HISTORY OF CONSTRUCTION

CFR 257.73(c)(1)

West Boiler Slag Pond

Clifty Creek Plant
Madison, Indiana

October, 2016

Prepared for: Indiana-Kentucky Electric Corporation

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

GERS-16-142

Table of CONTENTS

Attachments

Attachment A – Location Map
Attachment B – Design Drawings
Attachment C – Instrumentation Location Map

1.0 OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of CCR 257.73(c)(1) with an evaluation of the facility.

2.0 DESCRIPTION OF CCR THE IMPOUNDMENT

The Clifty Creek Power Plant is located near the City of Madison, Jefferson County, Indiana.
It is owned and operated by the Indiana-Kentucky Electric Corporation (IKEC). The facility operates one surface impoundment for storing CCR called the West Boiler Slag Pond (WBSP).

The West Boiler Slag Pond dam is a side-hill configuration located along the Ohio River. The dike is approximately 2500 feet long and has a maximum height of 41 feet. Currently, the facility functions as two ponds in series, the northern section and a southern section. There is a vegetated area that separates the north from the southern section. The northern section receives boiler slag sluice water and the plants other wastewater streams. The waters flow through the vegetated area into the southern pool prior to discharge into the Ohio River via the permitted outfall under NPDES permit IN0001759.

The WBAP was constructed in 1955 at the time when the plant was constructed. The crest elevation of the diking system is at a nominal elevation of 475 feet. The floodplain of the Ohio River is at elevation 440 feet and the normal pool level of the Ohio River is 420 feet. The crest of the dam is 20 feet wide; the upstream slopes are 1.5H:1V and the downstream slopes are 2.5H:1V. The bottom of the bottom is shown as elevation 433.0.

3.0 SUMMARY OF OWNERSHIP 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.]

The West Boiler Slag Pond at the Clifty Creek Power Plant is located at State Route 56, Madison, Jefferson County, Indiana. It is owned and operated by IKEC.

4.0 LOCATION OF THE CCR UNIT 257.73 (c)(1)(ii)

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

A location map is included in Attachment A.

5.0 STATEMENT OF PURPOSE 257.73 (c)(1)(iii)

[A statement of the purpose for which the CCR unit is being used.]

The West Boiler Slag pond is a surface impoundment for settling and storage of boiler slag. The boiler slag material is reclaimed and processed for beneficial use.

6.0 NAME AND SIZE OF WATERSHED THE CCR UNIT IS LOCATED 257.73 (c)(1)(iv)

[The name and size in acres of the watershed within which the CCR unit is located.]

The West bottom ash pond is located in the Silver-Little Kentucky Watershed (HUC 05140101) which is 811,706 acres (1,268.29 square miles). The watershed to the West Boiler Slag Pond is approximately 510 acres, consisting of primarily wooded hillsides, portions of the CCR landfill and the plant site.

7.0 DESCRIPTION OF THE FOUNDATION AND ABUTMENT MATERIALS 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 located.]

The diking system for the West Boiler Slag Pond was constructed on the natural soils and the abutment consists of the hillslope of the Devils Backbone Ridge on the west and natural ground on the east. A subsurface investigation was conducted in 2009, and the strength parameters of the foundation, as well as the embankment were defined based on laboratory tests or correlations to known strengths based on blow counts. The foundation materials are described as lean clay with sand and a relative density of very soft to medium stiff. The bedrock beneath the foundation soils is described as weathered gray shale. Results of laboratory testing of the foundation soils yield strength parameters of 27 degrees and 160 psf cohesion.

The geotechnical reports related to the safety factor assessment provide more specific properties of the foundation and embankment materials. Based on these reports, the foundation materials are adequate to support this facility.

8.0 DESCRIPTION OF EACH CONSTRUCTED ZONE OR STAGE OF THE CCR UNIT 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; and the approximate dates of construction of each successive stage of construction of the CCR unit.]

The West Boiler Slag Pond dam was constructed as a homogenous dam. The material was the native sandy, lean clay soils. There is no formal design report for this facility. However, the overall design parameters were defined by Casagrande Consultants. The compacted embankment material was tested and has strength values of 33 degrees and 165 psf cohesion.

9.0 ENGINEERING STRUCTURES AND APPURTENANCES, 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…]

The primary spillway is a decant-type concrete tower connected to a 36-inch diameter reinforced concrete pipe, which regulates normal flow conditions. There is no emergency spillway.
The engineering drawings of the engineering structures and appurtenances are included in Attachment B.

As described previously, the West Boiler Slag Pond is a side-hill embankment system and there are no diversion ditches around the facility.

Slope protection along the inboard slope consists primarily of sparse vegetation over the compacted embankment. The outboard slope has a strong, grass vegetation for the entire slope.

10.0 SUMMARY OF POOL SURFACE ELEVATIONS, AND MAXIMUM DEPTH OF CCR, 257.73 (c)(1)(vii)

[…in addition to the normal operating pool surface elevation and the maximum pool elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment.]

The table below describes the normal pool elevations and maximum pool elevations as well as maximum depth of CCR within the impoundment. The facility is considered a significant hazard potential classification. The corresponding design flood is the 1000-year event. The flood routing evaluation is based on the 0.5 PMF which has a rainfall value (13.8 inches in 6 hours) greater than the 1000-year rainfall value.

	West bottom ash pond
Dam Crest Elevation (ft)	470
Normal Pool Elevation/max. operating(ft)	447.0/457.7
Maximum Pool Elevation (ft) following peak discharge from inflow design flood (0.5 PMF)	462.8
Expected Maximum depth of CCR within impoundment	24 feet

11.0 FEATURES THAT COULD ADVERSELY AFFECT OPERATION DUE TO MALFUNCTION OR MIS-OPERATION (257.73 (c)(1)(vii))

[…and any identifiable natural or manmade features that could adversely affect operations of the CCR unit due to malfunction or mis-operation]

During an extreme flood event, natural debris may tend to collect in front of the concrete tower and block flow from being discharge. There is a floating skimmer structure in front to minimize any potential blockage.

12.0 DESCRIPTION OF THE TYPE, PURPOSE AND LOCATION OF EXISTING INSTRUMENTATION 257.73 (c)(1)(viii)

[A description of the type, purpose, and location of existing instrumentation.]

The West Boiler Slag Pond has 4 piezometers located within the structure of the dam. These piezometers are read on a minimum of every 30 days for the purpose of determining the phreatic water level within the dike. An instrumentation location map is provided in Attachment C.

13.0 AREA – CAPACITY CURVES FOR THE CCR UNIT 257.73 (c)(1)(ix)

[Area-capacity curves for the CCR unit.]

The area capacity table is shown below.

3.1 STAGE-STORAGE INFORMATION

The stage-storage information input into the model was used in the determination of the water level in the reservoir. The stage-storage data was calculated from 2005 topographic mapping provided by AEP (Reference 6). Table 2 lists the cumulative storage volume for a given elevation.

Table 2. WBAP Stage-Storage

Elevation (feet)	Storage (acre-feet)
433	0.0
435	161.4
437	324.4
439	488.9
441	654.9
443	822.5
445	991.6
447	1,162.2
449	1,334.4
451	1,508.1
453	1,683.4
455	1,860.2
457	2,038.6
459	2,218.5
461	2,399.9
463	2,582.9
465	2,767.4
467	2,953.4
469	3,141.0
471	3,330.1
473	3,520.8
475	3,713.0

14.0 257.73 (c)(1)(x) DESCRIPTION OF EACH SPILLWAY AND DIVERSION

[A description of each spillway and diversion design features and capacities and calculations used in their determination.]

The primary spillway is a decant-type concrete tower connected to a 36-inch diameter reinforced concrete pipe which regulates normal flow conditions. On one side of the tower, there is a three-foot wide opening that acts as a weir. Stop logs are added/removed to adjust the pool level. There is no emergency spillway.

Complete details of the spillway structure are included with the design drawings in Attachment B. Hydrology and Hydraulic Analysis, which include calculations for the spillway structure, are included in Inflow Design Flood Control Plan (separate from this report).

15.0 SUMMARY CONSTRUCTION SPECIFICATIONS AND PROVISIONS FOR SURVEILLANCE, MAINTENANCE AND REPAIR 257.73 (c)(1)(xi)

[The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.]

There are no construction specifications in the historic files for this facility. As noted, Casagrande Consultants provided recommendations for design parameters but there are no specific reports for the West Boiler Slag Pond.

As required by the CCR rule, the West Boiler Slag Pond is inspected at least every 7 days by a qualified person. Instrumentation data is collected at least every 30 days and reviewed by AEP Engineering Services. Also, as a requirement of the CCR rule, the impoundment is also inspected annually by a professional engineer.

If repairs are found to be necessary during any inspection, they will be completed as needed.

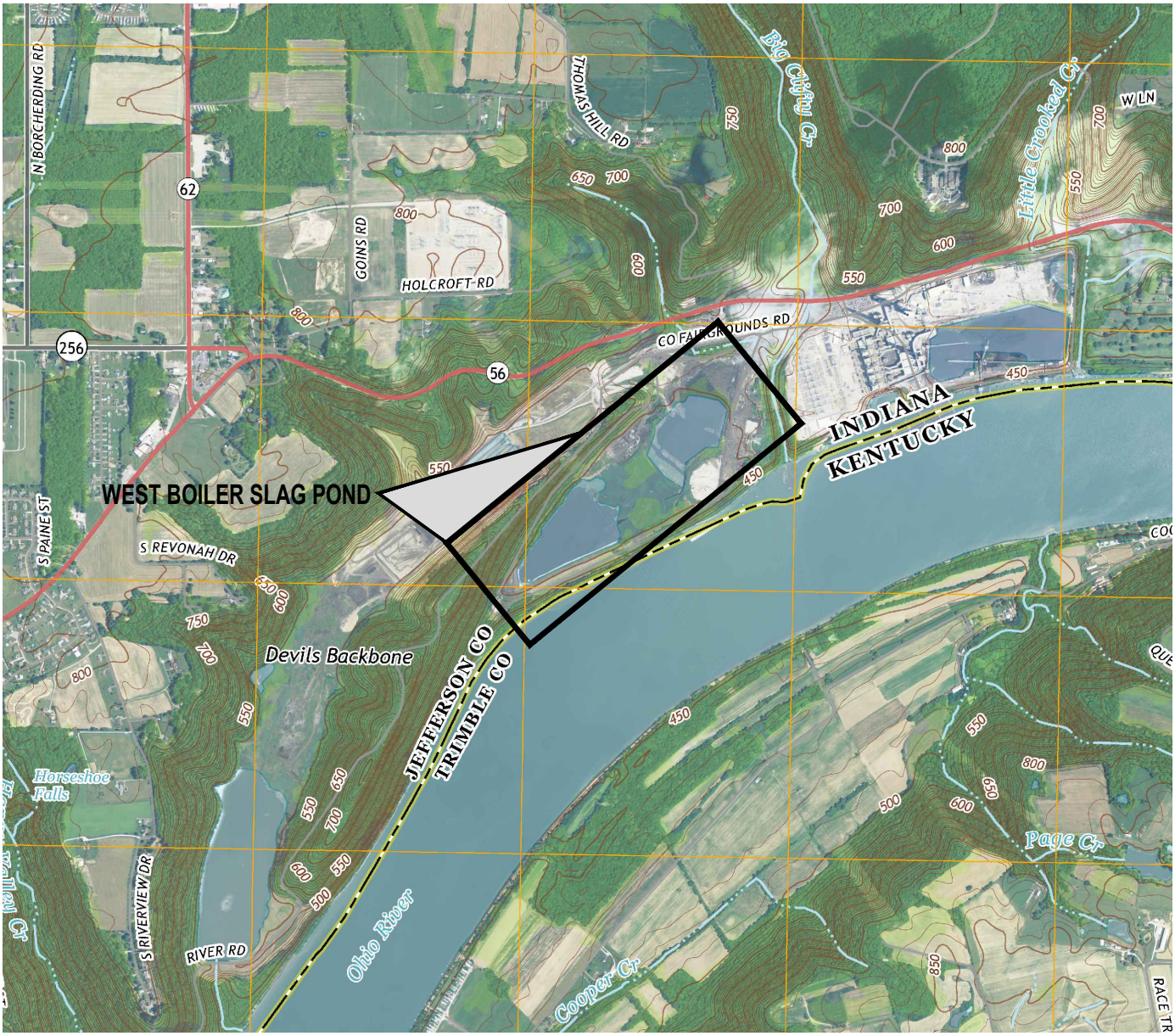
16.0 RECORD OR KNOWLEDGE OF STRUCTURAL INSTABILITY 257.73 (c)(1)(xii)

[Any record or knowledge of the structural instability of the CCR unit.]

To date there has been no record of knowledge of the structural instability of the CCR unit.

ATTACHMENT A

LOCATION MAP



1 0.5 0 KILOMETERS 1 2

1000 500 0 METERS 1000 2000

1 0.5 0 1

MILES

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

FEET

N

W E

THIS DRAWING IS CLASSIFIED AS:

AEP PUBLIC

REFERENCE AEP's CORPORATE INFORMATION SECURITY POLICY

INDIANA-KENTUCKY ELECTRIC CORPORATION

CLIFTY CREEK PLANT

MADISON INDIANA

WEST BOILER SLAG POND

USGS TOPO MAP

7.5-MINUTE SERIES

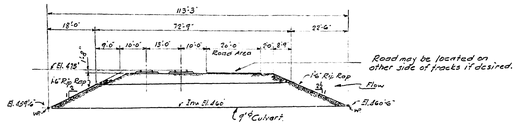
UNIT:	DRAWING NUMBER:	REV:
16	LOCATION MAP	1
SCALE: 1"=2000'	CIVIL ENGINEERING	
DR:		
CH:		
SUP:		
ENG:		
DATE: 10/13/16		

AEP AMERICAN ELECTRIC POWER

AEP SERVICE CORP.
1 RIVERSIDE PLAZA
COLUMBUS, OH 43215

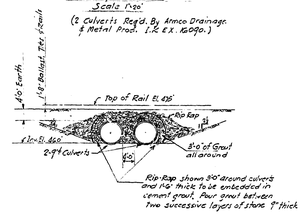
ATTACHMENT B

DESIGN DRAWINGS

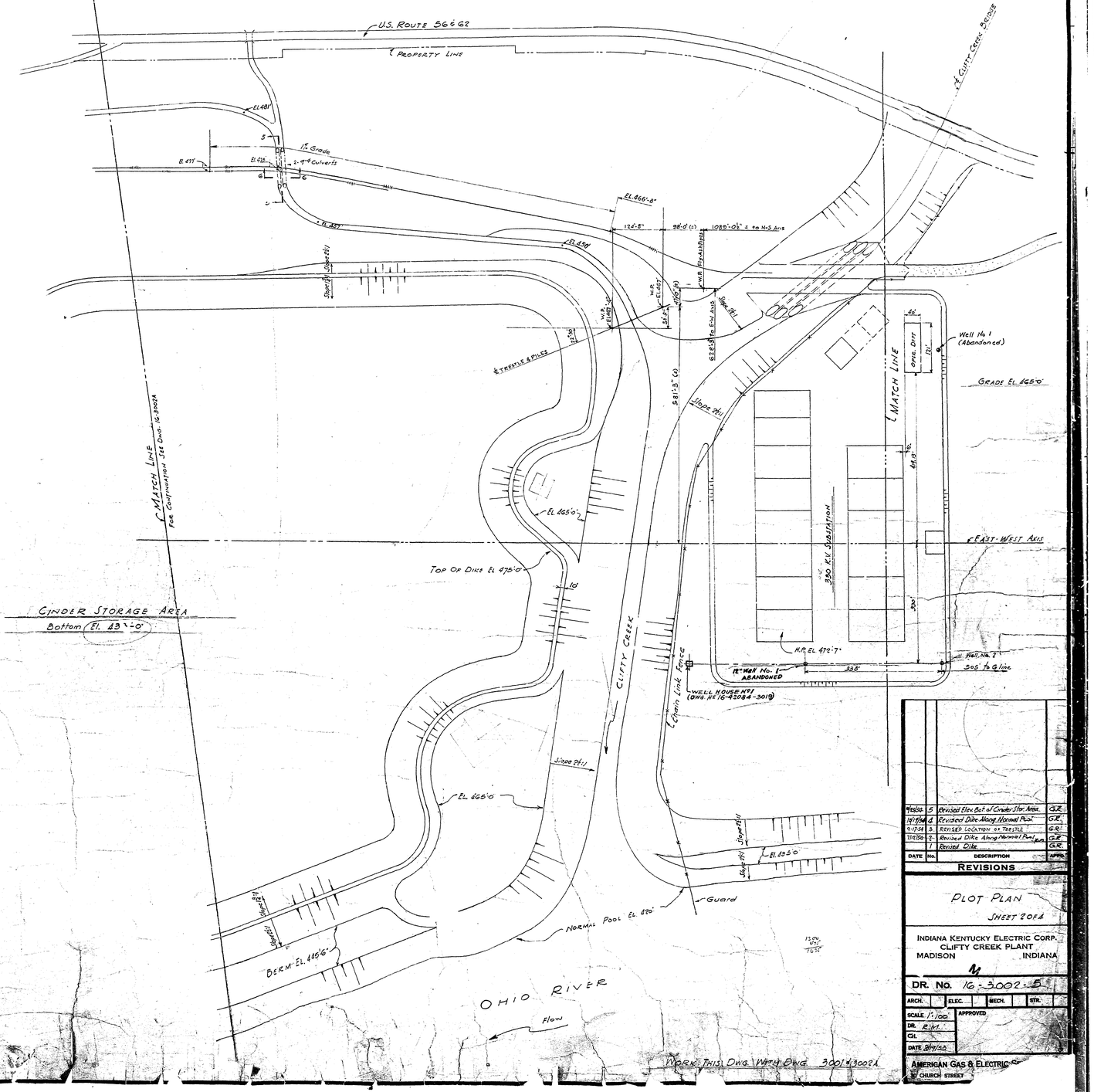


SECTION 5-5
Scale 1"=20'

(2 Culverts Req'd. By Amnco Drainage & Metal Prod. I.C.E.X. K6090.)



SECTION G-G
Scale 1"=20'



DATE	NO.	DESCRIPTION	APPD.
9-16-58	5	Revised Elev. Bot of Cinder Stor. Area.	GR
10-17-58	4	Revised Dike Along Normal Pool	GR
9-17-58	3	REVISED LOCATION OF TRESTLE	GR
7-17-58	2	Revised Dike Along Normal Pool Elev.	GR
6-16-58	1	Revised Dike	GR

REVISIONS

PLOT PLAN
SHEET 2 OF 6

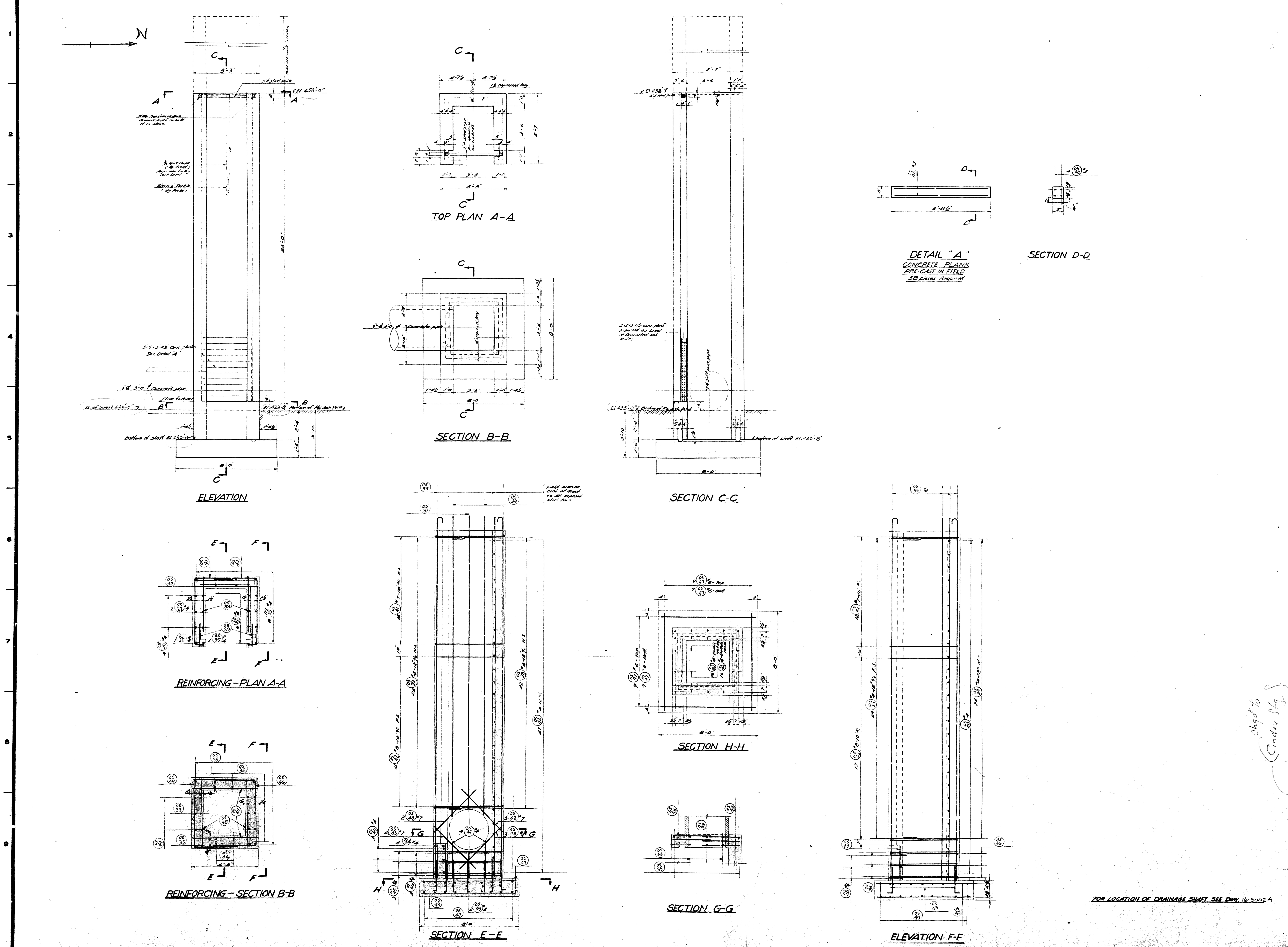
INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA

DR. No. 16-3002-5

ARCH.	ELEC.	MECH.	STR.
SCALE 1"=100'	APPROVED		
DR. R.M.T.			
CH.			
DATE 8/7/58			

AMERICAN GAS & ELECTRIC
30 CHURCH STREET


N.
U.S. Route 56 & 62
Top of Dike El. 475.0'
El. 445.6"
10'-0"
Drainage Shaft
Rip Rap
Normal Pool El. 420.0'
36" R.C. Pipe (Existing)
36" R.C. Pipe (New)
Original Grade
Inv. El. 430'
Inv. El. 435.0'
Bend Line
Section A-A
Scale 1" = 20'
Inv. El.
El. 433.0
5000'± to 'G' Line
FLY ASH DISPOSAL AREA
Top of Dike El. 475.0
4000'± to 'G' Line
3410'± to 'G' Line
East-West Axis
CINDER STORAGE AREA
Bottom El. 433.0' Boring's
Match Line
For Continuation See Dwg. 16-3002
Drainage Shaft (Field to Locate)
See Dwg. 16-3003
Boring's
Top of Dike El. 475.0'
Rip Rap
BERM El. 445.6"
Normal Pool El. 420
Boring 2
OHIO RIVER
Flow
Top of Dike El. 475.0'
Varies at other sections of Dike
El. 445.6"
Original Grade
Normal Pool El. 420
El. 433.0'
SECTION B-B
Scale 1" = 20'
Revisions
Revised Elev. Bot. of Cinder Stor. Area
Revised Dike Along Normal Pool
Revised Dike Along Normal Pool
DATE
No.
DESCRIPTION
REVISIONS
PLOT PLAN
SHEET 3 OF 4
INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT
MADISON INDIANA
DR. No. 16-3002A-3
ARCH.
ELEC.
MECH.
STR.
SCALE 1" = 100'
APPROVED
DR. R.M.
CH.
AMERICAN GAS
CHURCH STREET



General Notes:

Materials:
Concrete: 19 cu.yd. By Field
pipes: 1-3" pipe-4'-6" Long
Reinforcing Steel By: Field

Reference Drawings

RS 776 Reinforcing Schedule
16-3002A Fly Ash Yard

DATE	No.	DESCRIPTION	APPD.
10/25/54	1	Revised Elevations	G.R.

REVISIONS

ASH STORAGE YARD
DRAINAGE SHAFT
MASONRY & REINFORCING

1953-1954 CONSTRUCTION

INDIANA KENTUCKY ELECTRIC CORP.
CLIFTY CREEK PLANT.
MADISON INDIANA

DR. No. 16-3033 -1

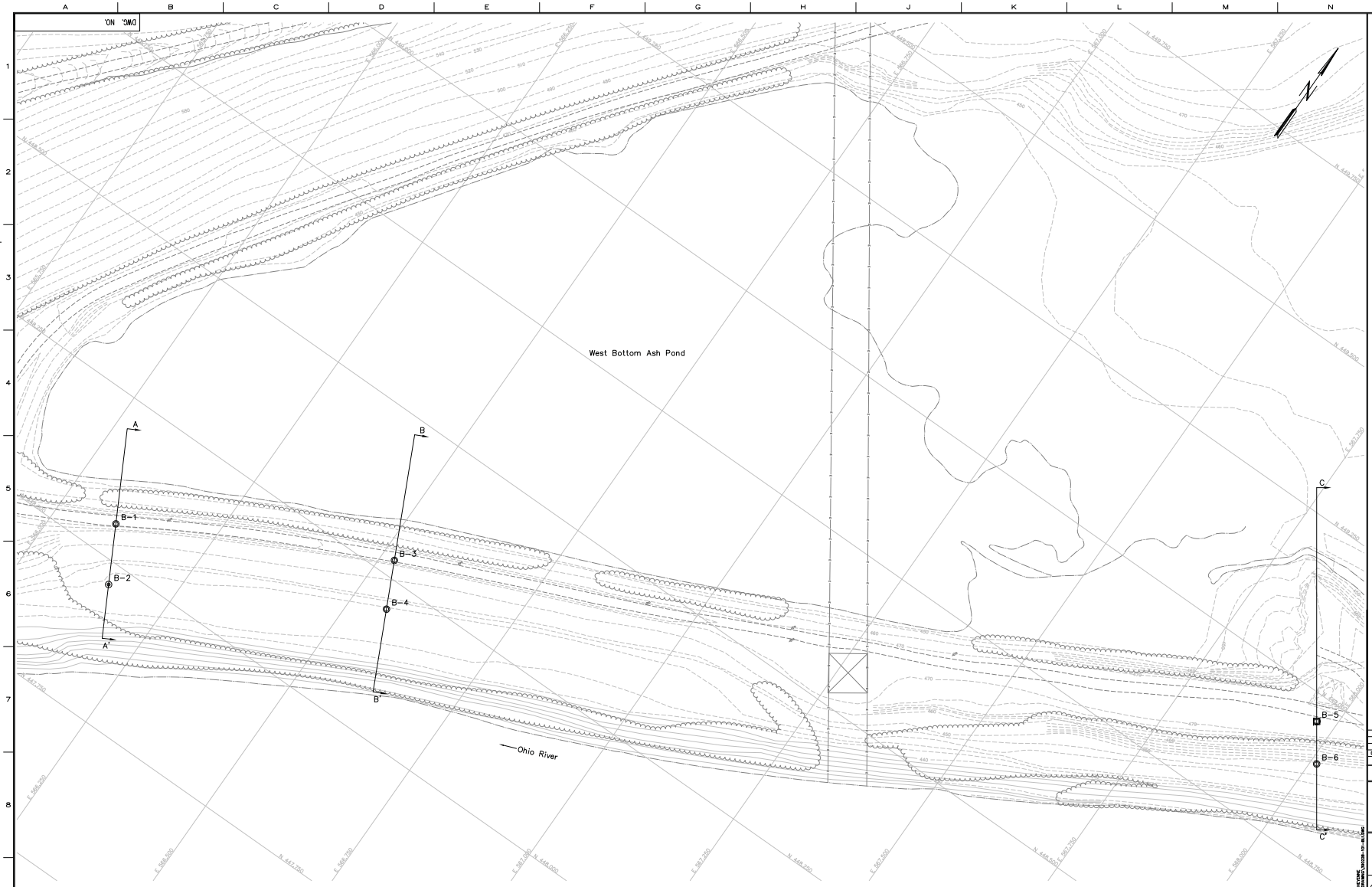
ARCH. | ELEC. | MECH. | STR.

SCALE 3/8"=1'-0"
DR. F.T.K.
CH. M.E.
DATE 4/16/54
APPROVED G.E.

AMERICAN GAS & ELECTRIC SERVICE CORP.
30 CHURCH STREET NEW YORK

ATTACHMENT C

INSTRUMENTATION LOCATION MAP



NOTES

REFERENCE DRAWINGS

Piezometers in borings:

B-1, B-3, B-4 & B-5

LEGEND

- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests
- Soil Boring with Undisturbed (Shelby) Tube Samples and/or Standard Penetration Tests and Rock Core

BORING LAYOUT
SCALE: 1"=60'

30 0 60 120 FEET
GRAPHIC SCALE

REVISIONS

DATE	NO.	DESCRIPTION	APPD.

INDIANA – KENTUCKY ELECTRIC CO.

CLIFTY CREEK PLANT

MADISON INDIANA

GEOTECHNICAL EXPLORATION
WEST BOTTOM ASH POND
BORING LAYOUT

DWG. NO.

SCALE:	CIVIL ENGINEERING DIVISION
DR:	
CH:	
APPR:	
ENGR:	
DATE:	

APPROVED BY:

SCALE: AS SHOWN	
DR: CW	
CH: EMK	
ENGR: CN	
DATE: APR., 2010	

Stantec

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