain system includes two 8 to 12-inch perforated PVC pipes laid just above the bentonite treated clay layer and surrounded by approximately 1-2 feet of No. 57 coarse aggregate along the length of the pipes. Above the pipes and across the bottom of the pond is 1'-6" of finer No. 8 coarse aggregate. Above the coarse aggregate is 2'-6" of raw bottom ash which is the primary filter media.



located at elevation 1005'-2 1/2" at the bottom of the discharge structure carries the overflow to an 18-inch VTC header which discharges into the lagoon at NPDES Outfall 503. Design data for the discharge structure is as follows:

- Material of construction Concrete
- Coating Coal tar epoxy
- Dimensions:
  - Width 6'-0"
  - Length 8'-0"
  - Height 17'-6"
- Discharge pipe 18-inch VTC
- Capacity of discharge pipe 8,100 gpm

A weir gate is installed in the pond side of the discharge structure and is used to decant the ash pond prior to cleaning. Design data for the discharge structure weir gate is as follows:

- Bill of Material BN-295
- Tag Nos. V-182-1A  
V-182-1B  
V-182-1C
- Manufacturer Hydro-Gate Corp.
- Manufacturer Drawing No. 860006001
- Model No. 10-00 "316 St. stl."
- No. required 1 per Discharge Structure
- Dimensions:
  - Gate width 54 inches
  - Gate height 72 inches
  - Overall frame height 114 1/2 inches
  - Height from top of frame to full open position 71 1/2 inches

- Gate operator Crank - counterclockwise to open (lower) gate
- Materials of construction:
  - Slide plate 316L stainless steel
  - Frame 316L stainless steel
  - Stem 316L stainless steel
  - J-seals Neoprene D2000, Grade 1BE625

Two 12-inch knife gate valves are mounted to the 12-inch underdrain lines which enter the discharge structure. The underdrain system is used to dewater the pond prior to cleaning. The valves are required to prevent backflow of water into the ash pond filter system during cleaning. Design data for the knife gate valve is as follows:

- Bill of Material BN-299
- Tag Nos. V-182-A1, V-182-A2  
V-182-B1, V-182-B2  
V-182-C1, V-182-C2
- Manufacturer L&M Valve Company Corp.
- Manufacturer Drawing No. D-870001
- Model No. M-100 knife gate
- No. required Two for each discharge structure
- Size 12-inch
- Length - bottom of floor stand to centerline of valve 181.81 inches
- Valve operator Handwheel
- Material of construction (valve body, gate, and stem) 316 stainless steel

*APPENDIX A*

*Document 10*

*Design Engineer's Report Keystone Station  
Feb 1993*

**DESIGN ENGINEER'S REPORT  
KEYSTONE STATION**

**INDUSTRIAL WASTE TREATMENT MODIFICATIONS:  
THERMAL DISCHARGE ABATEMENT PROJECT**

**February 1993**

**PENNSYLVANIA ELECTRIC COMPANY  
Johnstown, Pennsylvania**

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**Gilbert/Commonwealth, Inc.**  
engineers and consultants - Reading, Pennsylvania

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1.0 GENERAL INFORMATION

1.1 FACILITY STATUS

1.1.1 Introduction

Pennsylvania Electric Company (Penelec) operates the Keystone Generating Station, located along Crooked Creek in Plumcreek Township, Armstrong County, Pennsylvania. Treated effluent discharges from Keystone Station have occasionally exceeded the permitted thermal discharge limits for the lagoon outfall (NPDES Outfall 003) into Crooked Creek. The facilities described in this report are intended to assure compliance with thermal limitations.

Four modifications have been or are being implemented to achieve compliance with thermal limitations. The first modification, implemented in early 1992, consisted of using cold side circulating water for ash sluicing rather than hot side circulating water. The second modification involves the replacement of the fill in the cooling towers to increase their efficiency. This is currently being performed during station outages and will be completed in 1994. These two modifications are internal plant process changes which do not require a Water Quality Management Part II Permit.

The third modification consists of re-routing the bottom ash hopper overflow and seal trough overflow to the existing bottom ash filter ponds. This wastewater presently flows by gravity to the industrial waste treatment plant (IWT) and is subsequently discharged through Monitoring Point 403 to the station lagoon, and is then discharged to Crooked Creek through Outfall 003. This wastewater is similar in characteristics to the bottom ash transport water presently treated in the bottom ash filter ponds. The ash ponds will treat this wastewater as well as, or better than, the IWT, while improving the thermal discharge characteristics.

The fourth modification consists of re-routing the effluent from the bottom ash filter ponds to the existing "old bottom ash disposal ponds", which will be re-named "cooling ponds". These large ponds will provide additional evaporative cooling surface to improve thermal discharge characteristics. Monitoring Point 503 will be moved from the bottom ash filter pond discharge to the cooling pond discharge.

This report is a "Design Engineer's Report" as required for an application to the Pennsylvania Department of Environmental Resources (PaDER) for an amended Water Quality Management Part II Permit. The report describes the proposed facilities for the above modifications in the format suggested by the PaDER Industrial Waste Manual. An application for amendment of the existing NPDES Part I Permit has been previously submitted. An application for a Dam Permit for each cooling pond will be submitted to PaDER, Bureau of Dams and Waterway Management.

### 1.1.2 Regulatory Background

On March 30, 1990, PaDER revised and reissued NPDES Permit No. PA0002062 for Keystone Station. Effluent limitations for Monitoring Point 503 and Outfall 003, the only discharges affected by the facilities described in this report, are as follows:

- Monitoring Point 503  
TSS - 30 mg/l average monthly; 100 mg/l maximum daily  
Oil and Grease - 15 mg/l average monthly; 20 mg/l maximum daily  
pH - not less than 6.0 units
  
- Outfall 003  
TSS - 30 mg/l average monthly; 100 mg/l maximum daily  
Oil and Grease - 15 mg/l average monthly; 20 mg/l maximum daily; 30 mg/l instantaneous maximum  
pH - 6.0 to 9.0 units  
Temperature -  
    July 1 to Dec. 31 - Maximum daily heat rejection  $7.0 \times 10^8$  BTU/day  
    Jan. 1 to June 30 - Maximum daily heat rejection  $14.0 \times 10^8$  BTU/day

Penelec has entered a Consent Order and Agreement (COA) with PaDER establishing a schedule for design and construction of facilities necessary to meet effluent thermal limitations. Schedule requirements of the COA include the following:

- Convert the source of ash sluice water for Unit 2 to cooled water downstream of the cooling towers no later than August 31, 1992.
- Convert the source of ash sluice water for Unit 1 to cooled water downstream of the cooling towers no later than May 31, 1993.
- Replace fill material in the cooling towers as follows:
  - Two of four cooling towers by May 31, 1992
  - Three of four cooling towers by May 31, 1993
  - All four cooling towers by May 31, 1994
- Re-route bottom ash filter pond discharge to former ash settling ponds (cooling ponds) no later than September 30, 1994. Amendment applications for the Part I and Part II permits must be submitted within 150 days of the date of execution of the COA.

This report and application fulfill that portion of Paragraph 5 of the COA which requires submittal of a Part II Permit application within 150 days of execution of the COA, which means by February 12, 1993.

### 1.1.3 Source, Volume, and Nature of Wastewater

The wastewater presently treated in the bottom ash filter ponds is bottom ash transport water. Circulating water from the cooling towers is used, under pressure, to sluice ash from the ash hoppers at the bottom of the boilers to the bottom ash dewatering bins. Most of the bottom ash solids are removed in the dewatering bins. Dewatering bin overflow and decant water then flows by gravity to the bottom ash filter ponds for removal of residual suspended solids.

The wastewater which is proposed to be re-routed to the bottom ash filter ponds is ash hopper overflow and seal trough overflow. Both of these result from circulating water used in the ash handling system at the bottom of the boilers, and both are collected in boiler sumps located near the ash hoppers in each unit. Ash hopper overflow is primarily refractory cooling water that overflows the ash hopper when ash is not being sluiced. Seal trough overflow is cooling water that forms a water seal in a trough between the bottom of the boiler and the ash hopper. Both of these wastewaters have characteristics similar to the bottom ash transport water, except for a lower suspended solids concentration.

Wastewater flow rates for the bottom ash transport water are based on actual measured flow data at Monitoring Point 503 for the period of January 1991 through August 1992. Wastewater flow rates for bottom ash hopper overflow and seal trough overflow are estimated based on analysis of wastewater sources and flow rates at Monitoring Point 403. Flow rate for these sources is estimated to be a continuous flow of 1000 gpm (500 gpm for each unit). Discharge rates for Monitoring Point 503, as reported in the NPDES Part I Permit application, are as follows:

- Long term average discharge rate -
  - Bottom ash transport water = 2.75 mgd
  - Ash hopper overflow/seal trough overflow = 1.45 mgd
  - 4.20 mgd
  
- Maximum daily discharge rate -
  - Bottom ash transport water = 5.75 mgd
  - Ash hopper overflow/seal trough overflow = 1.45 mgd
  - 7.20 mgd

## 1.2 GENERAL FACILITY LAYOUT DIAGRAM

Drawing E-781-084 shows the general layout of Keystone Station, including the existing bottom ash filter ponds and the proposed cooling ponds. Project location is further identified by the attached U.S.G.S. topographic map reproduction.

## 1.3 GENERAL PROJECT DESCRIPTION

### 1.3.1 Existing Bottom Ash Filter Ponds

Three existing bottom ash filter ponds are provided, each sized for 50 percent of the design flow rate. Normal operation is two ponds in service at all times, with the third pond being drained, cleaned, and prepared for return to service.

This project does not involve any modifications to the existing bottom ash filter ponds. However, a new inlet distribution box will be provided to improve flow distribution between the ponds.

### 1.3.2

#### Proposed Modifications

The proposed modifications described in this application are as follows:

- Boiler Sump Pumps and Piping

Ash hopper overflow and seal trough overflow will be re-routed to the bottom ash filter ponds by installing two 100 percent capacity sump pumps in each of the two boiler sumps. Each pump will have a design capacity of 500 gpm, for a total capacity of 1000 gpm from two units (two boiler sumps). Pump discharge piping will generally follow the routing of the bottom ash sluice piping to the dewatering bins, where it will bypass the dewatering bins and follow the bin overflow piping to the bottom ash filter ponds. The existing boiler sump overflow piping to the industrial wastewater treatment plant will be retained for emergency and upset flow conditions.

- Ash Filter Pond Pump Station and Piping

Treated effluent from the bottom ash filter ponds will be directed to a new pump station to be located near the effluent end of the ponds. The pump station will be provided with three 50 percent capacity pumps. Each pump will have a nominal design capacity of 2,800 gpm, for a total capacity of 8,400 gpm with all three pumps operating. However, a single pump operating alone will run out on its operating curve and deliver approximately 3,500 gpm. Pump discharge piping will generally parallel the plant entrance road to the proposed cooling ponds. The existing gravity discharge line from the bottom ash filter ponds to the station lagoon will be retained for an emergency overflow from the pump station.

- Cooling Ponds

The two existing "old bottom ash disposal ponds" will be upgraded and modified for use as cooling ponds. Normal operation will be both ponds operating simultaneously, in parallel. The ponds will be provided with an impervious lining and an underdrain system to facilitate cleaning. The ponds will be designed to be cleaned once every five years, at a time when having one pond out of service will not affect the ability to meet thermal discharge limitations. It will not be practical to clean out the ponds on a more frequent basis, since only a small amount of solids will settle out on a yearly basis. NPDES Monitoring Point 503 will be moved from the bottom ash filter pond discharge to the cooling pond discharge.

The sequence of construction of the proposed modifications is not a significant concern for this project. It will not be necessary to remove any existing treatment units from operation during construction, and current treatment efficiency will not be affected.

The project schedule will be in accordance with the Consent Order and Agreement (COA). The COA requires the cooling ponds to be placed into service on or before September 30, 1994. The COA further requires Penelec to achieve full compliance with thermal limitations of NPDES Permit No. PA0002062 for Outfall 003 by November 30, 1994.

1.3.3 Wastewater Characteristics

The characteristics of the wastewater to be treated in the bottom ash filter ponds and cooling ponds are discussed in Section 1.1.3 and further presented in Module B. Effluent from the proposed system will meet existing effluent limitations for Monitoring Point 503 and will enable compliance with thermal limitations for Outfall 003.

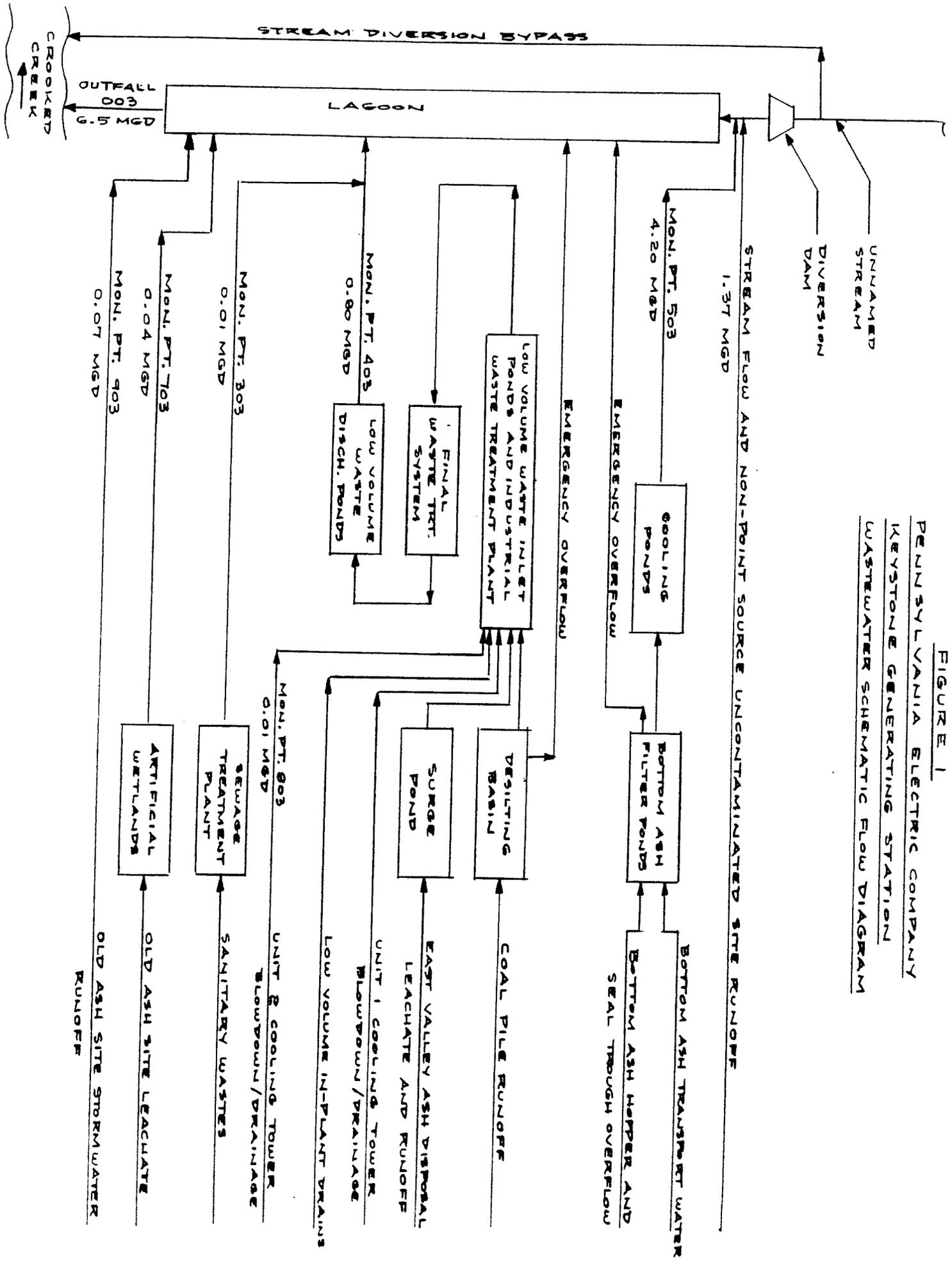
1.4 SCHEMATIC FLOW DIAGRAM

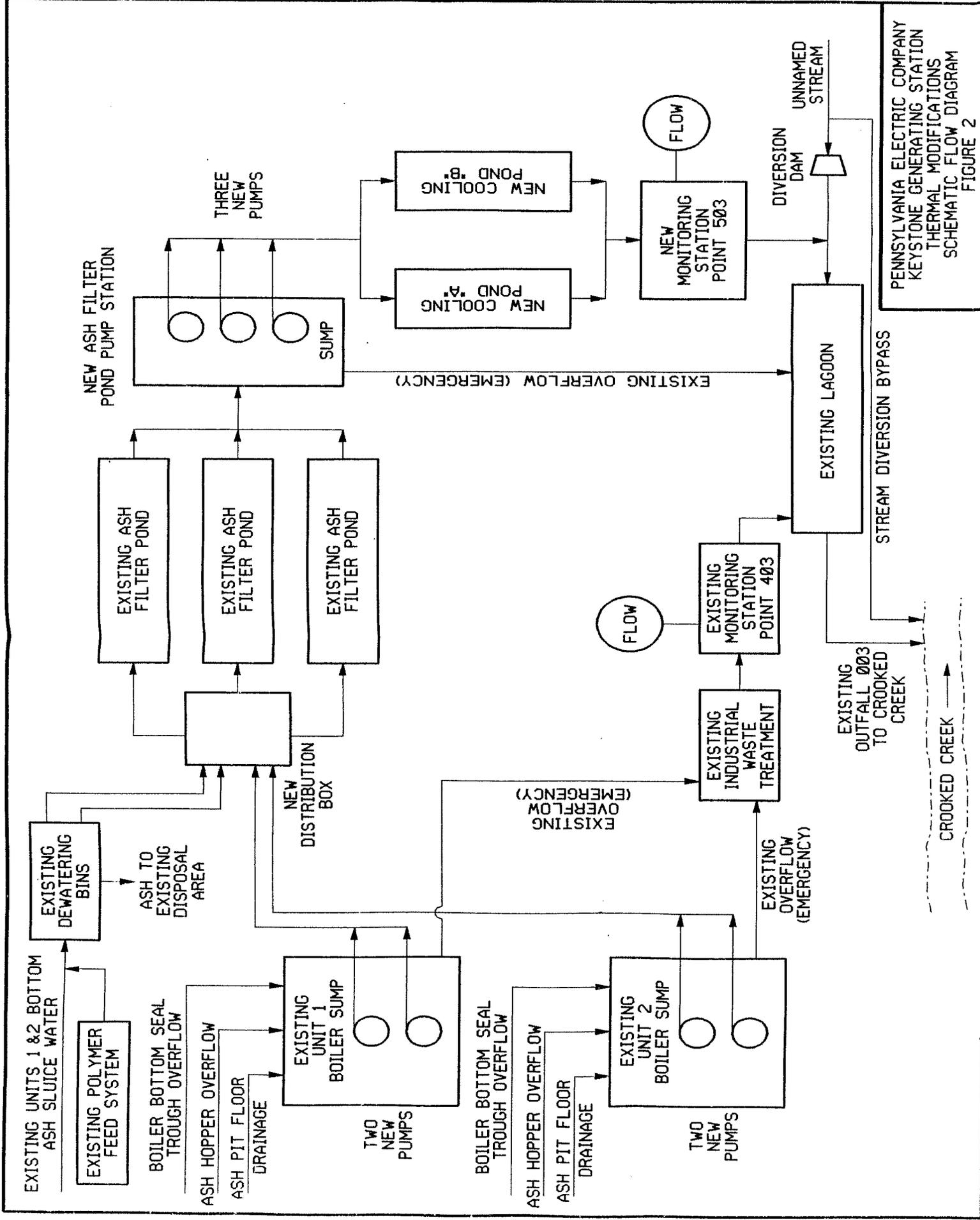
Figure 1 is a schematic flow diagram showing the relationship of the proposed facilities to other Keystone Station wastewater treatment systems. Figure 2 is a schematic flow diagram for the systems covered by this application, including the boiler sumps and pumps, bottom ash filter ponds, ash filter pond pump station, cooling ponds, and Monitoring Point 503. The functional relationship between existing and proposed treatment units is shown. The new pumps, piping arrangements, and new monitoring station for Monitoring Point 503 are also shown. Emergency overflows for each sump are shown.

1.5 TREATMENT FACILITY SIZE, CAPACITY, AND DIMENSION DIAGRAM

Figure 3 is a schematic flow diagram showing the size, capacity, and dimensions of each treatment unit.

FIGURE 1  
 PENNSYLVANIA ELECTRIC COMPANY  
 KEYSTONE GENERATING STATION  
 WASTEWATER SCHEMATIC FLOW DIAGRAM





PENNSYLVANIA ELECTRIC COMPANY  
 KEYSTONE GENERATING STATION  
 THERMAL MODIFICATIONS  
 SCHEMATIC FLOW DIAGRAM  
 FIGURE 2

## 4.0 SUBSURFACE INFORMATION

### 4.1 GENERAL GEOLOGY, SOILS, AND GROUNDWATER INFORMATION

The "Geological Map of Pennsylvania," as prepared by the Pennsylvania Topographic and Geological Survey in 1980, indicates that the geological formation underlying the site is the Glenshaw Formation of the Pennsylvania Age. The Glenshaw Formation is described as cyclic sequences of shale, sandstone, red beds, and then limestone and coal. It also includes four marine limestone or shale horizons. The red beds are involved in landslides and the base is at the top of Upper Freeport Coal.

The "Soil Survey of Armstrong County, Pennsylvania," Sheet Numbers 68 and 73, indicates that the site soils are Sm and WkF. Sm denotes Strip Mines and WkF denotes Weikert and Gilpin soils with 25 to 70 percent slopes.

Strip mines consist of sandstone, boulders, fractured shale, and some soil material that has been distributed by mining operations. Slopes range from nearly level to very steep.

WkF is described as shallow, well drained, and gently sloping to very steep soils on uplands. These areas consist of Weikert shaley silt loam and Gilpin channery silt loam. Typically, the surface layer consists of shaley or channery silt loam and is about 4 inches thick. The subsoil is 22 inches thick. It is weak, yellowish-brown silt loam in the upper 5 inches; moderate, heavy, yellowish-brown silt loam in the lower 17 inches. The substratum is yellowish-brown, shaley silt loam with 30% coarse fragments, to a depth of 34 inches. Surface runoff is rapid. Permeability is moderate to moderately rapid, and available moisture capacity is very low to moderate. The hazard of erosion is high if the soil is cultivated.

A total of twelve borings (Monitoring Well #3A, SD-1 through SD-5, SD-5A, and 92-1 through 92-5) and nine test pits (TP 93-1 through TP 93-9) have been drilled or excavated in the area of the proposed cooling ponds. Logs for the borings and test pits are included in Appendix A.

Four of the borings (92-1, 92-2, 92-4, and 92-5) were drilled recently in the eastern embankment of the cooling ponds. The borings indicated that the embankments were constructed of stiff to very stiff sandy silt and clay with rock fragments. Top of rock encountered in the borings varied from approximately elevation 971.5' to 962'. The rock appeared to be sloped at a 20:1 (horizontal:vertical) grade towards the stream.

The pond embankments are stable for all anticipated loading conditions. A slope stability analysis was performed for the critical section of the eastern embankment of the cooling ponds. The minimum factor of safety against embankment failure using Bishop's Method of Slices was 1.74 for static conditions and 1.35 for dynamic conditions.

Groundwater data obtained indicates that the groundwater will be below bottom of the proposed liner system for the cooling ponds. The groundwater elevation appears to vary from approximately elevation 984' at Monitoring Well #3A (located west of the ponds) to approximately elevation 972' at the stream (located east of the ponds). No groundwater seepage or springs has been observed in any of the embankments for the existing ponds. The liner system for the proposed cooling ponds is going to be placed on top of the subgrade for the existing ponds. For the bottom of Cooling Pond

"A", the liner varies from approximately elevation 1002' at the western end to elevation 980' at the eastern end. For the bottom of Cooling Pond "B", the liner varies from approximately elevation 988' at the western end to elevation 980' at the eastern end.

The cooling ponds are not located in the floodway boundaries as indicated on maps from flood insurance studies provided by the municipality (FEMA mapping). The flood hazard boundaries are shown on Figure 5.

#### 4.2 MONITORING WELLS

No monitoring wells are planned, because the only purpose of the proposed cooling ponds is thermal abatement.

**APPENDIX B**

Product Information for Liner and Cover

# NSC

## HDPE GEOMEMBRANE

National Seal Company's High Density Polyethylene (HDPE) geomembranes are extruded using virgin, first-quality, high molecular weight, polyethylene resin and are manufactured specifically for the purpose of containment in hydraulic structures. The HDPE compound used in NSC geomembranes has been formulated to be chemically resistant, free of leachable additives and resistant to ultraviolet degradation.

### 50 MIL (1.25mm) PHYSICAL PROPERTIES

ALL PROPERTIES MEET OR EXCEED NSF STANDARD 54 SPECIFICATIONS FOR HDPE

PROPERTY	MINIMUM AVERAGE ROLL VALUES (unless otherwise indicated)			
	ENGLISH		METRIC	
	UNITS	VALUE	UNITS	VALUE
THICKNESS, ASTM D 751, NSF Mod., Nominal	mils	50.0	mm	1.25
Minimum Average	mils	50.0	mm	1.27
Lowest Individual Reading	mils	47.5	mm	1.21
DENSITY, ASTM D 1505			g/cm <sup>3</sup>	0.940
MELT FLOW INDEX, ASTM D 1238, Cond. E, Max.			g/10 min	1.0
CARBON BLACK CONTENT, ASTM D 1603	percent	2.0 to 3.0	percent	2.0 TO 3.0
CARBON BLACK DISPERSION, ASTM D 3015	rating	A1 or A2	rating	A1 or A2
MINIMUM TENSILE PROPERTIES, ASTM D 638				
Stress at Yield	psi	2200	MPa	15.2
	ppi	110	N/cm	193
Stress at Break	psi	3800	MPa	26.2
	ppi	190	N/cm	333
Strain at Yield	percent	13	percent	13
nominal gage of 1.30" per NSF Mod.				
Strain at Break	percent	700	percent	700
nominal gage of 2.5" per NSF Mod.	percent	560	percent	560
TEAR RESISTANCE, ASTM D1004	ppi	700	N/cm	1230
	lbs	35	N	156
PUNCTURE RESISTANCE, FTMS 101, 2065	ppi	1300	N/cm	2280
	lbs	65	N	289
ESCR, ASTM D 1693, NSF Mod., Pass	hours	1500	hours	1500
DIMENSIONAL STABILITY, ASTM D1204, NSF Mod, Max.	percent	2.0	percent	2.0

### NATIONAL SEAL SEAMING PROPERTIES

(All NSC seams will demonstrate a Film Tearing Bond in Peel and Shear)

SHEAR STRENGTH, ASTM D 4437, NSF Mod.	psi	2000	MPa	13.8
	ppi	100	N/cm	175
PEEL ADHESION, ASTM D 4437, NSF Mod. (Hot wedge fusion weld)	psi	1500	MPa	10.3
	ppi	75	N/cm	131
PEEL ADHESION, ASTM D 4437, NSF Mod. (fillet extrusion weld)	psi	1300	MPa	8.97
	ppi	65	N/cm	114

HD-50-0391C

# NSC

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Fax: 708/898-3461



# HDPE GEOMEMBRANE

## 50 MIL (1.25mm) CHARACTERISTICS

### PROPERTY

### MINIMUM AVERAGE ROLL VALUES (unless otherwise indicated)

PROPERTY	ENGLISH		METRIC	
	UNITS	VALUE	UNITS	VALUE
MODULUS OF ELASTICITY, ASTM D 882	psi	80,000	MPa	552
HYDROSTATIC RESISTANCE, ASTM D 751 A	psi	375	MPa	2.59
COEF. LINEAR THERMAL EXPANSION, Nominal	/°F	6.7x10 <sup>-5</sup>	/°C	1.2x10 <sup>-4</sup>
BRITTLINESS TEMP, ASTM D 746 B, Pass	°F	-103	°C	-75
SOIL BURIAL RESISTANCE, NSF 54, Max. Change	percent	10	percent	10
OIT, 200° C, 1 atm O <sub>2</sub> , Al pan	minutes	100	sec	6,000
PUNCTURE RESISTANCE, ASTM D 4833	ppi	1800	N/cm	3150
	lbs	90	N	400
TENSILE IMPACT, ASTM D 1822	ft lbs/in <sup>2</sup>	238	kJ/m <sup>2</sup>	500
VOLATILE LOSS, ASTM D 1203A, Max.	percent	0.1	percent	0.1
OZONE RESISTANCE, ASTM D 1149, 168 hrs, 100 pphm		No Cracks		No Cracks
WATER ABSORPTION, ASTM D 570, 23° C	percent	0.1	percent	0.1
WATER VAPOR TRANSMISSION, ASTM E 96, Max.			g/hr m <sup>2</sup>	0.007
PERMEABILITY, WATER, ASTM E 96, Max.			cm/sec Pa	1.6x10 <sup>-13</sup>

### STANDARD ROLL DIMENSIONS\*

### TYPICAL ROLL VALUE

WEIGHT	lbs	5,000	kg	2,270
WIDTH	ft	15.0	m	4.57
LENGTH	ft	1,340	m	408
AREA	ft <sup>2</sup>	20,100	M <sup>2</sup>	1,867

\*Values Are Approximate  
 Custom Roll Sizes And Half Size Rolls Are Available  
 Sheet is Rolled on 12" Diameter Cores

HD-50-0391C

NSC does not generally perform conformance testing for properties on this page.

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# NSC

## FRICION SEAL™ HD

FRICION SEAL HD, National Seal Company's advanced textured high density polyethylene (HDPE) geomembrane, is manufactured by attaching an HDPE friction surface to NSC's high quality HDPE geomembrane. The friction surface is made from high molecular weight polyethylene resin compounded specifically for use in NSC geomembranes. The resin has been formulated to provide stress crack, chemical and ultraviolet resistance for fluid containment. NSC produces FRICION SEAL HD with a textured surface on one or both sides of the parent sheet.

### 50 MIL (1.25mm) PHYSICAL PROPERTIES

PROPERTY	MINIMUM AVERAGE ROLL VALUES* (unless otherwise indicated)			
	ENGLISH		METRIC	
	UNITS	VALUE	UNITS	VALUE
MASS PER UNIT AREA	lb/ft <sup>2</sup>	>0.25	kg/m <sup>2</sup>	> 1.22
CORE THICKNESS, ASTM D 751, NSF Mod., Nominal	mils	50.0	mm	1.25
Lowest Individual Reading	mils	47.5	mm	1.21
CORE DENSITY, ASTM D 1505			g/cm <sup>3</sup>	0.940
MELT FLOW INDEX, ASTM D 1238, Cond. E, Max.			g/10 min	1.0
CARBON BLACK CONTENT, ASTM D 1603	percent	2.0 to 3.0	percent	2.0 to 3.0
CARBON BLACK DISPERSION, ASTM D 3015	rating	A1 or A2	rating	A1 or A2
MINIMUM TENSILE PROPERTIES, ASTM D 638				
Stress at Yield	psi	2200	MPa	15.2
	ppi	110	N/cm	193
Stress at Break	psi	2200	MPa	15.2
	ppi	110	N/cm	193
Strain at Yield, nominal gage of 1.30" per NSF Mod.	percent	13	percent	13
Strain at Break	percent	300	percent	300
nominal gage of 2.5" per NSF Mod.	percent	240	percent	240
TEAR RESISTANCE, ASTM D1004	ppi	700	N/cm	1230
	lbs	35	N	156
PUNCTURE RESISTANCE, FTMS 101, 2065	ppi	1300	N/cm	2280
	lbs	65	N	289
ESCR, ASTM D 1693, NSF Mod., Pass	hours	1500	hours	1500
DIMENSIONAL STABILITY, ASTM D1204, NSF Mod, Max.	percent	2.0	percent	2.0

### NATIONAL SEAL SEAMING PROPERTIES

(All NSC seams will demonstrate a Film Tearing Bond in Peel and Shear)

SHEAR STRENGTH, ASTM D 4437, NSF Mod.	psi	2000	MPa	13.8
	ppi	100	N/cm	175
PEEL ADHESION, ASTM D 4437, NSF Mod. (hot wedge fusion weld)	psi	1500	MPa	10.3
	ppi	75	N/cm	131
PEEL ADHESION, ASTM D 4437, NSF Mod. (fillet extrusion weld)	psi	1300	MPa	8.97
	ppi	65	N/cm	114

\*Stress and strength values are normalized to the nominal base sheet thickness. NSC certifies properties based on values calculated using nominal thickness only. Stress values calculated using actual product thickness is not guaranteed due to the lack of industry accepted thickness test procedures for friction sheet.

FS-50-0491B

# NSC

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# FRICITION SEAL™ HD

## 50 MIL (1.25mm) CHARACTERISTICS

### PROPERTY

### MINIMUM AVERAGE ROLL VALUES (unless otherwise indicated)

PROPERTY	ENGLISH		METRIC	
	UNITS	VALUE	UNITS	VALUE
MODULUS OF ELASTICITY, ASTM D 882	psi	80,000	MPa	552
HYDROSTATIC RESISTANCE, ASTM D 751 A	psi	375	MPa	2.59
COEF. LINEAR THERMAL EXPANSION, Nominal	/°F	$6.7 \times 10^{-5}$	/°C	$1.2 \times 10^{-4}$
BRITTLENESS TEMP, ASTM D 746 B, Pass	°F	-103	°C	-75
SOIL BURIAL RESISTANCE, NSF 54, Max. Change	percent	10	percent	10
OIT, 200° C, 1 atm O <sub>2</sub> , Al pan	minutes	100	sec	6,000
PUNCTURE RESISTANCE, ASTM D 4833	ppi	1800	N/cm	3150
	lbs	90	N	400
TENSILE IMPACT, ASTM D 1822	ft lbs/in <sup>2</sup>	238	kJ/m <sup>2</sup>	500
VOLATILE LOSS, ASTM D 1203A, Max.	percent	0.1	percent	0.1
OZONE RESISTANCE, ASTM D 1149, 168 hrs, 100 pphm		No Cracks		No Cracks
WATER ABSORPTION, ASTM D 570, 23° C	percent	0.1	percent	0.1
WATER VAPOR TRANSMISSION, ASTM E 96, Max.			g/hr m <sup>2</sup>	0.007
PERMEABILITY, WATER, ASTM E 96, Typical			cm/sec Pa	$1.6 \times 10^{-13}$
FRICITION ANGLE, Tilt Table, ASTM D35 Proposed, Industry Standard Carpet, Typical	degrees	58	degrees	58

### STANDARD ROLL DIMENSIONS

FRICITION SEAL HD geomembranes are manufactured in 15 foot widths. Approximately 6 - 10 inches are left smooth on each edge providing ideal seaming surfaces. FRICITION SEAL HD is rolled on 12" diameter cores.

FS-50-0491B

NSC does not generally perform conformance testing for properties on this page.

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**Design steep. Design secure.**

← *Normal  
Landfill Slope*

← *Slope with  
FRICTION SEAL*

**Design slopes with confidence.**

**N C**

National Seal Company

National Seal Company (NSC), a leading manufacturer of waste containment systems, has developed a complete line of high-performance textured geomembranes called **FRICION SEAL**. **FRICION SEAL**'s textured surface increases the safety factor for steep slope designs by increasing friction angles between layers. As a result, the steeper slopes may increase the site's total airspace.

**FRICION SEAL** is manufactured using a secondary manufacturing process. This method attaches a high performance textured surface to an NSC base sheet. By applying the surface separately, **FRICION SEAL** offers many distinct advantages.

# FRICION SEAL

	Shear Crack Resistance	Puncture Resistance	Ultimate Tensile Strength	Chemical Resistance	Ability to Seal Small Punctures
<b>FRICION SEAL HD</b>	2	3	1	1	3
<b>FRICION SEAL VL</b>	1	1	3	3	2
<b>FRICION SEAL CC*</b>	1	2	1	2	1

1 = Highly Recommended    2 = Excellent    3 = Best with Proper Design

\*CC = COSE SEAL, a mechanical geoseal consisting of a 1/2" LDF membrane bonded between HDPE.

The chart above can assist in selecting the best liner material depending on which physical properties are most critical.

## HIGHEST COEFFICIENT OF FRICTION

FRICION SEAL AGAINST	FRICION ANGLE (degrees)	ADHESION (pounds per sq. ft.)
DRAINAGE SAND	37°	25psf
CLAY	29°	150psf
NONWOVEN GEOTEXTILE	32°	55psf

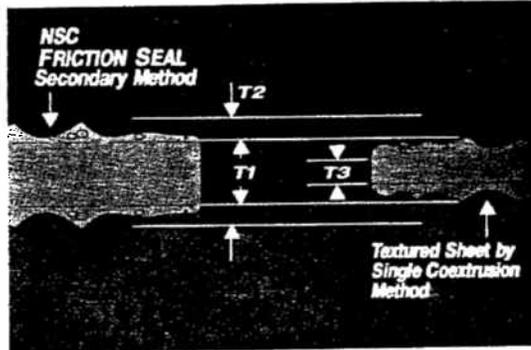
Test was run on a 12" x 12" direct shear box at strain rates of 0.04 in./min. on the soil profiles and 0.20 in./min. on the geotextile profile. Normal compressive loads of 3psi, 6psi, and 9psi were used.

# FEATURES AND BENEFITS

National Seal Company's manufacturing process adds a friction coating to HDPE, VLDPE, or COEX SEAL, a textured geomembrane. This capability allows the design engineer to select the textured sheet most suitable for the application at hand. Depending on the application, FRICTION SEAL can be textured on one or both sides of any of NSC's polyethylene geomembranes.

## QUALITY CONTROL ASSURANCE

Base Sheet Measurement vs. Peak to Peak Measurement



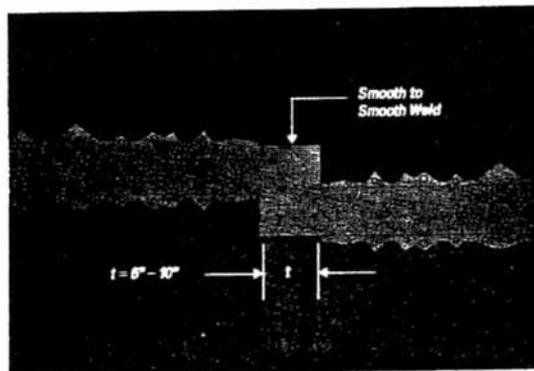
- T1: Compares FRICTION SEAL's minimum thickness (base sheet thickness) to the minimum thickness of the textured sheet by single coextrusion method (total sheet thickness)
- T2: Overall FRICTION SEAL thickness
- T3: Actual textured sheet base thickness by single coextrusion method

National Seal Company's exclusive secondary process permits conclusive quality control testing of both the parent sheet and the friction coating. This ensures that all base properties and friction properties are met. National Seal Company guarantees FRICTION SEAL's minimum thickness will never be less than the core thickness at any given point throughout the entire sheet.

Like all National Seal geomembranes, FRICTION SEAL's base sheet is manufactured using a computer controlled, flat sheet extruder. This process guarantees a material thickness of  $\pm 5\%$  from target, the most stringent quality control available in the industry. FRICTION SEAL is available in 40 mil (1mm), 60 mil (1.5mm), 80 mil (2mm), and 100 mil (2.5mm) for a wide range of applications.

FRICTION SEAL offers a superior coefficient of friction with soils and synthetics. By using FRICTION SEAL with a geocomposite, the friction between the various layers can be greatly increased. As a result, the critical failure plane can be moved into the soil improving slope stability. This allows engineers to design steeper slopes while maintaining high safety factors. The added safety measure provides extra assurance that material slippage will not occur.

## HIGH QUALITY SEAMING



FRICTION SEAL is produced with a 6"-10" smooth edge on both sides of the sheet, top and bottom. The smooth surfaces provide a better weld, ensuring the same high quality seams found in all of National Seal's geomembrane systems. Some other textured sheets weld two rough surfaces together. This may cause a decrease in welding speed and an increase in "squeeze out" due to the melt-through of the friction coating to the base sheet. By keeping FRICTION SEAL's edges smooth, there is never a concern about the various heights of the peaks and valleys. The smooth edges also permit quick verification of the core's thickness and strength before installation.

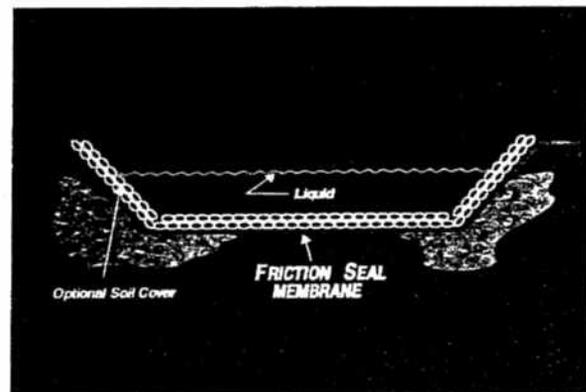
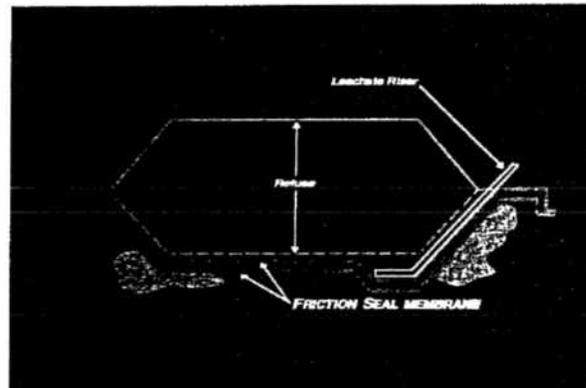
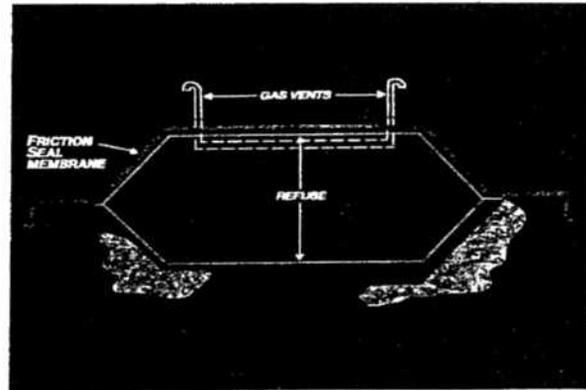
# Applications

**Caps and Closures** — Landfill caps are one of the most common uses of FRICTION SEAL. The textured coating permits the design of steeper slopes providing maximum airspace within the cell and greater safety factors against slope failure. FRICTION SEAL VL, a textured sheet with a VLDPE core, is well suited for this application due to its high elongation. Landfills can settle over time and the VLDPE composition is better able to conform to settlement than HDPE, without jeopardizing the integrity of the liner.

**Landfills** — FRICTION SEAL is ideal for steep slopes within landfill cells. Its unique design provides greater airspace on steep slopes while improving safety factors against slippage. Both FRICTION SEAL HD, a textured sheet with an HDPE core, and FRICTION SEAL CX, a textured sheet with a coextruded core consisting of HDPE and VLDPE, are excellent for landfill applications. Their excellent chemical resistance properties along with the friction coating, secures the geosynthetic site.

FRICTION SEAL CX is also superb for vertical expansions of new landfills over existing landfills. The HDPE composition provides chemical resistance to leachate, while the VLDPE exhibits the elongation needed for differential settlement created by the existing cell.

**Ponds and Lagoons** — FRICTION SEAL CX is recommended for pond and lagoon applications. The VLDPE composition provides excellent flexibility, while the HDPE offers superb ultraviolet resistance. FRICTION SEAL CX will improve the friction resistance of the geosynthetic lining system.



The information contained herein has been compiled by National Seal Company and is, to the best of our knowledge, true and accurate. All suggestions and recommendations are offered without guarantee. Final determination of suitability for use based on any information provided, is the sole responsibility of the user. There is no implied or expressed warranty of merchantability or fitness of the product for the contemplated use.

# NSC

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# THE ENGINEERED SYSTEM

## THE ARMORFORM SYSTEM DESIGNED FOR ECONOMY, STRENGTH, AND DURABILITY

The ARMORFORM system provides numerous advantages over conventional erosion control methods including; cost effectiveness, strength, durability, and minimal maintenance. ARMORFORM revetments and linings are constructed of water permeable, double-layer, woven fabric forms, filled with a high strength fine aggregate concrete (structural grout) which combines cement, fine aggregate (sand), and water into a mix designed to provide a readily pumpable structural grout. Unlike other cast-in-place concrete methods, which are cast into open forms, ARMORFORM is pumped and formed under pressure thereby providing superior quality in terms of physical strength and durability.

ARMORFORM fabrics are designed to serve as filters as well as forms. Structural grout is mixed with a typical water/cement ratio of 0.65 to 0.75. Excess mixing water is expelled through the specially designed permeable fabrics, allowing a substantial reduction in the water/cement ratio of the in-place grout thereby providing increased strength and durability.

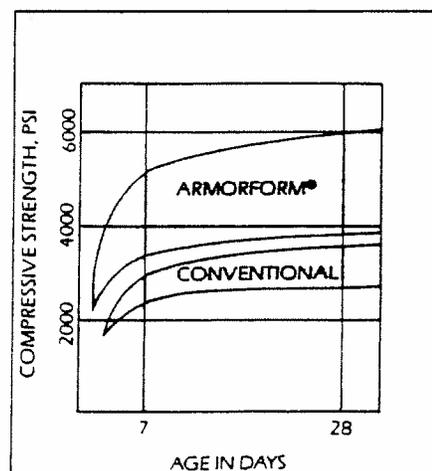
ARMORFORM revetments and linings provide superior physical properties. Structural grout pumped into ARMORFORM fabric forms is 1.5 to 1.75 times stronger than companion specimens taken from conventional forms. In addition, the structural grout has less than 5% water absorption. The ARMORFORM system is the ideal choice in applications requiring resistance to mild concentrations of acid, alkali, salt or petrochemicals. With minimal water absorption, the ARMORFORM system is also resistant to freeze thaw action. This prolongs the installation's life while reducing the chance of concrete "break-up" caused by extreme temperature changes.

The higher compressive strengths achieved by the ARMORFORM system permits revetments and linings to be constructed without steel reinforcement. This strength factor eliminates the need for costly materials and specialized labor, making it ideal for a diversity of demanding applications.

## ENGINEERED FOR PERFORMANCE

The ARMORFORM system is engineered for hydraulic efficiency. Unlike stone rip-rap linings or gabions, the ARMORFORM system permits design for maximum channel velocities by offering less resistance to flow. They are self-cleaning, require minimum maintenance, and provide a clean and environmentally attractive appearance which is far less hazardous to pedestrians and animals than stone rip-rap. The result is a less expensive erosion control system which can remove water up to three times as fast as stone rip-rap linings. Thus, large areas can be drained more efficiently, quickly, and at a lower installed cost with an ARMORFORM system.

## ARMORFORM CONCRETE -vs- CONVENTIONAL CONCRETE



Note: Compressive strength varies as a function of mix design

**ARMORFORM®**

# MANUFACTURE AND FABRICATION

## ARMORFORM FABRIC

Nicolon Corporation's manufacturing plant in Cornelia, Georgia is equipped with the most modern weaving equipment available in the world today. Our goal at Nicolon is to supply the customer with the best engineered and highest quality products on the market.

## MATERIALS USED ARE SECOND TO NONE

At Nicolon, we buy the finest raw materials available. We extrude our own polypropylene yarn in-house and have polyester and nylon yarns extruded and spun to our stringent specifications to insure greater quality control in the materials used to weave ARMORFORM fabric forms.

## CONTROLLED WEAVING AND INSPECTION

The yarn is woven on high-speed looms, the most modern and efficient machines available for weaving engineered fabrics in the industry. Trained professionals visually inspect each square inch of ARMORFORM fabric forms.



All ARMORFORM fabric forms are subjected to rigorous quality control testing following production. Samples of the fabrics are taken at regular intervals and tested at Nicolon's laboratory in strict accordance with ASTM procedures. A copy of the fabric certification is provided with each order of ARMORFORM fabric.

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U.S. Patent No. 4,502,815 and 4,449,847  
Other U.S. and foreign patents issued and pending



## FABRICATION OF PANELS

After weaving and inspection, the mill width rolls of fabric forms are ready for factory fabrication. In this step the fabric rolls are sewn together to form larger multiple mill width panels. Factory fabrication reduces the number of seams which will have to be made in the field. If the area to be protected is small enough, the entire finished panel may be pre-fabricated in one piece, eliminating field seaming altogether. Optional factory installed zippers can be installed for joining panels together in the field, or the installer can use a hand held sewing machine to make field seams.

## SUPPLY

An inventory of standard ARMORFORM styles and sizes is carried at our manufacturing facilities and can be shipped to any job site around the world. Fabric properties are selected to meet the structural requirements of the ARMORFORM style specified.

Nicolon Erosion Control Systems are currently in service around the world. Their uses range from channel linings to riverbank protection, and from subaqueous pipeline protection to major shoreline revetments. The positive results achieved by Nicolon in providing erosion control systems for civil engineering projects supply convincing proof of the benefits you may attain from Nicolon's broad spectrum of Erosion Control Systems.



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**ARMORFORM®**

# THE ENGINEERED SOLUTION TO EROSION CONTROL

Erosion control has traditionally been handled by stone rip-rap, gabions, or concrete slope paving. During installation these conventional erosion control methods require heavy machinery, forming and stripping, and considerable labor costs. Once in place, conventional methods require continuous maintenance due to loss of stone rip-rap, and corrosion of reinforcement steel.

Since the mid-1960's, engineers, architects and contractors have specified and installed superior cost effective alternatives: concrete forming systems that eliminate the problems associated with conventional erosion control installations. ARMORFORM is a unique system that provides a complete and engineered solution for erosion control, a solution that by design solves the installation, deterioration, and maintenance problems encountered with conventional erosion control methods.

ARMORFORM results in a stable erosion control system available in three styles: Filter Point Mat (FPM), Uniform Section Mat (USM), and Articulating Block Mat (ABM), to accommodate various design conditions.

## ENGINEERED DESIGN

Nicolon Corporation's professional staff of engineers, designers, and sales representatives are available to help you plan and select the ARMORFORM system that is right for your application. Our engineering department will prepare shop drawings for the project engineer's review and approval. Pre-bid and pre-construction conferences with contractors and on site construction assistance are also provided by Nicolon's construction service and sales representative groups.

## ENGINEERED FOR PERFORMANCE

ARMORFORM is technically and economically superior to conventional erosion control methods. Where conditions such as limited access, remote region construction, or quick delivery require fast installation using unskilled labor, even under water, ARMORFORM is the design solution.

## ENGINEERED FOR EASY INSTALLATION

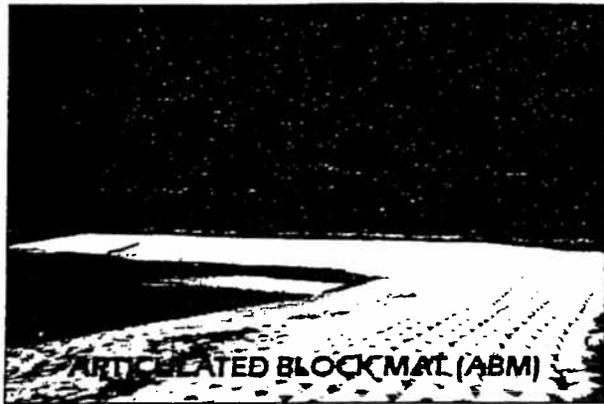
ARMORFORM is the cost saving answer for almost any application, revetment or lining. It can

be installed for substantially less than conventional methods since all construction is performed in place. The ARMORFORM fabric forms are positioned on the area to be protected, where they are filled with a pumpable fine aggregate concrete (structural grout). And, to make installation even easier and more cost effective, no heavy equipment or skilled labor is required for installation.

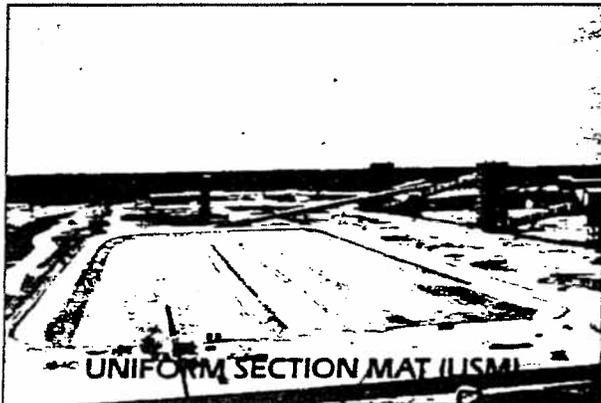


## APPLICATIONS

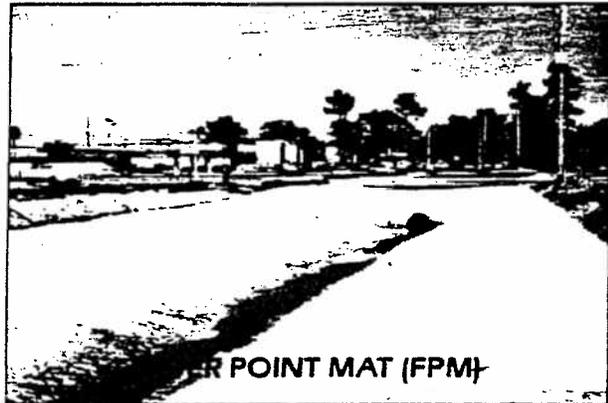
- Ponds & Holding Basins
- Earthen Dams
- Storm Channels & Ditches
- Lakes & Reservoirs
- Bulkheads
- Pipeline Crossings
- Rivers, Streams & Bayous
- Dikes & Levees
- Coastal Shorelines
- Bridge Abutments
- Water Control Structures
- Embankments
- Spillways
- Subaqueous Pipelines
- Culvert Inlets & Discharges
- Boat Launching Ramps



ARMORFORM's Articulating Block Mat (ABM) is designed for rivers and shorelines. High strength cables embedded in the concrete blocks tie the revetment together and provide for block articulation.



ARMORFORM's Uniform Section Mat (USM) is ideal for ponds and holding basins. Uniform Section Mat (USM) is impermeable for improved seepage control.



ARMORFORM's Filter Point Mat (FPM) exhibits a high coefficient of hydraulic friction. Filter Point Mat (FPM) is woven with filter points between cobbles to relieve hydrostatic uplift pressure.

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U.S. Patent No. 4,502,815 and 4,449,847  
Other U.S. and foreign patents issued and pending.

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The ARMORFORM Erosion Control System uses double-layer woven fabrics engineered exclusively to serve as forms for casting concrete erosion control revetments and linings. The fabric forms are woven from polypropylene, polyester or nylon yarns and are designed with the required strength, stability and filtration properties

of a superior fabric form. ARMORFORM is positioned on the area to be protected, where it is filled with a pumpable fine aggregate concrete (structural grout) to form an erosion control mat. Final appearance of the various styles of hardened mats is suggested by the drawings below.

## TYPICAL DIMENSIONS, WEIGHTS AND VOLUMES

(Values shown are typical only, and will vary with field conditions.)

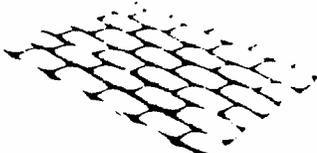
### FILTER POINT MAT (FPM)



Filter Point Size	Filter Point Spacing	Average Thickness	Weight/ Sq. Ft.	Coverage/ Cu. Yd. Concrete	Availability
5" FPM	5"	2.2"	26 lbs.	133 ft. <sup>2</sup>	Inventory
8" FPM	8"	4.0"	47 lbs.	73 ft. <sup>2</sup>	Inventory
10" FPM	10"	6.0"	70 lbs.	49 ft. <sup>2</sup>	Inventory

**Filter Point Mat (FPM)** is formed with a double-layer woven fabric, joined together by interwoven filter points. These spaced points serve as filter points to relieve hydrostatic uplift pressure. A filter fabric should be placed under FPM linings.

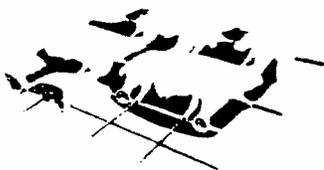
### UNIFORM SECTION MAT (USM)



Uniform Section Size	Cord Spacing	Nominal Thickness	Weight/ Sq. Ft.	Coverage/ Cu. Yd. Concrete	Availability
3" USM	3" x 3"	3.0"	35 lbs.	97 ft. <sup>2</sup>	Inventory
4" USM	3" x 3"	4.0"	47 lbs.	73 ft. <sup>2</sup>	Inventory
6" USM	3" x 4"	6.0"	70 lbs.	49 ft. <sup>2</sup>	Inventory
8" USM	3" x 5"	8.0"	93 lbs.	36 ft. <sup>2</sup>	Special Order

**Uniform Section Mat (USM)** is formed with a double-layer woven fabric, joined together by spacer cords on closely spaced centers. Relief of hydrostatic uplift pressure, where required, may be provided by inserting plastic weep tubes through the mat at specified centers. When weep tubes are used, the lower end of the weep tube should be covered by filter fabric or a filter fabric should be placed under USM linings.

### ARTICULATING BLOCK MAT (ABM)



Articulating Block Size	Nominal Block Dimensions	Weight/ Block	Weight/ Sq. Ft.	Coverage/ Cu. Yd. Concrete	Availability
4" ABM	24" x 12" x 4"	93 lbs.	41 lbs.	82 ft. <sup>2</sup>	Inventory
6" ABM	24" x 18" x 6"	210 lbs.	64 lbs.	53 ft. <sup>2</sup>	Inventory
8" ABM	24" x 24" x 8"	373 lbs.	86 lbs.	40 ft. <sup>2</sup>	Special Order

**Articulating Block Mat (ABM)** is formed with a double-layer woven fabric, joined together into a matrix of rectangular compartments each separated by a narrow perimeter of interwoven fabric. High strength cables may be threaded between the two layers of fabric to interconnect the concrete filled compartments (blocks), and provide for block articulation. Relief of hydrostatic uplift pressure is provided by slits cut between adjacent blocks and/or inserting plastic weep tubes through the mat at specified centers. A filter fabric should be placed under ABM revetments.

## IMPORTANT FACTORS IN SELECTING THE PROPER ARMORFORM STYLE FOR YOUR JOB

The steps involved and the subjects covered before final ARMORFORM style selection are very important. Advance preparation of a comprehensive set of specifications will greatly enhance the probability of satisfactory installation and performance.

### Common information which must be gathered includes:

- Velocity and/or flow rate, plus width, depth, longitudinal slope, and side slope of channel, stream or ditch.
- Significant or maximum wave height, plus wave period and angle of slope inclination.
- Type and condition of the soil, ground water table, and surrounding terrain.
- The location of the installation and the temperatures experienced in the area. Also, whether the locality is subject to high winds and the fetch of open water across from the installation.
- Accessibility of installation.
- Expected completion date.

A bid specification should then be prepared including the following:

### I. THE FABRIC FORM:

- Style and size of the ARMORFORM fabric form, after calculating hydraulic stability requirements and evaluation of other conditions.
- Required standards of quality.
- Thickness, weight and overall dimensions as well as physical property requirements for fabric forms, structural grout, and filter fabric when required.

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U.S. Patent No. 4,502,815 and 4,449,847  
Other U.S. and foreign patents issued and pending.

### II. FABRICATION:

- Specify the acceptable method of fabrication, seam strength, zipper strength and width of permissible panel lap joints.
- Stipulate minimum required fabric mill width.
- Require all seams to be downward facing.

### III. SITE PREPARATION:

- Provide suitable drawings including lines, grades and cross-sections, as well as other details of the specific site involved.

### IV. ARMORFORM INSTALLATION:

- Responsibilities of the fabric form manufacturer and installer.
- Methods of field joining of panels.
- Specify the minimum spacing between expansion joints as required by field conditions.
- Specify inspection of all field seams.
- Methods of checking integrity of installation.

### COSTS

Installed cost is a more important consideration than material cost alone. Included in these considerations are such factors as: weight or thickness of the ARMORFORM revetment or lining, whether it has cables, local labor and structural grout costs, special requirements based upon soil conditions, filter fabric when required, and all the job and site-oriented details that contribute to a final installed cost. Complete specifications must be developed before detailed costs can be determined.

Nicolon's engineering and sales representative groups are available to aid in the preparation of estimates and technical field services for potential projects.

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The successful ARMORFORM installation begins with thorough planning and culminates in well engineered materials properly installed. After the yarns are produced, woven into mill width rolls, and factory fabricated into panels, the installation is the final step. The importance of sound installation techniques in any erosion control project cannot be over emphasized. Regardless of the type of erosion control method used, the success or failure of any job will depend to a very large extent on the proper execution of the installation.

Once an installer has been chosen there are four basic steps to be taken in any ARMORFORM erosion control installation:

1. Site Preparation
2. Panel Placement and Field Assembly
3. Structural Grout Pumping
4. Inspection

### SITE PREPARATION

Slope grading equipment, such as backhoes or drag lines, is used to excavate to required depths, contour the slopes to the specified slope ratio, and form the anchor, toe, and terminal trenches around the periphery of the installation. The area to be protected must be free of rock, brush, roots, or large soil clods.



The fabric forms are usually anchored into a trench approximately two feet deep, by one foot wide, at the top of the slope. The trench should be located one to three feet from the top edge of the slope. The exposed soil beyond the anchor trench should be sloped away from the trench, or a drainage ditch should be excavated so surface water will run off and not saturate the slope.

The graded slope should be jointly inspected by the installer, owner's representative, and excavation contractor. If slope conditions are unacceptable for

the fabric forms, corrective measures should be taken.



### PANEL PLACEMENT AND FIELD ASSEMBLY

Once the slope and other related excavation conforms to finished grade and elevation specifications, installation of filter fabric, if required, and the ARMORFORM fabric forms may begin. First, the ARMORFORM panels are removed from their packages and placed in position for installation. The panels can be quite large to minimize joining on the site, sometimes weighing as much as 500 pounds per panel.

Next, a panel is rolled down the slope and positioned for unfolding. The panels are positioned according to a carefully prepared drawing where each panel is identified for placement. The panel is then unfolded by a work crew and pulled into position. The ARMORFORM panels should be positioned loosely along the slope.



Once positioned, the upper edge of the ARMORFORM panel is folded into the anchor trench atop the slope. The extra fabric provided for contraction during pumping should be accumulated and held at the top of the slope and gradually released as the form is filled.

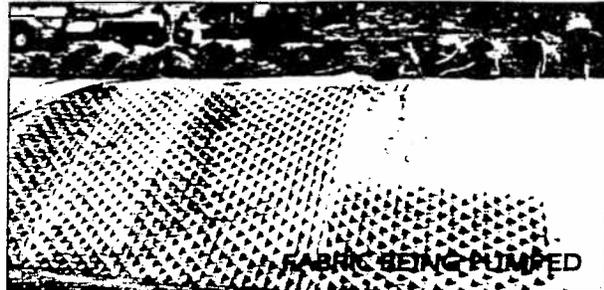
Adjacent panels are joined by field sewing or zippering the double-layer fabric forms, bottom edge to bottom edge, and top edge to top edge. When installing Articulated Block Mat (ABM), optional transverse high strength cables should be spliced prior to joining of the top layers of fabric.

As the first two panels are being joined, the third is positioned so that the seaming crew can start on it, upon completion of the first seam. This procedure is continued until all field seams are made. No more material than can be pumped in one day should be unrolled and positioned.

**FABRIC BEING ZIPPERED****FABRIC BEING SEWED****STRUCTURAL GROUT PUMPING**

The upper edge of the ARMORFORM panel which has been placed into the anchor trench should be pumped first, thus forming an anchor to prevent the remainder of the form from sliding down the slope as it is pumped with structural grout. The pumping crew should then inject grout into the lower mat

area, proceeding gradually up the slope until the fabric form has been filled.

**FABRIC BEING PUMPED**

Structural grout is injected into the ARMORFORM fabric form by inserting a 2" diameter grout injection pipe through a small slit cut in the upper layer of fabric. A grout tight seal is formed by wrapping the injection pipe with burlap, which is held in place by a laborer as grout is being injected. When the pipe is withdrawn, the burlap is stuffed in the hole where it remains until the grout stiffens to a point that it is no longer fluid. The burlap is then removed and the concrete surface at the hole smoothed by hand.

**INSPECTION**

When inspecting the panels prior to pumping, wrinkles and loose fabric should be expected as they are necessary to compensate for form contraction. (As much as 10% contraction in each direction may be expected.) Nicolon should be contacted to determine the appropriate contraction factor for your site conditions.

All field sewn seams, zipper connections, and lap joints must be carefully inspected. Colored thread is advised for all field sewn seams to facilitate inspection.

For detailed installation guidelines contact Nicolon Corporation.

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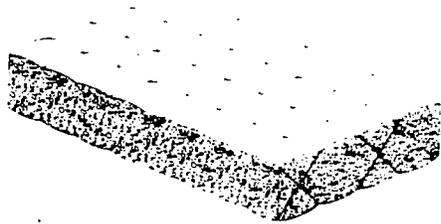
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# UNIFORM SECTION MAT (USM)

Uniform Section Mat fabric is a double-layer woven fabric, joined together by spacer cords and engineered exclusively to serve as a form for casting concrete erosion control linings. The fabric is woven from polypropylene, slit film yarns, and designed with the required strength, stability and filtration properties of a superior fabric form. Uniform Section Mats (USM) have a bonded cobble surface and conform to the dimensions, weights and volumes listed in the following table and the fabric properties indicated below.

## Typical Dimensions, Weights and Volumes

(Values shown are typical only, and will vary with field conditions.)



Uniform Section Size	Cord Spacing	Nominal Thickness	Weight/ Sq. Ft.	Coverage/ Cu. Yd. Concrete <sup>1</sup>	Availability
3" USM	3" x 3"	3.0"	35 lbs.	97 ft. <sup>2</sup>	Inventory
4" USM	3" x 3"	4.0"	47 lbs.	73 ft. <sup>2</sup>	Inventory
6" USM	3" x 4"	6.0"	70 lbs.	49 ft. <sup>2</sup>	Inventory
8" USM	3" x 5"	8.0"	93 lbs.	36 ft. <sup>2</sup>	Special Order

## Typical Property Values

(Typical property values are statistical mean (averages) of test data.  
For minimum certified values contact NICOLON CORPORATION.)

Property	Test Method	Unit	Values USM
<b>Physical:</b>			
Composition			PP <sup>2</sup>
Weight	ASTM D-3776-79	oz/lyd	10
Thickness	ASTM D-1777-75	mils	20
Mill Width		in	84/172
<b>Mechanical:</b>			
Grab Tensile Strength	ASTM D-1682-75	lbs	
Warp			200
Fill			200
Grab Tensile Elongation	ASTM D-1682-75	%	
Warp			20
Fill			20
Diaphragm Burst Strength	ASTM D-3786-80 a	psi	475
Trapezoid Tear Strength	ASTM D-1117-80	lbs	
Warp			65
Fill			75
Puncture Strength	ASTM D-3787-80	lbs	60
<b>Hydraulic:</b>			
Water Flow Rate	ASTM Proposed <sup>3</sup>	gal/min/sf	80
Coefficient of Permeability (k)	ASTM Proposed <sup>3</sup>	cm/sec	0.05
Permittivity (k/l)	ASTM Proposed <sup>3</sup>	l/sec	1.0
Porosity	ASTM D-737-75	cf/min/sf	125
<b>Spacer Cord:</b>			
Break Strength	ASTM D-2256	lbs/cord	75 (2)

<sup>1</sup>Concrete - Fine aggregate concrete (structural grout).

<sup>2</sup>PP - Polypropylene

<sup>3</sup>Test method proposed by the ASTM Subcommittee on Mechanical Reports for Geotextiles (03501).

The procedure calls for property determined using 5 cm constant head.

ARMORFORM<sup>®</sup> is a NICOLON<sup>®</sup> product.

U.S. Patent No. 4,502,815 and 4,449,847.

Other U.S. and foreign patents issued and pending.

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GUIDE SPECIFICATION FOR  
UNIFORM SECTION MAT (USM)

1.0 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, and incidentals required to perform all operations in connection with the installation of the proposed Uniform Section Mat (USM) lining in accordance with the lines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

1.2 DESCRIPTION

The work shall consist of installing an unreinforced concrete mat lining, by positioning a specially woven double-layer synthetic fabric form on the surface to be protected and filling it with a pumpable fine aggregate concrete (structural grout) in such a way as to form a stable mat of required thickness, weight and configuration.

2.0 MATERIALS

2.1 FINE AGGREGATE CONCRETE

Fine aggregate concrete shall consist of a mixture of portland cement, fine aggregate (sand), and water so proportioned and mixed as to provide a pumpable grout. Pozzolan and grout fluidifier conforming to these Specifications may be used at the option of the Contractor. The mix shall exhibit a compressive strength of 2000 psi at 28 days when made and tested in accordance with ASTM C-31 and C-39.

Note: The average compression strength of ARMORFORM cast fine aggregate concrete shall be at least 20% higher at 7 days than that of the companion test cylinders made in accordance with ASTM C-31, and not less than 2,500 psi at 28 days.

2.1.1 Portland cement shall conform to ASTM C-150, Type I or Type II.

2.1.2 Fine aggregate shall conform to ASTM C-33, except as to grading. Aggregate grading shall be reasonably consistent and shall be well graded from the maximum size which can be conveniently handled with available pumping equipment.

2.1.3 Water for mixing shall be clean and free from injurious amounts of oil, acid, salt, alkali, organic matter or other deleterious substances.

2.1.4 Pozzolan, if used, shall conform to ASTM C-350.

2.2 FABRIC FORM

The fabric forms shall be, as specified, ARMORFORM (note a) Uniform Section Mat as manufactured by Nicolon Corporation, or approved equal. Each layer of fabric shall meet the following statistical mean (average) results:

Property	Test Method	Unit	Values USM
<b>Physical:</b>			
Composition			PP <sup>2</sup>
Weight	ASTM D-3776-79	oz/yd	10
Thickness	ASTM D-1777-75	mils	20
Mill Width		in	84/172
<b>Mechanical:</b>			
Grab Tensile Strength	ASTM D-1682-75	lbs	
Warp			200
Fill			200
Grab Tensile Elongation	ASTM D-1682-75	%	
Warp			20
Fill			20
Diaphragm Burst Strength	ASTM D-3786-80 a	psi	475
Trapezoid Tear Strength	ASTM D-1117-80	lbs	
Warp			65
Fill			75
Puncture Strength	ASTM D-3787-80	lbs	60
<b>Hydraulic:</b>			
Water Flow Rate	ASTM Proposed <sup>3</sup>	gall/min/sf	80
Coefficient of Permeability (k)	ASTM Proposed <sup>3</sup>	cm/sec	0.05
Permittivity (k1)	ASTM Proposed <sup>3</sup>	1/sec	1.0
Porosity	ASTM D-737-75	cf/min/sf	125
<b>Spacer Cord:</b>			
Break Strength	ASTM D-2256	lbs/cord	75 (2)

<sup>1</sup>Concrete - Fine aggregate concrete (structural grout).

<sup>2</sup>PP - Polypropylene

<sup>3</sup>Test method proposed by the ASTM Subcommittee on Mechanical Reports for Geotextiles (03501).  
The procedure calls for property determined using 5 cm constant head.

The Contractor shall furnish the Engineer, in duplicate, manufacturer's certified test results showing actual test values obtained when the above physical properties were tested for compliance with the Specifications.

Note a: The Engineer shall indicate the Uniform Section Mat size required.  
Example: 4" USM

2.2.1 Fabric form material shall consist of double-layer

woven fabric joined together by spacer cords, of uniform length, to produce a mat with a finished nominal thickness of (note b) inches, and a weight of (note b) lbs./ft.<sup>2</sup> Spacer cords shall connect the two layers of fabric on (note c) centers. Points of connection shall be staggered to provide a bonded cobble surface appearance.

Note b: The Engineer shall indicate the nominal mat thickness and weight/sq.ft. for the Uniform Section Mat required.

Note c: The Engineer shall indicate the cord spacing for the Uniform Section Mat required.

2.2.2 Individual mill width rolls of fabric form shall be a minimum width of 84 inches. Mill width rolls shall be cut to the length required, and the two layers of fabric separately joined edge to edge by means of sewing thread, to form multiple mill width panels. All sewn seams shall be downward facing as shown on the Contract Drawing. The grab tensile strength of all sewn seams shall be not less than 100 lbs./in. when tested in accordance with ASTM D-1692-75.

2.2.3 Grout stops shall be installed at predetermined, mill width, intervals to regulate the flow of fine aggregate concrete.

2.2.4 Plastic weep tubes, for relief of hydrostatic uplift pressure, shall be inserted through the mat, at (note d) foot centers, at locations shown on the Contract Drawings. Where weep tubes are required, the lower end of the weep tube shall be covered by filter fabric held securely in place or the mat shall be placed over filter fabric as specified elsewhere in these Specifications.

Note d: Plastic weep tubes are normally inserted in Uniform Section Fabric on approximately 5' x 5' centers, or as specified by the Engineer.

2.2.5 Immediately following receipt of fabric forms to the job site, forms should be inspected and stored in a clean dry area where they will not be subject to mechanical damage, exposure to moisture or direct sunlight.

3.0 INSTALLATION

3.1 SITE PREPARATION

- 3.1.1 Areas on which fabric forms are to be placed shall be constructed to the lines and grades shown on the Contract Drawings. Where such areas are below the allowable grades they shall be brought to grade by placing layers of selected material and compaction. The depth of layers and amount of compaction shall be as specified by the Engineer. All obstructions such as roots and projecting stones shall be removed.
- 3.1.2 Excavation and preparation of anchor trenches, terminal trenches, and toe trenches or aprons shall be done in accordance with the lines, grades and dimensions shown on the Contract Drawings.
- 3.1.3 Immediately prior to placing the fabric forms, the prepared area shall be inspected by the Engineer and no forms shall be placed thereon until the area has been approved.
- 3.2 FABRIC FORM PLACEMENT
  - 3.2.1 Fabric form panels, as specified in Section 2.2 of this Specification shall be placed within the limits shown on the Contract Drawings.
  - 3.2.2 Adjacent fabric form panels shall be joined before fine aggregate concrete injection, by field sewing or zippering the two bottom layers of fabric together and the two top layers of fabric together. All sewn seams shall be downward facing as shown on the Contract Drawings.
  - 3.2.3 When conventional joining of panels is impractical, or where called for on Contract Drawings, adjacent panels may be overlapped a minimum of two feet pending approval by the Engineer. In no case shall simple butt joints between panels be permitted.
  - 3.2.4 Lap joints and expansion joints shall be provided as shown on the Contract Drawing, or as specified by the Engineer. Filter fabric with a minimum width of six feet shall be placed under all lap joints and expansion joints and shall extend continuously along the length of the joint.
  - 3.2.5 Immediately prior to injection of fine aggregate concrete, the assembled fabric form panels shall be inspected by the Engineer and no fine aggregate concrete shall be pumped therein until the fabric seams and panel connections have been approved.
- 3.3 FINE AGGREGATE CONCRETE PLACEMENT

- 3.3.1 Following panel placement, small slits shall be cut in the top layer of the fabric form to allow for the insertion of the injection pipe. Fine aggregate concrete shall be injected between the top and bottom layers of fabric, filling the panel to the recommended thickness and configuration.
- 3.3.2 Fine aggregate concrete shall be injected in such a way that excessive pressure on the fabric form and cold joints are avoided.
- 3.3.3 Holes in the fabric left by the removal of the injection pipe shall be temporarily closed by inserting a piece of burlap or similar material. The burlap shall be removed when the concrete is no longer fluid and the concrete surface at the hole smoothed by hand. Foot traffic on the filled mat shall be restricted to an absolute minimum for one hour after pumping.
- 3.3.4 Upon completion of the fine aggregate concrete placement, all the anchor trenches, terminal trenches and toe trenches shall be back-filled and compacted, as specified by the Engineer.

The information presented herein will not apply to every installation. Dimensions and quantities shown are approximate only and will vary as a result of site conditions and installation procedures. No warranty or guarantee expressed or implied is made regarding the performance of any product, since the manner of use and handling are beyond our control.

**APPENDIX A**

Subsurface Information

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR KIMBALL ASSOCIATES  
 DRILLER F. HARRIS  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

LOG NO. 92-1  
 ELEVATION 1019.9  
 COORDINATES S 13,690 approx.  
W 61,315 approx.  
 GWL dry (caved in @ 45 ft)  
 DATE 12-9-92  
 W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
				TOPSOIL	
	SS-1	5-7-11	1.3'		0.3' 6 in. hollow-stem auger
				CLAYEY SAND WITH ROCK FRAGMENTS low plasticity fines flat shale and sandstone rock fragments brown and gray moist	
5					
	SS-2	17-36-26	1.5'	same as above, more sandy, large sandstone fragments	
10					
	SS-3	9-12-16	0.2'	same as above, large sandstone fragments	Bag sample #1 (10'-15')
15					
	SS-4	10-11-17	0.5'	same as above, weathered shale and sandstone fragments	
20					
	SS-5	15-16-14	1.0'	same as above, weathered shale and sandstone fragments	
25					
	SS-6	10-11-12	1.0'	same as above, weathered shale and sandstone fragments, trace coal	Bag sample #2 (25'-30')
30					
	SS-7	5-7-11	1.1'	same as above, weathered shale fragments, trace coal	
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR KIMBALL ASSOCIATES  
 DRILLER F. HARRIS  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

LOG NO. 92-1  
 ELEVATION 1019.9  
 COORDINATES S 13,690 approx.  
W 61,315 approx.  
 GWL dry (caved in @ 45 ft)  
 DATE 12-9-92  
 W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	SS-8	6-8-10	1.3'	same as above, weathered shale and sandstone fragments, trace coal	6 in. hollow-stem auger
40					
	SS-9	7-7-7	0.7'	same as above, weathered shale fragments, trace coal	45.0'
45					
	SS-10	6-6-6	1.0'	SILTY CLAY some sand little weathered shale fragments brown moist	51.5'
50					
	SS-11	4-6-6	1.5'	same as above, more shale fragments, saturated	55.0' Auger refusal
55				WEATHERED SHALE gray and brown saturated	
	SS-12	50/2"		BOTTOM OF BORING	
60					
65					
70					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
CLIENT PENELEC (KEYSTONE)  
CONTRACTOR KIMBALL ASSOCIATES  
DRILLER F. HARRIS  
LOGGED BY M. SKYRMAN  
EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	SS-1	3-9-12	1.5'	FILL silty sandy gravel	6 in. hollow-stem auger
5					
	SS-2	2-3-4	1.1'	CLAYEY SAND WITH ROCK FRAGMENTS low plasticity fines some shale fragments, trace coal brown moist	
10					
	SS-3	7-3-5	1.0'	same as above, more shale fragments	
15					
	SS-4	7-7-10	0.4'	same as above	
20					
	SS-5	7-9-7	0.5'	same as above, little to some weathered sandstone and shale rock fragments	
25					
	SS-6	13-40-10	1.3'	same as above, some weathered shale fragments, moist to wet	
30					
	SS-7	3-4-6	1.0'	SANDY CLAYEY SILT little to some shale fragments brown wet	
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

GILBERT/COMMONWEALTH, INC.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET 2 of 2  
 LOG NO. 92-2  
 ELEVATION 1000.2  
 COORDINATES S 13,725 approx.  
 W 61,225 approx.  
 GWL dry (caved in @ 28.2 ft)  
 DATE 12-9-92  
 W.O. NO. 04-4267-230

PROJECT   THERMAL DISCHARGE    
 CLIENT   PENELEC (KEYSTONE)    
 CONTRACTOR   KIMBALL ASSOCIATES    
 DRILLER   F. HARRIS    
 LOGGED BY   M. SKYRMAN    
 EQUIPMENT   SIMCO TRACK DRILL AND HOLLOW STEM AUGER  

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	SS-8	50/3"	0.3'	WEATHERED SHALE, trace coal	6 in. hollow-stem auger
				BOTTOM OF BORING	38.3' Auger refusal
40					
45					
50					
55					
60					
65					
70					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT **THERMAL DISCHARGE**  
CLIENT **PENELEC (KEYSTONE)**  
CONTRACTOR **KIMBALL ASSOCIATES**  
DRILLER **F. HARRIS**  
LOGGED BY **M. SKYRMAN**  
EQUIPMENT **SIMCO TRACK DRILL, HOLLOW STEM AUGER, AND NX CORING**

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	<b>SS-1</b>	<b>14-14-50/2"</b>	<b>0.7'</b>	<b>FILL, gravelly</b>	<b>1.0'</b> <b>6 in. hollow-stem auger</b>
5	<b>SS-2</b>	<b>5-5-6</b>	<b>1.5'</b>	<b>SILTY CLAY</b> <i>little shale fragments</i> <i>brown</i> <i>moist</i>	
10				<i>same as above, grayish, wet</i>	
	<b>SS-3</b>	<b>4-4-50/5"</b>	<b>1.5'</b>	<b>WEATHERED SHALE</b> <i>gray</i>	<b>11.0'</b>
					<b>13.7'</b> <b>Auger refusal</b>
15	<b>NX-1</b>	<b>52%</b>	<b>4.9'</b>	<b>SHALE, slightly weathered, gray, hard, horizontal cleavages,</b> <b>4" thick coal layer at bottom</b>	<b>No clay seams</b> <b>16.6'</b>
				<b>LIMESTONE</b> <i>gray</i>	<b>19.5'</b>
20				<b>BOTTOM OF BORING</b>	
25					
30					
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR KIMBALL ASSOCIATES  
 DRILLER F. HARRIS  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	SS-1	4-5-26	1.0'	TOPSOIL	6 in. hollow-stem auger
				SILTY CLAY some shale fragments low plasticity fines brown moist to wet	
5					
	SS-2	5-26-12	1.3'	same as above, little sand, sandstone and shale fragments	
10					10.0'
	SS-3	20-20-9	1.1'	CLAYEY SAND some shale and sandstone fragments gray and brown humid	
15					
	SS-4	9-2-8	0.8'	same as above	Bag samples #3 (15'-20')
20					
	SS-5	4-9-14	1.3'	same as above, trace coal, wet	
25					
	SS-6	5-5-8	0	(no sample recovered)	
30					30.0'
	SS-7	4-5-8	0.8'	SILTY CLAY little shale fragments low plasticity fines brown wet	
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

GILBERT/COMMONWEALTH, INC.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET 2 of 2  
 LOG NO. 92-4  
 ELEVATION 1020.5  
 COORDINATES S 13,370  
 W 61,375  
 GWL 39.5' (0 hrs)  
 DATE 12-10-92  
 W.O. NO. 04-4267-230

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEystone)  
 CONTRACTOR KIMBALL ASSOCIATES  
 DRILLER F. HARRIS  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
40	SS-8	12-17-12	0.8'	SILTY CLAY some shale and sandstone fragments brown and gray moist to wet	6 in. hollow-stem auger  Bag sample #4 (35'-40')
45	SS-9	13-13-10	0.8'	same as above some shale fragments brown saturated	
50	SS-10	5-5-9	0.8'	same as above	46.0'  49.1' Auger refusal
				WEATHERED SHALE gray	
55					
60					
65					
70					
				BOTTOM OF BORING	

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR KIMBALL ASSOCIATES  
 DRILLER F. HARRIS  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT SIMCO TRACK DRILL AND HOLLOW STEM AUGER

SHEET 1 of 1  
 LOG NO. 92-5  
 ELEVATION 1002.1  
 COORDINATES S 13,330 approx.  
W 61,345 approx.  
 GWL dry (caved in @ 20.2 ft)  
 DATE 12-9-92  
 W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
	SS-1	4-8-10	1.3'	FILL, silty sandy gravel	6 in. hollow-stem auger
5					
	SS-2	5-5-4	1.5'	SANDY SILTY CLAY some shale rock fragments brown moist	
10					
	SS-3	2-3-5	1.2'	same as above, moist to wet, smaller shale fragments	
15					
	SS-4	12-5-4	0.5'	same as above	
20					
	SS-5	3-3-4	1.3'	same as above	
25					
	SS-6	3-4-4	0.2'	same as above, more silty	
30					
	SS-7	44-50/3'	0.8'	WEATHERED SHALE gray	
35					
					30.0'
					34.0' Auger refusal
				BOTTOM OF BORING	

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

GILBERT/Commonwealth, Inc.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET 1 of 1  
 LOG NO. TP 83-1  
 ELEVATION 982.0  
 COORDINATES S 13,740 approx.  
 W 61,610 approx.  
 GWL 1.5 ft (22 hrs)  
 DATE 1-14-83  
 W.O. NO. 04-4267-230

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				TOPSOIL, clayey, light brown, wet	
1.0				SILTY CLAY, large shale fragments, trace coal, brown, wet	
5					
7.0				BOTTOM OF TEST PIT	
10					
15					
20					
25					
30					
35					

SS - Split Spoon Sample      ST - Shelby Tube Sample      NR - NR Rock Core Sample

GILBERT/Commonwealth, Inc.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET 1 of 1  
 LOG NO. TP 93-2  
 ELEVATION 986.0 approx.  
 COORDINATES S 13,785 approx.  
 W 61,620 approx.  
 GWL 5.0' (22 hrs)  
 DATE 1-14-93  
 W.O. NO. 04-4267-230

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEystone)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				TOPSOIL, silty, brown, wet	
1.0					1.0'
5				SANDY SILTY CLAY, some large shale fragments, brown, moist to wet	
7.0					7.0'
				BOTTOM OF TEST PIT	
10					
15					
20					
25					
30					
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				BOTTOM ASH, sandy, gray, moist	
2.5					
5				SILTY CLAY WITH LARGE SHALE AND SANDSTONE FRAGMENTS, brown, moist to wet	
9.0					
10				BOTTOM OF TEST PIT	
15					
20					
25					
30					
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
CLIENT PENELEC (KEYSTONE)  
CONTRACTOR \_\_\_\_\_  
DRILLER \_\_\_\_\_  
LOGGED BY M. SKYRMAN  
EQUIPMENT CASE 580E BACKHOE

LOG NO. TP 93-4  
ELEVATION 1019.5' approx.  
COORDINATES S 13,620 approx.  
W 61,890 approx.  
GWL dry (24 hrs)  
DATE 1-15-93  
W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
				TOPSOIL, clayey, brown, moist	
					6"
				SILTY SAND/SANDY SILT WITH LARGE SHALE FRAGMENTS, brown, moist	
5					3' diameter shale fragments @ 6' approx.
					7.5'
				BOTTOM OF TEST PIT	
10					
15					
20					
25					
30					
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

GILBERT/COMMONWEALTH, INC.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET 1 of 1

LOG NO. TP 93-5

ELEVATION 982.0 approx.

COORDINATES S 13,540 approx.

W 61,690 approx.

GWL 3.0' (0 hrs)

DATE 1-15-93

W.O. NO. 04-4267-230

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				CLAYEY SILT WITH LARGE SANDSTONE AND SHALE FRAGMENTS, brown, moist to wet	
3.0					3.0' Solid rock @ 3.0' (Could be a boulder)
5					
10					
15					
20					
25					
30					
35					

BOTTOM OF TEST PIT

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

LOG NO. TP 93-6  
 ELEVATION 986.0 approx.  
 COORDINATES S 13,400 approx.  
W 61,870 approx.  
 GWL 4.5' (0 hrs)  
 DATE 1-15-93  
 W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
5				CLAYEY SILT WITH LARGE SHALE AND SANDSTONE FRAGMENTS, little sand, brown, moist to wet	Harder to dig @ 5'
					7.0'
				BOTTOM OF TEST PIT	
10					
15					
20					
25					
30					
35					

PROJECT THERMAL DISCHARGE  
CLIENT PENELEC (KEYSTONE)  
CONTRACTOR \_\_\_\_\_  
DRILLER \_\_\_\_\_  
LOGGED BY M. SKYRMAN  
EQUIPMENT CASE 580E BACKHOE

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				TOPSOIL, clayey, brown, moist	
6				SILTY CLAY/CLAYEY SILT WITH LARGE SANDSTONE AND SHALE ROCKS, brown, moist to wet	
8.0				BOTTOM OF TEST PIT	
10					
15					
20					
25					
30					
35					

PROJECT THERMAL DISCHARGE  
 CLIENT PENELEC (KEYSTONE)  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY M. SKYRMAN  
 EQUIPMENT CASE 580E BACKHOE

LOG NO. TP 93-8  
 ELEVATION 1015.5' approx.  
 COORDINATES S 13,440 approx.  
W 62,020 approx.  
 GWL 3.5' (0 hrs)  
 DATE 1-15-93  
 W.O. NO. 04-4267-230

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
0				TOPSOIL, clayey, brown, moist	
0				SILTY SAND/SANDY SILT WITH LARGE SHALE FRAGMENTS, brown, moist to wet	6"
5				BOTTOM OF TEST PIT	5.0' Difficult to dig
10					
15					
20					
25					
30					
35					

SS - Split Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

GILBERT/COMMONWEALTH, INC.  
 SOIL/ROCK CLASSIFICATION SHEET

SHEET *1 of 1*  
 LOG NO. *TP 93-9*  
 ELEVATION *1020.0' approx.*  
 COORDINATES *S 13,910 approx.*  
*W 62,450 approx.*  
 GWL *dry (0 hrs)*  
 DATE *1-15-93*  
 W.O. NO. *04-4267-230*

PROJECT *THERMAL DISCHARGE*  
 CLIENT *PENELEC (KEYSTONE)*  
 CONTRACTOR \_\_\_\_\_  
 DRILLER \_\_\_\_\_  
 LOGGED BY *M. SKYRMAN*  
 EQUIPMENT *CASE 580E BACKHOE*

DEPTH (FT)	SAMPLE			SOIL or ROCK DESCRIPTION	REMARKS
	TYP NO.	BLOWS/6" or RQD	REC.		
5				<i>SAND, little rock fragments, brown, moist</i>	
10				<i>BOTTOM OF TEST PIT</i>	<i>8.5'</i>
15					
20					
25					
30					
35					

SS - Spoon Sample

ST - Shelby Tube Sample

NX - NX Rock Core Sample

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Keystone Station W.O. 04-4267-187 SITE AREA Old Ash Site

DRILL HOLE NO. #3A

CONTRACTOR: PA Drilling COORDINATES \_\_\_\_\_

ELEVATION 1014.49

RILLER: K. Baumgartner

GWL 0 HRS \_\_\_\_\_

CLASSIFIED BY: T. DuGuay

DATE: 8-26-85

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	SPT Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock			REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape		
										Core	Rec.		
										Run	Core		
	1	5	14	17		0.3 TOPSOIL - Clayey, silty, sand some gravel, brown (SM-SC)							
5	2	4	4	6		2.0 FILL - Gravelly silty sand, brown (GM-SM)							
						5.7 FILL - Shale, grey, silt- stone, grey							
						8.0 FILL - Gravelly silty sand; some cobbles, brown (GM-SM)							
10	3	3	3	5		10.7 FILL - Shale, grey							
						12.0 FILL - Gravelly, silty, sand; some cobbles, brown (GM-SM)							
15	4	1	2	3		15.5 FILL - Silty clay, mod. plastic, yellow-brown, saturated (CL)							
						16.0 FILL - Sandy clay, low plasticity, yellow-brown, satur- ated (CL)							
20	5	2	3	4		17.0 FILL - Silty clay, mod. plastic, brown yellow, saturated (CL)							
						20.0 Sandy clay, moderately plastic, orange & grey, saturated (some cobbles, shale) (CL)							
25	6	5	8	6		26.0 Silty, sandy clay, mod. to high plasticity, orange & grey, saturated (CL,CH)							
						28.0 Siltstone, dark grey							
30	7	12	18	5		29.0 Gravelly silty sand, some clay, brown (SM-SC)							
						31.0 Shale, dark grey, med. soft & sandstone, lt. grey, fine to med. grained, medium hard							
35	8	16	6	7		36.5 Shale, dark grey, medium soft							
						40.5 COAL (overlain by clay seam)							
40	9	5	16	50		41.3 Sandstone, fine to med. grained, grey; siltstone, dark grey; some clayey shale							
45													
50													

Water @ 32'

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2

PROJECT: Keystone Station W.O. 04-4267-187 SITE AREA Old Ash Site

DRILL HOLE NO. #3A

CONTRACTOR: PA Drilling

COORDINATES \_\_\_\_\_

ELEVATION \_\_\_\_\_

DRILLER: K. Baumgartner

GWL 0 HRS \_\_\_\_\_

CLASSIFIED BY: T. DuGuay

DATE: 8-26-85

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	S P T Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.						Core	Core	
		Run	Core									
5												
10												
15						62.0 Limestone, (micrite) brown 63.5 Claystone, grey, very soft						
20												
25						72.0 Sandstone, medium grained, grey, hard; some siltstone, dark grey						
30												
35												
40												
45												
50						82.0 ——— BOTTOM OF HOLE ———						

COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF ENVIRONMENTAL RESOURCES  
BUREAU OF SOLID WASTE MANAGEMENT

GROUND WATER MODULE  
MONITORING POINTS  
MODULE NO. 8

I. D. NUMBER

--	--	--	--	--	--

DATE PREPARED  
8-27-85

PHASE II

Facility Identification

Name Keystone Generating Station Reviewed by \_\_\_\_\_ Date \_\_\_\_\_  
Municipality Plum Creek Twp. Recommend approval \_\_\_\_\_ disapproval \_\_\_\_\_  
County Armstrong Conditions \_\_\_\_\_

*TO BE SUBMITTED ON COMPLETION OF GROUND WATER MONITORING SYSTEM*

I. For approved monitoring sites complete the following:

A. Wells

1. Location

Monitoring Point Numbers*	Background or Down Gradient	Name and Date of Topographic Map	Measured from Southeast Corner		Latitude	Longitude
			Inches North	Inches West		
#2A	Down Gradient	Elderton, PA 1964 Photo Rev. 1973	6.0	14.7	40°39'28"	79°21'22"
3A	<del>Down</del> Gradient	Elderton, PA 1964 Photo Rev. 1973	6.9	14.6	40°39'47"	79°21'21"
	UP					

- \* Number all monitoring points consecutively. These numbers must not be changed; they will be used in all subsequent reports and communications (use numbers only.).

2. Completion Data

Monitoring Point Numbers*	Method Drilled	Date Completed	Depth	Surface Elevation	Depth to Static Water Level	Date of Measurement
#2A	Air Rotary	8-16-85	52'	1005.34	23.8'	8-16-85
#3A	Air Rotary	8-13-85	82'	1014.49	30.5'	8-13-85

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF ENVIRONMENTAL RESOURCES  
 BUREAU OF SOLID WASTE MANAGEMENT

ER-SWM-22A: Rev. 1/80

GROUND WATER MODULE  
 MONITORING POINTS  
 MODULE NO. 8

I. D. NUMBER

--	--	--	--	--	--

DATE PREPARED  
 8-27-85

PHASE II

2. Completion Data (continued)

Monitoring Point Numbers*	Casing:				Grouting:	
	Material (Type)	Size Diameter	Zones Cased	Zones Perforated	Zones Grouted	Type of Grouting
#2A	PVC	4"	0-10	10-50	0-8	Neat Cement Grout
#3A	PVC	4"	0-10	10-70	0-8	Neat Cement Grout

a. Does each well have a minimum of 3.5 inch diameter entrance port for samplers?  Yes  No

b. If the entrance port is not provided, indicate how samples of the upper foot of ground water will be secured. \_\_\_\_\_

\_\_\_\_\_

\* Number all monitoring points consecutively. These numbers must not be changed; they will be used in all subsequent reports and communications (use numbers only).

COMMONWEALTH OF PENNSYLVANIA  
 DEPARTMENT OF ENVIRONMENTAL RESOURCES  
 BUREAU OF SOLID WASTE MANAGEMENT

GROUND WATER MODULE  
 MONITORING POINTS  
 MODULE NO. 8

I. D. NUMBER

--	--	--	--	--	--

DATE PREPARED  
 8-27-85

PHASE II

3. Pump Test Data

Monitoring Point Number	#2A	#3A			
Use of water other than monitoring (fire, domestic, sanitary facilities, etc.)					
Pump					
Type					
Rated Capacity					
Depth to Pump (ft.)					
Depth to Water Intake (ft.)					
Pump Test Data					
Bailed or Pumped at (GPM-Uniform Rate)	3 gpm	3 gpm			
Static Water Level (prior to start of pumping) (ft.)	23.8	30.5			
Pumping Water Level (at end of pump test) (ft.)	24.9	31.6			
Drawdown (ft.)	1.1	1.1			
Length of Pump Test (hrs.)	0.83 hrs.	0.33 hrs.			
Specific Capacity (GPM/FT)					
<u>Pumping Rate</u> <u>Drawdown</u>	2.7	2.7			

a. Are the required geologic logs attached for each well?

Yes X No \_\_\_\_\_



**Gilbert/Commonwealth**  
ENGINEERS/CONSULTANTS  
**CALCULATION**

SUBJECT KEYSTONE STA - OLD ASH SITE  
MONITORING WELLS

IDENTIFIER

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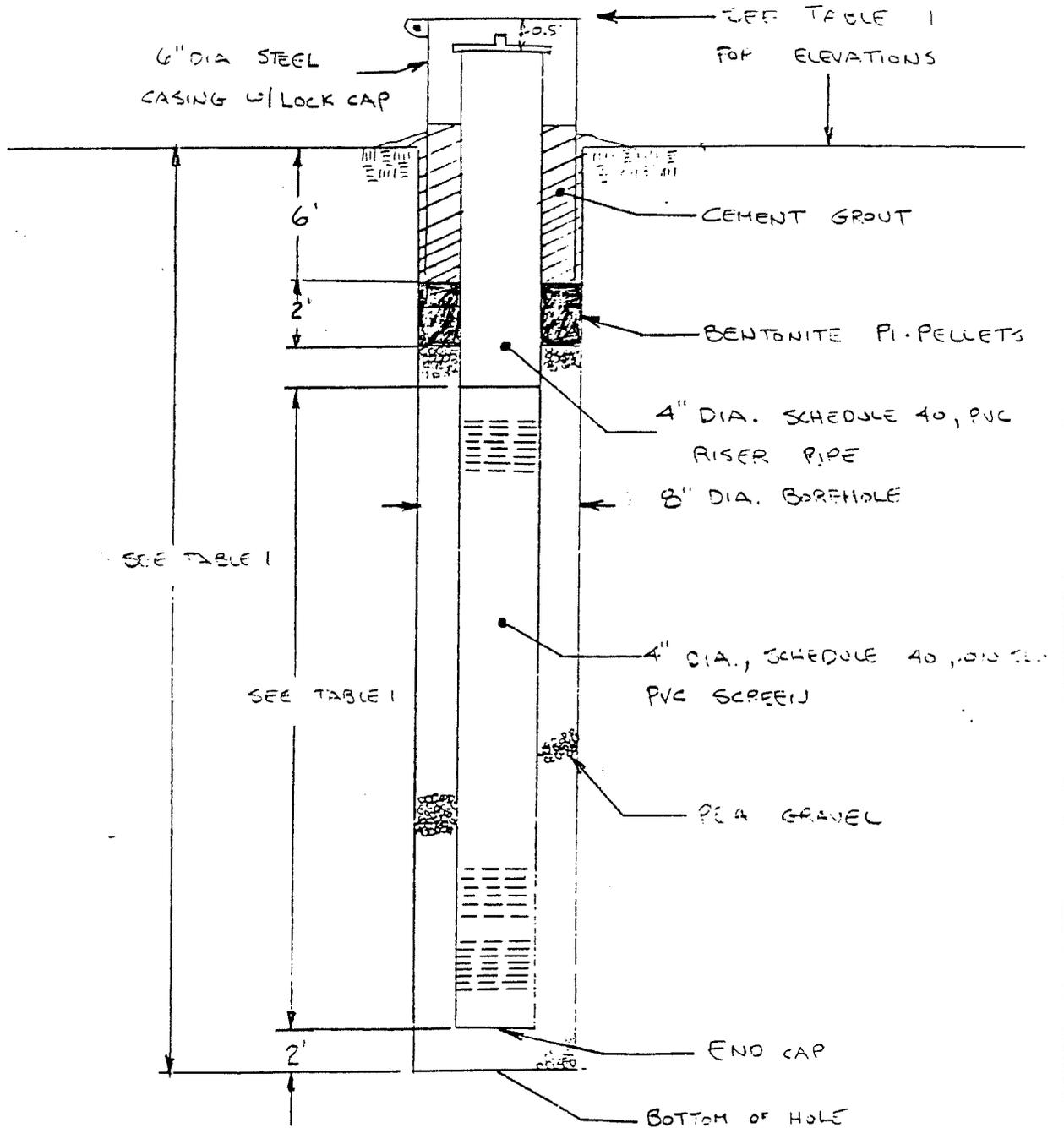
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PAGES

MICROFILMED

ORIGINATOR T. DUGWAY

DATE 9-20-85





**Gilbert/Commonwealth**  
ENGINEERS/CONSULTANTS

**CALCULATION**

SUBJECT KEYSTONE STA. - OLD ASH

IDENTIFIER

PAGE

SITE MONITORING WELLS

2  
OF

REV.

0

1

2

3

2  
PAGES

MICROFILMED

ORIGINATOR T. DU GUAY

DATE 9.25-85

TABLE 1

WELL #	DEPTH	LENGTH OF P/C SCREEN	GROUND ELEVATION	ELEVATION AT TOP OF CASING
# 2A	52'	40'	1005.34'	1008.14
# 3A	82'	70'	1014.49'	1017.21

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 1

PROJECT: Stream Diversion W.O. 04-4267-162 SITE AREA Keystone Station

DRILL HOLE NO. SD-1

CONTRACTOR: Penn. Drilling

COORDINATES \_\_\_\_\_

ELEVATION 1005.2

DRILLER: P. Waddell

GWL 0 HRS 17' - 0"

CLASSIFIED BY: Y. Shah

DATE: 9-13-84

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	SPT Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.						Core	Core	
		Run	Core	Core						Core		
						1'	Top soil (humus + silty sand)					
	51	9	7	8			Silty fine-med sand & gravel + cobbles (grey, silt/sand-stone rock fragments), trace clay, brown, moist (fill).	GM SM				
5'							Same, grey & damp (intermittently hard, indicating the presence of cobbles)					
	52	4	31	13								
10'						9 1/2'	Same, less gravel	SM				
	53	1	9	5								
15'							Same, more silt, less gravel					
	54	2	4	10								
20'						20'	Silty fine sand, little gravel (rock fragments), trace (to little) clay, brown, wet	SM ML				Wet spoon in S5 & S6
	55	2	2	2								
22'						22'	Clayey fine sandy silt, trace coarse sand & gravel (rock fragments), brown & grey, wet	CL ML				
25'							Hole terminated @ 26 1/2'					
	56	11	6	7								

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Stream Diversion W.D. 04-4267-162 SITE AREA Keystone Station

DRILL HOLE NO. SD-2

CONTRACTOR: Penn. Drilling  
 MILLER: P. Waddell

COORDINATES \_\_\_\_\_

ELEVATION 1020.3

CLASSIFIED BY: Y. Shah

DATE: 9-12-84

GWL 0 HRS None

24 HRS None\*

Depth Ft.	Sample No.	S P T Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.								
		Run	Core									
	51	3	5	7		Silty fine to medium sand, gravel & cobbles (mostly broken, weathered silt/sand-stone rock), trace clay trace coarse sand, brown, damp	GM SM					
5'												
	52	8	10	10		Same as above, more gravel Grey from 6' to 8' and contains trace ash/coal						
10'												
	53	9	18	12		Same, grey & brown and damp					Resistance to SPT in S3 intermittently high, indicating presence of hard rock fragments	
15'												
	54	4	6	7		Same, more silty and moist to wet						
20'												
	55	8	5	3		Same as above					*Hole filled up next day (9-13-84) to 33'-6" and was dry.	
25'												



SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Stream Diversion W.O. 04-4267-162 SITE AREA Keystone Station

DRILL HOLE NO. SD-3

CONTRACTOR: Penn. Drilling  
P. Waddell

COORDINATES \_\_\_\_\_

ELEVATION 1019.8

DRILLER: \_\_\_\_\_

GWL 0 HRS None

CLASSIFIED BY: Y. Shah

DATE: 9-13-84

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	S P T Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range	Grain	
										Size	Shape	
										Core	Rec.	
Run	Core											
						Clayey fine sandy silt, trace to little gravel (rock fragments), brown, damp (fill)	ML CL					
	51	10	8	9								
					3'							
						Silty fine sand/sandy silt, & gravel (rock fragments), trace clay, trace to little medium to coarse sand, grey, damp to moist (probably fill)	SM GM				Rock fragments of grey shale or silty fine-grained sandstone.	
5'												
	52	4	8	10								
10'						Same						
	53	7	9	9								
15'						Same						
	54	7	9	10								
20'						Same, moist to wet						
	55	6	6	5								
25'												

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2

PROJECT: \_\_\_\_\_ W.O. 04-4267-162 SITE AREA \_\_\_\_\_

DRILL HOLE NO. SD-3

CONTRACTOR: \_\_\_\_\_ COORDINATES \_\_\_\_\_

ELEVATION \_\_\_\_\_

DRILLER: \_\_\_\_\_

GWL 0 HRS \_\_\_\_\_

CLASSIFIED BY: Y. Shah

DATE: 9-13-84

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	SPT Blows/ 6 In.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
										Core	Rec.	
										Run	Core	
	56	18	6	6	25 1/2'	Silty, fine-medium sand, trace clay trace coarse sand & gravel (rock fragments) yellowish brown with grey spots, moist to wet	SM				Cobble at 25'+	
						Same					Intermittently hard in S7, indicating intermittent hard and soft materi	
	57	4	7	8								
						Hole terminated at 31 1/2'.						



SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2

PROJECT: \_\_\_\_\_ W.O. 04-4267-162 SITE AREA \_\_\_\_\_

DRILL HOLE NO. SD-4

CONTRACTOR: \_\_\_\_\_ COORDINATES \_\_\_\_\_

ELEVATION \_\_\_\_\_

OPERATOR: Paul Waddell

GWL 0 HRS \_\_\_\_\_

CLASSIFIED BY: Y. S. Shah

DATE: 9-11-84

24 HRS \_\_\_\_\_

Depth Ft.	Sample No.	SPT Blows/ 6 in.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.						Core	Core	
		Run	Core	Core						Core		
	56	2	5	6								
					27 1/2	Clayey silt, trace to little fine sand, trace coarse sand (weathered grey shale), yellowish to reddish brown & grey, wet	CL					
	57	5	6	9								
	58	5	7	9		Same as above						
35						Hole terminated at 35'.						

SOIL AND ROCK CLASSIFICATION SHEET

SHEET 1 OF 2

PROJECT: Stream Diversion w.o. 04-4267-162 SITE AREA Keystone Station

DRILL HOLE NO. SD-5

CONTRACTOR: Penn. Drilling

COORDINATES \_\_\_\_\_

ELEVATION 1021.2

DRILLER: Paul Waddell

GWL 0 HRS None

CLASSIFIED BY: Y. S. Shah

DATE: 9-11-84

24 HRS \*

Depth Ft.	Sample No.	SPT Blows/ 6 In.			Fl. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
										Core	Rec.	
										Run	Core	
	51	6	9	9		1 1/2' - Silty sand & gravel + slag, grey (fill)	GM SM				W.L. in the adjacent stream at El. 970+  *On 9-12-84, the hole was filled up to 29' and had 2' of water - probably rain water collected overnight.	
						1 1/2' - Clayey silt, little to some coarse sand & gravel (highly weathered shale rock fragments) yellowish to reddish brown & grey, moist (fill)	CL					
5												
	52	3	2	5		6 1/2' - Same, with little fine sand, wet						
						7 1/2' - Fine to coarse sand & slag, grey (fill)	SP					
10												
	53	2	2	3		13' - Clayey fine sandy silt, little to some coarse sand & gravel (weathered shale rock fragments), yellowish to reddish brown, moist to wet (probably fill)	CL ML					
15												
	54	2	2	3		13' - Clayey silty fine sand/sandy silt some coarse sand & gravel (grey shale & siltstone rock fragments) grey & brown, moist to wet (probably fill)	CL SC					
20												
	55	2	5	6		19 1/2' - Harder rock fragments below 19 1/2'.	SC GC					
25												

GILBERT ASSOCIATES, INC.  
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2  
 DRILL HOLE NO. SD-5  
 ELEVATION \_\_\_\_\_  
 GWL 0 HRS \_\_\_\_\_  
 24 HRS \_\_\_\_\_

PROJECT: \_\_\_\_\_ W.O. 04-4267-162 SITE AREA \_\_\_\_\_  
 CONTRACTOR: \_\_\_\_\_ COORDINATES \_\_\_\_\_  
 DRILLER: Paul Waddell  
 CLASSIFIED BY: Y. S. Shah DATE: 9-11-84

Depth Ft.	Sample No.	S P T Blows/ 6 in.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.								
		Run	Core									
	56	7	8	10		Same as above; contains trace coal fragments						
					27'	Grey Shale, highly weathered & fractured, horizontally bedded with clayey silt pockets, damp to moist					Intermittently harder augering below 27', indicating differential weathering & horizontal bedding.	
30												
	57	10	9	4								
35												
	58	4	7	7		Same as above, but silty & lighter grey						
						Hole terminated at 36.5'.						



GILBERT ASSOCIATES, INC.  
SOIL AND ROCK CLASSIFICATION SHEET

SHEET 2 OF 2  
DRILL HOLE NO. SD-5A  
ELEVATION \_\_\_\_\_  
GWL 0 HRS \_\_\_\_\_  
24 HRS \_\_\_\_\_

PROJECT: \_\_\_\_\_ W.O. 04-4267-162 SITE AREA \_\_\_\_\_  
CONTRACTOR: \_\_\_\_\_ COORDINATES \_\_\_\_\_  
DRILLER: \_\_\_\_\_  
CLASSIFIED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

Depth Ft.	Sample No.	S P T Blows/ 6 in.			Ft. Rec.	Profile	DESCRIPTION Density (or Consistency), Color Rock Or Soil Type - Accessories	U.S.C.S.	R.Q.D.	Soil Or Rock		REMARKS Chemical Comp, Geologic Data, Ground Water, Construction Problems, etc.
		6	12	18						Range Size	Grain Shape	
		Core		Rec.								
		Run	Core									
	56	4	4	4		Same as above (except shale, instead of s. stone).					Easy augering in rock.	
30	57	3	5	4		Same as above (without coal partings; sandstone instead of shale)					Wet spoon in S7 & S8.	
35	58	9	13	10		Same as above (harder rock)						
						Hole terminated at 36½'.						

## *APPENDIX B*

### *Document 11*

#### *Dam Inspection Check List Form Ash Ponds*



Site Name:	<b>Keystone Station</b>	Date:	<b>September 13, 2012</b>
Unit Name:	<b>Ash Filter Ponds</b>	Operator's Name:	<b>GenOn</b>
Unit I.D.:	<b>03831</b>	Hazard Potential Classification:	High <input type="checkbox"/> Significant <input type="checkbox"/> Low <input checked="" type="checkbox"/>
Inspector's Name:		Fred Tucker, P.E. and Edward Farquhar	

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?		√	18. Sloughing or bulging on slopes?		√
2. Pool elevation (operator records)?	√		19. Major erosion or slope deterioration?		√
3. Decant inlet elevation (operator records)?	1018.5		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)?	1020.5		Is water exiting outlet, but not entering inlet?		N/A
6. If instrumentation is present, are readings recorded (operator records)?	N/A		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)?	N/A		From underdrain?		N/A
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	No formal records or protocol is in place for inspections. However, maintenance Contractor of the ponds does inspect the ponds on a daily basic.
5	Lowest elevation is along inside edge of crest. Outside edge is 1021.0
20	Overflow from each pond (3 cells) is through "saw tooth" weirs into weir trough to concrete riser with bottom discharge through 18 inch VTC pipe to a pump station that pumps water to thermal pond. Only overflow into weir trough is visible.
21	Any seepage from underdrain pipes in pond bottom is not visible. Underdrain pipes discharge into outlet structure. Underdrain is associated with dewatering of settled ash pond and not associated with the dikes.

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# Coal Combustion Waste (CCW) Impoundment Inspection

**Impoundment NPDES Permit** PA0002062      **INSPECTOR** Fred Tucker, P.E. and Edward Farquhar

**Date** September 13, 2012  
**Impoundment Name** Ash Filter Ponds

**Impoundment Company** GenOn (part owner) et al.  
**EPA Region** 3

**State Agency** Pennsylvania Department of Environmental Protection  
**(Field Office) Address** Bureau of Waste Management  
286 Industrial Park Road  
Ebensburg, PA 15931

**Name of Impoundment** Ash Filter Ponds: Ash Filter Pond A (SPD-7); Ash Filter Pond B (SPD-8); Ash Filter Pond (SPD-9)

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

**New**       **Update**

	<b>Yes</b>	<b>No</b>
<b>Is impoundment currently under construction?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Is water or ccw currently being pumped into the impoundment?</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**IMPOUNDMENT FUNCTION:**

**Nearest Downstream Town Name:** South Bend, PA

**Distance from the impoundment:** 3.5 Miles

**Location:**

**Latitude** 40 Degrees 39 Minutes 38.7 Seconds **N**

**Longitude** -79 Degrees 20 Minutes 36.82 Seconds **W**

**State** Pennsylvania      **County** Armstrong

	<b>Yes</b>	<b>No</b>
<b>Does a state agency regulate this impoundment?</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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**If So Which State Agency?**

Department of Environmental Resources -  
Bureau of Waste Management; (water  
quality only) not regulated for dam safety.

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

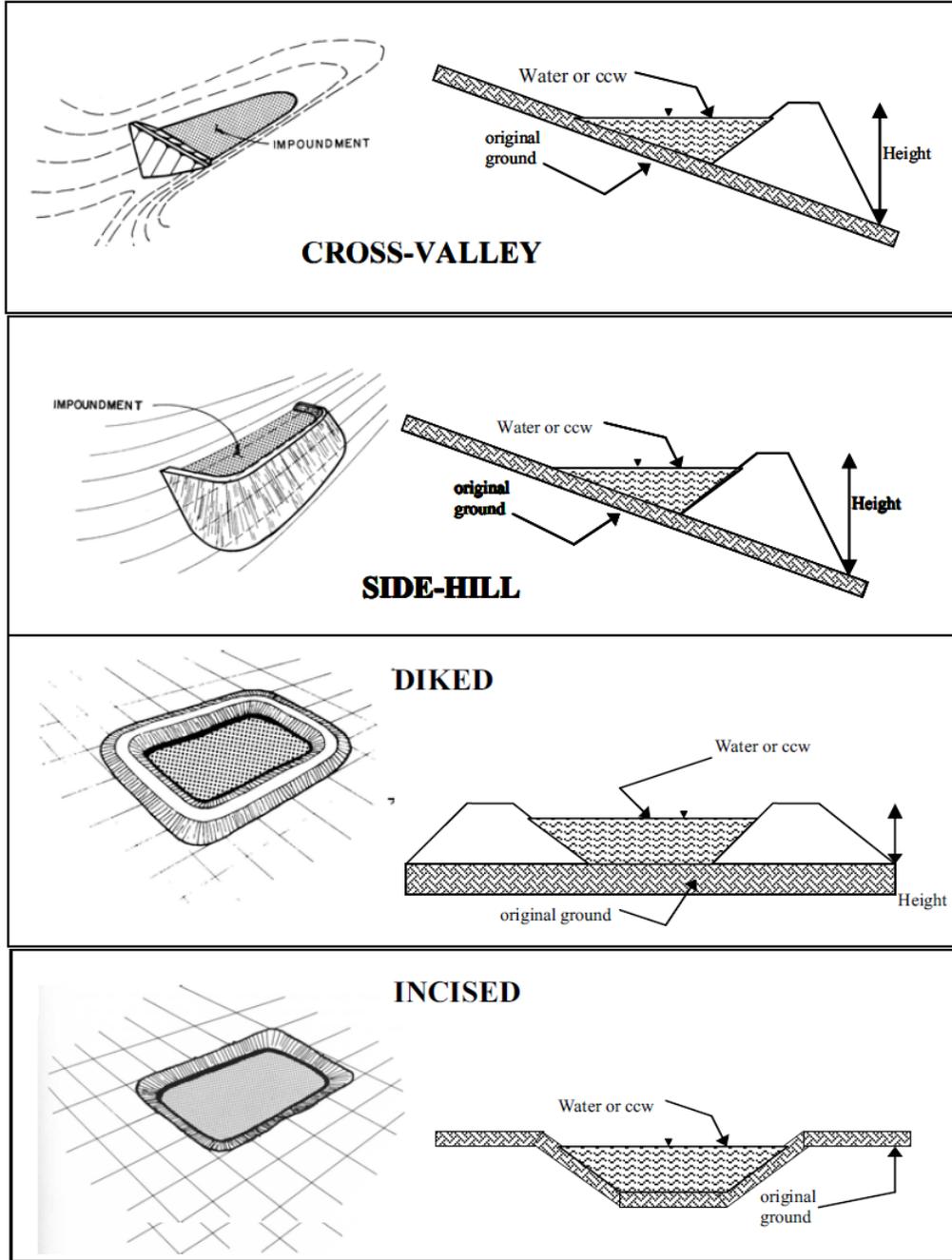
- LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.
- LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of 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:**

Low hazard potential classification for failure or release of some bottom ash into the immediate surrounding environment. There would be no significant risk of loss of human life. If failure occurred, ash would remain on GenOn property.



**CONFIGURATION:**



- |                          |                                    |                                     |                           |                          |       |
|--------------------------|------------------------------------|-------------------------------------|---------------------------|--------------------------|-------|
| <input type="checkbox"/> | Cross-Valley                       | <input type="checkbox"/>            | Side-Hill                 | <input type="checkbox"/> | Diked |
| <input type="checkbox"/> | Incised (form completion optional) | <input checked="" type="checkbox"/> | Combination Incised/Diked |                          |       |

**Embankment Height (ft)** Varies from 0 to 11 ft

**Embankment Material** N/A

**Pool Area (ac)** 2 acres

**Liner** Side Slopes 1.5 ft R-3 Rock lining over 2 ft impervious fill

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treated with bentonite.

Bottom: 2.5 ft bottom ash over 1.5 ft #8 coarse aggregate over 1.5 ft of impervious fill over 6 inches of impervious fill treated with bentonite over 1.5 ft of impervious fill over prepared subgrade.

**Current Freeboard (ft)** 2.0 Ft.

**Liner Permeability** 1.00E-07 cm/sec

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**TYPE OF OUTLET (Mark all that apply)**

**Open Channel Spillway**

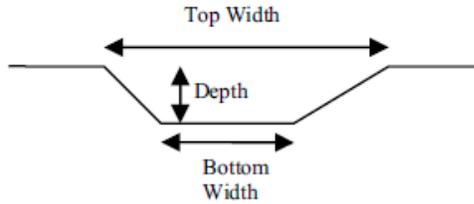
- Trapezoidal
- Triangular
- Rectangular
- Irregular

depth (ft)

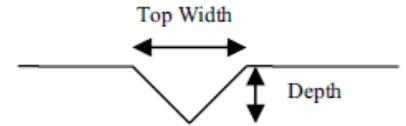
average bottom width (ft)

top width (ft)

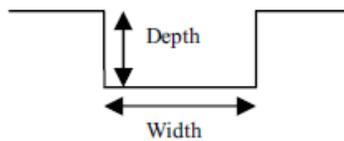
TRAPEZOIDAL



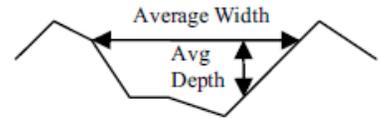
TRIANGULAR



RECTANGULAR



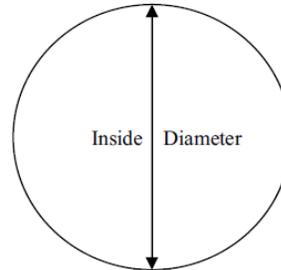
IRREGULAR



**Outlet**

Material

- 
- welded steel
- concrete
- plastic (hdpe, pvc, etc.)
- other (specify): 18 inch Vitrified Clay Pipe (VCP) pipe



**Is water flowing through the outlet?**

Yes

No

**No Outlet**

**Other Type of Outlet**  
(specify):



The Impoundment was Designed By **Not Known at this time.**

Yes

No

Has there ever been a failure at this site?

If So When?

If So Please Describe :

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

If So When?

If So Please Describe :

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	Yes	No
<b>Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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

**If So Please Describe :**

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**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

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

No

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

No

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## *APPENDIX B*

### *Document 12*

# *Dam Inspection Check List Form Thermal Pond*



Site Name:	<b>Keystone Station</b>	Date:	<b>September 13, 2012</b>
Unit Name:	<b>Thermal Pond</b>	Operator's Name:	<b>GenOn</b>
Unit I.D.:	<b>DER I.D. No: 03-044</b>	Hazard Potential Classification:	High <input type="checkbox"/> Significant <input type="checkbox"/> Low <input checked="" type="checkbox"/>
Inspector's Name:		Fred Tucker, P.E. and Edward Farquhar	

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

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	√		18. Sloughing or bulging on slopes?		√
2. Pool elevation (operator records)?	√		19. Major erosion or slope deterioration?		√
3. Decant inlet elevation (operator records)?	1017		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)?	1020		Is water exiting outlet, but not entering inlet?		√
6. If instrumentation is present, are readings recorded (operator records)?	N/A		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)?	N/A		From underdrain?		N/A
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
5	Lowest elevation is along inside edge of crest; outside edge is 1020.5.
21	Observed minor seepage on access road bench. Quarterly Dam Inspection Check lists reported minor seepage observed on access road bench from October 2011 to last inspection August 2012. Underdrain is associated with dewatering of settled ash and not associated with the dike. The underdrain pipes discharge into the outlet structure. Any seepage from the underdrain pipes in the pond bottom is not visible.

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## Coal Combustion Waste (CCW) Impoundment Inspection

**Impoundment NPDES Permit** PA0002062                      **INSPECTOR** Fred Tucker , P.E. and Edward Farquhar

**Date** September 13, 2012  
**Impoundment Name** Thermal Pond

**Impoundment Company** GenOn (part owner) et al.  
**EPA Region** 3

**State Agency** Pennsylvania Department of Environmental Protection  
**(Field Office) Address** Bureau of Waste Management  
286 Industrial Park Road  
Ebensburg, PA 15931

**Name of Impoundment** Thermal Pond (aka Cooling Pond A)

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

**New**

**Update**

	<b>Yes</b>	<b>No</b>
<b>Is impoundment currently under construction?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Is water or ccw currently being pumped into the impoundment?</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**IMPOUNDMENT FUNCTION:**

**Nearest Downstream Town Name:** South Bend, PA

**Distance from the impoundment:** 3.5 Miles

**Location:**

**Latitude**    40        Degrees        39        Minutes        49.36        Seconds        **N**

**Longitude**   -79        Degrees        21        Minutes        9.27        Seconds        **W**

**State** Pennsylvania                      **County** Armstrong

	<b>Yes</b>	<b>No</b>
<b>Does a state agency regulate this impoundment?</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**If So Which State Agency?** Department of Environmental Resources  
Bureau of Dams, Waterways and Wetlands  
(dam safety)

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Bureau of Waste Management (water  
quality)

**US EPA ARCHIVE DOCUMENT**



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

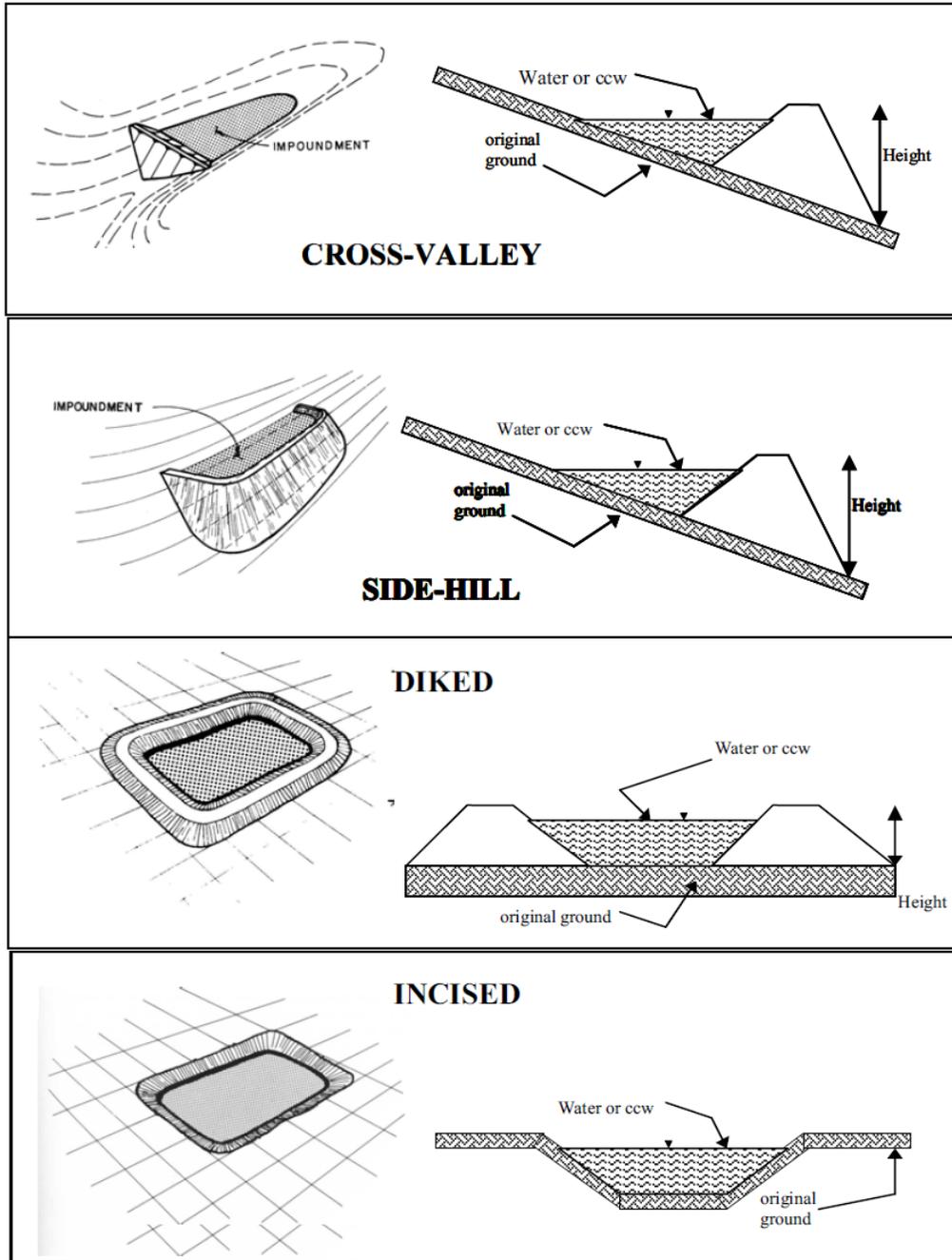
- LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.
- LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of 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:**

Low hazard potential classification for failure or release of very little bottom ash and water into a lagoon that discharges into Crooked Creek. There would be no significant risk of loss of human life. If failure occurred, ash would principally remain on GenOn property and no substantial flood wave would occur in Crooked Creek due to attenuation effects of an intervening railroad embankment with culvert and an onsite lagoon.



**CONFIGURATION:**



Cross-Valley



Side-Hill



Diked



Incised (form completion optional)



Combination Incised/Diked

**Embankment Height (ft)** 49.0 ft

**Embankment Material**

**Pool Area (ac)** 129 acre feet

**Liner** Side Slopes 3" thick concrete erosion control revetment, 50 Mil HDPE Liner (Textured on

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side slopes) Type "C"  
Geotextile, 2-inch thick sand  
bedding on prepared subgrade.  
Bottom Type "A" Geotextile, 50  
Mil HDPE Liner, Type "C"  
Geotextile, 2-inch thick sand  
bedding on prepared subgrade.

**Current Freeboard (ft)** 3.0 Ft.

**Liner Permeability** N/A

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**TYPE OF OUTLET (Mark all that apply)**

**Open Channel Spillway**

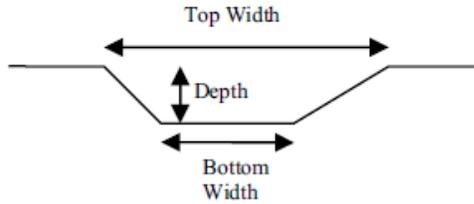
- Trapezoidal
- Triangular
- Rectangular
- Irregular

depth (ft)

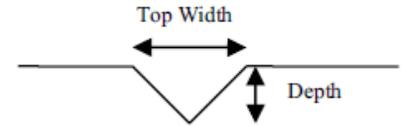
average bottom width (ft)

top width (ft)

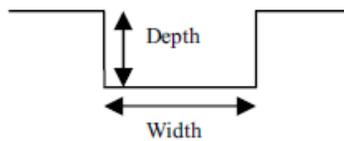
TRAPEZOIDAL



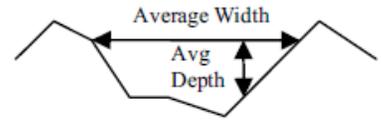
TRIANGULAR



RECTANGULAR



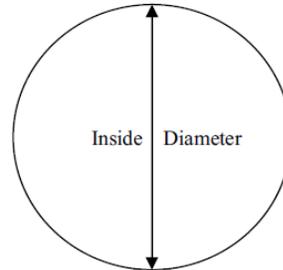
IRREGULAR



**Outlet**

**Material**

- corrugated metal 21" Dia CMP
- slip-lined with 18" Dia. HDPE pipe
- welded steel
- concrete
- plastic (hdpe, pvc, etc.) (See above note)
- other (specify):



**Is water flowing through the outlet?**

Yes

No

**No Outlet**



**Other Type of Outlet**  
(specify):

The Impoundment was Designed By **Not Known at this time.**

	Yes	No
Has there ever been a failure at this site?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**If So When?**

**If So Please Describe :**

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

If So When?

If So Please Describe :

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	Yes	No
<b>Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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

**If So Please Describe :**

**US EPA ARCHIVE DOCUMENT**



**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

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

No

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

No

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