

History of Construction Report

Upper AQC Impoundment La Cygne Generating Station

Kansas City Power & Light Company

October 6, 2016

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1 INTRODUCTION

1.1. Purpose

On behalf of Kansas City Power & Light Company (KCP&L), AECOM has prepared the following history of construction for the Upper Air Quality Control (AQC) Impoundment (formerly known as the “Upper AQC pond”) at the La Cygne 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: 25166 East 2200th Rd.
La Cygne, KS 66040

CCR Unit: Upper AQC 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** – Boicourt Quadrangle, Kansas 7.5-Minute Series.

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

The Upper AQC Impoundment contains AQC sludge formerly sluiced from the La Cygne Generating Station. Currently, the impoundment accepts CCR fill primarily for the purpose of solidifying and dewatering the wet material in the impoundment. Some areas of the impoundment temporarily retain storm water prior to release to the Lower AQC Impoundment.

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

The Upper AQC Impoundment is located in the Lower Marais Des Cygnes Watershed with a drainage area of 1,029,100 acres per United States Geological Survey¹ (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.

The available drawings and geotechnical data show that the foundation materials typically consist, from the top downward, of residual soils over primarily shale bedrock. Thin stringers of limestone and sandstone are present at some of the boring locations. Plans indicate the soil for the dam foundation was to be dewatered and stripped to sound foundation soil as approved by the Engineer.

Woodward-Clyde Consultants (WWC) Sheet 3² also contains notes stating that the dam foundation was to be cleared and stripped and that existing 'sludge' beneath the dam foundation (the drawings identified a small area of existing 'sludge' near embankment Station 100+00) was to be removed to sound foundation soil.

A summary of available engineering properties of the foundation materials for the Upper AQC Impoundment from the Geotechnical Report³ is presented in **Table 1**. The Upper AQC Impoundment is an enclosed impoundment with dikes and does not have abutments.

Table 1. Summary of Foundation Material Engineering Properties from Geotechnical Report³

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Residual Soil	126	150	25	500	15
Weathered Shale	130	150	25	500	15
Bedrock	140	5,000	35	5,000	35

§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.

Borrow materials used for the construction of the embankment were excavated from within the footprint of the impoundment. Embankment materials include residual clays and weathered, plastic shale. WWC Sheet 7⁴ (see Attachment C) shows that the embankment is comprised of three zones: an internal impervious zone, an external random fill zone, and internal drainage including an inner drain and a toe drain. The material used in the internal drains consists of bottom ash generated at the station.

An available summary of physical and engineering properties of the construction materials for the Upper AQC Impoundment from the Geotechnical Report³ is presented in **Tables 2 and 3** below.

Table 2. Summary of Embankment Material Engineering Properties from Geotechnical Report³

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
Embankment Fill	129	200	23	432	15

Table 3. Summary of Embankment Material Physical Properties from Geotechnical Report³

Test		Min	Max	Average
Water Content (%)		15	29	23
% Passing No. 200 Sieve		89	100	93
Atterberg Limits	Liquid Limit	47	75	60
	Plastic Limit	14	23	18
	Plasticity Index	24	54	42

Gradation tests conducted on samples of the internal drainage material collected for URS Corporation's Geotechnical Evaluation⁵ show that the drainage material classifies as poorly graded sand (SP) or poorly

graded sand with silt (SP-SM) based on the Unified Soil Classification System. The percentage of fines, defined as the amount of material passing the No. 200 sieve, ranged between 1.7 to 5.8 percent in the samples tested.

The methods used for preparation and construction of the Upper AQC Impoundment are described in the Technical Specifications⁶ (See **Attachment C**). Construction of the impoundment started in 1979 and was completed in 1980.

§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 for the Upper AQC Impoundment are listed in **Table 4**. Items marked as “Not Found” are items that are not reasonably or readily available. Record or as-built documentation was not reasonably or readily available.

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

Dimensional plan view (all zones)	Woodward-Clyde Consultants Sheets 2 ⁷ and 5 ⁸ (1979)
Dimensional cross sections	Woodward-Clyde Consultants Sheets 7 ⁴ , 8 ⁹ , & 9 ¹⁰ (1979)
Foundation Improvements	Woodward-Clyde Consultants Sheets 3 ² and 5 ⁸ (1979)
Drainage Provisions	Woodward-Clyde Consultants Sheet 7 ⁴ (1979)
Spillways	Woodward-Clyde Consultants Sheets 6 ¹¹ , 7 ⁴ , 8 ⁹ , & 9 ¹⁰ (1979)
Diversion Ditches	Woodward-Clyde Consultants Sheets 10 ¹² & 11 ¹³ (1979)
Outlets	Woodward-Clyde Consultants Sheets 6 ¹¹ , 7 ⁴ , 8 ⁹ , & 9 ¹⁰ (1979)
Instrument Locations	Figure 1: Existing Instrumentation Locations – Upper AQC Impoundment (AECOM, 2016)
Slope Protection	Woodward-Clyde Consultants Sheet 7 ⁴ (1979)
Normal Operating Pool Elevation	Not Found

Maximum Pool Elevation	Woodward-Clyde Consultants Sheet 7 ⁴ (1979)
Expected Maximum Depth of CCR	Not Found
Identifiable Natural or Manmade Features That Could Adversely Affect Operation of the Upper AQC Impoundment	None Identified

All reference drawings listed in **Table 4** are included in **Attachment B**. (Figure 1 is located before **Attachment A**.)

Slope protection shown in the original plans includes rip rap in the auxiliary spillway and topsoil and vegetation on exterior slopes. Rip rap has been placed along selected portions of the upstream slope of the impoundment. Records on when the rip rap on interior slopes was placed, or material properties of the rip rap are not reasonably or readily available. A maximum pool elevation of 885.8 is listed on WWC Sheet 7⁴ and is referred to as the “normal maximum pool elevation”. Information on a “normal operating pool elevation” is not reasonably or readily available.

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

A total of 14 settlement monuments were installed to monitor embankment settlement. The settlement monuments were surveyed as part of the Geotechnical Evaluation⁵. The survey showed settlement of the embankment was complete. The monuments are no longer serviceable.

Nine piezometers, P-501 through P-509 were installed in the Upper AQC Impoundment in June and July of 2010⁵. These piezometers were installed to monitor water levels within the embankments. A staff gage has been placed near the principal spillway to monitor water levels within the impoundment. The nine piezometers and the staff gauge are monitored no less than every 30 days. Instrument locations are shown in **Figure 1**.

(§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 Upper AQC Impoundment has both a principal spillway (referred to as a service spillway on WWC Sheet 8⁹) with an overflow structure, and an auxiliary spillway (referred to on WWC Sheet 7⁴ as emergency spillway). The principal spillway overflow structure is a 6 ft wide, 9 ft long, and 22 ft tall steel and concrete riser with concrete stop logs. A 30-inch diameter, 263 ft long corrugated metal pipe (CMP) connects the riser to a basin at the toe of the embankment. The basin ultimately discharges into the Lower AQC Impoundment. Three (3) cast-in-place reinforced concrete anti-seep collars, each 12 ft wide, and 8 ft tall were installed along the CMP.

The auxiliary spillway is a 50 ft. wide riprap lined channel that extends over the crest of the embankment and along the downstream slope and discharges into a drainage swale. The opening for the spillway is 3 ft. lower than the top of embankment and has a 1 ft. thick, 66 ft. wide, 4 ft. deep seepage cut off wall at the inside crest. The auxiliary spillway does not discharge into the Lower AQC Impoundment, but rather discharges into a drainage swale that slopes downward to the west and discharges into Lake La Cygne.

Capacities and calculations used to determine the spillways are not reasonably or readily available.

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

Kansas City Power & Light Company generated Technical Specifications⁶ for the construction of the Upper AQC Impoundment in a 1979 Bid Package. See **Attachment C**.

Provisions for surveillance include the piezometers and water level gauge indicated in **Figure 1**.

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

- La Cygne Generating Station accomplishes 7-day and 30-day inspections on the Upper AQC Impoundment in compliance with the CCR Rule¹⁴.
- La Cygne 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.

Two separate shallow slides have occurred on the downstream slope of the Upper AQC Impoundment⁵. The first slide occurred in 1987 and the second slide occurred in 1995. These slides were located approximately between Stations 50 and 58. On both occasions, the failure scarp developed below the crest of the dam and involved no impervious fill material. Repairs implemented by KCP&L involved removal of disturbed material and replacement with select imported fill and revegetation⁵. Historic and recent inspections of the repaired areas indicate that the repairs were effective.

3 LIMITATIONS

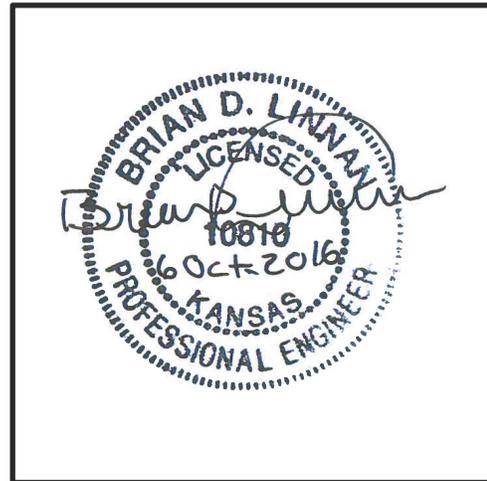
The signature of AECOM's authorized representative on this document represents that, to the best of AECOM's knowledge, information, and belief in the exercise of its professional judgment, it is AECOM's professional opinion that the aforementioned information is accurate as of the date of such signature. 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 Kansas. I certify, the History of Construction for the La Cygne Upper AQC 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

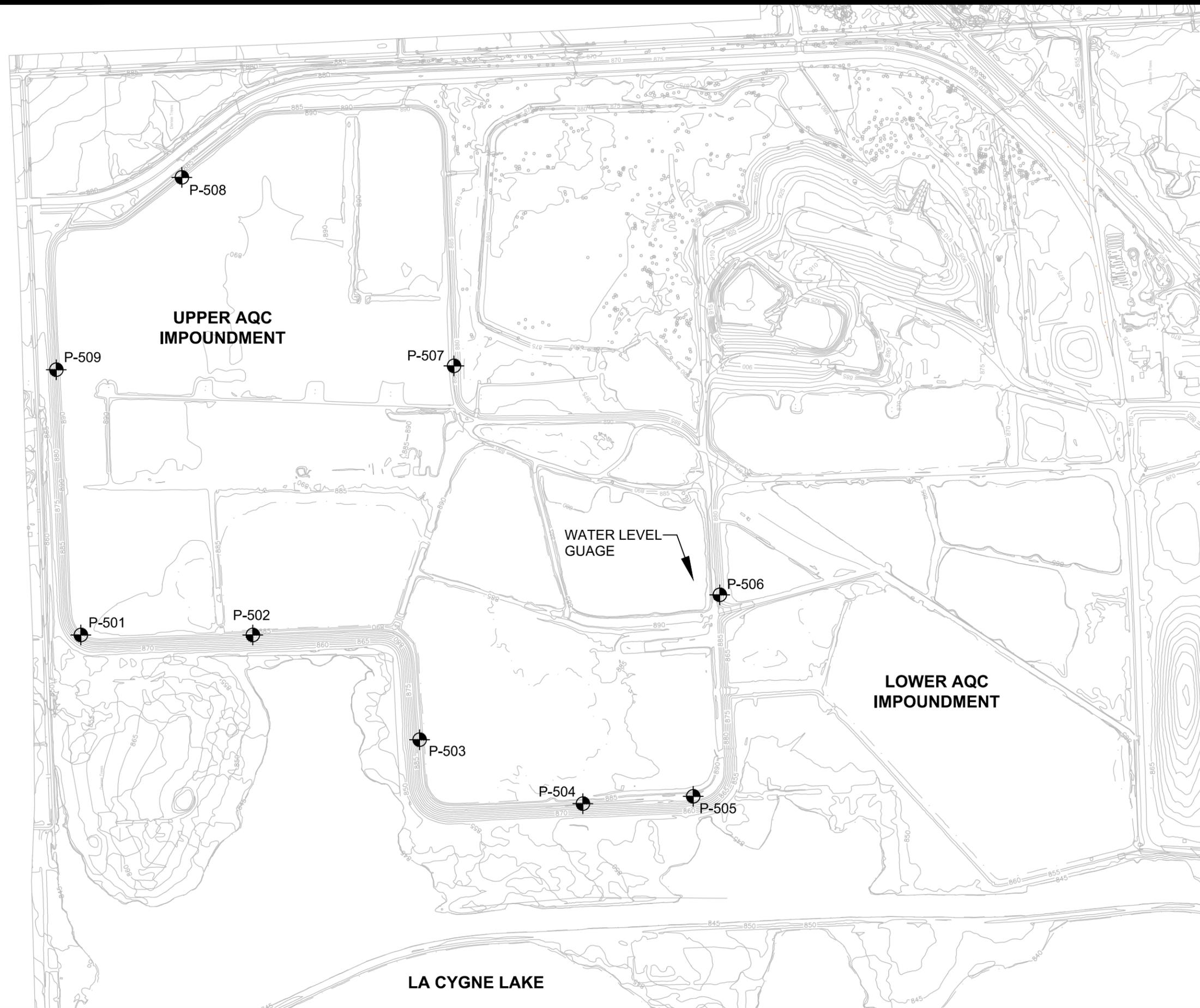
5 REFERENCES

1. United States Geological Survey (USGS). The National Map Viewer. <http://viewer.nationalmap.gov/viewer/>. USGS data first accessed in April of 2016.
2. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Limits of Clearing, Grubbing, Stripping and Spoil Areas (KC 205.80 Sheet 3)*, January, 1979.
3. AECOM. *Geotechnical Report for the Upper AQC Impoundment at La Cygne Generating Station*, October 2016.
4. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Dam Embankment Sections and Details (KC 205.80 Sheet 7)*, January, 1979.
5. URS Corporation. *Geotechnical Evaluation: AQC Impoundments – Kansas City Power & Light La Cygne Generating Station*, September 2010.
6. Kansas City Power and Light Company. *Kansas Gas and Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Bid Documents - Technical Specifications*, January 1979.
7. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Site Plan and General Arrangement (KC 205.80 Sheet 2)*, January, 1979.
8. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Dam Foundation Grade and Excavation Plan (KC 205.80 Sheet 5)*, January, 1979.
9. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Service Spillway Plan, Sections and Details (KC 205.80 Sheet 8)*, January, 1979.
10. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Service Spillway Reinforcing (KC 205.80 Sheet 9)*, January, 1979.
11. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Dam and Spillways Plan (KC 205.80 Sheet 6)*, January, 1979.
12. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Diversion Ditches Plan and Profile (KC 205.80 Sheet 10)*, January, 1979.

13. Woodward – Clyde Consultants. *Kansas Gas & Electric Company La Cygne Steam Electric Station New F.G.D. Sludge Retention Dam – Stage 1 Diversion Ditches Sections and Details (KC 205.80 Sheet 11)*, January, 1979.
14. KCP&L. *Coal Combustion Residual (CCR) Inspection Program, La Cygne Generating Station*, Rev. 3, August 2016.

Figure 1
Existing Instrument Locations -
Upper AQC Impoundment

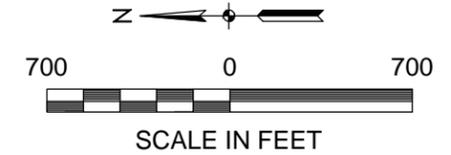
September 27, 2016 11:29.52 pm (mik)
J:\KCPL La Cygne Upper AQC Pond\CAD\Plan Sheets\Exist Instruments Upper AQC.dwg



LEGEND

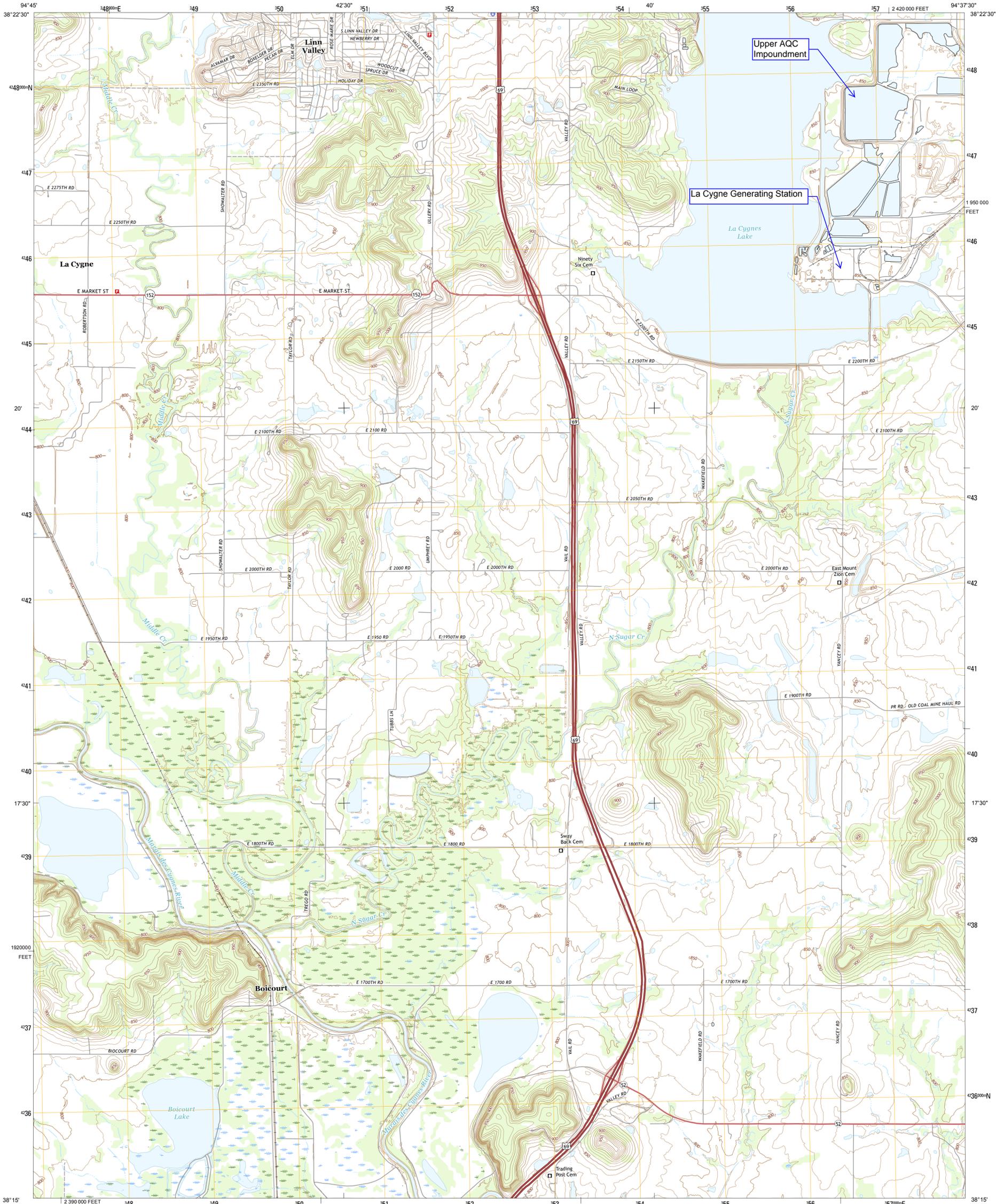
P-501  PIEZOMETER LOCATION AND NUMBER

SOURCE: EXISTING TOPOGRAPHY WAS PRODUCED FROM AERIAL MAPPING PROVIDED BY M. J. HARDEN ASSOCIATES INC., DATED 2001.



AECOM 2380 McGee Street, Suite 200 Kansas City, Missouri 64108		
CLIENT: KANSAS CITY POWER & LIGHT COMPANY		
LOCATION: LA CYGNE GENERATING STATION		
TITLE: EXISTING INSTRUMENTATION LOCATIONS UPPER AQC IMPOUNDMENT		
DRAWN BY TMS	CHECKED BY BDL	APPROVED BY BDL
PROJECT NO. 60505710	DATE AUG. 2016	FIGURE NO. 1

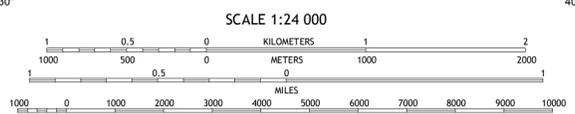
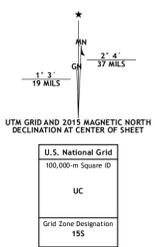
Attachment A
Boicourt Quadrangle, Kansas 7.5-
Minute Series



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1:100,000-meter grid: Universal Transverse Mercator, Zone 15S
10 000-foot ticks: Kansas Coordinate System of 1983 (south 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, July 2014
Roads:.....U.S. Census Bureau, 2014
Names:.....GNIS, 2015
Hydrography:.....National Hydrography Dataset, 2014
Contours:.....National Elevation Dataset, 2014
Boundaries:.....Multiple sources; see metadata file 1972-2015
Public Land Survey System:.....BLM, 2015
Wetlands:.....FWS National Wetlands Inventory 1977-2014



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 0.6.19

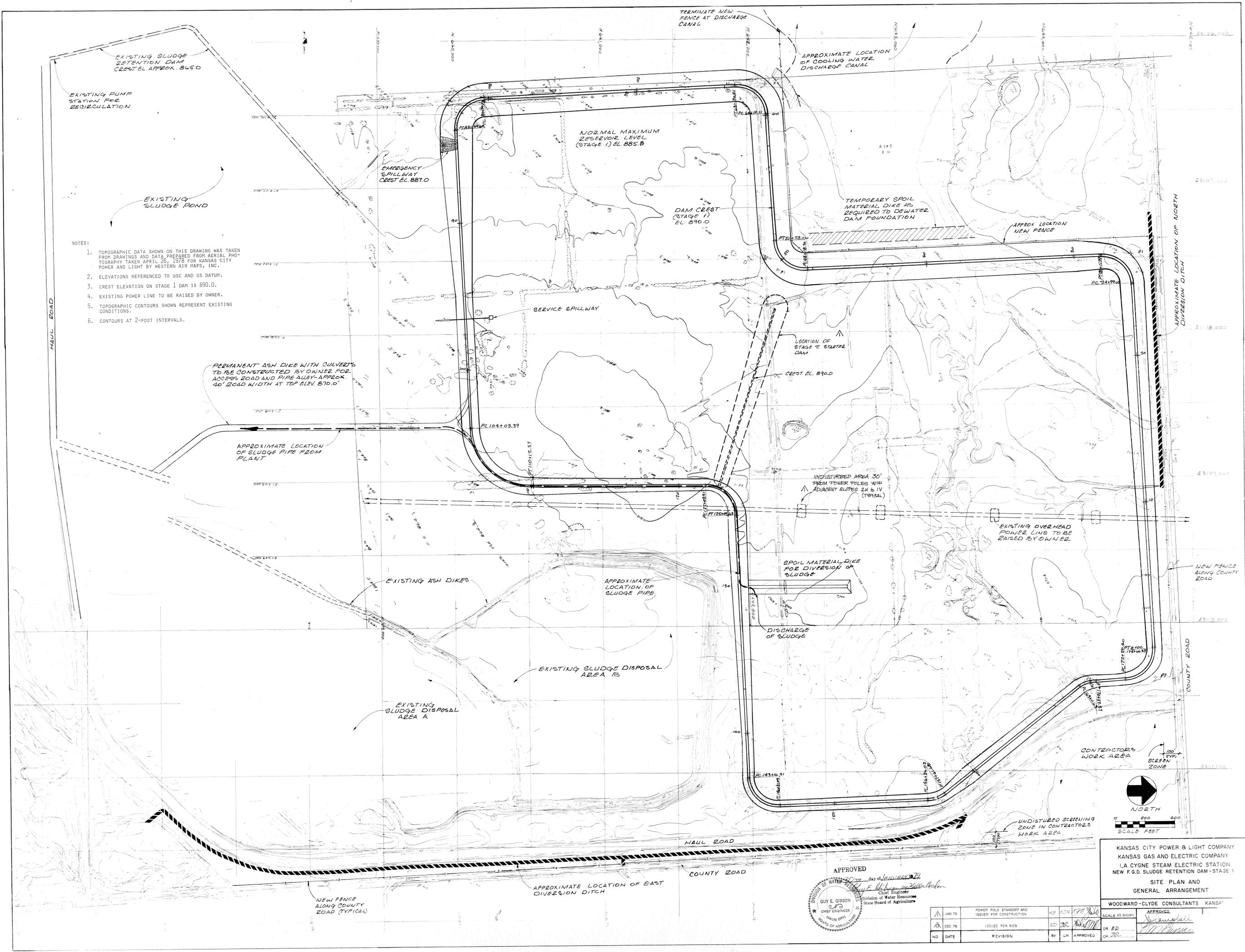


1	2	3
4	5	6
7	8	

ADJOINING QUADRANGLES

BOICOURT, KS
2015

Attachment B Reference Drawings



- NOTES:
1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
 2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
 3. CREST ELEVATION ON STAGE 1 DAM IS 890.0.
 4. EXISTING POWER LINE TO BE RAISED BY OWNER.
 5. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
 6. CONTOURS AT 2-FOOT INTERVALS.

PERMANENT ASH DIKE WITH CULVERTS TO BE CONSTRUCTED BY OWNER FOR ACCESS ROAD AND PIPE ALLEY - APPROX. 40' ROAD WIDTH AT TOP ELEV. 870.0'

APPROVED
 GUY E. GIBSON
 CHIEF ENGINEER
 DIVISION OF WATER RESOURCES
 STATE BOARD OF AGRICULTURE

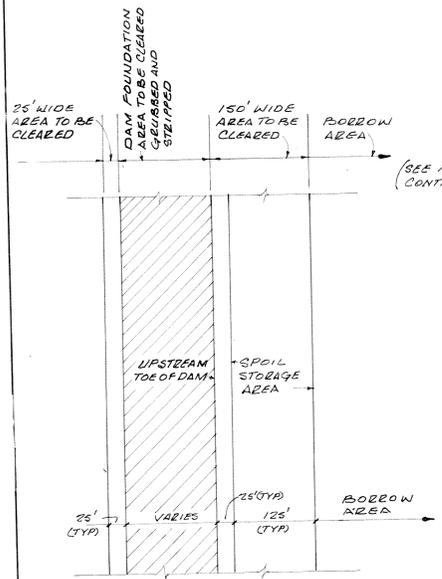
NO.	DATE	REVISION	BY	CHK	APPROVED	CH.
1	JAN 79	POWER POLE STANDOFF AND ISSUED FOR CONSTRUCTION	JCN	JCN	[Signature]	JCN
2	DEC 78	ISSUED FOR BIDS	ED	JCN	[Signature]	JCN
3						

KANSAS CITY POWER & LIGHT COMPANY
 KANSAS GAS AND ELECTRIC COMPANY
 LA CYGNE STEAM ELECTRIC STATION
 NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
 SITE PLAN AND
 GENERAL ARRANGEMENT

WOODWARD-CLYDE CONSULTANTS KANSAS

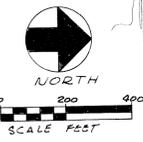
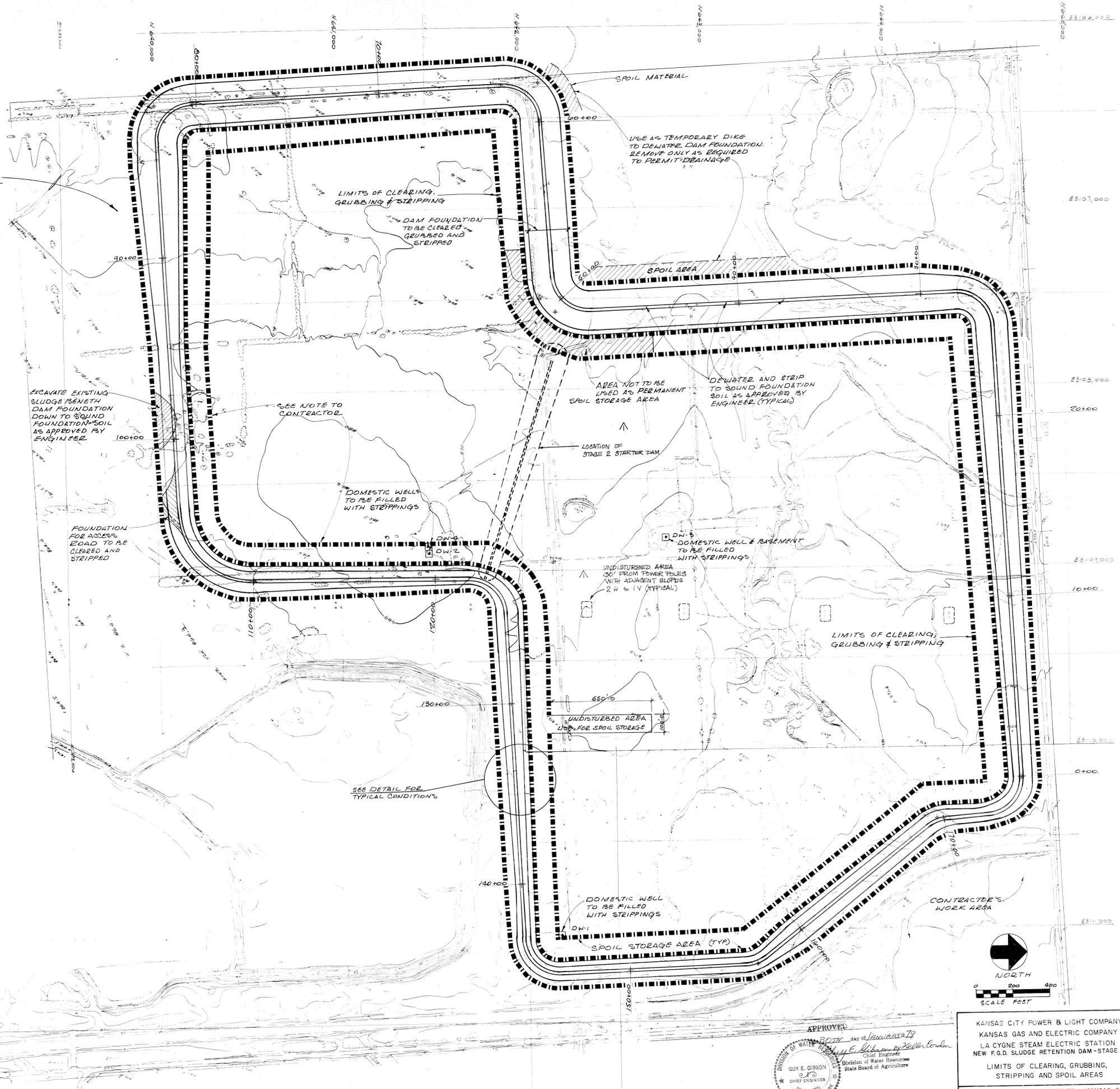
SCALE AS SHOWN
 APPROVED [Signature]
 DR. ED [Signature]
 CH. JCN [Signature]

- NOTES:
1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
 2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
 3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
 4. CONTOURS AT 2-FOOT INTERVALS.
 5. ALL CLEARING, GRUBBING AND STRIPPING SHALL CONFORM TO THE TECHNICAL SPECIFICATIONS.



NOTE TO CONTRACTOR
AREA TO BE CLEARED, GRUBBED AND STRIPPED WHERE BORROW IS OBTAINED.
AREAS NOT USED FOR BORROW TO BE USED FOR SPOIL STORAGE AS APPROVED BY ENGINEER.

TOPSOIL MAY BE STORED OUTSIDE DAM ALIGNMENT AT LOCATIONS APPROVED BY ENGINEER (TYPICAL)



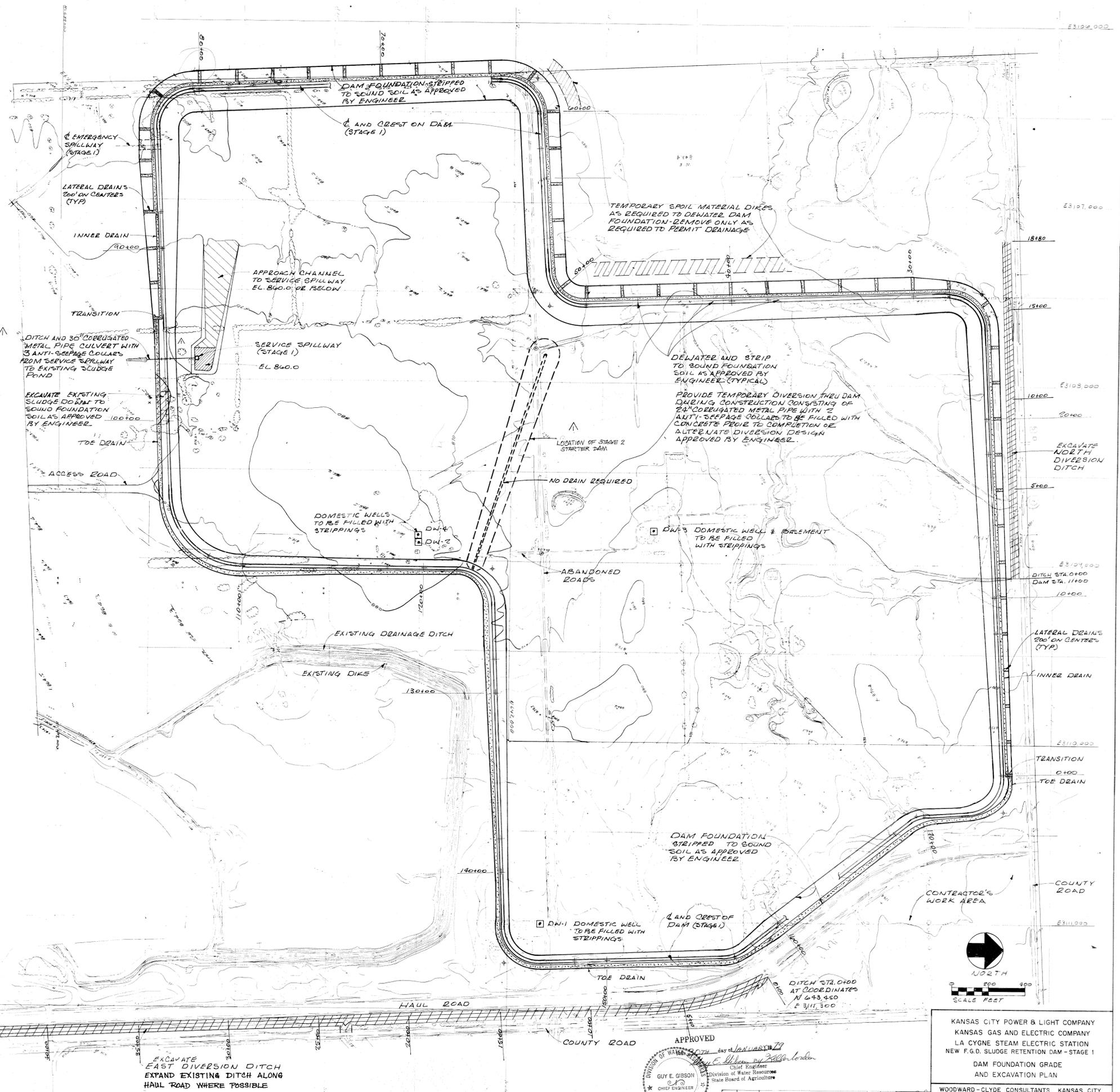
APPROVED
BOTH day of JANUARY 27
GUY E. GIBSON
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM-STAGE I
LIMITS OF CLEARING, GRUBBING, STRIPPING AND SPOIL AREAS

WOODWARD-CLYDE CONSULTANTS		KANSAS CITY	
SCALE AS SHOWN		APPROVED	
DATE DEC 1978		DATE DEC 1978	
SHEET 3		KC 205.80	
NO	DATE	REVISION	BY CH APPROVED
1	JAN 79	ISSUED FOR STANDOFF AND FOR CONSTRUCTION	CH. JRC
2	DEC 78	ISSUED FOR BIDS	CH. ED

NOTES:

1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
2. ELEVATIONS REFERENCED TO USC AND GS DATUM.
3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
4. CONTOURS AT 2-FOOT INTERVALS.
5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.



KANSAS CITY POWER & LIGHT COMPANY
 KANSAS GAS AND ELECTRIC COMPANY
 LA CYGNE STEAM ELECTRIC STATION
 NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
 DAM FOUNDATION GRADE
 AND EXCAVATION PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY		APPROVED	DATE DEC 1978
SCALE AS SHOWN		DR. ED	KC 205.80
		CH. JTC	SHEET 5



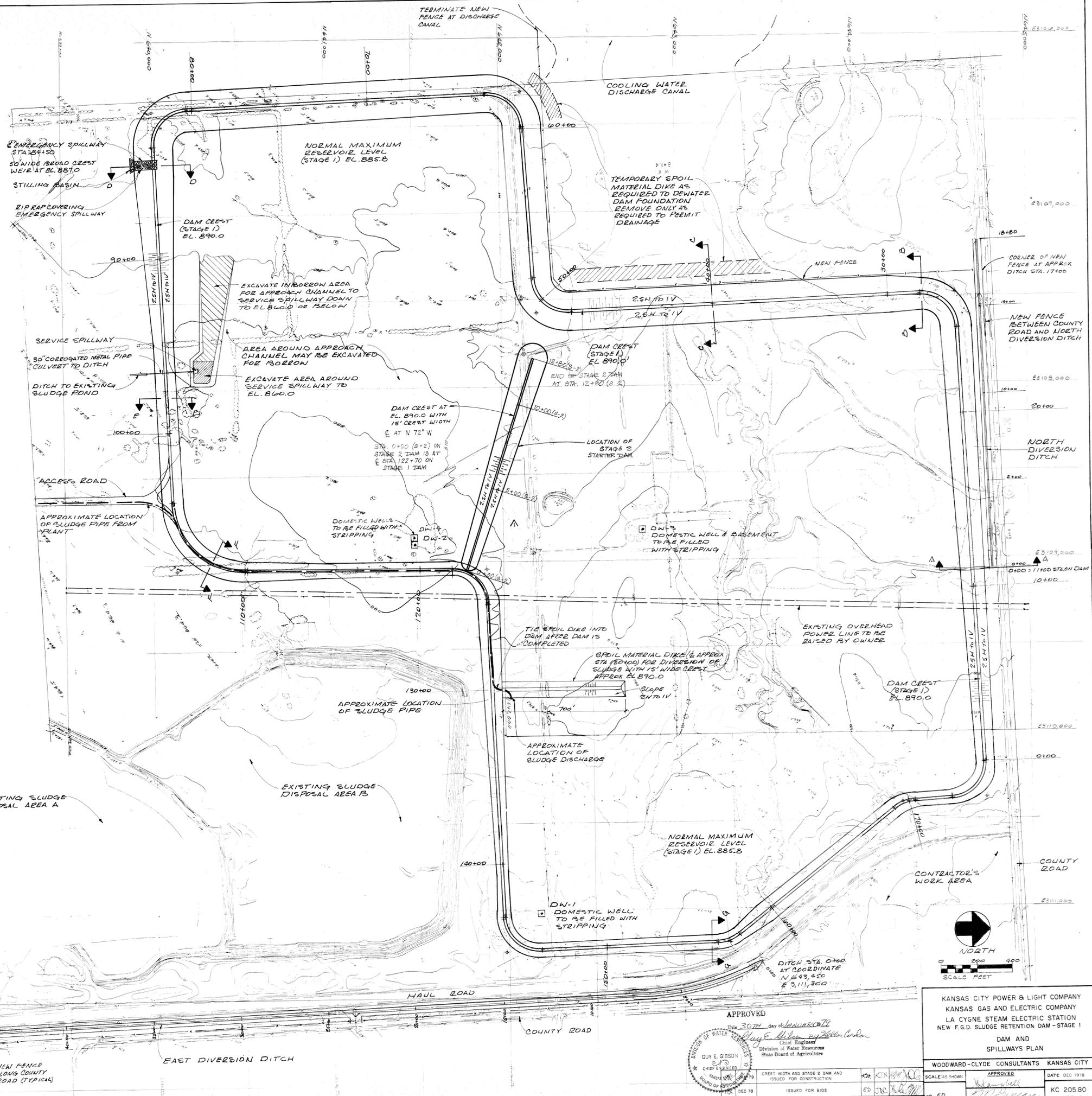
APPROVED

day of JANUARY 79

GUY E. GIBSON
 Chief Engineer
 Division of Water Resources
 State Board of Agriculture

NO.	DATE	REVISION	BY	CH	APPROVED
1	JAN 79	ADD ANTI-SEEPAGE COLLAR AND ISSUED FOR CONSTRUCTION	KCN	JTC	[Signature]
2	DEC 78	ISSUED FOR BIDS	ED	JTC	[Signature]

EXCAVATE EAST DIVERSION DITCH
 EXPAND EXISTING DITCH ALONG
 HAUL ROAD WHERE POSSIBLE



- NOTES:
1. TOPOGRAPHIC DATA SHOWN ON THIS DRAWING WAS TAKEN FROM DRAWINGS AND DATA PREPARED FROM AERIAL PHOTOGRAPHY TAKEN APRIL 26, 1978 FOR KANSAS CITY POWER AND LIGHT BY WESTERN AIR MAPS, INC.
 2. ELEVATIONS REFERENCED FROM USC AND GS DATUM.
 3. TOPOGRAPHIC CONTOURS SHOWN REPRESENT EXISTING CONDITIONS.
 4. CONTOURS AT 2-FOOT INTERVALS.
 5. ALL EXCAVATION PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 6. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 7. Crest width of dam shall be changed by a gradual transition over a 100ft length.

J.E.L.
30 Jan 79

LOCATION ALONG DAM STATION	CREST WIDTH OF DAM FEET
0+00 - 24+00	13
24+00 - 32+00	15
32+00 - 83+00	18
83+00 - 106+00	15
106+00 - 114+00	15
114+00 - 175+66	12

↑ INCLUDES AREA FOR RAMP FOR PIPE AND ROAD ACCESS

APPROVED

This 30th day of January 1979

Guy E. Gibson
GUY E. GIBSON
Chief Engineer
Division of Water Resources
State Board of Agriculture

John C. ...
John C. ...
State Board of Agriculture

NO. DATE REVISION BY CH. APPROVED

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1

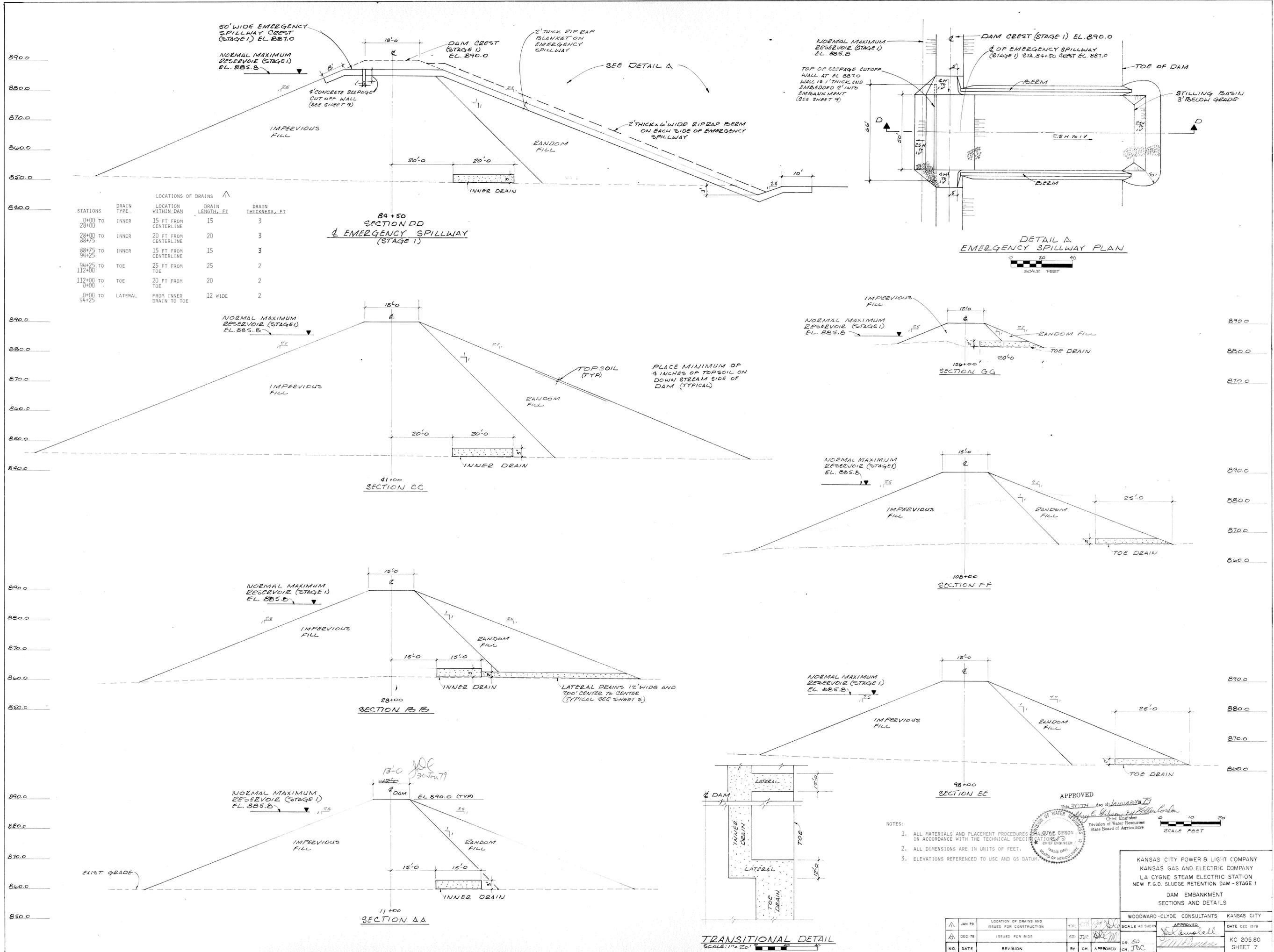
DAM AND SPILLWAYS PLAN

WOODWARD-CLYDE CONSULTANTS KANSAS CITY

SCALE AS SHOWN

DATE DEC 1978

KC 205.80 SHEET 6



LOCATIONS OF DRAINS

STATIONS	DRAIN TYPE	LOCATION WITHIN DAM	DRAIN LENGTH, FT	DRAIN THICKNESS, FT
0+00 TO 28+00	INNER	15 FT FROM CENTERLINE	15	3
28+00 TO 88+75	INNER	20 FT FROM CENTERLINE	20	3
88+75 TO 94+25	INNER	15 FT FROM CENTERLINE	15	3
94+25 TO 112+00	TOE	25 FT FROM TOE	25	2
112+00 TO 0+00	TOE	20 FT FROM TOE	20	2
0+00 TO 94+25	LATERAL	FROM INNER DRAIN TO TOE	12 WIDE	2

84+50 SECTION DD & EMERGENCY SPILLWAY (STAGE I)

DETAIL A EMERGENCY SPILLWAY PLAN



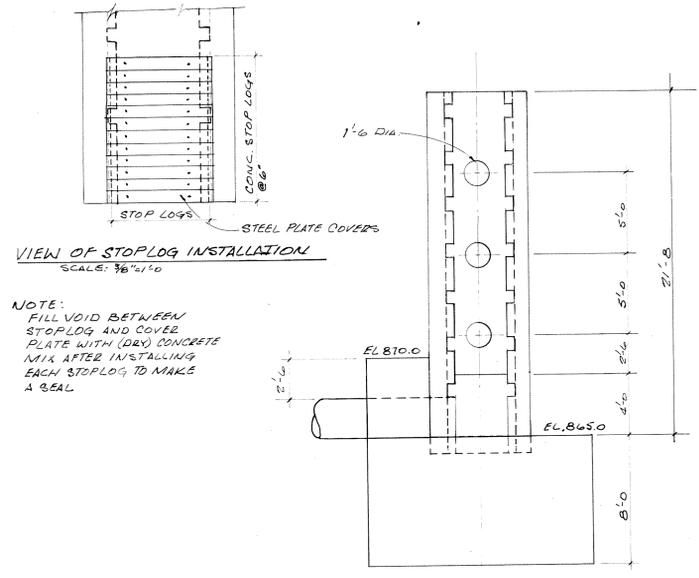
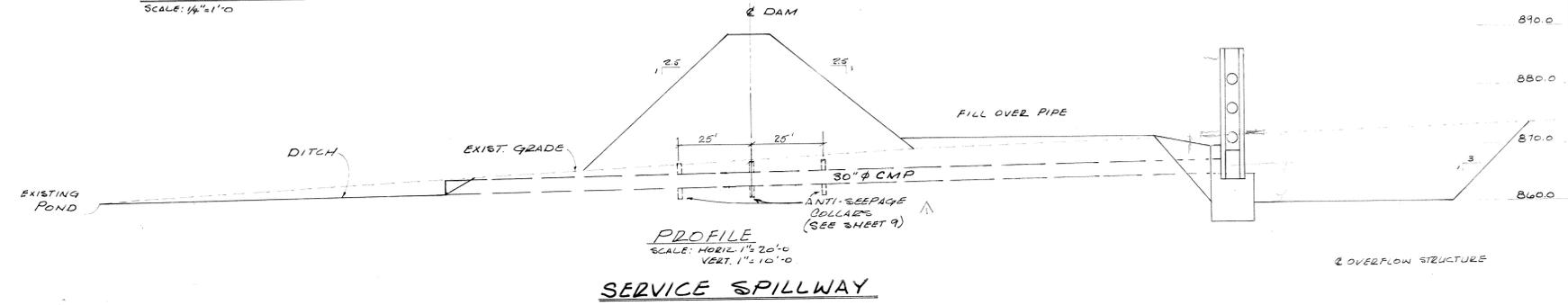
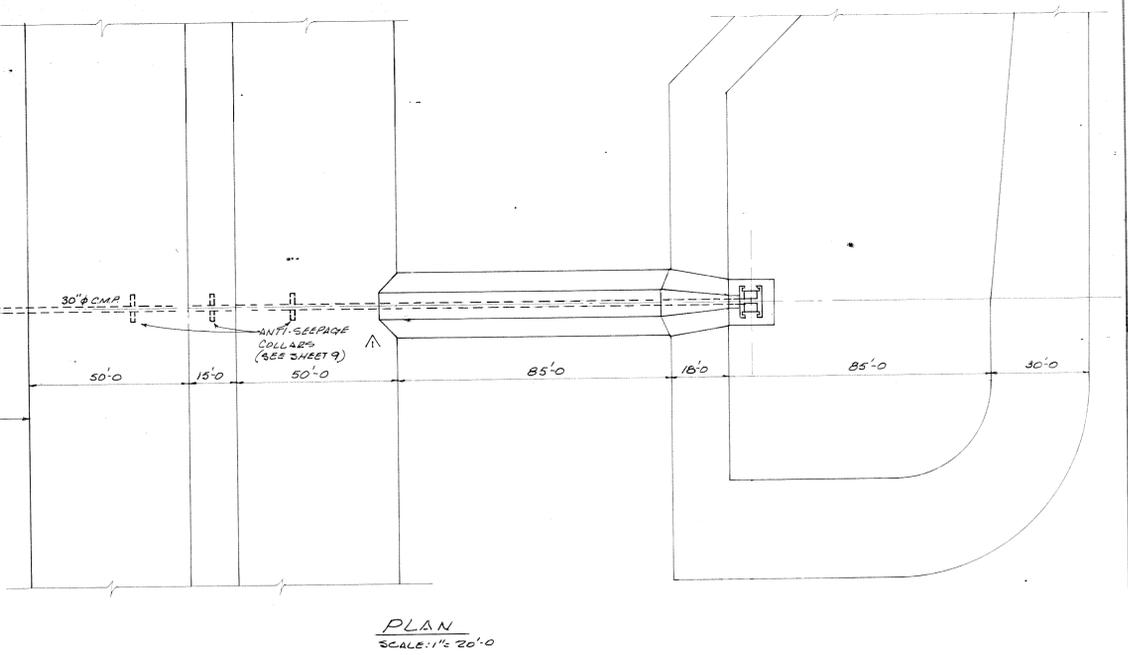
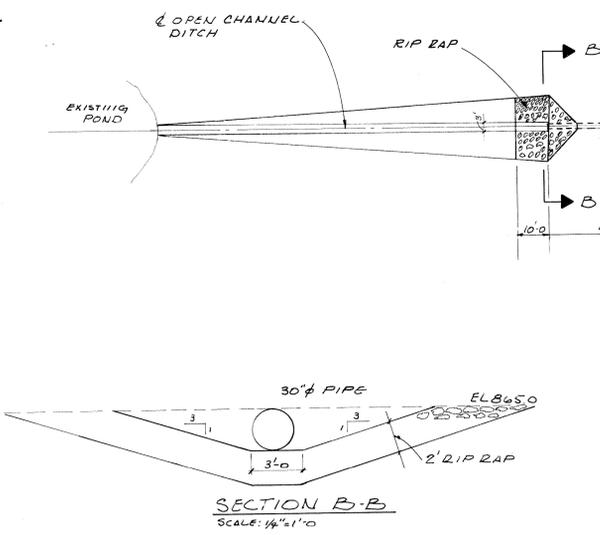
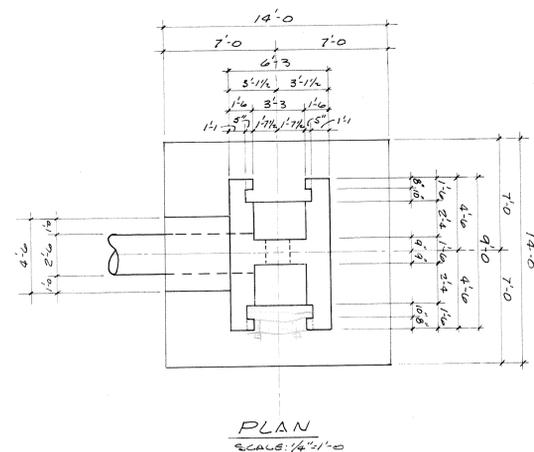
TRANSITIONAL DETAIL SCALE: 1" = 20'

- NOTES:
1. ALL MATERIALS AND PLACEMENT PROCEDURES IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 2. ALL DIMENSIONS ARE IN UNITS OF FEET.
 3. ELEVATIONS REFERENCED TO USC AND GS DATUM.

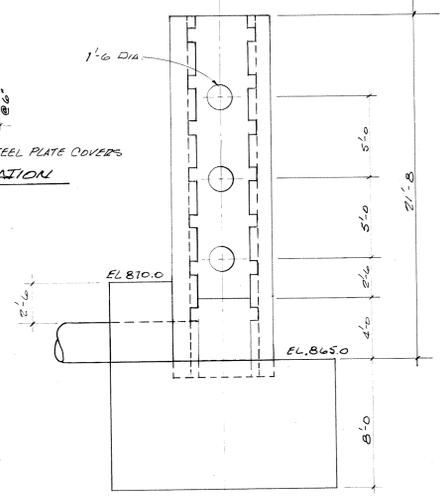
APPROVED
 This 30th day of JANUARY 1979
 E. Gibson
 Chief Engineer
 Division of Water Resources
 State Board of Agriculture

KANSAS CITY POWER & LIGHT COMPANY
 KANSAS GAS AND ELECTRIC COMPANY
 LA CYGNE STEAM ELECTRIC STATION
 NEW F.G.D. SLUDGE RETENTION DAM - STAGE I
 DAM EMBANKMENT
 SECTIONS AND DETAILS

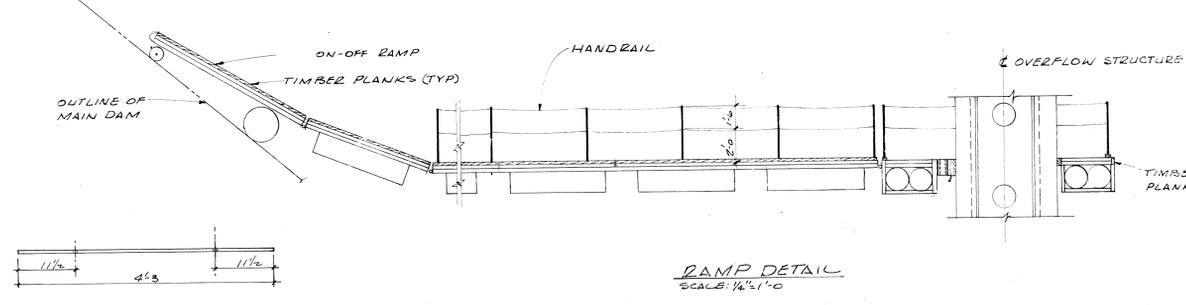
JAN 79		LOCATION OF DRAINS AND ISSUED FOR CONSTRUCTION	BY: CH. JOC	APPROVED: [Signature]	DATE: DEC 1978
DEC 78		ISSUED FOR BIDS	BY: JOC	APPROVED: [Signature]	DATE: DEC 1978
NO.	DATE	REVISION	BY	CH.	APPROVED
					DR. E.D. [Signature] CH. JOC



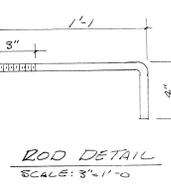
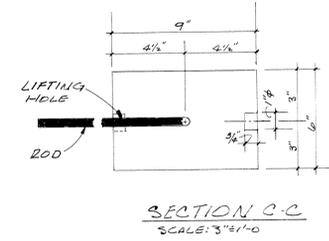
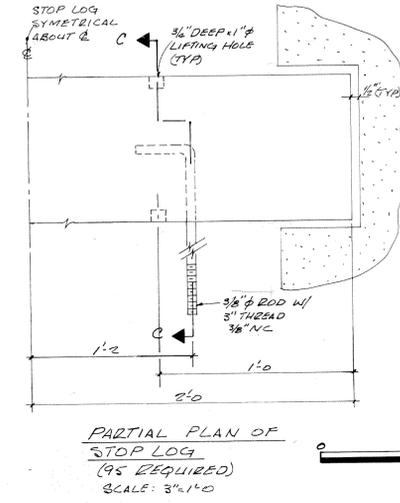
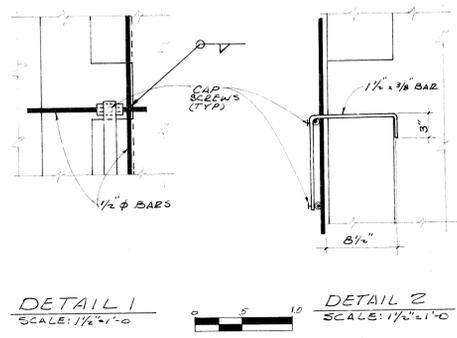
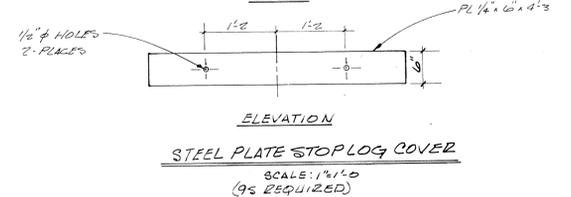
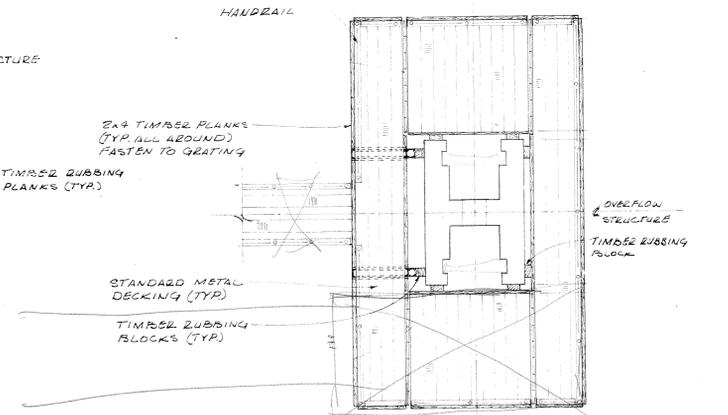
NOTE:
FILL VOID BETWEEN STOPLOG AND COVER PLATE WITH (DRY) CONCRETE MIX AFTER INSTALLING EACH STOPLOG TO MAKE A SEAL.



OVERFLOW STRUCTURE



APPROXIMATE LAYOUT FOR FLOTATION SYSTEM BY OTHERS

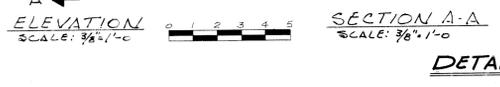


- NOTES:
1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
 3. ALL EXPOSED CORNERS OF STRUCTURE SHALL HAVE 1/2" RADIUS CHAMFERS. STOPLOGS SHALL NOT BE CHAMFERED.
 4. ELEVATIONS REFERRED TO USC AND GS DATUM.

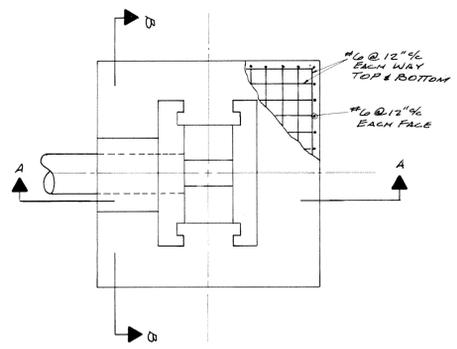
APPROVED
GUY E. GIBSON
CHIEF ENGINEER
DIVISION OF WATER CONSTRUCTION
STATE BOARD OF AGRICULTURE

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
SERVICE SPILLWAY
PLAN, SECTIONS AND DETAILS

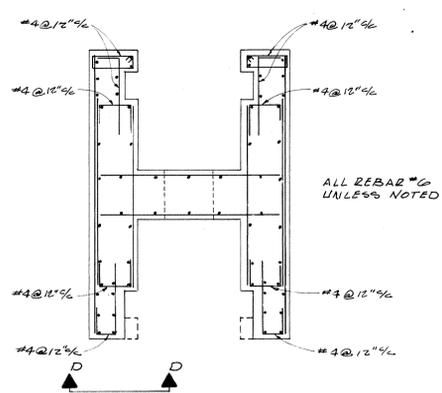
WOODWARD-CLYDE CONSULTANTS KANSAS CITY		APPROVED		DATE DEC 1978	
JAN 78	ANTI-SEEPAGE COLLARS AND ISSUED FOR CONSTRUCTION	BY	KJV	SCALE: AS SHOWN	
DEC 78	ISSUED FOR BID	ED	JDC		KC 205.80 SHEET 8
NO.	DATE	REVISION	BY	CH	APPROVED



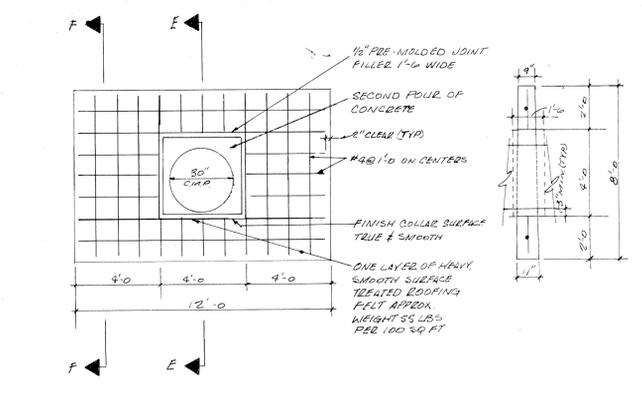
DETAIL OF TRASH SCREEN
2-REQUIRED



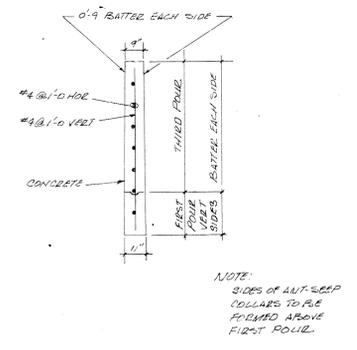
PLAN
SCALE: 1/4" = 1'-0"



SECTION C-C
SCALE: 1/4" = 1'-0"



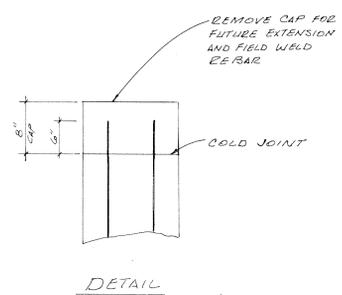
TYPICAL ANTI SEEPAGE COLLAR
(SEE SHEET B)



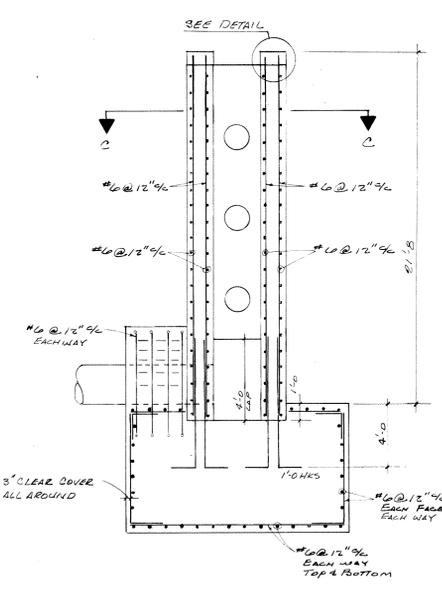
SECTION F-F

NOTE:
SIDES OF ANTI-SEEP COLLARS TO BE FORMED ABOVE FIRST POUR.

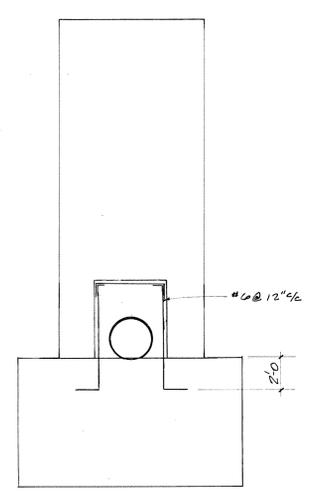
- NOTES:
1. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 2. ALL DIMENSIONS ARE IN UNITS OF FEET AND INCHES.
 3. SPLICES IN REINFORCING STEEL SHALL BE LAPPED OVER A LENGTH OF NOT LESS THAN 12 INCHES.
 4. ALL EXPOSED STEEL SHALL BE PROTECTED FROM CORROSION BY A MINIMUM OF TWO COATS LEAD BASED PAINT.
 5. ELEVATIONS REFERRED TO USC AND GS DATUM.
 6. DEFORMED BILLET STEEL REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A615-60, GRADE 60 STEEL EXCEPT USE GRADE 40 STEEL FOR MULTIPLE BEND BARS.



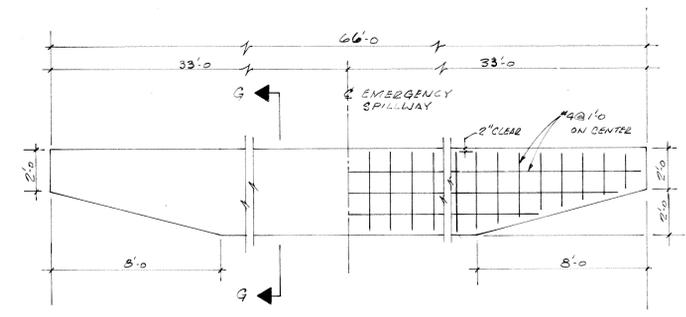
DETAIL



SECTION A-A
SCALE: 1/4" = 1'-0"

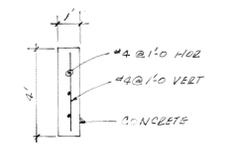


SECTION B-B
SCALE: 1/4" = 1'-0"

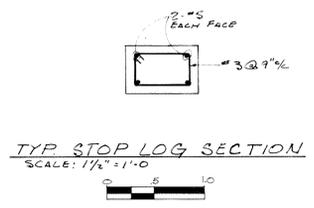


SEEPAGE CUTOFF WALL ON EMERGENCY SPILLWAY
(SEE SHEET 7)

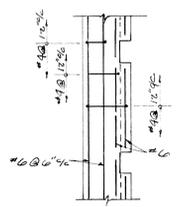
NOTE:
SIDES OF SEEPAGE CUTOFF WALL TO BE FORMED ABOVE EMBANKMENT



SECTION G-G



TYP STOP LOG SECTION
SCALE: 1/4" = 1'-0"



ELEVATION D-D
SCALE: 1/4" = 1'-0"

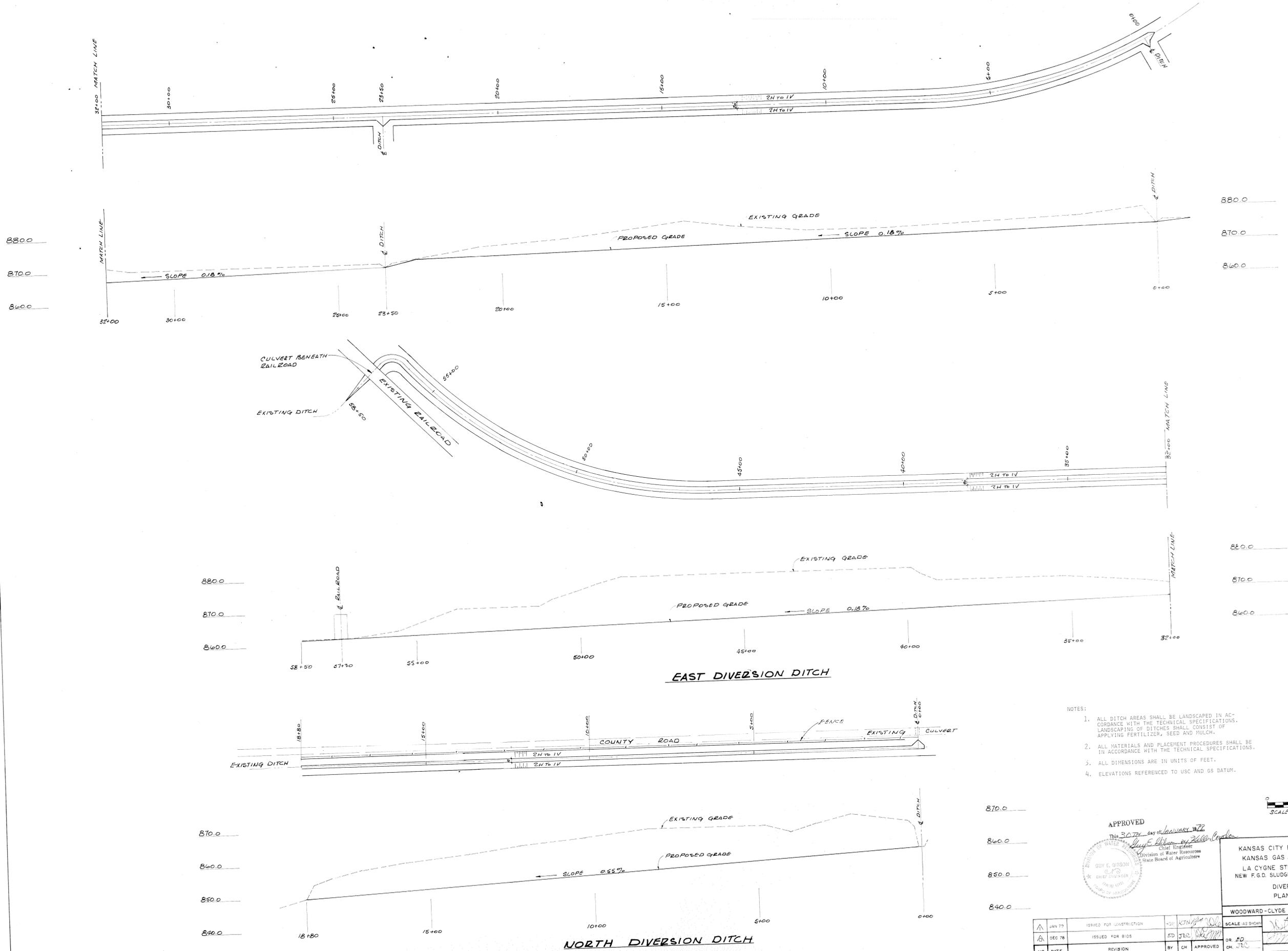
APPROVED
GUY E. GIBSON
C.E.
CHIEF ENGINEER
KANSAS STATE BOARD OF AGRICULTURE

30TH DAY OF JANUARY 1979
GUY E. GIBSON
Chief Engineer
Division of Water Resources
State Board of Agriculture

KANSAS CITY POWER & LIGHT COMPANY
KANSAS GAS AND ELECTRIC COMPANY
LA CYGNE STEAM ELECTRIC STATION
NEW F.G.D. SLUDGE RETENTION DAM - STAGE 1
SERVICE SPILLWAY
REINFORCING

NO	DATE	REVISION	BY	CH	APPROVED	SCALE AS SHOWN	DATE
1	JAN 79	ISSUED FOR CONSTRUCTION	KIN				DEC 1978
2	DEC 78	ISSUED FOR BIDS	ED	JDC			

WOODWARD-CLYDE CONSULTANTS KANSAS CITY
APPROVED
DR. ED
CH. JDC
KC 20580
SHEET 9



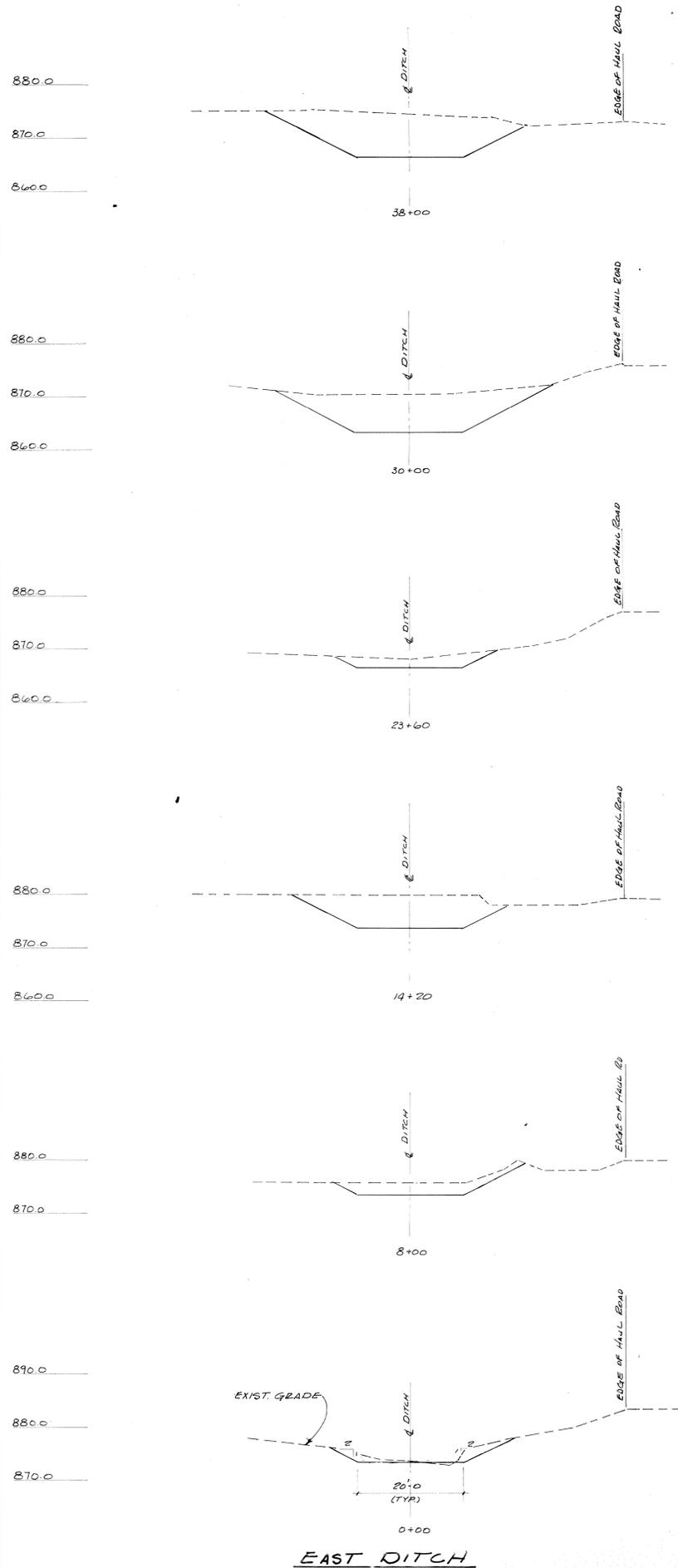
- NOTES:
1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZERS, SEED AND MULCH.
 2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 3. ALL DIMENSIONS ARE IN UNITS OF FEET.
 4. ELEVATIONS REFERENCED TO USC AND GS DATUM.



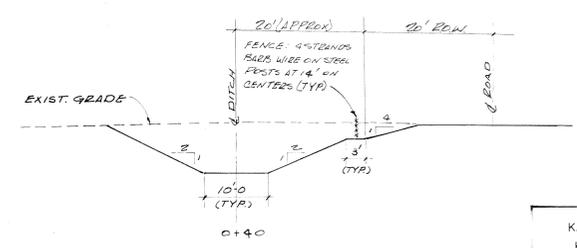
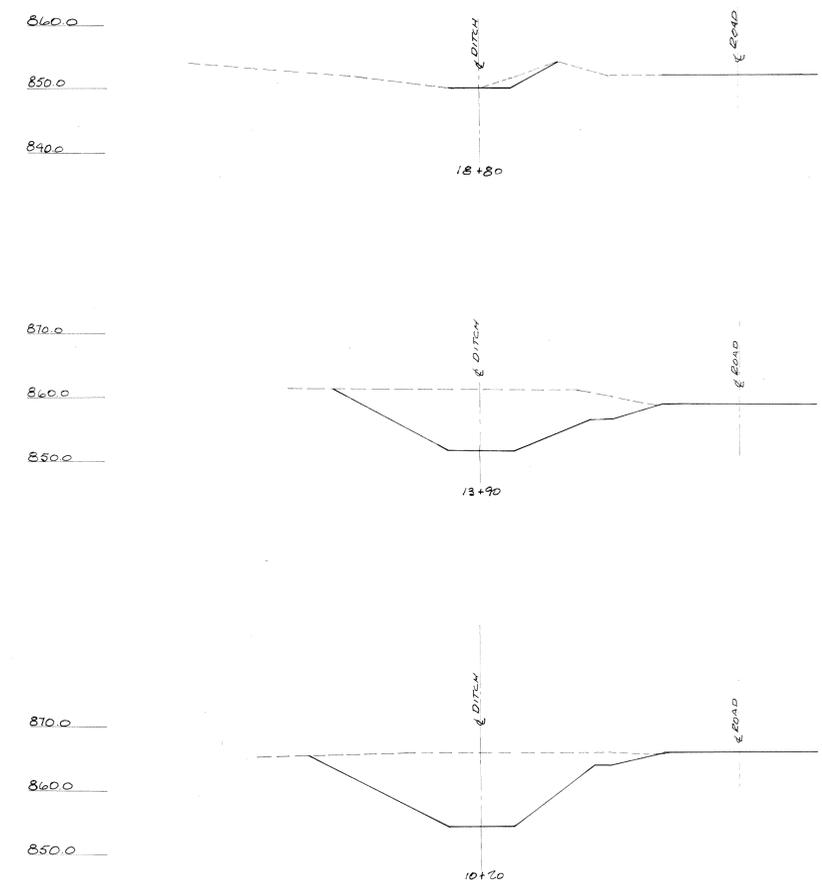
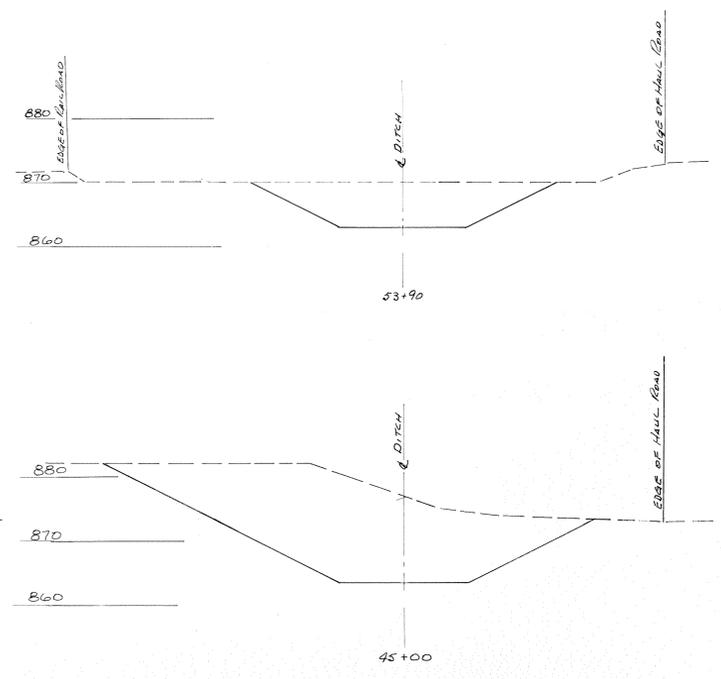
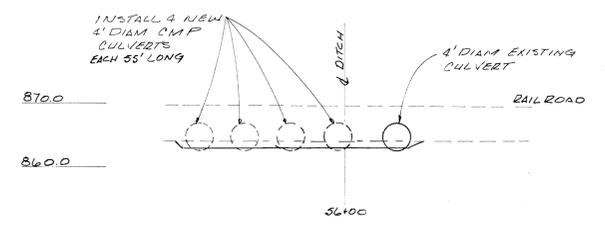
APPROVED
 This 30th day of January 1978
 GUY E. GIBSON
 Chief Engineer
 Division of Water Resources
 State Board of Agriculture

KANSAS CITY POWER & LIGHT COMPANY		WOODWARD-CLYDE CONSULTANTS KANSAS CITY	
KANSAS GAS AND ELECTRIC COMPANY		APPROVED	
LA CYGNE STEAM ELECTRIC STATION		DATE DEC 1978	
NEW F.G.D. SLUDGE RETENTION DAM - STAGE I		KC 205.80	
DIVERSION DITCHES		SHEET 10	
PLAN AND PROFILE			

NO	DATE	REVISION	BY	CH	APPROVED	CH
1	JAN 78	ISSUED FOR ADVERTISEMENT	JTG			
2	DEC 78	ISSUED FOR BIDS	JTG			



- NOTES:
1. ALL DITCH AREAS SHALL BE LANDSCAPED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS. LANDSCAPING OF DITCHES SHALL CONSIST OF APPLYING FERTILIZER, SEED AND MULCH.
 2. ALL MATERIALS AND PLACEMENT PROCEDURES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 3. ALL DIMENSIONS ARE IN UNITS OF FEET.
 4. ELEVATIONS REFERENCED TO USC AND GS DATUM.



EAST DITCH

NORTH DITCH

KANSAS CITY POWER & LIGHT COMPANY KANSAS GAS AND ELECTRIC COMPANY LA CYGNE STEAM ELECTRIC STATION NEW F.G.D. SLUDGE RETENTION DAM - STAGE I			
DIVERSION DITCHES SECTIONS AND DETAILS			
WOODWARD - CLYDE CONSULTANTS		KANSAS CITY	
APPROVED	DATE DEC. 1978	SCALE AS SHOWN	DATE DEC. 1978
DR. EC	CH. JR.	ED. JR.	CH. JR.
NO.	DATE	REVISION	BY

NO.	DATE	REVISION	BY	APPROVED
1	JAN 79	ISSUED FOR CONSTRUCTION	ED	CH
2	DEC 78	ISSUED FOR BIDS	ED	CH

Attachment C
Reference Documents
Technical Specifications

TECHNICAL SPECIFICATIONS

ITEM TS 1 - MOBILIZATION

1 - The work to be done under this item shall consist of supplying all labor, materials, and plant necessary for performing the work required under the contract.

**TS 1.1
SCOPE**

2 - It shall include the transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary facilities at the site; and performance of all work necessary for the mobilization of construction plant required to perform the work in accordance with these specifications.

3 - It shall not include mobilization for any specific item of work for which payment for mobilization is provided elsewhere in the Contract.

4 - The specification covers mobilization for work required by the Contract at the time of award. If additional mobilization costs are incurred during performance of the Contract as a result of changed or added items of work for which the Contractor is entitled to an adjustment in Contract price, compensation for such costs will be included in the price adjustment for the items of work changed or added.

1 - Contractor shall submit with his proposal, an itemized List of Construction Plant to be used on the job, together with the value of each item of construction plant.

**TS 1.2
LIST OF
CONSTRUCTION
PLANT**

2 - Contractor shall submit with monthly progress estimates, an itemized list of construction plant indicating the value of each piece of plant actually on the job site at the end of the monthly period.

After the initial payment, measurement for payment for mobilization will be made monthly on the basis of the percentage of the value of construction plant actually on the job site at the end of the monthly period less the total amount of all previous progress payment requests made under this item, providing that the total of all payment requests shall not exceed the lump sum price bid.

**TS 1.3
MEASUREMENT**

1 - Payment for mobilization of all construction plant necessary for the Contract will be made at the lump sum price bid in the Schedule of Bid Items, Item TS 1. One-third of the above sum will be payable 15 days after execution of the Contract.

**TS 1.4
PAYMENT**

2 - Payment of 90 percent of the remaining two-thirds of the lump sum price will be made as measured above.

3 - To the extent that the total of all payments under this item are less than the lump sum price bid, the balance will be included in the final payment for all work under the Contract.

**ITEM TS 2 - ACCESS AND HAUL ROADS CONSTRUCTION
AND MAINTENANCE**

The work to be done under this Item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for the construction and maintenance of access and haul roads required by the Contractor for his operations.

**TS 2.1
SCOPE**

1 - The locations of the existing and proposed access roads to the site are shown on the drawings. The Contractor may construct and maintain additional access and haul roads required by the Contractor for his operations.

**TS 2.2
GENERAL**

2 - Before commencing construction of the access and haul roads, the Contractor shall submit, for the approval of the Engineer, drawings showing the locations and details of such roads.

3 - Haul roads shall not traverse any land which is not the property of the Company.

4 - All access and haul roads built and maintained by the Contractor shall be available, without charge, for use by the Engineer and the Company and by others authorized by the Company.

5 - Signs, barriers, lighting, and all other devices and measures required to ensure the safe operation of vehicles on access and haul roads, and for the protection of life and property, shall be supplied and erected by the Contractor at no extra expense to the Company.

1 - Contractor shall maintain the access and haul roads in a safe and trafficable condition during the period of the Contract. Maintenance of the haul roads shall include, but not be limited to, grading at regular intervals, repairing the surface and shoulders, cleaning and repairing culverts and ditches, removal of fallen trees and other debris, repairs to signs, barriers, and other safety devices, dust control, and any other work which, in the opinion of the Engineer, is required to keep the roads in a safe and trafficable condition.

**TS 2.3
MAINTENANCE**

2 - Maintenance of access and haul roads shall start at the commencement of the Contract and shall continue, except as otherwise required by the Engineer, until completion of the Contract.

TS 2.3
MAINTENANCE
(cont'd)

Roads shall be provided with drainage ditches and culverts as required by the Contractor, subject to the approval of the Engineer. The access and haul roads shall not cause ponding of water or saturation of ground to the detriment of the operations of others.

TS 2.4
DRAINAGE

No separate payment shall be made for construction and maintenance of access and haul roads and the Contractor should include such costs in his unit prices.

TS 2.5
PAYMENT

ITEM TS 3 - CLEARING, GRUBBING, AND STRIPPING

1 - The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for clearing, grubbing, and stripping the site of the dam and borrow areas as shown on the drawings, as required by the Engineer, and as specified herein.

TS 3.1
SCOPE

2 - The work shall also include clearing and grubbing miscellaneous areas on the site, as required by the Engineer. The areas shall include, but not be limited to, working and storage areas for other contractors and storage areas required by the Engineer.

1 - The limits of the areas to be cleared, grubbed and stripped will be as shown on the drawings, as required by the Engineer, and as specified herein.

TS 3.2
LIMITS

1 - Clearing shall consist of cutting and disposing of all trees, shrubs, brush, debris and all other perishable materials, including fallen trees and logs which may be visible on the surface of the ground within the areas to be cleared.

TS 3.3
DEFINITIONS

2 - Grubbing shall consist of removing and disposing of all stumps, roots over 2 inches in diameter, and matted roots to a depth of 12 inches below the surface of the ground.

3 - Stripping shall consist of removing and disposing of all topsoil.

4 - Topsoil will include decomposed or partially decomposed wood, leaves, roots, or other organic matter, and material not acceptable to the Engineer for fill material from the borrow areas as designated by the Engineer and as specified herein.

TS 3.4
DISPOSAL OF
MATERIAL

1 - Topsoil obtained in stripping, which is suitable for landscaping, shall be stockpiled at locations approved by the Engineer.

2 - All soil, vegetation and debris resulting from clearing, grubbing, and stripping operations, regardless of size, shall be removed from the areas cleared, grubbed, or stripped and shall be disposed of in the Spoil Areas shown on the drawings by the following methods upon written approval of the Engineer.

a) Combustible materials may be piled and burned on open fires at locations approved by the Engineer and as specified herein. Material to be disposed of in this way shall be completely burned so that it is all reduced to ashes.

b) Materials obtained from clearing, grubbing, and stripping which cannot be burned may be placed in the spoil areas approved by the Engineer. When brush is placed in spoil areas, it shall be crushed with a tractor or other heavy equipment to a thickness of not more than 4 feet and covered with 2 feet of soil.

c) Materials obtained from the stripping operations may be used to construct dikes to dewater the dam foundation at the locations shown on the drawings.

d) No material from the clearing, grubbing, and stripping operations shall be placed or buried in areas not designated by the Engineer as spoil areas.

3 - At no time shall a fire be left unattended until it is fully extinguished. All burning shall be done in strict conformance with the rules and regulations of local, state, and federal agencies. Sufficient equipment shall be ready and available, together with a sufficient force of men, to control burning operations at any time.

Measurement for payment for stripping will be made on the number of cubic yards of material stripped between the original ground surface and the dam foundation surface as shown on the drawings and as specified by the Engineer.

**TS 3.5
MEASUREMENT**

1 - Payment for clearing and grubbing, complete in every respect and as specified herein, will be made at the lump sum price bid in Schedule of Bid Items, Item TS 3, 3A.

**TS 3.6
PAYMENT**

2 - Payment for stripping the dam foundation, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in Schedule of Bid Items, Item TS 3, 3B.

3 - No separate payment shall be made for stripping the borrow areas. The Contractor should include such costs in his unit prices.

ITEM TS 4 - DIVERSION AND DEWATERING

1 - The work to be performed under this item shall comprise the supply of all labor, material, and plant, and the performance of all work necessary, to divert and control surface water and to maintain the dam foundation free from water, as shown on the drawings, as required by the Engineer, and as specified herein.

TS 4.1
SCOPE

2 - The work to be done under this item shall include the following:

a) Diverting surface water - The Contractor shall build, maintain, and operate all cofferdams, channels, culverts, flumes, sumps, and other temporary diversion and protective works needed to divert streamflow and other surface water through or around the construction work while construction is in progress.

b) Dewatering the construction site - Foundations and other parts of the construction site shall be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction work. The Contractor shall furnish, install, operate, and maintain all drains, sumps, pumps, and other equipment needed to perform the dewatering as specified. Dewatering methods that cause a loss of fines from foundation areas will not be permitted.

Prior to initiating construction, the Contractor shall furnish to the Engineer, in writing and sketches, his plans for diverting surface water and dewatering of the construction site and obtain approval from the Engineer; the responsibility of diversion and dewatering is the Contractor's. Submission and approval of these plans do not remove this responsibility.

TS 4.2
GENERAL

No separate payment shall be made for diverting surface water and dewatering the construction site. The Contractor should include such costs in his unit prices.

TS 4.3
MEASUREMENT
AND PAYMENT

ITEM TS 5 - EXCAVATION

The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary to excavate, load, haul, and dispose of all materials from required excavations shown on the drawings, as required by the Engineer, and as specified herein. Required excavations shall include: east diversion ditch, north diversion ditch, and FGD sludge from dam foundation on south alignment.

TS 5.1 SCOPE

1 - Excavation will be classified as common excavation or sludge excavation in accordance with the following definitions.

TS 5.2 CLASSIFICATION

a) Common excavation shall be defined as the excavation of all materials containing no significant organic material or FGD sludge, as shown on the drawings and as required by the Engineer.

b) Sludge excavation shall be defined as the removal of all FGD sludge from the dam foundation areas as shown on the drawings and as required by the Engineer.

2 - Excavation will be classified according to the above definitions by the Engineer.

1 - Materials obtained from common excavation shall be used in the dam embankment and other fill areas subject to approval of the Engineer and provided that the material conforms to the appropriate requirements as specified in TS 6 - Embankment Fill. Excavated material which does not conform to these requirements shall be wasted in spoil areas shown on the drawings or approved by the Engineer.

TS 5.3 GENERAL

2 - The sludge deposit shall be removed in such a manner that the Engineer may readily determine that satisfactory foundation material has been encountered and that satisfactory removal has been accomplished.

TS 5.3
GENERAL
(cont'd)

3 - The procedure to be used by the Contractor for sludge excavation will be reviewed and approved by the Engineer prior to beginning the work. All excavated areas will be inspected and approved by the Engineer prior to backfilling with drain and embankment material as specified in TS 6 - Embankment Fill.

4 - Excavated sludge shall be disposed of in the adjacent existing sludge pond shown on the drawings, and as directed by the Engineer.

5 - Excavation beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earth fill, except that, if the earth is to become the subgrade for riprap, sand, or gravel bedding, or drain fill, the voids may be filled with material conforming to the specifications for the riprap, bedding, or drain fill.

6 - Structure or trench excavation shall be completed to the specified elevations and to sufficient length and width to include allowance for forms, bracing, and supports, as necessary, before any concrete, earth or granular fill is placed within the limits of the excavation.

7 - All necessary precautions shall be taken to preserve in a sound and undisturbed condition all material below and beyond the limits of the excavations shown on the drawings.

8 - Until final acceptance of the work, the Contractor shall have sole responsibility for the safety of excavations to be performed under this Contract. Contractor shall ensure that all slopes are maintained and left in a safe and stable condition.

9 - Excavated areas shall be drained as required in TS 4 - Diversion and Dewatering. No direct payment will be made for this work. Costs should be included in appropriate bid item for excavation.

The North Diversion Ditch and the East Diversion Ditch shall be excavated to full depth soon after the start of construction work.

TS 5.4
NORTH AND EAST
DIVERSION DITCHES

Measurement for payment for excavation will be made of the number of cubic yards of material excavated between the original ground surface or existing ground surface and the lines and grades shown on the drawings, or as required by the Engineer.

TS 5.5
MEASUREMENT

1 - Payment for excavating, loading, hauling, and disposing of each type and class of excavation, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in the Schedule of Bid Items, TS 5, 5A and 5B.

TS 5.6
PAYMENT

2 - Payment for backfilling overexcavation, as specified in TS 5.3 of this specification, will be made only if the excavation outside the specified lines and grades is directed by the Engineer to remove unsuitable material and if the unsuitable material is not a result of the Contractor's operations.

ITEM TS 6 - EMBANKMENT FILL

The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary to excavate, load, transport, dump, spread, adjust moisture content, and compact fill material for the dam, as shown on the drawings, as required by the Engineer, and as specified herein.

TS 6.1 SCOPE

The dam will be an earthfill structure composed of an upstream impervious zone and a downstream random fill zone. Drainage zones are included in the dam and are discussed in TS 7 - Filter Zones. It is the intent to utilize, as much as possible, the fill materials directly from designated borrow areas and required excavations, however, moisture content changes may be required.

TS 6.2 GENERAL

1 - The materials available in the designated borrow areas and required excavations in the diversion ditches consist of surficial layers of residual, plastic, silty clays and weathered, plastic, clay shales which are suitable for use in the impervious fill zone. The surficial soils are underlain by relatively less weathered and less plastic clay shales suitable for use in random portions of the fill.

TS 6.3 MATERIALS

2 - Fill materials shall contain no significant amount of sod, brush, roots, or other perishable materials.

1 - Foundation areas shall be cleared, grubbed, and stripped in accordance with TS 3 - Clearing, Grubbing, and Stripping.

TS 6.4 FOUNDATION PREPARATION

2 - Foundation excavations shall be completed as shown on the drawings and as required in TS 5 - Excavation.

3 - No dam embankment fill shall be placed on any section of the foundation areas until that section of foundation has been approved by the Engineer.

4 - Foundation preparation in the areas requiring dewatering shall be scheduled such that filter and fill materials may be placed immediately following preparation.

TS 6.4
FOUNDATION
PREPARATION
(cont'd)

5 - Foundation areas shall be free of loose, uncompacted soil in excess of 3 inches in thickness and shall be at such a water content that fill can be compacted to bond the fill and foundation soils.

1 - The detailed planning of the exploration of the designated borrow areas and approved excavations shall be the responsibility of the Contractor and shall be subject to the approval of the Engineer. To that end, prior to commencement of the work, Contractor shall submit for approval by the Engineer, a plan showing the general details for his proposed exploitation of designated borrow areas and approved excavations. During construction, the plan shall be reviewed weekly and modified as required.

TS 6.5
BORROW
OPERATIONS

2 - Borrow shall not be obtained outside the designated areas without prior approval of the Engineer.

3 - All permanent slopes in borrow areas and approved excavations shall not be steeper than those shown on the drawings unless approved by the Engineer.

4 - Drainage of surface and ground water in borrow areas shall be provided so as not to overwet borrow material.

5 - Haul roads shall be constructed in accordance with TS 2 - Access and Haul Road Construction and Maintenance.

TS 6.6
IMPERVIOUS FILL

1 - Fill to be placed in the impervious zone of the dam shall be silty or sandy clay and clay (identified by the Unified Soil Classification System as CL and CH) obtained from on-site borrow areas and the required excavations, and shall be placed to achieve a homogeneous fill. Segregation and nesting of pervious material will not be accepted. Whenever nesting or segregation of pervious material occurs, the material shall be removed to the random zone.

2 - The impervious fill shall be spread on lines parallel to the axis of the dam in lifts of uniform thickness not exceeding 8 inches before compaction.

3 - The water content of the impervious fill, prior to and during compaction, shall be uniform throughout each lift of material. Contractor shall control the water content of impervious fill between 2 percentage points below and 2 percentage points above the laboratory optimum water content as determined by the standard compaction test designated ASTM D698-70.

4 - If the water content of the impervious fill is less than that specified, water shall be added to the impervious fill and the fill worked with a harrow, scarifier, or other approved equipment until the water is uniformly distributed throughout the lift and the water content of the impervious fill satisfies the requirements of these specifications.

5 - If the water content of the impervious fill is more than that specified, the fill shall be reworked with harrow, scarifier, or other approved equipment or it shall be mixed with drier impervious fill to reduce the water content until it satisfies the requirements of these specifications.

TS 6.6
IMPERVIOUS FILL
(cont'd)

6 - When each lift of fill has been spread, it shall be compacted parallel to the axis of the dam by a sheepsfoot roller or approved equivalent. Each compactor coverage shall overlap the adjacent coverage. Maximum speed of compactor shall be 4 miles/hr unless otherwise approved by the Engineer. The impervious fill shall be compacted to a dry density at least equal to 95 percent of the maximum obtained by the standard compaction test designated ASTM D698-70.

7 - To minimize the effect of precipitation on placed fill, the surface shall be rolled smooth prior to any suspension of operations. During spreading and compacting, the impervious fill surface shall be provided with a grade transverse to the axis of the dam of not less than 3 percent to ensure drainage of surface water from the embankment.

8 - If the surface of any compacted lift of impervious fill is too dry or, in the opinion of the Engineer, too smooth to bond properly with the lift of material to be placed thereon, the lift shall be wetted and worked with a harrow, scarifier, or other approved equipment to a sufficient depth to provide a satisfactory bonding surface, before the succeeding lift is placed.

9 - If the surface of any compacted lift of impervious fill is too wet to allow proper compaction of the impervious fill to be placed thereon, it shall be reworked with harrow, disc, or other approved equipment or mixed with drier impervious fill material to reduce the water content until it satisfies the requirements of these specifications. The reworked fill shall be recompact to the requirements of these specifications at no additional cost to the Company before any succeeding lift of fill is placed thereon.

10 - Any compacted lifts of impervious fill which have suffered a reduction in density due to the action of frost, precipitation, or for any other reason, shall be worked and recompact to the requirements of these specifications at no additional cost to the Company, before spreading and compacting operations are resumed.

11 - Fill shall not be placed in a frozen condition, or on a surface which is frozen, or on which there is any snow or ice. Placing of impervious fill in freezing weather will be permitted only when proper measures are taken to prevent freezing of the material.

TS 6.6
IMPERVIOUS FILL
(cont'd)

12 - Construction traffic shall be routed such that ruts are not formed on the surface of any lift. If ruts are formed, they shall be graded level and recompact to the requirements of these specifications.

13 - Any and all materials which do not meet the requirements as specified for fill and accumulate on the surface of any lift or prepared foundation, shall be removed by Contractor at no additional cost to the Company before any material is placed in the succeeding lift.

14 - In the impervious fill, sheepsfoot rollers shall not be used within 24 inches of the conduits. Special attention shall be given to the compaction of the impervious fill within these areas. Within 24 inches of the conduits, impervious fill shall be spread in lifts of uniform thickness not exceeding 4 inches before compaction and compacted with six complete coverages of a Wacker Model GVR-200Y, or approved equivalent.

Random fill placed in the random fill zone of the dam shall meet the general placing, spreading, and compacting requirements presented for impervious fill except that clay shales as well as the impervious fill materials will be permitted from the approved borrow areas and required excavations.

TS 6.7
RANDOM FILL

1 - Field inspection and testing will be carried out by the Engineer. Contractor shall facilitate the inspection and the performance of these tests.

TS 6.8
INSPECTION

2 - Rejection by the Engineer of fill for any zone may be made in the borrow areas, in the transporting vehicle, or in the fill.

TS 6.8
INSPECTION
(cont'd)

To facilitate Contractor's plan for the sequence of construction of the dam, a limited number of temporary slopes in the embankment will be permitted upon approval of the Engineer. In no case shall such temporary slopes be steeper than 2.5 horizontal to 1 vertical. Care will be taken when fill is placed against these temporary slopes that all loose material is removed and a good bond is obtained.

TS 6.9
TEMPORARY
SLOPES IN
EMBANKMENT

Measurement for payment for various types of fill will be made on the actual number of cubic yards for each type of fill in place, between the surfaces of the prepared foundations and the lines and grades shown on the drawings, and as required by the Engineer.

TS 6.10
MEASUREMENT

1 - Payment for excavating, loading, hauling, dumping, spreading, adjusting moisture content, and compacting impervious fill in the impervious fill zone, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in the Schedule of Bid Items, Item TS 6, 6A.

TS 6.11
PAYMENT

2 - Payment for excavating, loading, hauling, dumping, spreading, adjusting moisture content, and compacting random fill in the dam, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in the Schedule of Bid Items, Item TS 6, 6B.

ITEM TS 7 - FILTER ZONES

The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for transporting, dumping, and spreading filter material as shown on the drawings, as required by the Engineer, and as specified herein. For the purpose of these specifications, the filter zones designated on the drawings shall include the inner drains, lateral drains and toe drains.

TS 7.1
SCOPE

1 - This material shall consist of bottom ash as produced by the La Cygne Power Plant. This material is available as is, at the power plant's bottom ash storage bin or disposal pile, free of charge to Contractor.

TS 7.2
FILTER MATERIAL
REQUIREMENTS

2 - Contractor shall haul the bottom ash from the storage bin or excavate and haul the bottom ash from the disposal pile and in doing so shall arrange with the power plant manager the method of excavation and transportation, and accommodate other requirements of the management.

3 - The material for use in the dam shall be free of foreign matter, and shall conform to the following grading requirements:

<u>U.S. Standard Sieve</u>	<u>Percentage Passing</u>
1-1/2 Inch	100 percent
No. 4	90 - 100 percent
No. 200	0 - 5 percent

Tests performed by Engineer which are included in the Data for Bidders indicate that this gradation is available in the bottom ash produced at the plant.

1 - All filter materials shall be approved by the Engineer prior to placement.

TS 7.3
FILTER MATERIAL
PLACEMENT

2 - Filter material shall not be placed until the subgrade has been inspected and approved by the Engineer.

**TS 7.3
FILTER MATERIAL
PLACEMENT
(cont'd)**

3 - Filter material shall be placed in such a manner as to avoid segregation of particle sizes and to ensure continuity and integrity of all lifts. No foreign materials shall be allowed to become intermixed with or otherwise contaminate the filter material.

4 - Any layer or layers which, in the opinion of the Engineer, have been significantly contaminated to impair free drainage of the filter material shall be removed at no additional expense to the Company before placing operations are resumed.

5 - Filter material shall generally be placed in the following manner:

- a) Embankment fill shall be placed adjacent to the drain locations according to the methods specified in TS 6.
- b) At the locations of the drains, trenches shall be excavated and cleaned to subgrade.
- c) The filter material shall be placed in one lift.
- d) No compaction of the filter material shall be required beyond that resulting from dumping and spreading operations.

Measurement for payment of all filter material will be made in the embankment as the actual volume in cubic yards between the surface of the prepared foundations and the lines and grades shown on the drawings, and as required by the Engineer.

**TS 7.4
MEASUREMENT**

Payment for excavating, hauling, and placing bottom ash filter material, complete in every respect and as specified herein, will be at the unit price per cubic yard bid in Schedule of Bid Items, Item TS 7.

**TS 7.5
PAYMENT**

ITEM TS 8 - RIPRAP AND EMERGENCY SPILLWAY

1 - The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for supplying, transporting, and constructing rock riprap which includes bedding for riprap on the emergency spillway and in the stilling basins, as shown on the drawings, as directed by the Engineer, and as specified herein.

**TS 8.1
SCOPE**

2 - The work shall also include supplying and installing a shallow concrete cutoff wall through the riprap on the crest of the emergency spillway, as shown on the drawings, as directed by the Engineer, and as specified herein.

1 - Riprap and bedding for riprap shall be obtained off-site subject to the approval of the Engineer. Rock for riprap and bedding for riprap shall be hard, dense, sound, durable, and free from cracks, seams, and other defects conducive to accelerated weathering. The rock fragments for riprap shall be generally cubical in shape with the largest dimensions not more than twice the smallest. Long flat stones shall not be used.

**TS 8.2
MATERIALS**

2 - Riprap shall be reasonably well graded and at least 50 percent by weight of riprap shall be rock exceeding the 100-pound size. Not more than 5 percent shall be rock dust or sand. The riprap shall be approved by the Engineer prior to placement.

3 - Bedding for riprap shall be reasonably well graded and at least 90 percent by weight shall range in particle size from 1/4 inch to 3 inches. Not more than 10 percent shall be rock dust or sand. The bedding for riprap shall be approved by the Engineer prior to placement.

4 - Concrete for the cutoff wall on the crest of the emergency spillway shall be in accordance with the requirements of TS-9.

1 - Bedding for riprap is required at all locations on the drawings where riprap is shown. Bedding for riprap shall be located in the lower 6 inches of the riprap zone shown on the drawings.

**TS 8.3
BEDDING**

2 - The subgrade surfaces on which the bedding for riprap is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of fill.

3 - Bedding for riprap shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved by the Engineer.

4 - Bedding material shall be spread uniformly on the prepared subgrade surfaces to a depth of 6 inches normal to the subgrade. Compaction of bedding will not be required, but the surface shall be finished reasonably free of mounds, dips, or windows.

5 - It is essential that the grading of the bedding material relative to the riprap be such that it will not be washed out through the voids in the riprap.

1 - Riprap shall be placed accurately and carefully to the required lines and grades. It shall be dumped and graded off in a manner to ensure that the larger rock is uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock in such a manner as will result in a uniform layer of riprap of the specified thickness. The Engineer shall be the sole judge as to the proper rock size, grading, and thickness of the riprap.

**TS 8.4
PLACEMENT**

2 - The specifications as to rock size and grading mentioned herein shall apply to riprap in place.

3 - Concrete cutoff wall on crest of emergency spillway may be formed and cast; riprap and bedding may then be placed against cutoff wall.

TS 8.4
PLACEMENT
(cont'd)

Measurement for payment for riprap, including bedding for riprap will be in square yards of the surface area covered to the neat lines and grades shown on the drawings and as required by the Engineer.

TS 8.5
MEASUREMENT

1 - Payment for supplying, hauling, and placing riprap, including bedding for riprap, complete in every respect and as specified herein, will be at the unit price per square yard bid in Schedule of Bid Items, Item TS 8, 8A.

TS 8.6
PAYMENT

2 - Payment for supplying, excavating, forming and installing cutoff wall on crest of emergency spillway, complete in every respect and as specified herein, will be at the lump sum price bid in Schedule of Bid Items, Item TS 8, 8B.

ITEM TS 9 - CONCRETE

The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for final grading and proofrolling of subgrades; supplying, transporting, storing, handling, batching, mixing, placing, curing, and finishing concrete; supplying fabricating, erecting, dismantling, and removing forms; and supplying, handling, storing, cutting, bending, and fastening in position reinforcing steel as shown on the drawings, as required by the Engineer, and as specified herein.

TS 9.1
SCOPE

1 - Concrete shall be composed of regular Portland cement, water, and fine and coarse aggregates and may include fly ash. It shall also contain an air-entraining admixture and, subject to the approval of the Engineer, may contain a water-reducing admixture.

TS 9.2
COMPOSITION
OF CONCRETE

2 - Cement shall conform to the requirements of ASTM C150 for Type II or Type IIA cement.

3 - Mixing water shall be clear and free from injurious amounts of oil, acid, alkali, organic matter, sediment, or any other deleterious substances. Fine and coarse aggregate shall conform to the requirements of ASTM C33. Fly ash shall conform to the requirements of ASTM C 618.

4 - The admixture required for air entrainment shall conform to the requirements of ASTM C 260. The water-reducing admixture shall conform to the requirements of ASTM C 494 for Type A water-reducing admixtures.

The concrete constituents shall be stored, handled, batched, mixed, placed, cured, and finished in accordance with best modern practice. The Engineer shall inspect and approve the equipment and methods proposed for all concrete work by the Contractor.

TS 9.3
CONCRETE
QUALITY
ASSURANCE
GENERAL

1 - The concrete mix design proposed by the Contractor shall be submitted to the Engineer for approval.

**TS 9.4
CONCRETE MIX
DESIGN
REQUIREMENTS**

2 - Concrete shall conform to the following requirements:

Minimum Cement Content (pounds per cubic yard)	550
Fly ash may be used to reduce the minimum cement content in amounts up to 15 percent of the cement content.	
Air Entrainment (percent)	4 to 8
Slump (inches)	3 to 4
Minimum 28-day Strength (psi)	4000
Maximum Aggregate Size for Section Thickness Less Than 11 Inches (inches)	3/4
Maximum Aggregate Size for Section Thickness 11 Inches and Greater (inches)	1-1/2

Samples of concrete shall be cast and taken by the Engineer for concrete strength tests. The Contractor shall provide unhindered access at all times for the purposes of inspection and selection of samples. The tests will be performed in accordance with ASTM C39. Tests will be performed on 6-inch diameter by 12-inch long cylinders, and each test will be the average of two companion cylinders.

**TS 9.5
CONCRETE
TESTING**

1 - Forming, falsework, and shoring shall be designed, constructed, supported, and braced by the Contractor subject to the approval of the Engineer.

**TS 9.6
FORMING
FALSEWORK**

2 - Construct formwork to conform to the following tolerances. Camber formwork as necessary to compensate for deflections resulting from construction load and placement of concrete.

TS 9.6
FORMING
FALSEWORK
(cont'd)

Variation from plumb: 1/4 inch in 10 feet

Variation from level or grades indicated on drawings: 1/4 inch in 10 feet

Variation in sizes and locations of sleeves, floor and wall openings: 1/4 inch

Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls: Plus 1/4 inch; minus 1/4 inch

Footings -

Variations from plan dimensions: Plus 2 inches; minus 1/2 inch

Variations from thickness: Minus 5 percent of thickness as shown on drawings

Misplacement or eccentricity: 2 percent of footing width

1 - Final grades shall be proofrolled by a method deemed satisfactory by the Engineer.

TS 9.7
CONCRETE
PLACEMENT

2 - All concrete shall be placed at the lines and grades shown on the drawings and as directed by the Engineer.

3 - The Contractor shall obtain approval of the Engineer before commencing placement of any concrete. Concrete placement will not be permitted when, as determined by the Engineer, conditions prevent proper placement and consolidation.

4 - Before proceeding with any concrete placement, the Contractor shall prepare and submit to the Engineer for approval, any proposed construction joint layout which differs from that shown on the drawings, and a schedule showing the number, size, and sequence of the placements proposed.

5 - Surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, mud, objectionable coating, debris, or other unsound material. All surfaces shall be wet prior to placing concrete.

**TS 9.7
CONCRETE
PLACEMENT
(cont'd)**

6 - The Contractor shall provide adequate facilities to protect the concrete from the weather at all times.

7 - The temperature of the concrete during the placing operation shall be not less than 40 degrees F and not greater than 90 degrees F.

8 - Vibrators shall be used to place concrete and shall be of the internal type and shall be operated at a frequency of not less than 7000 impulses per minute when fully immersed. Extreme care shall be taken to ensure that the vibrators do not disturb the reinforcing, embedded steel, or forms.

Formwork for columns, walls, sides of beams or other parts not supporting the weight of the concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations. Allow at least 4 days after placement of concrete before stripping.

**TS 9.8
REMOVAL OF
FORMWORK**

1 - Deformed Billet Steel Reinforcing Bars shall conform with the requirements of ASTM specification A615-68, Grade 60 steel except use Grade 40 for multiple bend bars.

**TS 9.9
REINFORCING
STEEL**

2 - All reinforcing steel, before being placed on position, shall be thoroughly cleaned of loose mill and rust scale, grease, paint, or other coatings of any type that would reduce the bond.

3 - Reinforcing steel shall be continuous through all construction joints.

4 - Reinforcing steel shall be properly located in accordance with the drawings and securely tied in position, prior to concreting.

5 - The Engineer shall inspect and approve reinforcing steel in place prior to concreting.

TS 9.9
REINFORCING
STEEL
(cont'd)

The finishes to be given to concrete surfaces are described below:

TS 9.10
CONCRETE
FINISHES

a) Type F1 finish shall apply to formed surfaces which will not be exposed to view. The surfaces will, in general, require no treatment after form removal other than repair of defective concrete and specified curing.

b) Type F2 finish shall apply to all permanently exposed formed surfaces. Forms shall be placed so that joint marks on the concrete surface are in general alignment both horizontally and vertically. Immediately after removal of forms, all ridges and fins shall be removed which, in the opinion of the Engineer, will interfere with proper operation of the structure and undesirable local bulging on exterior surfaces shall be remedied by tooling and rubbing, to the satisfaction of the Engineer.

c) Type U1 finish (screeded) shall apply to unformed surfaces that will be covered by fill material or by concrete. Type U1 finish shall be used as the first stage of Type U2 finish. Finishing operations shall consist of sufficient leveling and screeding to produce even, uniform surfaces.

d) Type U2 finish (floated) shall apply to unformed surfaces not permanently covered by fill or concrete. Floating may be performed by hand or by power-driven equipment. Floating shall be started as soon as the screeded surface has stiffened sufficiently, and shall be the minimum necessary to produce a surface free from screed marks and uniform in texture, to the satisfaction of the Engineer.

1 - Porous and defective concrete and concrete damaged from any cause shall be removed and replaced with acceptable concrete by Contractor. Irregularities of alignment due to inaccurate finishing of surfaces, bulging of forms, or other defects, shall be rectified.

TS 9.11
DAMAGED OR
DEFECTIVE
CONCRETE

2 - All porous and fractured concrete, and surface concrete to which additions are required to bring it to prescribed lines shall be removed by chipping openings into the concrete to bare the reinforcing with dimensions as directed by the Engineer. The chipped openings shall be sharp-edged and keyed, and shall be filled to the prescribed lines with approved high strength mortar, as required by the Engineer.

Measurement for payment for concrete will be made on the basis of the actual volume of cubic yards measured from neat lines of concrete to neat lines of excavation, as shown on the drawings, and as specified by the Engineer.

TS 9.12
MEASUREMENT

No separate payment shall be made under this item. Concrete costs shall be included in appropriate item in the Schedule of Bid Items.

TS 9.13
PAYMENT

ITEM TS 10 - SERVICE SPILLWAY, PIPE CULVERT
AND APPURTENANCES

1 - The work to be done under this item shall consist of the supply of all labor, materials, and plant and the performance of all work necessary to excavate, load, haul, and dispose of all materials from required excavations; supplying, installing, and jointing 30-inch diameter pipe culvert; supplying, transporting, storing, handling, batching, mixing, placing, curing and finishing concrete; supplying, fabricating, erecting, dismantling, and removing forms; supplying, handling, storing, cutting, bending, and fastening into position reinforced steel; supplying, transporting, dumping, spreading and compacting backfill material; supplying, handling, storing, fabricating, and installing service spillway structure, stop logs and covers and trash racks; and constructing rock riprap as shown on the drawings, as required by the Engineer and as specified herein.

TS 10.1
SCOPE

2 - The work to be done under this item shall include the following:

a) Culvert - excavate trench for culvert and open-channel ditch, prepare foundation, supply and install culvert, supply and install anti-seepage collars, supply and install backfill around culvert.

b) Service Spillway Structure - excavate foundation area, prepare foundation, construct service spillway structure, stop logs and cover plates, and trash rack.

1 - Excavation under this item shall include that required for the service spillway structure, culvert, and open-channel ditch.

TS 10.2
EXCAVATION

2 - Excavations shall be made in accordance with the requirements of TS 5. Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased, if necessary, to provide space for sheeting, bracing, shoring, and other supporting installations. The Contractor shall furnish, place, and subsequently remove such supporting installations. Payment for excavation will be made under the respective pay items in this section, TS 10.

**TS 10.2
EXCAVATION
(cont'd)**

3 - All culvert shall be installed in a trench excavated by approved means. The trench shall be of adequate width and depth to permit installation of culvert and backfill in accordance with the manufacturer's specifications and the dimensions shown on the drawings.

1 - Foundation areas for the service spillway structure, culvert, and anti-seepage collars shall be prepared and compacted to the lines and grades as shown on the drawings with six complete coverages of a Wacker Model GVR-200Y or approved equivalent.

**TS 10.3
FOUNDATION
PREPARATION**

2 - Prior to placement of culvert or concrete, foundation areas shall be inspected and approved by the Engineer.

The Contractor shall supply the culvert and all materials necessary for installation and backfill. The culvert shall be 30-inch diameter corrugated steel pipe such as the 14 gauge welded seam Hel-Cor pipe with 2-2/3 inch by 1/2 inch corrugations and full asphalt coating as manufactured by ARMCO or an approved equivalent. Joints shall be the asphalt coated H-10 Hugger joints with O-ring gaskets as manufactured by ARMCO or an approved equivalent.

**TS 10.4
CULVERT**

1 - Culvert shall be transported, handled on the site, and installed in such a manner as to avoid damage to the culvert or its coating. Damaged culvert shall be removed from the site and replaced by Contractor at no additional cost to the Company. Damaged coating shall be repaired by Contractor.

**TS 10.5
CULVERT
HANDLING**

2 - Culvert shall be laid to the lines and grades shown on the drawings and as required by the Engineer. It shall be laid continuously starting at the downstream section and working upstream.

TS 10.5
CULVERT
HANDLING
(cont'd)

1 - The Contractor shall spread and compact backfill to make intimate contact with the culvert in the locations and to the lines and grades shown on the drawings and as specified herein.

TS 10.6
CULVERT
BACKFILL

2 - Cast-in-place anti-seepage collars shall be constructed in the impervious zone around the pipe in accordance with the drawings. Concrete in these collars shall be in accordance with TS 9.

3 - Backfill material to be placed around the culvert in the impervious zone shall consist of impervious fill material in accordance with TS 6, as shown on the drawings and as required by the Engineer.

4 - Backfill material to be placed around the culvert in the random zone shall consist of random fill material in accordance with TS 6, as shown on the drawings and as required by the Engineer.

5 - To a height not less than 24 inches above the crown of the pipe, all backfill material shall not contain particles larger than 4 inches in maximum dimension and shall be spread in approximately horizontal 4 inch layers. Compaction of each lift shall be achieved by not less than six complete coverages of the surface of each lift by Wacker Model GVR-200Y or approved equivalent.

6 - For the remaining height of backfill placement, compaction requirements shall conform to the requirements for impervious fill and random fill, as specified in TS 6. In areas where trench dimensions restrict the use of compactors specified in TS 6, the Contractor shall obtain approval of Engineer of alternate compaction procedures.

1 - The Contractor shall construct a reinforced concrete service spillway structure, stop-logs and covers, and trash racks, to the lines and grades shown on the drawings, as directed by the Engineer and as specified herein.

**TS 10.7
SERVICE
SPILLWAY
STRUCTURE**

2 - The service spillway structure shall be a stop-log type decant structure and connect to the 30-inch diameter culvert as shown on the drawings. Concrete shall be in accordance with TS 9.

1 - Contractor shall excavate an open-channel ditch at outlet of culvert to the lines and grades shown on the drawings.

**TS 10.8
OPEN-CHANNEL
DITCH**

2 - Riprap shall be placed at outlet of culvert as shown on the drawings and shall conform to the requirements of TS 8.

Measurement for payment for supplying, excavating, installing and backfilling shall be made on the length of culvert in feet installed from the edge of the service spillway structure as shown on the drawings and as required by the Engineer.

**TS 10.9
MEASUREMENT**

1 - Payment for excavating, supplying, installing and backfilling culvert, anti-seepage collars, open-channel ditch and riprap complete in every respect and as specified herein shall be made at the unit price per lineal foot bid in Schedule of Bid Items, item TS 10, 10A.

**TS 10.10
PAYMENT**

2 - Payment for constructing service spillway structure, stop-logs and cover plates, and trash racks, complete in every respect and as specified herein, shall be made at the lump-sum price bid in Schedule of Bid Items, item TS 10, 10B.

ITEM TS 11 - DIVERSION DRAINAGE CULVERTS

1 - The work to be done under this item shall consist of the supply of all labor, materials, and plant and the performance of all work necessary to dismantle, move, store and replace existing railroad tracks; excavate, load, haul, and dispose of all materials from required excavations; supplying, installing, and jointing four 48-inch diameter pipe culverts, as shown on the drawings, as required by the Engineer and as specified herein.

TS 11.1
SCOPE

2 - The work to be done under this item shall include the following:

a) Railroad - dismantle and remove existing track in the work area and supply and replace subgrade, ballast, and track after installation of culverts.

b) Culverts - excavate trench for culverts, prepare foundation, supply and install culverts, supply and install backfill around culverts.

Diversion Drainage Culverts shall be installed soon after the start of construction in coordination with excavation for the east diversion ditch and subject to the approval and prior scheduling of the Company's plant management.

TS 11.2
GENERAL

1 - Excavation under this item shall include that required for installation of the culverts.

TS 11.3
EXCAVATION

2 - Excavations shall be made in accordance with the requirements of TS 5. Excavated surfaces too steep to be safe and stable if unsupported shall be supported as necessary to safeguard the work and workmen, to prevent sliding or settling of the adjacent ground, and to avoid damaging existing improvements. The width of the excavation shall be increased, if necessary, to provide space for sheeting, bracing, shoring, and other supporting installations. The Contractor shall furnish, place, and subsequently remove such supporting installations. Payment for excavation will be made under the respective pay items in this section, TS 11.

3 - All culverts shall be installed in a trench excavated by approved means. The trench shall be of adequate width and depth to permit installation of culverts and backfill in accordance with the manufacturer's specifications and the dimensions shown on the drawings.

**TS 11.3
EXCAVATION
(cont'd)**

1 - Foundation areas for the culverts shall be prepared and compacted to the lines and grades as shown on the drawings with six complete coverages of a Wacker Model GVR-200Y or approved equivalent.

**TS 11.4
FOUNDATION
PREPARATION**

2 - Prior to placement of culverts, foundation areas shall be inspected and approved by the Engineer.

The Contractor shall supply the culverts and all materials necessary for installation and backfill. The culverts shall be 48-inch diameter corrugated steel pipe such as the 14 gauge welded seam Hel-Cor pipe with 3 inch by 1 inch corrugations as manufactured by ARMCO or an approved equivalent. Joints shall be the H-10 Huggar joints as manufactured by ARMCO or an approved equivalent.

**TS 11.5
CULVERTS**

1 - Culvert shall be transported, handled on the site, and installed in such a manner as to avoid damage to the culvert. Damaged culvert shall be removed from the site and replaced by Contractor at no additional cost to the Company.

**TS 11.6
CULVERT
HANDLING**

2 - Culvert shall be laid to the lines and grades shown on the drawings and as required by the Engineer. It shall be laid continuously starting at the downstream section and working upstream.

1 - The Contractor shall spread and compact on-site material conforming to the requirements for random fill as specified in TS 6 for backfill to make intimate contact with the culverts in the locations and to the lines and grades shown on the drawings and as specified herein.

**TS 11.7
CULVERT
BACKFILL**

2 - To a height not less than 24 inches above the crown of the pipe, all backfill material shall not contain particles larger than 4 inches in maximum dimension and shall be spread in approximately horizontal 4 inch layers. Compaction of each lift shall be achieved by not less than six complete coverages of the surface of each lift by Wacker Model GVR-200Y or approved equivalent.

TS 11.7
CULVERT
BACKFILL
(cont'd)

3 - For the remaining height of backfill placement, compaction requirements shall conform to the requirements for random fill, as specified in TS 6. In areas where trench dimensions restrict the use of compactors specified in TS 6, the Contractor shall obtain approval of Engineer of alternate compaction procedures.

1 - The Contractor shall remove and replace in service the railroad track subject to the approval and prior scheduling by the Company's plant management.

TS 11.8
RAILROAD

2 - The Contractor shall have the railroad track out of service for no more than two days.

3 - The Contractor shall supply and replace the subgrade, ballast, ties, and track to their original location in accordance with the specifications of the Railroad and Company and as approved by the Engineer.

Measurement for payment for removing and replacing the railroad tracks and supplying, excavating, installing and backfilling the culverts shall be made on the length of culvert in feet installed as shown on the drawings and as required by the Engineer.

TS 11.9
MEASUREMENT

Payment for removing and replacing railroad tracks; and supplying, excavating, installing and backfilling culvert, complete in every respect and as specified herein shall be made at the unit price per lineal foot bid in Schedule of Bid Items, Item TS 11.

TS 11.10
PAYMENT

ITEM TS 12 - LANDSCAPING AND FENCING

TS 12.1
SCOPE

1 - The work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary for landscaping the dam and other specified work areas; supplying and installing fences along east and north county roads; and the removal of all plant, surplus material, scrap, waste, and debris which have been deposited on the site during, or as a result of, the work, and for the final cleaning of all permanent structures, as shown on the drawings, required by the Engineer, and as specified herein.

2 - The work shall include the final shaping, trimming, and finishing uniformly of areas, to the lines, grades, and cross sections as shown on the plans and as required by the Engineer.

3 - This work shall also include, in designated areas, the transporting, spreading, compacting, and finishing topsoil to the depth of at least 4 inches. Soil that is removed in the stripping operation and approved by the Engineer, may be used for topsoil. Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones, or other foreign materials. Spreading shall not be done when the ground or topsoil is excessively wet or otherwise in a condition detrimental to the work. The topsoil shall be rolled with suitable equipment as required by the Engineer.

4 - The work shall include preparing the seed bed, supplying, transporting, and placing seed, fertilizer, mulch, and other materials required in the seeding operation on the surface of the dam and other specified work areas.

5 - The work shall also include preparing the fence area, supplying and installing barbed wire fence, as shown on the drawings, required by the Engineer, and as specified herein.

TS 12.2
MATERIALS

1 - The seed, fertilizer, mulch, and other materials required for vigorous plant growth shall be as follows and as approved by the Engineer.

a) Fertilizer - Fertilizer shall be pelleted or granulated with an analysis of 16-8-8 and shall be suitable for application with approved equipment at the rate of 400 pounds per acre. Fertilizer shall be stored at a weather-proof location.

b) Seed - The seed mixture shall be as follows:

K-31 Fescue	50 pounds per acre
Perennial Rye	50 pounds per acre

Seed shall be stored at a weather-proof location.

c) Mulch - Straw for mulch shall be clean straw of oats, wheat, barley, or rye.

2 - The barbed wire, fence posts, and other materials for the fence shall be as follows and as approved by the Engineer:

a) Barbed Wire - Two strands of 12 1/2 gauge Type 1 galvanized wire with 14 gauge 4-point barbs spaced approximately 5 inches apart shall be used for the barbed wire.

b) Line Posts - The line posts shall be 6-foot long painted steel T-posts with flanges.

c) Corner, Terminal, Pull Posts and Angle Braces - The corner, terminal and pull posts shall be 7-foot long by 2 1/2-inch OD pipe posts. The angle braces shall be 1 5/8-inch OD pipe.

1 - Applying fertilizer, seeding, mulching and other operations necessary for vigorous plant growth shall be generally as follows:

a) Care shall be taken so that the finished surface of the dam is reasonably free from clay lumps, brush, objectionable weeds, and other litter or material that might be harmful to plant growth, or be a hindrance to grading, planting, and maintenance operation.

TS 12.3
METHOD AND
PROCEDURES

TS 12.3
METHOD AND
PROCEDURES
(cont'd)

b) Fertilizer shall be applied and uniformly distributed over all areas of the dam at the rate of 400 pounds per acre. It shall be thoroughly disked, harrowed or raked into the soil, and shall be done at times neither the soil or fertilizer will blow away.

c) Seeding of the dam surface at the specified rate shall be completed during the period of February 15 through April 20, or during the period August 15 through September 15. Seeding shall not be done when ground is frozen or covered with snow. Each container of seed shall be legibly tagged with the name of the seed, percent of purity, percent germination, percent of noxious weed seeds, and all other information required by the current seed laws of the State of Kansas.

d) Mulching shall be done within 24 hours after seeding with mechanical drills and within 4 hours after seeding by other methods, and shall not be done on windy or rainy days.

2 - Preparing the fence area and installing the fence shall be as follows:

a) The area for the fence along the Company's property line adjacent to the county roads bordering the site on the north and east shall be prepared for the fence construction as required consisting of clearing brush and grading the ditch and fence area.

b) Corner posts and braces shall be set in concrete and braced both directions.

c) Terminal posts and braces shall be set in concrete and braced one direction toward the fence line.

d) Pull posts and braces, located on 500-foot centers between terminal or corner posts, shall be set in concrete and braced in both directions.

e) Four strands of barbed wire shall be attached to the posts spaced 1 foot above the ground and at 1 foot spacing between the strands.

1 - Contractor shall burn or remove from site, or otherwise dispose of, to satisfaction of the Engineer, all surplus material, forms, waste steel, cement, and other materials, and debris of any description.

TS 12.4
CLEANUP

2 - Contractor shall leave the entire site, including work areas and temporary roads, in a neat and tidy condition.

Measurement for payment for landscaping and cleanup will be made of the number of acres of the dam and in accordance with these specifications, measured to the nearest 1/10 acre as the projection onto a horizontal plane, as shown on the drawings, and as required by the Engineer.

TS 12.5
MEASUREMENT

1 - Payment for landscaping using no topsoil, complete in every respect and as specified herein, will be made at the unit price per acre bid in Schedule of Bid Items, Item TS 12, 12A.

TS 12.6
PAYMENT

2 - Payment for landscaping using at least 4 inches of topsoil, complete in every respect and as specified herein, will be made at the unit price per acre bid in Schedule of Bid Items, Item TS 12, 12B.

3 - Payment for supplying and installing fencing, complete in every respect and as specified herein, will be made at the unit price per lineal foot bid in Schedule of Bid Items, Item TS 12, 12C.

ALTERNATE

ITEM TS 13 - ALTERNATE STAGE 2 STARTER DAM

The alternate work to be done under this item shall consist of supplying all labor, materials, and plant, and the performance of all work necessary to prepare foundation; and excavate, load, transport, dump, spread, adjust moisture content, and compact fill material; and landscape the Alternate Stage 2 Starter Dam, as shown on the drawings, as required by the Engineer, and as specified herein.

TS 13.1
SCOPE

1 - The Alternate Stage 2 Starter Dam will be an earthfill structure composed of random fill. There are no drainage zones included in the dam. It is the intent to utilize, as much as possible, the fill materials directly from designated borrow areas and required excavations, however, moisture content changes may be required.

TS 13.2
GENERAL

2 - The Alternate Stage 2 Starter Dam will be landscaped without the application of topsoil which will consist of fertilizing, seeding and mulching.

1 - The materials available in the designated borrow areas and required excavations in the diversion ditches consist of surficial layers of residual, plastic, silty clays and weathered, plastic, clay shales which are suitable for use in the random fill zone. The surficial soils are underlain by relatively less weathered and less plastic clay shales also suitable for use in random portions of the fill.

TS 13.3
MATERIALS

2 - Fill materials shall contain no significant amount of sod, brush, roots, or other perishable materials.

3 - The materials for landscaping shall be in accordance with TS 13 - Landscaping and Fencing.

TS 13.3
MATERIALS
(cont'd)

1 - Foundation areas shall be cleared, grubbed, and stripped in accordance with TS 3 - Clearing, Grubbing, and Stripping.

TS 13.4
FOUNDATION
PREPARATION

2 - Foundation excavations shall be completed as shown on the drawings and as required in TS 5 - Excavation.

3 - Foundation preparation shall be in accordance with TS 6 - Embankment Fill.

Borrow operations shall be in accordance with TS 6 - Embankment Fill.

TS 13.5
BORROW
OPERATIONS

1 - Random fill to be placed in the Alternate Stage 2 Starter Dam shall be silty or sandy clay and clay (Identified by the Unified Soil Classification System as CL and CH) or clay shale obtained from on-site borrow areas and the required excavations, and shall be placed to achieve a homogeneous fill.

TS 13.6
RANDOM FILL

2 - Random fill shall be in accordance with TS 6 - Embankment Fill.

Inspection shall be in accordance with TS 6 - Embankment Fill.

TS 13.7
INSPECTION

Landscaping without the application of topsoil shall be in accordance with TS 12 - Landscaping and Fencing.

TS 13.8
LANDSCAPING

1 - Measurement for payment for stripping the Alternate Stage 2 Starter Dam foundation will be in accordance with TS 3 - Clearing, Grubbing, and Stripping.

TS 13.9
MEASUREMENT

2 - Measurement for payment for fill will be made on the actual number of cubic yards of fill in place, between the surfaces of the prepared foundations and the lines and grades shown on the drawings, and as required by the Engineer.

3 - Measurement for payment for landscaping Alternate Stage 2 Starter Dam shall be in accordance with TS 12 - Landscaping and Fencing.

TS 13.9
MEASUREMENT
(cont'd)

1 - Payment for stripping the Alternate Stage 2 Starter Dam foundation, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in Schedule of Bid Items, Item TS 3, 3B.

TS 13.10
PAYMENT

2 - Payment for excavating, loading, hauling, dumping, spreading, adjusting moisture content, and compacting random fill in the Alternate Stage 2 Starter Dam, complete in every respect and as specified herein, will be made at the unit price per cubic yard bid in the Schedule of Bid Items, Item TS 13.

3 - Payment for landscaping using no topsoil, complete in every respect and as specified herein, will be made at the unit price per acre bid in Schedule of Bid Items, Item TS 12, 12A.

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About AECOM

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