AECOM

History of Construction Report

Fly Ash Impoundment

Sibley Generating Station

KCP&L Greater Missouri Operations Company

October 6, 2016

Table of Contents

List of Attachments

1 INTRODUCTION

1.1. *Purpose*

On behalf of KCP&L Greater Missouri Operations Company, (KCP&L GMO) AECOM has prepared the following history of construction for the Fly Ash Impoundment (formerly known as the Fly Ash Pond) at the Sibley Generating Station in accordance with 40 C.F.R. § 257.73(c).

1.2. *Background*

40 C.F.R. § 257.73(c)(1) requires the owner or operator of an existing coal combustion residual (CCR) surface impoundment that exceeds a specified size threshold to compile a history of construction that contains, to the extent feasible, the information specified in § 257.73(c)(1)(i)–(xii). Specifically, by October 17, 2016, a history of construction is required for each existing CCR surface impoundment that either (i) has a height of five feet or more and a storage volume of 20 acre-feet or more, or (ii) has a height of 20 feet or more (40 C.F.R. § 257.73(b)).

2 HISTORY OF CONSTRUCTION

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

Operator: Kansas City Power & Light Company

Address: 33200 E. Johnson Road
Sibley, MO 64088

CCR Units: Fly Ash Impoundment

The above named CCR unit does not have a state assigned identification number.

§257.73 (c)(1)(ii): The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7½ minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

See **Attachment A** – Buckner Quadrangle, Missouri 7.5-Minute Series.

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

The Fly Ash Impoundment at Sibley Generating Station is an on-site surface impoundment used primarily for fly ash management. Fly ash is sluiced from the plant or ash silo into the impoundment. The impoundment also receives non-CCR wastewater streams.

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

Sibley Generating Station is located in the Lower Missouri-Crooked Watershed with a drainage area of 1,607,787 acres per United States Geological Survey[1] (USGS).

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

Burns & McDonnell[2] Fly Ash Pond Construction Drawings show the foundation of the impoundment is comprised of native soils. Per the Goeke[3] Memorandum, borings at the Fly Ash Impoundment location indicated that the foundation soils consist of “an alluvial deposit consisting mainly of clean sands, silty sands, and silts of low plasticity”.

A summary of available engineering properties of the foundation materials for the Fly Ash Impoundment from the Geotechnical Report[4] is presented in **Table 1**. The Fly Ash Impoundment is an enclosed impoundment with dikes (embankments) and does not have abutments.

Table 1. Summary of Foundation Material Engineering Properties from Geotechnical Report[4]

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Alluvial Clay/Silt	120	100	31	500	14
High Plastic Clay	120	0	25	440	10
Alluvial Sand	120	0	34	0	34
Bedrock	150	5,000	30	5,000	30

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

Drawing No. Y11[5] shows that the embankment is a homogeneous clay fill embankment and that the borrow used to construct the embankment was obtained from within the footprint of the impoundment and from a borrow site on station property. The embankment was constructed using Type 'A' and Type 'B' materials that fulfilled engineering specifications[6]. Type 'A' materials were obtained from the borrow area and were required by the project specifications to have a Unified Soil Classification (USC) of CH or CL. Type 'B' materials were obtained within the footprint of the impoundment. The specifications state that any material excavated from within the footprint of the impoundment was suitable for embankment construction.

Excavation of Fly Ash Impoundment Site: The method of excavation for the proposed Fly Ash Impoundment was not detailed in the design drawings. Drawing No. Y4[7] shows that excavations were made to elevation 705 (the bottom of the liner) and that excavations were to extend 6 inches below the footprint of the foundation or as required to remove vegetation.

On-site borrow area: Drawing No. Y6[8] shows that the approximately 10-acre borrow area was located approximately one mile from the Fly Ash Impoundment. Geotechnical tests conducted during the design phase of the project show that the borrow area was composed primarily of silty clay with a USC of CL. The reported liquid limit of soils tested ranged between 37 and 46 and the reported plasticity index of soils tested ranged between 14 and 21[3].

Backfilling with Type 'A' Compacted Material to El. 707.0: A 2-ft thick liner was constructed within the Fly Ash Impoundment footprint[5]. The liner was specified to be constructed using Type 'A' Material compacted to 92% ± 5% of the maximum dry density with moisture content between optimum and optimum plus 4%. Compaction requirements for Type 'A' Material required use of sheeps foot rollers and placement of the material in 6-inch thick loose lifts[3]. Tests conducted on remolded soils obtained from the borrow area showed that soils compacted to this range of water content and density would have a hydraulic conductivities between 10^{-6} to 10^{-7} cm/sec.

Construction of Embankments from Sta. 0+00 to Sta. 23+25: An approximately 6-inch thick layer of vegetative material was shown to be removed to prepare the embankment area. Compacted Type 'B' Material was designated for the embankments. Compaction requirements for Type 'B' Material included placement in 6-inch thick loose lifts. A 4.5-foot thick layer of Compacted Type 'A' Material was placed on the interior slope of the embankment. The exterior portion of the embankment is shown on the drawings to be constructed using Type 'B' Material. The drawings also show that a 6-inch thick aggregate surfacing was to be placed on the embankment crest.

Construction of Embankments from Sta. 23+25 to Sta. 51+30.89: Drawing Y11[9] show an approximately 6-inch thick layer of vegetative material was to be removed to prepare the embankment area. Compacted Type 'A' Material is shown to be placed at a 2H:1V slope at a height of 18 ft and a crest width of 12 ft (See **Table 2** for a summary of material properties). A layer of compacted Type 'B' Material was then placed on the exterior slope of the embankment at a 3H:1V slope to an 18 ft height matching the Type 'A' Material, providing a total top crest width of 20 ft. A 6-inch filter blanket was placed on the exterior slope of the embankment from the toe of slope to approximately elevation 717.5 ft. Rip rap was placed over the filter blanket. A 4-inch thick layer of topsoil was shown to be added from elevation 717.5 feet to the crest of the embankment.

A summary of physical and engineering properties of the construction materials for the Fly Ash Impoundment from the Geotechnical Report[4] is presented in **Table 2 and 3** below.

Table 2. Summary of Construction Material Engineering Properties from Geotechnical Report[4]

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Embankment Fill*	128	200	29	283	21.4

*The embankment fill materials sampled and tested were Type 'A' Material.

Table 3. Summary of Embankment Material Physical Properties from Geotechnical Report[4]

Test		Min	Max	Average
Water Content (%)		16	24	19
% Passing No. 200 Sieve		97.4	98.7	98.2
Atterberg Limits	**Liquid Limit**	35	42	38
	Plastic Limit	17	24	20
	Plasticity Index	11	23	17

Available Records indicate the Fly Ash Impoundment was constructed in 1977[6].

§257.73 (c)(1)(vii): At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Drawings that contain items pertaining to the requested information for the Fly Ash Impoundment are listed in **Table 4**. Items marked as "Not Found" are items not found in available record documentation. The available construction plans for the Fly Ash Impoundment are included in **Attachment B**.

Table 4: List of Drawings with Design Information Requested in § 257.73(c)(1)(vii)

	Sibley Fly Ash Impoundment
Dimensional plan view (all zones)	Burns & McDonnell Drawing No. Y1[10], Y3[2], Y4[7], Y2-Rev 2[11], Y5-Rev 3[12], (1977 & 1988)
Dimensional cross sections	Burns & McDonnell Drawing No. Y7[13], Y8[14], Y9[15], Y10[16], Y11[9], Y12[17], Y8-2[18] (1977 & 1988)
Foundation Improvements	Sargent & Lundy Drawing No. S-103[19] (1992) (Foundations for Fly Ash Silo)
Drainage Provisions	Burns & McDonnell Drawings No. Y3[2], Y4[7], Y7[13], Y8[14], Y9[15], Y11[9] (1977)
Spillways	Burns & McDonnell Drawing No. Y4[7], Y13[20],Y14[21] (1977)
Diversion Ditches	Burns & McDonnell Drawings No. Y3[2], Y4[7], Y7[13], Y8[14], Y8-2[18], Y9[14], Y11[9] (1977 & 1988)
Outlets	Burns & McDonnell Drawing No. Y4[7], Y13[20], Y14[21] (1977)
Instrument Locations	None Included in Original Design
Slope Protection	Burns & McDonnell Drawing No. Y2-Rev 2[11], Y3[2], Y4[7], Y11[9], Y12[17] (1977)
Normal Operating Pool Elevation	722 ft Per Dam Assessment Report (Dewberry & Davis[22], 2011)
Maximum Pool Elevation	723 ft (Per Dam Assessment Report, Dewberry & Davis[22], 2011)
Expected Maximum Depth of CCR	Not Found
Identifiable Natural or Manmade Features That Could Adversely Affect Operation of the Sibley Fly Ash Impoundment	None Identified

All drawings listed in **Table 4** are included in **Attachment B**.

The following modifications were made to the Fly Ash Impoundment:

- Between 1993 and 1994, the western end of the Fly Ash Impoundment was filled in and a new silo was placed on driven steel piles[19].

- In 1996 Sibley Generating Station constructed work pads and interior dikes within the Fly Ash Impoundment[11]. The shot rock work pads provide stable and durable location for heavy equipment to be used when dredging and other maintenance operations are conducted. The addition of the interior dikes helps to localize sediment settling to the western portion of the Impoundment and along the corners of the protruding internal dikes.

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

There is no existing instrumentation on the Fly Ash Impoundment.

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

Area-capacity curves were not reasonably or readily available.

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

The outlet structure for the Fly Ash Impoundment is located in the southeastern corner of the impoundment. Water enters in at a 12-inch diameter pipe with an invert elevation of 720.5 ft, and is conveyed to the outfall structure, where a 48-inch sharp crested weir with an inlet elevation of 716 ft discharges water through an outlet structure to a tributary of the Missouri River[18].

The calculations used to determine the capacity of the outlet structure were not reasonably and readily available.

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

Missouri Public Service Company[6] generated construction specifications for the construction of the Fly Ash Impoundment in a 1977 Bid Package. See **Attachment C**.

KCP&L provisions for surveillance, maintenance, and repair of Fly Ash Impoundment in compliance with the USEPA CCR Rule include the following:

- Sibley Generating Station accomplishes 7-day and 30-day inspections on the Sibley Fly Ash Impoundment in compliance with the CCR Rule[23].
- Sibley Generating Station supervisory staff reviews inspection documentation.
- In the event further evaluation is needed, station management and/or corporate staff will be consulted as appropriate.
- Follow-on work is scheduled to repair issues determined to be in need of remediation.

§257.73 (c)(1)(xii): Any record or knowledge of structural instability of the CCR unit.

No signs of structural instability have been reported.

3 LIMITATIONS

The signature of AECOM's authorized representative on this document represents that to the best of AECOM's knowledge, information and belief in the exercise of its professional judgment, it is AECOM's professional opinion that the aforementioned information is accurate as of the date of such signature. Any recommendation, opinion or decisions by AECOM are made on the basis of AECOM's experience, qualifications and professional judgment and are not to be construed as warranties or guarantees. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data and that actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

4 ENGINEER'S CERTIFICATION

This document was prepared under the direct personal supervision of Brian D. Linnan, a Registered Professional Engineer in good standing in the State of Missouri. I certify, the History of Construction for the Sibley Fly Ash Impoundment, dated October 6, 2016, which includes all pages in Sections 1 and 2, meets the requirements of 40 CFR § 257.82.

Brian D. Linnan
Printed Name

October 6, 2016
Date

AECOM
2380 McGee Street, Suite 200
Kansas City, Missouri 64108
1-816-561-4443

5 REFERENCES

1. United States Geological Survey. The National Map Viewer. http://viewer.nationalmap.gov/viewer/. USGS data first accessed in April of 2016.

2. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Grading Plan – Area II (Drawing No. Y3),* December 29 1976.

3. Goeke. *Memorandum. Subsurface Recommendation for Fly Ash Pond Missouri Public Service – Sibley*, January 26 1977.

4. AECOM. *Geotechnical Report for the Fly Ash Impoundment at KCP&L GMO Sibley Generating Station*, October 2016.

5. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Grading Details & Sections (Drawing No. Y11),* December 29 1976.

6. Missouri Public Service Co. *Bid Documents Sibley Power Station, Contract 100 – Fly Ash Pond Construction Detailed Specifications, March 1977.*

7. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Grading Plan – Area III (Drawing No. Y4),* December 29 1976.

8. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Borrow Area Plan (Drawing No. Y6),* December 29 1976.

9. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Grading Details & Sections (Drawing No. Y11),* December 29 1976.

10. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Site Plan & Vicinity Map (Drawing No. Y1),* December 29 1976.

11. Burns & McDonnell. *Sibley Power Station Fly Ash Landfill Construction –Sediment Removal Plan (Drawing No. Y2-Rev 2)*, June 6, 1993.

12. Burns & McDonnell. *Sibley Power Station Fly Ash Landfill Construction – Existing Fly Ash Pond Site Improvement & Pond Sediment Removal Plan (Drawing No. Y5-Rev 3)*, June 30, 1993.

13. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Fly Ash Pond Access Rd. Cross Sections (Drawing No. Y7),* December 29 1976.

14. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Fly Ash Pond Dike Cross Sections I (Drawing No. Y8),* December 29 1976.

15. Burns & McDonnell. *Sibley Generating Station Contract 100 - Fly Ash Pond Construction Fly Ash Pond Dike Cross Sections II (Drawing No. Y9),* December 29 1976.

16. Burns & McDonnell*. Sibley Generating Station Contract 100 - Fly Ash Pond Construction Fly Ash Pond Dike Cross Sections III (Drawing No. Y10),* December 29 1976.

17. Burns & McDonnell*. Sibley Generating Station Contract 100 - Fly Ash Pond Construction Miscellaneous Details (Drawing No. Y12),* December 29 1976.

18. Burns & McDonnell*. Sibley Power Station Fly Ash Landfill Construction – Miscellaneous Details (Drawing No. Y8-Rev 2)*, June 6 1988.

19. Sargent & Lundy. *Fly Ash Silo Grading and Drainage Plan Sibley Generating Station Unit 3, (*Drawing No. S-103*) August 11 1992.*

20. Burns & McDonnell*. Sibley Generating Station Contract 100 - Fly Ash Pond Construction Outfall Structure (Drawing No. Y13),* December 29 1976.

21. Burns & McDonnell*. Sibley Generating Station Contract 100 - Fly Ash Pond Construction Outfall Structure Details (Drawing No. Y14),* December 29 1976.

22. Dewberry & Davis. *Final Coal Combustion Waste Impoundment Round 7 – Dam Assessment Report for Sibley Generating Station Fly Ash Pond*, March 2011.

(Prepared for United States Environmental Protection Agency under contract number EP-09W001727.)

23. KCP&L. *Coal Combustion Residual (CCR) Inspection Program, Sibley Generating Station*, Rev. 1, July 2016.

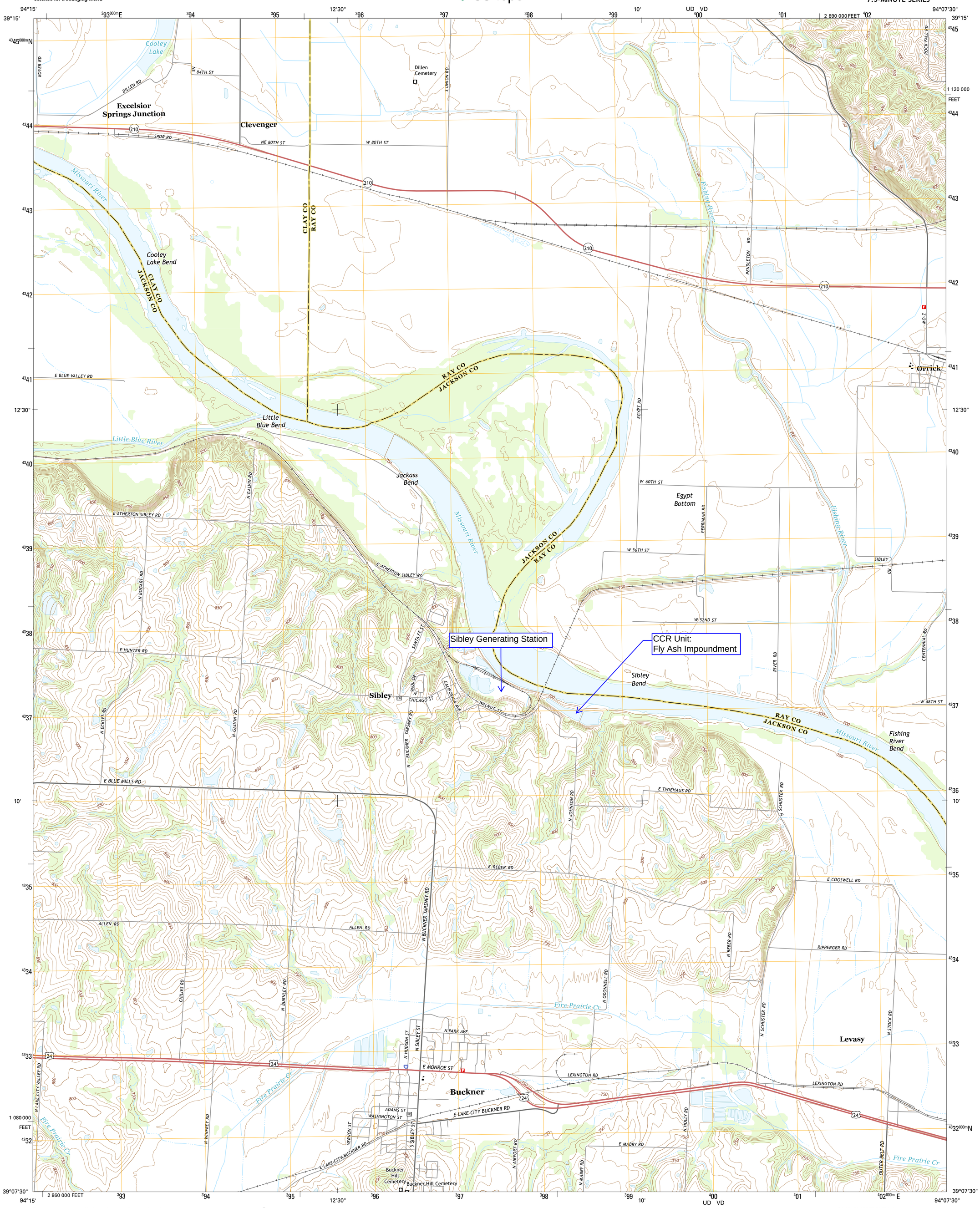
Attachment A
Buckner Quadrangle, Missouri
7.5-Minute Series

USGS science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

BUCKNER QUADRANGLE
MISSOURI
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 15S
10 000-foot ticks: Missouri Coordinate System of 1983 (west zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, June 2012
Roads..... HERE, ©2013
Names.....GNIS, 2013
Hydrography.....National Hydrography Dataset, 2012
Contours.....National Elevation Dataset, 2005
Boundaries.....Multiple sources; see metadata file 1972 - 2014
Public Land Survey System.....BLM, 2011

MN 1° 41' 30 MILS
GN 0° 45' 13 MILS
UTM GRID AND 2014 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
4°00 UD VD
Grid Zone Designation 15S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1 MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

1	2	3
4		5
6	7	8

1 Kearney
2 Excelsior Springs
3 Rayville
4 Missouri City
5 Camden
6 Blue Springs
7 Oak Grove
8 Bates City
ADJOINING QUADRANGLES

BUCKNER, MO
2014

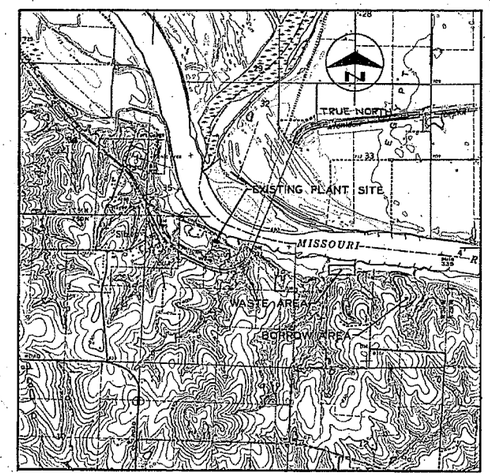
NSN. 7643016373759
NGA REF NO. USGSX24K69481

Attachment B
Reference Drawings

Selected Sheets from 1977 Burns & McDonnell Drawings

GENERAL NOTES

1. ALL ELEVATIONS SHOWN ARE TOP OF SUBGRADE UNLESS OTHERWISE NOTED.
2. CULVERT LENGTH NOTED ON PLANS IS FROM LOCATION POINT TO LOCATION POINT (SEE PIPE END SECTION DETAIL DWG. Y 12.)
3. CULVERT SHOWN IN PLANS MAY BE 16 GA. C.M.P. OR CLASS III RCP AT CONTRACTORS OPTION.
4. REFERENCE POINTS NO. 1 AND 2 ARE ⅝" REBARS SET IN THE GROUND. BENCH MARK NO. 1 IS A BRASS ROD SET IN CONCRETE.



VICINITY MAP

2000 0 2000 4000
SCALE IN FEET

LEGEND

EXISTING		THIS CONTRACT	EXISTING		THIS CONTRACT
	TOP OF SLOPE			FLOW INDICATORS	
	TOE OF SLOPE			V-BOTTOM DITCH OR SWALE	
720	CONTOUR	720		SPOT ELEVATION	EL. 721.0
	PROPERTY LINE			UTILITY POLES	
	CULVERT W/ END SECTIONS			STRUCTURES	
	CRUSHED ROCK			TRANSMISSION TOWER	
	RAILROADS			FENCE	
	ROADS				
	RIP RAP				

SITE PLAN

200 0 200 400
SCALE IN FEET

NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES HUMBER E-16549
REGISTERED PROFESSIONAL ENGINEER

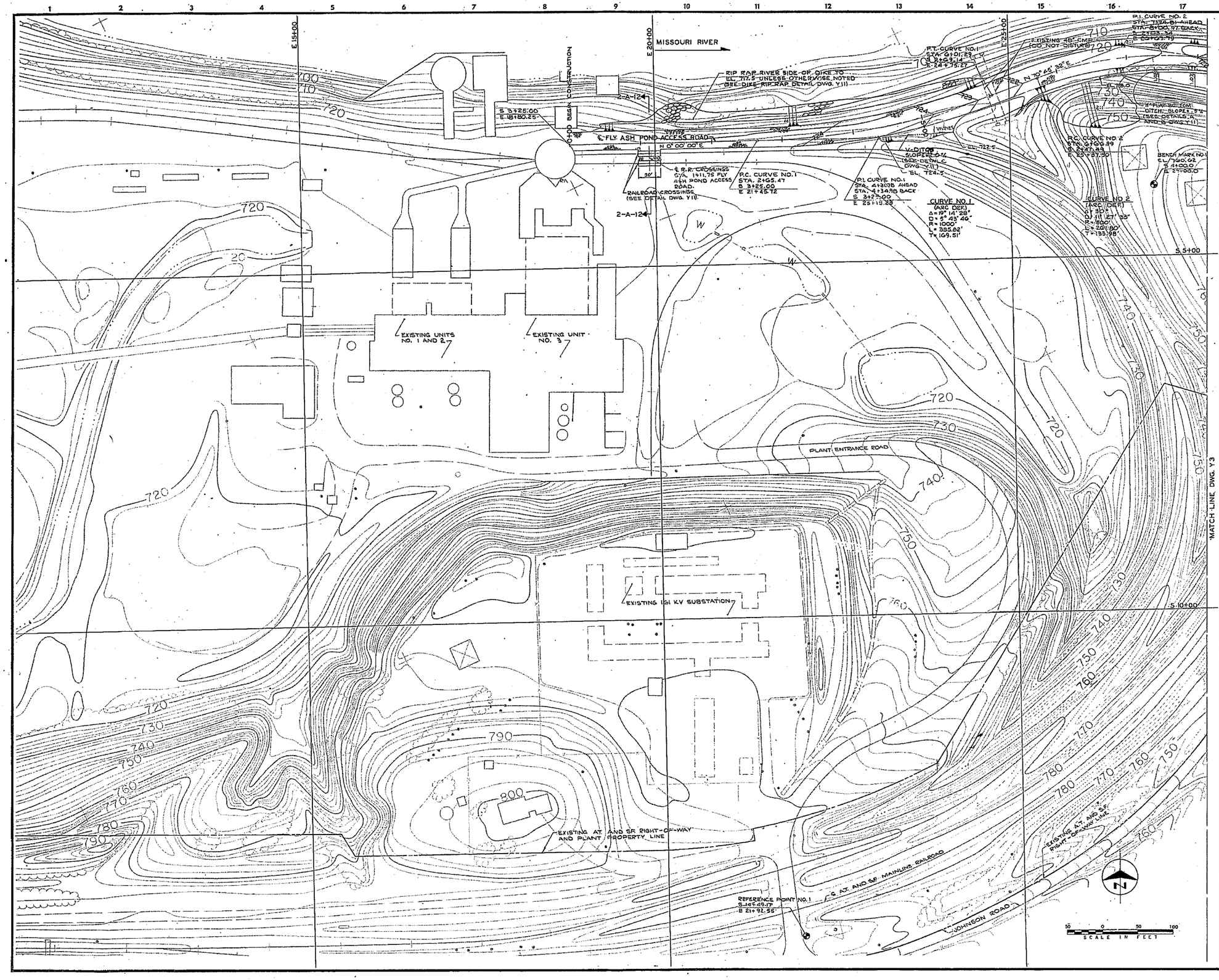
CONTRACT NO.100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

SITE PLAN & VICINITY MAP

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

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



NO.	DATE	BY	REVISION
1			

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

GRADING PLAN – AREA I

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

DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	JJB	Y2	–
DETAILED	DEJ	PROJECT	73-062-1-005
CHECKED		SHEET	OF SHEETS

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-16549
REGISTERED PROFESSIONAL ENGINEER

EXISTING BRIDGE PIERS (TYP.)

AT AND SF RAILROAD OVERHEAD TRESTLE

PT CURVE NO. 2
STA. 11+28.79
S 2+28.35
E 27+05.41

RIP RAP DIKE TO EL. 719.0

S 2+44.58
E 30+90.80
INV. EL. 714.72

STA. 50+89.40 AHEAD
STA. 51+02.16 BACK
S 1+62.66
E 31+85.75

50'-0" - TRANSITION RIP RAP FROM EL. 717.5 TO EL. 719.0 BEGINNING AT STA. 50+20.00 FLY ASH POND DIKE.

MISSOURI RIVER

NOTE
EXCAVATE FLY ASH POND BOTTOM TO EL. 709.0 AND BACKFILL TO EL. 707.0 WITH TYPE "A" EMBANKMENT MATERIAL AS SPECIFIED.

RIP RAP RIVER SIDE OF DIKE TO EL. 717.5 UNLESS OTHERWISE NOTED. (SEE DIKE RIP RAP DETAIL DWG. Y11)

FLY ASH POND ACCESS ROAD

SEE DETAIL A THIS DWG.

STA. 0+00 FLY ASH POND ACCESS RD. = STA. 0+00 AND STA. 92+26.89 FLY ASH POND DIKE.
S 2+97.65
E 31+60.10

4' FLAT BOTTOM DITCH SLOPE = 0.5%
(SEE DETAIL A DWG. Y11)

EL. 719.38

STA. 12+52 ACCESS RD. 42" R.C.P. CULVERT
(SEE GRADING NOTES 2 AND 3 DWG. Y-1)

EL. 714.52

12' DIA. R.C.P. (SEE RIP RAPPED DITCH DETAIL DWG. Y11)

S 3+16.25
E 30+77.17
INV. EL. 715.08

℄ DIKE EL. 725.0 (TOP OF SUBGRADE)

TOE OF SLOPE EL. 707.0 (SEE NOTE 1)

50' TRANSITION TO 20' RD. WIDTH

4' FLAT BOTTOM DITCH SLOPE = 0.4%

FLY ASH POND

STA. 43+52.153 AHEAD
STA. 43+52.293 BACK
S 4+50.02
E 31+30.54

STA. 9+30.13
S 4+71.28
E 45+75.89

STA. 9+50 TO STA. 10+50 PLACE 12" RIP RAP (SEE RIP RAPPED DITCH DETAIL DWG. Y11)

EXISTING PLANT PROPERTY LINE

EXISTING R.O.W. LINE

EXISTING R.O.W. LINE

AT AND SF TRANSVERSE RAILROAD

MATCH LINE DWG. Y2

MATCH LINE DWG. Y4

JOHNSON ROAD

E 30+00

E 35+00

E 40+00

0+00

5+00

10+00

700

710

720

730

740

750

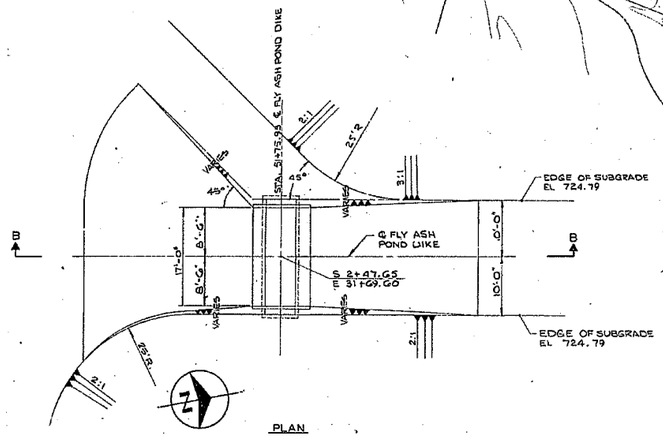
760

770

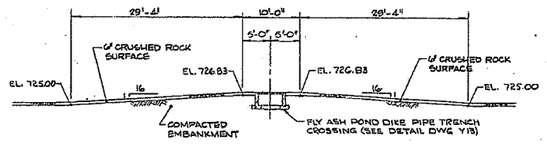
780

3-B-12

SCALE IN FEET
50 0 50 100



PLAN



SECTION B

DETAIL A
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM FORREST
NUMBER E-16549
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			

NOTE:
EXCAVATE FLY ASH POND BOTTOM TO EL. 705.0 AND BACKFILL TO EL. 707.0 WITH TYPE 'A' EMBANKMENT MATERIAL AS SPECIFIED.

MISSOURI RIVER

RIP RAP RIVER SIDE OF DIKE TO EL. 717.5 UNLESS OTHERWISE NOTED (SEE DIKE RIP RAP DETAIL DWG. Y 11)

STA. 28+35.99 AHEAD
STA. 28+71.79 BACK
N 14+66.28
E 52+81.00

TOE OF SLOPE, EL. 707.0 (SEE NOTE)

FLY ASH POND

WASTE AREA

STA. 23+72.00 AHEAD
STA. 23+78.13 BACK
S 1+12.17
E 55+03.01

FLY ASH POND INLET STRUCTURES (SEE DWG. Y13)

18" DRAW LINE PLACE IN EARTH PIPE EMBEDMENT AS SPECIFIED

S 2+30.80
E 55+16.68

FLY ASH POND OUTFALL STRUCTURE (SEE DWG. Y13)

FLAT BOTTOM DITCH (SEE RIP RAPPED DITCH DETAIL DWG. Y11)

EL. 700.0
EL. 712.25
EL. 719.82

S 2+93.39
E 54+72.02

S 3+07.07
E 54+78.18

STA. 23+48.13 AHEAD
STA. 23+63.16 BACK
S 3+17.33
E 54+95.38

STA. 12+80.39
S 5+00.43
E 44+22.37

E 720.0

4'-0" FLAT BOTTOM DITCH SLOPE = 0.4%

EL. 721.0

4'-0" FLAT BOTTOM DITCH SLOPE = 0.4%

STA. 20+64.90
S 4+39.79
E 51+83.42

STA. 18+60.77 AHEAD
STA. 18+76.22 BACK
S 5+34.38
E 50+02.54

EXISTING PLANT PROPERTY LINE

EXISTING PLANT PROPERTY LINE

TRANSITION SLOPE FROM 2:1 TO 3:1

MATCH LINE DWG. Y 3

SCALE IN FEET

WILLIAM TORRES NUMBER E-16569 STATE OF MISSOURI REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

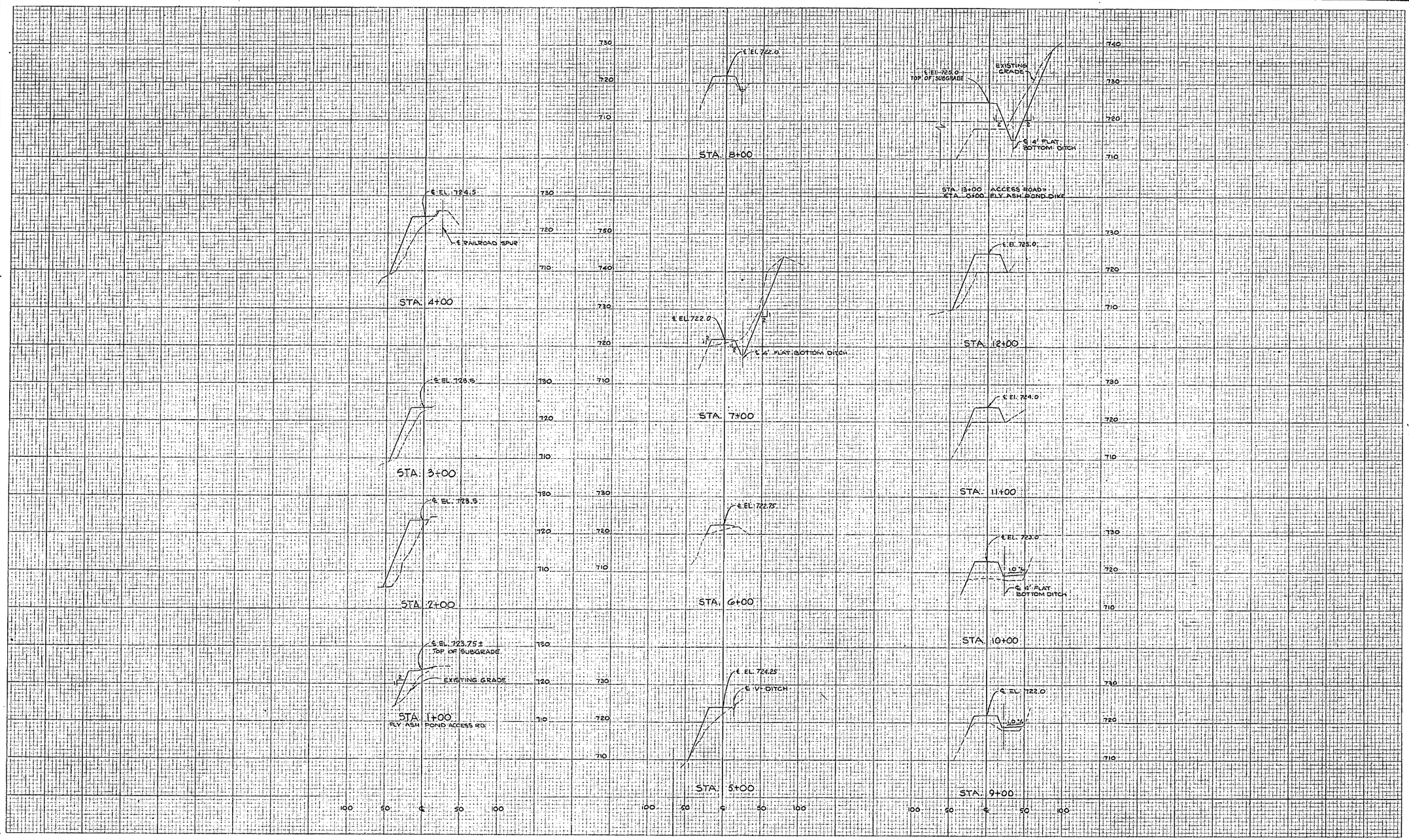
MISSOURI PUBLIC SERVICE COMPANY

KANSAS CITY, MISSOURI

GRADING PLAN - AREA III

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

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



NO.	DATE	BY	REVISION
1			

GENERAL NOTES:

1. ALL SECTIONS ARE CUT IN THE DIRECTION OF INCREASING STATIONS.
2. EMBANKMENT SHALL BE TYPE "A" AS SPECIFIED.

VERT. 10 0 10 20 SCALE IN FEET

HORIZ. 50 0 50 100 SCALE IN FEET

STATE OF MISSOURI — REGISTERED PROFESSIONAL ENGINEER — WILLIAM TORRES — NUMBER E-16549

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY

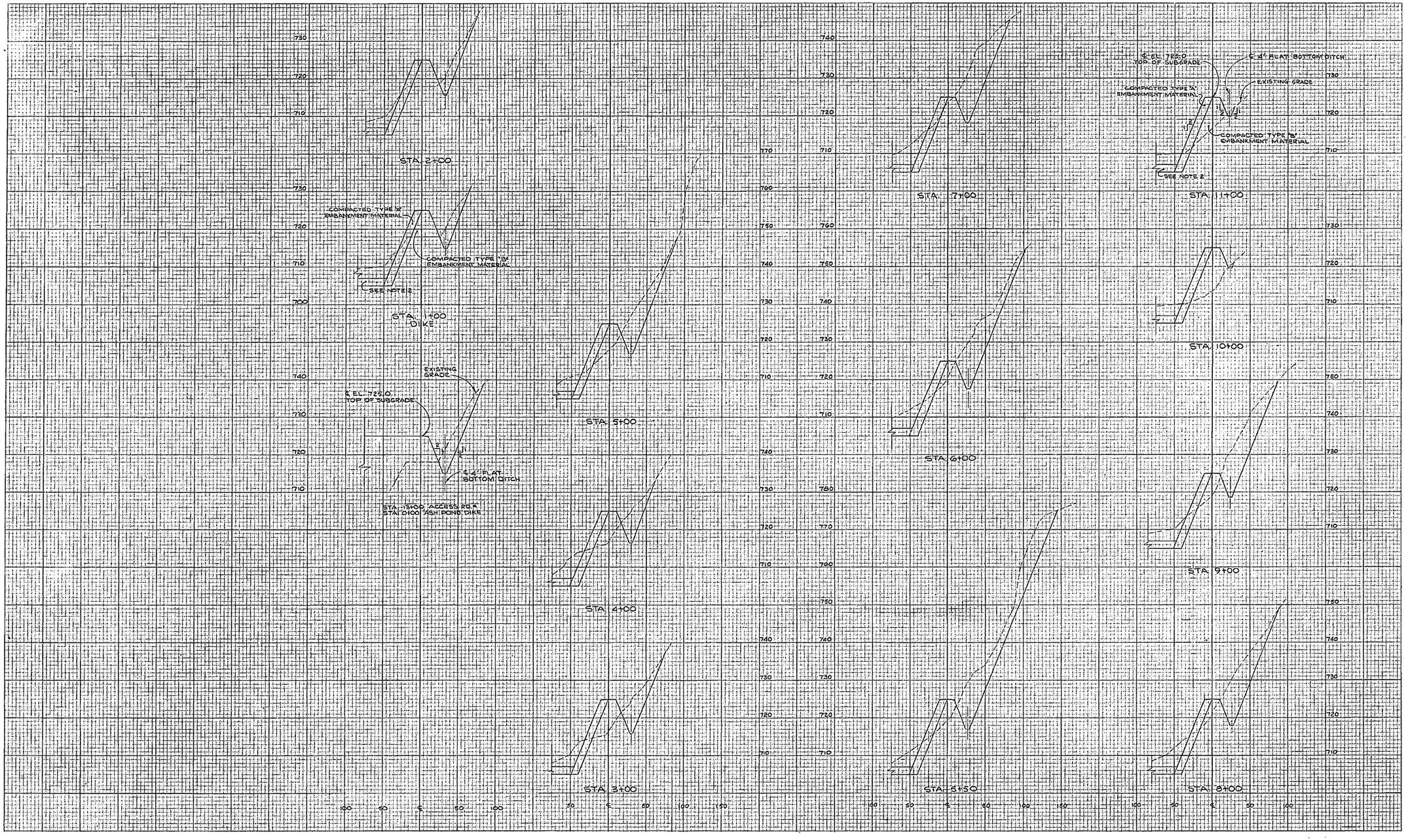
KANSAS CITY, MISSOURI

FLY ASH POND ACCESS RD. CROSS SECTIONS

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

DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	JJB	Y7	–
DETAILED	DEJ	PROJECT	73-062-1-005
CHECKED		SHEET	OF SHEETS

3-29-77



NO.	DATE	BY	REVISION
1			

GENERAL NOTES:

1. ALL SECTIONS ARE CUT LOOKING IN THE DIRECTION OF INCREASING STATIONS.
2. EXCAVATE TO EL. 705.0 AND BACKFILL TO EL. 707.0 WITH TYPE 'A' EMBANKMENT MATERIAL. (SEE DWG Y11 FOR TYPICAL SECTION).

VERT. 10 0 10 20 SCALE IN FEET

HORIZ. 50 0 50 100 SCALE IN FEET

STATE OF MISSOURI — WILLIAM TORRES — NUMBER E-46549 — REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

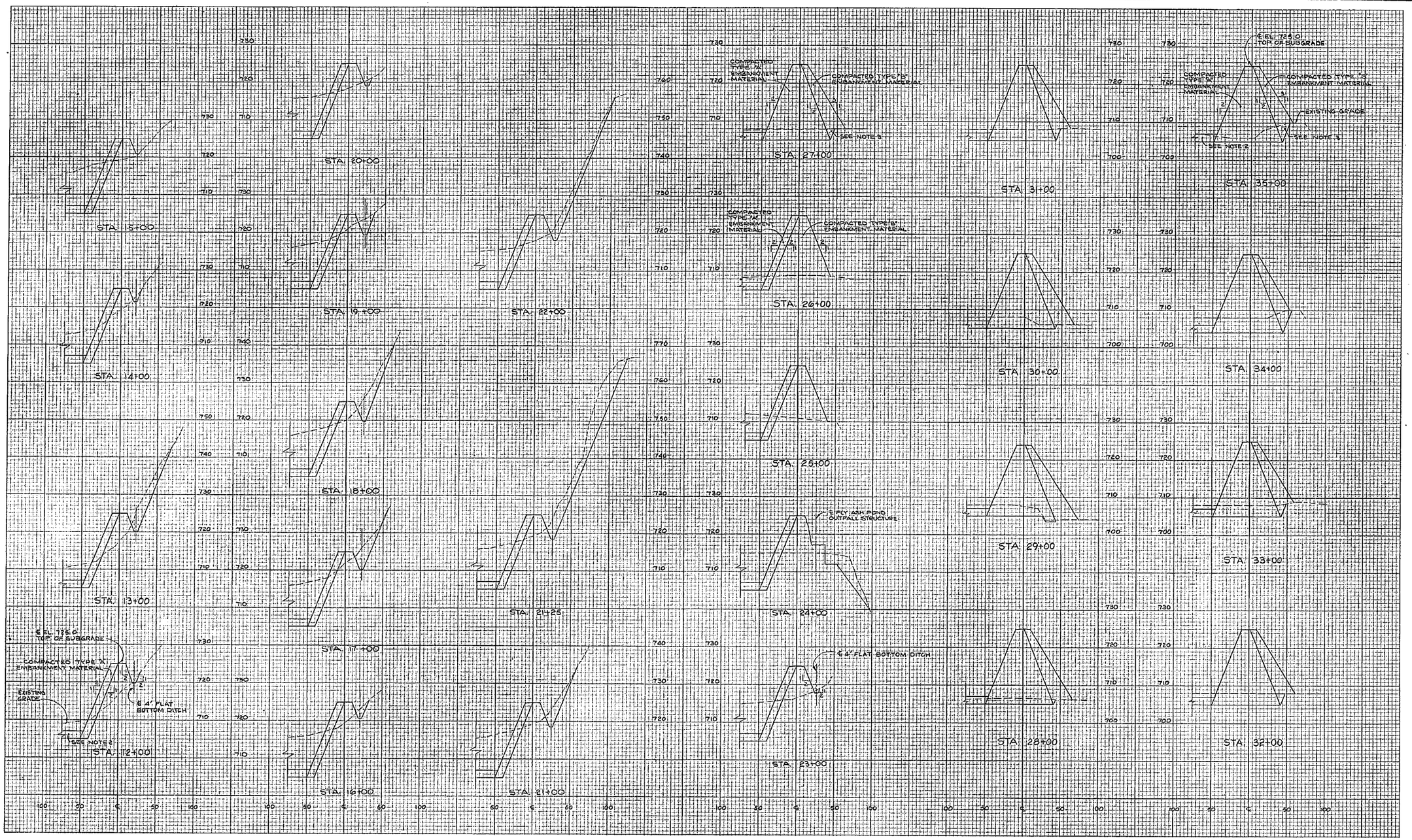
SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

FLY ASH POND DIKE CROSS SECTIONS I

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

DATE Dec. 29, 1976	DRAWING NO. Y8 — REV.
DESIGNED JJB	
DETAILED DEJ	PROJECT 73-062-1-005
CHECKED	SHEET OF SHEETS

J3872



NO.	DATE	BY	REVISION
1			

GENERAL NOTES:

1. ALL SECTIONS ARE CUT LOOKING IN THE DIRECTION OF INCREASING STATIONS.
2. EXCAVATE TO EL. 705.0 AND BACKFILL TO EL. 707.0 WITH TYPE 'A' EMBANKMENT MATERIAL. (SEE DWG. Y 11 FOR TYPICAL SECTION).
3. LAY BACK TO STABLE SLOPE TO CONSTRUCT TYPE 'A' EMBANKMENT, AND BACKFILL WITH COMPACTED TYPE 'B' MATERIAL AS SPECIFIED.
4. FROM STA. 26+00 TO STA. 27+00, TRANSITION OUTSIDE SLOPE OF DIKE FROM 2:1 TO 3:1. ALSO PROVIDE SMOOTH, REGULAR TRANSITION BETWEEN THE SECTIONS SHOWN FOR STA. 26+00 AND FOR STA. 27+00.

VERT. -10 0 10 20 SCALE IN FEET

HORIZ. -50 0 50 100 SCALE IN FEET

STATE OF MISSOURI WILLIAM TORRES NUMBER E-16549 REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

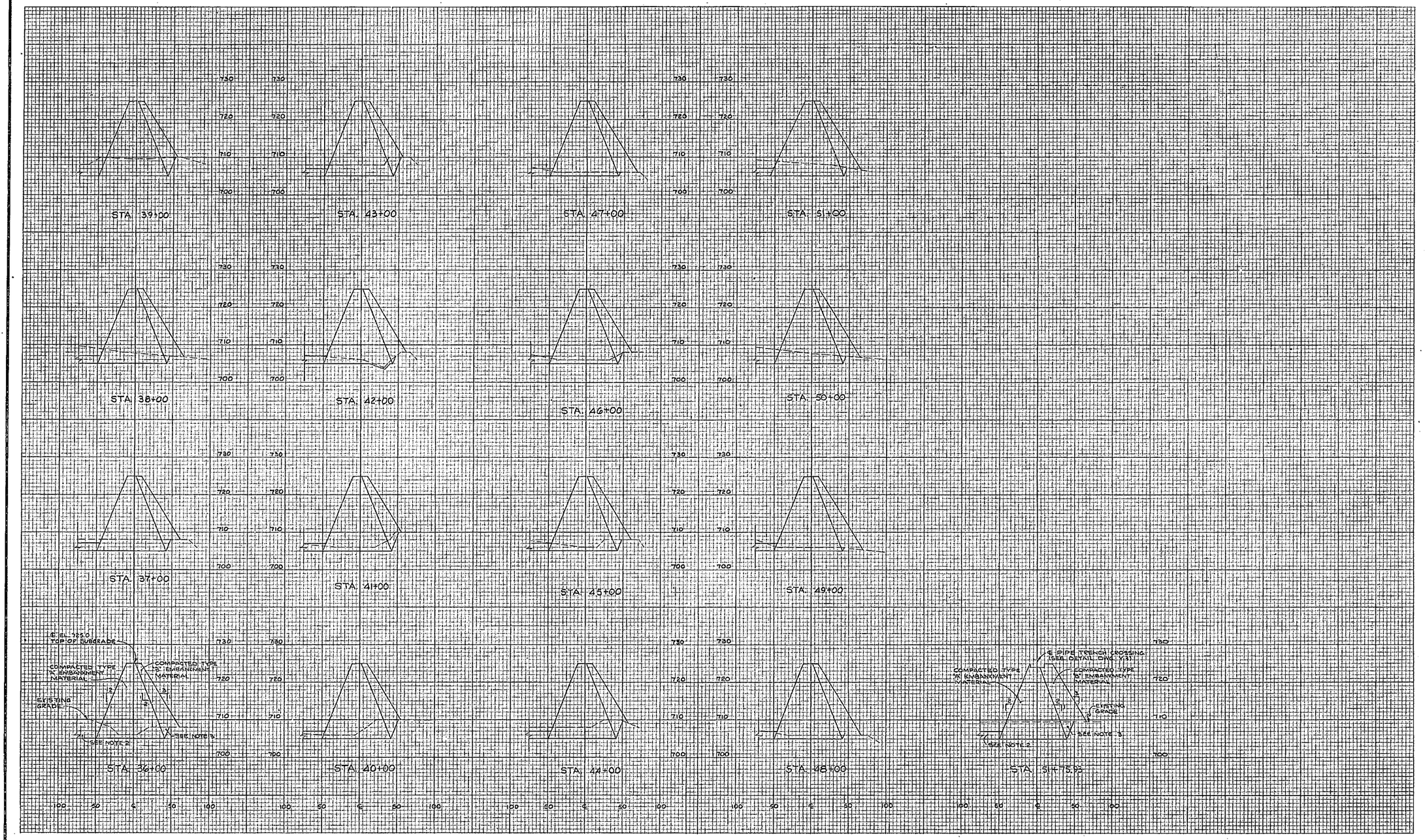
SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

FLY ASH POND DIKE CROSS SECTIONS II

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

DATE Dec. 29, 1976	DRAWING NO. Y9 — REV.
DESIGNED JJB	
DETAILED DEJ	PROJECT 73-062-1-005
CHECKED	SHEET OF SHEETS

M-3-3-2 5-28-76



NO.	DATE	BY	REVISION
1			

GENERAL NOTES:

1. ALL SECTIONS ARE CUT LOOKING IN THE DIRECTION OF INCREASING STATIONS.
2. EXCAVATE TO EL. 705.0 AND BACKFILL TO EL. 707.0 WITH TYPE 'A' EMBANKMENT MATERIAL. (SEE DWG. Y11 FOR TYPICAL SECTION.)
3. LAY BACK TO STABLE SLOPE TO CONSTRUCT TYPE 'A' EMBANKMENT, AND BACKFILL WITH COMPACTED TYPE 'B' MATERIAL AS SPECIFIED.

VERT. 10 0 10 20 SCALE IN FEET

HORIZ. 50 0 50 100 SCALE IN FEET

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-15549
REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

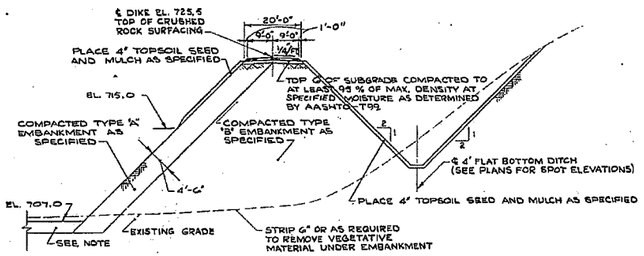
SIBLEY POWER STATION

MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

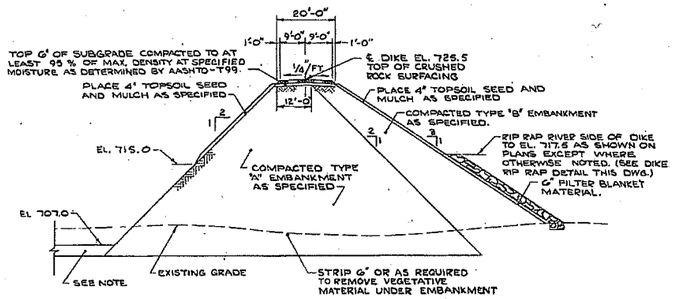
FLY ASH POND DIKE CROSS SECTIONS III

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

DATE Dec. 29, 1976	DRAWING NO. Y10 — REV.
DESIGNED JJB	
DETAILED DEJ	PROJECT 73-062-1-005
CHECKED	SHEET OF SHEETS

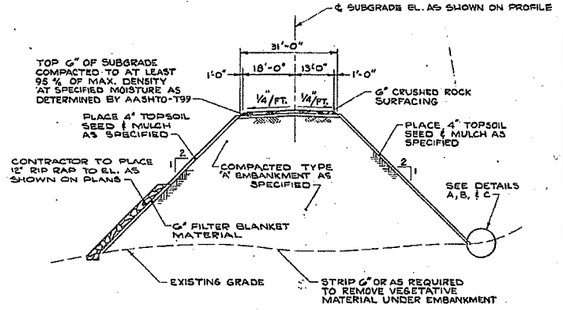


TYPICAL SECTION
FLY ASH POND DIKE
STA. 0+00 TO STA. 23+25
NOT TO SCALE

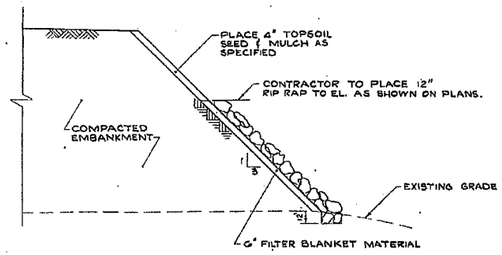


NOTE:
EXCAVATE FLY ASH POND BOTTOM TO EL. 705.0 AND BACKFILL TO EL. 707.0 WITH TYPE "A" EMBANKMENT MATERIAL.

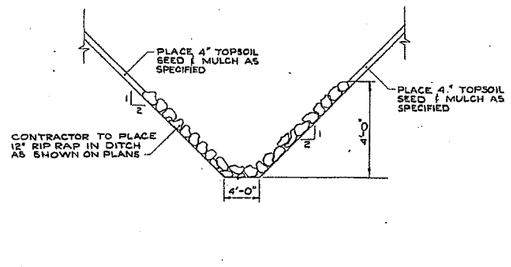
TYPICAL SECTION
FLY ASH POND DIKE
STA. 27+00 TO STA. 51+30.89
NOT TO SCALE



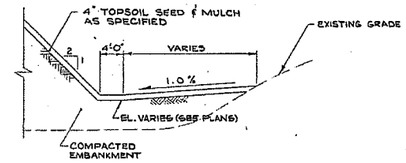
TYPICAL SECTION
NORMAL CROWN
FLY ASH POND ACCESS RD.
STA. 5+50 TO STA. 6+40 &
STA. 10+75 TO STA. 12+22
NOT TO SCALE



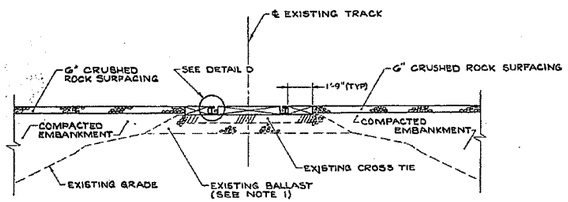
DIKE RIP RAP DETAIL
NOT TO SCALE



RIP RAPPED DITCH DETAIL
NOT TO SCALE

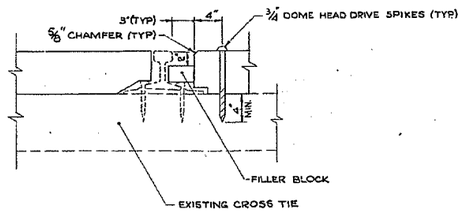


DETAIL A
STA. 8+00 TO STA. 10+75
NOT TO SCALE

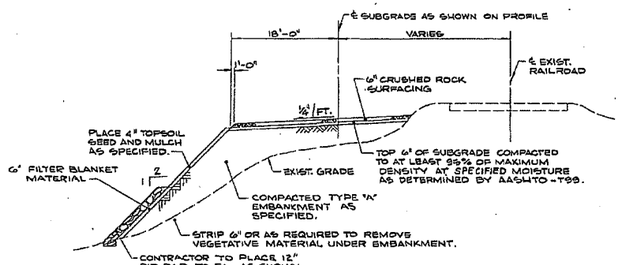


NOTES:
1. EXISTING BALLAST TO BE LEFT UNDISTURBED DURING INSTALLATION OF ROAD CROSSING.
2. EXISTING TIES ARE 7'-0" x 8'-0" EXISTING RAIL IS 131 # RE RAIL, AND EXISTING TIE PLATES ARE AREA # 10

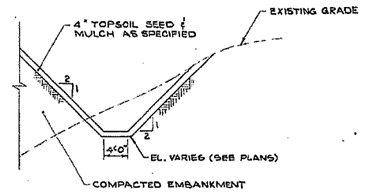
RAILROAD CROSSING SECTION
NOT TO SCALE



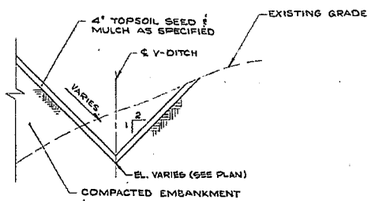
DETAIL D
NOT TO SCALE.



TYPICAL SECTION
CONSTANT CROSS SLOPE
FLY ASH POND ACCESS RD.
STA. 0+25 TO STA. 0+96.75
STA. 1+26.75 TO STA. 4+00
NOT TO SCALE



DETAIL B
STA. 6+40 TO STA. 8+00 &
STA. 12+22 TO STA. 13+00
NOT TO SCALE



DETAIL C
STA. 4+50 TO STA. 5+50
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

WILLIAM TORRES
NUMBER E-11549
REGISTERED PROFESSIONAL ENGINEER
STATE OF MISSOURI

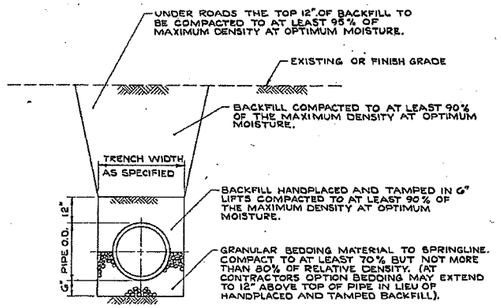
CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

GRADING DETAILS & SECTIONS

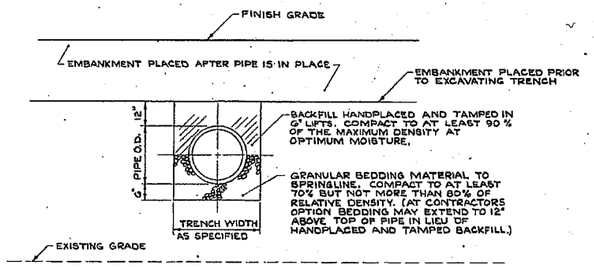
Burns & McDonnell
Engineers - Architects - Consultants
KANSAS CITY, MISSOURI

DATE Dec. 29, 1976	DRAWING NO. Y11 — REV.
DESIGNED JJB	
DETAILED DEJ	PROJECT 73-062-1-005
CHECKED	SHEET OF SHEETS



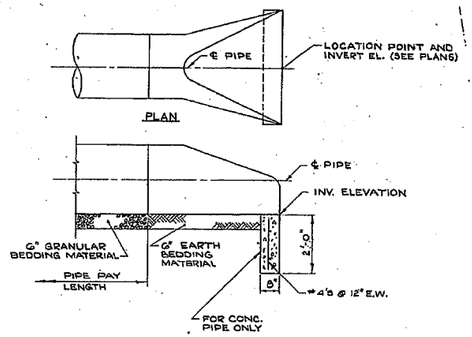
NOTES:
1. MAXIMUM DENSITY AT OPTIMUM MOISTURE AS DETERMINED BY AASHTO DESIGNATION T-99.
2. RELATIVE DENSITY AS DETERMINED BY U.S. BUREAU OF RECLAMATION E-12 OR ASTM STP 479.

PIPE TRENCH IN EXCAVATION
NOT TO SCALE



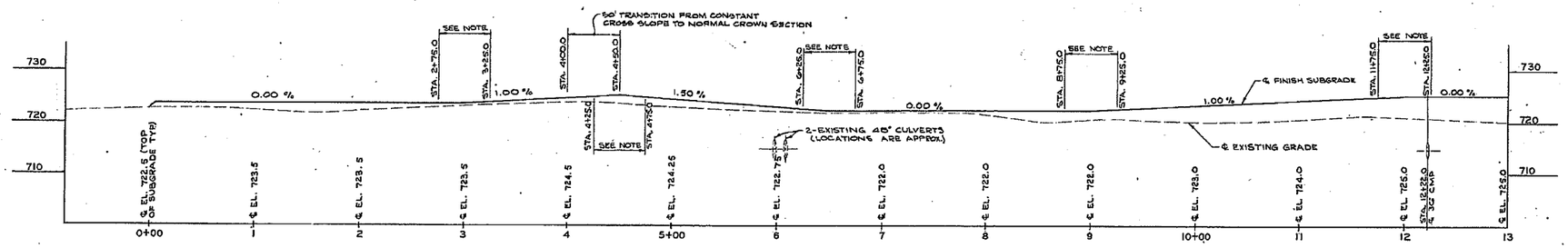
NOTES:
1. MAXIMUM DENSITY AT OPTIMUM MOISTURE AS DETERMINED BY AASHTO DESIGNATION T-99.
2. RELATIVE DENSITY AS DETERMINED BY U.S. BUREAU OF RECLAMATION E-12 OR ASTM STP 479.

PIPE TRENCH IN EMBANKMENT
NOT TO SCALE



SECTION

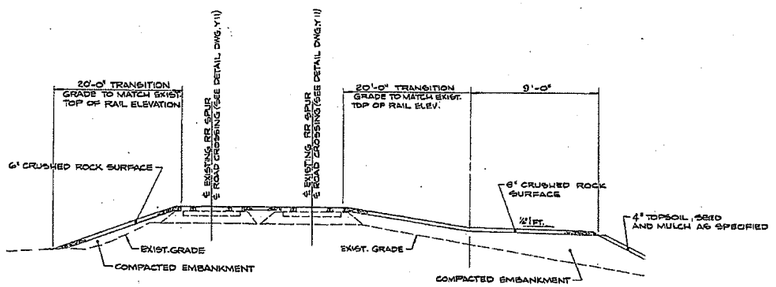
PIPE END SECTION
NOT TO SCALE



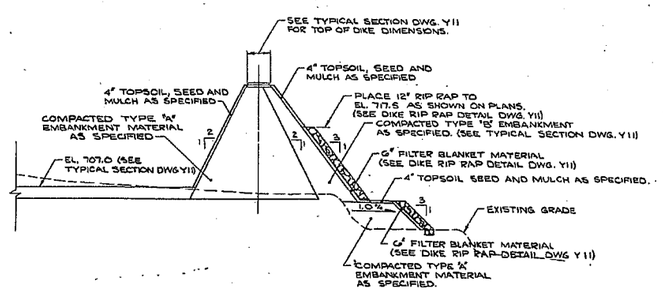
NOTE:
PROVIDE A SMOOTH 50' LONG TRANSITION AT AREAS INDICATED ON PROFILE.

VERT. 10 0 10 20 SCALE IN FEET
HORIZ 50 0 50 100 SCALE IN FEET

FLY ASH POND ACCESS ROAD PROFILE



SECTION 2-A-12
NOT TO SCALE



SECTION 3-B-12
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-15549
REGISTERED PROFESSIONAL ENGINEER

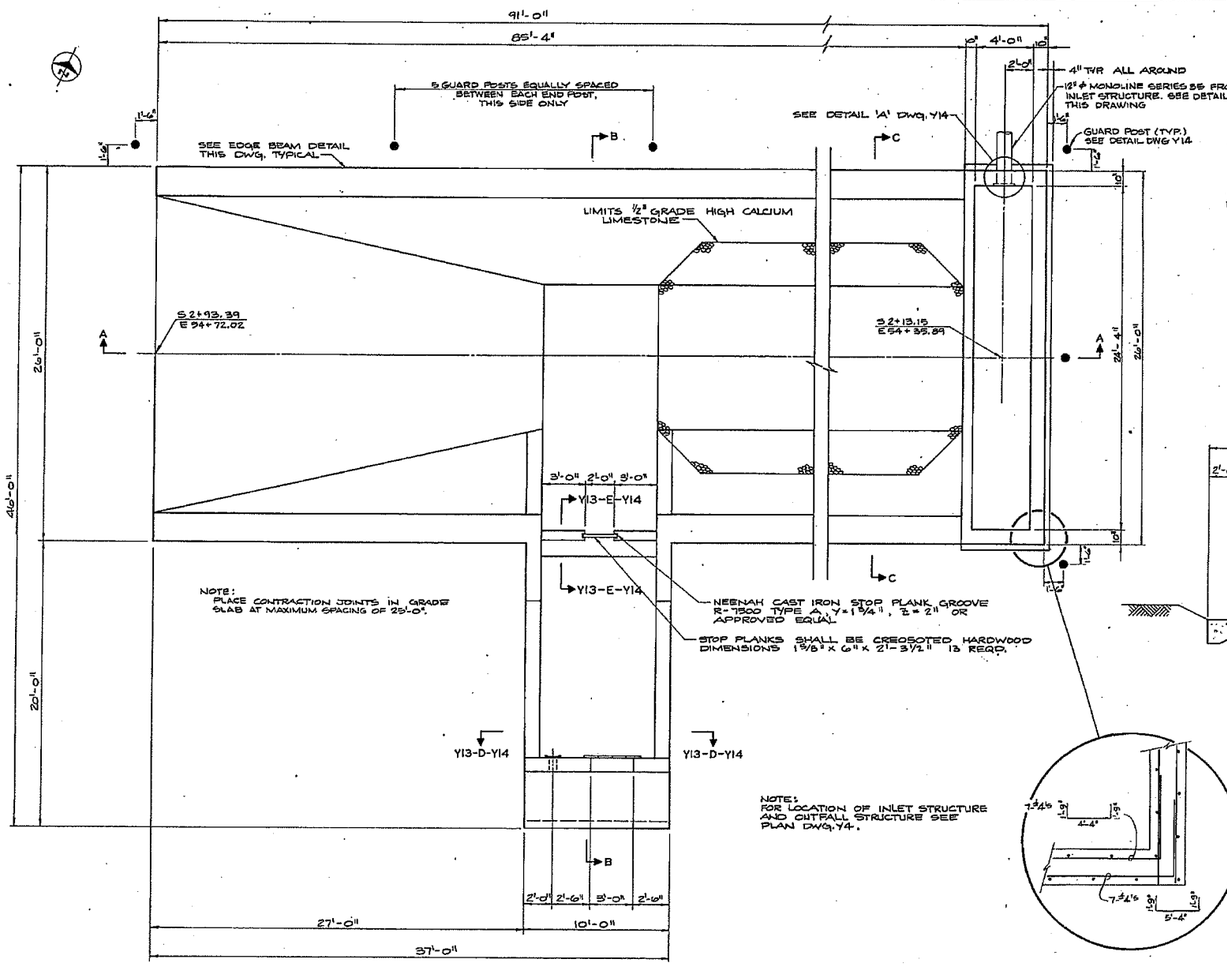
CONTRACT NO. 100
FLY ASH POND CONSTRUCTION

SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

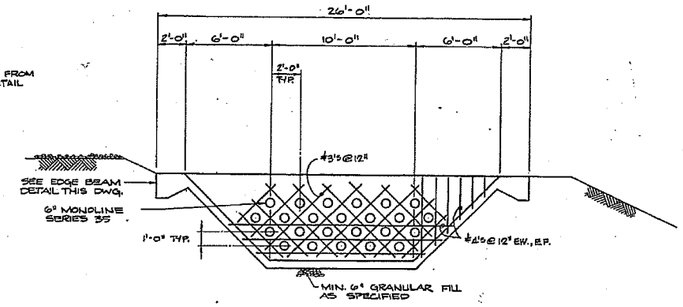
MISCELLANEOUS DETAILS

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

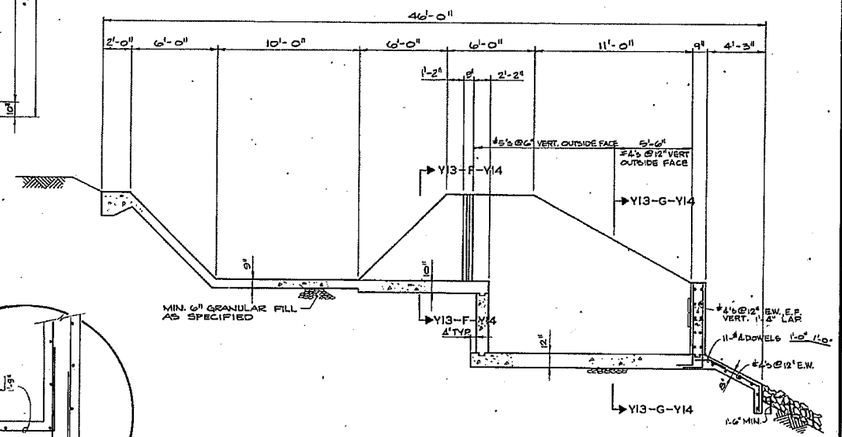
DATE Dec. 29, 1976	DRAWING NO. Y12 - REV.
DESIGNED JJB	
DETAILED DEJ	PROJECT 73-062-1-005
CHECKED	SHEET OF SHEETS



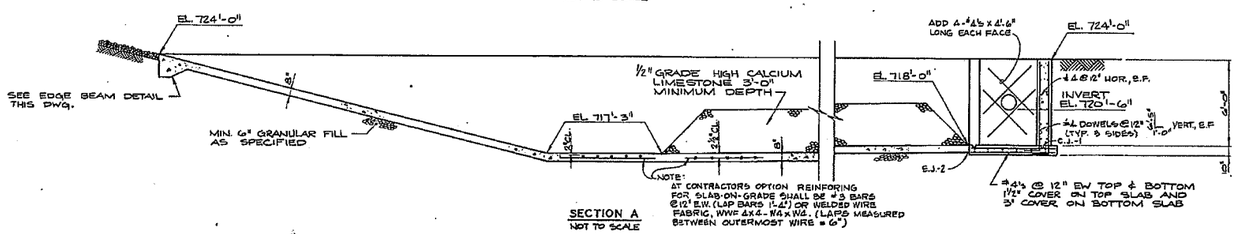
PLAN FLY ASH POND OUTFALL STRUCTURE
NOT TO SCALE



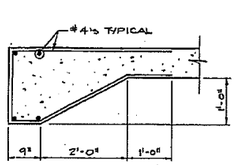
SECTION C



SECTION B
NOT TO SCALE

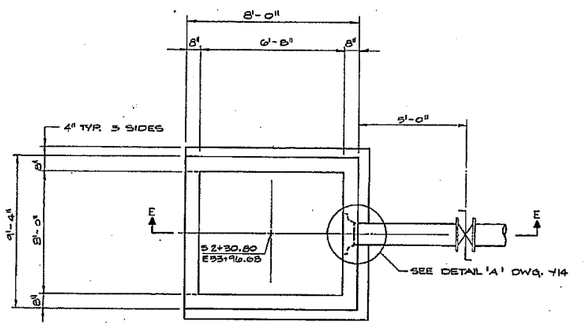


SECTION A
NOT TO SCALE

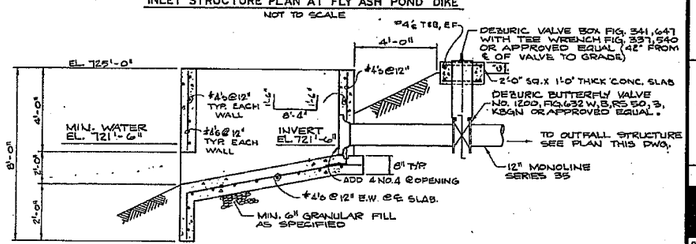


NOTE: ALL AROUND SLAB-ON-GRADE

TYP EDGE BEAM
NOT TO SCALE



INLET STRUCTURE PLAN AT FLY ASH POND DIKE
NOT TO SCALE



SECTION E
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

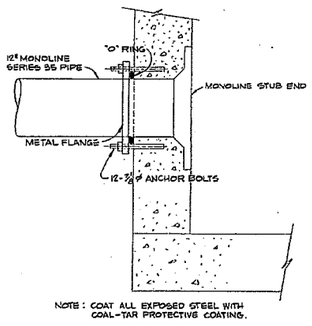
STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-18589
REGISTERED PROFESSIONAL ENGINEER

CONTRACT NO. 100
FLY ASH POND CONSTRUCTION
SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

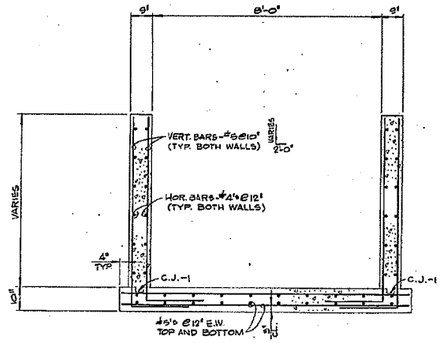
OUTFALL STRUCTURE

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

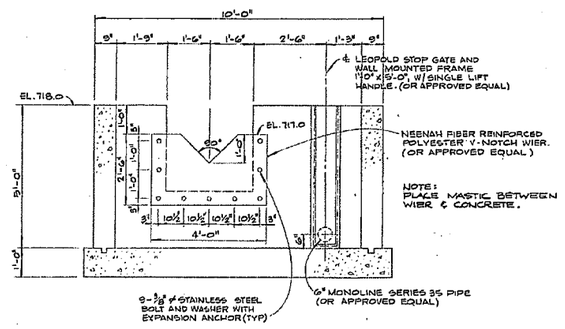
DATE	Dec. 29, 1976	DRAWING NO.	REV.
DESIGNED	SPG	Y13 —	
DETAILED	EDH	PROJECT	73-062-1-005
CHECKED		SHEET	OF SHEETS



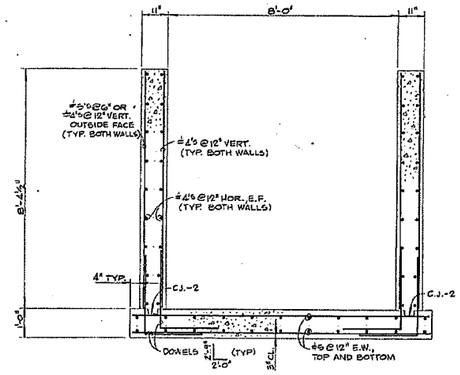
DETAIL A
NOT TO SCALE



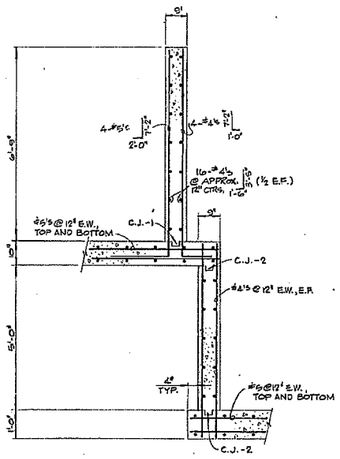
SECTION Y13-F-Y14
NOT TO SCALE



SECTION Y13-D-Y14
NOT TO SCALE

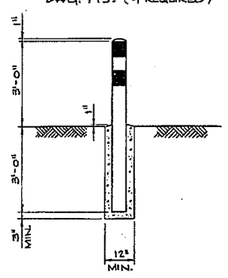


SECTION Y13-G-Y14
NOT TO SCALE



SECTION Y13-E-Y14
NOT TO SCALE

NOTE:
GUARD POSTS SHALL BE 6" ø x 6'-0" LONG GALVANIZED STEEL PIPE FILLED WITH CONCRETE. FOR LOCATION OF GUARD POSTS SEE PLAN OUTFALL STRUCTURE DWG. Y13. (9 REQUIRED)



DETAIL B
NOT TO SCALE

NO.	DATE	BY	REVISION
1			

STATE OF MISSOURI
WILLIAM TORRES
NUMBER E-16549
REGISTERED PROFESSIONAL ENGINEER

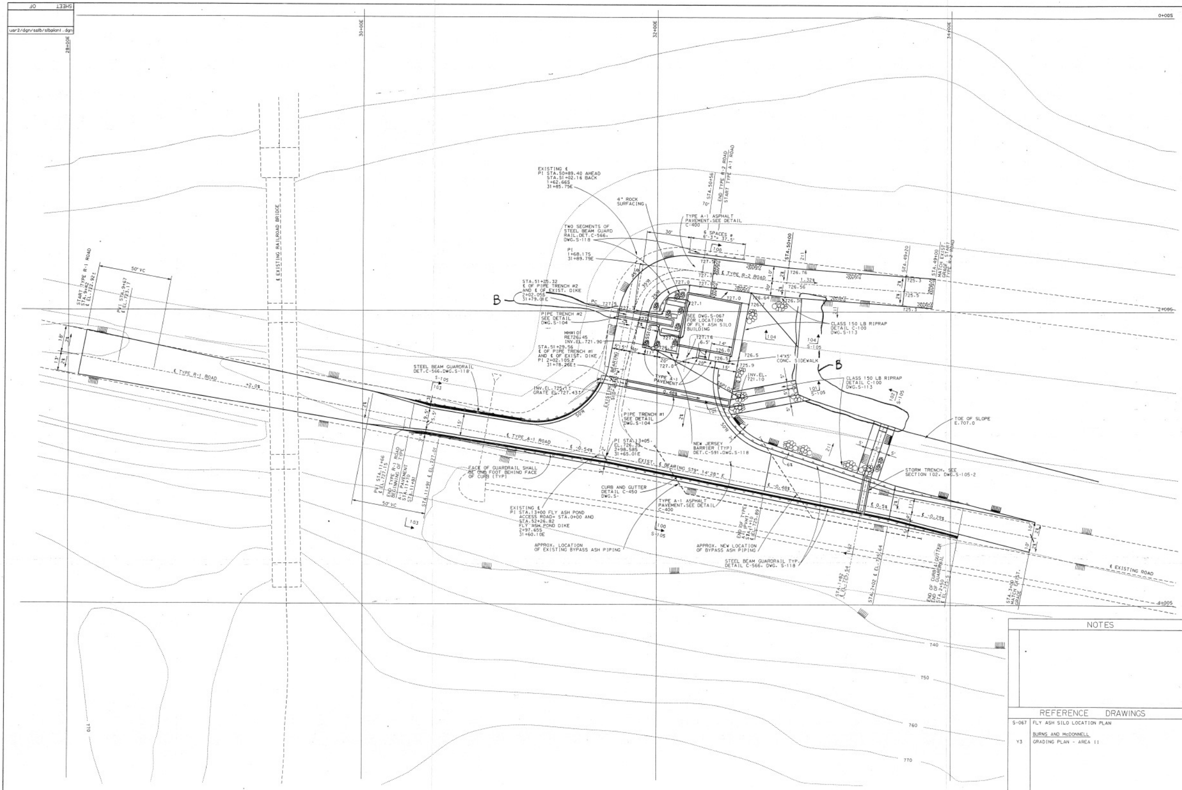
CONTRACT NO. 100
FLY ASH POND CONSTRUCTION
SIBLEY POWER STATION
MISSOURI PUBLIC SERVICE COMPANY
KANSAS CITY, MISSOURI

OUTFALL STRUCTURE DETAILS

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

DATE	JAN. 31, 1977	DRAWING NO.	REV.
DESIGNED	SPG	Y 14 —	
DETAILED	TRP	PROJECT	73-052-1-005
CHECKED	WT	SHEET	OF SHEETS

Selected Sheets from 1992 Sargent & Lundy Fly Ash Silo Grading and Drainage Plan



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	[signature]			FOR BIDS. SPEC.K-4484	
B	08-11-92	[signature]	[signature]		FOR PERMIT	

STATE OF MISSOURI
RICHARD W. KNOEBEL
NUMBER E-25472
REGISTERED PROFESSIONAL ENGINEER
08-11-92

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.	REV.
S-103	B

SHEET OF

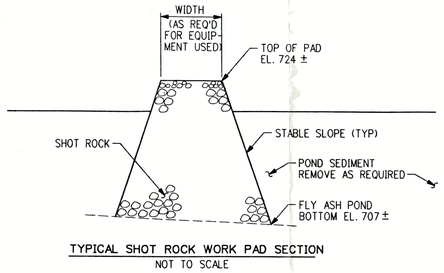
CSAH03

08-11-92

Selected Sheets from 1988 Burns & McDonnell Drawings

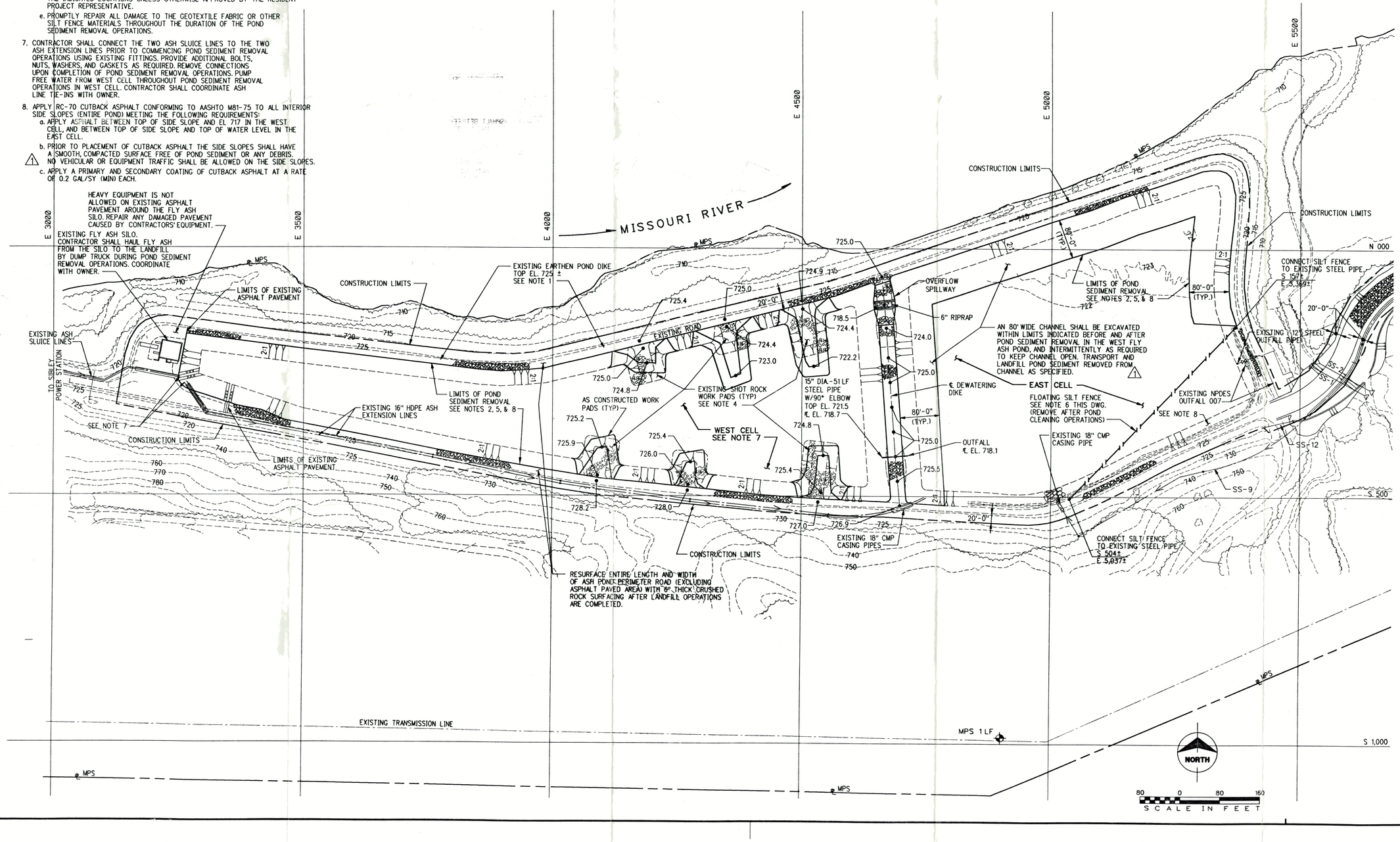
NOTES:

1. SEE REFERENCE DRAWINGS FROM BURNS AND McDONNELL PROJECT NO. 73-062-1-005 CONTRACT 100 - FLY ASH POND CONSTRUCTION FOR ELEVATIONS, SECTIONS, AND DETAILS OF THE "AS CONSTRUCTED" EXISTING FLY ASH POND.
2. CONTRACTOR SHALL VERIFY EXISTING POND SEDIMENT ELEVATIONS AND ESTIMATE QUANTITIES (INCLUDING SUBMERGED QUANTITIES) BEFORE SUBMITTING BID AS SPECIFIED.
3. ALL ELEVATIONS SHOWN ARE EXISTING GRADE UNLESS OTHERWISE NOTED.
4. EXISTING WORK PADS SHALL BE MODIFIED OR RELOCATED AT LOCATIONS REQUIRED AS PER THE TYPICAL DETAIL SHOWN ON THIS DRAWING. SHOT ROCK FOR THE WORK AREA SHALL BE SOUND, DURABLE ROCK AND SHALL NOT CONTAIN EXCESSIVE FINES OR PIECES LARGER THAN 1.5 CUBIC FEET. FINISHED SURFACE SHALL BE SUITABLE FOR VEHICULAR TRAFFIC AND SHOULD BE RELATIVELY SMOOTH. CONTRACTOR SHALL VERIFY LOCATIONS AND ELEVATIONS
   ⚠1 OF ALL WORK PADS BEFORE AND AFTER LANDFILL CONSTRUCTION. RELOCATED SHOT ROCK MATERIAL SHALL NOT CONTAIN EXCESSIVE POND SEDIMENT, FINES, OR OTHER DEBRIS.
5. REMOVE, TRANSPORT, AND LANDFILL POND SEDIMENT IN THE EXISTING FLY ASH POND WITHIN THE REMOVAL LIMITS INDICATED TO AN ELEVATION OF 710.0. REMOVE POND SEDIMENT ALONG DIKES BUT DO NOT EXCAVATE INTO THE EXISTING TYPE "A" EMBANKMENT MATERIAL DIKES. DAMAGE TO THE EXISTING POND DIKES CAUSED BY POND CLEANING OPERATIONS SHALL BE REPAIRED IMMEDIATELY.
6. SUBMIT FLOATING SILT FENCE MATERIAL LIST AND CONSTRUCTION PLAN. FLOATING SILT FENCES SHALL BE INSTALLED AT LOCATIONS INDICATED AND SHALL BE CONSTRUCTED TO MEET THE FOLLOWING REQUIREMENTS:
   a. TOP OF GEOTEXTILE FABRIC SHALL BE A MINIMUM OF 1 FOOT ABOVE THE WATER SURFACE AT ALL TIMES. PLACE BUOYS AS REQUIRED TO MAINTAIN FABRIC TOP ELEVATION.
   b. BOTTOM OF FABRIC SHALL BE NO MORE THAN 1 FOOT ABOVE THE TOP OF EXISTING POND SEDIMENT OR POND BOTTOM, WHICHEVER IS HIGHER. ANCHOR SILT FENCE TO BOTTOM USING CONCRETE BLOCKS OR OTHER APPROVED METHOD.
   c. GEOTEXTILE FABRIC SHALL BE TRIVERA-SPUNBOND 1114 AS MANUFACTURED BY THE HOECHST CLEANESE CORP. S.C. OR APPROVED EQUAL.
   d. SILT FENCE MAY BE RELOCATED AS REQUIRED WHEN POND SEDIMENT BUILDS UP ON INSIDE FACE OF SILT FENCE BUT NO MORE THAN 20 FEET FROM THE INDICATED LOCATIONS UNLESS OTHERWISE APPROVED BY THE RESIDENT PROJECT REPRESENTATIVE.
   e. PROMPTLY REPAIR ALL DAMAGE TO THE GEOTEXTILE FABRIC OR OTHER SILT FENCE MATERIALS THROUGHOUT THE DURATION OF THE POND SEDIMENT REMOVAL OPERATIONS.
7. CONTRACTOR SHALL CONNECT THE TWO ASH SLUICE LINES TO THE TWO ASH EXTENSION LINES PRIOR TO COMMENCING POND SEDIMENT REMOVAL OPERATIONS USING EXISTING FITTINGS. PROVIDE ADDITIONAL BOLTS, NUTS, WASHERS, AND GASKETS AS REQUIRED. REMOVE CONNECTIONS UPON COMPLETION OF POND SEDIMENT REMOVAL OPERATIONS. PUMP FREE WATER FROM WEST CELL THROUGHOUT POND SEDIMENT REMOVAL OPERATIONS IN WEST CELL. CONTRACTOR SHALL COORDINATE ASH LINE TIE-INS WITH OWNER.
8. APPLY RC-70 CUTBACK ASPHALT CONFORMING TO AASHTO M81-75 TO ALL INTERIOR SIDE SLOPES (ENTIRE POND) MEETING THE FOLLOWING REQUIREMENTS:
   a. APPLY ASPHALT BETWEEN TOP OF SIDE SLOPE AND EL 717 IN THE WEST CELL, AND BETWEEN TOP OF SIDE SLOPE AND TOP OF WATER LEVEL IN THE EAST CELL.
   b. PRIOR TO PLACEMENT OF CUTBACK ASPHALT THE SIDE SLOPES SHALL HAVE A SMOOTH, COMPACTED SURFACE FREE OF POND SEDIMENT OR ANY DEBRIS.
   ⚠1 NO VEHICULAR OR EQUIPMENT TRAFFIC SHALL BE ALLOWED ON THE SIDE SLOPES.
   c. APPLY A PRIMARY AND SECONDARY COATING OF CUTBACK ASPHALT AT A RATE OF 0.2 GAL/SY (MIN) EACH.



TYPICAL SHOT ROCK WORK PAD SECTION
NOT TO SCALE

no.	date	by	revision
	7-27-93	TLL	ISSUED FOR BID
⚠1	9-1-93	KVC	REVISED PER ADDENDUM NO. 1
	9-3-93	TLL	ISSUED FOR CONSTRUCTION
⚠2	1-19-95	DLM	CONFORMING TO CONSTRUCTION RECORDS



Scale For Microfilming: Millimeters / Inches

STATE OF MISSOURI — TERRENCE LEE LADCOM — NUMBER E-23603 — REGISTERED PROFESSIONAL ENGINEER
2-13-95

Burns & McDonnell

date	detailed
JUNE 30, 1993	K. LANGHAMMER
designed	checked
J. ENGLISH	TLL

MISSOURI PUBLIC SERVICE
KANSAS CITY, MISSOURI
SIBLEY GENERATING STATION
PHASE II - FLY ASH
LANDFILL CONSTRUCTION

POND SEDIMENT REMOVAL PLAN

project	contract
92-144-1-002	93-PHASE II
drawing	rev.
Y2	2

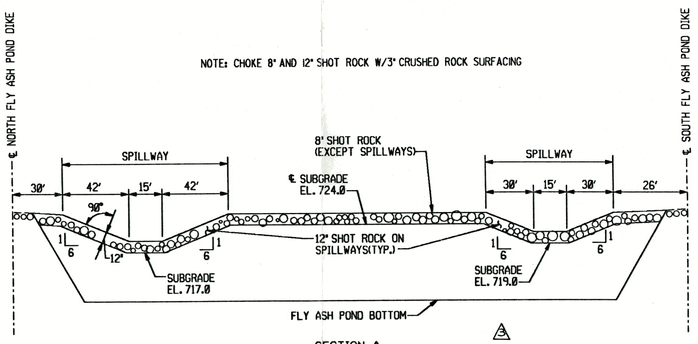
sheet 2 of 5 sheets

file /usr/dv/pwr/mopub/civ/mpy2a.dgn Feb 13 15 13:29/pciv

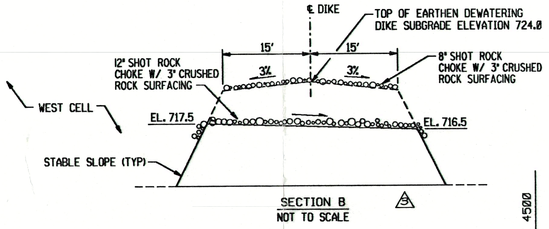
NOTES:

1. SEE REFERENCE DRAWINGS Y3, Y4, Y8, Y9, Y10 AND Y11FROM FLY ASH POND CONSTRUCTION DRAWINGS. (BURNS AND McDONNELL PROJECT NO. 73-062-1-005 CONTRACT 100) FOR ELEVATIONS, SECTIONS, AND DETAILS OF THE "AS CONSTRUCTED" EXISTING FLY ASH POND.
2. INDICATED POND SEDIMENT ELEVATIONS ARE TAKEN FROM M.J. HARDEN AND ASSOCIATES, MARCH 31, 1987 AERIAL SURVEY AND MAY HAVE CHANGED SINCE THE TIME THE AERIAL SURVEY WAS PERFORMED. CONTRACTOR SHALL VERIFY EXISTING POND SEDIMENT ELEVATIONS AND ESTIMATE QUANTITIES (INCLUDING SUBMERGED QUANTITIES) BEFORE SUBMITTING BID AS SPECIFIED.
3. ALL ELEVATIONS SHOWN ARE EXISTING GRADE UNLESS OTHERWISE NOTED.
4. WORK PADS SHALL BE INSTALLED AT LOCATIONS AS REQUIRED AS PER THE TYPICAL DETAIL SHOWN ON THIS DRAWING. SHOT ROCK FOR THE WORK AREA SHALL BE SOUND, DURABLE ROCK AND SHALL NOT CONTAIN EXCESSIVE FINES OR PIECES LARGER THEN 1.5 CUBIC FEET. FINISHED SURFACE SHALL BE SUITABLE FOR VEHICULAR TRAFFIC AND SHOULD BE RELATIVELY SMOOTH.
5. REMOVE, TRANSPORT, AND LANDFILL POND SEDIMENT IN THE WESTERN PORTION OF EXISTING FLY ASH POND WITHIN THE REMOVAL LIMITS INDICATED TO AN ELEVATION OF 710.0. REMOVE POND SEDIMENT ALONG DIKES BUT DO NOT EXCAVATE INTO THE EXISTING TYPE "A" EMBANKMENT MATERIAL DIKES. DAMAGE TO THE EXISTING POND DIKES CAUSED BY POND CLEANING OPERATIONS SHALL BE REPAIRED IMMEDIATELY.
6. FLOATING SILT FENCES SHALL BE INSTALLED AT LOCATIONS INDICATED AND SHALL BE CONSTRUCTED TO MEET THE FOLLOWING REQUIREMENTS:
   a. TOP OF GEOTEXTILE FABRIC SHALL BE A MINIMUM OF 1FOOT ABOVE THE WATER SURFACE AT ALL TIMES. PLACE BUOYS AS REQUIRED TO MAINTAIN FABRIC TOP ELEVATION.
   b. BOTTOM OF FABRIC SHALL BE NO MORE THAN 1FOOT ABOVE THE TOP OF EXISTING POND SEDIMENT OR POND BOTTOM, WHICHEVER IS HIGHER. ANCHOR SILT FENCE TO BOTTOM USING CONCRETE BLOCKS OR OTHER APPROVED METHOD.
   c. GEOTEXTILE FABRIC HEIGHT SHALL BE NO GREATER THAN 1.25 TIMES THE ELEVATION DIFFERENCE BETWEEN THE WATER SURFACE AND THE TOP OF EXISTING POND SEDIMENT OR POND BOTTOM WHICHEVER IS HIGHER.
   d. GEOTEXTILE FABRIC SHALL BE TRIVERA-SPUNBOND #14 AS MANUFACTURED BY THE HOECHST CLEANESE CORP. S.C. OR APPROVED EQUAL.
   e. SILT FENCE MAY BE RELOCATED AS REQUIRED WHEN POND SEDIMENT BUILDS UP ON INSIDE FACE OF SILT FENCE BUT NO MORE THAN 20 FEET FROM THE INDICATED LOCATIONS UNLESS OTHERWISE APPROVED BY THE RESIDENT PROJECT REPRESENTATIVE.
   f. PROMPTLY REPAIR ALL DAMAGE TO THE GEOTEXTILE FABRIC OR OTHER SILT FENCE MATERIALS THROUGHOUT THE DURATION OF THE POND SEDIMENT REMOVAL OPERATIONS.
7. AFTER REMOVAL OF POND SEDIMENT, REMOVE ASH EXTENSION LINES BETWEEN POINT (A) AND (B) AT TIE-IN WITH EXISTING ASH SLUICE LINES AND STORE AS DIRECTED BY THE OWNER. 3

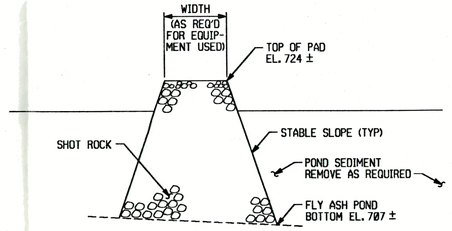
NOTE: CHOKE 8" AND 12" SHOT ROCK W/3" CRUSHED ROCK SURFACING



SECTION A 3
NOT TO SCALE



SECTION B 3
NOT TO SCALE



TYPICAL SHOT ROCK WORK PAD SECTION
NOT TO SCALE

	date	by	revision
1	8-10-88	JKL	CORRECTED GRID AND COORDINATES.
	8-18-88	TLL	ISSUED FOR CONSTRUCTION
2	8-30-88	JKL	REVISED HAUL ROAD SS-9, AND CONSTRUCTION LIMITS.
	9-1-88	TLL	ISSUED PER CHANGE ORDER #1
3	11-10-89	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI REGISTERED PROFESSIONAL ENGINEER CHARLES CALVIN MORRIS, JR. NUMBER E-15858

Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
Kansas City, Missouri

date	detailed
6-6-88	LANGHAMMER
designed	checked
LARSON	KUMTHEKAR

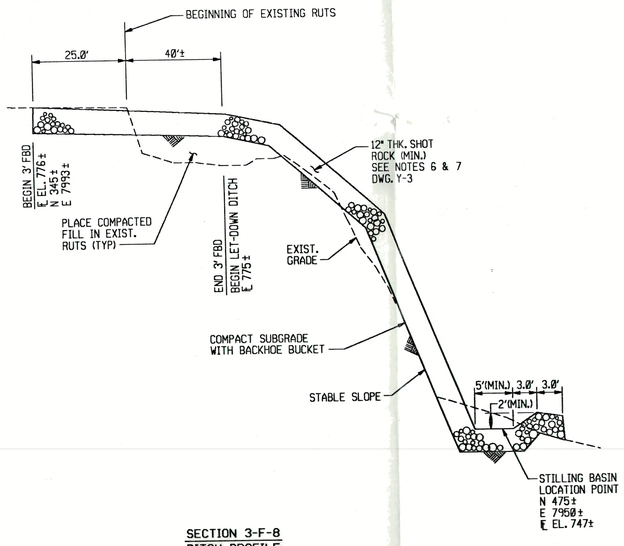
MISSOURI PUBLIC SERVICE
KANSAS CITY, MISSOURI
SIBLEY POWER STATION
FLY ASH LANDFILL CONSTRUCTION

EXISTING FLY ASH POND
SITE IMPROVEMENT &
POND SEDIMENT REMOVAL PLAN

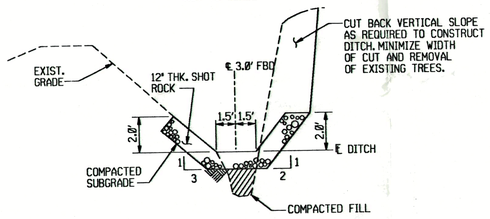
project no.	contract
88-024-1	88-PHASE I
drawing	rev.
Y5	- 3

Scale For Mm=1/1mm Millimeters
Inches

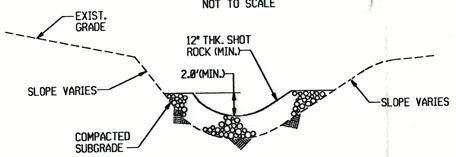
8-DEC-1988 09:38 Q024(101.27)MPY500.DGN61



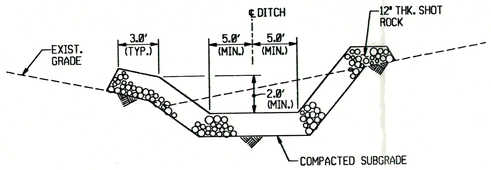
SECTION 3-F-8
DITCH PROFILE
NOT TO SCALE



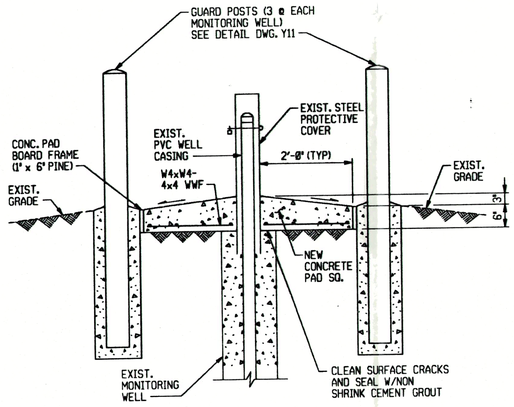
SECTION 3-C-8
NOT TO SCALE



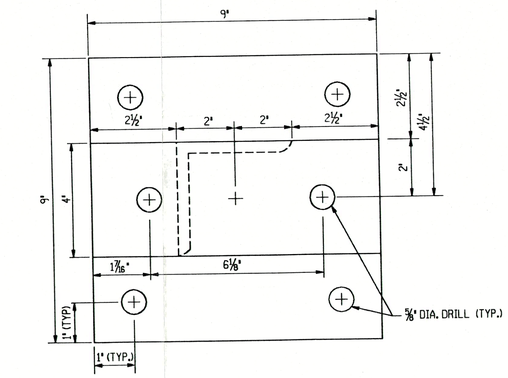
SECTION 3-D-8
NOT TO SCALE



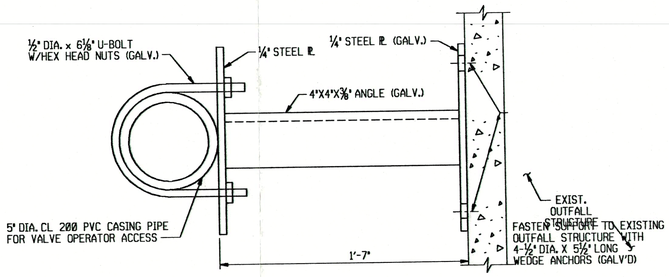
SECTION 3-E-8
NOT TO SCALE



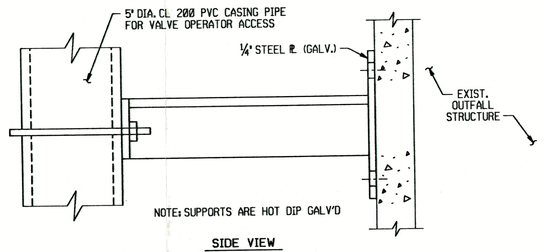
TYPICAL SECTION
CONCRETE PAD - MONITORING WELL
NOT TO SCALE



FRONT VIEW - STEEL PLATE
NOT TO SCALE

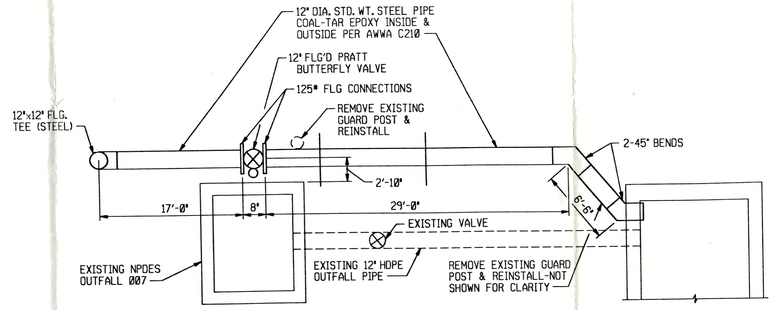


TOP VIEW
NOT TO SCALE

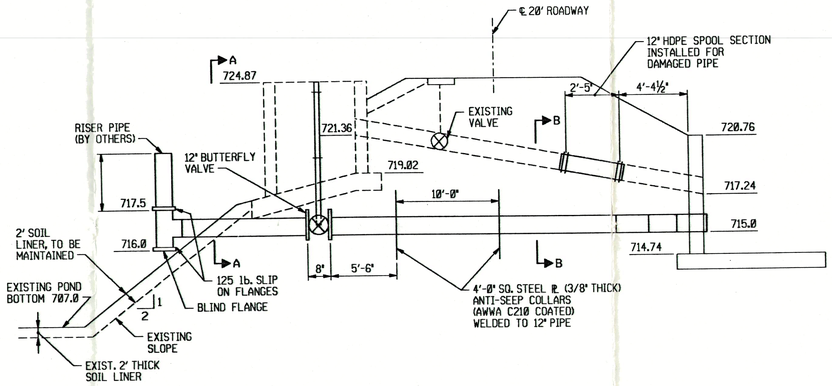


SIDE VIEW
NOT TO SCALE

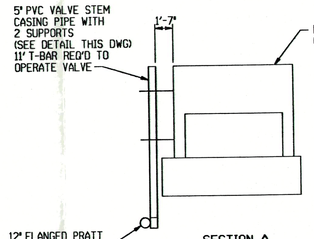
CASING PIPE SUPPORTS (2 EACH)
FOR NEW 12" STEEL OUTFALL PIPE
NOT TO SCALE



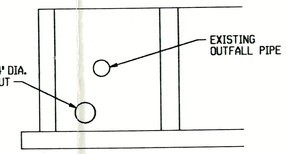
PLAN
NOT TO SCALE



ELEVATION - LOOKING SOUTH
NOT TO SCALE



SECTION A
NOT TO SCALE



SECTION B
NOT TO SCALE

NOTE:
1. BACKFILL PIPE TRENCH WITH COHESIVE FILL (CLAY) AND COMPACT AS SPECIFIED

NEW 12" STEEL OUTFALL PIPE
NOT TO SCALE

	date	by	revision
	8-18-88	TLL	ISSUED FOR CONSTRUCTION
1	8-30-88	DLM	REVISED HAUL ROAD CROSS SECTIONS
	9-1-88	TLL	ISSUED PER CHANGE ORDER #1
2	11-15-89	DLM	CONFORMING TO CONSTRUCTION RECORDS

STATE OF MISSOURI
CHARLES CALVIN MORRIS, JR.
NUMBER E-15859
REGISTERED PROFESSIONAL ENGINEER

Barns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
Kansas City, Missouri

date	detailed
6-6-88	LANGHAMMER
designed	checked
LARSON	KUMTHEKAR

MISSOURI PUBLIC SERVICE
KANSAS CITY, MISSOURI
SIBLEY POWER STATION
FLY ASH LANDFILL CONSTRUCTION

MISCELLANEOUS DETAILS

project no.	contract
88-024-1	88-PHASE I
drawing	rev.
Y8	- 2

8-DEC-1989 08:20
QS24\101.27\MPY850.DGN51

Scale For Microfilming
Millimeters
Inches

Attachment C
Reference Documents
Technical Specifications

2A SITE PREPARATION AND EARTHWORK

2A-1 GENERAL

A. DESCRIPTION:
1. This Section includes site preparation activities and certain items of earthwork common to other related work as necessary to complete the Work.
2. Related Work Specified Elsewhere:
   a. Storm Drainage: SECTION 2B.
   b. Landscaping: SECTION 2C.
   c. Roads, Drives and Surfaced Area Construction: SECTION 2D.

B. QUALITY ASSURANCE:
1. Applicable Standards:
   a. American Association of State Highway and Transportation Officials Standard Method of Test (AASHTO):
      (1) T99 - The Moisture-Density Relations of Soils Using a 5.5-Pound Rammer and a 12-Inch Drop.
      (2) T104 - Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Test.
      (3) M147 - Materials for Soil Aggregate Subbase, Base, and Surface Courses.
   b. American Society for Testing and Materials (ASTM) 1970, 5th Edition, Special Procedures for Testing Soil and Rock for Engineering Purposes:
      (1) STP 479 - Burmister Method.
   c. U. S. Department of the Interior, Bureau of Reclamation, Earth Manual, 1st Edition:
   d. Missouri Department of Highways Standard Specifications for Road and Bridge Construction.

C. JOB CONDITIONS:
1. Lines and grades shall be as indicated. Engineer will furnish one bench mark and two reference points as necessary to permit the Contractor to lay out and construct the work properly.
2. Maintain carefully all bench marks, monuments, and other reference points and replace as directed if disturbed or destroyed.
3. Explosives: It is not anticipated that blasting will be required to complete the Work. The Engineer will consider written requests from the Contractor for permission to blast should the need arise. Minimal requirements governing the approved use of explosives are as follows:
   a. Before delivery of any explosives at jobsite, Contractor must have obtained a blasting endorsement on his public liability and property damage insurance policy.
   b. Store and use explosives to conform to local, state and federal regulations.
   c. Blasting:
      (1) Blasting shall be performed only under the direction of an employee of Contractor who is qualified, competent, and thoroughly experienced in the use of explosives.

(2) Persons handling explosives shall be licensed or otherwise authorized to use explosives.
(3) Locate charge holes properly and drill to correct depth for charges used.
(4) Limit charges in size to minimum required for reasonable removal of material by excavating equipment.
(5) Avoid excessive overbreak or damage to adjacent structures, equipment, utilities, or buried pipeline and conduit as follows:
(a) With properly designed pattern.
(b) By use of approved explosion mats.
(6) Blasting near utilities shall be subject to written approval of owning agency.

4. Protection of Trees: Protect tops, trunks, and roots of existing trees on project site which are outside specified clearing limits, as follows:
a. Box, fence around, or otherwise protect trees before any construction work is started.
b. Do not permit heavy equipment or stockpiles within branch spread.
c. Trim or prune to obtain working space in lieu of complete removal when possible. Conduct operation as follows:
(1) With experienced personnel.
(2) Conform with good horticultural practice.
(3) Preserve natural shape and character.
(4) Protect cuts with approved tree paint.
d. Remove when damage occurs to make survival doubtful.
e. Replace with similar item when damaged through carelessness and so requested.

5. Disposition of Utilities:
a. Adequately protect from damage all active utilities and remove or relocate only as indicated or specified.
b. Report inactive and abandoned utilities encountered in excavating and grading operations. Remove, plug, or cap as directed.

6. Storm Runoff Retention Ponds:
a. Construct at locations as required to collect all runoff from areas to be graded and as directed by the Engineer.
b. Construct berms, ditches, and channels necessary to direct all runoff to the retention ponds.
c. Construction of the storm runoff retention ponds shall include the following:
(1) Dikes:
(a) Dikes to be constructed in accordance with the provisions for "Embankment" this section.
(b) Controlled discharge facilities consisting of pipe culverts valves, weirs, or other appurtenances approved by the Engineer.
(c) Seeding, riprap, and slope paving as required to protect dike slopes from erosion.
(d) Drain ponds in a manner which will prevent sediment from leaving the pond with the discharge. Accomplish as soon as practical after each rainfall.
(2) Silt Fences:
(a) Silt Fences shall consist of Marafi 140 Fabric or approved equal attached to a support system such as wire mesh or snow fence, the

toe of the fabric to be anchored by burying at least 12".

(b) Silt fences shall be placed in such a manner that all construction runoff shall pass through them before being discharged.

(c) Silt fences shall be cleaned as necessary to prevent clogging.

(3) Sediment Traps:

(a) Sediment traps shall include the following:

1. Sand bags stacked in an interlocking fashion.
2. Wire-tied straw bales anchored to the ground by 2 steel fence posts per bale. Straw bales are to be replaced when rotton or disintegrating.

(b) Straw bales or Sand bags shall be set in a trench excavated to a depth of 6 inches. Upstream face of trench shall be backfilled and tamped to prevent piping.

(c) Sediment traps shall be cleaned as necessary to prevent clogging.

d. Dikes, Silt fences and Sediment traps shall be a minimum of 4'-0" in height but shall be of sufficient height to prevent overtopping.

e. Size ponds to retain the runoff resulting from a 10-year, 24-hour rainfall over the entire drainage area above the retention pond.

f. Remove sediment from pond when the depth of the sediment reaches 2'-6" and place material in the waste area.

2A-2 EQUIPMENT AND MATERIALS

A. MATERIALS:

1. Materials Encountered:

a. All materials encountered in excavation, regardless of type, character, composition, and condition thereof, shall be unclassified for payment.

b. Excavation shall include all materials found within the designated limits for excavation,

c. Determine quantity of various materials to be excavated prior to submitting Bid Form. If encountered, remove rock at no extra cost to Owner.

d. Arrangements for entry to site for purpose of conducting subsurface investigations, including test borings, shall be made with Owner.

e. Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands exclusive of clayey and silty material - materials which are free-draining and for which impact compaction will not produce a well-defined moisture-density relationship curve and for which the maximum density by impact methods will generally be less than by vibratory methods.

f. Cohesive materials include silts and clays generally exclusive of sands and gravel - materials for which impact compaction will produce a well-defined moisture-density relationship curve.

2. Waste Materials:

a. Includes excess suitable materials and materials unsuitable for use in the Work.

(1) Unsuitable materials include all material that contains debris, roots, organic matter, frozen matter, rock (with any dimension greater than one-half the loose layer thickness) or other materials that are determined by Engineer as too wet or otherwise unsuitable for providing a stable subgrade or stable foundation for structures.

(2) Suitable materials include material that is free of debris, roots, organic matter, refuse, ashes, cinders, frozen matter and, which is free of rock with any dimension greater than one-half the specified loose layer thickness.

b. Remove unsuitable materials from work area as excavated.

c. Keep excess suitable material segregated from unsuitable waste in the disposal area.

d. Deposit waste materials in locations and within areas designated by Engineer and as indicated.

e. Construct erosion control devices as specified in SECTION 2A.

f. Topsoil, seed, and mulch as specified in SECTIONS 2A and 2C.

g. Grade waste areas and leave them free draining and with an orderly and neat appearance.

3. Borrow Materials:

a. Refers to all fill materials and topsoil obtained from approved locations either on or off the jobsite.

b. Borrow shall include all excavating, handling, and final disposal of materials as specified. Borrow, if required, to bring the embankments to the lines and grades indicated, shall be furnished by the Contractor, as specified, without additional compensation.

c. Borrow areas shall be as indicated.

d. Material removed from borrow areas shall be as approved by Engineer.

e. Leave borrow areas graded to drain and to present a neat appearance.

4. Embankment Material:

a. Includes suitable approved material from excavations and borrow areas.

b. Suitable embankment material shall be as follows:

(1) Type "A": shall be CH or CL material to be obtained only from the designated borrow area.

(2) Type "B": shall include any material excavated from the inside of the fly ash pond area.

c. Do not use material containing gravel, stones, or shale particles greater in dimension than one-half the depth of the layer to be compacted.

d. Material shall be free of roots or other organic matter, refuse, ashes, cinders, frozen earth or other unsuitable material.

e. Perform any wetting or drying of the material as required to obtain the specified density when compacted and to maintain moisture content at time of placement (to not less than optimum or more than 4 percent above optimum) as determined by AASHTO T99.

5. Trench Stabilization Material: Material shall be as follows:

a. As specified for granular fill material, or

b. Conform to AASHTO M147, Grading A or B, well graded, with not more than 10% passing No. 200 sieve.

6. Granular Fill Material:

a. Material shall be crushed rock with the following gradation:

Sieve Size (Square Openings)	Percent Passing (By Weight)
1"	100
3/4"	90-100
3/8"	30-65
No. 4	5-25
No. 8	0-10
No. 16	0-5

b. Material shall not have a loss of more than 15% after 5 cycles when tested for soundness with sodium sulfate as described in AASHTO T104.
c. In lieu of using crushed rock meeting the above gradation, crushed slag may be used.
(1) The slag shall have a maximum of 10% passing #200 sieve.
(2) The slag is available on the plant site.
d. Use for the following:
(1) Under slabs on grade.
(2) Pipe embedment.
(3) Trench stabilization.

7. Topsoil Materials:
a. Includes those materials obtained from excavation which are most suitable and stockpiled for such purpose, or
b. Borrow when required.

8. Riprap Material:
a. All stone shall be durable and of suitable quality to insure permanence in the structure and in the climate in which it is to be used.
b. Boulders or quarried rock may be used and shall be graded as follows:

Weight in Pounds Per Stone	Percent of Total Weight Lighter Than or Passing
300	100
150	55-75
50	25-45
2-inch screen	5-15

c. Quantity of rock with an elongation greater than 3:1 shall not exceed 20 percent of the mass. No stone shall have an elongation greater than 4:1.
d. Material shall be free from cracks, seams, or other defects that would tend to increase its deterioration from natural causes.
e. Objectionable quantities of dirt, sand, clay and rock fines will not be permitted.
f. Not more than 10 percent of the stone shall show splitting, crumbling, or spalling when subjected to 5 cycles of the sodium soundness test as required by AASHTO T104.
g. Furnish Engineer certification from an approved laboratory that the material conforms to these specifications.
h. In lieu of conforming to above specified test requirements, material with a proven history of satisfactory performance will be approved for use in the work provided certification of this history is acceptable to the Engineer.

9. Railroad Crossings:
a. Conform to AREA specifications and standards for construction of prefabricated sectional treated timber crossings, Type A.
b. As manufactured by Kerr-McGee Chemical Corporation, Forest Products Division, or approved equal.
c. Timber material shall be hardwood.
d. Flangeway width shall be 3 inches.

10. Filter Blanket Material:
a. Material shall conform to the applicable requirements of AASHTO M80 and shall be reasonably well graded within the following limits.

Sieve Sizes	Percent Passing By Weight
4 inch	100
3 inch	80-100
2 inch	70-90
3/4 inch	45-60
No. 4	20-30
No. 10	5-15
No. 40	0-5

b. Crushed rock may be used as a bedding material providing it meets the gradation specified above.

B. EQUIPMENT:

1. Compaction equipment shall conform to the following requirements and be subject to the approval of the Engineer.
   a. Tamping Rollers:
      (1) Tamping roller may be towed or self-propelled.
      (2) Rollers shall have staggered uniformly spaced knobs or feet. When fully loaded, they shall exert at least 300 psi on combined area of tamping feet in contact with ground.
      (3) Rollers shall be equipped with cleaning fingers maintained at full length to prevent accumulation of material between feet.
      (4) Maintain all equipment in good repair.
   b. Rubber-tired rollers shall have two axles, not less than 9 wheels with pneumatic tires, a rigid steel frame, and a body suitable for ballast loading.
   c. Power tampers shall be used for compaction of material in areas where it is impractical or unsafe to use heavy equipment, and as directed by the Engineer.
   d. Vibratory compactor shall have a steel drum 42 inches in diameter, with a vibrating force of 300 pounds per cycle per inch of drum width and a vibrating frequency of 1,200 cycles per minute.
   e. Vibratory plate compactor suitable for compacting granular pipe embedment.

2A-3 PERFORMANCE

A. CLEARING AND GRUBBING:

1. Perform clearing and grubbing only as necessary to perform excavation, trenching, embankment, borrow and other work required.
2. Clearing:
   a. Clearing includes felling and disposal of trees, brush, and other vegetation.
   b. Remove existing fence within the limits of clearing. Waste or store as indicated.
   c. Conduct work in a manner to prevent damage to property and to provide for the safety of employees and others.
   d. Keep operations within property lines indicated.
3. Grubbing:
   a. Removal and disposal of tree stumps and roots larger than 3 inches in diameter.
   b. Remove to a depth of at least 18 inches below existing grade elevation.

c. Backfill all excavated depressions with approved material and grade to drain.

B. DEMOLITION:

1. Remove existing construction to limits indicated, or as required to perform new construction.
2. Materials not indicated or specified to be relocated or returned to Owner shall be disposed of as specified in "Disposal of Debris" this section.
3. Perform demolition work to protect existing facilities, structures and property, which are to remain, against damage from operations, falling debris, or other cause.
4. Make provisions for temporarily accommodating flows in existing facilities to be relocated or disturbed.
5. Take precautions to guard against movement or settlement, and provide shoring and bracing as necessary.
6. If at any time safety of existing structure to remain is endangered, cease operations, notify Engineer and do not resume operations prior to approval.
7. Store materials and equipment to be reused in a manner to avoid corrosion, staining, breakage, or damage from any cause.

C. DISPOSAL OF DEBRIS:

1. Dispose of debris from clearing and grubbing (and demolition) at a location off the jobsite as arranged for by Contractor or by burying on the site with approval of Engineer.
2. Place debris buried on the site a minimum of 5 feet below finished grade in areas acceptable to Owner. Indicate locations of buried debris on Contractor-furnished construction record drawings.
3. Contractor may claim and salvage any timber or other debris which he may consider of value, but shall not delay in any manner either this contract or other work with salvaging operations.
4. Combustible waste material and debris may be burned subject to the Contractor obtaining all required permits and conducting all burning operations in strict accordance with applicable regulations. Bury wastes from burning in approved areas and restore these areas to natural conditions at the completion of this work.

D. STRIPPING:

1. Remove topsoil from areas within limits of excavation, trenching, borrow and areas designated to receive embankment and compacted fill.
2. Scrape areas clean of all brush, grass, weeds, roots and other materials.
3. Strip to a minimum depth of 6 inches but, to a sufficient depth to remove excessive roots in heavy vegetation or brush areas and as required to segregate topsoil.
4. Stockpile topsoil in areas where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, debris and stones larger than 2-inch diameter.
5. Dispose of waste on the site at locations indicated and as approved by the Engineer.

E. SHEETING AND BRACING:

1. Requirements:
   a. Use as necessary to conform with the following:
      (1) Federal and state laws and local ordinances.
      (2) To protect life, property and the work.
      (3) To avoid excessively wide cuts in unstable material.
   b. Use is mandatory where construction is adjacent to existing buildings and utilities where sloped side walls would extend beyond construction right-of-way.
2. Approved Materials:
   a. Provide on site prior to start of excavation in each section, and make such adjustments as are required to meet unexpected conditions.
   b. Space and arrange sheeting and bracing as required to exclude adjacent material and according to the stability of excavation slopes.
   c. Remove simultaneously with backfilling, except as otherwise approved, and fill voids left after withdrawal with sand or other approved material.
   d. Leave in place when required by conditions of supported material and cut off at approved elevation below the surface.
      (1) No higher than one foot below finished surface grade.
      (2) No lower than one foot above top of buried pipe.

F. DEWATERING:

1. Control grading around excavations to prevent surface water from flowing into excavation areas.
2. Drain or pump as required to continually maintain all excavations and trenches free of water or mud from any source, and discharge to approved drains or channels. Commence when water first appears and continue until work is complete to the extent that no damage will result from hydrostatic pressure, flotation, or other causes.
3. Use pumps of adequate capacity to insure rapid drainage of area, and construct and use drainage channels and subdrains with sumps as required.
4. Remove unsuitable excessively wet subgrade materials and replace with approved backfill material.

G. STOCKPILING:

1. Stockpile in amounts sufficient for and in a manner to segregate materials suitable for the following:
   a. Topsoiling.
   b. Constructing embankments and fills.
   c. Backfilling.
   d. Waste only.
2. Do not obstruct or prevent access to the following:
   a. Roads and driveways.
   b. Utility control devices.
   c. Ditches or natural drainage channels.
3. Perform in a manner to avoid endangering the work, stability of banks or structures, or health of trees and shrubs to be saved.
4. Maintain safe distance between toe of stockpile and edge of excavation or trench.
5. Stockpile in other areas or off site when adjacent structures, easement limitations, or other restrictions prohibit sufficient storage

adjacent to the Work. Off-site areas shall be arranged for by Contractor at no additional cost to Owner.

H. COMPACTION:

1. Compact subgrades, fills, embankments and backfills using spreading equipment, tamping rollers, rubber-tired rollers, vibratory compactors, or power tampers, as required to obtain reasonable uniformity.
2. Perform within moisture content range as specified to obtain required results with equipment used.
3. Achieve minimum densities specified as referenced to:
   a. Cohesive soils - Maximum density at optimum moisture, AASHTO T99.
   b. Cohesionless soils:
      (1) ASTM STP 479 Burmister Method.
      (2) USBR E-12 Relative Density.

I. SITE GRADING:

1. Excavate, fill, compact fill, and rough grade to bring project area to subgrades as follows:
   a. For surfaced areas, to underside of respective surfacing or base course.
   b. For seeded areas, ditches and slopes 3:1 and greater, as indicated on grading sections.
2. Rock:
   a. If encountered in grading areas outside of buildings, the provisions contained herein shall apply.
   b. Backfill to grade, with earth compacted in place after removing rock to depths as follows:
      (1) Under surfaced areas, to 6 inches below the top of respective subgrades for such areas.
      (2) Under planted areas to 24 inches below finished grade except that boulder or protruding rock outcrop, if so indicated, shall be left undisturbed.
3. Embankment:
   a. Placement:
      (1) Place embankment to the contours and elevations indicated, using suitable approved material from excavations or borrow areas.
      (2) Place fill material in 6-inch maximum layers (uncompacted depth).
      (3) Place embankment only on ground surfaces which have been compacted by rolling, roughened by discing or scarifying to 6 inches deep, wetted or dried as required to obtain correct moisture content, and approved by Engineer.
      (4) Do not place snow, ice or frozen earth in fill and do not place fill on a frozen surface.
   b. Compaction:
      (1) Type A Material:
         (a) Obtain compaction by use of tamping rollers.
         (b) Compaction shall be ninety-two (92) percent ± five (5) percent at maximum density at specified moisture content as determined by AASHTO T99 for all areas except those areas in which a different minimum density is indicated or specified.
         (c) Moisture content shall be maintained within a range of not less than optimum nor more than four (4) percent above optimum.

(2) Type B Material:
(a) Obtain compaction by a minimum of five (5) passes with a tamping roller.

c. Remove all debris subject to termite attack, rot, or corrosion, from areas to be filled.

4. Excavation:

a. General:
(1) Perform excavation by any recognized method of good practice to complete the job in the most expeditious manner.
(2) Take precautions to insure no damages to existing facilities or equipment, or other work.

b. Trenching:
(1) Extent of Work:
(a) Includes excavation, sheeting, bracing and all operations necessary for the preparation of trenches for bedding of pipes and all appurtenances thereto.
(b) Remove material as required for alignment and elevation of work as indicated.
(2) Equipment and Methods:
(a) Types of equipment and methods may be at Contractor's option, where structures or other facilities are not endangered.
(b) Equipment and methods shall be subject to approval of jurisdictional agency where stability or usefulness of other facilities may be impaired.
(c) Perform by hand methods when required to save culverts, utilities or other structures above or below ground.
(d) Maximum length of open trench shall be limited as necessary to conform to local codes.
(3) Side Walls:
(a) Make vertical below top of pipe.
(b) Make vertical or sloped from a plane 12 inches above top of pipe down to top of pipe.
(c) Make vertical or sloped as required for stability, above a plane 12 inches above top of pipe.
(d) Sheet and brace where necessary.
(e) Excavate without undercutting.
(4) Trench Depth:
(a) Depth shall be sufficient to provide the minimum bedding requirements for the pipe being placed.
(b) Do not exceed depth indicated where conditions of bottom are satisfactory.
(c) Increase depth as necessary to remove unsuitable supporting materials.
(5) Trench Bottom:
(a) Protect and maintain when suitable natural materials are encountered.
(b) Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
(c) Restore to proper subgrade with granular fill material or compacted backfill as approved by the Engineer.
(6) Trench Stabilization: Compact in lifts not exceeding 6 inches to approved firm condition with penumatic or vibratory equipment.

(7) Trench Width:

(a) Excavate trench to a minimum width which will permit satisfactory jointing of the pipe and thorough tamping of bedding.

(b) Maintain trench widths below a plane 12 inches above top of pipe as follows:

	Trench Width	
Nominal Pipe Size	Minimum	Maximum
Less than 24"	Pipe od + 1'	Pipe od + 2'
24" to 60"	Pipe od + 2'	Pipe od + 4'

(c) Maximum trench width limitations shall apply beginning 3 feet from manhole or structure walls.

(d) Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods utilized.

(e) Correct when overexcavated at no additional cost to the Owner.

1. Use stronger pipe or higher class embedment.
2. Obtain approval of Engineer before proceeding.

(8) Trenching Under Existing Utilities: The pipe trench walls shall be maintained vertical under existing duct banks and other utilities. This shall be accomplished by driving steel H-section beams each side of the utility and placing timber lagging between the beams. All excavation under utilities shall be by hand methods.

(9) Trenching Across Drainage Ditches: Open cuts through existing drainage ditches shall be provided with protection from flows entering the trench. Methods of blocking and disposing of flows shall be by methods as approved by the Engineer.

(10) Test Pits:

(a) Excavate test pits sufficiently in advance of trenching to enable adequate planning of construction procedure.

(b) Locate as follows:

1. Where unstable material is suspected that may require special protective measures.
2. Where ground water may require special handling methods.
3. Where indicated or otherwise approved.
4. Where interference or conflict with other utilities or structures could affect alignment of pipe.
5. Where advisable to assess adequacy of blasting pattern.

(c) With lateral dimension not less than minimum trench width specified for location excavated.

(d) To depth required to obtain information desired.

(11) Fill Areas: Perform trenching in fill areas only after compacted fill has reached an elevation of not less than one foot above the top of the pipe.

c. Structures: Perform as specified for "Trenching," and as follows:

(1) Excavate area adequate to permit efficient erection and removal of forms.

(2) Trim to neat lines where details call for concrete to be deposited against earth.

(3) Excavate by hand in areas where space and access will not permit use of machines.

(4) Notify Engineer immediately when excavation has reached the depth indicated. Do not proceed further until approved.

(5) Restore bottom of excavation to proper elevation in areas overexcavated, as follows:
(a) For structures supported by caissons, with compacted embankment.
(b) For structures supported by footings, with concrete.

5. Backfilling:

a. Trenches: Perform as specified for "Embankment," this section, with the following additional provisions:
(1) Complete promptly after approval to proceed.
(a) Upon completion of pipe embedment.
(b) Only after concrete encasement (when required) has attained 70 percent of design strength.
(2) Use hand methods to a plane 12 inches above top of pipe.
(3) Use approved mechanical methods where hand backfill is not required.
(4) Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. Distance may then be increased 2 feet for each additional foot of cover.
(5) Insure thorough compaction of fill under and around the conduit for the full length.
(6) Accomplish without inundation or flooding.
(7) Backfill failing to meet required densities shall be removed or scarified and recompacted as necessary to achieve specified results.
(8) All backfill under existing utilities shall be granular pipe embedment, vibratory compacted to 70% relative density.

b. Granular Pipe Embedment:
(1) Granular pipe embedment material shall be as specified for granular fill material.
(2) Place granular bedding to conform to the following:
(a) Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout its length.
(b) Form shallow depression under each joint to facilitate grouting.
(c) Form depression under each joint such that no part of bell or coupling is in contact with trench when pipe is placed in position.
(d) Add second layer simultaneously to both sides of the pipe with care to avoid displacement.
(e) Complete promptly after grouting of joint and approval to proceed.
(f) Substitute for any part of earth backfill to within 2 feet of final grade at Contractor's option.
(3) Compact granular bedding as follows:
(a) In lifts not exceeding 12 inches in compacted depth.
(b) Rod, spade, or use pneumatic or vibratory equipment as follows:
1. As required to obtain not less than 70 percent relative density as determined by ASTM STP 479 or USBR E-12.
2. Throughout depth of embedment.
(4) Include arch or total concrete encasement as follows:
(a) In locations indicated or where approved by Engineer to correct overwidth trench condition.
(b) Form to dimensions indicated or construct full width of trench.
(c) Place 4000 psi concrete, plain or reinforced, conforming to DIVISION 3, as required.
(d) Start and terminate encasement at a pipe joint.
(e) Install keyed construction joints coincident with pipe joints at 30- to 36-foot intervals. Provide separation of at least 75 per-

cent of cross-section area at construction joints. Do not run horizontal steel through joint.
(f) Suitably support and block pipe to maintain position and prevent flotation.
(g) Place promptly after installation of granular bedding.
(h) Protect against damage by heavy equipment with layer of earth.
(5) Include concrete cradle as follows:
(a) In locations indicated and where designated by Engineer to reinforce unstable trench bottom.
(b) Place on undisturbed trench bottom or on stabilized subbase.
(c) Form to dimensions shown or construct full width of trench.
(d) Place 4000 psi concrete, plain or reinforced, conforming to DIVISION 3, as required.
(e) Start and terminate cradle at a pipe joint.
(f) Place without horizontal construction joints other than indicated.
(g) Suitably support and block pipe to maintain position and prevent flotation.
(h) Provide anchorage where indicated.

c. Earth Pipe Embedment:
(1) Earth pipe embedment shall be as specified for Type A embankment material.
(2) Shape trench bottom to fit the pipe and backfill throughout depth of trench with compacted impervious materials.

d. Structures:
(1) Backfill only after concrete has attained 70 percent design strength.
(2) Backfill adjacent to structures only after, in the opinion of Engineer, a sufficient portion of the structure has been built to resist the imposed load.
(3) Remove all debris from excavation prior to placement of material.
(4) Use material free of gravel, rock, or shale particles larger than 2 inches within one foot of structure.
(5) Perform backfilling simultaneously on all sides of structures.
(6) Place backfill in level layers within compacting ability of equipment used.
(7) Exercise extreme care in the use of heavy equipment in areas adjacent to structures.
(8) Accomplish compaction without inundation or flooding.
(9) Compact to 95 percent of maximum density at optimum moisture as determined by AASHTO T99.

6. Subgrade Preparation:
a. General:
(1) Excavate or backfill as required to construct subgrades to the elevations and grades indicated.
(2) Remove all unsuitable material and replace with approved fill material, and perform all wetting, drying, shaping, and compacting required to prepare a suitable subgrade.

b. Subgrade for Fills and Embankments: Roughen by discing or scarifying and wet or dry top 6 inches as required to insure bond with fill or embankment.

c. Subgrade for Roadways and Drives:
(1) Extend subgrade the full width of the surfaced area plus one foot outside the edges of the overlying course to be placed.

(2) Compact subgrade embankments as specified in "Embankment" this section except for the top 6".
(3) Compact the top six inches of subgrades for traffic areas in embankment or excavation to 95 percent.

d. Subgrades for Concrete Slabs on Grade:
(1) Compact subgrade in embankment areas and in the top six inches in excavation areas to 95 percent.
(2) Place granular fill material on compacted subgrade in areas and to thickness as indicated. Compact by rolling and tamping until firm.

7. Construction Requirements:
a. Grade and compact all areas within the project, including excavated and filled sections, and adjacent transition areas reasonably smooth and free from irregular surface changes.
b. Degree of finish shall be that ordinarily obtained from blade grader or scraper operations, except as otherwise specified.
c. Finished grades shall generally be not more than 0.25 feet above or below established grade or approved cross sections with due allowance for topsoil.
d. Finished grade for areas within 10 feet of (future) building shall not exceed 0.15 feet above or below established subgrade.
e. Finished subgrades for roads, drives and surfaced areas shall not be lower than indicated, nor higher than 0.1 foot above than indicated.
f. Finish all ditches, swales, and gutters to drain readily.
g. Provide roundings at top and bottom of banks and at other breaks in grade.

J. TOPSOILING:
1. Place topsoil on all areas indicated and on approved waste areas.
2. Subgrade Treatment:
a. Clear site of vegetation heavy enough to interfere with proper grading and tillage operations.
b. Clear surfaces of all stones or other objects larger than 3 inches in thickness or diameter, all roots, brush, wire, grade stakes, or other objectionable material.
c. Loosen subgrade by discing or scarifying to a depth of 2 inches wherever compacted by traffic or other causes to permit bonding of the topsoil to the subgrade.
3. Placement:
a. Distribute over required areas without compaction other than that obtained with spreading equipment.
b. Place to extent material is available within following limits:
(1) Not less than 4 inches in depth.
(2) Do not exceed 6 inches in depth.
c. Shape cuts, fills and embankments to contours shown.
d. Grade to match contours of adjacent areas and permit good natural drainage.
e. With gentle mound over trenches.
4. After topsoil has been spread, clear surface of stones or other objects larger than 2 inches in thickness or diameter and all other objects that might interfere with planting and maintenance operations.
5. Protect topsoiled areas from the elements until grass is established. Repair eroded areas as required.

K. RIPRAP:

1. Foundation Preparation:
   a. Trim and dress areas requiring riprap to conform to cross sections indicated within an allowable tolerance of plus or minus 2 inches from the theoretical slope lines and grades.
2. Placement of Filter Blanket Material:
   a. Place a 6" layer of filter blanket material on the slopes as indicated.
   b. Spread material uniformly on the prepared base to neat lines as indicated.
   c. Placement of material by methods which will tend to segregate particle sizes within the material will not be permitted.
   d. Repair any damage to the surface of the prepared base during placement of the filter blanket, before proceeding with the work.
   e. Compaction of the bedding will not be required, but it shall be finished to present a reasonably even surface free of mounds or windows.
3. Placement of Riprap:
   a. Place on the slopes within the limits as indicated.
   b. Place riprap on the prepared base in such a manner as to produce a reasonably well graded mass of rock with a minimum practicable percentage of voids.
   c. Place to its full course thickness in one operation in a manner to avoid displacing the base material.
   d. Finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Hand place only if necessary to secure the desired results.
   e. A tolerance of plus or minus 4 inches from the slope lines and grades will be allowed to the extremes that such a tolerance shall not be continuous over an area greater than 200 square feet.
   f. Maintain the riprap protection until accepted and replace any material displaced by any cause.
   g. Filter point style mats of Fabriform as manufactured by Construction Techniques, Inc., or approved equal is considered an acceptable alternate to riprap provided it is installed in accordance with manufacturer's recommendations. Mat thickness shall be subject to the approval of the Engineer.

L. RAILROAD CROSSING:

1. Install conforming to AREA Specifications and Standards for the Construction of Prefabricated Sectional Treated Timber Crossings.

M. MAINTENANCE AND REPAIR:

1. Maintenance:
   a. Protect newly graded and topsoiled areas from actions of the elements.
   b. Settling or erosion occurring prior to landscaping shall be filled and repaired and grades reestablished to the required elevations and slopes.

2. Correction of Settlement:
   a. Under provisions of the guarantee, Contractor is responsible for correcting any settlement in excess of the amount of the specified grading tolerance for the specific areas of embankments or backfill and damages created thereby within one year after acceptance of the Work.
   b. Make repairs within 10 days from and after due notification by Owner of embankment or backfill settlement and resulting damage.
   c. Make own arrangements for access to the site for purposes of repair.

* * * * *

2380 McGee Street
Suite 200
Kansas City, MO 64108
1-816-561-4443

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With nearly 100,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $19 billion.

More information on AECOM and its services can be found at www.aecom.com.