FINAL

Coal Combustion Waste Impoundment

Round 7 - Dam Assessment Report

Sibley Generating Station

Fly Ash Pond

KCP&L Greater Missouri Operations Company

Sibley, Missouri

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

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

This assessment of the stability and functionality of the Sibley Generating Station Fly Ash Pond management unit is based on a review of available documents and on the site assessment conducted by Dewberry personnel on Wednesday, September 22, 2010. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2.5, there are three recommendations based on field observations that may help to maintain a safe and trouble-free operation. A second pond was also observed on site that was used for slag settling; since the pond was incised no dike assessment was required.

In summary, the Sibley Generating Station Fly Ash Pond is SATISFACTORY for continued safe and reliable operation, with no recognized existing or potential management unit safety deficiencies.

PURPOSE AND SCOPE

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

In early 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion waste. 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 waste release from management units that have or have not been rated for hazard potential classification. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided via telephone communication with the management unit owner. After the field visit additional information was received by Dewberry & Davis LLC about the Sibley Generating Station Fly Ash Pond that was 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).

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 waste 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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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit and review of technical documentation provided by Kansas City Power and Light (KCP&L) Greater Missouri Operations (GMO).

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

The dike embankments and spillway appear to be structurally sound based on a review of the engineering data provided by the owner's technical staff and Dewberry engineers' observations during the site visit. However the slope stability analysis was limited, and did not include long term static or seismic events.

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

Hydrologic and hydraulic data performed by Dewberry indicate adequate impoundment capacity to contain the 1 percent probability design storm without overtopping the dikes.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is adequate. Engineering documentation reviewed is referenced in Appendix A.

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

The description of the management unit provided by KCP&L GMO was an accurate representation of what Dewberry observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management units required to conduct a thorough field observation. The visible parts of the dike embankments and outlet structure 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. Embankments visually appear

structurally sound. There are no indications of unsafe conditions or conditions needing remedial action.

1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the fly ash management unit. There was no evidence of repaired embankments or prior releases observed during the field inspection. Dewberry identified the need for brush clearing and re-sodding on the North dike; a geotechnical engineering firm should be consulted to develop a plan to properly remove brush and re-sod the slope.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. The management unit dikes are not instrumented. Based on the size of the dikes, the history of satisfactory performance and the current inspection program, installation of a dike monitoring system is not needed at this time.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is SATISFACTORY 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) in accordance with the applicable criteria.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Structural Stability

Recommend performing a stability analysis for seismic loading applied to the steady state loading and a static analysis under rapid draw down condition.

1.2.2 Recommendations Regarding the Maintenance and Methods of Operation

The following recommendations may help maintain safe and trouble-free operation:

- Monitor encroachment of vegetation.
- Employ a Geotechnical Engineer to develop a program to safely remove large trees and woody brush and replace with grasses.
- Dewberry recommends that an operations and maintenance (O&M) procedures document be created that includes a Record of Maintenance.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Paul Ling, Kansas City Power & Light
Steve Brooks, Kansas City Power & Light
Bob Beck, Kansas City Power & Light
Michael McLaren, S.E., P.E., PSA-Dewberry
Andrew Cueto, P.E., Dewberry

1.3.2 Acknowledgement and Signature

We acknowledge that the management unit referenced herein has been assessed on September 22, 2010.

STATE OF MISSOURI
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Michael J McLaren, PE (MO 2007032432) 5-15-11

Andrew Cueto, PE, PMP

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

2.1 LOCATION AND GENERAL DESCRIPTION

The Sibley Generating Station is located by the Missouri River bank near Sibley, MO. The plant is operated by KCP&L GMO. The Fly Ash Pond is adjacent to the plant. A project location map is provided in Appendix A – Doc. 02. An aerial photograph of the impoundment is provided in Appendix A – Doc. 01.

The Sibley Generating Station Fly Ash Pond is a continuous native clayey fill embankment that impounds fly ash and pond water. It was constructed in 1977.

The maximum height of the dike is 18 feet. The impoundment area is approximately 15.0 acres and has a storage capacity of 361,000 cubic yards (223.8 acre-feet) (See Appendix A – Doc. 3). Construction began on the dike in 1977, and the plant opened for operation in 1977. Between 1993 and 1994, the west end of the pond was filled (75 x 125 feet) for placement of a new silo.

2.2 SIZE AND HAZARD CLASSIFICATION

The classification for size, based on the height of the dam is "Small" and based on the storage capacity is "Small" in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria summarized in Table 2.2a.

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

	Impoundment	
Category	**Storage (Ac-ft)**	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

Missouri does not have a dam safety program, and the Sibley Generating Station Fly Ash Pond is not in the National Inventory of Dams, therefore the dike does not have an established hazard classification. Dewberry conducted a qualitative hazard classification based on the 2004 Federal Guidelines for Dam Safety classification system (shown in Table 2.2b).

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

	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Loss of human life is not probable in the event of a catastrophic failure of the dikes and a failure of the dikes is expected to have a low economic and environmental impact. Therefore, Dewberry evaluated the fly ash pond as "**low hazard potential.**"

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

The data reviewed by Dewberry did include the volume of residuals stored in the fly ash pond at the time of inspection. The pool elevation is approximately 722 feet, and the surface area of the pond is approximately 15.0 acres.

Table 2.3: Amount of Residuals and Maximum Capacity of Unit

Greene County Fly Ash Pond	
Surface Area (acre)[1]	15.0
Current Storage Capacity (cubic yards)[1]	9,747,000
Current Storage Capacity (acre-feet)	223.8
Total Storage Capacity (cubic yards)[1]	10,260,000
Total Storage Capacity (acre-feet)	235.5
Crest Elevation (feet)	725
Normal Pond Level (feet)	722

[1] See Appendix A – Doc. 03

2.4 PRINCIPAL PROJECT STRUCTURES

2.4.1 Earth Embankment

The dike is an earthen embankment. The crest width is approximately 20 feet. The perimeter of the dike is approximately 5250 feet. The inside slope of the dike embankment is approximately 2:1 on each dike. The outside slopes of the dike embankment range from approximately 2:1 to 3:1 on the east, west dikes. The outside slope embankment is approximately 3:1 on the north dike and 2:1 on the south dike (See Appendix A – Doc. 04, 05). Much of the south embankment is covered in various species of grasses. The outside slope of the east and north and portions of south embankment are covered in dense vegetation (various species of tall grass. trees and other plants). A small portion of the north embankment is also covered in rip-rap.

Table 2.4.1: Summary of Dike Dimensions and Size

	East Dike	South Dike	West Dike	North Dike
Dam Height	18’	18’	18’	18’
Crest Width	20’	20’	20’	20’
Length	500’	2350’	150’	2250
Side Slopes (inside)	2:1	2:1	2:1	2:1
Side Slopes (outside)	2:1 to 3:1	2:1	3:1	3:1
Hazard Classification	low	low	low	low

2.4.2 Outlet Structures

The impoundment has a 48” sharp crested weir inlet elevation at 716.0’ which discharges through a spillway into the Missouri River.

The impoundment has no emergency spillway.

2.5 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

Critical infrastructure inventory data was not provided to Dewberry for review.

Based on available area topographic maps, surface drainage in the area of the Fly Ash Pond is to the northeast. A bend in the Missouri river intercepts surface runoff at the east of the Fly Ash Pond (See Appendix A Doc. 04, 05). Releases from the east side of the impoundment will discharge into the Missouri River. Based on available area aerial photographs and a brief driving tour of the area Dewberry did not identify critical infrastructure assets down gradient of the Fly Ash Pond.

The nearest town, Napoleon, is approximately 7 miles down gradient from the impoundment.

3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

3.1 SUMMARY OF REPORTS ON THE SAFETY OF THE MANAGEMENT UNIT

KCP&L GMO provided one dam safety report of inspections conducted by State of Missouri Department of Natural Resources. The report provided included:

- Utilicorp-Sibley Generating Station, routine inspection, March 5, 2009,(See Appendix A – Doc. 06)

The 2009 report concluded that the structures appeared to be performing adequately and no conditions were observed that would affect the continued safe operation of the impoundment.

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

The State of Missouri has not implemented a dam safety program; therefore there is no local or state permit. However, discharge from the impoundment is regulated by the Missouri Department of Natural Resources.

The impoundment has been issued a Missouri State Operating Permit No. MO 0004871 issued November 3, 2000, and expires November 02, 2005 (See Appendix A – Doc 07). KCP&L GMO filed for a renewal of the permit in 2005, MDNR continues to review the permit for reissuance.

3.3 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted release, or other performance related problems with the dam.

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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 Sibley Generating Station Fly Ash Pond was constructed beginning in 1977, and was completed in 1977. The original design crest elevation was 725 feet (See Appendix A – Doc. 04, 05).

4.1.2 Significant Changes/Modifications in Design since Original Construction

Between 1993 and 1994, the west end of the pond was filled (75 x 125 feet) for placement of a new silo also added was a dewatering dike (See Appendix A- Doc. 8).

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

The impoundment was designed and operated for fly ash sedimentation and control. The pond receives plant process waste water, coal combustion waste slurry. Treated (via sedimentation) process water is discharged through an overflow outlet structure.

4.2.2 Significant Changes in Operational Procedures and Original Startup

No documents were provided to indicate any operational procedures have changed.

4.2.3 Current Operational Procedures

Modification in 1994 which added a fly ash silo redirected precipitator ash pneumatically to the new silo. (See Appendix A- Doc. 9).

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry of other notable events impacting the operation of the impoundment.

5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Michael McLaren, P.E. and Andrew Cueto, P.E. performed a site visit on Wednesday, September 22, 2010 in company with the participants.

The site visit began at 9:00 AM. The weather was warm and cloudy. 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.

The Dam Inspection Checklist is provided in Appendix B. The overall assessment of the dam was that it was in satisfactory condition and no significant findings were noted.

5.2 SOUTH DIKE

5.2.1 Crest

The crest of the south dike had no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory conditions. Figure 5.2.1-1 shows the conditions of the crest of the east dike.

Figure 5.2.1-1. Photo Showing Crest/ inside slope of South Dike.

5.2.2 Inside Slope

The inside dike embankments include areas of bare earth. Figure 5.2.1-1 shows the general condition of the unprotected bare earth interior slope of the east dike. Photographs 2 and 6, Appendix B provide additional views of the crest and inside slope of the south dike.

5.3 EAST DIKE

5.3.1 Crest

The crest of the east dike had no signs of any depressions, tension cracks, or other indications of settlement or shear failure, some minor signs of tire rutting, and appeared to be in satisfactory condition. Figure 5.3.1-1 shows the conditions of the dike crest.

Figure 5.3.1-1. East Dike Crest

5.3.2 Upstream/Inside Slope

The inside slope of the east dike is covered with limited vegetation. There were no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion. Figure 5.3.1-1 shows the general condition of the inside slope of the east dike.

5.3.3 Downstream/Outside Slope and Toe

There were no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion. The outside slope borders areas of dense vegetation including trees. Figure 5.3.3-1 shows the general condition of the outside slope. Appendix B provides additional views of the outside slopes of the east dike.

Figure 5.3.3-1. Photo Showing Typical Condition of Outside Slope of East Dike

5.4 NORTH DIKE

5.4.1 Crest

The crest of the north dike had no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Figure 5.4.1-1 shows the conditions of the dike crest. Photographs 15 – 22, Appendix B provide additional views of the crest of the north dike.

Figure 5.4.1-1. Crest of North Dike

5.4.2 Upstream/Inside Slope

Most of the inside slope of the north dike embankment is covered with limited vegetation. There were no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability or signs of erosion. Figure 5.4.1-1 shows the general condition of the inside slope of the north dike.

5.4.3 Outside Slope and Toe

The outside slope is covered in various species of tall grass, trees and rip rap. There were no observed scarps, sloughs, bulging, cracks, or depressions or other indications of slope instability some limited signs of erosion. The outside slope borders the Missouri River.

Figure 5.4.3-1. Outside Slope of North Dike.

Figure 5.4.3-2. Outside Slope of North Dike Erosion.

5.5 WEST DIKE

5.5.1 Crest

The crest of the west dike had no signs of any depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory conditions. Figure 5.5.1-1 shows the conditions of the dike crest.

Figure 5.5.1-1. Crest of West Dike

5.5.2 Outside Slope

Most of the outside slope is covered in various species of tall grass, and trees. In one area, the outside slope is covered in riprap. There were no observed scarps, sloughs, bulging, cracks, scarps, or depressions or other indications of slope instability or signs of erosion. Figure 5.5.1-1 shows the general condition of the outside dike.

5.6 OUTLET STRUCTURES

5.6.1 Overflow Structure

As described on the discharge stream assembly drawings (See Appendix A- Doc. 10), the impoundment has an 8'-0" x 9'-4" concrete inlet structure with an invert elevation at 722.0' and a steel pipe 12-in diameter which discharges through a spillway into the Missouri River.

The primary overflow structure was observed to be working properly, discharging flow from the pond, and visually appeared to be in satisfactory condition. There was no sign of clogging of the spillway and the water exiting the outlet was flowing clear. Figure 5.6.1-1 shows the main outlet structure. Photographs 12 and 13, Appendix B provide additional views of the spillway riser.

Figure 5.6.1-1. Main Outlet Structure.

5.6.2 Outlet Conduit

The outlet weir appeared to be in good shape and operating normally with no sign of clogging and the water exiting the outlet was flowing clear. Figure 5.6.2-1 shows the water discharging from the main spillway tunnel outfall. Photographs 12 and 13, Appendix B provide additional views of the spillway outfall conduit and channel.

Figure 5.6.2-1. Main Spillway Outfall.

5.6.3 Emergency Spillway

No emergency spillway is present.

5.6.4 Low Level Outlet

No low level outlet is present.

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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.

6.1.2 Inflow Design Flood

Dewberry conducted a hydrologic and hydraulic analysis of the capacity of the Fly Ash Pond to store water from the design storm event (See Appendix A – Doc. 11). The design storm was a 100-year (1 percent probability in a given year), 24-hour event with an estimated intensity of 11.32-inches. The report estimates that the 1 percent probability storm can be retained in the Fly Ash Pond, raising the spillway pond water elevation to about 723 feet, leaving a freeboard of at least 2.0 feet.

6.1.3 Spillway Rating

No spillway hydraulic data was provided for review.

6.1.4 Downstream Flood Analysis

No downstream flood analysis data was provided for review Breach Analysis?

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Supporting documentation reviewed by Dewberry is adequate.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

Based on the calculations provided in the hydrologic and hydraulic study (See Appendix A – Doc 11) the Fly Ash Pond can retain the 1 percent design storm event with a freeboard safety of at least 2.0 feet. Hence dike failure by overtopping seems improbable.

7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

The January 26, 1977 Memorandum Subsurface Recommendation for Fly Ash Pond Missouri Public Service - Sibley, This document (See Appendix A – Doc. 12) includes the original stability analysis for the pond.

The stability analyses included the results of a single loading condition:

- Steady state conditions based on ground water levels measured at the time of the borings.

The stability analyses did not address:

- Seismic loading applied to the steady state loading
- A static analysis under rapid draw down conditions.

Based on the results of the analyses it was concluded that the embankments have stability safety factors at or above the minimum recommended values.

7.1.2 Design Parameters and Parameters of Materials

Documentation provided to Dewberry for review was the January 26, 1977 Memorandum Subsurface Recommendation for Fly Ash Pond Missouri Public Service - Sibley (See Appendix A – Doc. 12).

7.1.3 Uplift and/or Phreatic Surface Assumptions

No documentation of uplift calculations was provided to Dewberry for review. Based on the Geotechnical Findings (See Appendix A – Doc. 14) the initial phreatic surface was assumed to be at the elevation measured in the borings.

7.1.4 Factors of Safety and Base Stresses

The safety factors computed in the Slope Stability Analysis report (See Appendix A - Doc. 12) are listed in Table 7.1.4.

Table 7.1.4 Factor of Safety Sibley Fly Ash Pond

Location	Loading Condition	US Corps of Engineers Recommended Minimum Safety Factors	Inside Slope	Outside Slope
North Dike	Steady State	1.5	1.9	1.77
	Sta 31+00			
North Dike	Steady State	1.5	1.36*	1.21*
	Sta 46+00			
North Dike	Steady State			
	Sta 34+50	1.5	2.23	1.6

* *15 foot bench was added to increase slope stability factor of safety.*

Based on Dewberry's observations at the site, the overflow weir discussed in the slope stability analysis report is the only discharge location provided for the impoundment. As the weir outlet is uncontrolled, it does not provide the capability to conduct a rapid drawdown. Therefore Dewberry concurs with the conclusion that the probability of a catastrophic failure due to a rapid drawdown event is low.

7.1.5 Liquefaction Potential

The documentation reviewed by Dewberry did not include an evaluation of liquefaction potential. Foundation soil conditions do not appear to be susceptible to liquefaction.

7.1.6 Critical Geological Conditions

There was no documentation provided to Dewberry that included an evaluation of Critical Geological Conditions.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is not adequate. The slope stability analysis was too limited, and did not include long-term static or seismic events.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Overall, the structural stability of the dikes appears to be satisfactory based on the following observations during the September 22, 2010 filed visit and dam inspection by Dewberry, available dam inspection report (See Appendix A - Doc. 12):

- The crest appeared free of depressions and no significant vertical or horizontal alignment variations were observed,
- There were no indication of major scarps, sloughs or bulging along the dikes,
- Boils, sinks or uncontrolled seepage was not observed along the slopes, groins or toe of the dikes,
- The computed factors of safety comply with accepted criteria for the condition assessed.

Additional analyses are recommended to address long-term static conditions and seismic events.

8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATIONAL PROCEDURES

The facility is operated for settling pond and storage of fly ash deposits. Treated coal combustion process waste water is discharged through an overflow outlet structure.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

No maintenance plan was supplied to Dewberry for review. Through dam maintenance discussions during the site visit, it appears that the procedures are adequate.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operational Procedures

No operational procedures were supplied to Dewberry for review. Based upon the site visit, however, the current methods of operation appear to be adequate for the fly ash management unit. There was no evidence of prior releases observed during the field inspection. Dewberry recommends that an operations and maintenance (O&M) procedures document be created to formalize onsite activities.

8.3.2 Adequacy of Maintenance

No Record of Maintenance was supplied to Dewberry for review. The current maintenance activities appear to be adequate for the fly ash management unit, based upon discussions during the site visit. There was no evidence of repaired embankments or prior releases observed during the field inspection. Dewberry identified the need for brush clearing and re-sodding on the North dike. Dewberry recommends development of an operations and maintenance (O&M) procedures document that includes creation of a Record of Maintenance.

9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Weekly Inspections

Weekly inspections are conducted by plant personnel. Inspection reports are submitted to the plant manager for review and appropriate corrective actions are supplied in form of work order if required.

Annual Inspections

Annual inspections are conducted by the Missouri Department of Natural Resources. The 2009 inspection report was submitted June 16, 2009 (See Appendix A – Doc. 13).

Special Inspections

No special inspections have been conducted at the Sibley fly ash pond.

9.2 INSTRUMENTATION MONITORING

The Sibley Generating Station fly ash impoundment dikes do not have an instrumentation monitoring system.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

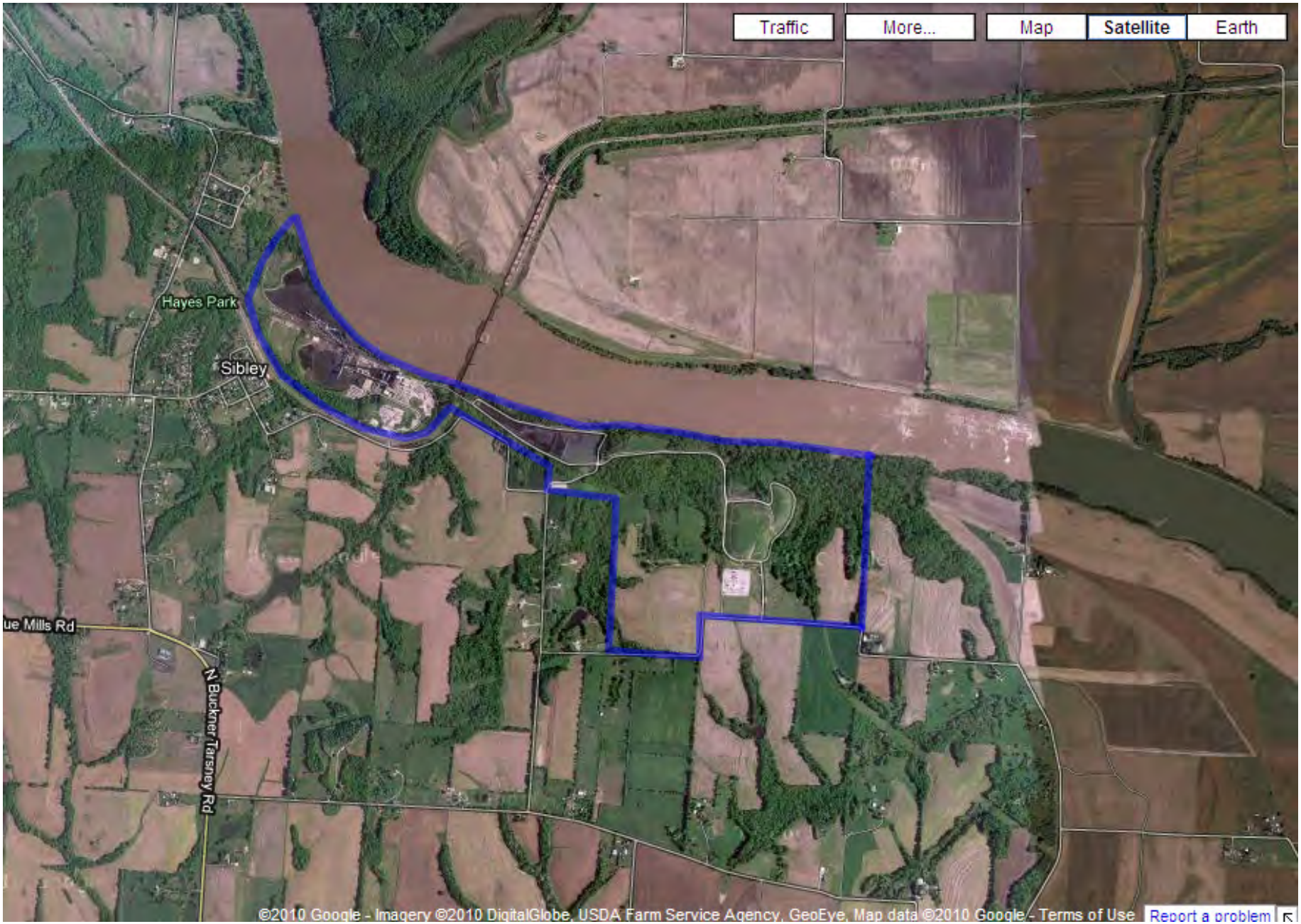
9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate, but should be documented.

9.3.2 Adequacy of Instrumentation Monitoring Program

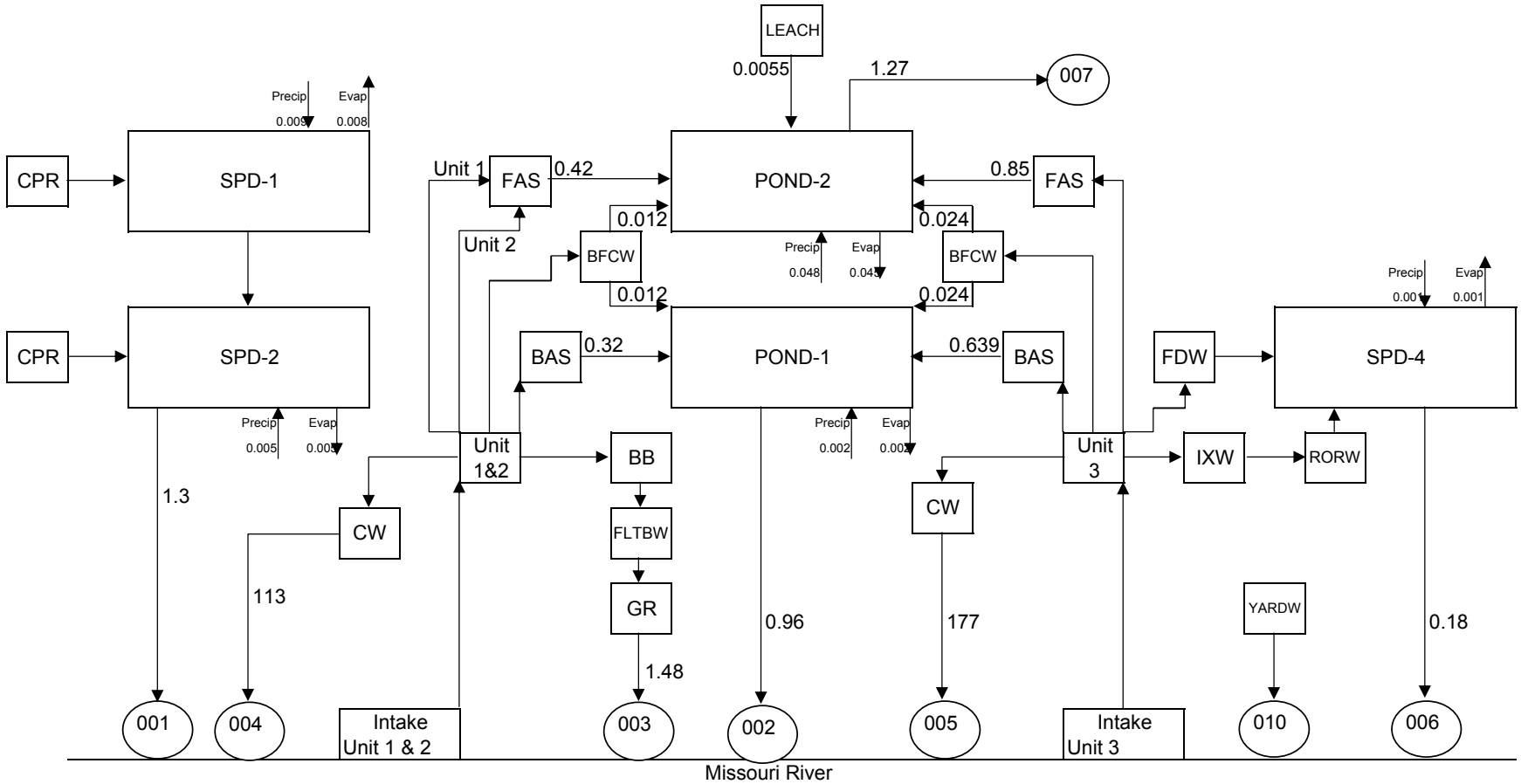
The Sibley fly ash dikes are not instrumented. Based on the size of the dikes, the portion of the impoundment currently used to store wet fly ash and stormwater, the history of satisfactory performance and the current inspection program, installation of a dike monitoring system is not needed at this time.

Plant Name: Sibley Generating Station Plant ID: 06984 Map 1



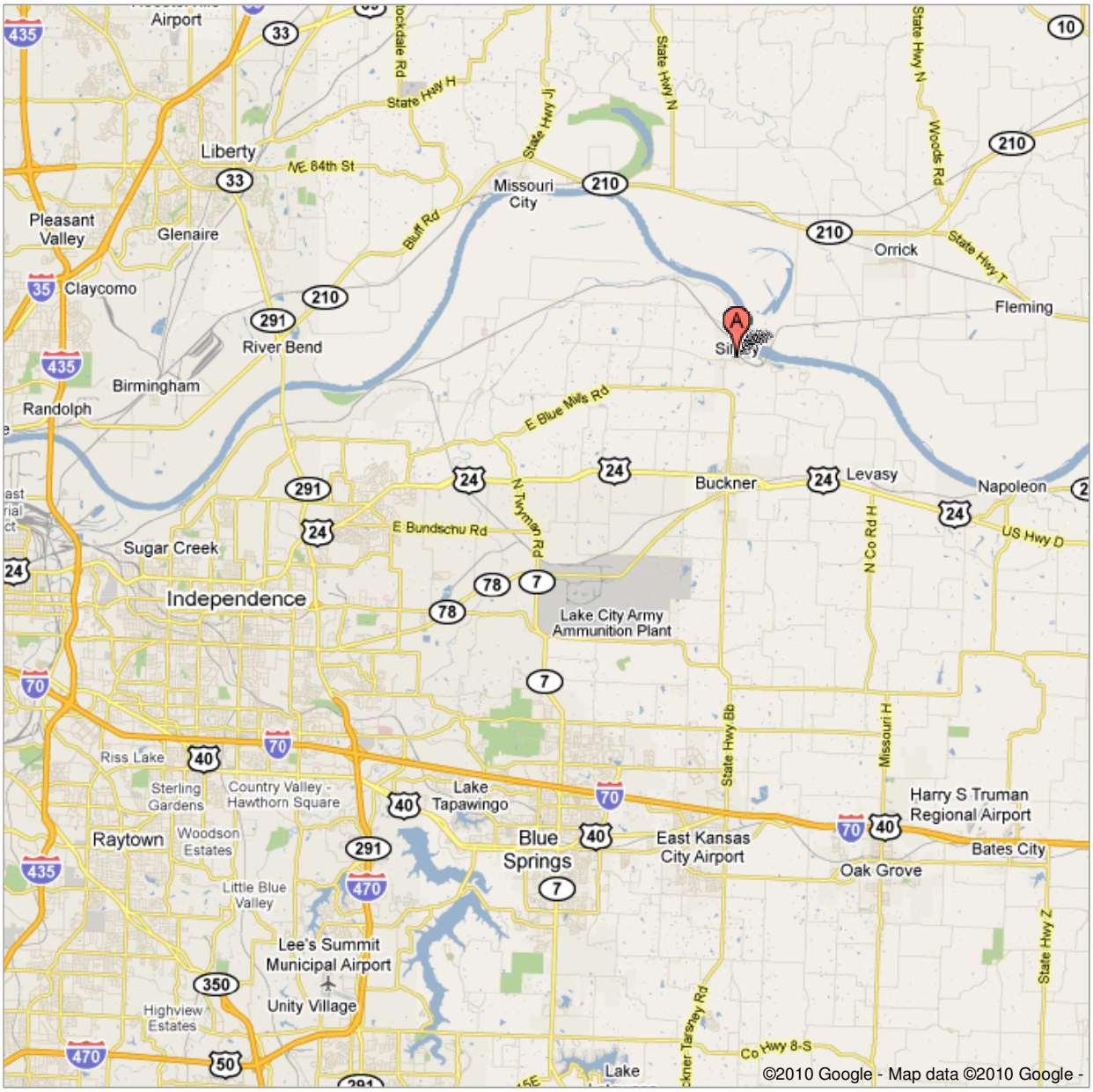
All flows are in MGD

Plant Name: Sibley Generating Station
Plant ID: 06984
WB-1



Google maps Address **Sibley, MO**

Get Google Maps on your phone
Text the word "GMAPS" to 466453



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

Plant ID: 6984
Plant Name: Sibley Generating Station

Steam Electric Questionnaire

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

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Section Title	Tab Name
Part D Instructions	Part D Instructions
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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: 6984
Plant Name: Sibley Generating St

PART D. POND/IMPOUNDMENT SYSTEMS AND OTHER WASTEWATER TREATMENT OPERATIONS

INSTRUCTIONS

Part D requests information about all ponds/impoundments used (or planned to be used or under construction/installation 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. Additionally, Part D requests information about wastewater treatment systems, other than pond/impoundment systems, for the treatment of wastewaters from ash handling or FGD operations that are located at the plant or are planned to be located at the plant. Complete Part D if you operate one or more systems, or if you are currently constructing/installing, or planning to construct/install one or more systems by December 31, 2020.

Refer to the following definitions throughout Part D.

A "***pond/impoundment"*** is defined as a natural topographic depression, man-made excavation, or diked area formed from earthen materials or man-made materials or a combination of them, which is designed to hold an accumulation of liquid process wastes or process wastes containing free liquids, and which is not an injection well. Examples of ponds/impoundments include holding, storage, settling, and aeration pits, ponds, and lagoons. It does not include building sumps and outdoor collection/transfer concrete basins.

A "***pond/impoundment system***" is defined as a system consisting of one or more ponds/impoundments.

A "***wastewater treatment unit***" is defined as a unit operation used to remove pollutants from process wastewater. Wastewater treatment units include, but are not limited to: ponds/impoundments, chemical precipitation, pH adjustment, clarification, biological reactor, thickeners, filters, and constructed wetlands.

A "***wastewater treatment system***" is defined as a combination of one or more "wastewater treatment units", other than ponds/impoundments, designed to achieve wastewater treatment.

NOTE: If a pond/impoundment unit (as defined in Section 4.1) is part of a broader "wastewater treatment system" containing non-pond units (e.g., a pond/impoundment unit in a biological wastewater treatment system), it is not considered part of a pond/impoundment system.

Throughout Part D, information is requested for pond/impoundment and wastewater treatment units and systems that are under construction/installation, or planned to be under construction/installation by December 31, 2020. Provide design information, or best engineering estimates as necessary, for these planned systems/units. Additionally, indicate “NA” if the information requested is not applicable for planned systems/units (e.g., a question that requests flow rate data for year 2009).

As you are completing the electronic form, note the following: When you enter your plant name and plant ID on the Part D Table of Contents tab, all name and ID fields throughout Part D will automatically populate. Refer to the overall questionnaire instructions, the glossary, and the acronym list for assistance with completing Part D.

Please provide all free response answers in the highlighted yellow areas. Throughout Part D, you may need to make copies of certain sections/questions. Instructions are provided throughout Part D regarding making copies. Note that pond/impoundment system (and unit) and wastewater treatment system ID's 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 pond/impoundment or wastewater treatment system.

Use the Part D Comments tab to do the following: provide additional information as requested in certain questions within Part D; 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: 6984
Plant Name: Sibley Generating S

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-adjoining 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-adjoining 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-adjoining 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	1986	Slag Settling Pond	☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-2	1979	Fly Ash Pond	☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-3			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-4			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-5			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-6			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-7			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-8			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-9			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14
POND-10			☐ SPD - 1 ☐ SPD - 3 ☐ SPD - 5 ☐ SPD - 7 ☐ SPD - 9 ☐ SPD - 11 ☐ SPD - 13 ☐ SPD - 2 ☐ SPD - 4 ☐ SPD - 6 ☐ SPD - 8 ☐ SPD - 10 ☐ SPD - 12 ☐ SPD - 14

Retired/Closed Pond/Impoundment Systems			
RET-POND-1	1988	Sedimentation Pond	☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-2			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-3			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-4			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
RET-POND-5			☐ RET SPD - 1 ☐ RET SPD - 3 ☐ RET SPD - 2 ☐ RET SPD - 4
Planned Pond/Impoundment Systems			
POND-A	2010	Leachate Pond	☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D
POND-B			☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D
POND-C			☐ SPD - A ☐ SPD - C ☐ SPD - E ☐ SPD - B ☐ SPD - D

CBI?
☐ Yes

D2-7. Do you operate OR plan to operate (or begin construction/installation of) by December 31, 2020 any wastewater treatment systems, including those located on non-adjoining property, other than pond/impoundment systems for the treatment of *process wastewaters* from ash handling or FGD operations?

○ Yes (Continue)
○ No (Skip to Section 3.1)

List these wastewater treatment systems in Table D-2. For each wastewater treatment system, EPA assigned a number (e.g., WWT-1, WWT-2) in Table D-2, which will be used throughout the remainder of the survey. In the “Plant Designation” column, provide the plant’s name for each wastewater treatment system. As an example, if a plant operates a *chemical precipitation* FGD wastewater treatment system that discharges to an ash pond/impoundment system (as shown in EPA example diagrams EPA_D-1 and EPA_D-2 located at the bottom of Part D Section 3.1) the FGD wastewater treatment system should be identified in Table D-2 (e.g., as WWT-1) and the ash pond/impoundment system should have been previously identified in Table D-1 (e.g., as POND-1).

Note that "Approximate Length of Piping from FGD Scrubber System" refers to the length of piping from the *FGD solids separation* overflow storage tank (or *FGD scrubber absorber* if no FGD solids separation) to the beginning of the FGD wastewater treatment system. "Approximate Length of Piping to Subsequent Treatment or Discharge" refers to the length of piping from the end of the FGD wastewater treatment system to either the beginning of the subsequent treatment system or the wastewater discharge point,
as appropriate.

Table D-2. Plant Wastewater Treatment Systems

Wastewater Treatment System ID	Plant Designation	Treatment System Footprint (ft^2)	Year Initially Brought On Line	FGD Wastewater Treatment	
				Approximate Length of Piping from FGD Scrubber System (ft)	Approximate Length of Piping to Subsequent Treatment or Discharge (ft)
Operating Wastewater Treatment Systems					
WWT-1					
WWT-2					
WWT-3					
WWT-4					
WWT-5					
WWT-6					
Planned Wastewater Treatment Systems					
WWT-A					
WWT-B					
WWT-C					

Plant ID: 6984
Plant Name: Sibley Generating S
Pond/Impoundment Unit ID: SPD-3

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-adjoining 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

D4-2. 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.

_____ Residence time, hours (as currently operated)

_____ 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.

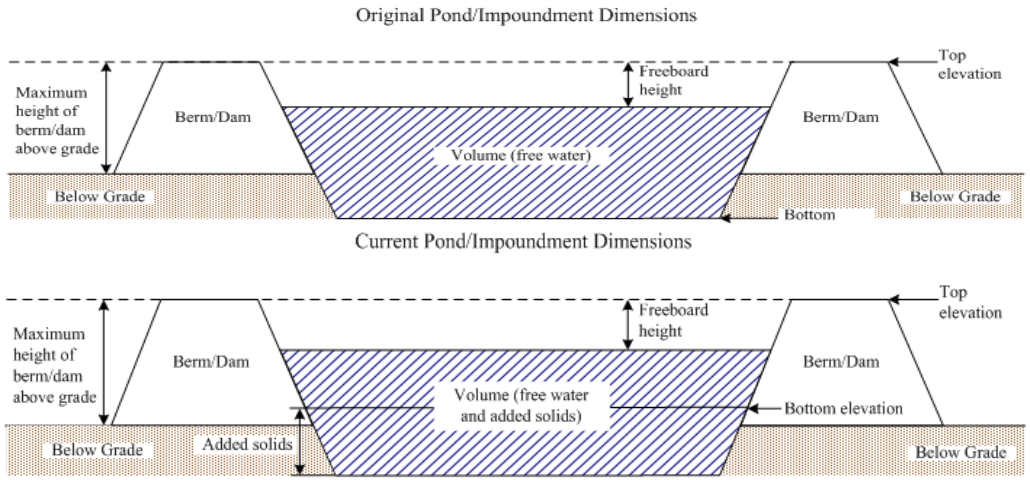


Figure D-1. Pond/Impoundment Dimensions

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

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	102000	102000	102000
Surface area, ft^2	27000	27000	27000
Bottom elevation, ft	713	713	713
Top elevation, ft	724	724	724
Freeboard height, ft	5	5	5
Maximum height of berms/dams above grade, ft	0	0	0
Total solids placed in the pond/impoundment, tons			
Expected year of closure/retirement			

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	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ◉ Other (provide below:) Roller Compacted concrete	15.4	
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI? ☐ Yes

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

◉ Yes (Provide following information)

2009 Year of last dredging
365 Frequency of dredging that year, dpy
64154 Amount of material removed that year, tons
1825 Number of times dredged in the last five years
1825 Number of days dredged in the last five years
269980 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): marketed or landfilled

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)

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:
Limitation: Select
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 (dpy)
						○ gpd ○ lb/day	○ Solid ○ Liquid	
						○ gpd ○ lb/day	○ Solid ○ Liquid	
						○ gpd ○ lb/day	○ Solid ○ Liquid	
						○ gpd ○ lb/day	○ Solid ○ Liquid	
						○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 6984
Plant Name: Sibley Generating S
Pond/Impoundment Unit ID: SPD-5

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-adjoining 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

D4-2. 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.

_____ Residence time, hours (as currently operated)

_____ 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.

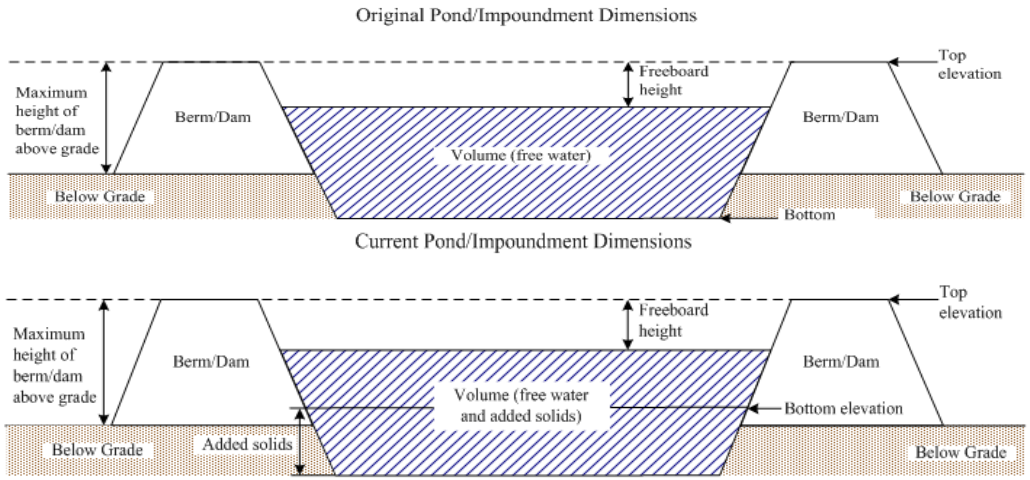


Figure D-1. Pond/Impoundment Dimensions

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

	Originally Built or Planned/Designed	Current	Expected End of Life
Volume, ft^3	10260000	9747000	9747000
Surface area, ft^2	687789	653400	653400
Bottom elevation, ft	703	703	703
Top elevation, ft	725	725	725
Freeboard height, ft	3	3	3
Maximum height of berms/dams above grade, ft	18	18	18
Total solids placed in the pond/impoundment, tons			
Expected year of closure/retirement			

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	◉ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)	61.5	
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		
	○ Compacted clay ○ Geosynthetic clay ○ High density polyethylene (HDPE) ○ Other (provide below:)		

CBI? ☐ Yes

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

◉ Yes (Provide following information)

2007 Year of last dredging

1 Frequency of dredging that year, dpy

110000 Amount of material removed that year, tons

1 Number of times dredged in the last five years

120 Number of days dredged in the last five years

110000 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)

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:
Limitation: Select
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 (dpy)
CO2	Compressed CO2	NA	pH control	Within the pond		300	○ gpd ◉ lb/day	○ Solid ◉ Liquid	365
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	
							○ gpd ○ lb/day	○ Solid ○ Liquid	

Plant ID: 6984
Plant Name: Sibley Generating Statio

Part: D
Section Title: Part D 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).

CBI?	Question Number	Comments
☐ Yes	D4-2	For SPD-3 and SPD-5 residence time varies with flow rate and amount of material present in the pond. The expected life of pond is the life of the plant which has not been determined. The expected life of SPD-A is the life of the landfill which is not known.
☐ Yes	D4-3 copy 2 and 3	Amount of solids is unknown, the pond will close at the end of the plant life.
☐ Yes	Table D-7	Dose is unknown.
☐ Yes	D4-15	Max height of berms/dams above grade is NA
☐ Yes	D5-13	Was accidently answered. It is meant to be blank.
☐ Yes	D4-5	For SPD-3 the last full year of dredging was 2009. The pond has been dredged daily in 2010.
☐ Yes	Section 6.1 & 6.2	Capital and operating costs and other information have not been provided for SPD-A because it is still under construction.
☐ Yes	Table D-3 and D-4, all PONDs	Influent and Effluent flows are estimates
☐ Yes	Table D-5, all PONDs	All values vary.
☐ Yes	D4-5 all PONDs	These values are estimates.
☐ Yes		
☐ Yes		

CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		
CBI? ☐ Yes		

Steam Electric Questionnaire Code Tables

Process Wastewaters	
For Use in Tables and Questions throughout Parts A, B, C, D, and F.	
Air heater cleaning water	AHCW
Ash pile runoff	APR
Boiler blowdown	BB
Boiler fireside cleaning water	BFCW
Boiler tube cleaning water	BTCW
Bottom ash sluice	BAS
Carbon capture wastewater	CCAPW
Coal pile runoff	CPR
Combined ash sluice	CAS
Combustion turbine cleaning (combustion gas portion of turbine) water	COMBCW
Combustion turbine cleaning (compressor portion of the turbine) water	COMPRCW
Combustion turbine evaporative coolers blowdown	TECB
Cooling tower blowdown	CTB
FGD scrubber purge	SCRBP
FGD slurry blowdown	FGDB
Filter Backwash	FLTBW
Floor drain wastewater	FDW
Flue gas mercury control system wastewater	FGMCW
Fly ash sluice	FAS
General runoff	GR
Gypsum pile runoff	GPR
Gypsum wash water	GYPWW
Ion exchange wastewater	IXW
Landfill runoff - capped landfill	LRC
Landfill runoff - uncapped landfill	LRUC
Leachate	LEACH
Limestone pile runoff	LPR
Mill reject sluice	MRS

Treated Wastewaters	
For Use as Effluents from Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-4.	
Effluent - 1	EFF-1
Effluent - 2	EFF-2
Effluent - 3	EFF-3
Effluent - 4	EFF-4
Effluent - 5	EFF-5
Effluent - 6	EFF-6
Filter backwash	FltBW
Sludge	SLDG
For Use as Influents to Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-3, AND Recycled Waters Throughout Questionnaire.	
POND-1 Effluent	POND-1-EFF
POND-2 Effluent	POND-2-EFF
POND-3 Effluent	POND-3-EFF
POND-4 Effluent	POND-4-EFF
POND-5 Effluent	POND-5-EFF
POND-6 Effluent	POND-6-EFF
POND-7 Effluent	POND-7-EFF
POND-8 Effluent	POND-8-EFF
POND-9 Effluent	POND-9-EFF
POND-10 Effluent	POND-10-EFF
POND-A Effluent	POND-A-EFF
POND-B Effluent	POND-B-EFF
POND-C Effluent	POND-C-EFF
WWT-1 Effluent	WWT-1-EFF
WWT-2 Effluent	WWT-2-EFF
WWT-3 Effluent	WWT-3-EFF
WWT-4 Effluent	WWT-4-EFF
WWT-5 Effluent	WWT-5-EFF

Steam Electric Questionnaire Code Tables

Process Wastewaters	
For Use in Tables and Questions throughout Parts A, B, C, D, and F.	
Once -through cooling water	CW
Reverse osmosis reject water	RORW
SCR catalyst regeneration wastewater	SCRRW
SCR catalyst washing wastewater	SCRWW
Soot blowing wash water	SOOTW
Steam turbine cleaning water	STCW
Yard drain wastewater	YARDW

Treated Wastewaters	
For Use as Influents to Pond/Impoundment Systems and/or Wastewater Treatment Systems in Part D, Table D-3, AND Recycled Waters Throughout Questionnaire.	
WWT-6 Effluent	WWT-6-EFF
WWT-A Effluent	WWT-A-EFF
WWT-B Effluent	WWT-B-EFF
WWT-C Effluent	WWT-C-EFF

Steam Electric Questionnaire Code Tables

Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Adsorptive media	ADSORB
Aerobic Biological Reactor	AERBIO
Anaerobic Biological Reactor	ANBIO
Aerobic/Anaerobic Biological Reactor	AER/ANBIO
Chemical Precipitation Reaction Tank 1 - 1	CP-1-1
Chemical Precipitation Reaction Tank 1 - 2	CP-1-2
Chemical Precipitation Reaction Tank 2 - 1	CP-2-1
Chemical Precipitation Reaction Tank 2 - 2	CP-2-2
Chemical Precipitation Reaction Tank 3 - 1	CP-3-1
Chemical Precipitation Reaction Tank 3 - 2	CP-3-2
Clarification, Primary - 1	CL-P-1
Clarification, Primary - 2	CL-P-2
Clarification, Secondary - 1	CL-S-1
Clarification, Secondary - 2	CL-S-2
Clarification, Tertiary - 1	CL-T-1
Clarification, Tertiary - 2	CL-T-2
Constructed wetland - Cell 1	CWL -1
Constructed wetland - Cell 2	CWL -2
Constructed wetland - Cell 3	CWL -3
Constructed wetland - Cell 4	CWL -4
Constructed wetland - Cell 5	CWL -5
Constructed wetland - Cell 6	CWL -6
Constructed wetland system	CWTS
Equalization, Primary	EQ-P
Equalization, Secondary	EQ-S
Filter, Microfiltration - 1	FLT-M-1
Filter, Microfiltration - 2	FLT-M-2

Destinations	
For Use in Tables and Questions Throughout Parts A, C, D, and F.	
Burned on site	BURN
Deep-well injection	DWELL
Discharge to POTW	POTW
Discharge to PrOTW	PrOTW
Discharge to surface water	SW
Evaporation	EVAP
Hauled off site for reuse (removal fee)	HAULR - RF
Hauled off site for reuse (given away)	HAULR - GA
Hauled off site for reuse (marketed and sold)	SOLD
Hauled off site for disposal	HAUL
Mixed with fly ash for disposal	MFA
On-site landfill (as reported in Table A-6)	LANDF
POND-1	POND-1
POND-2	POND-2
POND-3	POND-3
POND-4	POND-4
POND-5	POND-5
POND-6	POND-6
POND-7	POND-7
POND-8	POND-8
POND-9	POND-9
POND-10	POND-10
POND-A	POND-A
POND-B	POND-B
POND-C	POND-C
WWT-1	WWT-1
WWT-2	WWT-2

Steam Electric Questionnaire Code Tables

Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Filter, Microfiltration - 3	FLT-M-3
Filter, Microfiltration - 4	FLT-M-4
Filter, Sand/Gravity - 1	FLT-S-1
Filter, Sand/Gravity - 2	FLT-S-2
Filter, Sand/Gravity - 3	FLT-S-3
Filter, Sand/Gravity - 4	FLT-S-4
Filter, Ultrafiltration - 1	FLT-U-1
Filter, Ultrafiltration - 2	FLT-U-2
Filter, Ultrafiltration - 3	FLT-U-3
Filter, Ultrafiltration - 4	FLT-U-4
Filter press - 1	FP-1
Filter press - 2	FP-2
Holding tank	HT
Ion exchange	IX
Natural wetlands	NW
pH adjustment - 1	PH-1
pH adjustment - 2	PH-2
pH adjustment - 3	PH-3
Reverse osmosis	ROS
Pond Unit - 1	SPD-1
Pond Unit - 2	SPD-2
Pond Unit - 3	SPD-3
Pond Unit - 4	SPD-4
Pond Unit - 5	SPD-5
Pond Unit - 6	SPD-6
Pond Unit - 7	SPD-7
Pond Unit - 8	SPD-8
Pond Unit - 9	SPD-9

Destinations	
For Use in Tables and Questions Throughout Parts A, C, D, and F.	
WWT-3	WWT-3
WWT-4	WWT-4
WWT-5	WWT-5
WWT-6	WWT-6
WWT-A	WWT-A
WWT-B	WWT-B
WWT-C	WWT-C
Reuse as boiler water	RECYC - BW
Reuse as bottom ash sluice	RECYC - BAS
Reuse as combined ash sluice	RECYC - CAS
Reuse as FGD slurry preparation water	RECYC - FGDP
Reuse as FGD absorber makeup	RECYC - FGDAB
Reuse as fly ash sluice	RECYC - FAS
Reuse as mill reject sluice	RECYC - MRS
Reuse in cooling towers	RECYC - CW

Steam Electric Questionnaire Code Tables

Wastewater Treatment Units	
For Use in Tables and Questions Throughout Parts D and F.	
Pond Unit - 10	SPD-10
Pond Unit - 11	SPD-11
Pond Unit - 12	SPD-12
Pond Unit - 13	SPD-13
Pond Unit - 14	SPD-14
Settling tank - 1	ST-1
Settling tank - 2	ST-2
Settling tank - 3	ST-3
Settling tank - 4	ST-4
Settling tank - 5	ST-5
Thickener - 1	TH-1
Thickener - 2	TH-2
Vacuum drum filter - 1	VF-1
Vacuum drum filter - 2	VF-2
Vacuum filter belt - 1	VFB-1
Vacuum filter belt - 2	VFB-2

Solids Handling	
For Use as Planned Solids Handling for the FGD Slurry Blowdown in Part B Table B-2.	
Centrifuge - 1	CENT-1
Centrifuge - 2	CENT-2
Centrifuge - 3	CENT-3
Centrifuge - 4	CENT-4
Hydrocyclones - 1	HYC-1
Hydrocyclones - 2	HYC-2
Hydrocyclones - 3	HYC-3
Hydrocyclones - 4	HYC-4
Filter press - 1	FP-1
Filter press - 2	FP-2
Thickener - 1	TH-1
Thickener - 2	TH-2
Vacuum drum filter - 1	VF-1
Vacuum drum filter - 2	VF-2
Vacuum filter belt - 1	VFB-1
Vacuum filter belt - 2	VFB-2

Daniel F. Rembold
Sibley Generating Station
33200 East Johnson Road
Sibley, MO 64088

May 15, 2009

Mr. Richard Kinch
US Environmental Protection Agency
Two Potomac Yard
2733 S. Crystal Dr.
5th Floor; N-5738
Arlington, VA 22202-2733

Re: Request for Information Under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9604(e)

Dear Mr. Kinch:

Enclosed is the response of KCP&L Greater Missouri Operations Company (KCP&L GMO) to EPA's Section 104 (e) request for information not dated that was received May 4, 2009 regarding an ash settling pond and slag settling pond at KCP&L GMO's Sibley Generating Station. Both ponds are currently being operated for settling and not disposal. Slag is removed from the slag settling pond and beneficially used off-site. Fly ash is removed from the fly ash settling pond and deposited in an on-site permitted landfill.

I certify that the information contained in this response to EPA's request for information and the accompanying documents is true, accurate, and complete. As to the identified portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this response and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

If you have any questions regarding this response, please contact me at 816-650-2900.

Sincerely,

Daniel F. Rembold
Plant Manager
Sibley Generating Station

Enclosure A

Enclosure A

KCP&L Greater Missouri Operations Company **May 15, 2009**
Sibley Generating Station
Management Unit: Slag Settling Pond

Please provide the information requested below for each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material 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. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

The Management Unit does not have a known rating. The Missouri Department of Natural Resources - Solid Waste Management Program regulates solid waste facilities in Missouri.

2. What year was each management unit commissioned and expanded?

The Management Unit was commissioned approximately in 1986 and has not been expanded. Slag is removed from the Management Unit and beneficially used off-site.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Slag.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

The Management Unit is in ground without dikes or berms. The Management Unit was designed by a Professional Engineer. The construction drawings for the Management Unit were sealed by a Professional Engineer. Inspection and monitoring of the safety of the Management Unit is not completed under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the management unit(s)? Briefly describe the credentials of those conducting the structural integrity

assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

The Management Unit is visually inspected on approximately a weekly basis by operational or security personnel. There has been no known assessment or evaluation of the safety (i.e., structural integrity) of the Management Unit beyond the visual inspection. There have been no known actions taken or planned by facility personnel as a result of the visual inspections of the Management Unit. There are no planned assessments or evaluation of this Management Unit in the future beyond the visual inspections.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

There have been no known State or Federal regulatory official inspection or evaluation of the safety (structural integrity) the Management Unit. We are not aware of a planned state or federal inspection or evaluation in the future.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

There have been no known assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year that uncovered a safety issue(s) with the Management Unit.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management units(s). The basis for determining the maximum height is explained later in this Enclosure.

The Management Unit's surface area is less than one acre and the total storage capacity is approximately 500 cubic yards. The capacity measurements were made as of 1986. The volume of material currently stored in the Management Unit is estimated today to be approximately 300 cubic yards. The Management Unit is in ground without dikes or berms and therefore has no Dam Height.

9. Please provide a brief history of known spills or unpermitted releases from the unit within the last ten years, whether or not these were reported to State or federal regulatory agencies. For

purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

There have been no known spills or unpermitted releases from the Management Unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

The current legal owner of the Sibley Generating Station is KCP&L Greater Missouri Operations Company. The current operator of Sibley Generating Station is KCP&L Greater Missouri Operations.

Enclosure A

KCP&L Greater Missouri Operations Company **May 15, 2009**
Sibley Generating Station
Management Unit: Fly Ash Settling Pond

Please provide the information requested below for each surface impoundment or similar diked or bermed management unit(s) or management units designated as landfills which receive liquid-borne material 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. This includes units that no longer receive coal combustion residues or by-products, but still contain free liquids.

1. Relative to the National Inventory of Dams criteria for High, Significant, Low, or Less-than-Low, please provide the potential hazard rating for each management unit and indicate who established the rating, what the basis of the rating is, and what federal or state agency regulates the unit(s). If the unit(s) does not have a rating, please note that fact.

The Management Unit does not have a known rating. The Missouri Department of Natural Resources - Solid Waste Management Program regulates solid waste facilities in Missouri.

2. What year was each management unit commissioned and expanded?

The Management Unit was commissioned approximately in 1979 and has not been expanded. Fly ash is periodically removed from the Management Unit and deposited into an on-site permitted landfill.

3. What materials are temporarily or permanently contained in the unit? Use the following categories to respond to this question: (1) fly ash; (2) bottom ash: (3) boiler slag; (4) flue gas emission control residuals; (5) other. If the management unit contains more than one type of material, please identify all that apply. Also, if you identify "other," please specify the other types of materials that are temporarily or permanently contained in the unit(s).

Fly ash.

4. Was the management unit(s) designed by a Professional Engineer? Is or was the construction of the waste management unit(s) under the supervision of a Professional Engineer? Is inspection and monitoring of the safety of the waste management unit(s) under the supervision of a Professional Engineer?

The Management Unit was designed by a Professional Engineer. The construction drawings for the Management Unit were sealed by a Professional Engineer. Inspection and monitoring of the safety of the Management Unit is not completed under the supervision of a Professional Engineer.

5. When did the company last assess or evaluate the safety (i.e., structural integrity) of the

management unit(s)? Briefly describe the credentials of those conducting the structural integrity assessments/evaluations. Identify actions taken or planned by facility personnel as a result of these assessments or evaluations. If corrective actions were taken, briefly describe the credentials of those performing the corrective actions, whether they were company employees or contractors. If the company plans an assessment or evaluation in the future, when is it expected to occur?

The Management Unit is visually inspected on approximately a weekly basis by operational or security personnel. There has been no known assessment or evaluation of the safety (i.e., structural integrity) of the Management Unit beyond the visual inspection. There have been no known actions taken or planned by facility personnel as a result of the visual inspections of the Management Unit. There are no planned assessments or evaluation of this Management Unit in the future beyond the visual inspections.

6. When did a State or a Federal regulatory official last inspect or evaluate the safety (structural integrity) of the management unit(s)? If you are aware of a planned state or federal inspection or evaluation in the future, when is it expected to occur? Please identify the Federal or State regulatory agency or department which conducted or is planning the inspection or evaluation. Please provide a copy of the most recent official inspection report or evaluation.

There have been no known State or Federal regulatory official inspection or evaluation of the safety (structural integrity) the Management Unit. We are not aware of a planned state or federal inspection or evaluation in the future.

7. Have assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year uncovered a safety issue(s) with the management unit(s), and, if so, describe the actions that have been or are being taken to deal with the issue or issues. Please provide any documentation that you have for these actions.

There have been no known assessments or evaluations, or inspections conducted by State or Federal regulatory officials conducted within the past year that uncovered a safety issue(s) with the Management Unit.

8. What is the surface area (acres) and total storage capacity of each of the management units? What is the volume of material currently stored in each of the management unit(s)? Please provide the date that the volume measurement(s) was taken. Please provide the maximum height of the management units(s). The basis for determining the maximum height is explained later in this Enclosure.

The Management Unit's surface area is approximately 15 acres and the total storage capacity is approximately 361,000 cubic yards. The volume measurement was taken approximately January 1987. The volume of material currently stored in the Management Unit is estimated today to be approximately 220,000 cubic yards. The Management Unit's Dam Height, pursuant to Enclosure A, is approximately 18 feet.

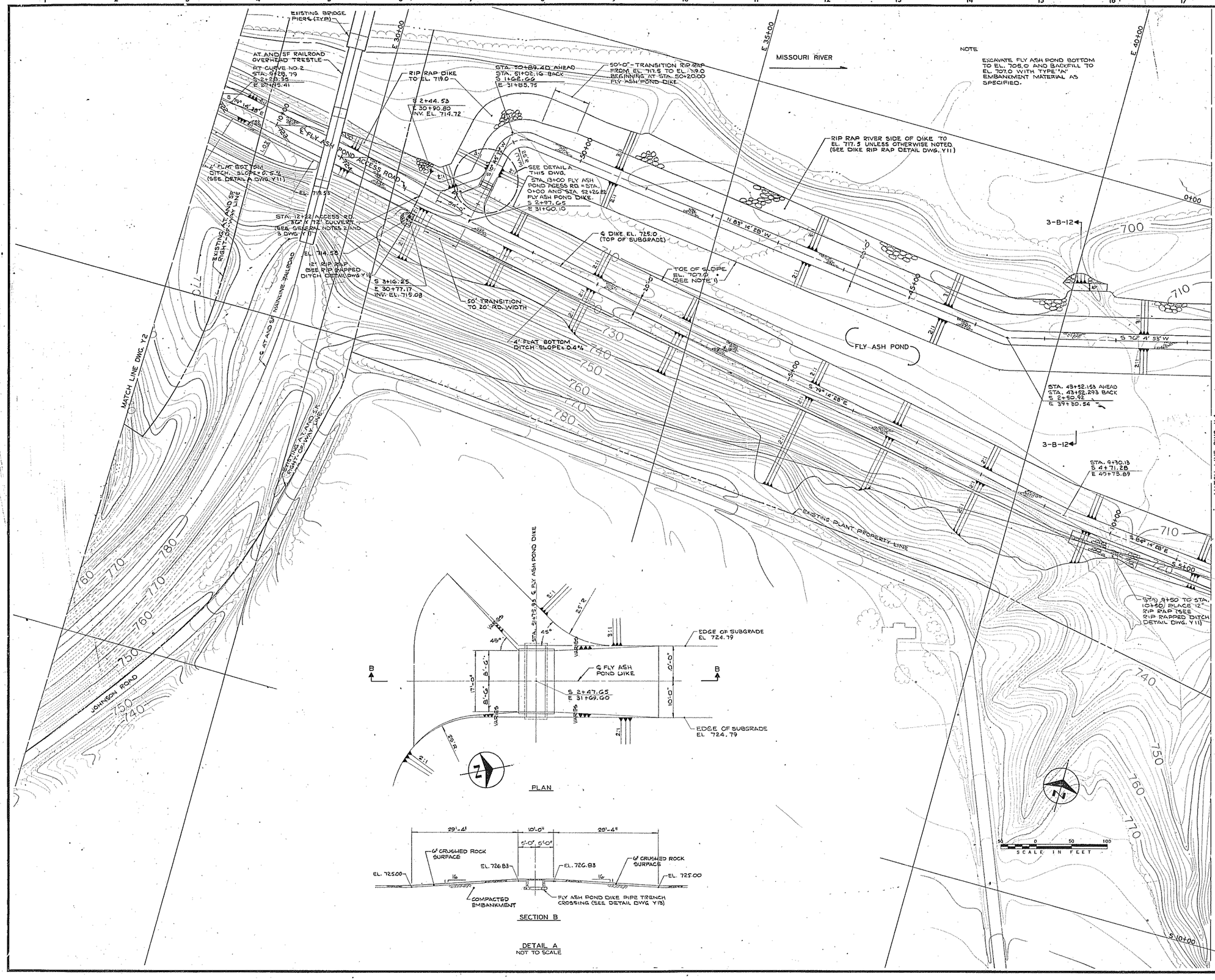
9. Please provide a brief history of known spills or unpermitted releases from the unit within the

last ten years, whether or not these were reported to State or federal regulatory agencies. For purposes of this question, please include only releases to surface water or to the land (do not include releases to groundwater).

There have been no known spills or unpermitted releases from the Management Unit within the last ten years.

10. Please identify all current legal owner(s) and operator(s) at the facility.

The current legal owner of the Sibley Generating Station is KCP&L Greater Missouri Operations Company. The current operator of Sibley Generating Station is KCP&L Greater Missouri Operations.



NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-13349
REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

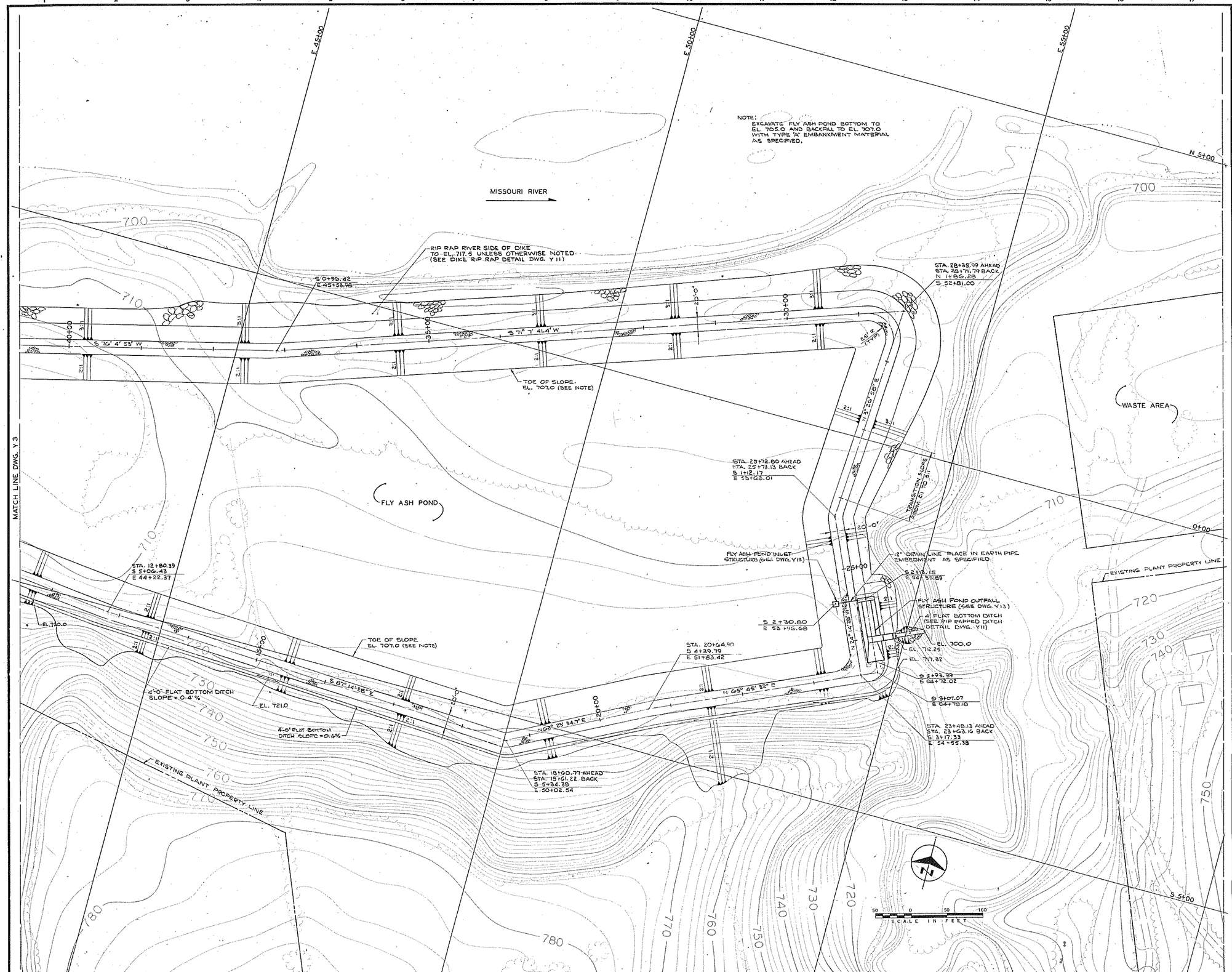
MISSOURI PUBLIC SERVICE COMPANY

KANSAS CITY, MISSOURI

GRADING PLAN - AREA II

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

DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	JJB	Y3	—
DETAILED	DEJ	PROJECT	73-062-1-005
CHECKED		SHEET OF SHEETS	



NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-16549
PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY

KANSAS CITY, MISSOURI

GRADING PLAN - AREA III

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

DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	JJB	Y4	—
DETAILED	DEJ	PROJECT	73-062-1-005
CHECKED		SHEET OF SHEETS	

Utilicorp-Sibley Generating Station
Clay County
MO-0004871

STATE OF MISSOURI

Jeremiah W. (Jay) Nixon, Governor • Mark N. Templeton, Director

DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

JUN 16 2009

Mr. Bob Beck
Utilicorp-Sibley Generating Station
33200 East Johnson Road
Sibley, MO 64088

Dear Mr. Beck:

On March 5, 2009, Patrick Peltz and Ryan Kivett from the Missouri Department of Natural Resources, Kansas City Regional Office (the department), conducted a routine inspection of Utilicorp-Sibley Generating. Station #2. The purpose of the inspection was to assess compliance with the Missouri Clean Water Law, Missouri Clean Water Commission regulations, and the facility's Missouri State Operating Permit.

The inspector's report is enclosed for your review. The facility was found to be in compliance. If you have any questions or comments regarding this report, please feel free to contact Patrick Peltz at the Kansas City Regional Office, 500 Northeast Colbern Road, Lee's Summit, Road, 64086 at (816) 622-7013 or Richard Sanders at the same address, (816) 622-7000. Thank you.

Sincerely

KANSAS CITY REGIONAL OFFICE

Dorothy Franklin

Dorothy E. Franklin
Environmental Manager

DEF/pkp

Enclosures

c: Water Pollution Control Program

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Recycled Paper

Missouri Department of Natural Resources
Kansas City Regional Office/Water Pollution Program
Utilicorp-Sibley Generating Station
Report of Inspection
33200 E Johnson Road
Sibley, MO 64088
MO-0004871

INTRODUCTION

On March 5, 2009, Patrick Peltz and Ryan Kivett of the Missouri Department of Natural Resources Kansas City Regional Office (the department), conducted a routine inspection of Utilicorp-Sibley Generating Station. The purpose of the inspection was to assess compliance with the Missouri Clean Water Law (MCWL), Missouri Clean Water Commission (MCWC) regulations, and the facility's Missouri State Operating Permit (MSOP); and conducted with the authority granted to the department by the Missouri Clean Water Commission [644.026.1 (21) RSMo]. The inspection also served to promote proper operation and to provide technical assistance where necessary. At the time of the inspection the facility was found to be in compliance.

PARTICIPANTS

Missouri Department of Natural Resources, Kansas City Regional Office
Patrick Peltz, Environmental Specialist
Ryan Kivett, Environmental Specialist

Independence Power and Light
Bob Beck, Engineer
Steve Brooks, Engineer

FACILITY DESCRIPTION

Utilicorp-Sibley is a Coal Fired Steam Electricity Generating Plant. The back-up energy source is fuel oil. This facility is owned by Utilicorp United, Inc. in Kansas City Missouri. The Standard Industrial Codes for this Utilicorp-Sibley Electrical Generating Plant is 4911.

Utilicorp Sibley has three electrical power generators at the Sibley location. The first generator was placed on line in 1960. In 1962 Utilicorp-Sibley placed the second generator on line. In 1963 generator number three was brought into service.

Utilicorp-Sibley has a total of ten outfalls in its Missouri State Operating Permit. Eight outfalls are being utilized as listed below. Outfalls 008 and 009 have been closed.

1. Outfall 001 serves the settling ponds for coal solids from the coal pile runoff/.settling pond.

2. Outfall 002 serves the slag settling pond for Generator 1, 2, and 3 slag sluice.

3. Outfall 003 serves various sources including boiler number one and number two, boiler blowdown, slag tank overflow, manhole stormwater drains, aerator basin overflow, roof stormwater and slag tank seals.

4. Outfall 004 discharges, once-through, non-contact cooling water for boiler number one and number two.

5. Outfall 005 discharges, once-through, non-contact cooling water for boiler number three, slag tank overflow.

6. Outfall 006 accepts the effluent from multiple sources. The bulk of the effluent comes from the machinery maintenance and plant effluent, carbon filter backwash, chemical cleaning wastes. The effluent is stabilized in a lagoon prior to discharge in a manner to extract the liquid and leave the oil and grease on the lagoon.

7. Outfall 007 serves the fly ash pond and the landfill leachate effluent.

8. Outfall 008 has been eliminated.

9. Outfall 009 has been eliminated.

10. Outfall 010 discharges stormwater from the plant area.

On June 13, 1997, Utilicorp-Sibley constructed a 24 inch thick base-pad from 22,000 tons of fly ash. This flexible, six acre fly ash pad is being used to support the coal stockpile. Constructing the fly ash base gave Utilicorp a place to use fly ash as well as create a coal storage base pad that would resist cracking and material leaching.

Utilicorp-Sibley maintains a fly ash landfill. This closed landfill is at capacity, and is not accepting fly ash. The facility has been capped with an impervious layer of clay, stabilized with top soil and heavy grasses. The spillways are profoundly engineered to stabilize erosion created by stormwater runoff from the massive landfill.

Utilicorp Sibley no longer treats its own domestic wastewater but pumps it to the main. Waste disposal for used oil and hazardous wastes are handled by licensed haulers.

COMPLIANCE HISTORY

The DNR issued Missouri State Operating Permit, MO0004588, to Utilicorp-Sibley on November 1, 2002. This permit expired on October 31, 2007. Utilicorp is presently operating on the expired permit while the department is processing the new permit. Clean Water Commission regulations at 10 CSR 20-6.010(5)(C) require that an application for renewal be submitted within 180 days prior to expiration of the permit. Utilicorp-Sibley submitted the application within proper time frames.

In the January 26, 2001, inspection, the department detected an oily ring and sheen on the lagoon berm serving outfall #006. Because the design of the outfall and catch lagoon was to retain oily wastes, the department found outfall #006 to be in compliance. During the March 9, 2009 inspection, the department detected a similar ring around the lagoon and a minute sheen on the lagoon surface of about 3 square feet. The department found outfall #006 to be in compliance. In April 30, 2006 outfall #006 showed a TSS exceedence level of 31 mg/L.

Utilicorp-Sibley is presently engineering a landfill expansion. On April 17, 2009, the department's solid waste management program acknowledged Sibley's request for a construction permit for the expansion.

A review of the facility's Discharge Monitoring Reports (DMR) in the WQIS database was conducted. The monthly Discharge Monitoring Reports are submitted to the Kansas City Regional Office on a Quarterly Basis. Utilicorp's MSOP requires that the Discharge Monitoring Reports be submitted to the department no later than the 28th of each month. The review covered the previous sixty months. The DMRs were analyzed for the permitted parameters and effluent limitations. Each outfall has different monitoring requirements, parameters, final effluent limits, units and frequencies because of the conditions, requirements, and the location of the outfall. These conditions are outlined in the Missouri State Operating Permit. The table below lists the measured values that exceeded the permitted effluent limits.

REPORT PERIOD	PARAMETER	OUTFALL	PERMIT LIMIT	REPORTED VALUE
20050831	TSS	001	30 mg/l	63 mg/l
20070430	TSS	001	30 mg/L	126 mg/L
20060430	TSS	002	30 mg/L	64 mg/L
20070831	SO4	002	30 mg/L	
20070930	TSS	002	30 mg/L	39 mg/L
20071031	WET Violation	002	30 mg/L	
20080731	TSS	002	30 mg/L	40 mg/L
20050131	WET Violation	003		
20060131	WET Violation	003		
20060531	TSS	003	30 mg/L	34 mg/L
20060630	WET Violation	003	30 mg/L	mg/L
20070131	WET Violation	003	30 mg/L	mg/L
20080131	TSS	003	30 mg/L	96 mg/L
20070131	WET Violation	004		
20060630	TSS	006	30mg/L	31mg/L
20070131	WET Violation	006		
20040930	pH	007	6.0-9.0	9.05
20060430	pH	007	6.0-9.0	9.1
20060731	pH	007	6.0-9.0	9.1
20061031	pH	007	6.0-9.0	9.29
20070131	pH	007	6.0-9.0	9.5
20070831	pH	007	6.0-9.0	9.2
20070930	pH	007	6.0-9.0	9.1
20070930	WET Violation	007		
20071130	pH	007	6.0-9.0	9.1
20080131	pH	007	6.0-9.0	9.1
20080430	pH	007	6.0-9.0	9.2
20080531	pH	007	6.0-9.0	9.2
20080630	pH	007	6.0-9.0	9.5
20080831	pH	007	6.0-9.0	9.3
20080930	TSS	007	30 mg/L	62

OBSERVATIONS

Utilicorp-Sibley Generating Plant has 10 Outfalls, all outfalls were inspected.

1. Outfall 002 serves the slag settling pond for Generator 1, 2, and 3 slag sluice. At the time of the inspection, the pond had ample storage space available.

2. Outfall 007 serves the fly ash pond and the landfill leachate effluent. At the time of the inspection, effluent was not discharging from the landfill. The landfill is in good shape and well maintained. The black fly ash is stored in patterns in the pond. The pond is not stressed but nearing optimal storage capacity Utilicorp-Sibley uses low sulphur coal which creates high pH in this wet storage area. This is a contributing factor for multiple exceedences on the pH parameter.

3. Utilicorp-Sibley maintains a closed fly ash landfill. Leachate from the landfill is collected in the fly ash, wet storage pond and discharged through outfall #007.

4. Clean, dry fly ash is stored in a silo and sold for commercial purposes.

5. The coal stock piles are maintained on top of a fly ash structure. This provides a flexible, crack resistant, protective cap, and a stabile base to store the coal on. It also provides a place to use the fly ash.

6. Fly ash is stored in a heavily constructed, uniformly built, wet pond. The storage is approaching capacity. Presently, the fly ash remains at a level that is below berm tops. There is adequate freeboard. There appears to be room for further safe storage. Utilicorp-Sibley annually performs a TCLP on the fly ash stored in the pond. Recently the pH has demonstrated a trend of being over the permitted limit of 9.0. Sibley reports that its engineers are continuing to work towards a solution to the high pH.

7. On March 5, 2009 the department inspected the inside of the facility and examined the floor drains, contents, materials and work performed in the shed of each drain. The drains were found to be protected from contaminants.

8. Materials and liquids display the supplier's label, showing material type, characteristics, and manufacture contact information in case of a spill. Utilicorp-Sibley utilizes booms and spill prevention practices to protect the floor drains. The power plant has a spill team. It is the practice of Utilicorp to refrain from using drains to catch liquid. All material is recovered as opposed to being disposed of in the drains. The wastes and sludge are handled through a licensed hauler. As a final protection, the drains terminate into a lagoon supporting outfall #006.

UNSATISFACTORY FEATURES

Some of the outfall markers were not acceptable. One was held down to a culvert with rocks.

REQUIRED ACTIONS

Continue to monitor pH levels and progress toward maintaining a pH no higher than 9.0 for outfall 007. Utilicorp-Sibley has attempted to adjust the pH by metering acid into the discharge. Success was limited therefore Utilicorp-Sibley should seek a solution for maintaining the pH limitation within the permitted limit.

Monitor the capacity of fly ash pond. The pond was engineered for a limited amount of fly ash and water. Disallow the structure to become stressed, putting it at risk for a release or failure.

Position and display outfall markers so that they can be seen from both directions and make them permanent.

COMMENTS

Utilicorp-Sibley is a large complicated facility. It maintains a diverse series of outfalls with many environmental exposures and varied parameters. Commonly, the parameter limits are being met.

DMRs for outfall #007 exhibit consistent exceedences with the pH limits since September 2004. The managers expressed that the pH has risen with the switch to low sulfur coal and that the limit of 9.0 is difficult to maintain. They have endeavored to implement new methods to seek solutions. In a Utilicorp-Sibley report, the Missouri River consistently displays a pH of 8.44 in the intake water. The permitted effluent limit is 9.0. Continued attention should be given to lowering the pH and stabilizing outfall #007 effluent limitations.

Overall, Utilicorp-Sibley Power Generating Station is well managed environmentally. The managers have a good knowledge of all issues and management of these issues.

CONCLUSION

The overall operation and appearance of the facility is satisfactory, and the facility was determined to be in compliance with the Missouri Clean Water Law and the Missouri Clean Water Commission Regulations.

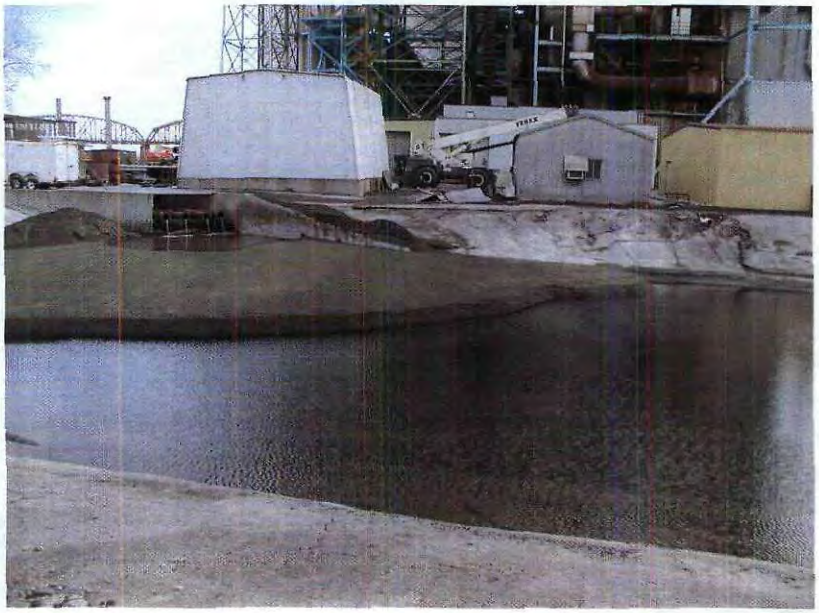
If you have any questions or comments regarding this report, please feel free to contact Patrick Peltz or Richard Sanders at the Kansas City Regional Office, 500 NE Colbern Road, Lee's Summit, MO 64086 or by telephone at (816) 622-7013 or (816) 622-7000. Thank you.

Reported By

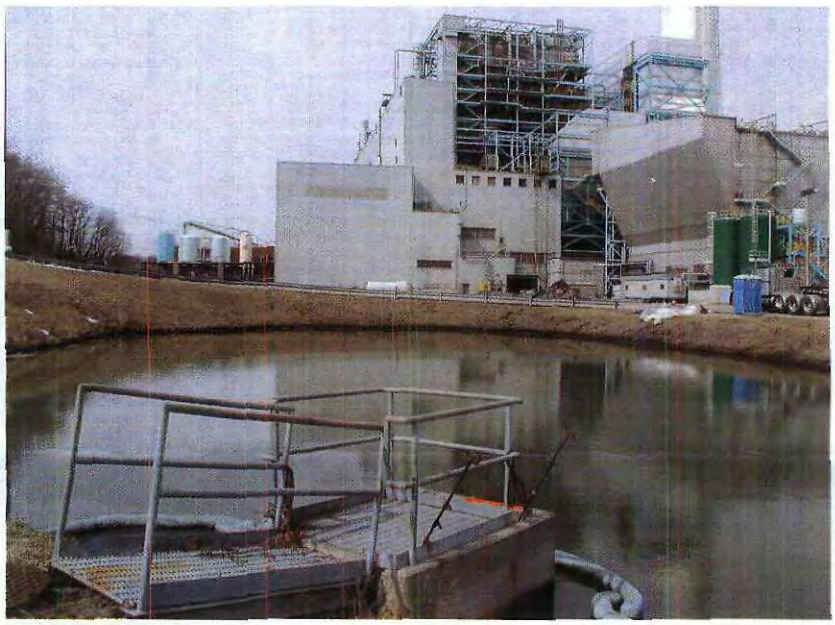
Patrick Peltz
Environmental Specialist
Water Pollution Program
Kansas City Regional Office

Approved By:

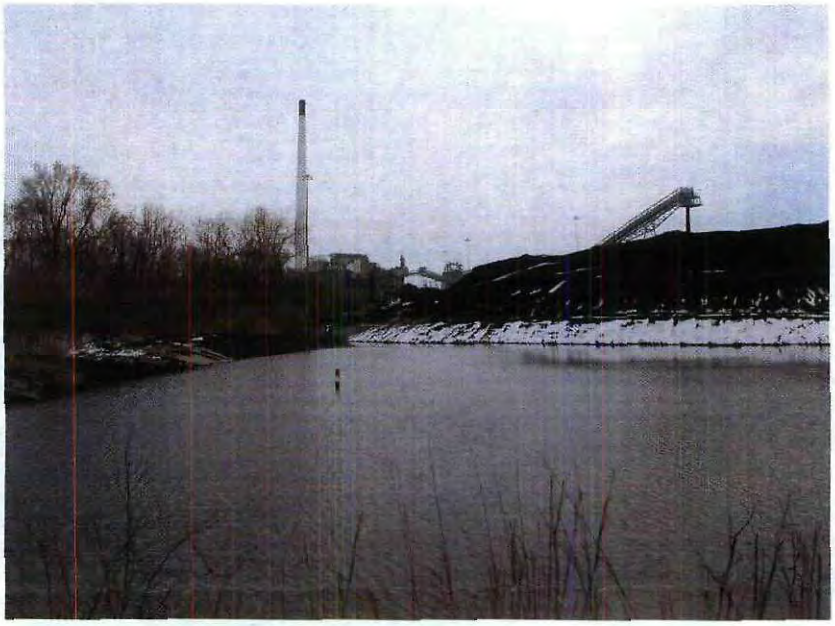
Richard W Sanders II
Unit Chief
Water Pollution Program
Kansas City Regional Office



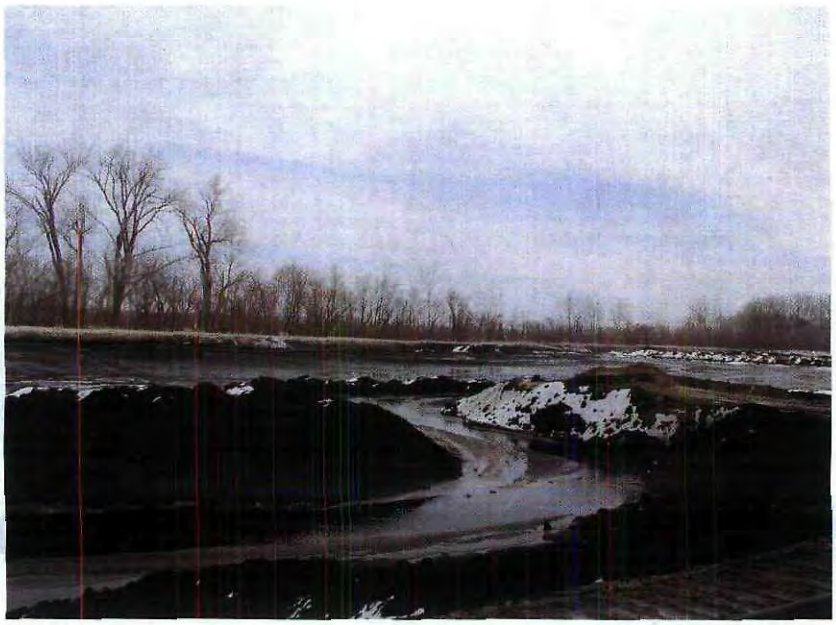
Photograph 001, Ryan Kivett. March 5, 2009. Ash sluice and boiler slag. The Missouri River is protected from products and by-products of the plant operations.



Photograph 002, Ryan Kivett. March 5, 2009. Outfall 006. This pond catches oil and grease from the floor drains in the building and service areas, inside and outside. It serves to settle solids and to trap oil and grease before water is discharged through outfall 006.

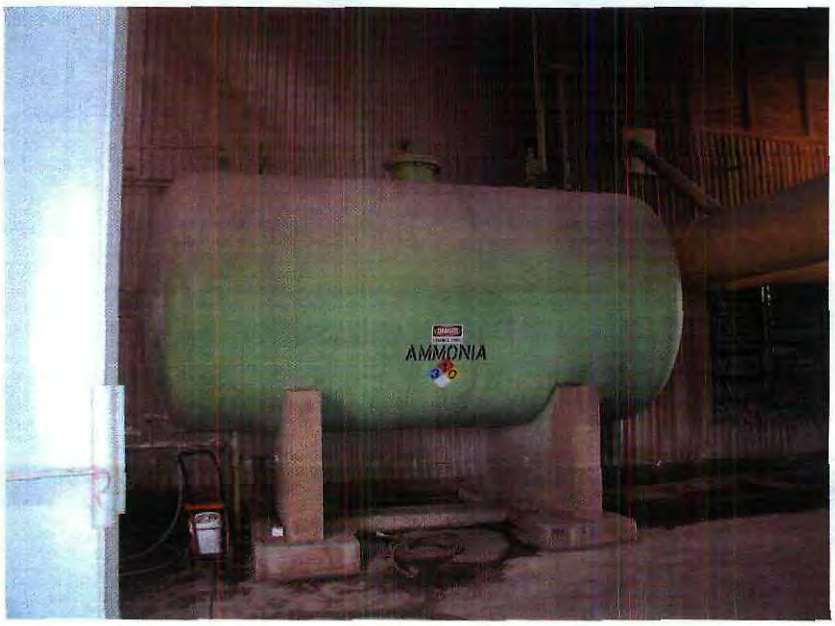


Photograph 003, Ryan Kivett. March 5, 2009. Coal runoff settling pond. Utilicorp monitors its settling ponds and maintains its outfalls.



Photograph 004, Ryan Kivett. March 5, 2009. Fly ash storage pond. The outfall serving the flyash pond has consistently been a challenge for Utilicorp to maintain the pH levels. They have continued to research and implement methods to control levels.

Photograph 005, Ryan Kivett. March 5, 2009. Closed fly ash landfill. Leachate is discharged to the fly ash storage pond. This landfill is well maintained.



Photograph 006, Ryan Kivett. March 5, 2009. Chemicals are stored inside the generating plant. Utilicorp has spill emergency plan with trained personnel. The plant floor drains terminate into the storage lagoon at the outfall 006. Utilicorp is careful to monitor all agents and chemicals stored within the building to keep them from spilling or tracking into the environment. Utilicorp captures all agents before discharging from outfall 006.

Photograph 007, Ryan Kivett. March 5, 2009. This outfall marking designates that this is certainly outfall 002, however it is less than the department requires. Utilicorp's Missouri State Operating Permit does not specifically tell Utilicorp, exactly how to place and make the outfall sign but the method of attempting to adhere tape to a structure obviously may be improved upon. Outfalls must be marked so that they can be seen from both sides in letters that are legible at a distance. The department recommends to elevate the sign at least two feet from the ground and to use letters at least two inches tall. It is a good idea to make certain that signage is fastened more permanently.

08-035 21.2A.16

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended, . .

Permit No.	MO-0004871
Owner:	Utilicorp United, Inc.
Address:	10700 east 350 Highway, Kansas City, MO 64138
Continuing Authority:	Same as above
Address:	Same as above
Facility Name:	Utilicorp - Sibley Station
Facility Address:	33200 East Johnson Road, Sibley, MO 64088
Legal Description:	SW ¼, NW ¼, Sec. 2, T50N, R30W, Jackson County
Latitude/Longitude:	See Page 2
Receiving Stream:	Missouri River (P)
First Classified Stream and ID:	Missouri River (P) (00356)
USGS Basin & Sub-watershed No.	(10300101-080002)

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

Outfall #001 - Coal Pile Runoff - SIC #4911
North settling pond/south settling pond
Design flow is 5.364 MGD.
Actual flow is 2.89 MGD.
Outfall #002 - Slag Settling Pond - SIC #4911
Unit 1 and 2 slag sluice/unit 3 slag sluice
Design flow is 8.386 MGD.
Actual flow is 1.446 MGD.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System. It does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051 [illegible] RSMo.

November 3, 2000
Effective Date

Stephen M. Mahfood, Director, Department of Natural Resources
Executive Secretary, Clean Water Commission

[illegible]nber 2, 2005
[illegible]

Director of Staff, Clean Water Commission

LATITUDE/LONDITUDE

#001 +3910445/-09411238
#002 +3910463/-09411079
#003 +3910476/-09411106
#004 +3910443/-09411020
#005 +3910418/-09411276
#006 +3910400/-09410591
#007 +3910293/-09410211
#008 & #009 eliminated
#010 +3910447/-09411261

FACILITY DESCRIPTION (continued)

Outfall #003 - Various Sources - SIC #4911
Units 1 and 2 slag tank overflow/boiler blowdown/roof stormwater drains/aerator basin overflow/electric manhole stormwater drains/slag tank seals.
Design flow is 1.844 MGD.
Actual flow is 0.677 MGD.

Outfall #004 - Non-contract Cooling Water - SIC #4911
Units 1 and 2 once-through cooling water.
Design flow is 174.65 MGD.
Actual flow is 96.923 MGD.

Outfall #005 - Non-contact Cooling Water - SIC #4911
Unit 3 once-through cooling/unit 3 slag tank overflow/slag tank seals.
Design flow is 266.40 mad.
Actual flow is 164.05 mad.

Outfall #006 - Various Sources - SIC #4911, including:
Overflow, including carbon filter backwash/demineralizer - effluent samples/chemical cleaning wastes/units 1 and 2 control room treated sanitary waste/unit 3 control room treated sanitary waste/laboratory drain/units 1 and 2 floor drains/units 3 floor drain/all non-PCB oil filled transformer containment drains/condensate polishers backwash /neutralization tank overflow.
Design flow is 0.313 MGD.
Actual flow is 0.159 MGD.

Outfall #007
Units 1 and 2 fly ash sluice/units 3 fly ash sluice/filter backwash/clarifier sluice/chemical feed area floor drains/neutralization tank discharge/fly ash landfill sedimentation pond.
Design flow is 5.6 MGD.
Actual flow is 1.32 MGD.

Outfall #008 - Eliminated.

Outfall #009 - Eliminated.

Outfall #010
Stormwater from various plant areas.
Design flow is 0.007 MGD.
Actual flow is 0.003 MGD.

2/14

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MONITORING REQUIREMENTS MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #001 - Coal Pile Runoff						
Flow	MGD	*		*	once/month	24 hr. total
Total Suspended Solids	mg/L	50		50	once/month	grab
pH - Units	SU	***		***	once/month	grab
Oil and Grease	mg/L	20		15	once/quarter*****	grab
Outfall #002-Slag Settling Pond						
Flow 32¼" ↓ ~~225~~	MGD	*		*	once/month	24 hr. total
Intake Suspended Solids	mg/L	*		*	once/month	grab
Effluent Total Suspended Solids 9.46	mg/L	*		*	once/month	grab
Net Total Suspended Solids****	mg/L	100		30	once/month	grab
pH - Units 7.19	SU	***		***	once/month	grab
Oil and Grease	mg/L	20		15	once/quarter*****	grab
Sulfate Temp 11°C	mg/L	*		*	once/quarter*****	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001.						
Whole Effluent Toxicity (WET) Test	% Survival	(See Special Conditions)			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE October 28, 2001.						
Outfall # 003-Various Sources						
Flow	MGD	*		*	once/month	24 hr. total
Intake Suspended Solids	mg/L	*		*	once/month	grab
Effluent Total Suspended Solids	mg/L	*		*	once/month	grab
Net Total Suspended Solids****	mg/L	100		30	once/month	grab
pH - Units	SU	***		***	once/month	grab
Oil and Grease	mg/L	20		15	once/quarter*****	grab

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED Parts I & III. STANDARD CONDITIONS DATED October 1, 1980 and August 15, 1994, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MONITORING REQUIREMENTS MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #004 - Non-contact Cooling Water Units 1 & 2						
Flow	MGD	*		*	once/week	24 hr. total
Intake Temperature	°F	*		*	once/week	grab
Effluent Temperature	°F	*		*	once/week	grab
Thermal Discharge	% of River flow over 5°F (Note 1)				once/week	calculated
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001.						
Whole Effluent Toxicity (WET) Test	%Survival	(See Special Conditions)			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE October 28, 2001.						
Outfall #005 - Non-contact Cooling Water Unit 3						
Flow	MGD	*		*	once/week	24 hr. total
Intake Temperature	°F	*		*	once/week	grab
Effluent Temperature	°F	*		*	once/week	grab
Thermal Discharge	% of river flow over 5°F (Note 1)				once/week	calculated
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001.						
Whole Effluent Toxicity (WET) Test	% Survival	(See Special Conditions)			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE October 28, 2001.						
Outfall #006 - Various Sources						
Flow	MGD	*		*	once/month	24 hr. total
Intake Total Suspended Solids	mg/L	*		*	once/month	grab
Effluent Total Suspended Solids	mg/L	*		*	once/month	grab
Net Total Suspended Solids****	mg/L	100		30	once/month	grab
Oil and Grease	mg/L	20		15	once/quarter*****	grab
Biochemical Oxygen Demand	mg/L		45	30	once/month	grab
pH - Units	SU	***		***	once/month	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001.						
Whole Effluent Toxicity (WET) Test	%Survival	(Special Conditions)			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE October 28, 2001.. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.						

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A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

PERMIT NUMBER MO-0004871

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Outfall #007 - Fly Ash Pond						
Flow	MGD	*		*	once/month	24 hr. total
Intake Total Suspended Solids	mg/L	*		*	once/month	grab
Effluent Total Suspended Solids	mg/L	100		30	once/month	grab
Net Total Suspended Solids****	mg/L	*		*	once/month	grab
Oil and Grease	mg/L	20		15	once/quarter*****	grab
pH - Units	SU	***		***	once/month	grab
Sulfate	mg/L	*		*	once/ quarter*****	grab
MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001.						
Whole Effluent Toxicity (WET) Test	% Survival	(See Special Conditions)			once/year	grab
MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE October 28, 2001.						
Outfall # 10 - Stormwater						
Flow	cfs	*		*	once/quarter*****	24 hr. estimate
Oil and Grease	mg/L	20		15	once/quarter*****	grab
Settleable Solids	mL/L/hr	2.0		1.0	once/quarter*****	grab
pH - Units	SU	***		***	once/quarter*****	grab
Total Suspended Solids	mg/L	*		*	once/quarter*****	grab

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE January 28, 2001. THERE SHALL BE NO DISCHARGE OF FLOATING SOLIDS OR VISIBLE FOAM IN OTHER THAN TRACE AMOUNTS.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED Parts I & III STANDARD CONDITIONS DATED October 1, 1980 and August 15, 1994, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

002

006 → 10:02

Barb Dalby (816) 622-2044
K

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

* Monitoring requirement only.
** Reserved
*** pH is measured in pH units and is not to be averaged. The pH is limited to the range of 6.0-9.0 pH units.
**** Intake Total Suspended Solids values should be utilized to calculate "net" effluent limitations. (Effluent value - influent value = net value).
***** Sample once per quarter in the months of February, May, August, and November.

Note 1 - The percent of concurrent receiving-stream flow that exceeds a 5°F increase shall be computed weekly and the results reported quarterly. Complete and uniform mixing shall be assumed, using the following formula:

$$\frac{\%\ \text{stream flow exceeding 5°F increase}}{\text{stream flow (cfs)} \times 11{,}200^{*}} = \frac{\text{average daily btus/hour}}{}$$

USGS stream-flow records for the Missouri River at Kansas City shall be used.

$$^{*}11{,}200 \text{ is } \frac{3{,}600\ \text{sec/hr} \times 62.4\ \text{lb/ft}^3 \times 5°\text{F}}{100}$$

C. SPECIAL CONDITIONS

1. Whole Effluent Toxicity (WET) tests will be conducted as follows:

SUMMARY OF WET TESTING FOR THIS PERMIT				
OUTFALL	A.E.C. %	FREQUENCY	SAMPLE TYPE	MONTH
#002, #004, #005, #006, & #007	10%	See Special Conditions	24 hr. Composite	January

Whole Effluent Toxicity (WET) tests will be required for Outfalls #004 and #005 only if biocides are used. The WET test will only be required in the first year if the initial test passes. If the WET test does not pass in the first year, the test must be run annually for the duration of the permit or until biocide use is discontinued.

An initial WET test will be required for Outfalls #002, #006, and #007. The WET test will only be required in the first year if it passes at all effluent concentrations. If the WET test does fail at any concentration in the first year, the rest must be run annually for the duration of the permit on Outfall #002, #006 and #007.

a. Test Schedule and Follow-Up Requirements
   (1) Perform a single-dilution test in the months and at the frequency specified above.

   If the test passes the effluent limit do not repeat test until the next test period. Submit results with the annual report.
   If the test fails the effluent limit a multiple dilution test shall be performed within 30 days, and biweekly thereafter until one of the following conditions are met:
   (a) THREE CONSECUTIVE MULTIPLE-DILUTION TESTS PASS. No further tests need to be performed until next regularly scheduled test period.
   (b) A TOTAL OF THREE MULTIPLE-DILUTION TESTS FAIL. DNR's letter. This plan must be approved by DNR before the TIE or TRE is begun. A schedule for completing the TIE or TRE shall be established in the plan approval.

C. SPECIAL CONDITIONS (continued)

1. Whole Effluent Toxicity (WET) (continued)

a. Test Schedule and Follow-Up Requirements (continued)

(2) The permittee shall submit a summary of all test results for the test series to the Planning Section of the WPCP, DNR, Box 176, Jefferson City, MO within 14 days of the third failed test. DNR will contact the permittee with initial guidance on conducting a toxicity identification evaluation (TIE) or toxicity reduction evaluation (TRE). The permittee shall submit a plan for conducting a TIE or TRE to the Planning Section of the WPCP within 60 days of the date of DNR's letter. This plan must be approved by DNR before the TIE or TRE is begun. A schedule for completing the TIE or TRE shall be established in the plan approval.

(3) Upon DNR's approval, the TIE/TRE schedule may be modified if toxicity is intermittent during the TIE/TRE investigations. A revised WET test schedule may be established by DNR for this period.

(4) If a previously completed TIE has clearly identified the cause of toxicity, additional TIEs will not be required as long as effluent characteristics remain essentially unchanged and the permittee is proceeding according to a DNR approved schedule to complete a TRE and reduce toxicity. Regularly scheduled WET testing as required in part b.(1) will be required during this period.

(5) In addition to the WET test summary report required in part (2), all failing test results shall be reported to DNR within 14 days of the availability of results.

(6) All WET test results for the reporting period shall be summarized and submitted to DNR by the end of the following October. When WET test sampling is required to run over one DMR period, each DMR report shall contain information generated during the reporting period.

b. PASS/FAIL procedure and effluent limitations

(1) To pass a single-dilution test, mortality observed in the AEC test concentration shall not be significantly different (at the 95% confidence level; $p = 0.05$) than that observed in the upstream receiving-water control. The appropriate statistical tests of significance will be those outlined in the most current USEPA acute toxicity manual or those specified by the MDNR.

(2) To pass a multiple-dilution test:

(a) the computed percent effluent at the edge of the zone of initial dilution (AEC) must be less than three-tenths (0.3) of the LC_{50} concentration for the most sensitive of the test organisms, or,
(b) all dilutions equal to or greater than the AEC must be nontoxic. Failure of one multiple-dilution test is considered an effluent limit violation.

C. SPECIAL CONDITIONS (continued)

1. Whole Effluent Toxicity (WET) (continued)

c. Test Conditions

(1) Test species: Ceriodaphnia dubia and fathead minnows, Pimephales promelas. Organisms used in WET testing should come from cultures reared for the purpose of conducting toxicity tests and should be cultured in a manner consistent with the most current USEPA guidelines. All test animals should be cultured as described in EPA-600/4-90/027.

(2) Test period: 48 hours at the "Acceptable Effluent Concentration" (AEC) specified above.

(3) When dilutions are required, upstream receiving stream water will be used as dilution water. If upstream water is unavailable or if mortality in the upstream water exceeds 10%, "reconstituted" water will be used. Procedures for generating reconstituted water will be supplied by the Department of Natural Resources (DNR).

(4) Tests should be initiated immediately after the sample is collected, but tests must be initiated no later than 36 hours after collection.

(5) Single-dilution tests will be run with:
(a) Effluent at the AEC concentration;
(b) 100% receiving-stream water (if available), collected upstream of the outfall at a point beyond any influence of the effluent; and
(c) reconstituted water.

(6) Multiple-dilution tests will be run with:
(a) 100%, 50%, 25%, 12.5%, and 6.25% effluent, unless the AEC is less than 25% effluent, in which case dilutions will be 4 times the AEC, two times the AEC, AEC, 1/2 AEC and 1/4 AEC.
(b) 100% receiving-stream water (if available), collected upstream of the outfall at a point beyond any influence of the effluent; and
(c) reconstituted water.

(7) If reconstituted-water control mortality for a test species exceeds 10%, the entire test will be rerun.

2. Report as no-discharge when a discharge does not occur during the report period.

3. This permit may be reopened and modified, or alternatively revoked and reissued, to:
(a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
(1) contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
(2) controls any pollutant not limited in the permit.
(b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri's Water Quality Standards.
(c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri's list of waters of the state not fully achieving the state's water quality standards, also called the 303(d) list.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.

4. There shall be no discharge of polychlorinated biphenyl compounds.

C. SPECIAL CONDITIONS (continued)

5. Discharge of wastewater from this facility must not alone or in combination with other sources cause the receiving stream to violate the following:

   (a) Water temperature and temperature differentials specified in Missouri Water Quality Standards shall be met.

6. Any pesticide discharge from any point source shall comply with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act, as amended (7 U.S.C. 136 et. seq.) and the use of such pesticides shall be in a manner consistent with its label.

7. Neither free available chlorine nor total residual chlorine may be discharge from any unit for more than two hours in any one day.

8. An upset provision, identical to the upset provision set forth at 40 CSR 122.41(n), is hereby incorporated in this permit.

9. Changes in Discharges of Toxic Substances

   The permittee shall notify the Director as soon as it knows or has reason to believe:

   a. That any activity has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following :notification levels:"
      (1) One hundred micrograms per liter (100 ug/L);
      (2) Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2, 5 dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
      (3) Five (5) times the maximum concentration value reported for the pollutant in the permit application;
      (4) The level established in Part A of the permit by the Director.

   b. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

10. Permittee is to abandon the domestic waste facilities described herein and shall connect the tributary waste load to trunk sewers within 90 days of notice of availability if trunk sewers operated by one of the authorities outlined in Section (3)(B) 1 or 2 of Clean Water Commission Regulation 10 CSR 6.010 are made available to the site during the time a valid discharge permit exists.

11. Sludge and Biosolids Use for Domestic Wastewater Treatment Facilities

   a. Permittee shall comply with the pollutant limitations, monitoring, reporting, and other requirements in accordance with the attached permit Standard Conditions.

C. SPECIAL CONDITIONS (continued)

12. Use or Disposal of Ash from Power Plants
    a. Disposal of ash is not authorized by this permit.
    b. This permit does not pertain to permits for disposal of ash or exemptions for beneficial uses of ash under the Missouri Solid Waste Management Law and regulations.
    c. This permit does not authorize off-site storage, use of disposal of ash in regard to water pollution control permits required under 10 CSR 20-6.015 and 10 CSR 20-6.200.
    d. Ash stored in on-site treatment ponds (ash ponds) shall not cause a discharge to subsurface waters of the state. Ash ponds which have a leakage rate exceeding the limitations under 10 CSR 20-8.020 and 10 CSR 20-8.200 are discharges to waters of the state and must by authorized by permit.
    e. An annual report shall be submitted by January 28 each year for the previous calendar year period. The report shall include the quantity of ash generated; the cumulative quantity of ash stored on-site at the end of the year, including ash ponds; the quantity of ash sold or given away to each customer, and the intended use of the ash.

13. General Criteria. The following water quality criteria shall be applicable to all waters of the state at all times including mixing zones. No water contaminant, by itself or in combination with other substances, shall prevent the waters of the state from meeting the following conditions:

    a. Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses;
    b. Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses;
    c. Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
    d. Waters shall be free from substances or conditions in sufficient amounts of result in toxicity to human, animal or aquatic life;
    e. There shall be no acute toxicity to livestock or wildlife watering;
    f. Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community;
    g. Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such material is specifically permitted pursuant to section 260.200-260.247;

14. Once per year, permittee will inspect soil covered ash pile to ascertain that erosion has not occurred and that vegetation is adequate to control erosion. This should be submitted to the department annually.

SUMMARY OF TEST METHODOLOGY FOR WHOLE-EFFLUENT TOXICITY TESTS

Whole-effluent-toxicity test required in NPDES permits shall use the following test conditions when performing single or multiple dilution methods. Any future changes in methodology will be supplied to the permittee by the Missouri Department of Natural Resources (MDNR). Unless otherwise specified by MDNR, procedures should be consistent with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA/600/4-90/027.

Test conditions for Ceriodaphnia dubia:

Test duration:	48 h
Temperature:	25 ± 2°C
Light Quality:	Ambient laboratory illumination
Photoperiod:	16 h light, 8 h dark
Size of test vessel:	30 mL (minimum)
Volume of test solution:	15 mL (minimum)
Age of test organisms:	<24 h old
No. of animals/test vessel:	5
No. of replicates/concentration:	4
No. of organisms/concentration:	20 (minimum)
Feeding regime:	None (feed prior to test)
Aeration:	None
Dilution water:	Upstream receiving water; if no upstream flow, synthetic water modified to reflect effluent hardness.
Endpoint:	Mortality (Statistically significant difference from upstream receiving water control at $p \leq 0.05$)
Test acceptability criterion:	90% or greater survival in controls

Test conditions for (Pimephales promelas):

Test duration:	48 h
T mperature:	25 ± 2°C
Light Quality:	Ambient laboratory illumination
Photoperiod:	16 h light/ 8 h dark
Size of test vessel:	250 mL (minimum)
Volume of test solution:	200 mL (minimum)
Age of test organisms:	1-14 days (all same age)
No. of animals/test vessel:	10
No. of replicates/concentration:	4 (minimum) single dilution method 2 (minimum) multiple dilution method
No. of organisms/concentration:	40 (minimum) single dilution method 20 (minimum) multiple dilution method
Feeding regime:	None (feed prior to test)
Aeration:	None, unless DO concentration falls below 4.0 mg/L; rate should not exceed 100 bubbles/min.
Dilution water:	Upstream receiving water; if no upstream flow, synthetic water modified to reflect effluent hardness.
Endpoint:	Mortality (Statistically significant difference from upstream receiving water control at $p \leq 0.05$)
Test Acceptability criterion:	90% or greater survival in controls

Date of Fact Sheet: June 21, 2000

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
AUGUST 15, 1994

PART III - SLUDGE & BIOSOLIDS FROM DOMESTIC WASTEWATER TREATMENT FACILITIES

SECTION A - GENERAL REQUIREMENTS

1. This permit pertains to sludge requirements under the Missouri Clean Water Law and regulations and incorporates applicable federal sludge disposal requirements under 40 CFR 503. The Environmental Protection Agency (EPA) has principal authority for permitting and enforcement of the federal sludge regulations under 40 CFS 503 until such time as Missouri is delegated the new EPA sludge program. EPA has reviewed and accepted these standard sludge conditions. EPA may choose to issue a separate sludge addendum to this permit or a separate federal sludge permit at their discretion to further address federal requirements.
2. These PART III Standard Conditions apply only to sludge and biosolids generated at domestic wastewater treatment facilities, including public owned treatment works (POTW) and privately owned facilities.
3. Sludge and Biosolids Use and Disposal Practices.
   a. Permittee is authorized to operate the sludge and biosolids treatment, storage, use, and disposal facilities listed in the facility description of this permit.
   b. Permittee shall not exceed the design sludge volume listed in the facility description and shall not use sludge disposal methods that are not listed in the facility description, without prior approval of the permitting authority.
   c. Permittee is authorized to operate the storage, treatment or generating sites listed in the Facility Description section of this permit.
   d. A separate operating permit is required for each operating location where sludge or biosolids are generated, stored, treated, or disposed, unless specifically exempted in this permit or in 10 CSR 20, Chapter 6 regulations. For land application, see section H, subsection 3 of these standard conditions.
4. Sludge Received From Other Facilities
   a. Permittees may accept domestic wastewater sludge from other facilities including septic tank pumpings from residential sources as long as the design sludge volume is not exceeded and the treatment facility performance is not impaired.
   b. The permittee shall obtain a signed statement from the sludge generator or hauler that certifies the type and source of the sludge.
   c. Sludge received from out-of-state generators shall receive prior approval of the permitting authority and shall be listed in the facility description or special conditions section of the permit.
5. These permit requirements do not supersede nor remove liability for compliance with county and other local ordinances.
6. These permit requirements do not supersede nor remove liability for compliance with other environmental regulations such as odor emissions under the Missouri Air Pollution Control Law and regulations.
7. This permit may (after due process) be modified, or alternatively revoked and reissued, to comply with any applicable sludge disposal standard or limitation issued or approved under Section 405(d) of the Clean Water Act or under Chapter 644 RsMo.
8. In addition to these STANDARD CONDITIONS, the department may include sludge limitations in the special conditions portion or other sections of this permit.
9. Alternate Limits in Site Specific Permit.
   Where deemed appropriate, the department may require an individual site specific permit in order to authorize alternate limitations:
   a. An individual permit must be obtained for each operating location, including application sites.
   b. To request a site specific permit, an individual permit application, permit fees, and supporting documents shall be submitted for each operating location. This shall include a detailed sludge/biosolids management plan or engineering report.
10. Exceptions to these Standard Conditions may be authorized on a case-by-case basis by the department, as follows:
    a. The department will prepare a permit modification and follow permit public notice provisions as applicable under 10 CSR 20-6.020, 40 CFR 124.10, and 40 CFR 501.15(a)(2)(ix)(E). This includes notification of the owners of property located adjacent to each land application site, where appropriate.
    b. Exceptions cannot be granted where prohibited by the federal sludge regulations under 40 CFR 503.
11. Compliance Period
    Compliance shall be achieved as expeditiously as possible but no later than the compliance dates under 40 CFR 503.2.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER POLLUTION CONTROL PROGRAM

FORM S - SECTION 1. DOMESTIC SLUDGE REPORTING

GENERAL INFORMATION

REPORTING PERIOD: (YEAR)

FACILITY NAME	CITY NAME
PERMIT NUMBER	COUNTY NAME

Instructions: See Instruction Sheet for directions.

1. Sludge Production, including sludge received from others:

ACTUAL DRY TONS/YEAR	ACTUAL POPULATION EQUIVALENT

2. Sludge Treatment:

- ☐ Anaerobic Digester
- ☐ Aerobic Digester
- ☐ Composting
- ☐ Storage Tank
- ☐ Air or Heat Drying
- ☐ Lime Stabilization
- ☐ Other, Describe: _____

3. Sludge Use or Disposal: Complete the rest of this form only for the sections applicable to your method of sludge and biosolids use or disposal.

X All Permittees	Complete Section 1
☐ Land Application (LA)	Complete Sections 2 and 3
☐ Contract Hauler (CH) >150 PE	Complete Sections 2 and 4
☐ Contract Hauler (CH) <150 PE	Complete Section 4
☐ Hauled to another Treatment Facility (HT)	Complete Section 4
☐ Solid Waste Landfill (LF)	Complete Section 4
☐ Sludge Disposal Lagoon (SD)	Complete Section 5
☐ Incineration (IN)	Complete Section 6
☐ Sludge Hauled to Incinerator (IO)	Complete Section 6

4. Certification: I certify under penalty of law that the information contained in this report and attachments are true and correct. This determination has been made under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information used to determine these requirements have been met. I am aware that there are significant penalties for false certification, including the possibility of fine and imprisonment.

PRINT NAME	OFFICIAL TITLE	
SIGNATURE	DATE	PHONE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY

NPDES MONITORING REPORT FOR NON-MUNICIPAL WASTEWATER DISCHARGES

INSTRUCTIONS:

1. Mail to the appropriate DNR regional office as noted in your permit.
2. Report must be signed by owner and by analyst. Report should be typed or neatly printed.
3. Part A of the permit specifies the parameters to be monitored, frequency of monitoring and frequency of reporting results. If quarterly reports are required, they are due on April 28, July 28, October 28, and January 28, each report covering the preceding 3-month period not including the reporting month. See the permit for reporting dates if other than quarterly.
4. Report results of all analyses, even if performed more frequently than required by Part A of the permit.
5. File a report even if discharge is intermittent and no discharge occurred during the monitoring period. Complete the identification section, write "ND" in the appropriate columns for the dates the facility was checked, and sign the report. NOTE: If a discharge occurs any time during the monitoring period, it must be reported.
6. Under "Sample Type" indicate whether sample analyzed was: (a) grab sample; (b) 24-hour composite sample; or (c) modified composite sample. NOTE: See permit for type of sample required for each parameter.
7. Under "Sample Type" for Flow indicate whether figures shown are based on (a) instantaneous measurements or (b) actual 24-hour measured flow. Figure recorded is to represent the total 24-hour flow for the date shown or a reasonable estimate.
8. Indicate whether samples were collected by owner or by personnel of the lab performing the analyses.

NOTE: This reporting form is a universal reporting form for non-municipal sewage treatment plants, industries, and other point-source discharges.

Industries and individuals who have their own report forms designed for their specific needs are encouraged to substitute their forms. A suitable substitute must meet the following specifications.

(a) Form must be 8½" x 11".
(b) Report must show all of the information indicated on this standard form.

FACILITY NAME	PERMIT NUMBER	COUNTY	OWNER	TYPE OF FACILITY
REQUIRED FREQUENCY OF MONITORING		THIS REPORT COVERS PERIOD	_____, 19___ THROUGH _____, 19___	

| | | |

STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION
Revised
October 1, 1980

PART I - GENERAL CONDITIONS
SECTION A - MONITORING AND REPORTING

1. **Representative Sampling**
   a. Samples and measurements taken as required herein shall be representative of the nature and volume, respectively, of the monitored discharge. All samples shall be taken at the outfall(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.
   b. Monitoring results shall be recorded and reported on forms provided by the Department, postmarked no later than the 28th day of the month following the completed reporting period. Signed copies of these, and all other reports required herein, shall be submitted to the respective Department Regional Office, the Regional Office address is indicated in the cover letter transmitting the permit.

2. **Schedule of Compliance**
   No later than fourteen (14) calendar days following each date identified in the "Schedule of Compliance", the permittee shall submit to the respective Department Regional Office as required therein, either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or if there are no more scheduled requirements, when such noncompliance will be corrected. The Regional Office address is indicated in the cover letter transmitting he permit.

3. **Definitions**
   Definitions as set forth in the Missouri Clean Water Law and Missouri Clean Water Commission Definition Regulation 10 CSR 20-2.010 shall apply to terms used herein.

4. **Test Procedures**
   Test procedures for the analysis of pollutant shall be in accordance with the Missouri Clean Water Commission Effluent Regulation 10 CSR 20-7015.

5. **Recording of Results**
   a. For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:
      (i) the date, exact place, and time of sampling or measurements;
      (ii) the individual(s) who performed the sampling or measurements;
      (iii) the date(s) analyses were performed;
      (iv) the individual(s) who performed the analyses;
      (v) the analytical techniques or methods used; and
      (vi) the results of such analyses.
   b. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six (6) months per violation, or both.
   c. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

6. **Additional Monitoring by Permittee**
   If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Monitoring Report Form. Such increased frequency shall also be indicated.

7. **Records Retention**
   The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recording for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

SECTION B - MANAGEMENT REQUIREMENTS

1. **Change in Discharge**
   a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant not authorized by this permit or any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.
   b. Any facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants shall be reported by submission of a new NPDES application at least sixty (60) days before each such changes, or, if they will not violate the effluent limitations specified in the permit, by notice to the Department at least thirty (30) days before such changes.

2. **Noncompliance Notification**
   a. If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Department with the following information, in writing within five (5) days of becoming aware of such conditions:
      (i) a description of the discharge and cause of noncompliance, and
      (ii) the period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.
   b. Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally with 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided with five (5) days of the time the permittee becomes aware of the circumstances. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

3. **Facilities Operation**
   Permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions. Operators or supervisors of operations at publicly owned or publicly regulated wastewater treatment facilities shall be certified in accordance with 10 CSR 209.020(2) and any other applicable law or regulation. Operators of other wastewater treatment facilities, water contaminant source or point sources, shall, upon request by the Department, demonstrate that wastewater treatment equipment and facilities are effectively operated and maintained by competent personnel.

4. **Adverse Impact**
   The permittee shall take all necessary steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit or set forth in the Missouri Clean Water Law and Regulations (hereinafter the Law and Regulations), including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

TIM STALLMAN
573 522 9920
'MOVE'

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
ANNUAL NPDES OPERATION REPORT FOR NON-MUNICIPAL WASTEWATER DISCHARGES

MAIL TO: The appropriate DNR regional office as noted in your permit.

PERMIT NUMBER	COUNTY	REPORT DATE _____, 19___ THROUGH _____, 19___

OWNER NAME	OWNER ADDRESS
FACILITY NAME	FACILITY ADDRESS

THIS REPORT CONTAINS, BUT IS NOT LIMITED TO, THE FOLLOWING:

(1.) RECORD OF MAINTENANCE AND REPAIRS PERFORMED AND ANY MAJOR PROBLEMS EXPERIENCED DURING THE YEAR.

	time	temp	pH	flow measure	
001	903	—	—	∅	
002	0910	28°c	7.20	2" ↑	
003	0918	41°c	6.85	↓12" from 23	
006	0925	28°c	8.00	↓6"	~~Bad~~
007	0934	27°	8.6	@ top 0"	
Intake	1000				

(2.) AVERAGE NUMBER OF TIMES PER MONTH THE FACILITY IS CHECKED FOR PROPER OPERATION _____

(3.) DESCRIPTION OF VISUAL APPEARANCE OF THE EFFLUENT.

	time	temp	pH	
001	10:40			0 + frozen
2	10:25	10.3	7.3	5" ↑
3	10:32	23.6	6.4	9.5" ↑
6	1017	13.1	6.7	7" ↓
7	1008	4.1	8.8	1" ↓
~~Int~~	~~1055~~			

NOTE: THE NPDES PERMIT MAY SPECIFY OTHER ITEMS IN ADDITION TO THOSE ABOVE TO BE INCLUDED IN THE OPERATION REPORT. PLEASE REFER TO YOUR RESPECTIVE PERMIT FOR THIS INFORMATION. ATTACH ADDITIONAL SHEET IF NECESSARY.

REPORT COMPLETED BY	DATE
REPORT APPROVED BY (OWNER OR OPERATING AUTHORITY)	DATE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION BRANCH
(SEE MAP FOR APPROPRIATE REGIONAL OFFICE)

APPLICATION FOR TRANSFER OF OPERATING PERMIT

FOR AGENCY USE ONLY	
CHECK NO.	
DATE RECEIVED	FEE SUBMITTED

NOTE ► PLEASE READ THE ACCOMPANYING INSTRUCTIONS BEFORE COMPLETING THIS FORM.

1.00 – 4.00 TO BE COMPLETED BY CURRENT PERMITTEE (PRESENT OWNER/SELLER). THE FOLLOWING ITEMS PRESENTLY APPLY TO THIS FACILITY: (SEE INSTRUCTIONS FOR APPROPRIATE FEE TO BE SUBMITTED WITH APPLICATION.)

1.00 FACILITY

NAME		TELEPHONE NUMBER	
SIBLEY GENERATING STATION		816-650-2900	
ADDRESS	CITY	STATE	ZIP
33200 EAST JOHNSON ROAD	SIBLEY	MO	64088

2.00 CURRENT OWNER

NAME		PHONE	816-467-3321
AQUILA, INC.		E-MAIL	steve.brooks@ aquila.
ADDRESS	CITY	STATE	ZIP
20 WEST 9TH	KANSAS CITY	MO	64105

3.00 CONTINUING AUTHORITY: (If same as owner, write same.)

NAME		TELEPHONE NUMBER	
SAME			
ADDRESS	CITY	STATE	ZIP

4.00 SIGNATURE

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION GIVEN ABOVE, THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF SUCH INFORMATION IS TRUE, COMPLETE AND ACCURATE, AND UNTIL TRANSFER APPROVAL, I AGREE TO CONTINUE TO ABIDE BY THE MISSOURI CLEAN WATER LAW AND ALL RULES, REGULATIONS, ORDERS AND DECISIONS, SUBJECT TO ANY LEGITIMATE APPEAL AVAILABLE UNDER THE MISSOURI CLEAN WATER LAW, OF THE MISSOURI CLEAN WATER COMMISSION.

NAME AND OFFICIAL TITLE (TYPE OR PRINT)	PHONE NO. (AREA CODE & NO.)
SCOTT HEIDTBRINK VICE PRESIDENT POWER GEN AND ENERGY RESOURCES	816-467-3830
SIGNATURE	DATE SIGNED

THE FOLLOWING ITEMS (5.00-10-00) WILL APPLY AFTER COMPLETION OF TRANSFER (SALE) AND ARE TO BE COMPLETED BY THE APPLICANT FOR TRANSFER OF OPERATING PERMIT (BUYER) OR AUTHORIZED AGENT.

5.00 FACILITY

NAME	NPDES NUMBER	TELEPHONE NUMBER
SIBLEY GENERATING STATION	MO-0004871	816-650-2900

ADDRESS	CITY	STATE	ZIP
33200 EAST JOHNSON ROAD	SIBLEY	MO	64088

6.00 FUTURE OWNER

NAME	TELEPHONE NUMBER
KANSAS CITY POWER & LIGHT COMPANY	816-556-2200

ADDRESS	CITY	STATE	ZIP
1201 WALNUT STREET	KANSAS CITY	MO	64106-2124

7.00 CONTINUING AUTHORITY: (if same as owner, write same)

NAME	TELEPHONE NUMBER
SAME	

ADDRESS	CITY	STATE	ZIP

8.00 FACILITY CONTACT

NAME	TELEPHONE NUMBER

TITLE

9.00 ADDITIONAL INFORMATION

ANTICIPATED EFFECTIVE DATE OF TRANSFER IN OWNERSHIP

ARE ANY CHANGES IN PRODUCTION, RAW MATERIALS OR IN THE QUANTITY OR QUALITY OF THE DISCHARGES FROM THIS FACILITY PLANNED OR ANTICPATED?

☐ YES ☒ NO IF YES EXPLAIN (IF ADDITIONAL SPACE IS REQUIRED, ATTACH SHEET)

10.00 SIGNATURE

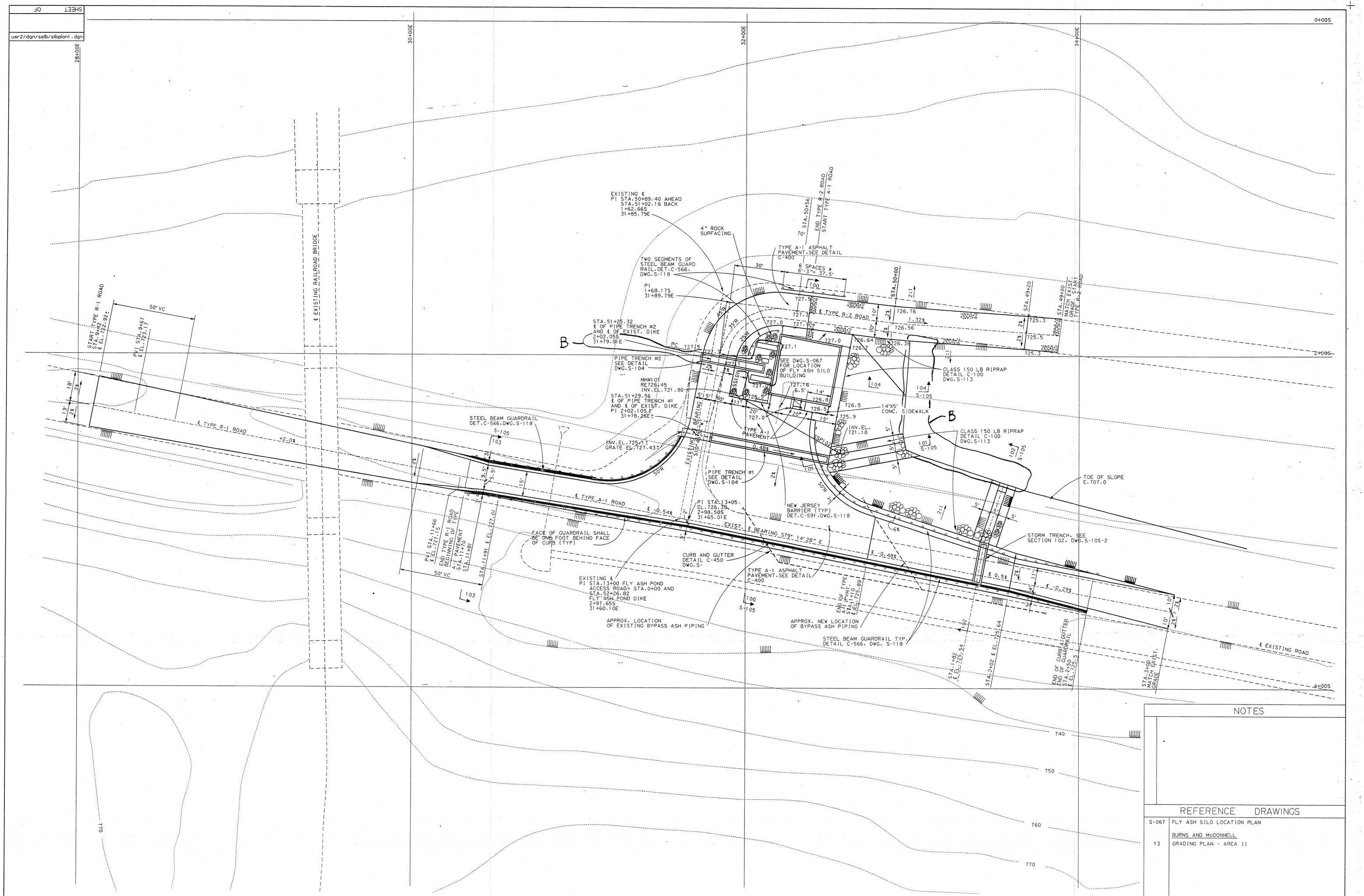
I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION GIVEN ABOVE, THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF SUCH INFORMATION IS TRUE, COMPLETE AND ACCURATE, AND UPON TRANSFER APPROVAL, I AGREE TO ABIDE BY THE MISSOURI CLEAN WATER LAW AND ALL RULES, REGULATIONS, ORDERS AND DECISIONS, SUBJECT TO ANY LEGITIMATE APPEAL AVAILABLE UNDER THE MISSOURI CLEAN WATER LAW, OF THE MISSOURI CLEAN WATER COMMISSION.

NAME AND OFFICIAL TITLE (TYPE OR PRINT)	PHONE NO. (AREA CODE & NO.)

SIGNATURE	DATE SIGNED

usr2/dgn/sslb/slbplan1.dgn

SHEET OF



NOTES

REFERENCE DRAWINGS

S-067	FLY ASH SILO LOCATION PLAN
	BURNS AND McDONNELL
Y3	GRADING PLAN - AREA II

DRAWING RELEASE RECORD

REV.	DATE REL'D.	PREPARED	REVIEWED	APPROVED	PURPOSE	FILM
A	06-26-92				FOR BIDS. SPEC.K-4484	
B	08-11-92				FOR PERMIT	

STATE OF MISSOURI — RICHARD W. KNOEBEL NUMBER E-25472 — REGISTERED PROFESSIONAL ENGINEER

08-11-92

CSAH03

SCALE 1"=20'-0"

PROJECT NUMBER 8742-08

FLY ASH SILO
GRADING AND DRAINAGE-PLAN
SIBLEY GENERATING STATION UNIT 3
MISSOURI PUBLIC SERVICE
SIBLEY, MISSOURI

SARGENT & LUNDY ENGINEERS CHICAGO

DRAWING NO. S-103 REV. B

SHEET OF

08-11-92

MISSOURI PUBLIC SERVICE
SIBLEY GENERATING STATION
CONSTRUCTION PERMIT FOR FLY ASH POND MODIFICATIONS

As part of its acid rain compliance plan at the Sibley Generating Station, Missouri Public Service (MPS) is planning to switch from a high-sulfur Illinois coal to a low sulfur western coal blend by the year 1995. The Sibley Generating Station is located along the Missouri River in Jackson County approximately one-half mile east of Sibley, Missouri.

Although the Sibley Generating Station will not begin burning the blended coal on a permanent basis until 1995, construction for modifying plant systems to burn the blended fuel will begin in September of this year. As part of the plant modifications, the existing fly ash handling and pond disposal system will be altered. These fly ash pond modifications will require a construction permit. Proposed fly ash pond and ash disposal system modifications are as follows.

1. Fly Ash Handling System Modifications:

   Precipitator ash will be pneumatically conveyed from the plant to a new fly ash silo located at the west end of the existing fly ash pond. Precipitator ash is currently sluiced from the plant and discharged directly into the west end of the fly ash pond. New ash lines will be routed along the existing ash piping corridor.

   Economizer ash will continue to be sluiced to the fly ash pond through the existing ash conveying system. Slag will continue to be sluiced to existing dewatering pond facilities located west of the plant.

2. Fly Ash Pond and Disposal Modifications:

   The western side of the fly ash pond will be filled with slag or soil for siting the new fly ash silo (see construction drawings accompanying this letter). An area approximately 75 feet by 120 feet will be reclaimed for silo placement. The silo foundation will be placed on driven steel piles. The existing ash sluice lines will be extended in a concrete pipe trench to the relocated west pond slope.

   Precipitator ash can be handled three ways from the silo to provide disposal flexibility; 1) the fly ash can be mixed with water and sluiced into the fly ash pond; 2) the fly ash can be loaded dry onto bulk trucks for potential sell; or 3) the fly ash can be conditioned with water in a pugmill and loaded onto trucks for disposal at the existing fly ash landfill.

Several improvements were made to the fly ash pond as part of pond cleanout and ash landfill operations in 1988 and 1989. The cleanout and landfill operations were permitted through MDNR waste management program. As part

of this construction permit application, MPS is proposing to revise the existing permit to incorporate these improvements. Existing fly ash pond improvements (see Dwg. Y5) made as part of the pond cleaning project are as follows:

1. Additional Pond Overflow Pipe:

   A pond overflow pipe was placed north of the existing fly ash pond outfall structure. The pipe discharges into the limestone bed structure just north of where the existing pond overflow pipe enters the structure (See Drawing Y8).

   The new overflow pipe was placed at a lower elevation than the existing outfall to enable lowering of the fly ash pond water level. The pond water level is lowered during pond cleanout operations to facilitate dewatering and removal of deposited ash. The overflow pipe is provided with adjustable risers to allow fluctuation of the water level. This enables the pond level to be incrementally increased as the pond is filled which promotes better distribution of deposited ash.

2. Center Dewatering Dike:

   An earthen dewatering dike was constructed across the center of the fly ash pond. The dike divides the pond into an east and west cell, and enables the west cell to be taken out of service, dewatered, and cleaned. The center dike also acts as a weir to improve sedimentation of ash in the west cell. Care was taken during construction of the center dike to avoid excavation of the pond's clay liner. Deposited ash was removed as the earthen dike was extended.

3. Fly Ash Sluice Line Extension:

   Two 16-inch diameter High Density Polyethylene (HDPE) pipes were placed abovegrade along the outer shoulder of the south fly ash pond dike. The pipes discharge into the east pond cell so that the west cell is bypassed during pond cleaning operations. The HDPE extension pipes are connected to the existing fiberglass ash lines during pond cleanings with a flanged connection.

4. Floating Silt Fences:

   Floating silt fences are placed along the flow path of the east cell during pond cleaning operations when the fly ash sluice line extensions are used. The silt fences filter the pond flow to improve pond discharge quality. The silt fences consist of a geotextile fabric suspended from a series of floats.

5. Shot Rock Work Pads:

   Work pads constructed out of quarried limestone were placed in the west pond cell to access the center of the fly ash pond for removal of deposited fly ash. Rock is transferred between work pads as required

to extend pads to desired cleanout locations. Deposited ash is removed as the pads are extended. Care is taken not to excavate into the clay liner as the rock is placed.

6. Landfill Return Water Line:

A 12-inch diameter HDPE pipe was placed from the landfill sedimentation pond to the fly ash pond. Landfill stormwater runoff and leachate overflows from the sedimentation pond into the return water line where it drains by gravity to the fly ash pond and is discharged through NPDES permitted Outfall 007. The return water line runs both above and below grade along the fly ash haul road. The routing and function of this line was included in the landfill operation permit application.

7. Pond pH Adjustment:

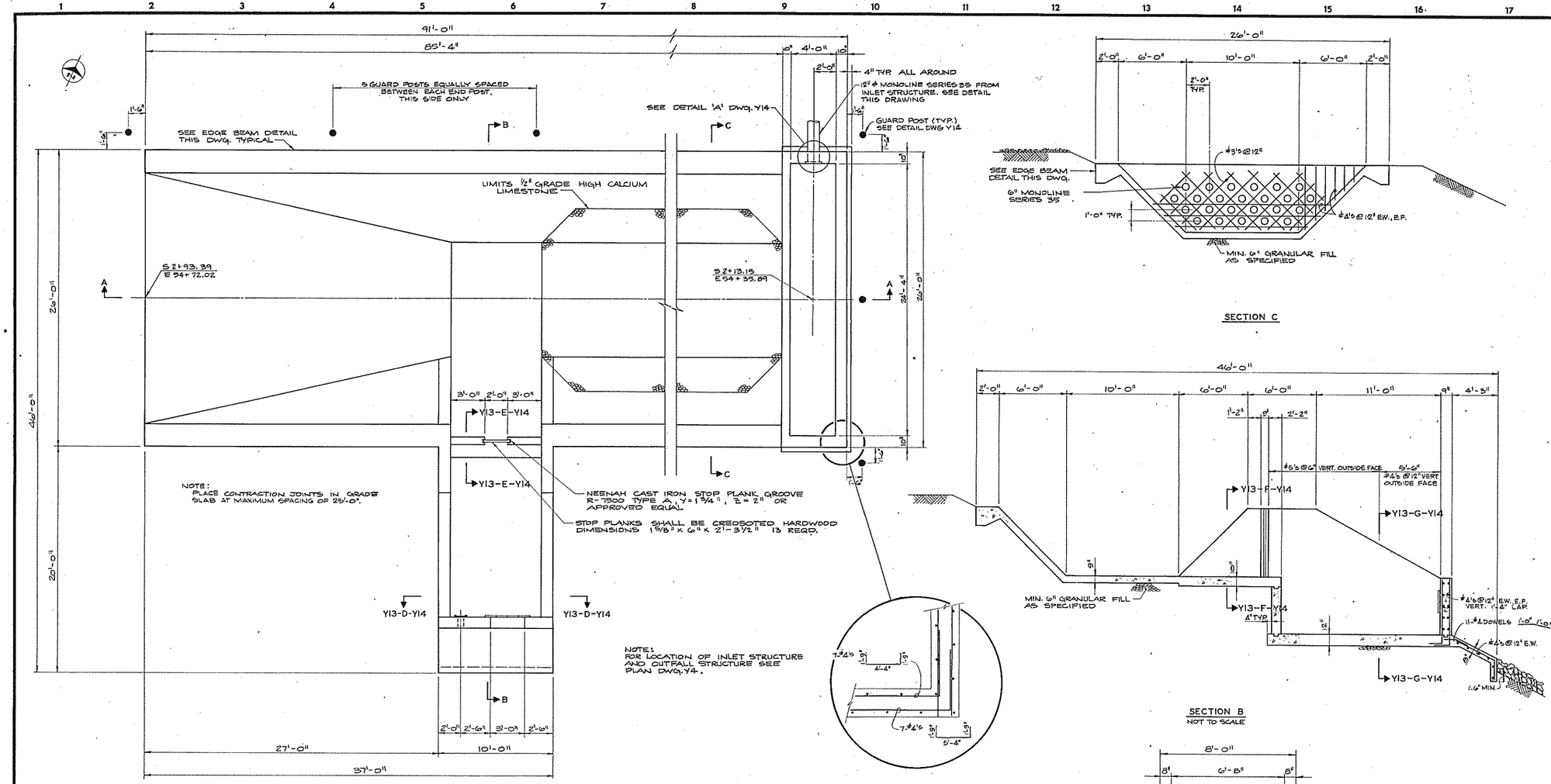
The method of pH adjustment in the fly ash pond was modified due to ongoing pluggage problems occurring in the limestone bed structure. The structure was constructed when the pond was built in 1976. Overflow from the pond flowed through a limestone bed in the structure to raise the pH. However, lower pH pond water reacted with the limestone and formed a gel which plugged the limestone bed.

Pond pH adjustment is now performed at the plant by chemical injection. Lime is occasionally added to the fly ash pond when pond pH is low. Fly ash pond overflow continues to flow through the limestone bed structure without the limestone bed. The NPDES sampling point continues to be at the limestone bed structure discharge.

The fly ash pond modifications are not anticipated to have an adverse effect on pond performance. Though the fly ash silo, center dewatering dike and work pads consume a small percentage of the fly ash pond storage capacity, the treatment capability of the pond has been enhanced by the center dike, additional overflow pipe and silt fences. No significant increase in flow to or solids loading in the pond is anticipated. Historically the fly ash pond has met NPDES effluent limitations and should continue to meet these limits in the future provided periodic removal of deposited ash continues in the west pond cell.

TL/j1867.tl

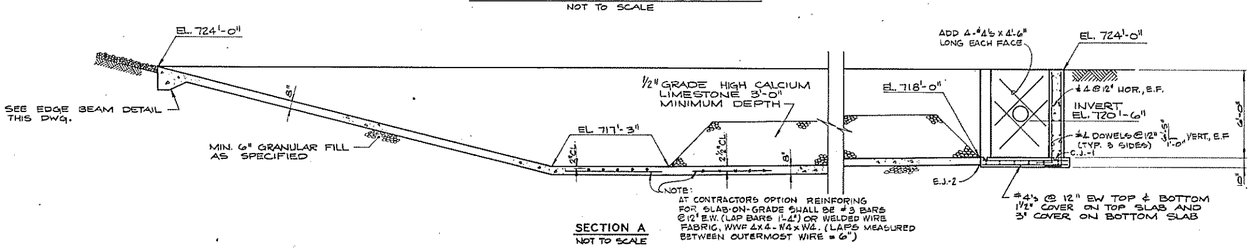
STATE OF MISSOURI
TERENCE LEE LARSON
NUMBER E-23603
REGISTERED PROFESSIONAL ENGINEER



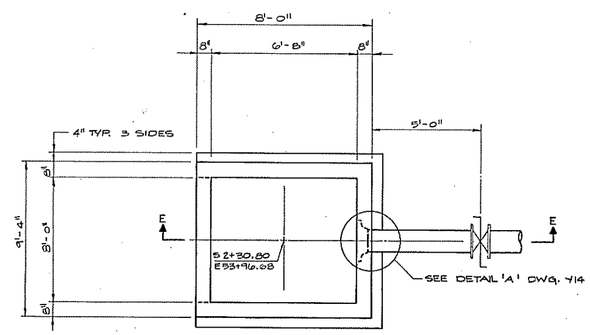
PLAN FLY ASH POND OUTFALL STRUCTURE
NOT TO SCALE

SECTION C

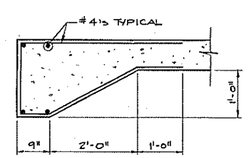
SECTION B
NOT TO SCALE



SECTION A
NOT TO SCALE

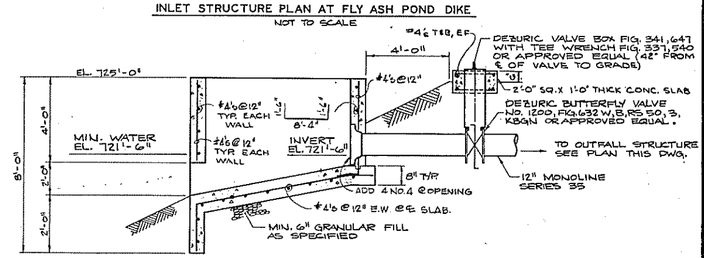


INLET STRUCTURE PLAN AT FLY ASH POND DIKE
NOT TO SCALE



NOTE: ALL AROUND SLAB-ON-GRADE

TYP EDGE BEAM
NOT TO SCALE



SECTION E
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-16540
REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

OUTFALL STRUCTURE

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

DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	SPG	Y13	—
DETAILED	EDH	PROJECT	73-062-1-005
CHECKED		SHEET	OF SHEETS

Dewberry

Calculation Shee

Designer McLREN Date 10-19-10 Checker _____ Date _____
Title _____ Job No. _____
Subject IN FLOW DESIGN FLOOD ANALYSIS Sheet No. ____ of ____

NO RUNOFF FROM AROUND POND
CAN CONTRIBUTE TO POND level.

POND IS LOCATED MISSOURI DEPARTMENT
OF TRANSPORTATION DISTRICT 4.

RAINFALL INTENSITY-DURATION-FREQUENCY
CURVES FROM MoDOT District 4 (See ATTACHED)

CREST 725'

NORMAL POOL 722'

FREE BOARD 3'

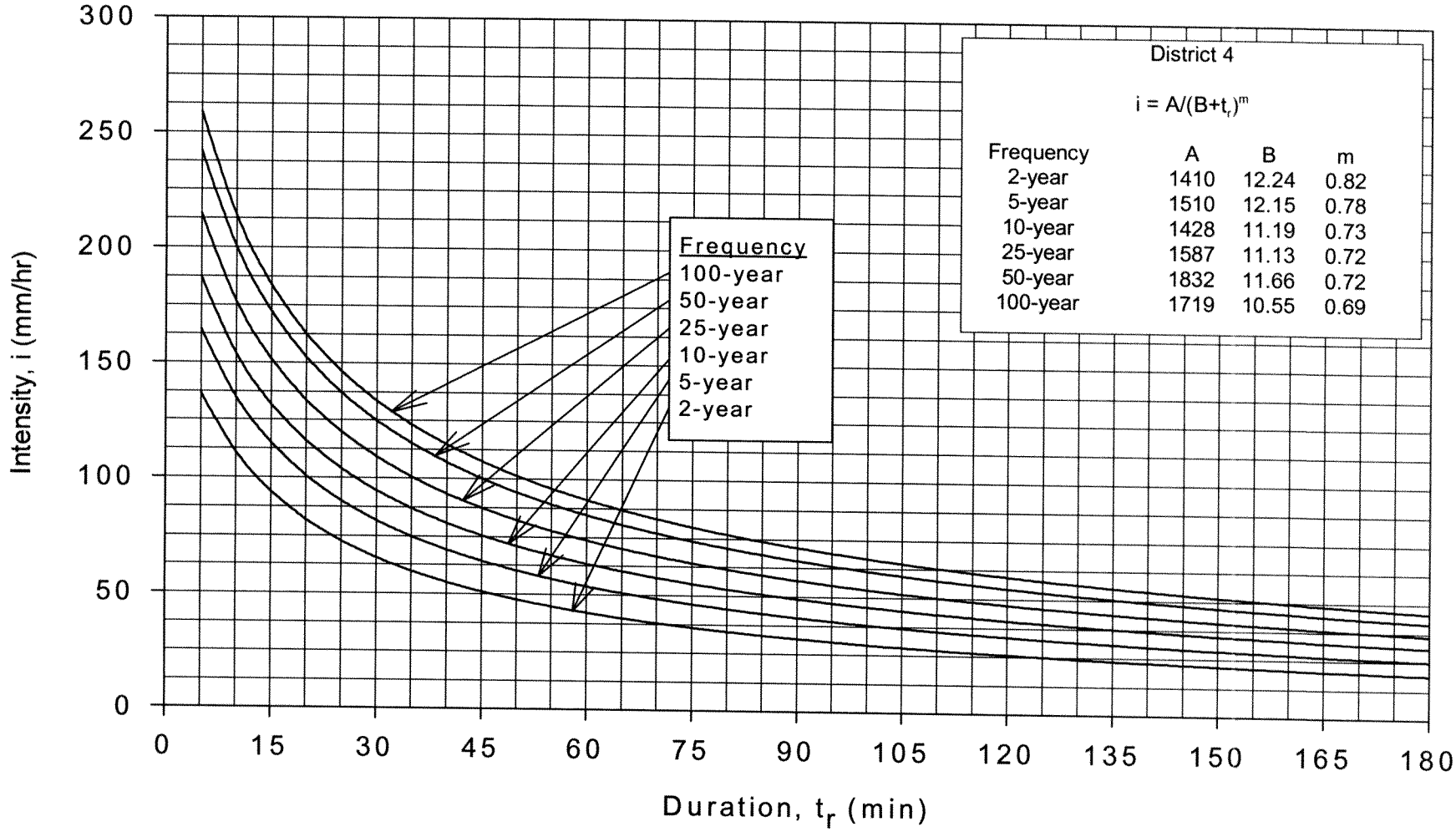
100 YEAR 24 hour Duration
(1% Design STORM)

$i = A/(B + t_r)^n$

A = 1719
B = 10.55
n = .69
$t_r = 24 \text{ hrs} \times \frac{60 \text{ min}}{\text{hr}} = 1440 \text{ min}$

$i = \frac{1719}{(10.55 + 1440)^{.69}} = 11.32 \text{ in}$

$3' - 11.32/12 = 2.05'$ of FREEBOARD
After storm OK



Rainfall Intensity-Duration-Frequency Curves for MoDOT District 4

Sibley
1-26-1977

MEMORANDUM

January 26, 1977

To: Bill Torres

From: Patrick Goeke

Re: Subsurface Recommendation for Fly Ash Pond
Missouri Public Service - Sibley
Project: 73-062-1-005

I. DRILLING AND TESTING RESULTS

Subsurface Investigation: Fly Ash Pond

The subsurface investigation for the proposed Ash Disposal Pond consisted of nineteen auger borings with bag samples taken at approximately 5 foot intervals. Laboratory testing included classification tests and strength tests. The resistivity survey conducted by staff geologists was unreliable due to the heterogeneous deposits in the river valley. The locations of the borings are shown on the attached drawings.

The borings in the fly ash pond indicate that the soil is an alluvial deposit consisting mainly of clean sands, silty sands, and silts of low plasticity. Some highly plastic and varved clays were found. These clay deposits are usually isolated lenses. The amount and distribution of clay found on the site will not be sufficient to prevent seepage from the pond.

To prevent seepage from the pond, an impervious liner will be required.

Subsurface Investigation: Borrow Area

Five preliminary borings were drilled in the field in the vicinity of line E 75+00. Each boring was drilled approximately 20 feet with bag samples taken at 5 foot intervals. These borings indicate that at least 20 feet of clayey silts (loess) exist over the site.

Laboratory tests were run on bag samples obtained from the borrow area. Atterburg limit tests indicate that the soil is a CL type soil with a liquid limit from 37 to 46 and a plastic index from 14 to 21.

Standard proctor tests indicate that this material has a maximum dry density of 103 pcf and an optimum moisture content of 18%.

Four permeability tests were run on combined samples with the calculated

permeability coefficient (k) ranging from 10^{-6} to 10^{-7} cm/sec. These samples were compacted to approximately 90% of maximum density.

One sieve and hydrometer test is being run with no results as of this date.

As of this date, final drilling for contract 100 is complete. Seven 30 foot borings were drilled in the proposed borrow area as shown on Drawing No. 3. The borings indicate that the soil in the borrow area is as good as that found in the preliminary borings. Laboratory tests will be assigned this week. When the laboratory tests are complete, the subsurface investigation work for this contract will be concluded.

II. DESIGN RECOMMENDATIONS

Liner Requirements

The preliminary tests run on samples from the borrow area indicate that the soils in the borrow area will be suitable for use as a pond liner.

Liquid Limits:	ranges from 44 to 37
Plastic Limits:	ranges from 22 to 24
Plastic Index:	ranges from 13 to 21
Maximum Dry Density:	102 pcf
Permeability:	10^{-6} to 10^{-7} cm/sec
Hydrometer Analysis:	Incomplete

In discussing the problem with Dr. Roy Leonard, he felt that the loess from the borrow area would provide an adequate liner if it is compacted to 92% ± 5% of the maximum dry density. Moisture should be held between optimum and optimum plus 4%.

The thickness of the liner will be dependent on the seepage requirements set down by the state.

Dike Requirements

Construction of dikes between Sta. 0+00 and Sta. 23+50 will be as shown in Figure #1.

Construction of dikes between Sta. 23+50 and Sta. 51+00 will be as shown in Figure #2.

The following requirements shall apply:

Type A soil shall be limited to soil taken from the designated borrow areas. Type A sections of the dike should be compacted using sheeps foot rollers to 92% ± 5% of the maximum dry density as determined by the Standard proctor. Moisture control is necessary and should be held between optimum and optimum plus 4%. Compactions will be in 6" uncompacted lifts.

Type B material can be any material removed from the pond area as waste material. Type B sections of the dike shall be compacted in 6" uncompacted lifts. Compaction shall be specified by a performance specification with the contractor making 5 passes with a sheeps foot roller.

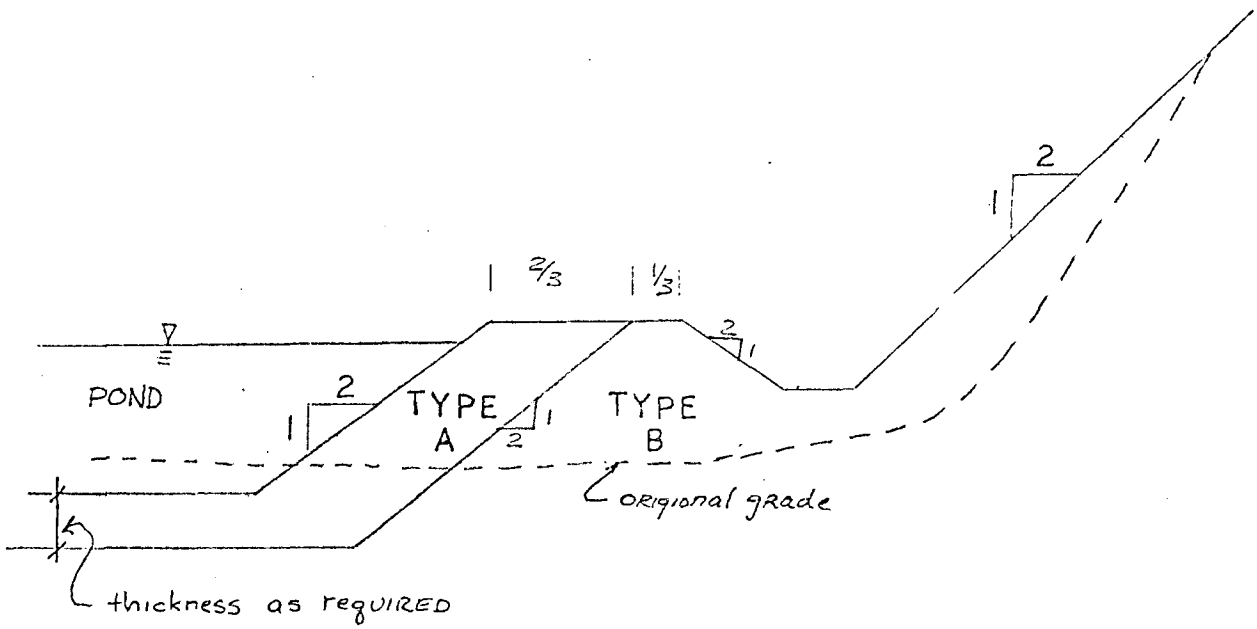


FIGURE 1 STA 0+00 TO 23+50

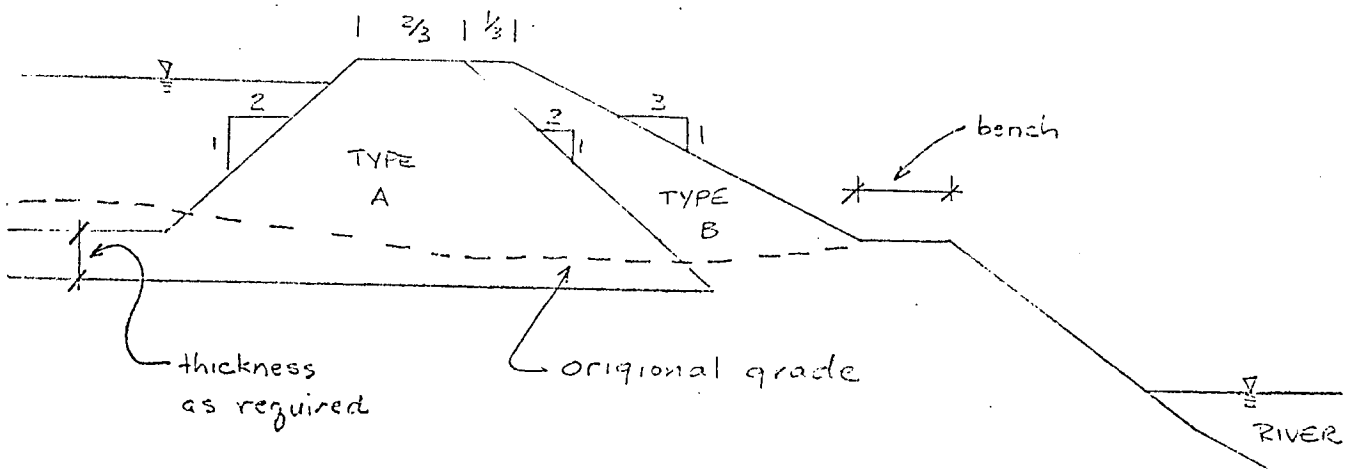


FIGURE 2 STA 23+50 TO 51+00

III. ASH POND DIKE STABILITY

A preliminary analysis of the stability of the proposed dikes for the fly ash pond has been completed. Three locations considered to be the least stable were investigated. The stations investigated were 31+00, 34+50 and 46+00.

Sta. 31+00

The factor of safety for the dike depends on the soil values given the loess fill and the underlying strata. Test samples from boring AP-5 indicate that the underlying clay strata has an undrained shear strength of 300 psf. The sand strata has an estimated value of 30° for the friction angle.

The loess fill was given a cohesion of 500 psf and a ϕ of 10 degrees. Subsequent direct shear test on a remolded sample of loess indicates that the loess may act as a sand with a ϕ of 26° and a cohesion of 100 psf.

For the 2:1 dike at Sta. 31+00 without a bench the factor of safety was 0.89 for the clayey loess ($\phi = 10^{\circ}$, c = 500). The factor of safety decreased to 0.91 for the sandy loess ($\phi = 26^{\circ}$, c = 100).

When the dike is moved away from the river to provide a 15 foot bench between the dike and the river bank, the factor of safety for the clayey

loess dike increases to 1.90. For the sandy loess fill the factor of safety with the 15 foot bench was computed to be 1.77.

Sta. 46+00

The soil at Sta. 46+00 is similar to that of Sta. 31+00 except for a decrease in the thickness of the clay layer. The strength values for the soil remain the same.

For the 2:1 dike without a bench, the factor of safety was computed to be 1.36 for the clayey loess. With sandy loess, the factor of safety decreased to 1.21. The addition of a 15 foot bench increases the factor of safety additionally.

Sta. 34+50

Two borings were taken approximately 150 feet from Sta. 34+50. Boring AP-7, to the east, consisted of 20 feet of poorly graded medium sand. Boring AP-9, to the west, consisted of 9 feet of sandy silty, overlying 11^{+} feet of medium stiff silty clay (c = 500 psf). Dikes were analyzed with clayey loess.

No Bench

The sand was estimated to have a ϕ of 28°. The computed factor of safety for the sand profile was found to be 1.31.

When analyzing the profile with an 11 foot clay layer overlying sand, the factor of safety decreased to 1.01.

15 Foot Bench

When analyzing the sand profile with a 15 foot bench, the factor of safety was computed to be 1.56. The same profile with an 11 foot clay layer, resulted in a factor of safety of 1.15.

The minimum factor of safety for a 2:1 dike consisting of sandy loess constructed on the clay profile with a 15 foot bench was found to be 1.07.

The above analysis was primarily directed at a deep failure circle which moves large masses of soil on long failure arcs.

The stability of the dikes on 2:1 slopes has been studied. It was determined that the minimum factor of safety for loess dikes with $\phi = 26^{\circ}$ and

c = 100 psf was 1.60. The minimum factor of safety with $\emptyset = 10^{o}$ and c = 500 psf was computed to be 2.23.

Affect of Clay Seams on Slope Stability

In analyzing the data from the slope stability programs, it can be seen that the presence of subsurface clay seams can decrease the stability of the dike slopes. The shear strength of samples tested indicate that the undrained shear strength is 300 to 500 psf.

Taking into consideration the deposition process in an alluvial valley, it is to be anticipated that the clay found in some of the borings are plugs. These clay plugs can be bridged by the width of the dike base and not adversely affect the stability of the slopes.

By controlling the placement rate of the fill, the pore pressure in the clay can be reduced and the shear strength of the clay increased.

Conclusions:

1) The stability of 2:1 dikes made from loessial type soils has an adequate factor of safety against shallow (slope) failure circles.

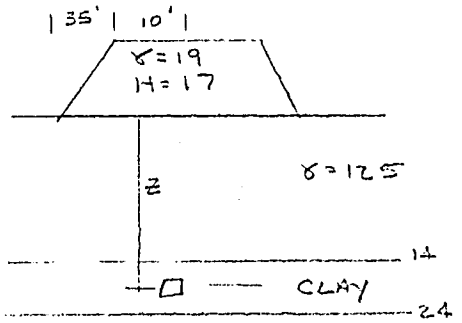
2) Providing a minimum bench of 15 feet between the toe of the dike and the top of the river bank increases the factor of safety of the slope.

3) The factor most incluencing the factor of safety is the presence of compressible clay seams.

   By controlling the rate of fill, the possibility of a slope failure due to increased pore pressures is reduced. The dikes should be constructed in a manner such that all portions of the dikes are about the same height.

Settlement Considerations

For normally loaded clays, the settlement due to an increased load can be predicted based on the Compression Index $-C_c'$ (Terzaghi and Peck - Article 13).



$a = 35$ $\quad A/z = 1.8$

$b = 16$ $\quad B/z = .52$

$z = 19$

From Navfac (7-5-7)

$I = .435$

$P = 17 \times 95 = .80$ TSF

$\sigma_z = 2IP = 2 \times .435 \times .80 = .70$ tsf $= \Delta P$

$P_o = 1.02$ tsf

$C_c = .009(LL - 10) = .009(58 - 10)$

$= .432$

$$S = H \frac{C_c}{1+e_o} \log_{10} \frac{P_o + \Delta P}{P_o}$$

$H = 10$ ft

$P_o = 1.02$ tsf

$\Delta P = .70$ tsf

$$S = 10 \frac{.432}{1.98} \log \frac{1.72}{1.02}$$

$= .53$ feet

$= 6$ inches

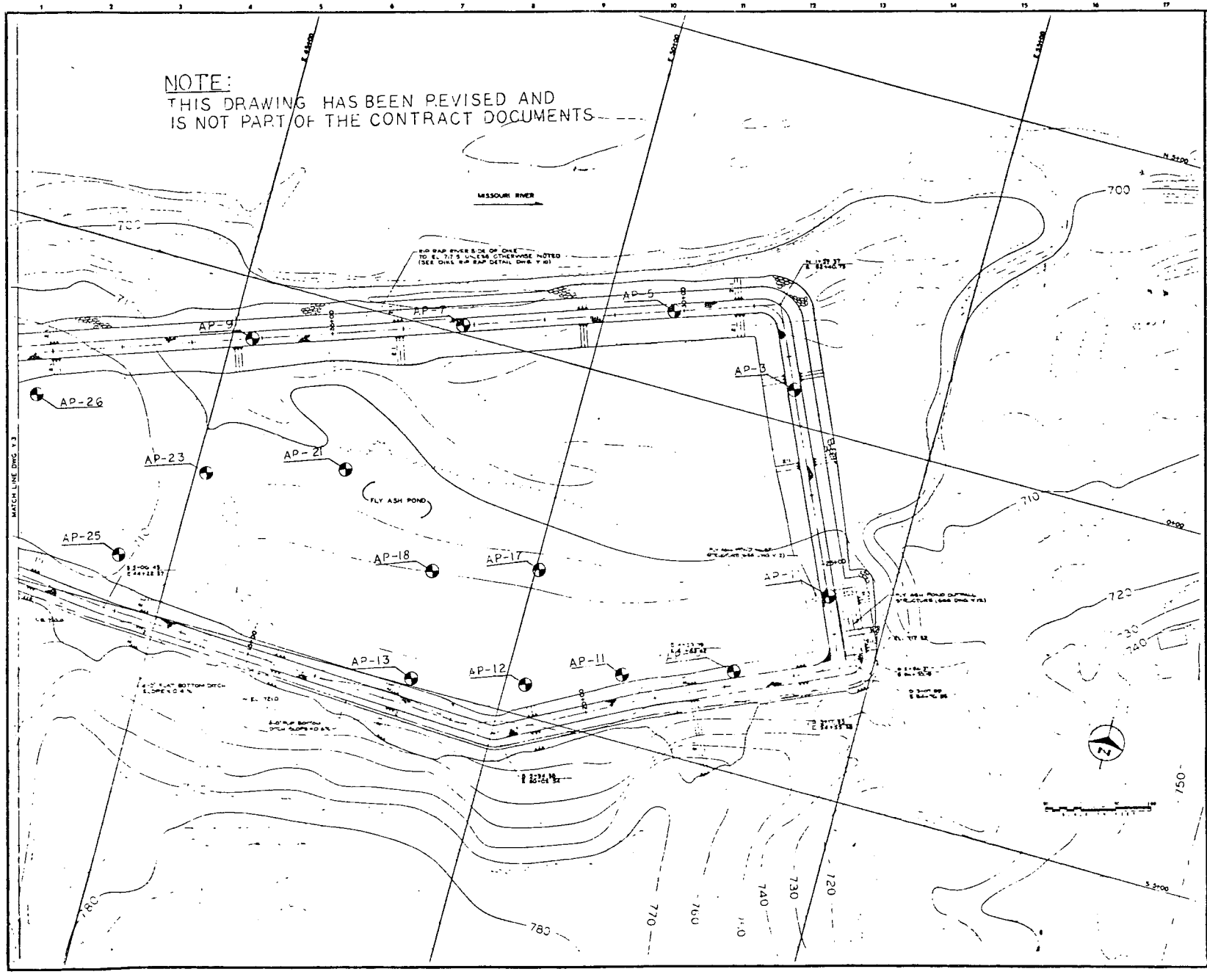
$Se = Gw$

$$e = \frac{Gw}{S} = \frac{2.72(36)}{100}$$

$e = .98$

Possible settlement of the dike is 6 inches and will occur at unpredictable locations due to the nature of the deposits.

NOTE:
THIS DRAWING HAS BEEN REVISED AND
IS NOT PART OF THE CONTRACT DOCUMENTS

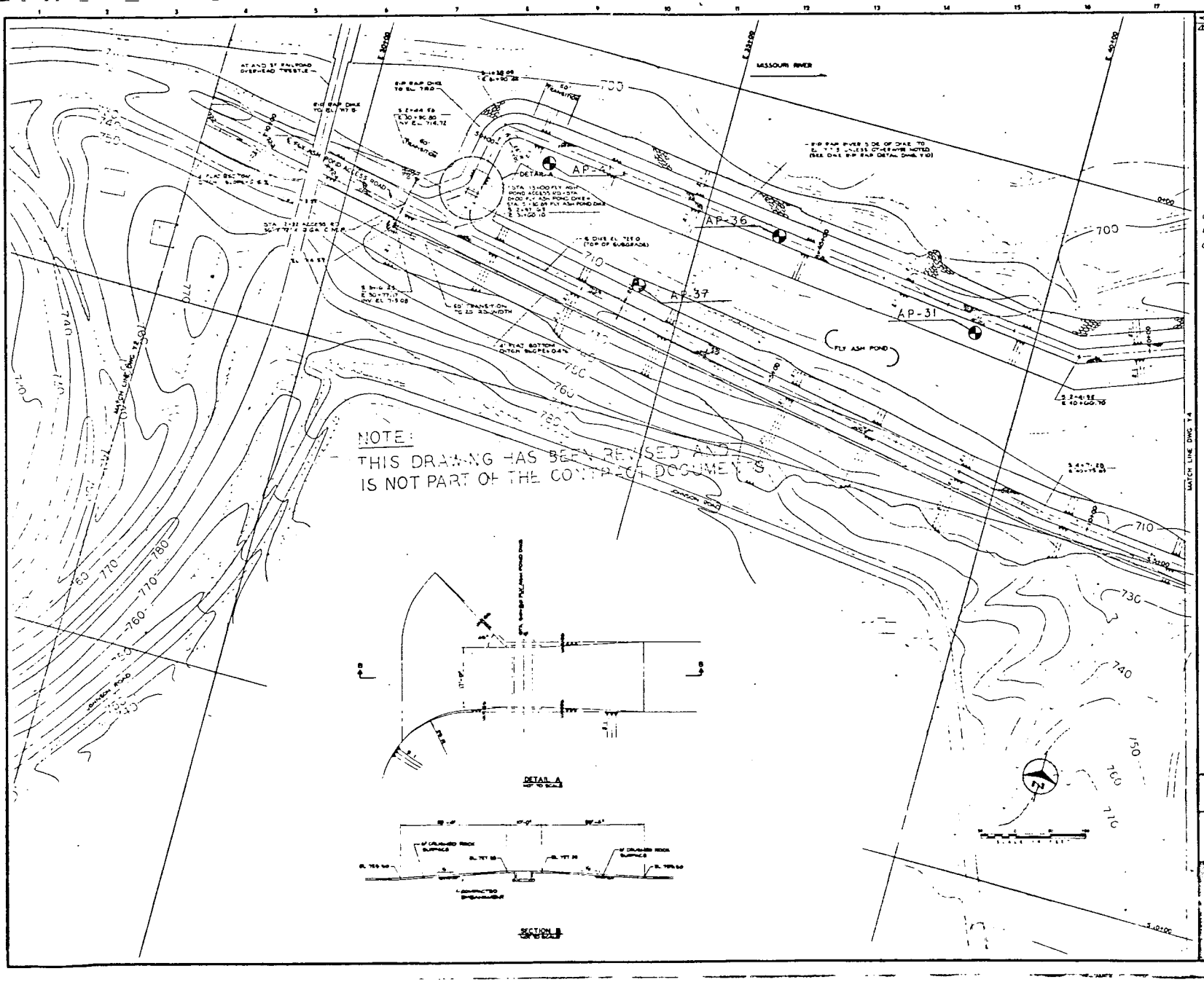


The locations of the dikes shown on this drawing does not conform to the contract documents.

BORING LOCATIONS

CONTRACT NO. 118
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI



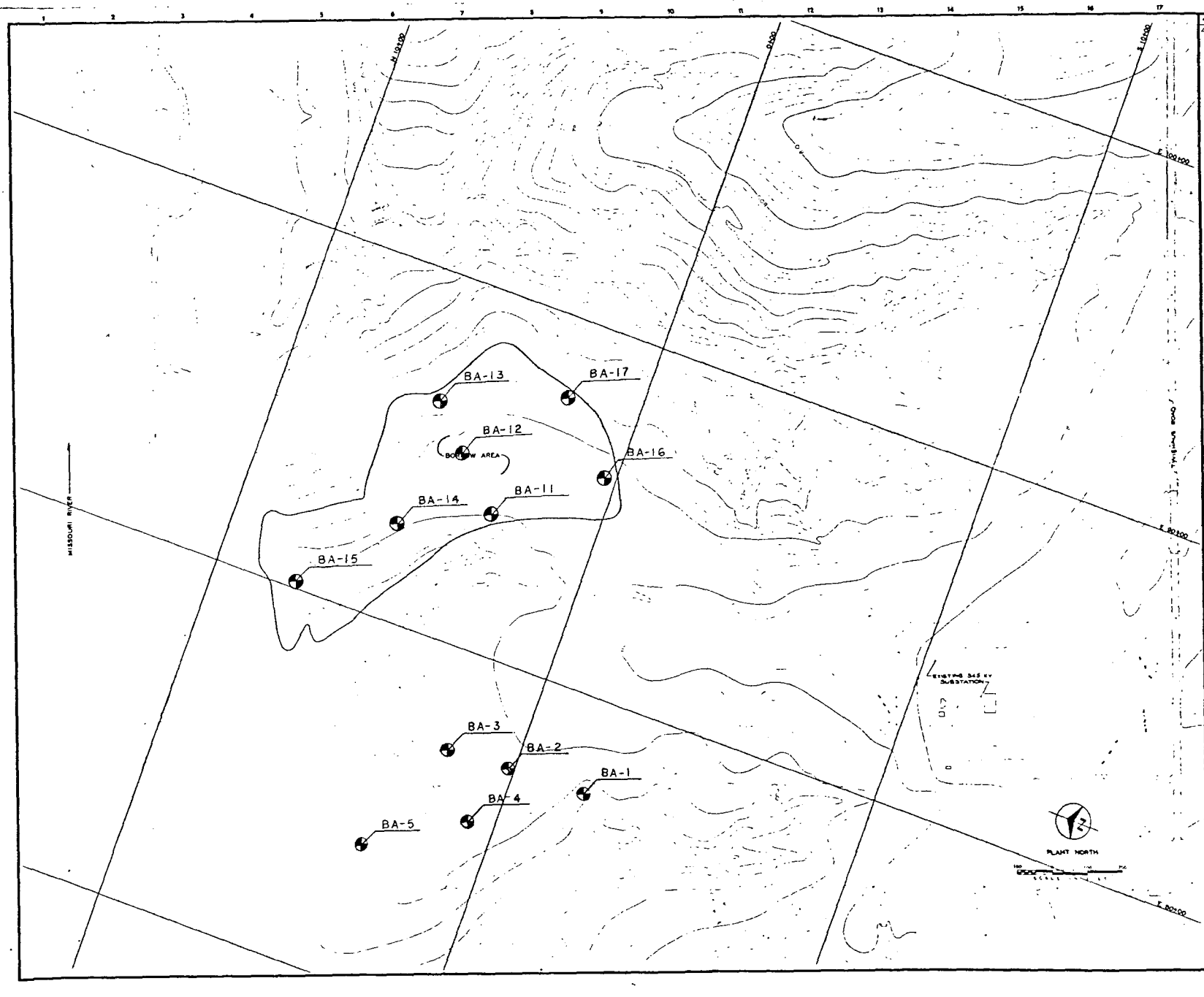
The location of dikes shown on this drawing does not conform to the contract documents

BORING LOCATIONS

CONTRACT NO. 148
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY



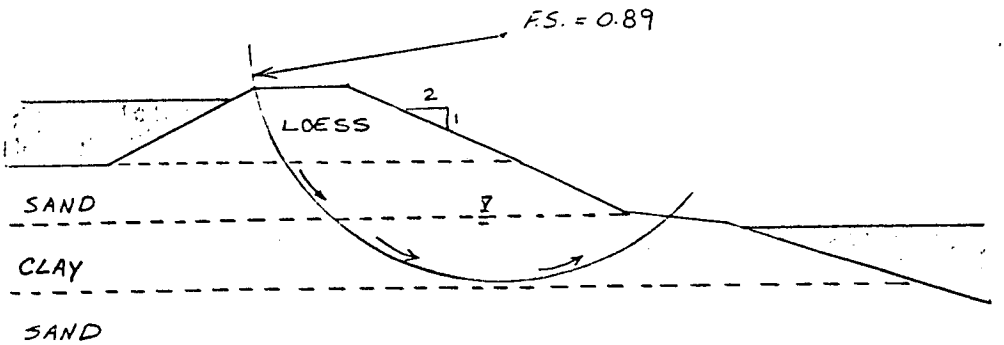
NO	DATE	BY	REVISION
1			

BORING LOCATIONS

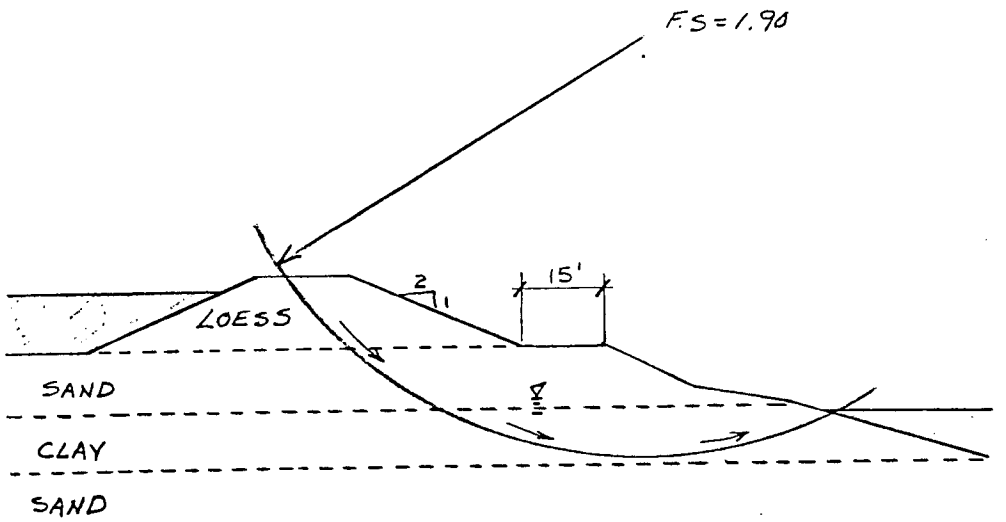
CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

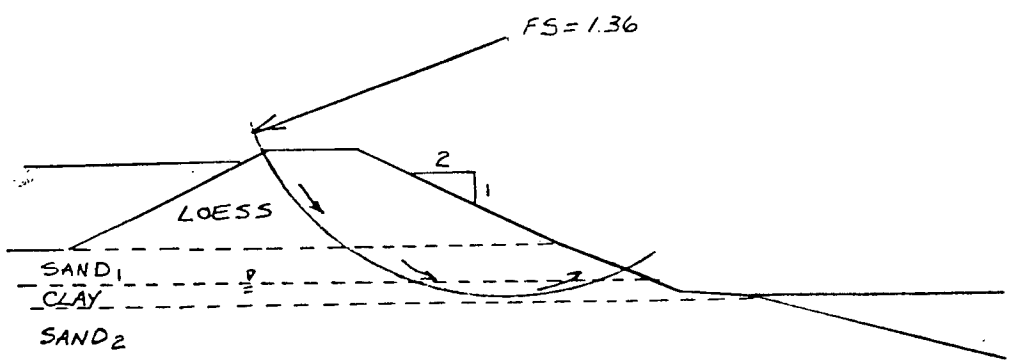
Summary of dike analysis



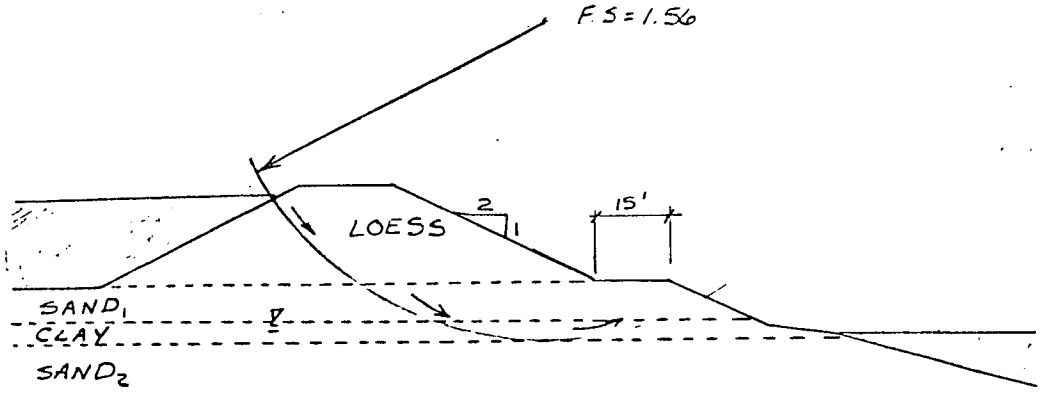
Sta 31+00
No BENCH
Clay: c = 300 psf
$\phi = 0°$
Sand: c = 0 psf
$\phi = 30°$



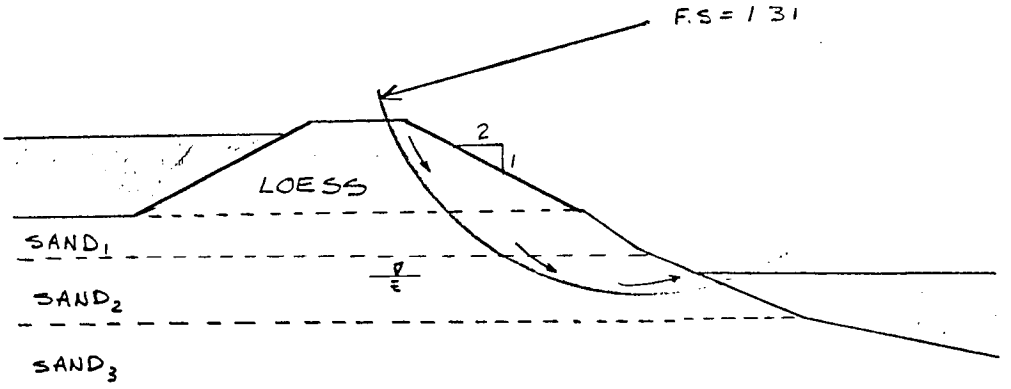
Sta 31+00
15 foot bench
Clay: c = 300 psf
$\phi = 0°$
Sand: c = 0 psf
$\phi = 30°$



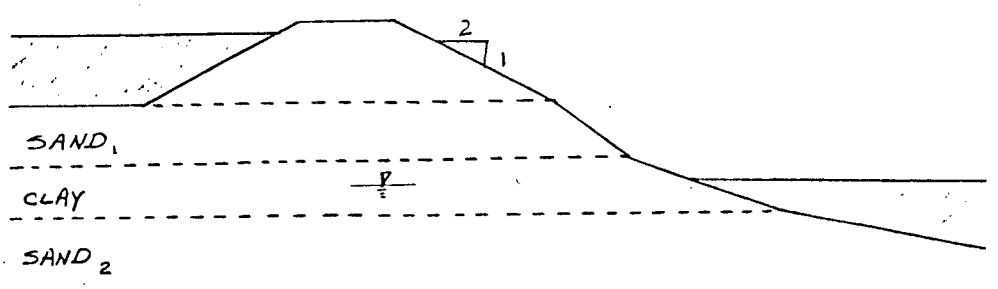
Sta 46+00
No BENCH
$Sand_1$: $\phi = 28°$ c = 0
Clay: c = 300 psf
$\phi = 0°$
$Sand_2$: $\phi = 30°$ c = 0



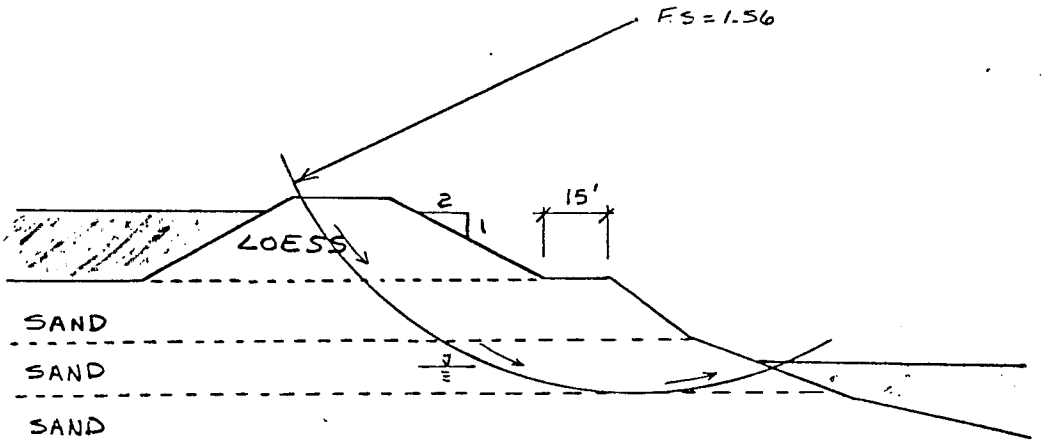
Sta 46+00
15' BENCH
Sand1 : $\phi = 28°$, $C = 0$
Clay : $C = 300$
$\phi = 0$
Sand2 : $\phi = 30$, $C = 0$



Sta 34+50
No BENCH
Sand1 : $\phi = 28$ $C = 0$
Sand2 : $\phi = 28$ $C = 0$
Sand3 : $\phi = 30$ $C = 0$



Sta 34+50
No BENCH
Sand1 : $\phi = 28°$ $C = 0$
Clay : $\phi = 0°$
$C = 500$ psf
Sand2 : $\phi = 30°$ $C = 0$



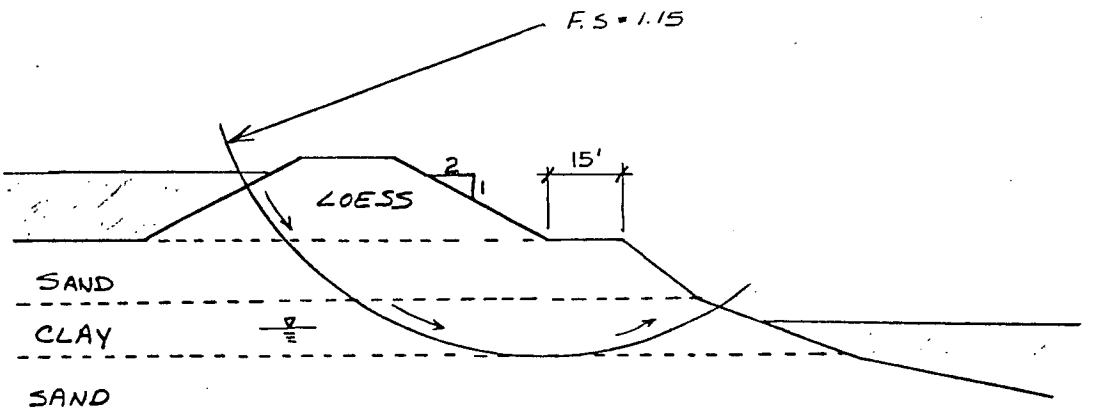
Sta 34+50

15' BENCH

$Sand_1$: $\phi = 28$ $c = 0$

$Sand_2$: $\phi = 28$ $c = 0$

$Sand_3$ $\phi = 30$ $c = 0$



Sta 34+50

15' BENCH

$Sand_1$: $\phi = 28$ $c = 0$

Clay : $c = 500 psf$

$\phi = 0$

$Sand_2$: $\phi = 30°$ $c = 0$

Breach Impact Analysis: Sibley Generating Plant Ash Settling Ponds

Facility Description

There are two ponds at the KCP&L Company Greater Missouri Operations Sibley Generating Plant that receive coal combustion products. One is small, about 500 cubic yards and settles out slag. The other settles out fly ash and is about 361,000 cubic yards in capacity. Since both ponds are routinely dredged, no solid material is permanently deposited in the ponds. The ponds contain varying levels of water depending upon rainfall and operations. Discharge from both ponds is regulated under the plant's NPDES permit.

Breach Scenarios

The ponds are located alongside the Missouri River. Any surface release would be contained on the property, which is bounded by low bluffs on three sides, or it would go to the Missouri River after traveling across the land between the ponds and river. Flow toward the bluff area would be against a rising terrain so would have negligible impact. Flow toward the river would result in water runoff of the released water that did not soak into the ground at the river and solids deposited on the river bank and into the river. Due to the cementious nature of the solid material in the ponds, the solid material is not expected to be flowable; it would simply slump toward the river. Some solid material would be carried by the water outflow by erosion of the surface of the solid material. For a release toward the river, a significant failure of the ground between the pond and river would have to occur. There appears to be little or no trigger to cause the magnitude of ground failure.

Even though a release is unlikely, an impact is calculated based on the total instant release of the full capacity of both ponds into the river with no residual left on land. The calculations are based on a lower river level of 15.6 feet at Kansas City against a flood stage at that station of 32 feet. The impact of a release to the river would be greatest at lower flows.

Impact Calculations

Total capacity of both ponds is 361,500 cubic yards. The length along the river of the combined ponds is approximately 2700 feet. River flow is taken as 2 miles per hour with a flow rate of 74,884 cubic feet per second. The surface area of the river along the ponds scales to be approximately 675,000 square feet.

Total pond Capacity ÷ surface area of adjoining river = rise in river due to sudden total release.

(361,500 cubic yards x 27) ÷ 675,000 square feet = 14.46 feet increase in depth. This would not put the river into flood stage along the plant and the effect would rapidly dissipate.

The result of a total release would be a momentary rise in the river. The amount of the rise in river would be dependent on the level of the river at the time, the flow rate, and the speed of release. The north side of the river across from the ponds is a low marshy area which would absorb any wave action from the release while most of the surge would simply spread out up and down the river. At higher river levels the impact would create a much lower rise in the river because of the resulting higher river flow volumes and wider expanse of the river into low areas across from the plant which would dilute the impact of the release because of the greater volume of water in the river and much greater surface area of the river at higher levels. While seemingly counter intuitive, the higher the river level, the

lower the impact of any release. The aerial photo of the river, with the plant outlined, shows the river at high level. The old channel marshy area north of the river is covered showing the river over twice as wide adjacent to the plant than it was for the calculations.

The impact to the river would be a layer of inert ash along the bank and an addition of water to the river which would be absorbed quickly. No environmental damage or property damage should result. The area south of the river is occupied by the plant which is surrounded by bluffs, so any rise would be contained in the plant. The area north of the river is mostly fields, as the attached aerial shows.

There is no known scenario that could result in the immediate release of all the material. Much of the solids would not flow and remain in the plant area. The ponds are routinely dredged so the amount of material available for release would be much lower than the calculated case.

MISSOURI PUBLIC SERVICE COMPANY

KANSAS CITY, MISSOURI

SIBLEY POWER STATION, SIBLEY, MISSOURI

SUBSURFACE INFORMATION

(BOOK NO. 1)
(FLY ASH POND AND BORROW AREA)

NOTICE

THERE IS NO EXPRESS OR IMPLIED GUARANTEE AS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION AND DATA CONTAINED IN THIS DOCUMENT, NOR OF THE INTERPRETATION THEREOF BY MISSOURI PUBLIC SERVICE COMPANY, THE BURNS & McDONNELL ENGINEERING COMPANY, KANSAS CITY, MISSOURI, OR ANY OF THEIR REPRESENTATIVES.

THE SUBSURFACE INFORMATION AND DATA CONTAINED HEREIN DO NOT FORM A PART OF ANY CONTRACT DOCUMENT ISSUED BY THE MISSOURI PUBLIC SERVICE COMPANY.

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

1977

73-062-1-005

_____
Date

Burns & McDonnell Engineering Company
P.O. Box 173
Kansas City, Missouri 64141

Re: Sibley Power Station
Contract 100
Project: 73-062-1-005

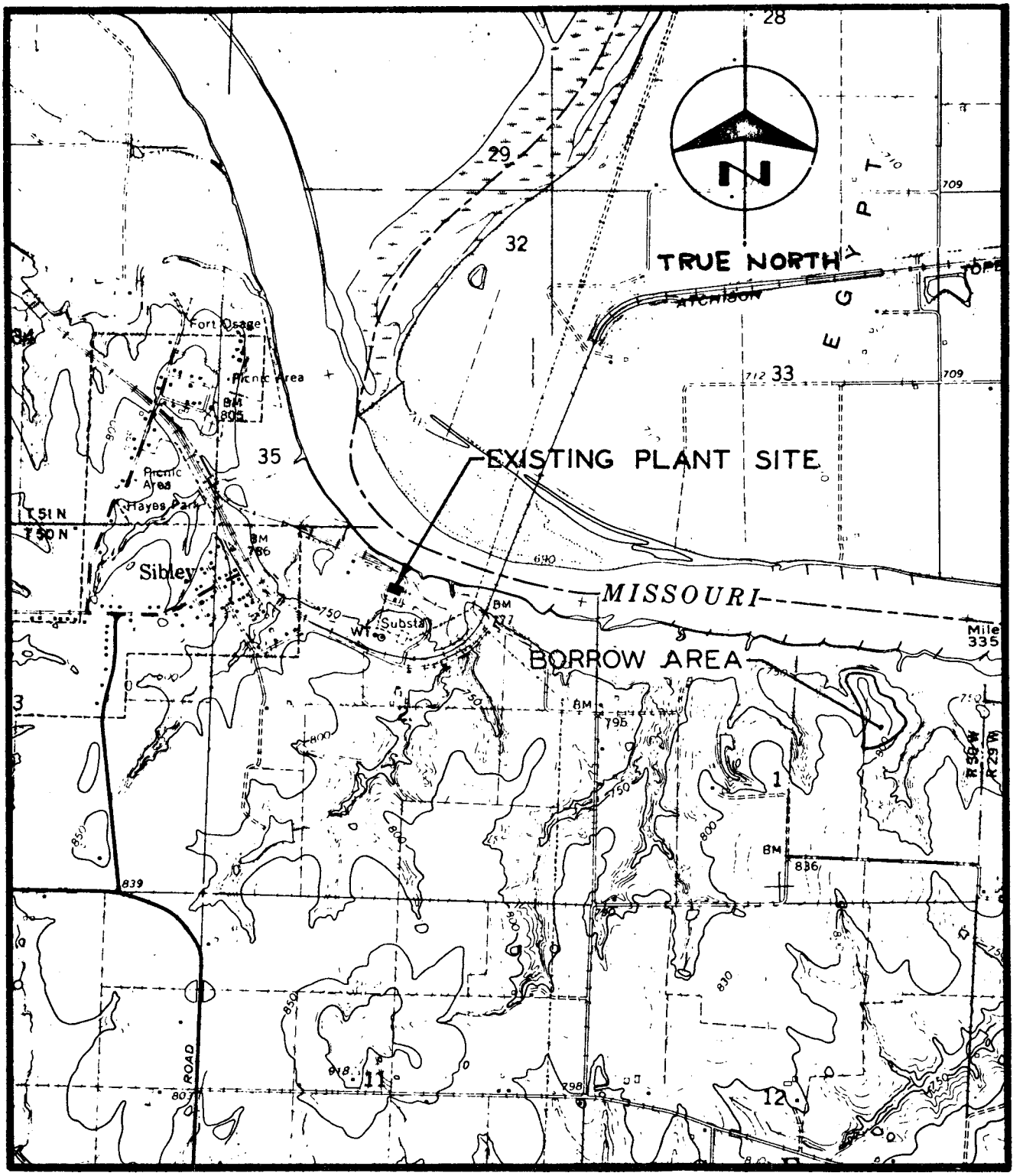
The undersigned acknowledges receipt of the SUBSURFACE INFORMATION requested for the contract identified above and acknowledges that such SUBSURFACE INFORMATION must be returned to Burns & McDonnell to obtain refund of deposit on the Contract Documents.

The undersigned further acknowledges and agrees there is no express or implied guarantee as to the accuracy or completeness of the information and data received, nor of the interpretation thereof by the Owner, Burns & McDonnell Engineering Company, or any of their representatives; and, the subsurface information and data received herein DO NOT form a part of any contract document issued by the Owner.

_____
Company

_____
By

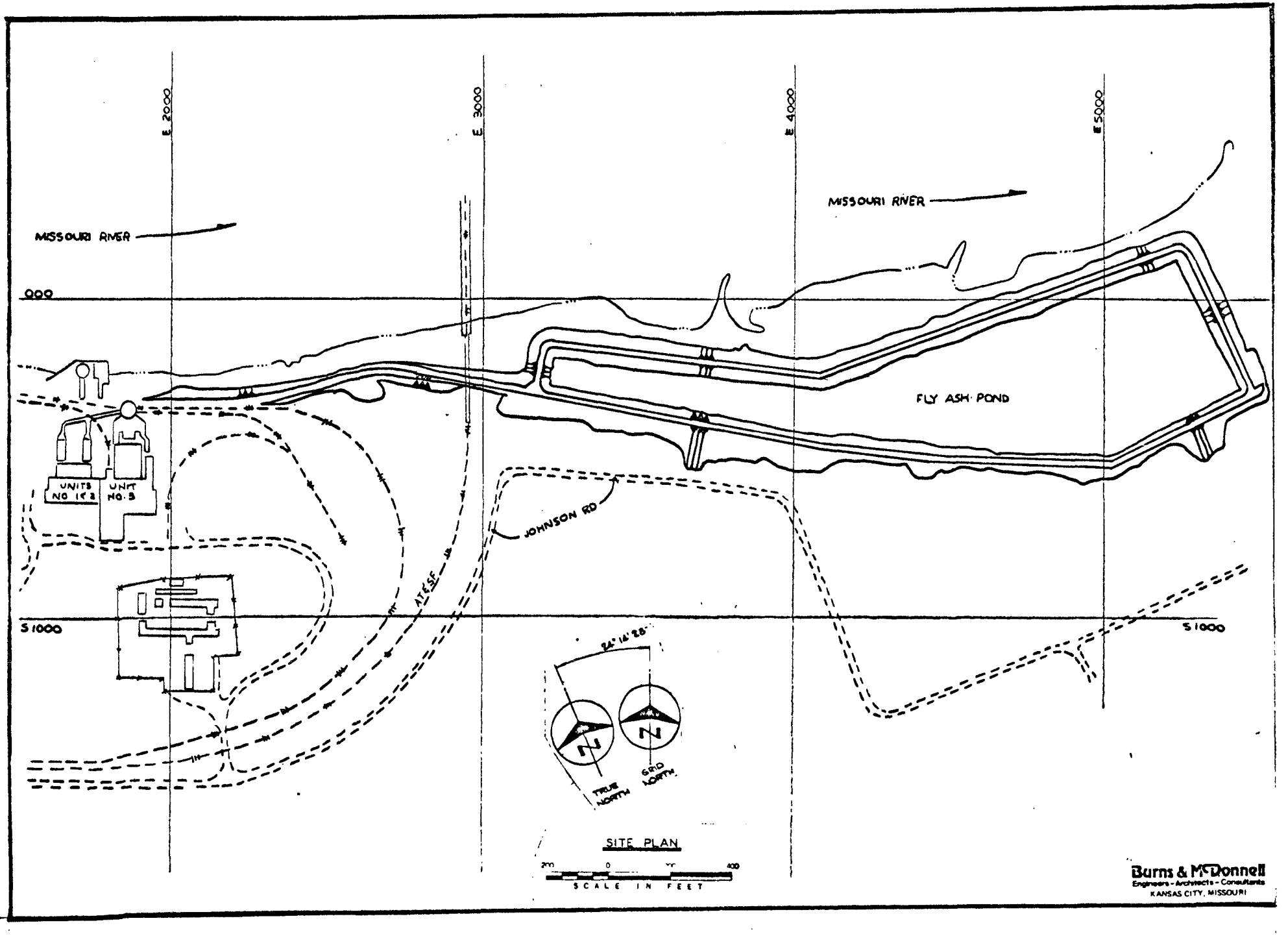
0336-K177

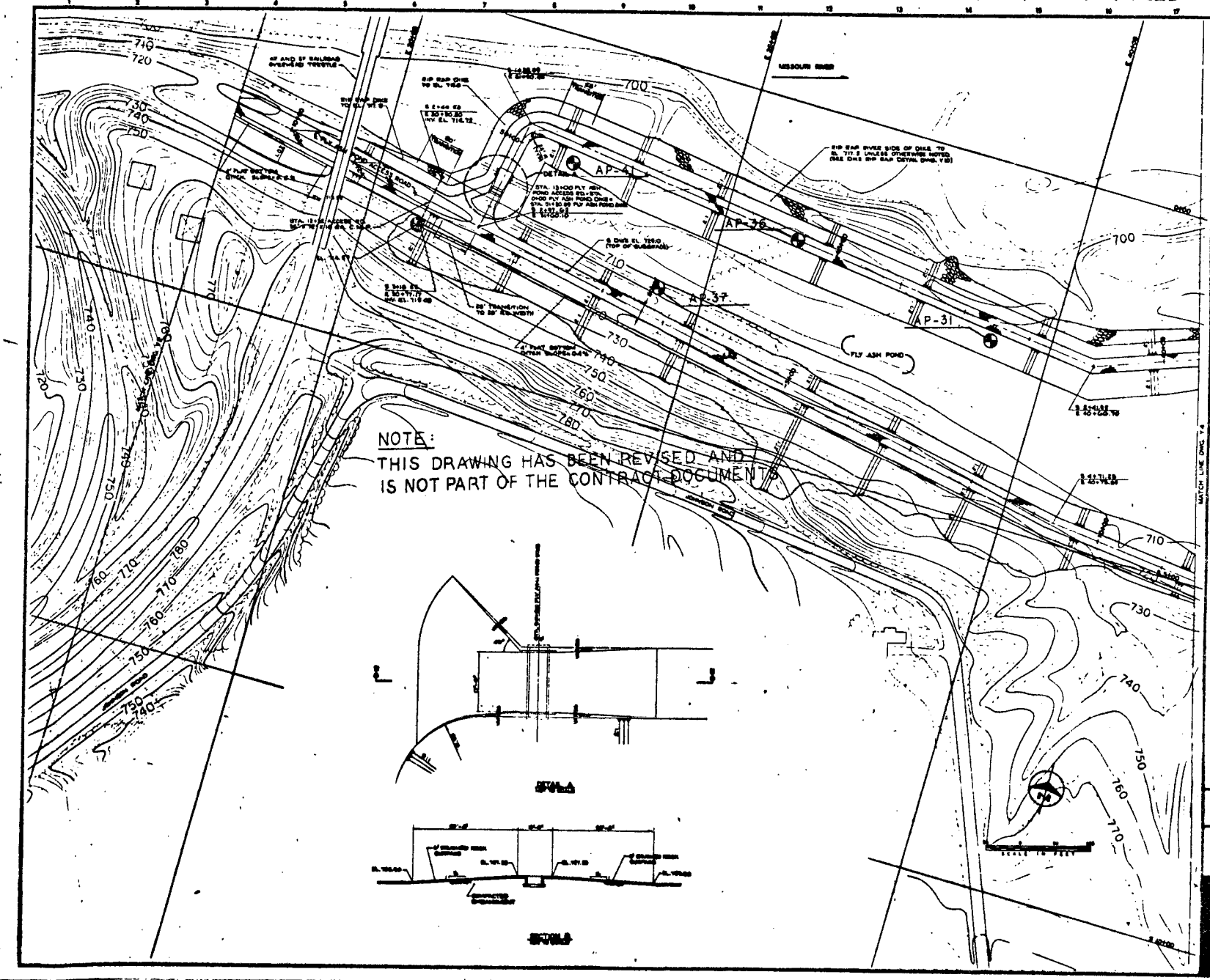


VICINITY MAP

2000 0 2000 4000

SCALE IN FEET


E 2000
E 3000
E 4000
E 5000
MISSOURI RIVER
MISSOURI RIVER
000
S 1000
S 1000
FLY ASH POND
UNITS NO 1 & 2
UNIT NO. 3
JOHNSON RD
AT&SF
24° 14' 28"
TRUE NORTH
GRID NORTH
SITE PLAN
200 0 200 400
SCALE IN FEET
Burns & McDonnell
Engineers - Architects - Consultants
KANSAS CITY, MISSOURI



The location of dikes shown on this drawing does not conform to the contract documents

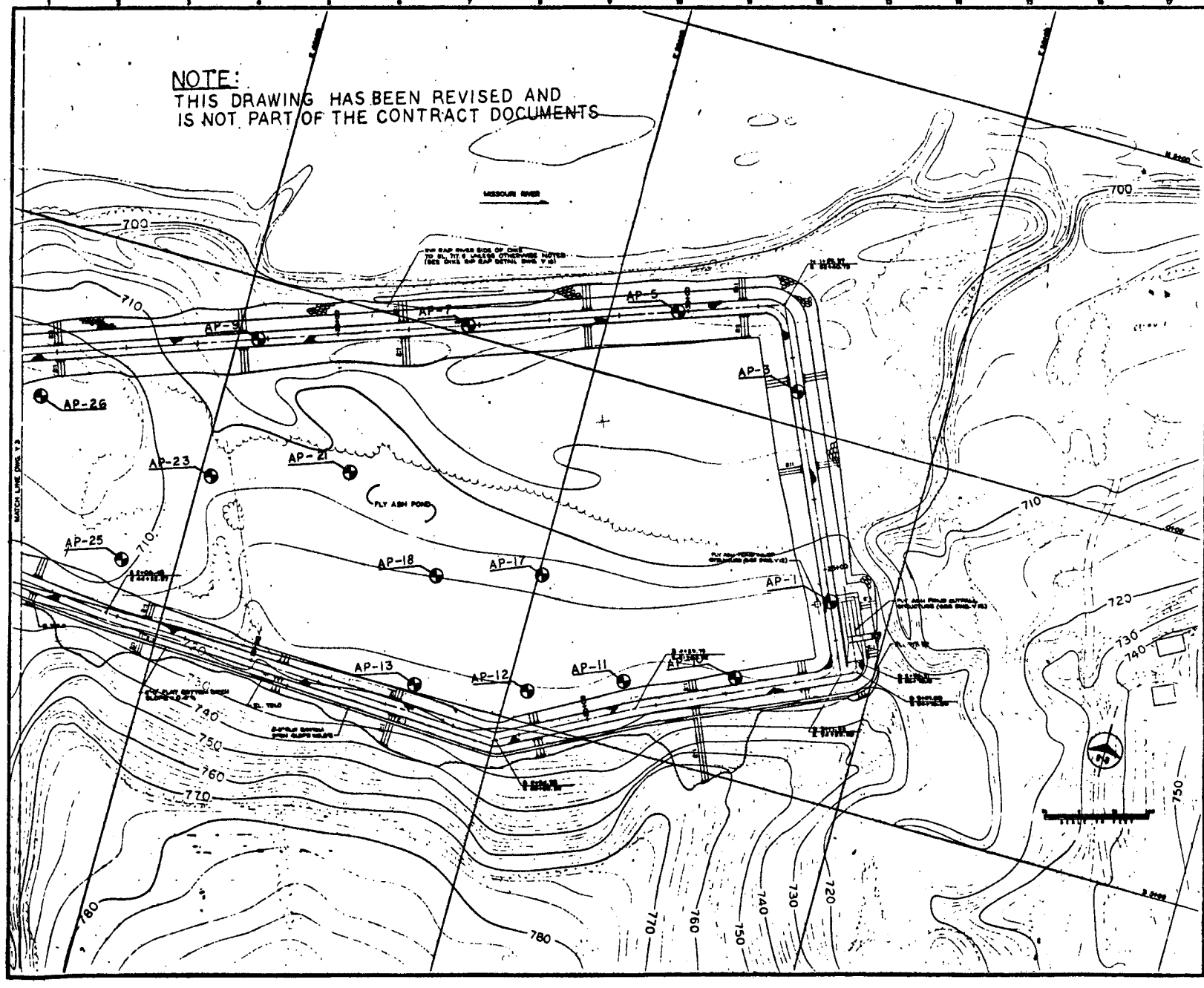
BORING LOCATIONS

CONTRACT NO. 110
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY

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



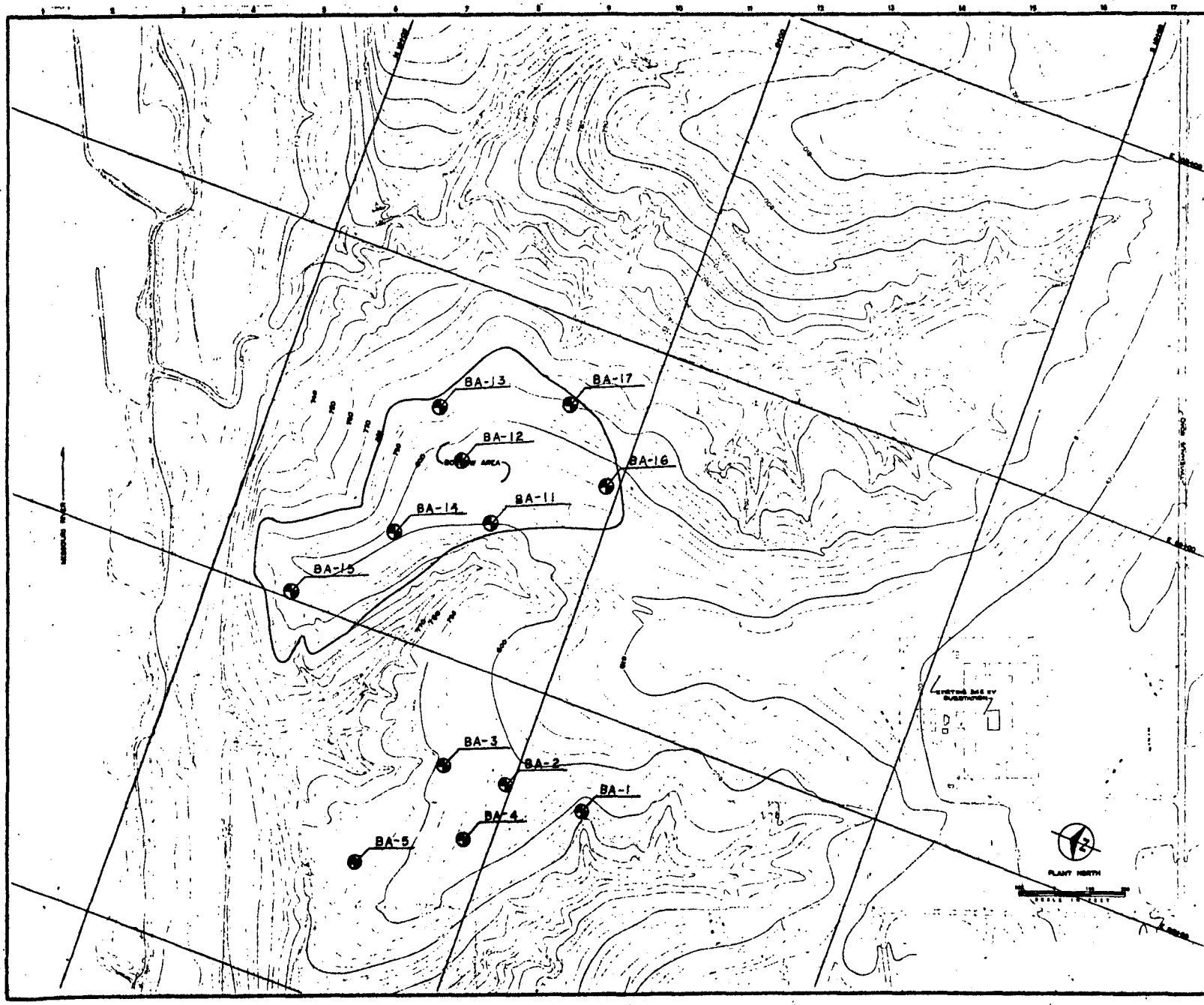
The locations of the dikes shown on this drawing does not conform to the contract documents.

BORING LOCATIONS

CONTRACT NO. 1-10
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

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



BORING LOCATIONS

CONTRACT NO. 118
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY

KANSAS CITY, MISSOURI

Burns & McDonnell

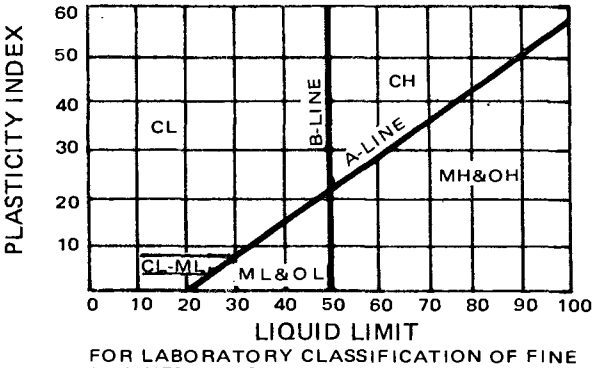
BURNS & McDONNELL DRILLING LOGS

The material classifications and stratagraphic sequence presented herein reflect the observations of personnel present during drilling and sampling operations. The boring logs are based on VISUAL classifications and constitute only an opinion of the personnel making the observation. The Unified Soil Classification system is used for all soil descriptions.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			LETTER SYMBOL	DESCRIPTION
COARSE-GRAINED SOILS MORE THAN 50% LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS	GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURE
		LITTLE OR NO FINES	GP	POORLY-GRADED GRAVEL, GRAVEL–SAND MIXTURE
		GRAVELS WITH FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
		APPRECIABLE FINES	GC	CLAYEY-GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND AND SANDY SOILS	CLEAN SANDS	SW	WELL-GRADED SAND, GRAVELLY SAND
		LITTLE OR NO FINES	SP	POORLY-GRADED SAND, GRAVELLY SAND
		SANDS WITH FINES	SM	SILTY SAND, SAND-SILT MIXTURE
		APPRECIABLE FINES	SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS MORE THAN 50% SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	SILT, CLAYEY SILT, SILTY OR CLAYEY VERY FINE SAND, SLIGHT PLASTICITY
			CL	CLAY, SANDY CLAY, SILTY CLAY, LOW TO MEDIUM PLASTICITY
			OL	ORGANIC SILTS OR SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT MORE THAN 50	CH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			CH	CLAY, HIGH PLASTICITY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOIL

PLASTICITY CHART



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

RELATIVE PARTICLE SIZE

BOULDER	LARGER THAN 12"
COBBLE	3" TO 12"
GRAVEL COARSE	3/4" TO 3"
FINE	4.76MM TO 3/4"
SAND COARSE	2MM TO 4.76MM
MEDIUM	0.42MM to 2MM
FINE	0.074MM TO 0.42MM
SILTS AND CLAY	SMALLER THAN 0.074MM

RELATIVE PLASTICITY

NONPLASTIC	CANNOT ROLL INTO BALL
TRACE PLASTICITY	BARELY ROLL INTO BALL
MEDIUM PLASTIC	CAN BE ROLLED INTO BALL
HIGHLY PLASTIC	NO RUPTURE BY KNEADING

RELATIVE COMPOSITION

TRACE	0-10%
SOME	11-35%
AND/WITH	36-50%

RELATIVE MOISTURE

DRY	POWDERY
DAMP	BELOW PLASTIC LIMIT
MOIST	PL TO LL RANGE
WET	ABOVE LIQUID LIMIT

DENSITY	N-VALUE
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM	11-30
DENSE	31-50
VERY DENSE	>50

RELATIVE CONSISTENCY

VERY SOFT	< 1/4 TSF
SOFT	1/4-1/2 TSF
MEDIUM	1/2-1 TSF
STIFF	1-2 TSF
VERY STIFF	2-4 TSF
HARD	> 4 TSF

N-VALUE (BLOW COUNT) IS THE STANDARD PENETRATION RESISTANCE BASED ON THE TOTAL NUMBER OF BLOWS, USING A 140-LB HAMMER WITH 30-INCH FREE FALL, REQUIRED TO DRIVE A SPLIT-SPOON THE LAST TWO OF THREE 6-INCH DRIVE INCREMENTS. (EXAMPLE: 4/7/9, N = 7+9=16)

DRILLING LOG

Job No. 73-062-1-005		Project MPS Ash Pond				Hole No. AP-1	
Ground Elev. 712		Location N 52697, 48280 E				Sheet 1 of 1	
Drilling Type	Hole Depth	Overburden Footage	Bedrock Footage	Overburden Samples	No. Core Boxes	% Core Recovery	Water Table
Auger	20.0	20.0	0	5	--	--	19.8'

Drilling Co. Layne Western — Driller(s) Jack Highley

Drilling Rig CME-55 — Penetration Test

Drilling Date 12/76 to — Inspector(s) John Zey

Depth	Description	Log or Class	No. Blows	Core Recov. & Loss	Depth	Box or Sample No.	Remarks
0	Silty clay, medium stiff, medium plasticity, moist, brown				1	1	LL = 43 PI = 23
2	Clayey silt, medium stiff, low plasticity, moist, brown, some sand				4	2	
6	Interbedded sandy silt and clayey silt, moist, brown						
8	Fat clay, stiff, medium to high plasticity, moist brown				9	3	
10	Silty clay, medium stiff, medium plasticity, moist, brown						
12							
14					15	4	
16							
18	Same - wet						
20	Total Depth = 20.0'				20	5	

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-3	
GROUND ELEV. 707		LOCATION 53,000 N, 48280 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2, 4, 6	Silty sand, medium dense, nonplastic, damp, light brown				5	1	
8, 10, 12, 14, 16, 18, 20	Silty clay, medium stiff, medium plasticity, wet, blue gray, trace of sand				10, 15, 20	2, 3, 4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-5	
GROUND ELEV. 708		LOCATION 53135 N, 48130 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry

DRILLING CO. Layne Western — DRILLER(S) Jack Highley

DRILLING RIG CME-55 — PENETRATION TEST

DRILLING DATE 12/76 TO — INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2							
4							
				10"	5	SS-1	
6	Sand, poorly graded, medium dense, damp, light brown, medium grained						
8							
10				5"	10	SS-2	
12							
14							
	Silty clay, soft, medium plastic, moist, blue gray			10"	15	ST-3	Qp = 1.25 LL=58 PI = 38 q_u = 0.31 tsf γ_{dry} = 82 pcf
16							
18							
20	Same - Wet Total Depth = 20.0'			12"	20	ST-4	QP less than 1 LL=56 PI=31 q_u = .30 tsf γ_{dry} = 77 pcf

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-7	
GROUND ELEV. 704		LOCATION 53165 N, 47832 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	17'?
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST SPT			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Sand, poorly graded, medium dense, medium grained, damp, light brown						
4				6"	5	SS-1	
6							
8	Same - moist						
10				10"	10	SS-2	
12							
14							
16				8"	15	SS-3	
18	Same - wet, higher silt content, gray						Hole caved below 17'
20	Same - saturated			7"	20	SS-4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-9	
GROUND ELEV. 707		LOCATION 53192 N, 47533 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Silty sand, medium dense, nonplastic, damp, light brown, fine grained						
4					5	1	
6							
8							
10					10	2	
12							
14	Silty clay, medium stiff, medium plasticity, moist, blue gray, some sand						
16					15	3	
18							
20	Total Depth = 20.0'				20	4	

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-10	
GROUND ELEV. 716		LOCATION 52,618 N; 48,133 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	13.0'	13.0'	0	2	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST SPT			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Silty clay, medium stiff, medium plasticity, moist, dark brown						
4	Sandy silt, medium dense, damp, light brown				4	1	
6							
8	Silty clay, medium stiff, medium plasticity, moist brown				8	2	
10							
12	Broken rock						
14	Auger refusal						
16	Total Depth = 13.0'						
18							
20							

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS Ash Pond					HOLE NO. AP-11	
GROUND ELEV. 717	LOCATION 52,640 N, 47,984 E					SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	5	--	--	Dry

DRILLING CO. Layne Western	DRILLER(S) Jack Highley
DRILLING RIG CME-55	PENETRATION TEST
DRILLING DATE 12/76 TO	INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Silty clay, medium stiff, medium plasticity, moist, brown, trace of sand				1	1	
4	Clayey silt, moist, brown				3	2	LL=37 PI=12
6							
8	Silty sand, medium dense, low plasticity, moist, light brown						
10					10	3	
12							
14							
16	Same - gray, wet				15	4	
18							
20	Total Depth 20.0'				20	5	

DRILLING LOG

Job No. 73-062-1-005		Project MPS Ash Pond				Hole No. AP-12	
Ground Elev. 716		Location 52,661 N, 47,836 E				Sheet 1 of 1	
Drilling Type	Hole Depth	Overburden Footage	Bedrock Footage	Overburden Samples	No. Core Boxes	% Core Recovery	Water Table
Auger	20.0	20.0	0	4	--	--	Dry
Drilling Co. Layne Western				Driller(s) Jack Highley			
Drilling Rig CME-55				Penetration Test			
Drilling date 12/76 to				Inspector(s) John Zey			

Depth	Description	Log or Class	No. Blows	Core Recov. & Loss		Box or Sample No.	Remarks
0	Clayey silt, moist, dk. brown						
2, 4, 6, 8	Silty sand, medium dense, non plastic, damp, brown, fine to medium grained				5	1	
10, 12, 14, 16	Silty clay, medium stiff, low plasticity, moist, brown, some sand				10, 15	2, 3	
18, 20	Sandy clay, stiff, medium plasticity, moist brown, fine grained				20	4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-13	
GROUND ELEV. 717		LOCATION 52,682 N, 47,687 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0	Silty sand, medium dense, moist light brown						
2							
4	Clayey sand, medium dense, medium plasticity, moist brown				5	1	LL=36 PI=18
6							
8	Silty clay, stiff, medium to high plasticity, moist brown				10	2	
10							
12							
14	Silty clay, medium stiff, medium plasticity, moist brown				15	3	
16							
18							
20	Total Depth = 20.0'				20	4	

DRILLING LOG

Job No. 73-062-1-005		Project MPS Ash Pond				Hole No. AP-17	
Ground Elev. 713		Location 52,811 N, 47,858 E				Sheet 1 of 1	
Drilling Type	Hole Depth	Overburden Footage	Bedrock Footage	Overburden Samples	No. Core Boxes	% Core Recovery	Water Table
Auger	20.0	20.0	0	3	--	--	14'
Drilling Co. Layne Western				Driller(s) Jack Highley			
Drilling Rig CME-55				Penetration Test			
Drilling Date 12/76 to				Inspector(s) John Zey			

Depth	Description	Log or Class	No. Blows	Core Recov. & Loss		Box or Sample No.	Remarks
0							
2, 4, 6, 8	Clayey sand, medium stiff, medium plastic, moist, brown, very fine grained				5	1	LL = 90 PI = 70
10, 12, 14	Silty sand, medium dense, medium plasticity, wet, brown, fine grained				10	2	
16	Silty clay, medium stiff, medium plasticity, wet, brown				15	3	
18, 20	Sand, silty sand, poorly graded, medium to coarse grained, wet, brown						
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS Ash Pond		HOLE NO. AP-18
GROUND ELEV. 714	LOCATION 52,831 N, 47,710 E		SHEET 1 OF 1

DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry

DRILLING CO. Layne Western	DRILLER(S) Jack Highley
DRILLING RIG CME-55	PENETRATION TEST
DRILLING DATE 12/76 TO	INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Sandy clay, medium stiff, medium plasticity, moist, brown, some sand						
4							
6					5	1	
8							
10	Silty clay, medium stiff, medium plasticity, moist, light brown, trace of sand				10	2	
12							
14							
16					15	3	
18	Silty sand, medium dense, wet, brown gray, very fine grained						
20	Total Depth 20.0'				20	4	

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-21	
GROUND ELEV. 711		LOCATION 53,000 N, 47,585 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	—	—	Dry

DRILLING CO. Layne Western — DRILLER(S) Jack Highley

DRILLING RIG CME-55 — PENETRATION TEST

DRILLING DATE 12/76 TO — INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Sandy silt, medium dense, low plasticity, moist, light brown						
4	Silty sand, medium dense, low plasticity, moist, light brown, very fine grained				5	1	
6							
8	Silty clay, medium stiff, medium plasticity, moist, brown, some sand				10	2	
10							
12							
14	Same - blue gray trace of sand				15	3	
16							
18	Silty sand, medium dense, low plasticity, wet, blue gray						
20	Total Depth = 20.0'				20	4	

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-23	
GROUND ELEV. 711'		LOCATION N 53,005, E 47,448				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/20/76 TO 12/20/76				INSPECTOR(S) C.A. Buhr			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
2, 4, 6, 8, 10, 12	Light brown clayey silt, some fine sand, moist, low plasticity, soft, low dry strength				5, 10	1, 2	
14, 16	Gray clayey silt, some fine sand, moist to wet, low plasticity				15	3	
	Gray silty clay, moist to wet, ~~stiff, with sand~~						
18, 20	Gray sand silt, trace of clay, wet to saturated, soft				20	4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-25	
GROUND ELEV. 709'		LOCATION N 52,925, E 47,280				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	11.0
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/76 TO				INSPECTOR(S) C.A. Buhr			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
2	Brown clayey silt, trace of fine sand, damp to moist, soft low plasticity					1	
4, 6, 8, 10	Brown silty clay, trace of fine sand, moist, very stiff, medium plasticity					2	LL=66 PI=43
12, 14	Brown sand silty with some clay, wet, medium firm, low plasticity					3	
16, 18	Light brown silty sand, with trace of coarse sand, wet to saturated, very little to no plasticity						
20	Gray medium to coarse sand, medium density, wet to saturated					4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS Ash Pond		HOLE NO. AP-26
GROUND ELEV. 707'	LOCATION N 53,117, E 47,220		SHEET 1 OF 1

DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	14.0

DRILLING CO. Layne Western	DRILLER(S) Jack Highley
DRILLING RIG CME-55	PENETRATION TEST
DRILLING DATE 12/76 TO	INSPECTOR(S) C.A. Buhr

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
	Brown clayey silt, trace of sand, ~~moist, firm, medium plasticity~~						
2	Brown silty clay, trace of sand, moist, hard, medium to high plasticity						
4	Gray-brown clayey silt, trace of fine sand, very stiff, medium plasticity, moist to wet						LL: 77 PI: 51
6							
8	Gray, sandy silt, some clay, moist to wet, firm						
10							
12							
14	Gray sandy silt, some clay, wet to moist, firm, medium to low plasticity						
16	with gray silty clay seams, stiff.						
18							
20					20	4	

Total Depth = 20.0'

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-31	
GROUND ELEV. 706		LOCATION 53,290 N, 46,908 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	12.75'
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST SPT			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Silty sand, medium dense, non plastic, damp, brown						
4							
6	Same - wet, gray		8/5/4	18"	5	SS-1	
8							
10				12"	10	ST-2	Qp = 2.5
12	Same - damp, brown						LL = 30 PI = 2.6
14							
16	Same - wet, gray to brown				15	ST-3	Qp = 1
18							
20	Total Depth = 20.0'				20	ST-4	

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS Ash Pond				HOLE NO. AP-36	
GROUND ELEV. 706		LOCATION 53,463 N, 46,661 E				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	15'
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST SPT			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2	Sandy silty or sandy clay, medium dense, low plasticity, moist, light brown						
4	Silty sand, loose, non-plastic, moist, light brown, very fine grained			18"	5	ST-1	Qp = 2.75 LL=25 PI=0
6							
8							
10	Silty clay, soft, medium plasticity wet, gray trace of sand		2/2/2	0"	10	SS-2	
12							
14							
16	Silty sand, loose, low plasticity, moist, gray, fine to medium grained				15	ST-3	Qp = 2.25 q_u = .48 γ = 93 pcf
18							
20	Same Total Depth = 20.0'				20	ST-4	Qp = 1.75 γ = 90 pcf

DRILLING LOG

Job No. 73-062-1-005	Project MPS Ash Pond		Hole No. AP-37
Ground Elev. 709'	Location N 53,947, E 46,463		Sheet 1 of 1

Drilling Type	Hole Depth	Overburden Footage	Bedrock Footage	Overburden Samples	No. Core Boxes	% Core Recovery	Water Table
Auger	17.5	17.5	0	3	--	--	--

Drilling Co. Layne Western	Driller(s) Jack Highley
Drilling Rig CME-75	Penetration Test
Drilling Date 12/76 to	Inspector(s) C.A. Buhr

Depth	Description	Log or Class	No. Blows	Core Recov. & Loss		Box or Sample No.	Remarks
2	Brown silty clay, trace of fine sand, moist, firm to stiff, medium plasticity						
4	Brown clayey silt, some sand, moist to wet, soft, medium plasticity						
6					5	1	
8							
10	Gray sandy silt, with some clay, moist to wet, soft, low plasticity				10	2	
12							
14							
16							
					17.5	3	
18	Refusal at 17.5'						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS Ash Pond					HOLE NO. AP-41	
GROUND ELEV. 708	LOCATION 53,630 N, 46,310 E					SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
Auger	20.0	20.0	0	4	--	--	Dry
DRILLING CO. Layne Western				DRILLER(S) Jack Highley			
DRILLING RIG CME-55				PENETRATION TEST			
DRILLING DATE 12/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
0							
2, 4, 6, 8	Silty sand, medium dense, non plastic, damp, light brown				5	1	
10, 12, 14	Clayey sand, medium dense, medium plasticity, moist, light brown				10, 15	2, 3	
16, 18, 20	Silty clay, medium dense, medium to high plasticity, moist, blue gray, some sand				20	4	
	Total Depth = 20.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT Borrow Area				HOLE NO. BA-1	
GROUND ELEV.		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	24.5	24.5	--	--	--	--	--

DRILLING CO. Layne-Western	DRILLER(S) Jack Highley
DRILLING RIG CME	PENETRATION TEST --
DRILLING DATE 12/16/76 TO	INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
5	Brown clayey silt with trace of sand moist						
10							
15	Brown silty clay with trace of sand very moist						
20							
25	Total Depth = 24.5						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-2	
GROUND ELEV.		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	20	20	--	--	--	--	--

DRILLING CO. Layne-Western	DRILLER(S) Jack Highley
DRILLING RIG CME	PENETRATION TEST --
DRILLING DATE 12/16/76 TO	INSPECTOR(S) John Zey

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
5	Brown clayey silt with trace of sand moist						
10							
15	Brown silty clay with trace of sand moist						
20	Total Depth = 20 feet						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-3	
GROUND ELEV.		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	20	20	--	--	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG CME				PENETRATION TEST --			
DRILLING DATE 12/16/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
5	Brown clayey silt with trace of sand moist						
10							
15	Brown silty clay with trace of sand very moist						
20	Total Depth = 20 feet						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-4	
GROUND ELEV.		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	20	20	--	--	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG CME				PENETRATION TEST --			
DRILLING DATE 12/16/76 TO				INSPECTOR(S) John Zey			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
	Brown clayey silt with trace of sand moist						
5							
10							
	Brown clayey silt with trace of sand very moist						
15							
20							
	Total Depth = 20 feet						

DRILLING LOG

Job No. 73-062-1-005		Project MPS - Borrow Area				Hole No. BA-5	
Ground Elev.		Location				Sheet 1 of 1	
Drilling Type	Hole Depth	Overburden Footage	Bedrock Footage	Overburden Samples	No. Core Boxes	% Core Recovery	Water Table
4" Auger	20	20	--	--	--	--	--

Drilling Co. Layne-Western	Driller(s) Jack Highley
Drilling Rig CME	Penetration Test --
Drilling date 12/16/76 to	Inspector(s) John Zey

Depth	Description	Log or Class	No. Blows	Core Recov. & Loss		Box or Sample No.	Remarks
5							
10	Brown clayey silt with trace of sand moist						
15							
20	Total Depth = 20 feet						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS - Borrow Area		HOLE NO. BA-11
GROUND ELEV. 800	LOCATION		SHEET 1 OF 1

DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	--	6	--	--	--

DRILLING CO. Layne-Western	DRILLER(S) Jack Highley
DRILLING RIG Tractor Rig	PENETRATION TEST --
DRILLING DATE 1/77 TO	INSPECTOR(S) Patrick Goeke

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS	BOX OR SAMPLE NO.	REMARKS
					1	
	Brown silty clay dry to damp stiff					
5						
					2	
10						
	Same moist, medium stiff				3	
15						
	Same - becoming very silty				4	
20						becoming easier to drill
	Brown clayey silt moist, soft to medium stiff				5	
25						
					6	
30	Total Depth = 29.0'					

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-12	
GROUND ELEV. 804		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG Tractor Rig				PENETRATION TEST --			
DRILLING DATE 1/77 TO				INSPECTOR(S) Patrick Goeke			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
	Dark brown silty clay dry to damp, medium stiff					1	
5							
						2	
10	Red brown silty clay dry, very stiff						
						3	
15							
						4	
	Light brown silty clay moist, plastic						
20							
	Becoming very silty					5	
25							
						6	
30	Total Depth = 29.0'						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS - Borrow Area					HOLE NO. BA-13	
GROUND ELEV. 790±	LOCATION					SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG Tractor Rig				PENETRATION TEST --			
DRILLING DATE 1/77 TO				INSPECTOR(S) Patrick Goeke			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
	Red brown silty clay damp, medium stiff					1	
5							
	Same - light brown					2	
10							
	Light brown silty clay damp, medium stiff					3	
15	becoming very silty					4	
20	Same					5	
25	Light brown very silty clay moist, medium stiff					6	
30	Total Depth = 29.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-14	
GROUND ELEV. 801		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG Tractor Rig				PENETRATION TEST --			
DRILLING DATE 1/77 TO				INSPECTOR(S) Patrick Goeke			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
						1	
5	Red brown silty clay						
						2	
10							
	Light brown silty clay damp medium stiff					3	
15							
	becoming moist, plastic					4	
20							
	Same					5	
25							
	Light brown silty clay moist, medium to soft, plastic					6	
30	Total Depth = 29.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-15	
GROUND ELEV. 792±		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG Tractor				PENETRATION TEST --			
DRILLING DATE 1/77 TO				INSPECTOR(S) Patrick Goeke			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
						1	
5	Red brown silty clay damp, medium stiff						
						2	
10							
						3	
15							
						4	
20	Light brown silty clay dry to damp very stiff						
						5	
25							
						6	
30	Total Depth = 29.0'						

DRILLING LOG

JOB NO. 73-062-1-005		PROJECT MPS - Borrow Area				HOLE NO. BA-16	
GROUND ELEV. 805±		LOCATION				SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--

DRILLING CO. Layne-Western

DRILLER(S) Jack Highley

DRILLING RIG Tractor

PENETRATION TEST

DRILLING DATE 1/77 TO

INSPECTOR(S) Patrick Goeke

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
						1	
5	Brown, silty clay damp, medium stiff						
						2	
10							
						3	
15							
	Brown, silty clay moist, soft to medium					4	
20							
						5	
25							
						6	
30	Total Depth = 29.0'						

DRILLING LOG

JOB NO. 73-062-1-005	PROJECT MPS - Borrow Area					HOLE NO. BA-17	
GROUND ELEV. 790±	LOCATION					SHEET 1 OF 1	
DRILLING TYPE	HOLE DEPTH	OVERBURDEN FOOTAGE	BEDROCK FOOTAGE	OVERBURDEN SAMPLES	NO. CORE BOXES	% CORE RECOVERY	WATER TABLE
4" Auger	29	29	0	6	--	--	--
DRILLING CO. Layne-Western				DRILLER(S) Jack Highley			
DRILLING RIG Tractor				PENETRATION TEST --			
DRILLING DATE 1/77 TO				INSPECTOR(S) Patrick Goeke			

DEPTH	DESCRIPTION	LOG OR CLASS	NO. BLOWS	CORE RECOV. & LOSS		BOX OR SAMPLE NO.	REMARKS
						1	
5	Brown silty clay damp, medium stiff						
						2	
10							
						3	
15	Tan silty clay medium to soft, moist					4	
20						5	
25	Becoming very silty					6	
30	Total Depth = 29.0'						

LABORATORY TEST RESULTS

Project MPS - Ash Pond

Laboratory Layne-Western

SUMMARY OF SOIL TESTS

Project No. 73-062-1-005

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS			UNCONFINED COMPRESSION					REMARKS
						LL	PL	PI	TSF	% E				
AP 1	1	0 - 1.5	Brown silty clay (CL)			43	20	23						
AP 5	ST 3	15.0	Blue-gray silty clay (CH)	36.2	82.1	58	20	38	0.31	18.0				
AP 5	ST 4	20.0	Blue-gray silty clay (CH)	41.4	77.4	56	25	31	.030	16.3				
AP 1	2	2.5 - 4.0	Brown silty clay (CL)			37	25	12						
AP 13	1	5.0	Brown sandy clay (CL-SC)			36	18	18						
AP 17	1	5.0	Brown sandy clay (CH)			91	21	70						

Project MPS - Ash Pond

Laboratory Layne-Western

SUMMARY OF SOIL TESTS

Project No. 73-062-1-005

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS			UNCONFINED COMPRESSION					REMARKS
						LL	PL	PI	TSF	% E				
AP 23	1	5.0	Light brown clayey silty (CL-ML)			34	24	10						
AP 25	1	5.0	Brown silty clay (CH)			66	23	43						
AP 26	1	5.0	Brown silty clay (CH)			77	26	51						
AP 31	ST 2	9.5 - 11.0	Brown silty sand (SM)			30	28	2						
AP 31	ST 3	14.5 - 16.0	Gray brown silty sand											
AP 31	ST 4	19.5 - 21.0	Gray brown silty sand	33.0	89.2									

Project MPS - Ash Pond

Project No. 73-062-1-005

SUMMARY OF SOIL TESTS

Laboratory Layne-Western

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS			UNCONFINED COMPRESSION					REMARKS
						LL	PL	PI	TSF	% E				
AP 36	ST 1	4.5 - 6.0	Light brown silty sand (SM)			25	25	0						
AP 36	ST 3	14.5 - 16.0	Silty sand	29.4	93.1				0.48	3.6				
AP 36	ST 4	19.5 - 21.0	Silty sand	30.4	90.0									
AP 37	1	5.0	Brown clayey silt			30	26	4						

Project MPS - Borrow Area

Project No. 73-062-1-005

Laboratory Layne-Western

SUMMARY OF SOIL TESTS

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS			UNCONFINED COMPRESSION		Proctor	Direct Shear		PERMEABILITY CM/SEC
						LL	PL	PI	TSF	% E				
BA 1	1,2	0 - 10	CL			46	24	22			√			
BA 2	1,2 3,4	0 - 20	CL	22.3*	94.8*	41	24	17						1.1×10^{-6}
BA3 BA5	1,2 1,2,3		CL			40	23	17			√			
BA 4	1,2,3	0 - 15	CL	22.2*	94.6*	44	23	21			√	√		3×10^{-7}
BA-1 BA-3 BA-5	4,5 4 4		CL	21.7*	92.8*	37	23	14						5.5×10^{-6}

050373

Burns & McDonnell
Engineers-Architects-Consultants

* after permeability test

J-1-2-1

Project MPS - Borrow Area

Project No. 73-062-1-005

SUMMARY OF SOIL TESTS

Laboratory KCTL

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	UNCONFINED COMPRESSION TSF	UNCONFINED COMPRESSION % E		% < 2 μ		PERMEABILITY CM/SEC
BA-1 BA-3 BA-4	3 3 4		CL			38	24	14						
BA 11	2	5-10	CL			35	23	12						
BA 11	5	20-25	CL			39	22	17				18		
BA 12	1	0-5	CL			35	22	13						
BA 12	4	15-20	CL		92.1	37	20	17				23		$K = 3.11 \times 10^{-5}$
BA 13	2	5-10	CL			38	22	16						

Project MPS - Borrow Area

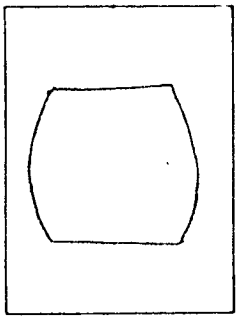
Project No. 73-062-1-005

SUMMARY OF SOIL TESTS

Laboratory KCTL

Date January 1977

BORING NUMBER	SAMPLE NUMBER	DEPTH OR ELEVATION	CLASSIFICATION	W %	DRY UNIT WT. PCF	ATTERBERG LIMITS			UNCONFINED COMPRESSION			% < 2 μ		PERMEABILITY CM/SEC
						LL	PL	PI	TSF	% E				
BA 14	4	15-20	CL			38	22	16						
BA 15	1	0-5	CL		94.2	32	22	10				21		$K = 2.10 \times 10^{-5}$
BA 15	4	15-20	CL			35	21	14						
BA 16	1	0-5	CL			33	23	10						
BA 16	4	15-20	CL			40	22	18						
BA 17	2	5-10	CL		99.4	36	19	17				21		$K = 2.11 = 10^{-5}$

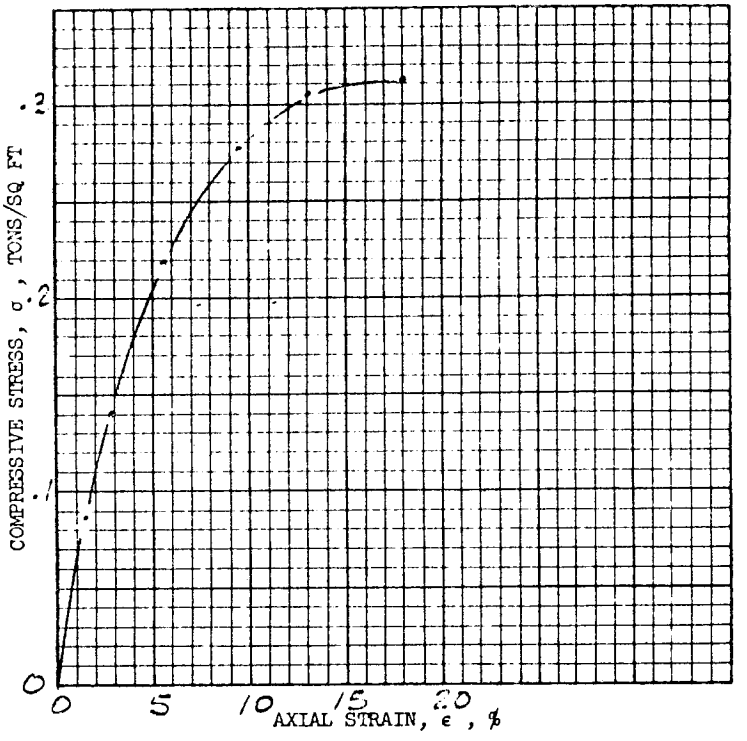


Sketch of specimen after failure

TEST TYPE
(Check one)

☐ Controlled-stress

☒ Controlled-strain



Type of specimen ☒ Undisturbed ☐ Remolded			Test No.	Test No.	Test No.	Test No.
Initial	Water content	w_o	36.2 %	%	%	%
	Void ratio	e_o				
	Saturation	S_o	%	%	%	%
	Dry density, lb/cu ft	γ_d	82.1			
Time to failure, min		t_f				
Unconfined compressive strength, tons/sq ft		q_u	0.31			
Undrained shear strength, tons/sq ft		s_u				
Sensitivity ratio		S_t				

Classification CH

LL 57.7	PL 19.7	PI 38.0	G_s

Specimen Diam 7.16 cm ~~in.~~ | Specimen Height 13.28 cm ~~in.~~

Remarks

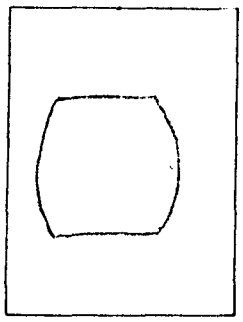
Project MISSOURI PUBLIC SERVICE Job No.

Area

Boring No. AP-5 Sample No. ST-3

Depth, El 15' Date 12-28-76

UNCONFINED COMPRESSION TEST REPORT

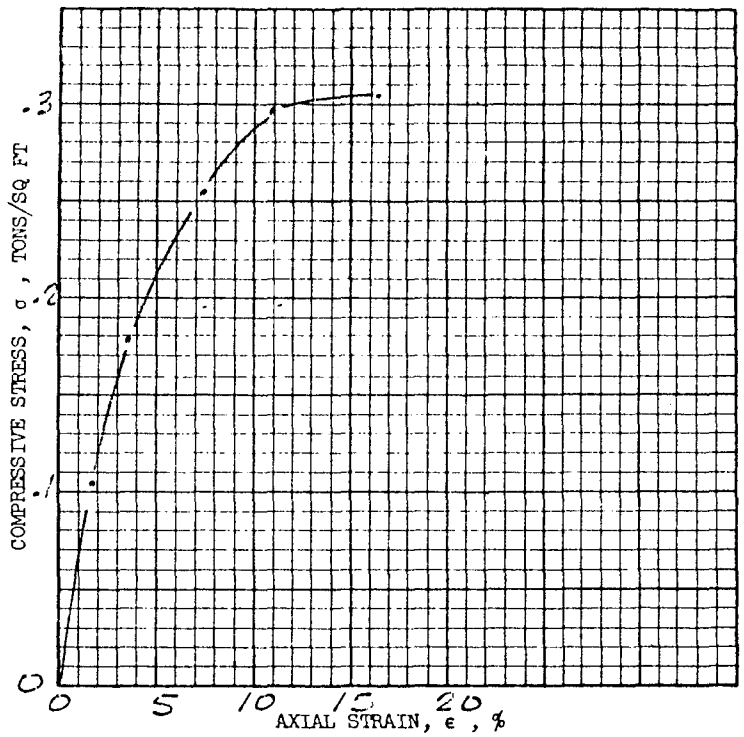


Sketch of specimen after failure

TEST TYPE
(Check one)

☐ Controlled-stress

☒ Controlled-strain



Type of specimen ☒ Undisturbed ☐ Remolded		Test No.	Test No.	Test No.	Test No.
Initial: Water content	w_o	41.4 %	%	%	%
Initial: Void ratio	e_o				
Initial: Saturation	S_o	%	%	%	%
Initial: Dry density, lb/cu ft	γ_d	77.4			
Time to failure, min	t_f				
Unconfined compressive strength, tons/sq ft	q_u	0.30			
Undrained shear strength, tons/sq ft	s_u				
Sensitivity ratio	S_t				

Classification CH

LL 55.9 | PL 24.6 | PI 31.3 | G_s

Specimen Diam 7.23 cm ~~in.~~ | Specimen Height 14.03 cm ~~in.~~

Remarks

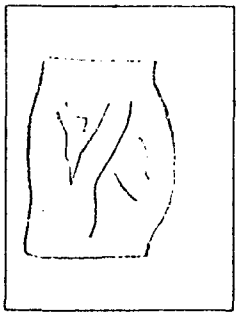
Project MISSOURI PUBLIC SERVICE Job No.

Area

Boring No. AP-5 Sample No. ST-4

Depth, El 20' Date 12-28-76

UNCONFINED COMPRESSION TEST REPORT

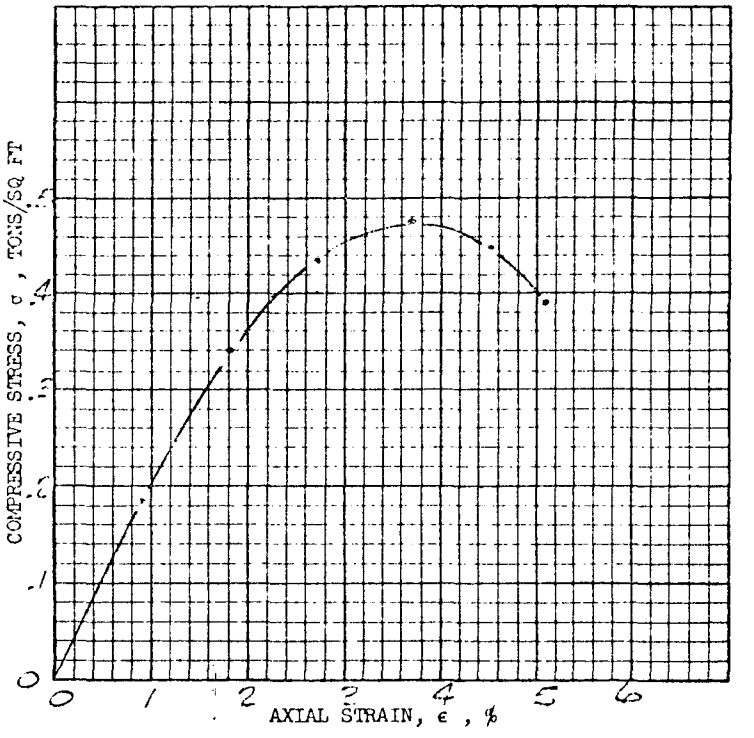


Sketch of specimen after failure

TEST TYPE
(Check one)

☐ Controlled-stress

☒ Controlled-strain



Type of specimen ☒ Undisturbed ☐ Remolded			Test No.	Test No.	Test No.	Test No.
Initial	Water content	w_o	29.4 %	%	%	%
	Void ratio	e_o				
	Saturation	S_o	%	%	%	%
	Dry density, lb/cu ft	γ_d	93.1			
Time to failure, min		t_f				
Unconfined compressive strength, tons/sq ft		q_u	0.48			
Undrained shear strength, tons/sq ft		s_u				
Sensitivity ratio		S_t				

Classification

LL	PL	PI	G_s

Specimen Diam 7.24 cm ~~in.~~ Specimen Height 14.00 cm ~~in.~~

Remarks

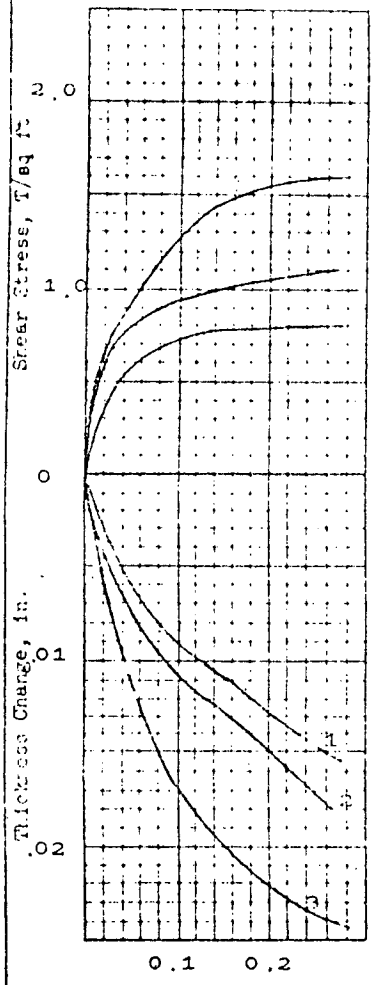
Project MISSOURI PUBLIC SERVICE Job No.

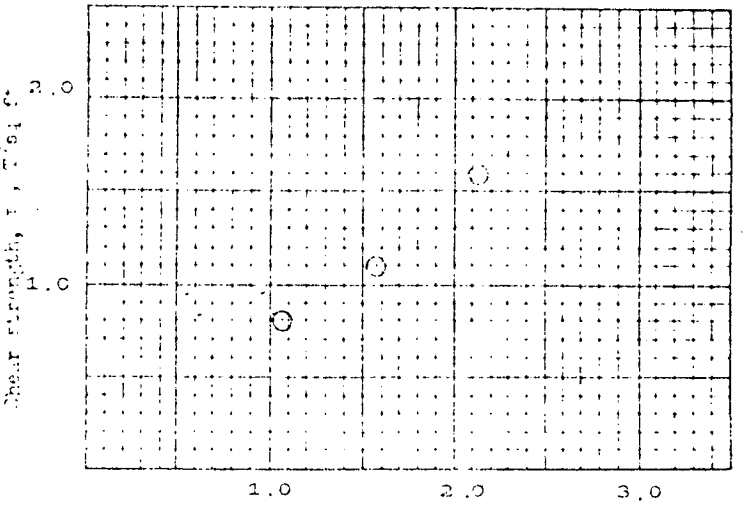
Area

Boring No. AP-36 Sample No. UT-2

Depth, El 15' Date 10-29-76

UNCONFINED COMPRESSION TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	22.5 %	24.6 %	21.7 %	%
	Void ratio	e_o	.840	.800	.882	
	Saturation	S_o	71.0 %	81.4 %	65.2 %	%
	Dry density lb/cu ft	γ_d	90.3	92.3	88.3	
Void ratio after consolidation *		e_c	.804	.765	.860	
Time for 50% consolidation, min		t_{50}				
Final	Water content	w_f	25.4 %	24.8 %	24.5 %	%
	Void ratio	e_f	.753	.701	.749	
	Saturation	S_f	89.4 %	93.7 %	86.7 %	%
Actual time to failure, min.		t_f	6	6	6.5	
Normal stress T/sq ft		σ	1.068	1.581	2.127	
Maximum shear strength, T/sq ft		τ	0.800	1.109	1.607	

Shear Values

ϕ' = _____

tan ϕ' = _____

c' = _____

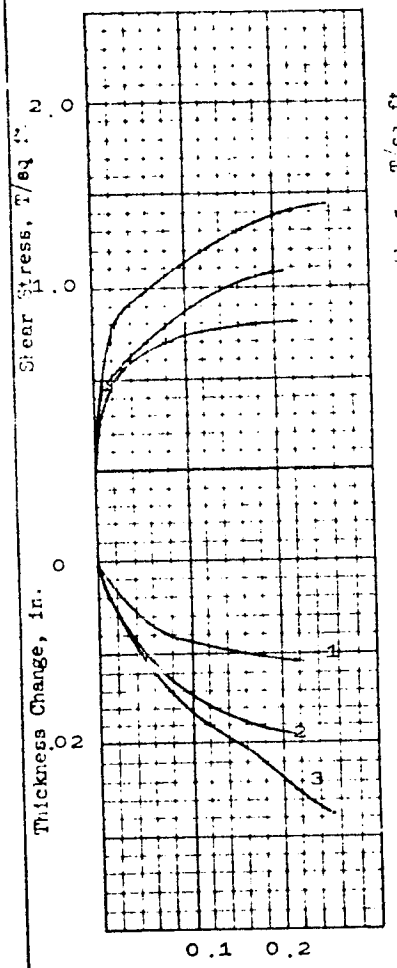
Test Type (Check One) ☐ Controlled stress ☒ Controlled strain

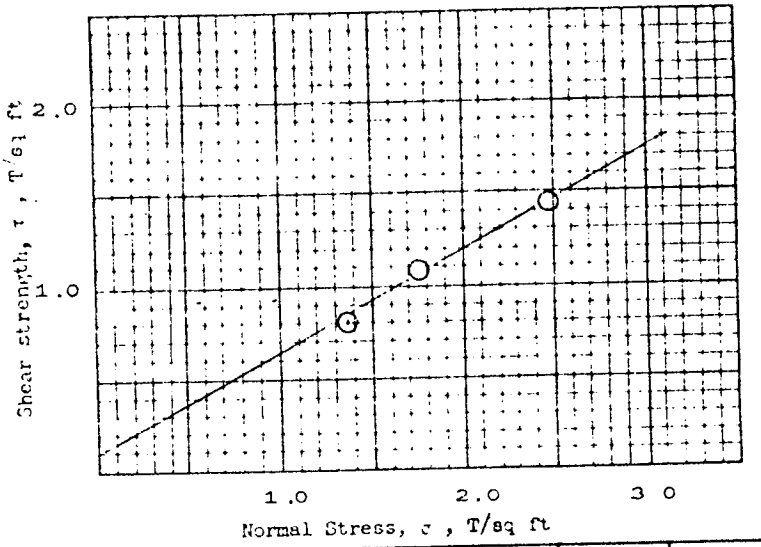
Type of Specimen	☒ Undisturbed ☐ Remolded	4.904 in. Square	1.0 in. Thickness

Classification ML

LL 30.3	PL 27.7	PI 2.6	D_{10}

Remarks Grayish brown clay silt with numerous wood fragments *void ratio after preload of .554 TSF and consolidation of 10 min.	Project MPS	No. 029
	73-062-1-005	
	Area Layne Western	
	Boring No. AP 31	Sample No. ST 2
	Depth 10'	Date 1-19-77
	DIRECT SHEAR TEST REPORT	





Test No.			1	2	3	
Initial	Water content	w_o	32.7 %	33.3 %	36.2 %	%
	Void ratio	e_o	.900	.921	.976	
	Saturation	S_o	96.2 %	95.8 %	98.3 %	%
	Dry density lb/cu ft	γ_d	87.4	86.5	84.0	
Void ratio after consolidation *		e_c	.788	.800	.867	
Time for 50% consolidation, min		t_{50}				
Final	Water content	w_f	28.6 %	26.5 %	27.3 %	%
	Void ratio	e_f	.751	.732	.758	
	Saturation	S_f	101.0 %	96.0 %	95.4 %	%
Actual time to failure, min.		t_f	5	5	6	
Normal stress T/sq ft		σ	1.361	1.750	2.495	
Maximum shear strength, T/sq ft		τ	0.808	1.073	1.431	

Shear Values

ϕ' = 28°

tan ϕ' = _____

c' = .1 TSF

Test Type (Check One) ☐ Controlled stress ☒ Controlled strain

Type of Specimen ☒ UNDISTURBED ☐ REMOLDED 4.904 in. Square 1.0 in. Thickness

Classification

LL | PL | PI | D_{10}

Remarks Brown and gray silt very wet-free moisture in wrapping

*void ratio after preload of .848 TSF and consolidation of 10 min.

Project MPS No. 029

73-062-1-005

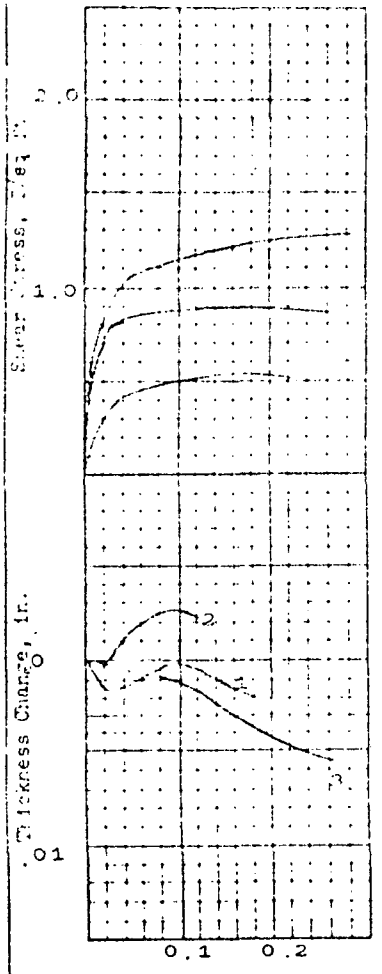
Area Layne Western

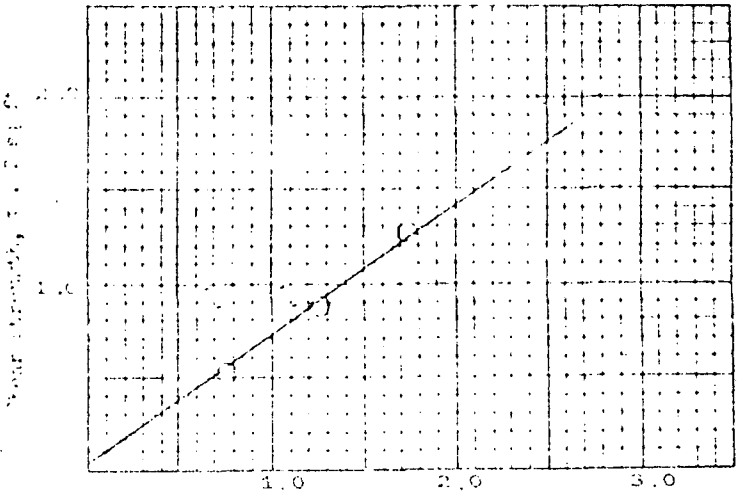
Boring No. AP 31 Sample No. ST 3

Depth El 15' Date 1-19-77

DIRECT SHEAR TEST REPORT

3/12/64 BURNS & McDONNELL ENGINEERING COMPANY FORM J-1-9-18





Test No.			1	2	3	
Initial	Water content	w_c	16.4 %	16.2 %	16.3 %	%
	Void ratio	e_o	.842	.775	.768	
	Saturation	S_o	51.6 %	55.4 %	56.2 %	%
	Dry density lb/cu ft	γ_d	90.2	93.6	93.9	
Void ratio after consolidation *		e_c	.813	.761	.761	
Time for 50% consolidation, min		t_{50}				
Final	Water content	w_f	27.0 %	27.2 %	25.7 %	%
	Void ratio	e_f	.820	.768	.747	
	Saturation	S_f	87.3 %	93.9 %	91.2 %	%
Actual time to failure, min.		t_f	4	3	6	
Normal stress T/sq ft		σ	.774	1.288	1.750	
Maximum shear strength, T/sq ft		τ	0.517	0.893	1.280	

Shear Values

ϕ' = 34°

tan ϕ' = _____

c' = 0.5

Test Type (Check One) ☐ Controlled stress ☒ Controlled strain

Type of Specimen ☒ Cubic ☐ Rectangular | 4.904 in. Square | 1.0 in. Thickness

Classification ML

LL 25.0 | PL 25.0 | PI 0 | D_{10}

Remarks Tan silt

*void ratio after preload of .261 TSF and consolidating 10 min.

Project MPS No. 029

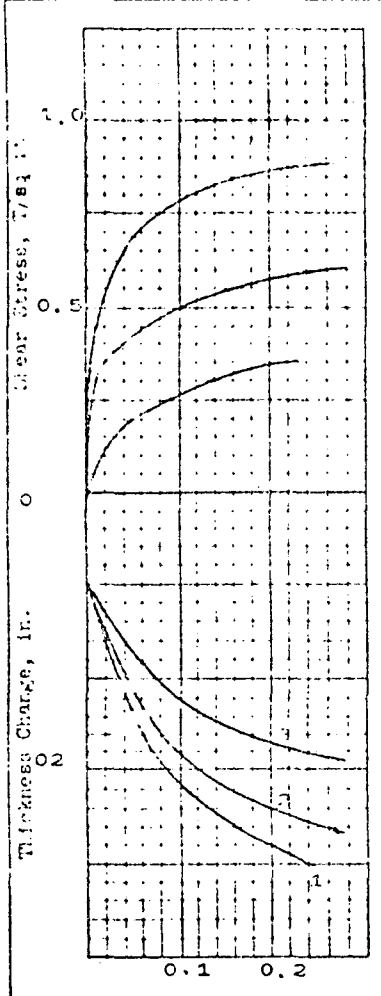
73-062-1-005

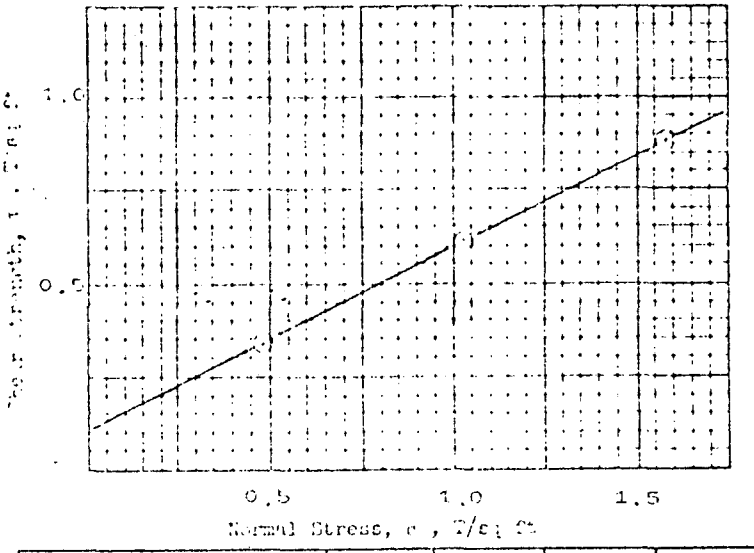
Area Layne Western

Boring No. AP 36 | Sample No. ST 1

Depth Ft 5 ft. | Date 1-5-77

DIRECT SHEAR TEST REPORT





Test No.			1	2	3	
Initial	Water content	w_o	20.8 %	21.3 %	21.5 %	%
	Void ratio	e_o	.808	.782	.676	
	Saturation	S_o	68.3 %	72.1 %	81.6 %	%
	Dry density lb/cu ft	γ_d	91.9	93.2	99.1	
Void ratio after consolidation		e_c	.765	.677	.643	
Time for 50% consolidation, min		t_{50}				
Final	Water content	w_f	24.4 %	23.3 %	21.5 %	%
	Void ratio	e_f	.708	.628	.610	
	Saturation	S_f	91.3 %	98.3 %	93.5 %	%
Actual time to failure, min.		t_f	5	6	6	
Normal stress T/sq ft		σ	.481	1.027	1.508	
Maximum shear strength, T/sq ft		τ	.341	.611	.897	

Shear Values

ϕ' = 26°

tan ϕ' =

c' = 0.1

Test Type (Check One) ☐ Controlled stress ☒ Controlled strain

Type of Specimen ☐ Undisturbed ☒ Remolded 4.904 in. Square 1.0 in. Thickness

Classification CL

LL 43.5 PL 22.9 PI 20.6 I_c

Remarks Brown silty clay density varies due to remolding operation

Project MPS No. 029 73-062-1-005

Area

Boring No. A669 Sample No. B4

Depth Ft Date 1-11-77

DIRECT SHEAR TEST REPORT

Standard compaction test

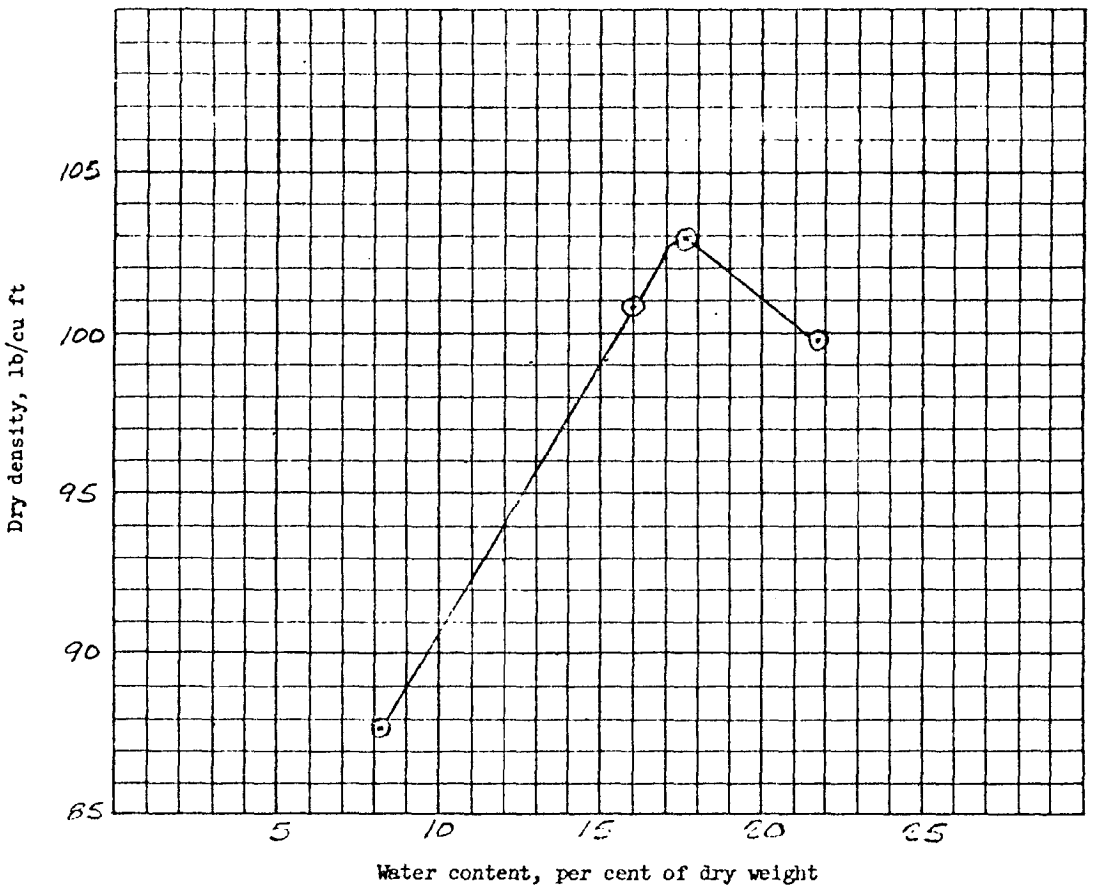
25 blows per each of 3 layers, with 5.5 lb rammer and

12 inch drop. 4 inch diameter mold

Sample No.	Elev or Depth	Classification	G	LL	PL	% > No. 4	% > 3/4 in.
1 & 2		CL		46.1	23.6		

Sample No.				
Natural water content in per cent	18.4			
Optimum water content in per cent	17.7			
Max dry density in lb/cu ft	102.3			

Remarks	Project MISSOURI PUBLIC SERVICE
	Job No.
	Area
	Boring No. BA-1 Date 1-2-77
	COMPACTION TEST REPORT



Standard compaction test

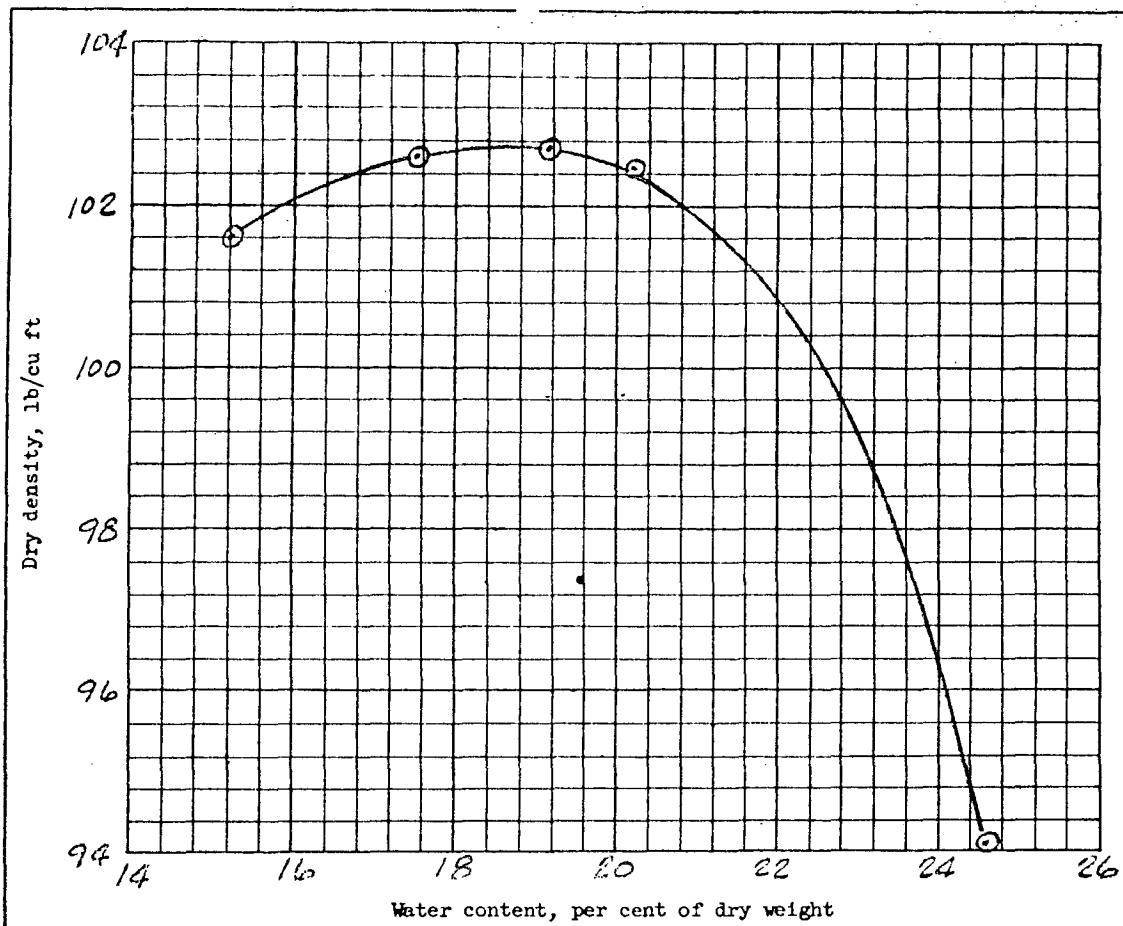
25 blows per each of 3 layers, with 5.5 lb rammer and

12 inch drop. 4 inch diameter mold

Sample No.	Elev or Depth	Classification	G	LL	PL	% > No. 4	% > 3/4 in.
1,2,3		CL		43.5	22.9		

Sample No.				
Natural water content in per cent	17.2			
Optimum water content in per cent	17.5			
Max dry density in lb/cu ft	102.0			

Remarks	Project Missouri Public Service
	Job No.
	Area
	Boring No. 2A-4 Date 1-3-77
	COMPACTION TEST REPORT



Standard compaction test

25 blows per each of 3 layers, with 5.5 lb rammer and

12 inch drop. 4 inch diameter mold

Sample No.	Elev or Depth	Classification	G	LL	PL	% > No. 4	% > 3/4 in.
1 & 2		CL		40.3	22.8		
1,2,3							

Sample No.				
Natural water content in per cent	19.1			
Optimum water content in per cent	18.8			
Max dry density in lb/cu ft	102.7			

Remarks

Project MISSOURI PUBLIC SERVICE

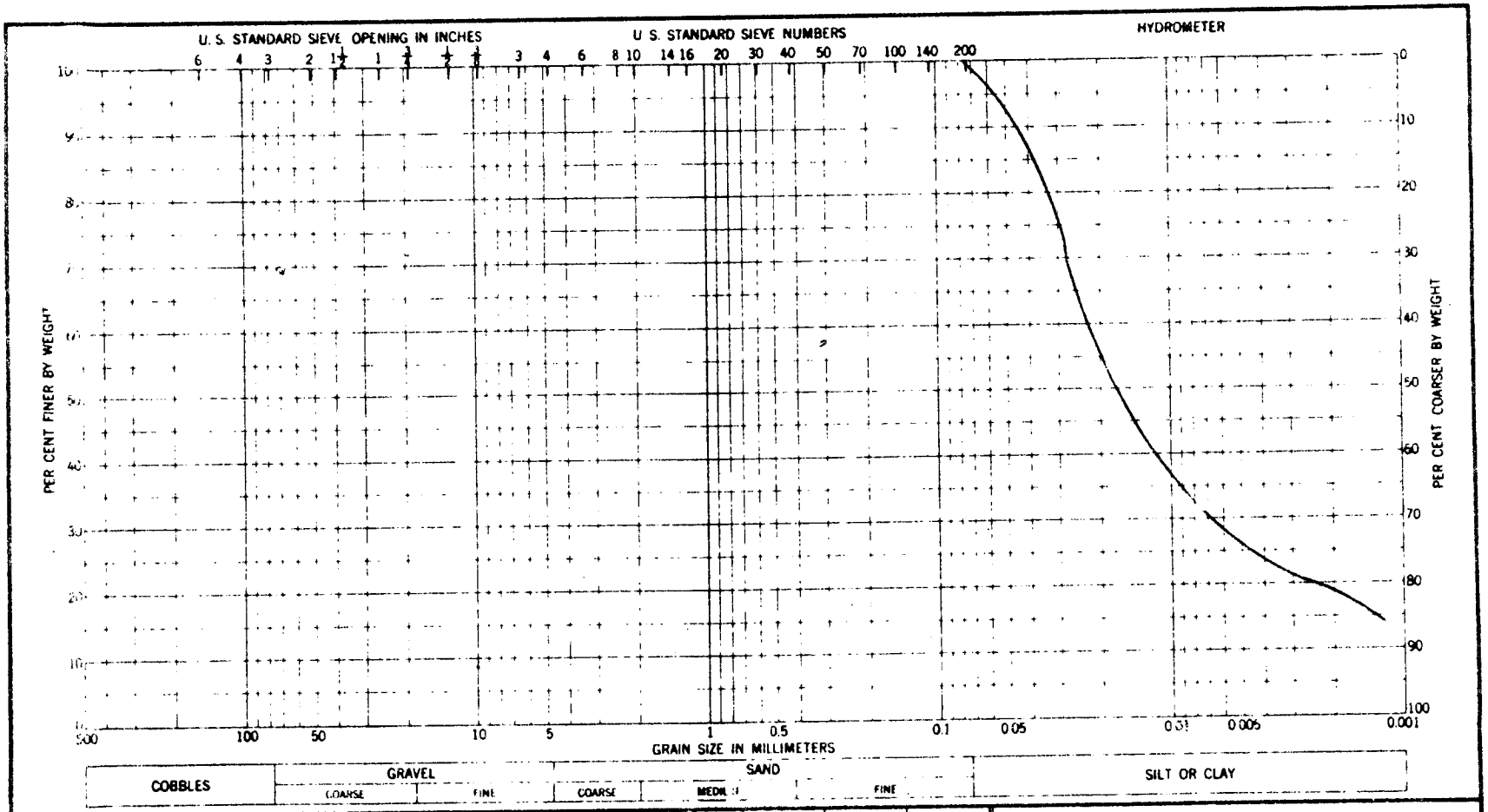
Job No.

Area

Boring No. BA-2 & 5 Date 1-4-77

COMPACTION TEST REPORT

KANSAS CITY TESTING LABORATORY

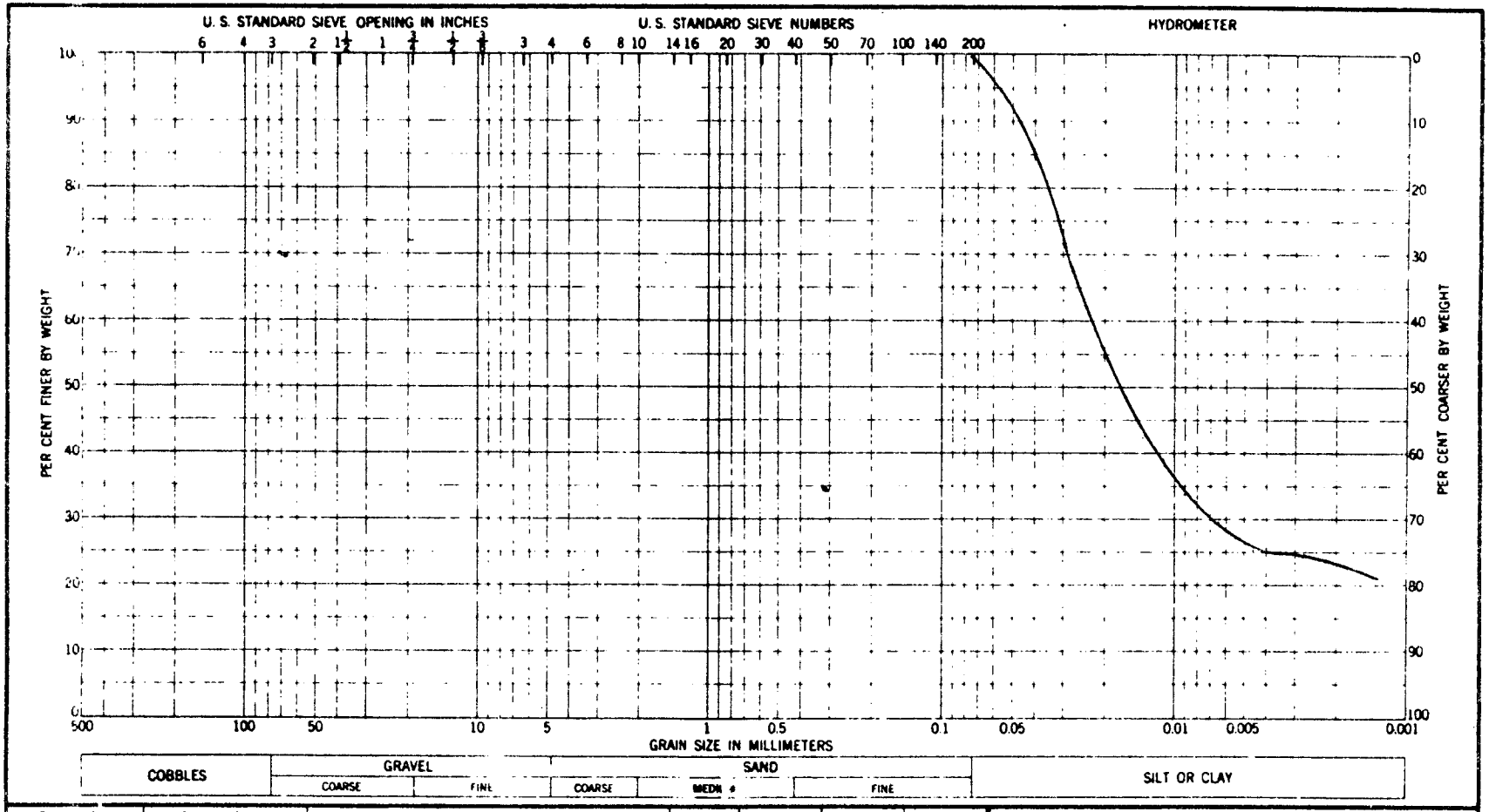


Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
	20-25	CL		39	22	17

GRADATION CURVES

Project: Missouri Public Service
Job No. 209
Area: Sibley
Boring No: BA 11
Date: 2-14-77

KANSAS CITY TESTING LABORATORY



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
	15.0-20.0	CL		37	20	17

Project: Missouri Public Service

Job No. 209

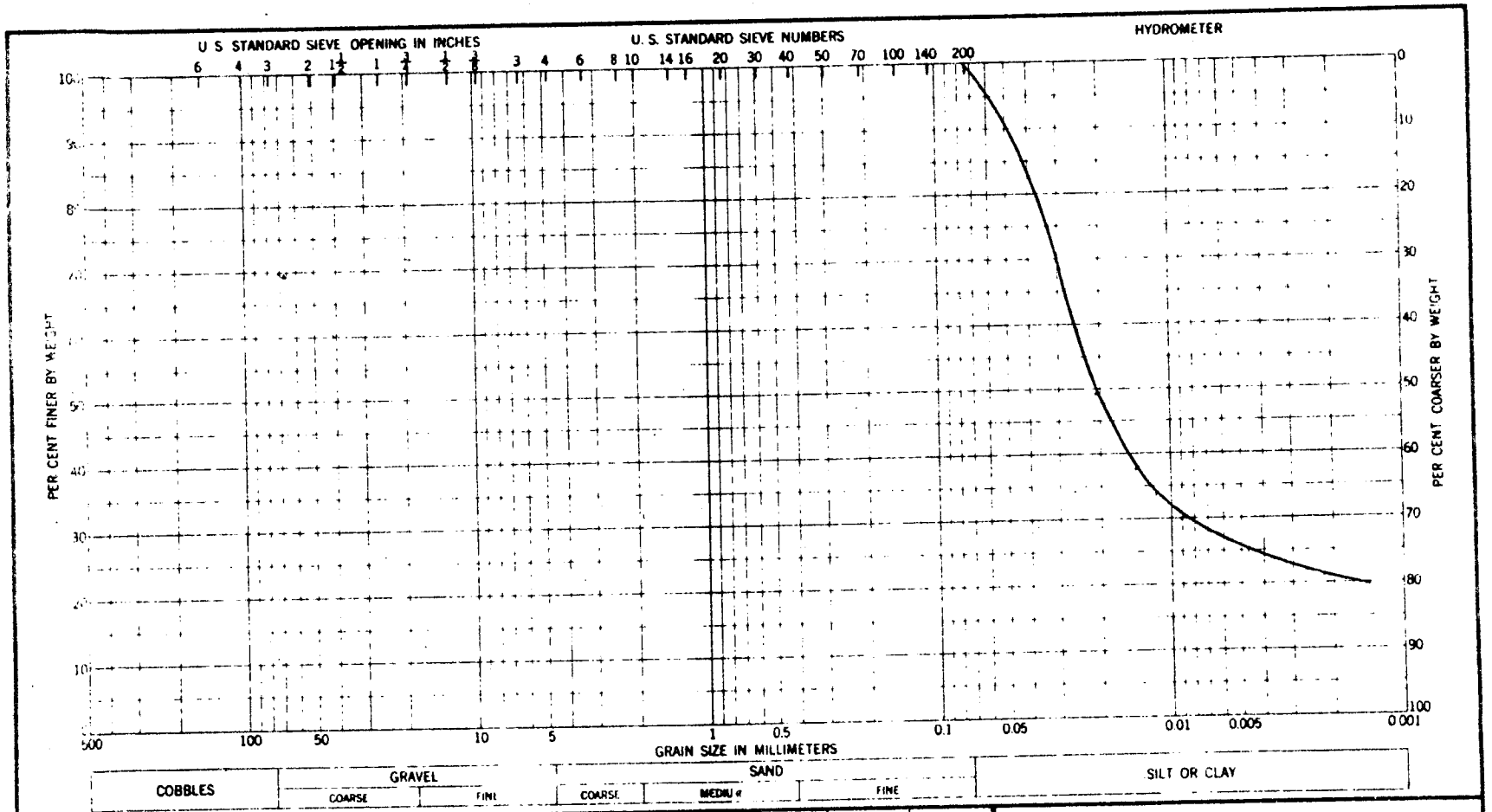
Area: Sibley

Boring No: BA 12

Date: 2-14-77

GRADATION CURVES

KANSAS CITY TESTING LABORATORY



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
	G-5	CL	--	32	22	10

Project: Missouri Public Service

Job No. 209

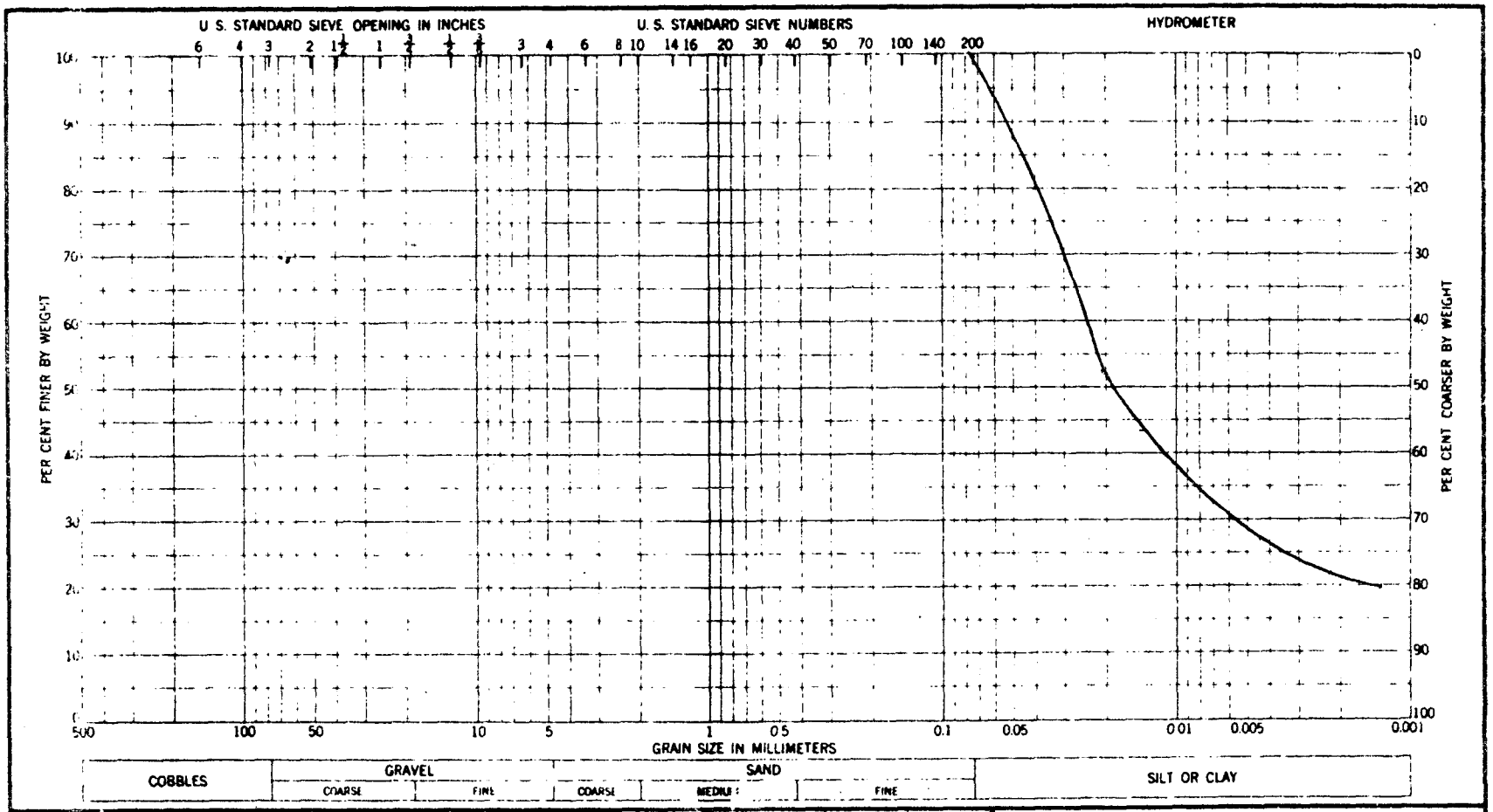
Area: Sibley

Boring No: BA 15

Date: 2-14-77

GRADATION CURVES

KANSAS CITY TESTING LABORATORY



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
	5-10	CL		36	19	18

Project Missouri Public Service

Job No. 209

Area Sibley

Boring No. BA 17

Date 2-14-77

GRADATION CURVES

Site Name:	**Sibley Generating Station**	Date:	**22 Sept 2010**
Unit Name:	**Fly Ash Pond**	Operator's Name:	**Kansas City Power and Light**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☐ **Low** ☒
Inspector's Name:		Michael McLaren, Andrew Cueto	

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?	X weekly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	725'		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	
2	
3	
4	

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit n/a **INSPECTOR** Michael McLaren, Andrew Cueto

Date 22 Sept 2010
Impoundment Name Fly Ash Pond

Impoundment Company Kansas City Power and Light
EPA Region Region 7

State Agency (Field Office) Address Missouri Department of Natural Resources
Name of Impoundment Sibley Generating Station Fly Ash Pond

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

New ☒ **Update** ☐

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

IMPOUNDMENT FUNCTION: Settling Pond

Nearest Downstream Town Name: Wellington, MO

Distance from the impoundment:

Location:

Longitude	39	**DEG**	10	**MIN**	34.06	**SEC**	**W**
Latitude	94	**DEG**	10	**MIN**	36.52	**SEC**	**N**

State MO **County** JACKSON

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

If So Which State Agency? Missouri Department of Natural Resources

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.

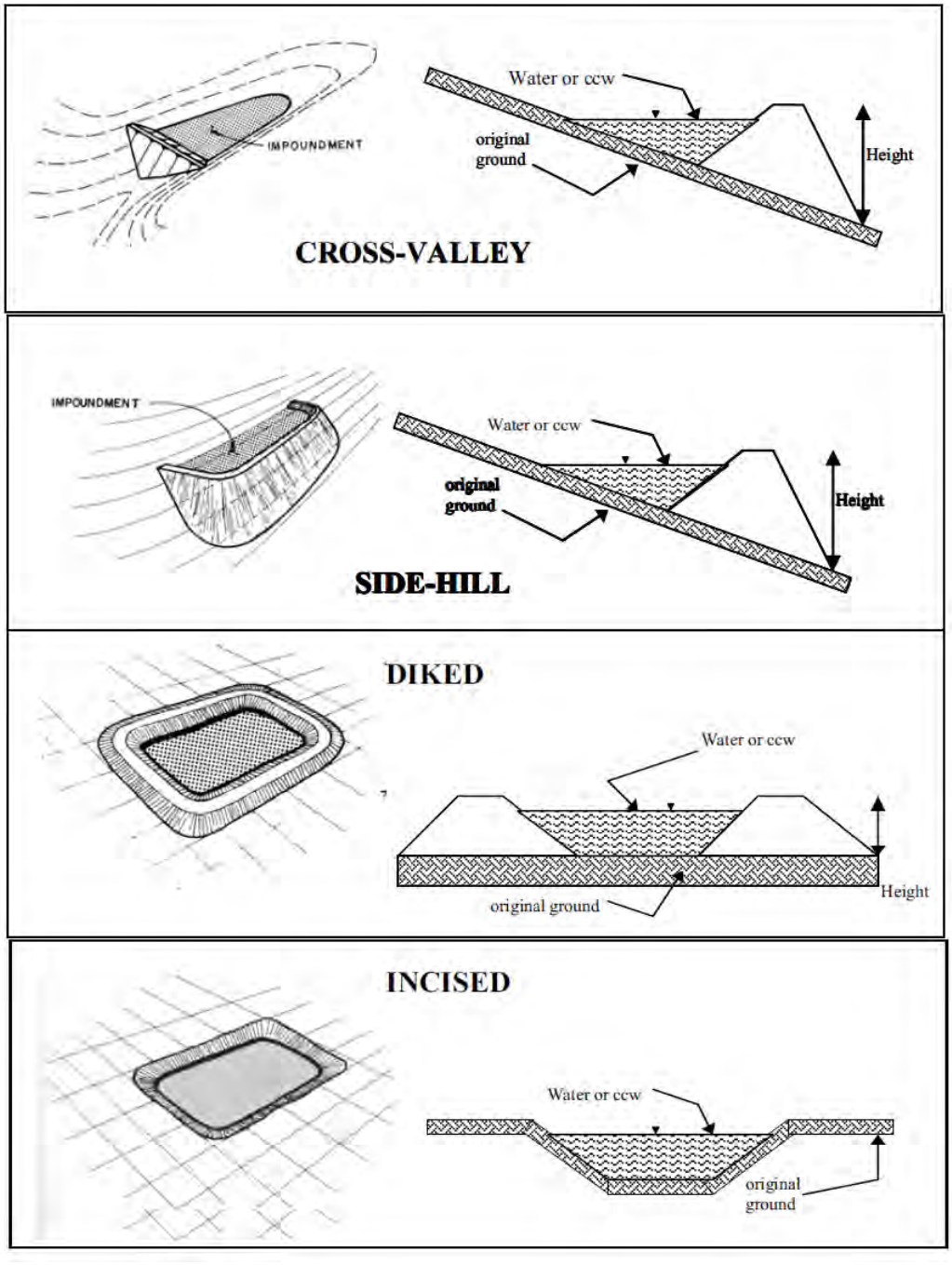
☐ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns.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

Pond would spill into Missouri River and be contained within the River's storage. There would be little to no environmental damage.

CONFIGURATION:



☐ Cross-Valley ☒ Side-Hill ☐ Diked

☐ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	18	**Embankment Material**	Native clay
Pool Area (ac)	15	**Liner**	clay
Current Freeboard (ft)	3+	**Liner Permeability**	$<10^{-7}$

TYPE OF OUTLET (Mark all that apply)

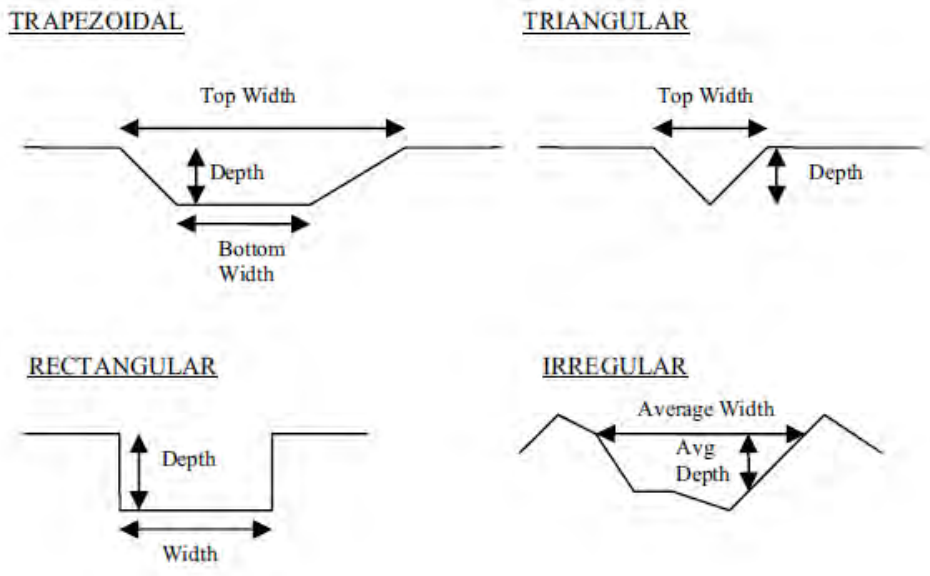
☐ **Open Channel Spillway**

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

depth (ft)

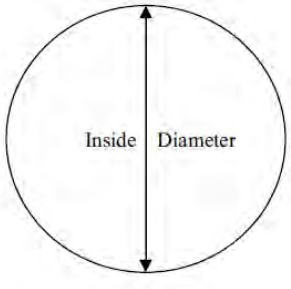
average bottom width (ft)

top width (ft)



☒ **Outlet**

inside diameter



Material

- ☐ corrugated metal
- ☐ welded steel
- ☐ concrete
- ☐ plastic (hdpe, pvc, etc.)
- ☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☒ **Other Type of Outlet**

(specify): **48" sharp crested weir**

The Impoundment was Designed By **Burns and McDonald – designed by a P.E.**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

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

If So Please Describe :

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

No. Pond embankment was structurally designed and keyed into native soils that were cleared and grubbed.

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

Drawings were provided from Engineer-of-Record.

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

No.

Site Name:	**Sibley Generating Station**	Date:	**22 Sept 2010**
Unit Name:	**Slag Settling Pond**	Operator's Name:	**Kansas City Power and Light**
Unit I.D.:		Hazard Potential Classification:	**High** ☐ **Significant** ☐ **Low** ☐
Inspector's Name:		Michael McLaren, Andrew Cueto	

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?	X weekly		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	X		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	X		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	n/a		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	724'		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?		X	Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	X		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trashracks clear and in place?		N/A	From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		N/A	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		N/A	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Issue #	Comments
1	Pond is incised into ground
2	
3	
4	

Coal Combustion Waste (CCW)

Impoundment Inspection

Impoundment NPDES Permit n/a **INSPECTOR** Michael McLaren, Andrew Cueto

Date 22 Sept 2010
Impoundment Name Slag Settling Pond

Impoundment Company Kansas City Power and Light
EPA Region Region 7

State Agency (Field Office) Address Missouri Department of Natural Resources
Name of Impoundment Sibley Generating Station Slag Settling Pond

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

New ☒ **Update** ☐

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

IMPOUNDMENT FUNCTION: Settling Pond

Nearest Downstream Town Name: Wellington, MO

Distance from the impoundment:

Location:

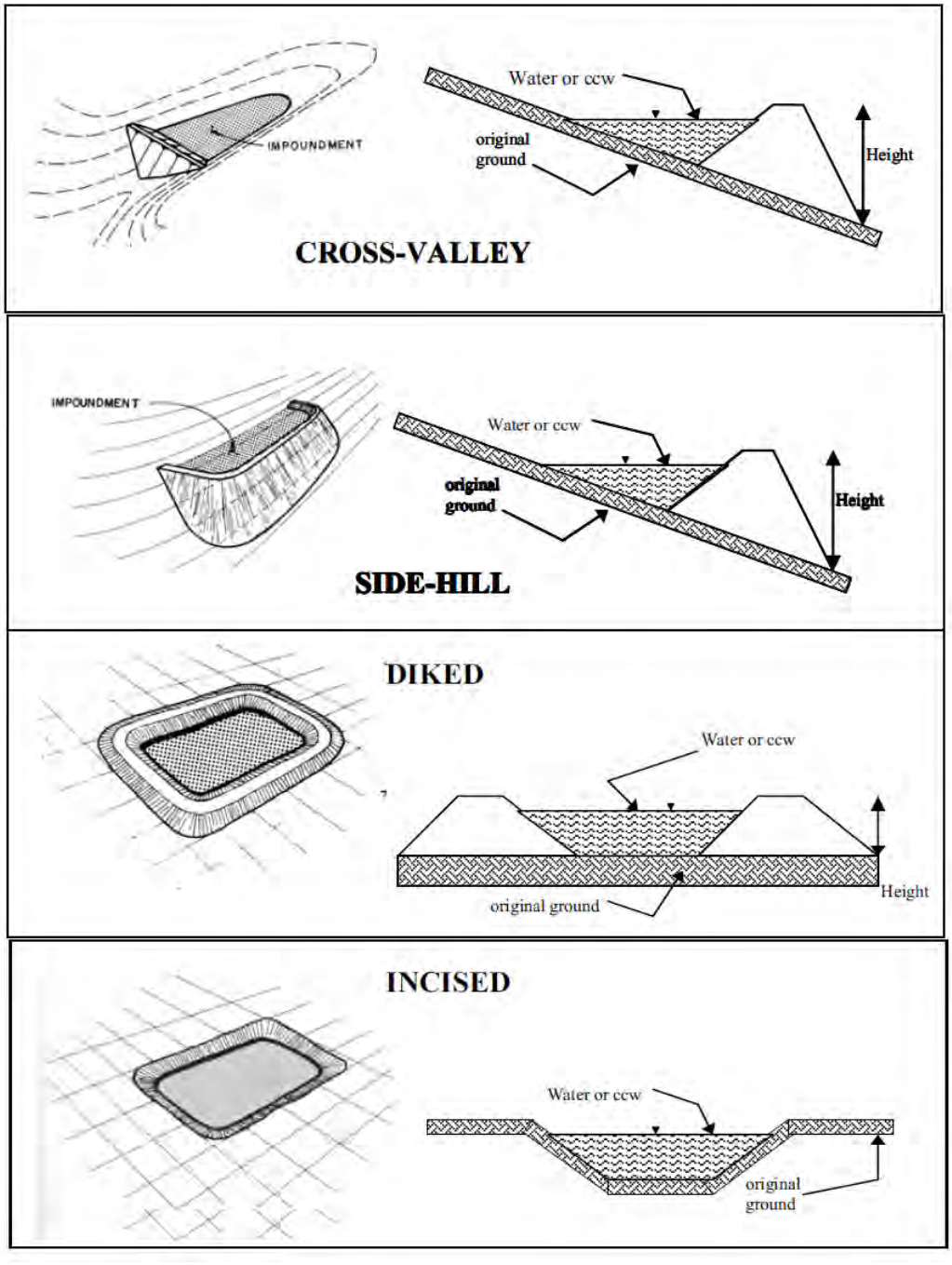
Longitude	39	**DEG**	10	**MIN**	44.37	**SEC**	**W**
Latitude	94	**DEG**	11	**MIN**	10.01	**SEC**	**N**

State MO **County** JACKSON

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

If So Which State Agency? Missouri Department of Natural Resources

CONFIGURATION:



☐ Cross-Valley ☐ Side-Hill ☐ Diked

☒ Incised (form completion optional) ☐ Combination Incised/Diked

Embankment Height (ft)	n/a	**Embankment Material**	n/a
Pool Area (ac)	0.62	**Liner**	Roller compacted concrete
Current Freeboard (ft)	5+	**Liner Permeability**	0.00

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

N/A **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.

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☐ **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:

Pond is incised into ground and concrete lined.

TYPE OF OUTLET (Mark all that apply)

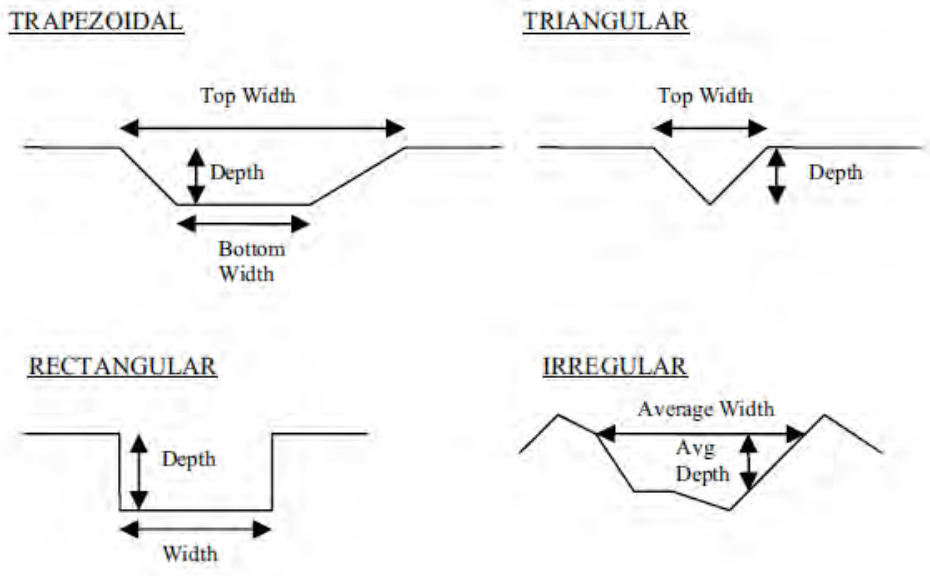
☐ **Open Channel Spillway**

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

depth (ft)

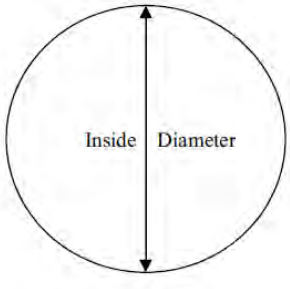
average bottom width (ft)

top width (ft)



☒ **Outlet**

inside diameter



Material

- ☐ corrugated metal
- ☐ welded steel
- ☐ concrete
- ☐ plastic (hdpe, pvc, etc.)
- ☐ other (specify):

	Yes	No
Is water flowing through the outlet?	☒	☐

☐ **No Outlet**

☒ **Other Type of Outlet**

(specify): **48" sharp crested weir**

The Impoundment was Designed By **Burns and McDonald – designed by a P.E.**

	Yes	No
Has there ever been a failure at this site?	☐	☒

If So When?

If So Please Describe :

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

If So Please Describe :

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

If So Please Describe :

ADDITIONAL INSPECTION QUESTIONS

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

No. Pond was incised into bank.

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

Drawings were provided from Engineer-of-Record.

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

No.