HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2016
File No. 128064-003

SUBJECT: History of Construction – Cell 004
Associated Electric Cooperative, Inc.
Thomas Hill Energy Center
Clifton Hill, MO

Haley & Aldrich, Inc. (Haley & Aldrich) has assisted Associated Electric Cooperative, Inc. (AECI). with compiling the history of construction in accordance with §257.73(c)(1) for the existing coal combustion residuals (CCR) surface impoundment known as Cell 004 at the Thomas Hill Energy Center (THEC). This document addresses the requirements of the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (CCR Rule) effective 19 October 2015. To the extent feasible, AECI has provided documentation supporting the history of construction. Information on the history of construction of Cell 004 is presented in the following sections.

§257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Owner:	Associated Electric Cooperative, Inc. 2814 South Golden Avenue P.O. Box 754 Springfield, Missouri 65807
Name of CCR Unit:	Cell 004 (current naming convention, historically referred to as Pond 3, Cell No. 3, and/or Cell 3)

§257.73(c)(1)(ii): The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7 ½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

Latitude: 39°32'28"
Longitude: 92°38'25"
The general location of the facility is provided in Appendix A.

§257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

This impoundment currently receives flows from Cell 003 decant water. Historically, this impoundment has received minor amounts of CCRs as well.

§257.73(c)(1)(iv): The name and size in acres of the watershed within which the CCR unit is located.

USGS Watershed Name: Little Chariton Watershed 10280203
Watershed Area: 15 acres (direct watershed, plus flows from upstream impoundments)

It should be noted that updated drainage area is being revised and determined as part of the Inflow Flood Control System Plan required by §257.83 of the CCR Rule which will be provided under separate cover.

§257.73(c)(1)(v): A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

The description of the physical and engineering properties of the foundation and abutment materials on which Cell 004 was constructed was discussed on page 4-5 of "Slope Stability and Seepage Analysis Ash Pond No. 3"" by Geotechnology, Inc. dated 3 February 2012, and the excerpt is provided as Appendix B.

§257.73(c)(1)(vi): A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

The type, size, range, and physical engineering properties of the materials of each zone of the Cell 004 were discussed on page 6 to 7 of "Slope Stability and Seepage Analysis Ash Pond No. 3" by Geotechnology, Inc. dated 3 February 2012, and the excerpt is provided as Appendix B. AECI was not able to locate other original construction design documents related to this criterion.

Information on the method of site preparation and construction of Cell 004 is included on the drawings included in Appendix C.

Cell 004 was constructed circa 1979.

§257.73(c)(1)(vii): At a scale that details engineering structures and appurtenances relevant to the design, construction, operation and maintenance of the CCR unit, detailed dimensional drawings of the

CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Drawings providing information listed above, as available have been provided in Appendix C. AECI was not able to locate other original construction design documents related to this criterion.

§257.73(c)(1)(viii): a description of the type, purpose, and location of existing instrumentation.

No documentation of instrumentation exists for Cell 004.

§257.73(c)(1)(ix): area-capacity curves for the CCR unit.

Original design area-capacity curves for Cell 004 are not available. It should be noted that updated area-capacity curves for the impoundment is being developed as part of the Inflow Flood Control System Plan required by §257.83 of the CCR Rule which will be provided under separate cover.

§257.73(c)(1)(x): a description of each spillway and diversion design features and capacities and calculations used in their determination.

Spillway and diversion structures for Cell 004 are shown on the following design drawings: “Grading Plan II,” Drawing No. Y8, “Dike Profile and Grading Section,” Drawing No. Y12 and “Outfall Structure Details,” Drawing No. S1 by Burns and McDonnell dated December 1, 1978, and the excerpts are provided as Appendix C.

§257.73(c)(1)(xi): The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

The construction specifications and provisions for surveillance, maintenance, and repair of the Cell 004 are discussed in the “Pond 001, The Ash Pond Series Operating and Management Plan” by AECI dated 3 January 2012 provided as Appendix D.

<u>§257.73(c)(1)(xii)</u>: any record or knowledge of structural instability of the CCR unit.

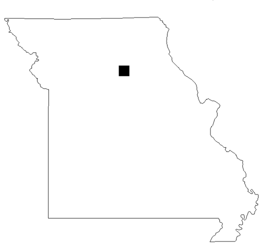
There are no records or knowledge of structural instability associated with Cell 004.

Cc: Kim Dickerson-AECI;
Steve Putrich/Jason Pokorny-Haley & Aldrich

APPENDIX A
Site Locus

MAP SOURCE: ESRI

SITE COORDINATES: 39°32'28"N, 92°38'26"W



ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER - POND 4
CLIFTON HILL, MISSOURI

PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT
SEPTEMBER 2016

FIGURE 1

40616_1_LOCUS.PDF

APPENDIX B

Excerpts from:

Slope Stability and Seepage Analysis Ash Pond No. 3

By Geotechnology, Inc., Dated February 3, 2012

SLOPE STABILITY AND SEEPAGE ANALYSIS
ASH POND NO. 3
THOMAS HILL ENERGY CENTER
CLIFTON HILL, MISSOURI

Prepared for:

ASSOCIATED ELECTRIC COOPERATIVE, INC.
Springfield, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Geotechnology Project No. J011309.02

February 3, 2012

LABORATORY TESTING

Laboratory testing was performed to estimate pertinent engineering and index properties of the soil. Moisture contents were determined for cohesive soil samples, and Atterberg limits tests were accomplished on selected samples. An unconfined compression test was performed on a selected Shelby tube sample. Results of the laboratory tests are presented on the boring logs.

A multi-point, consolidated-undrained, triaxial compression test with pore pressure measurements (R-bar test) was performed on a selected Shelby tube sample. Summary results of this test are provided in Appendix C.

SECTION IV - SUBSURFACE CONDITIONS

STRATIGRAPHY

The embankments of Ash Pond No. 3 consist of clay fill with gravel and coal. The underlying, natural soils consist generally of clay and silty clay. Siltstone and shale bedrock occur at an approximate depth of 27 feet.

The fill embankments extend to approximate depths of 10 to 13.5 feet in the borings. The embankments consist generally of brown, gray, and tan clay with variable amounts of gravel and coal. The clay is high plasticity based on Atterberg limits test results. SPT N-values in the fill range from 4 to 9 blows per foot (bpf). Samples of the fill had moisture contents of 21 to 30 percent. Shelby tubes collected in the fill had dry unit weights of 91 to 98 percent per cubic foot (pcf). A shear strength of 940 psf was obtained from an unconfined compressive strength test on a Shelby tube sample.

The fill embankments are underlain by tan and gray to blackish-gray, clay and silty clay soils with trace amounts of gravel. The clay and silty clay are high and low plasticity, respectively, based on Atterberg limits test results. Shelby tube samples of the clay had dry unit weights of 91 to 92 pcf. Moisture contents in the natural soils range from 22 to 30 percent. The soils are generally stiff in Boring B-4 and soft in Boring B-5.

Bedrock consisting of soft, tan siltstone and gray shale occurs at an approximate depth of 27 feet in the borings. The recovered samples were soft and highly to moderately weathered. Moisture contents in the rock range from 14 to 17 percent. Split-spoon sampler refusal, considered to be a penetration resistance of 50 blows per 6 inches or less, occurred in the rock at approximate depths of 30 to 34 feet. Split-spoon sampler refusal can be indicative of the horizon at which bedrock strength increases due to a decrease in moisture content and weathering. Since rock coring was not performed, the character of the sampler refusal was not determined.

GROUNDWATER

Groundwater was observed during drilling in Boring B-5 at an approximate depth of 15 feet (El 682). Groundwater was not observed during drilling in Boring B-4. Groundwater levels shown on the logs might not have stabilized before backfilling, which is typical in less permeable cohesive soil. Consequently, the indicated or lack of observed groundwater levels might not represent present or future levels. Groundwater levels could vary significantly over time due to the effects of seasonal variation in precipitation, recharge from nearby ponds and creeks, or other factors not evident at the time of exploration.

Approximately one day after drilling Boring B-4, groundwater was measured in an offset, temporary piezometer at a depth of approximately 9.7 feet (El 700).

SECTION V – EMBANKMENT INSPECTION AND GLOBAL STABILITY EVALUATION

As part of the embankment evaluation, seepage and slope stability analyses were performed. Recent surveys of the sites were not performed, and our analyses are based on topographic plans prepared by Surdex Corporation in 2005. We understand that the site grades have not been altered, and that these plans accurately depict the current topography. Results of the analysis are discussed in subsequent sections.

EMBANKMENT INSPECTION

An engineer from Geotechnology visually inspected the existing embankments of Ash Pond No. 3. An inspection checklist and selected photographs of the embankments are included in Appendix D. The photograph locations and viewing directions are shown on Plate 2. Based on our inspection, adverse conditions were generally not observed. However, a wet area was observed at the toe of the slope at the south corner of the ash pond near the location of Boring B-5 (Plate 2). This area should be monitored on a routine basis. Geotechnology should be contacted if the size of the wet area increases and/or other signs of distress are observed.

SEEPAGE ANALYSIS

Geotechnology performed numerical modeling of seepage through and under the fill embankment of Ash Pond No. 3 using the SEEP/W Version 7.16 finite element program developed by GEO-SLOPE International Ltd. SEEP/W allows the embankment and underlying soil stratigraphy to be explicitly modeled with hydraulic conductivity values applied to each soil type.

Seepage was analyzed for a steady-state flow condition with the water level in Ash Pond No. 3 at El 705.9. Seepage models were developed using the existing topography. Model results include seepage direction, flow, and potentiometric head contours through the levee and the underlying soil profile. SEEP/W output plots are presented in Appendix D. A summary of the model results is provided below.

Hydraulic Conductivity. Hydraulic conductivity values can vary greatly depending on soil types, gradations, plasticity, and unit weights. Geotechnology selected order of magnitude values of hydraulic conductivity based on published correlations with soil index properties and engineering judgment. Saturated hydraulic conductivity values applied in the SEEP/W models are summarized in the following table.

HYDRAULIC CONDUCTIVITY VALUES USED IN THE SEEP/W MODELS	
Material Description	**Hydraulic Conductivity (ft/sec)**
Embankment Fill – Clay with Gravel	5×10^{-6}
Clay	5×10^{-9}
Silty Clay	5×10^{-9}
Shale	5×10^{-10}

Calculated seepage flow through the southwest embankment ranges from approximately 3 to 6 gallons per day per lineal foot (gpd/ft) of embankment for normal and maximum pool levels in Ash Pond No. 3 of El 705.9 and El 710, respectively. The calculated seepage flow could be larger or smaller depending on the in-place hydraulic conductivity of the embankment fill. The seepage models indicate maximum exit gradients into surface drainage features of 0.18 to 0.23. By comparison, the USACE allows a maximum exit gradient of 0.50 for its levees.

SLOPE STABILITY ANALYSIS

Slope stability analysis consists of comparing the driving forces within a slope to the resisting forces and determining the factor of safety. Gravity forces tend to move the slope downwards (driving force), while resisting forces derived from the soil shear strength tend to keep the slope in place. When the driving force acting on the slope is greater than the resisting force, sliding can occur. The factor of safety of the slope is the ratio of the restraining force divided by the driving force. Generally, when the factor of safety is 1.0 or less, the slope is considered to be unstable. In accordance with Missouri Department of Natural Resources (MDNR) permit requirements for dams (10CSR22-3), a minimum factor of safety of 1.5 is required for steady-state seepage at normal pool, 1.3 is required for steady-state seepage at maximum pool, and 1.0 is required for pseudo-static seismic loading conditions.

Slope stability analyses were performed at the critical section of the Ash Pond No. 3 fill embankment, which was considered to be the south corner. The cross-section location is represented by Section A-A’ on Plate 2. Soil properties used in the analysis were selected based on laboratory triaxial compression testing, published correlations with soil index properties, and

Geotechnology's experience with similar materials. The soil properties used in the models are summarized in the following table:

SOIL PROPERTIES USED IN THE SLOPE STABILITY MODELS				
Soil Type	**Density (pcf)**	**Static**		**Seismic**
		Cohesion (psf)	**Friction Angle (°)**	**Undrained Shear Strength (psf)**
Embankment Fill	129	20	23	700
Clay	118	0	26	900
Silty Clay	118	0	26	400

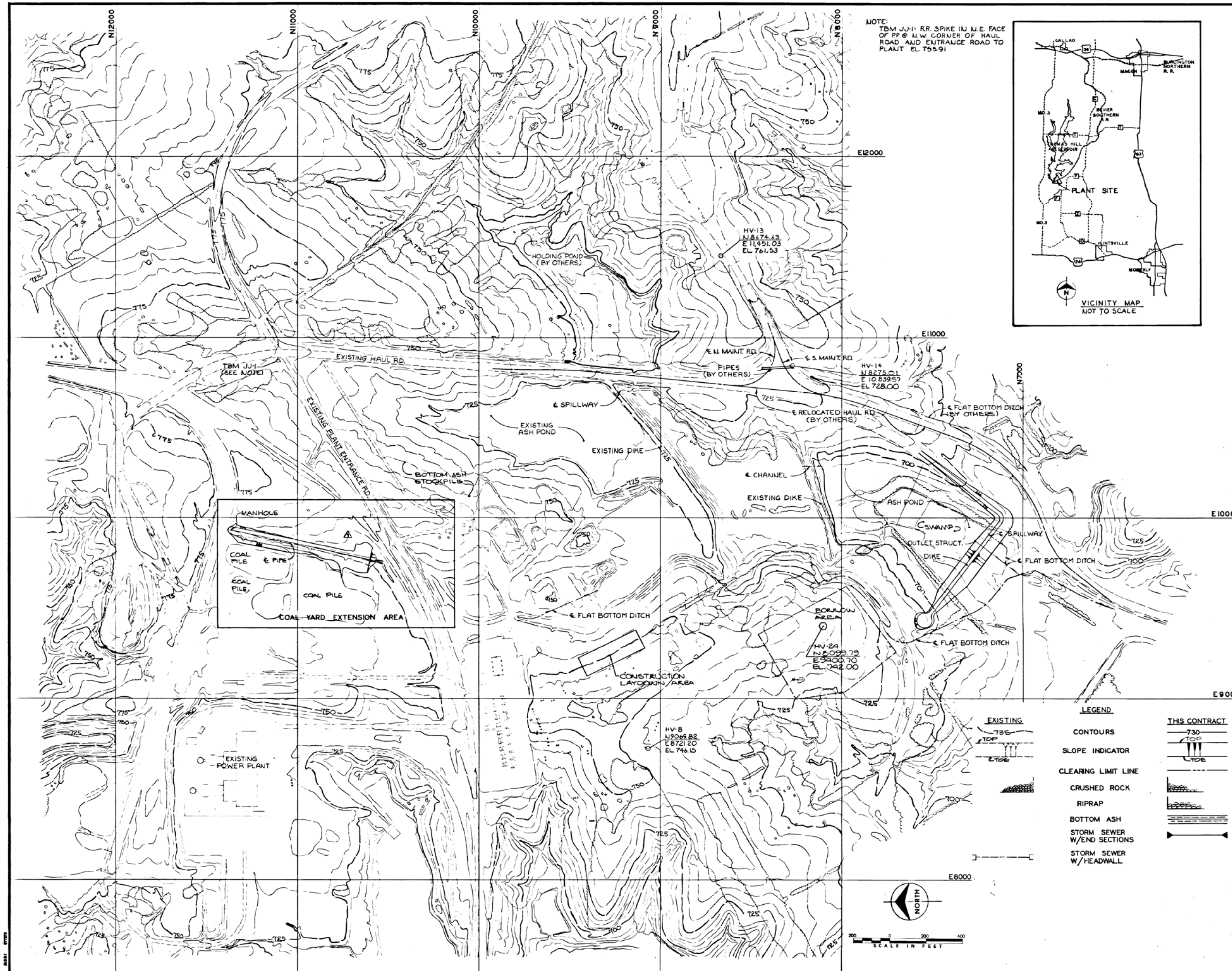
Geotechnology performed stability analyses for deep seated, global failure of the embankment using the SLOPE/W Version 7.16 software developed by GEO-SLOPE International Ltd. We analyzed the section for steady-state seepage conditions by importing seepage forces from the corresponding SEEP/W model for steady-state flow. Spencer's procedure was used to compute factors of safety. Global stability analysis results are summarized in the following table; selected SLOPE/W output plots are presented in Appendix E.

Geotechnology performed stability analysis for deep seated, global failure of the embankment. The computer program SLOPE/W was used to perform the computations. Since the embankment has been in place for several years, long-term stability of the embankment was analyzed (i.e., effective stress conditions). The normal pool level at the pond was considered to be at El 706 based on the 2005 topographic survey. Spencer's procedure was used to compute factors of safety. The calculated factors of safety are given in the following table. A representative cross-section of the embankment is presented in Appendix E.

Pseudo-static seismic analyses were performed on the embankment section using 20% of the horizontal probable maximum acceleration of bedrock (PMA) of 0.20g as required by the State of Missouri Dam and Reservoir Safety Council per 10 CSR 22-3.030 (Table 4, Zone E, Environmental Class III).

SLOPE STABILITY ANALYSIS RESULTS				
Cross Section	**Description**	**Condition**	**Target Factor of Safety**	**Calculated Factor of Safety**
A-A'	South Embankment, Exterior Slope	Static, Normal Pool	1.5	1.8
		Static, Maximum Pool	1.3	1.4
		Seismic, Normal Pool	1.0	1.9

APPENDIX C
Drawings Y6-Y9, Y12, and S1:
By Burns and McDonnell dated December 1, 1978



NO.	DATE	BY	REVISION
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1	7-24-79	DLM	(G-5) REVISE COAL YARD EXTENSION AREA.
	7-27-79	RAW	ISSUED
2	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI
RICHARD A. WHEATON
NUMBER E-12309
REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT

ASH POND FACILITIES #2

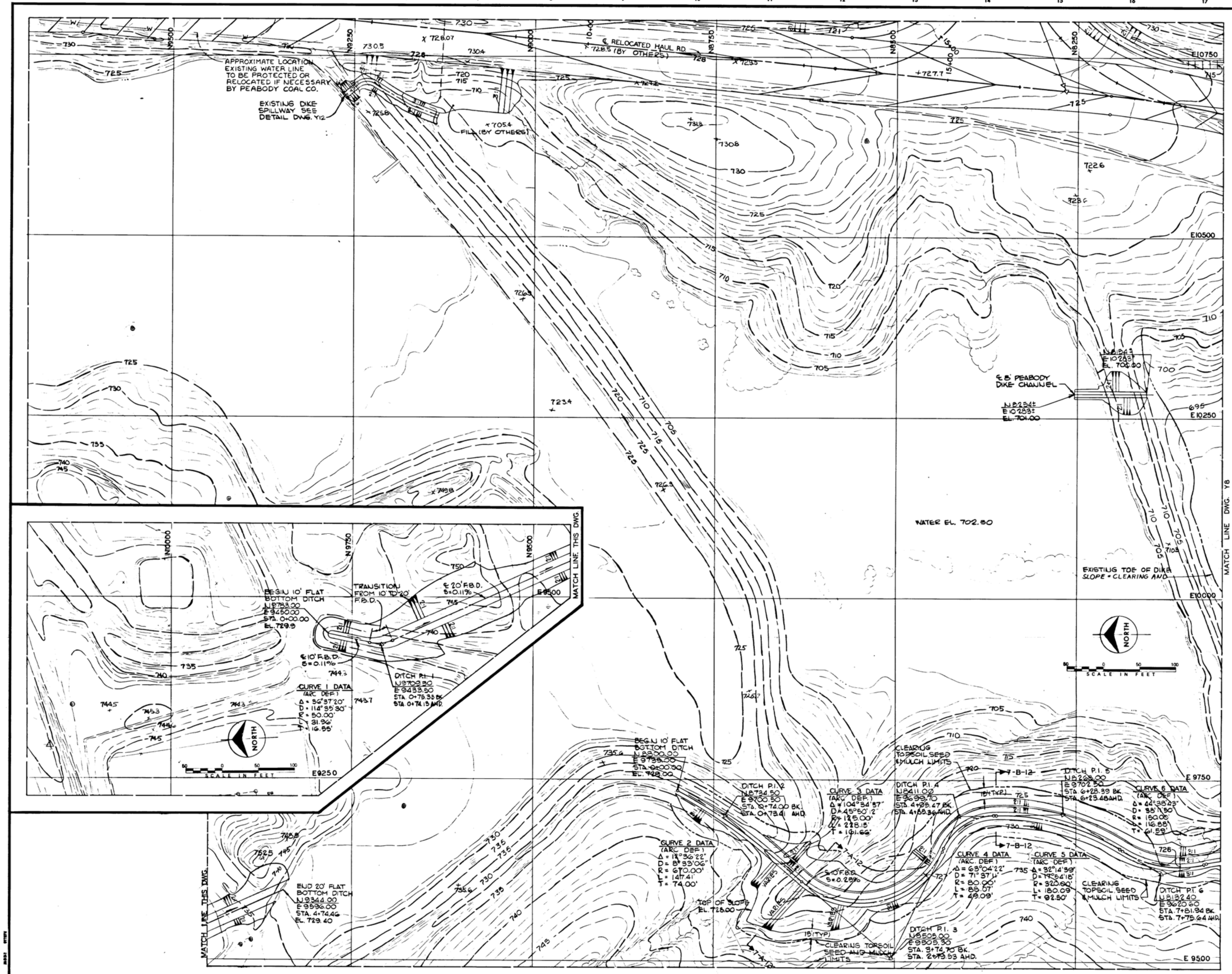
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73

CONTRACT NO. 142

SITE PLAN

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE DEC. 1, 1978	DRAWING NO. Y6 REV. 2
DESIGNED GAGNE	
DETAILED ALLEN	PROJECT 75-077-1-032
CHECKED WWH	SHEET OF SHEETS



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS BID
1	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

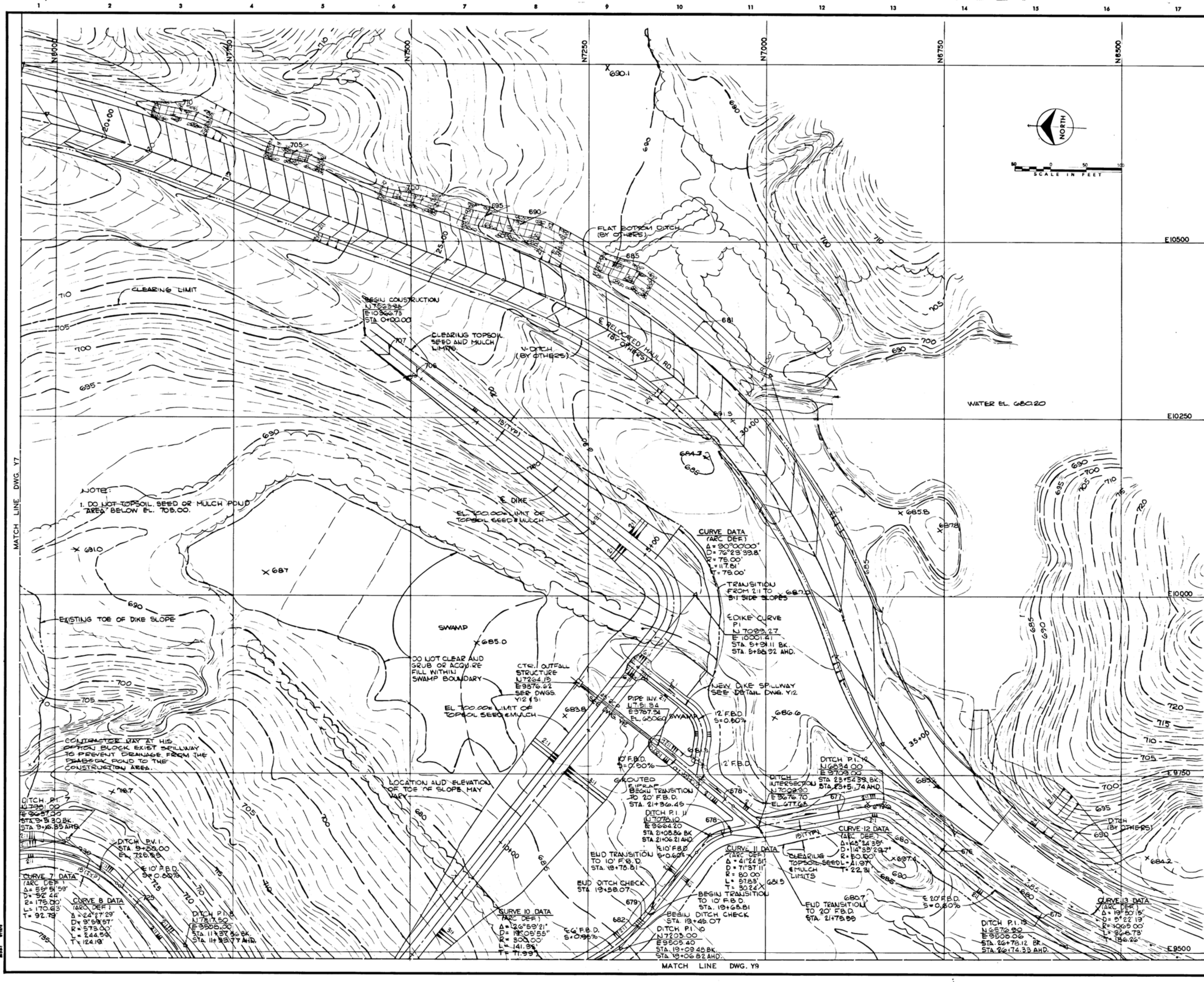
STATE OF MISSOURI · RICHARD A. WHEATON · NUMBER E-12309 · REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT
ASH POND FACILITIES #2
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73
CONTRACT NO. 142

GRADING PLAN 1

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE	DEC. 1, 1978	DRAWING NO. Y7	REV. 1
DESIGNED	WHEATON		
DETAILED	MADDOCK	PROJECT	75-077-1-032
CHECKED	WWH	SHEET OF SHEETS	



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS BID
1	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

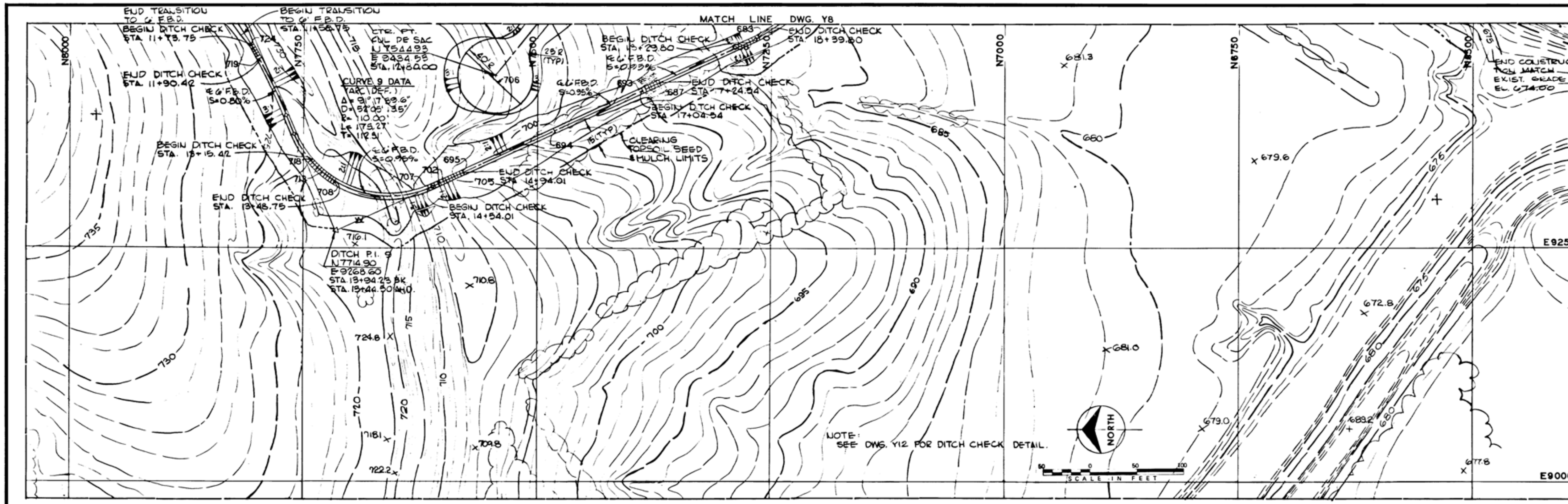
STATE OF MISSOURI
RICHARD A. WHEATON
NUMBER E-12309
REGISTERED PROFESSIONAL ENGINEER

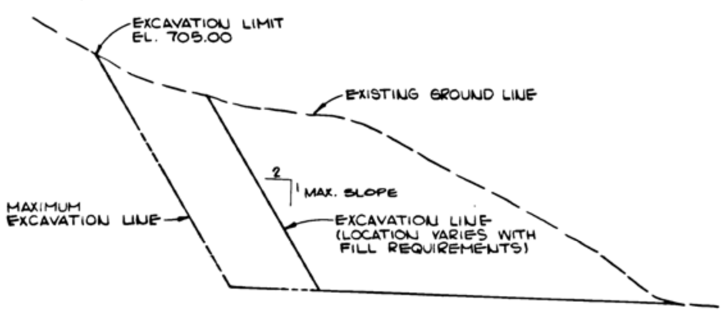
THOMAS HILL POWER PLANT
ASH POND FACILITIES #2
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73
CONTRACT NO. 142

GRADING PLAN II

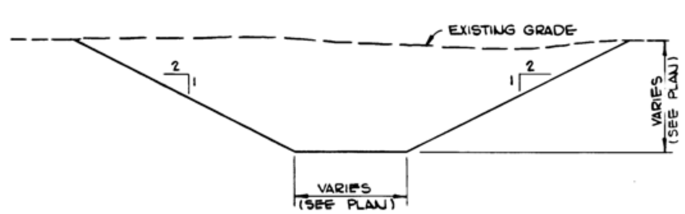
Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE DEC. 1, 1978	DRAWING NO. Y8 — REV. 1
DESIGNED WHEATON	
DETAILED MADDOCK	PROJECT 75-077-1-032
CHECKED WWH	SHEET OF SHEETS

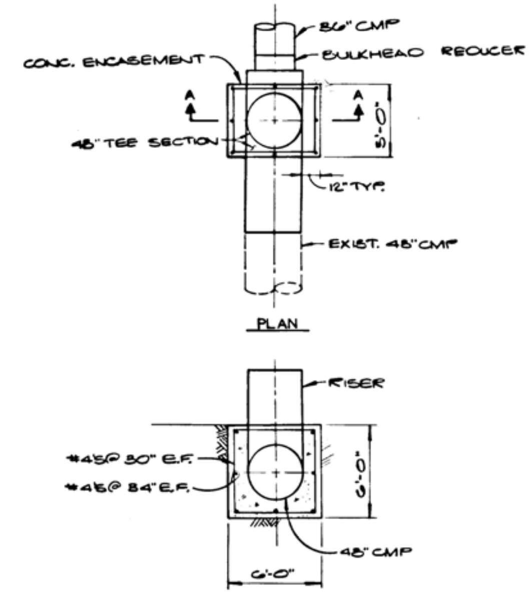




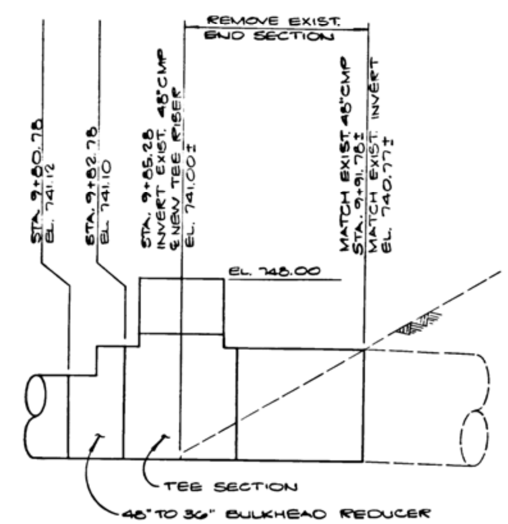
BORROW DETAIL
NOT TO SCALE



TYPICAL DITCH SECTION
NOT TO SCALE



48" TEE SECTION ENCASEMENT DETAIL
NOT TO SCALE



PIPE PROFILE DETAIL
NOT TO SCALE

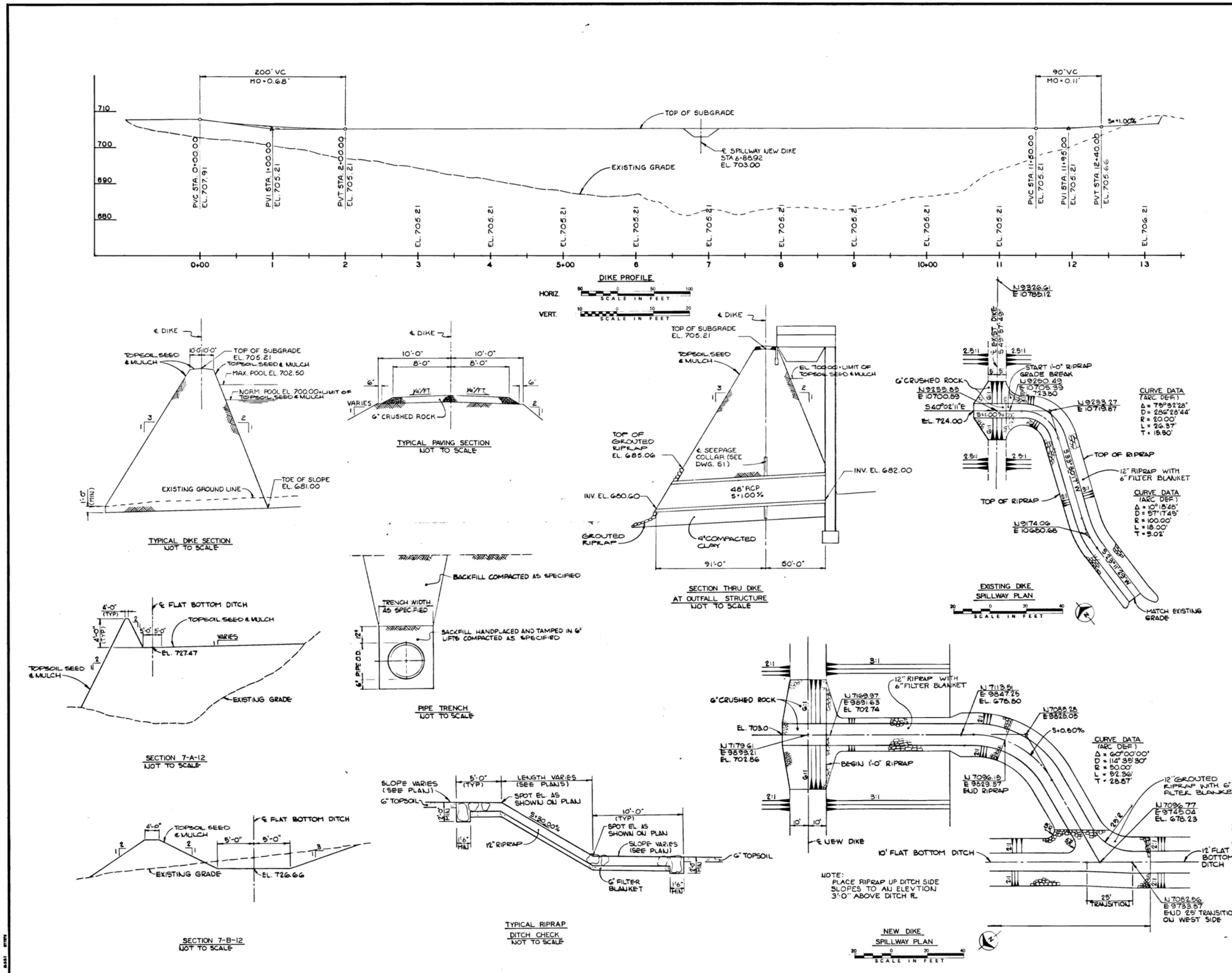
NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS BID
△	7-23-79	DLM	(J-12) ADDED PIPE PROFILE DETAIL & 48" TEE SECTION ENCASEMENT DET.
	7-27-79	RAW	ISSUED
	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

RICHARD A. WHEATON NUMBER E-12309 STATE OF MISSOURI REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT
ASH POND FACILITIES #2
ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73
CONTRACT NO. 142
GRADING PLAN III

Burns & McDonnell
Engineers–Architects–Consultants
KANSAS CITY, MISSOURI

DATE DEC. 1, 1978		DRAWING NO. Y9	REV. 1
DESIGNED WHEATON			
DETAILED MADDOCK		PROJECT 75-077-1-032	
CHECKED WWH		SHEET OF SHEETS	



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS BID
1	3-10-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI
RICHARD A. WHEATON
NUMBER E-12309
REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT

ASH POND FACILITIES #2

ASSOCIATED ELECTRIC COOPERATIVE

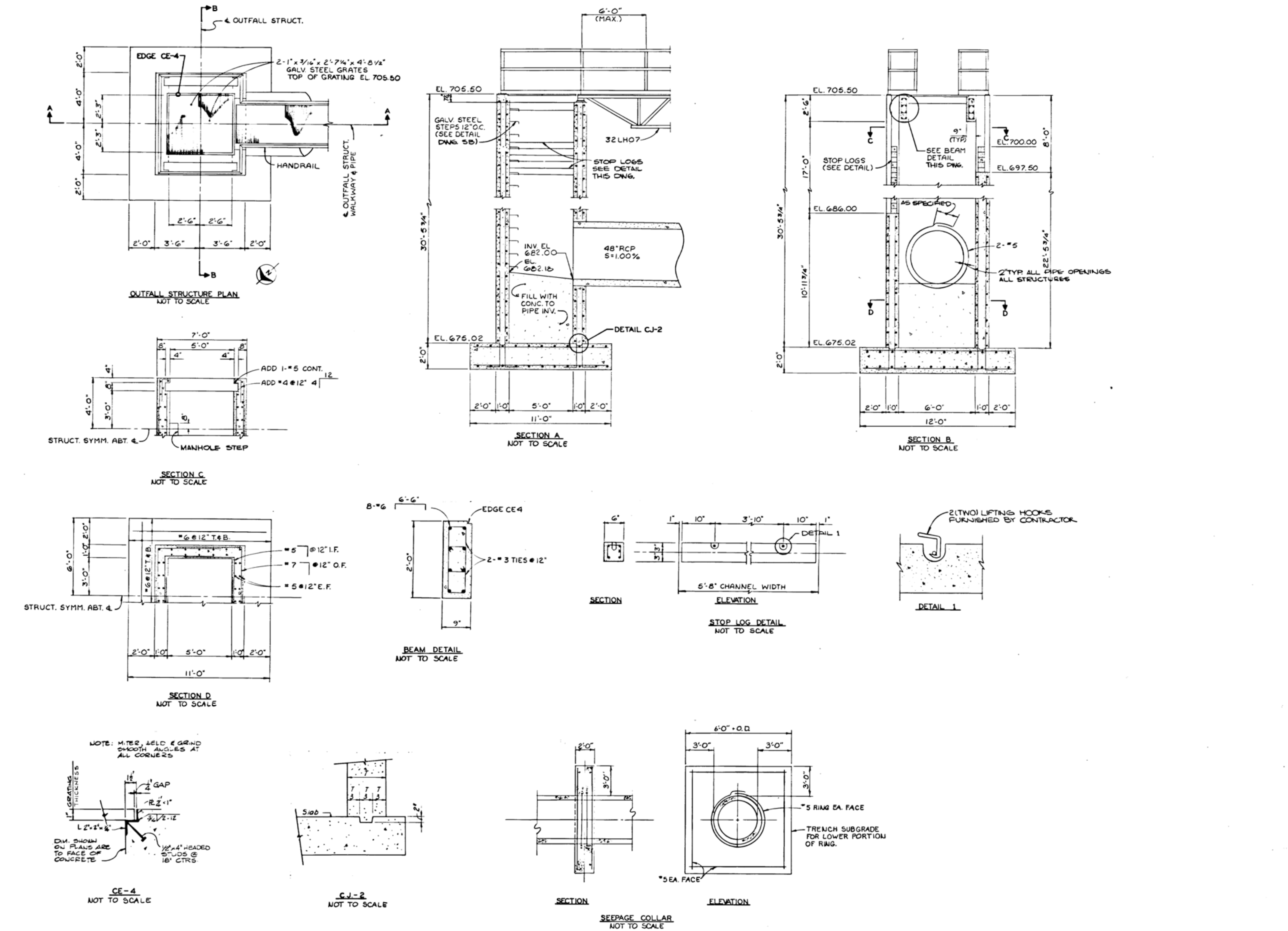
MISSOURI 73

CONTRACT NO. 142

DIKE PROFILE AND GRADING SECTION

Burns & McDonnell
Engineers–Architects–Consultants
KANSAS CITY, MISSOURI

DATE DEC. 1, 1978	DRAWING NO. Y12 REV. 1
DESIGNED GAGNE	
DETAILED HADDOCK	PROJECT 75-077-1-0??
CHECKED WWH	SHEET OF SHEETS



NO.	DATE	BY	REVISION
	6-8-79	RAW	ISSUED AS B:D
1	5-13-80	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI
RICHARD A. WHEATON
NUMBER E-12309
REGISTERED PROFESSIONAL ENGINEER

THOMAS HILL POWER PLANT

ASH POND FACILITIES

ASSOCIATED ELECTRIC COOPERATIVE
MISSOURI 73
CONTRACT NO. 142

OUTFALL STRUCTURE DETAILS

Burns & McDonnell
Engineers–Architects–Consultants
KANSAS CITY, MISSOURI

DATE	DEC. 1, 1978	DRAWING NO. S1	REV. — 1
DESIGNED	GAGNE		
DETAILED	GAGNE	PROJECT	75-077-1-032
CHECKED	WWH	SHEET OF SHEETS	

APPENDIX D
Pond #001,The Ash Pond Series
Operating Management Plan
Dated January 3, 2012

Pond #001, the Ash Pond Series

Operating and Management Plan

1/3/2012 (Revised 12/14/2012)

Overview -

The ash pond series consists of 4 cells, each of which performs a vital function in separating ash and sediment from the clean discharge water.

At the head of the series are Cells 1 and 2. Cell 1 sits inside Cell 2 and collects the pipe-discharged, slag slurry sluiced from the power plant. Cell 2 receives some runoff from the plant's coal yard as well as the slag solids, which are mechanically moved with heavy machinery from Cell 1 to Cell 2.

The purpose of Cell 2 is to collect the slag generated by the power plant. As such, an ash recycling contractor stages a slag recovery and sizing operation on this cell. The waste solids are removed to the plant's permitted utility waste landfill. The water discharge from Cell 2 flows into Cell 3 through the principal spillway discharge weir located on the eastern side of the Cell 2 dam. Similarly, the water discharge from Cell 1 flows to Cell 3. The path differs, however, with flow entering Cell 3 from the western side, through a stream-like channel that also carries the majority of the coal yard runoff, be it storm water, wash water, or pumped discharges.

The sediments carried into Cell 3 drop out in this pool. Cell 3 is managed to capture the particles separating the water through gravitational settling. The water then discharges through the principal spillway weir in the Cell 3 dam into the pool of Cell 4.

Cell 4 is a polishing pond, collecting the finest of sediments before allowing flow from the plant's NPDES permitted discharge point, #001, located at the outlet of the Cell 4 principal spillway weir. The final discharge water joins the Middle Fork of the Little Chariton River after flowing overland for about one quarter mile. Please see the diagram below for a visual depiction:

Operation –

Water pumped from the Thomas Hill Reservoir transports the slag, primarily from Thomas Hill Units 1 and 2, through an abrasion resistant, ceramic lined (Abersist) pipeline to Cell 1 of the Ash Pond Series. A small flow from the Thomas Hill Unit 3 economizer screens also joins the pipeline discharge. Slurry flow usually is continuous, but a water conservation mode can be implemented, if needed, to help reduce the amount of water removed from the Thomas Hill Reservoir, or to support low flow needs within the pond system for maintenance work or for water quality consideration. (The Operations Department manages sluice line operation when low flow conditions warrant.)

Sluice Pumps * -			Continuously Pumped	+	Sluiced	=	Total from Sluice Pumps
	(GPM)		(gallons / year)		(gallons / year)		(gallons / year)
Unit 1	1,500		721,440,000		90,180,000		811,620,000
Unit 2	2,700		1,318,032,000		164,754,000		1,482,786,000
Unit 3	20		10,512,000		0		10,512,000
Total							2,304,918,000
* Calculation basis: Unit 1&2 - One pump on each unit runs continuously. Sluice every 4 hours, 30 minutes per unit. Sluicing requires 2 pumps.							
	2011 - No water conservation measures were in place.						
	Unit 3 - A continuous flow, measured by Operations as 5 gallons every 15 seconds, is pumped from U3 and joins U2 sluice line discharge.						
	Unit 3 source of flow - spray nozzles in the economizer ash tanks on the 6th floor.						
	Water source is circulating water pumps at the intakes and the discharge follows the sluice lines to discharge through #001 into the Middle						
	Fork of the Little Chariton River.						

During periods when the Thomas Hill Reservoir water levels are below the permanent pool elevation of 712 feet, the ash pond discharge provides the primary flow to the Middle Fork of the Little Chariton River. In an agreement with the Missouri Department of Conservation (MDC), the plant is obligated to provide a 5 cubic feet per second (cfs) flow to the river, either through the hole in the reservoir principal spillway, or through the ash pond. During non-drought conditions, discharge flow is more than sufficient to support the MDC obligation. Ash pond discharges average 15 cubic feet per second, continuously (NPDES weekly monitoring records).

Maintenance –

Cell 1 - The pipeline, which receives a daily visual inspection for leaks (Operations Department, Daily Environmental Report) discharges into Cell 1. Solids build up and are pushed out with heavy equipment. The Materials Handling Department moves the slag from Cell 1 to Cell 2 as needed, but usually on a weekly or bi-weekly (every other week) basis.

Water flows around the horse shoe shaped pond, maximizing retention time to allow the majority of the slag particles to settle within the pond. Water discharge typically is not controlled or manipulated, but simply is allowed to discharge through the principal spillway weir.

Cell 2 – The recycling contractor, currently the Harsco Company operates on Cell 2, under their own direction. Routinely the plant Environmental staff, Material Handling Department, and Harsco discuss operations and sediment control techniques on the cell. Material Handling supervisors observe the operation daily and coordinate waste removal with the Harsco crew. Quarterly, the Environmental staff inspects the operation regarding spill prevention, control and countermeasures.

The Materials Handling Department manages the principal spillway weir. Pool is maintained at the agreed upon level. After consultation with the Environmental staff and Harsco, if affected, weir boards are removed or added as needed. The weir stop logs allow water level adjustments in 6-inch increments and may be used to facilitate the operation, such as lowering water level during annual channel cleanout. A channel without ash is maintained adjacent to the dam. Sediments are removed annually. Water level is dropped to allow settling before discharging.

<u>Cell 3</u> – The pond is the workhorse of the system, treating sediment laden water by promoting settling. A baffle (dike) extends out from the western shore, downstream from the overland flow channel that brings water into the pond from Cell 1 and from the Coal Yard. Similarly, on the eastern side, the principal spillway weir discharges flow from Cell 2 that travels toward the west before entering the main body of the pond. Both arrangements ensure that the flow slows, since it takes a longer distance to travel through the pond before discharging, thus prompting the sediment load to drop out. Accumulation is heavy on the north end, along the toe of the Cell 2 embankment, which is one of the pond's challenges.

The Cell 2 embankment toe is inundated with the pool water of Cell 3, and subsequently with the sediment as well. Care must be taken when removing sediment, to insure the integrity of the upstream dam. Also complicating management of the cell are two large transmission power lines that bisect the pond, a 161Kv and a 345Kv line. A 20 foot buffer zone must be maintained around the lines to avoid arcing, and the lines sag with increasing weather temperatures, limiting the use of equipment under the lines. The third challenge in Cell 3 is an underwater embankment that parallels the controlling structure. It can be seen on the design drawings. The ash pond capacity was increased in the early 1980s, with construction of an independent dam downstream, flooding the old dam in place. When the water level is lowered in Cell 3, the old dam can become exposed, allowing an increased sediment load as water cuts into the old clay dam surface. Sediment loading must be watched when 2 or more stop logs are removed below permanent pool.

Management of the pond centers on making it function as a sediment collection basin, maximizing its shape to support sedimentation, and working through the challenges. Cleaning the pond is essential to assuring adequate capacity, thus the need for a distinct dredging plan to insure timely removal of the sediment.

<u>Dredging Plan</u> – A contracted dredge is used routinely to clean Cell 3 of the Ash Pond. The waste is pumped through a semi-permanent pipeline to the AECI-owned, Utility Waste Landfill # 717502. Past dredging has occurred roughly every seven years, but with the 2011 completion of the pipeline construction, more frequent dredging becomes economical. The pipeline is a 12-inch, high density polyethylene, welded pipe. It follows the terrain, so increasing elevation toward the landfill cell prompts the need for a booster pump. The pipe is flanged at the low point in the line, with the site being located at a point where a concrete pad sits inside a spill containment area. The contractor is able to set his booster pump on the pad and quickly hook up to the pipeline. The slurry discharges into the western end of Ash Cell #3 in the landfill.

About 18,000 cubic yards were dredged from the southern half of Ash Pond Cell 3 in 2011. Removal is needed in the northern half and is planned for 2013. Since this area is full above current pool elevation, dry removal is being discussed for 2013. Operational support would involve lowering, rather than raising the water level to accommodate the operation. Once capacity is reestablished, dredging will proceed at two year intervals, as follows: Dredge southern half of pond in 2015. Dredge northern half of pond in 2017. Dredge southern half in 2019, northern in 2021, with this recurrence interval continuing into the future.

Operationally, the plant will support the contracted dredging projects, primarily through water level fluctuation. The Materials Handling Department will add water depth as needed to float the dredge. Depth requirements may vary with the type of dredge deployed. Weir boards, or stop logs are added for short durations to increase pool depth in 6-inch intervals. When 3 boards have been added, it becomes necessary to seal the emergency spillway (ES). Clay is placed over the rock surface of the ES. One more stop log may be added to achieve maximum pool depth. At this level, the dam still has 2 feet of freeboard. Weather conditions are monitored to assure removal of the clay ES plug should a potential arise for a storm flow level increase. The Environmental staff and the Materials Handling Department coordinate to remove the boards if storm flow warrants. Operational measures also can help to influence water level, such as implementing water conservation measures to decrease inflow, or by doing the reverse. Wash water in the coal yard also can be managed to help establish the desired pool elevation. Significantly slowing Cell 3 discharge or raising the pool above the old submerged dam are the best ways to control sediment load leaving the pond.

Cell 4 – The final discharge point from the Ash Pond Series, Cell 4 functions as a settling basin. Permanent pool, design elevation is maintained in this pond. If a change is needed to facilitate a non-routine maintenance activity, the departments coordinate to assess risks and to develop an individual plan for the specific task.

Plant chemical lab technicians check water quality weekly at the discharge from Cell 4. The location is marked with a labeled, red post. If trouble shooting, control points (identified with white stakes) may be used for sampling. Though rare, quality problems are reported to the assistant plant chemists and to the environmental staff. Appropriate responses are coordinated with the Materials Handling Department.

Parameters of concern include total suspended solids and oil and grease. For instance, if an increasing suspended solids trend is developing, upstream sediment sources are evaluated and cleaned up if possible. If not possible, control alternatives within the cells exist: Incoming water flow can be reduced, a weir board may be added to the Cell 3 principal spillway, or to the Cell 2 principal spillway if the source is in that cell, thus allowing additional settling time. The pool area of each cell is observed daily for the presence of an oil sheen. Oil absorbent booms are in place at each discharge structure. The Materials Handling Department responds to an oil sighting, using spill control and clean up products to contain and remove the sheen. If discharge manipulation is needed, it is coordinated between the departments, again with the options of reducing incoming water flow from plant operations, a weir board may be added to the Cell 3 principal spillway, or to the Cell 2 principal spillway if the source is in that cell. A portable pump also may be placed to run pump-back operations geared at reducing or stopping flow while cleanup is started.

Documents -

Structural stability reports are available for each cell, and design drawings are available for Cells 1, 3 and 4. They are accessible in plant environmental files or in RX Index.

Ash Pond #001 Specs -											
Cell Description	**Cell Number**	**Top of Dam (TOD)**	**Down stream Toe**	**Normal Pool**	**Emergency Spillway (ES) Dimensions**			**Principal spillway (PS) Dimensions (elev. Ft.)**			
		Elevation (ft)	**Elevation (ft)**	**Elevation (ft)**	**Crest Elevation (ft)**	**Control Section**	**Side Slopes (perpendicular to flow)**	**crest (normal pool)**	**Stop log extent**	**pipe invert elevation**	**Stop log height (in)**
Dewater pond	1	740		731	na			731			6
Slag Pond, supporting slag recycling operation	2	726.5	692-695 *	723.4	724						6
(Submerged Dam in pool of Cell 3)		710.3	692	-	702.5						
Coal Yard Sediment Control Basin	3	717	690	713 **	715	10'x10'	6:1				6
Polishing Pond; final discharge water	4	705.2 - 705.7	681	700	703	10'x10'	6:1	700	682.2	680.6	6
* Underwater and covered with sediment											
** Estimated relative to TOD and ES. (2005 elevation discrepancy should be resolved the next time a land survey crew performs work on the Ash Pond Series)											

Actions Upcoming:

Project # 1301020 is planned for execution in 2013: Removal of Waste Ash From Cell 2. The project involves removal of 352,000 cubic yards of waste fly ash, and slag from the eastern side of Cell 2. The waste will be hauled to Landfill Cells 2 and 3 for final disposal, leaving the ash pond cell as solely a slag recycling operation.

Survey drop log spillway structures to determine heights, and confirm structure elevations to establish relationship between PS, ES and TOD and to resolve discrepancy with 2005 flown topography. *(complete when surveying for waste ash removal project, Spring 2013)*

Project # 1300380 is planned for execution in 2013: Dredging of sediments from Cell 3. Discussed in the dredging plan, this effort needs to focus on removal of the sediments deposited in the northern part of the cell.

Tentative, possibly in the future: Draft NPDES permit, under negotiation discusses a ground water monitoring program around the Ash Pond Series.