

Report 1 - Groundwater Monitoring Network for CCR Compliance

SWEPCO - Flint Creek Primary Bottom Ash Pond
Permit No. 0273-S3N-R2
AFIN: 04-00107

October 2017
Project No. 35157124



Prepared for:

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Terracon

Environmental



Facilities



Geotechnical



Materials

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1.0 Objective

The purpose of this Groundwater Monitoring Network Report (GWMNR) is to demonstrate adequacy and compliance of the existing monitoring well network with EPA Coal Combustion Residuals (CCR) regulations at the Southwestern Electric Power Company (SWEPCO) – Flint Creek Primary Bottom Ash Pond (Permit No. 0273-S3N-R2).

2.0 Background Information

2.1 Facility Description

The SWEPCO facility consists of an approximately 42.8-acre Primary Bottom Ash Pond along with a 40-acre permitted Class 3N Landfill and various support facilities including entrance roads, leachate and contact water storage ponds, vehicle/equipment facilities, groundwater monitoring facilities, and storm water control systems. The site is located in portions of Section 8, Township 18 North, and Range 33 West in Benton County, Arkansas (**FIGURE 1 & 2**).

2.2 Description of CCR Unit

2.2.1 Embankment Configuration

The Primary Bottom Ash Pond (**See FIGURE 3**) was constructed from 1974 to 1978. The site is situated on a topographically level feature, with a slight slope from northeast to southwest. The surface elevation of the study site is 1100 to 1160 feet above mean sea level (msl). Little Flint Creek enters the subject site along the western portion of the property and flows into the reservoir. The ash pond is divided into two impoundments in series, the Primary Bottom Ash Pond and the Clear Water Pond (non-CCR). The Primary Bottom Ash Pond berm is 820-foot long, the clear water pond is 750-foot long. Surface water runoff from the site is expected to move to the southwest along Little Flint Creek. The Primary Bottom Ash Pond embankment is approximately 45 feet deep and the clear water pond embankment is approximately 35 feet deep with a berm crest height of 1155 feet-msl for both. (**Golder Associates Inc., Inspection of the Ash Ponds at Little Flint Creek, November 2015**)¹

The fill material in the containment berm consists primarily of stiff to very stiff lean clay (CL) or fat clay (CH) with gravel and medium dense clayey gravel (GC) or clayey sand (SC) with gravel overlying native soils which consist primarily of weathered limestone with layers of stiff to hard lean clay (CL) with gravel. The limestone encountered typically consisted of solid layers less than 14 inches thick. The Rock Quality Designation (RQD) of the cores is less than 25%. (**ETTL Engineers and Consultants Inc., Slope Stability Report, Revised August 2010**)²

2.2.2 Area/Volume

The Primary Ash Pond is approximately 42.8 acres and Clear Water Pond is approximately 3.7 acres. (Dewberry & Davis LLC, Coal Combustion Residue Impoundment Round 9 – Dam Assessment Report, December 2011)³

2.2.3 Construction and Operational History

The Primary Bottom Ash Pond was constructed from 1974 to 1978. It is used for the management of bottom ash from the coal combustion operations on site. The primary ash pond is approximately 45 feet deep and the clear water pond is approximately 35 feet deep with a berm crest height of 1155 feet-msl for both. The embankment was constructed with 3:1 slopes.

There were no signs of sloughing or slope instability. The crests of both embankments are in good conditions with no obvious depressions in the crest. The riprap on the downstream slope of the Primary pond appears to be in fair conditions, but it is in poor condition along the Secondary Pond due to significant vegetation growth. Two animal burrows were identified on the Primary Pond slope. Sapling trees, 1 to 2-inches in diameter, have established near the shoreline of the Primary Pond embankment, and clusters of 2 to 3-inch diameter trees have established on the slope of the Secondary Pond embankment. No seeps, signs of sloughing, or signs of slope instability were observed. (Golder Associates Inc., Inspection of the Ash Ponds at Little Flint Creek, November 2015)¹

In 2010 a slope stability analysis was conducted on the embankment of the Primary Bottom Ash Pond by E TTL Engineers & Consultants Inc. (E TTL). According to a slope stability analysis performed by E TTL, the site coefficients determined for site class C contained in the IBC, parameters as listed below are recommended by the Code:

Site Coefficients:	Fa = 1.60
	Fv = 2.40
Maximum Earthquake Spectral Response Acceleration Parameters:	SMS = 0.217*
	SM1 = 0.139
Design Spectral Response Acceleration Parameters:	SDS = 0.144
	SD1 = 0.093

*Note: Acceleration used for seismic evaluation.

The minimum factor of safety under static conditions was 1.9, and under seismic conditions was 1.3 (E TTL Engineers & Consultants Inc., Slope Stability Analysis, August 2010)².

2.2.4 Surface Water Control

Surface Water is controlled by stormwater diversion berms, reinforced letdowns, perimeter ditches (with permanent erosion control matting where necessary), and culverts. A small portion of run-off from the final cover from a southeast portion of the Landfill will flow to the Primary Ash Pond (**Major Modification, Appendix N-I, March 2014 – Rev. 2, Page PN-26, ADEQ Doc ID #65699**)⁴.

Discharge

SWEPCO is authorized to discharge through Outfall 101 from ash ponds (bottom ash discharge, low volume wastewater, and stormwater runoff, including coal pile runoff from a facility, treated municipal wastewater from the City of Gentry, and spring water/stormwater) from facility located as follows: approximately 3 miles southwest of Gentry in Benton County, Arkansas to receiving waters named:

Outfall 001: Little Flint Creek, thence to Flint Creek in Segment 3J of the Arkansas River Basin.
Outfalls 101 and 401: SWEPCO Reservoir, thence to Little Flint Creek, thence to Flint Creek in Segment 3J of the Arkansas River Basin.

The outfalls are located at the following coordinates (NAD 27):

Outfall 001: Latitude: 36° 14' 0.366"; **Longitude:** 94° 33' 05.944"

Outfall 101: Latitude: 36° 14' 59.38"; **Longitude:** 94°31' 34.90"

Outfall 401: Latitude: 36° 15' 29.17"; **Longitude:** 94°31' 33.80"

Discharge shall be in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit.

2.3 Previous Investigations – Geotechnical, Groundwater and Other Environmental

- § Golder Associates Inc., Inspection of the Ash Ponds at Little Flint Creek, May 2015
- § Dewberry & Davis, LLC, Dam Assessment Report, December 2011
- § E TTL Engineers & Consultants Inc., Existing Ash Storage Ponds Embankment Investigations(Revision 2), August 2010.

2.4 Hydrogeologic Setting

Groundwater occurs at various depths and the presence of water appears to be related to a number of factors, including site lithology, rock type and thickness, and number of fractures encountered.

Perched groundwater is occasionally present within the upper unconsolidated soils; however, this perched zone appears discontinuous across the site. Groundwater can occur in both the unconsolidated soils and within the limestone. (**Terracon Well Installation Report, August 2011, pg. 7**)⁵

In the area of the Flint Creek Power Plant, water wells supply rural domestic households. According to state water well records, water wells are typically drilled through the Boone Formation and Chattanooga Shale into the underlying Ordovician age dolomites, due to the low yield of the upper Boone Formation. In general, the total depth of the water wells is approximately 500 feet below ground surface. The water wells are usually cased to allow water production from both the Boone Formation and the Ordovician dolomites. Yields generally range from 2 to 30 gallons per minute (gpm). Some wells within the area have been completed only within the Boone Formation at a typical depth of approximately 200 feet below ground surface. Yields from these wells generally range from 2 to 10 gpm with some wells yielding up to 100 gpm. (**Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 20**)⁶

2.4.1 Climate

The Arkansas River Basin lies in a semi-humid region characterized by long summers, relatively short winters, and a wide range of temperatures. Extremes in air temperatures may vary from winter lows around 0°F, usually caused by Canadian air masses to summer highs above 100°F. Extreme temperatures may occur for short periods of time at any location within the study area. The growing season averages 244 days per year.

The average pan evaporation is about 54.9 inches for the Arkansas River Basin. Lake evaporation averages about 69 percent of the class A pan evaporation.

Precipitation is well distributed throughout the year with the driest periods occurring during the late summer and early fall. Mean annual precipitation in the study area ranges from less than 40 inches per year to greater than 52 inches per year (**Arkansas State Water Plan, Arkansas River Basin, pg. 3**)⁷.

2.4.2 Regional and Local Geologic Setting

The Site is located in northwest Arkansas in the Springfield Plateau of the Ozark Plateau's Province. The Ozark Plateaus Province covers northern Arkansas and consists of sedimentary rock strata which have undergone massive uplift and which remain relatively horizontal with only minor deformation. Stream erosion has removed much of the original surface rock and typically dissected the area into hills and low mountains. Elevations typically range from 1200 to 1400 feet above mean sea level. Extensive relatively flat areas occur in Benton County (**USCS, Soil Survey of Benton County, Arkansas, January 1977**)⁸. The Site is underlain by the Boone Formation which consists primarily of limestone and chert of Lower Mississippian age. In-situ weathering has reduced the limestone, leaving chert and limestone gravel mixed with clay as a residual soil overburden. The Boone Formation, in this area, consists of a highly weathered cherty limestone with red to brown clay seams. (**Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 20**)⁶

Groundwater occurs at various depths and the presence of water appears to be related to a number of factors, including site lithology, rock type and thickness, and number of fractures encountered. (**FIGURES 4 & 5**)

In the vicinity of the study area, the stratigraphy consists of a weathered residuum of the Boone Formation, overlying the cherty limestone of the Boone Formation (Mississippian). The Boone Formation lies conformably atop the St. Joe Member (Mississippian) and together comprises one hydrostatic unit known as the Boone-St. Joe Aquifer. Unconformably underlying the Boone-St. Joe is the Chattanooga Shale (Devonian), which acts as the upper confining layer of the Sylamore, Clifty, and Everton Aquifers.

In-situ weathering has reduced the limestone, leaving chert and limestone gravel mixed with clay as residual soil overburden. The Boone residuum is characterized by red (iron-rich) clay, weathered limestone and chert. The thickness of residuum varies from 30 to 50 feet, and the limestone and chert content also varies in lateral extent. The chert is typically the remnant of weathering after the limestone is removed by dissolution in surface and groundwater.

The Boone Formation is a gray, crinoidal limestone abundantly interbedded with gray, black and blue chert. It is massive, well cemented and has a thickness of approximately 280 feet in northwest Arkansas. It is nearly pure calcium carbonate which is soluble, and therefore underground drainage channels, sinkholes, caves and fissures can occur.

The underlying St. Joe Member is typically a light-gray, mud-supported Crinozoan-Bryozoan crystalline limestone, and is easily recognized by its lack of chert. In Northern Arkansas, the formation exhibits a thickness of between 6 to 84 feet, with an average of thickness of 45 feet.

The underlying Chattanooga Shale is a black, fissile and carbonaceous rock with abundant pyrite. It thickens (up to 70 feet) westward and acts as a barrier to vertical groundwater flow (**Nature and Extent Groundwater Monitoring Well Installation Report, Terracon. August 2011**)⁹.

2.4.3 Surface Water/Groundwater Interactions

Based on water level elevations, groundwater flow across the pond is to the west. Currently there is not enough data to determine if there is surface water to groundwater communication.

2.4.4 Water Users

A spring and well survey was conducted on November 11, 1991. The area within one-quarter mile of the Site was searched for springs, flowing streams, lakes, ponds, and water wells. **FIGURE 7** includes the results of the survey. A more recent search of an Arkansas USGS water well database provided additional wells

The closest water well was located approximately 1995 feet from the landfill boundary. No springs were located during the spring and well survey. When questioned, plant personnel knew of no springs within the survey area. All streams within the survey area are intermittent and were dry at the time of the survey.

Three large ponds are present within the survey area. The pond located in the SW 1/4 of the NW1/4 of Section 9 contains little water and is used for farming purposes. The plant's bottom ash storage pond is located in the SW1/4 of the NE1/4 of Section 9. The third pond is in the northern portion of the SE1/4 of the SE1/4 of Section 5. Two smaller ponds are also present in the SW1/4 of the SER of Section 5, and in the NW1/4 of the NE1/4 of Section 8. (**Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 21**)¹⁰

3.0 Certified Groundwater Monitoring Network

3.1 Hydrostratigraphic Units

3.1.1 Horizontal and Vertical Position Relative to CCR Unit

Flint Creek is currently monitored by up-gradient wells AP-51, AP-53, and AP-54 and down-gradient wells AP-58, AP-59 and AP-60. The wells monitor the upper part of the Boone Formation. Horizontal monitoring well locations relative to the CCR Unit are provided in **FIGURE 3**. Vertical positioning of monitoring wells is shown in **TABLE 2 – WELL CONSTRUCTION DETAILS**.

3.1.2 Overall Flow Conditions

Based on water level elevations from the March 2016 sampling event groundwater flow across the Primary Bottom Ash Pond is to the west. (**FIGURE 6**)

3.2 Uppermost Useable Aquifer

3.2.1 CCR Rule Definition

“**Aquifer**” means a geologic formation, group of formations or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.

“**Uppermost Aquifer**” means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility’s property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season.

Common Definition

“**Aquifer**” is a geologic formation(s) that is water bearing. A geological formation or structure that stores and/or transmits water, such as to wells and springs. Use of the term is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute a usable supply for people’s uses. (USGS, Water Science Glossary of Terms)

3.2.2 Identified Onsite Hydrostratigraphic Unit

3.2.2.1 Relative Position to CCR Unit

Based on water level elevations from the March 2016 sampling event groundwater flow across the pond is to the west (**FIGURE 6**). The current groundwater monitoring network consists of up gradient wells AP-51, AP-53, and AP-54 and down gradient wells AP-58, AP-59 and AP-60.

3.2.2.2 Water Quality

Rural domestic household water wells installed in the upper Boone-St. Joe Formation typically do not yield large quantities of water. Wells within the area completed only within the Boone Formation are installed at a typical depth of approximately 200 feet below ground surface. Yields from these wells generally range from 2 to 10 gpm with some wells yielding up to 100 gpm. The underlying Roubidoux Formation and Gunter Sandstone are the most regionally significant water bearing units in this area, and the units are typically encountered at depths of greater than 1,200 feet below land surface.

Wells in the Roubidoux Formation yield an average of less than 150 gal/min, but can yield up to 450 gal/min. Well yields from the Gunter average more than 200 gal/min, with local yields up to 500 gal/min. The depth to water in the Gunter Sandstone ranges from approximately 27 to 465 feet below land surface in the study area, and the depth to water in the Roubidoux Formation ranges from approximately 90 to 200 feet below land surface. Year-to-year water-level fluctuations are due primarily to temporal variations in pumpage and do not represent long-term trends.

Analyses of samples from wells tapping subsurface rock units show that water in these units is a moderately hard to very hard, calcium and magnesium carbonate water. The quality of water from these units is well within the established drinking water standards with the exception of high iron and nitrate concentrations in a few isolated Benton County wells. The subsurface rock units will yield fresh water in Benton and Washington Counties, but the water becomes mineralized and is unusable to the south (**Arkansas State Water Plan, Arkansas River Basin, pg. 121**)¹¹

3.2.3.3 Users/Receptors

A spring and well survey was conducted on November 11, 1991. The area within one-quarter mile of the Site was searched for springs, flowing streams, lakes, ponds, and water wells. **FIGURE 7** includes the results of the survey. A more recent search of an Arkansas USGS water well database provided additional wells

The closest water well was located approximately 1995 feet from the Primary Bottom Ash Pond boundary. No springs were located during the spring and well survey. When questioned, plant personnel knew of no springs within the survey area. All streams within the survey area are intermittent and were dry at the time of the survey.

Three large ponds are present within the survey area. The pond located in the SW 1/4 of the NW1/4 of Section 9 contains little water and is used for farming purposes. The plant's bottom ash storage pond is located in the SW1/4 of the NE1/4 of Section 9. The third pond is in the northern portion of the SE1/4 of the SE1/4 of Section 5. Two smaller ponds are also present in

the SW1/4 of the SER of Section 5, and in the NW1/4 of the NE1/4 of Section 8. (**Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 21**)¹⁰

3.3 Existing Monitoring Network

3.3.1 Overview

The current groundwater monitoring network at the Flint Creek Primary Bottom Ash Pond consists of 6 groundwater monitoring wells (AP-51, AP-53, AP-54, AP-58, AP-59 and AP-60). The groundwater monitoring network was previously evaluated to determine compliance with the new CCR requirements. Based upon the review AEP installed 3 new downgradient groundwater monitoring wells. Wells AP-58 and AP-59 were installed on February 4, 2016. In December, 2016 well AP-52 was decommissioned and replaced with well AP-60. With the installation of the 3 new wells the current groundwater monitoring network at the Primary Bottom Ash Pond complies with the new CCR requirements.

3.3.1.1 Well Construction Summary Table

Please refer to **TABLE 2** for construction details of the groundwater monitoring wells.

3.3.1.2 Depth Ranges and Hydrostratigraphic units monitored

Please refer to **TABLE 1** for groundwater elevation data taken from the groundwater monitoring system.

3.3.1.3 Position in Terms of Flow Directions and Distance from Waste Boundary

Based on water level elevations from the March 2016 sampling event groundwater flow across the pond is to the west (**FIGURE 6**). The groundwater monitoring network consists of up gradient wells AP-51, AP-53, and AP-54 and down gradient wells AP-58, AP-59 and AP-60.

3.3.1.4 Uppermost Useable Aquifer

The groundwater monitoring network at the Flint Creek Primary Bottom Ash Pond is installed to monitor the uppermost aquifer at the facility. The uppermost usable aquifer at the site is the Mississippian age Boone Formation.

3.3.1.5 Insufficient Definition of Background Water Quality

Background water quality data will need to be reestablished according to the new requirements set by 40 CFR 257 using Appendix III and IV Constituents for groundwater monitoring at CCR units. Background concentrations need to be established by October 17, 2017 in accordance with §257.90.

Appendix III to Part 257—Constituents for Detection Monitoring

Common Name ¹
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids

¹ Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

Appendix IV to Part 257—Constituents for Assessment Monitoring

Common Name ¹
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

¹ Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

3.3.1.6 Key Down-gradient Directions

Groundwater flow at the Primary Bottom Ash Pond is to the west and is currently monitored by monitoring wells AP-58, AP-59 and AP-60. (See FIGURE 6)

3.3.1.7 Key Users/Receptors Not Protected

Key users/receptors are protected with the recently installed monitoring wells that reduce the spacing between the down-gradient wells.



4.0 Certification

The monitoring wells currently installed are adequate to monitor the uppermost aquifer as required by §257.91.

4.1 Limitations

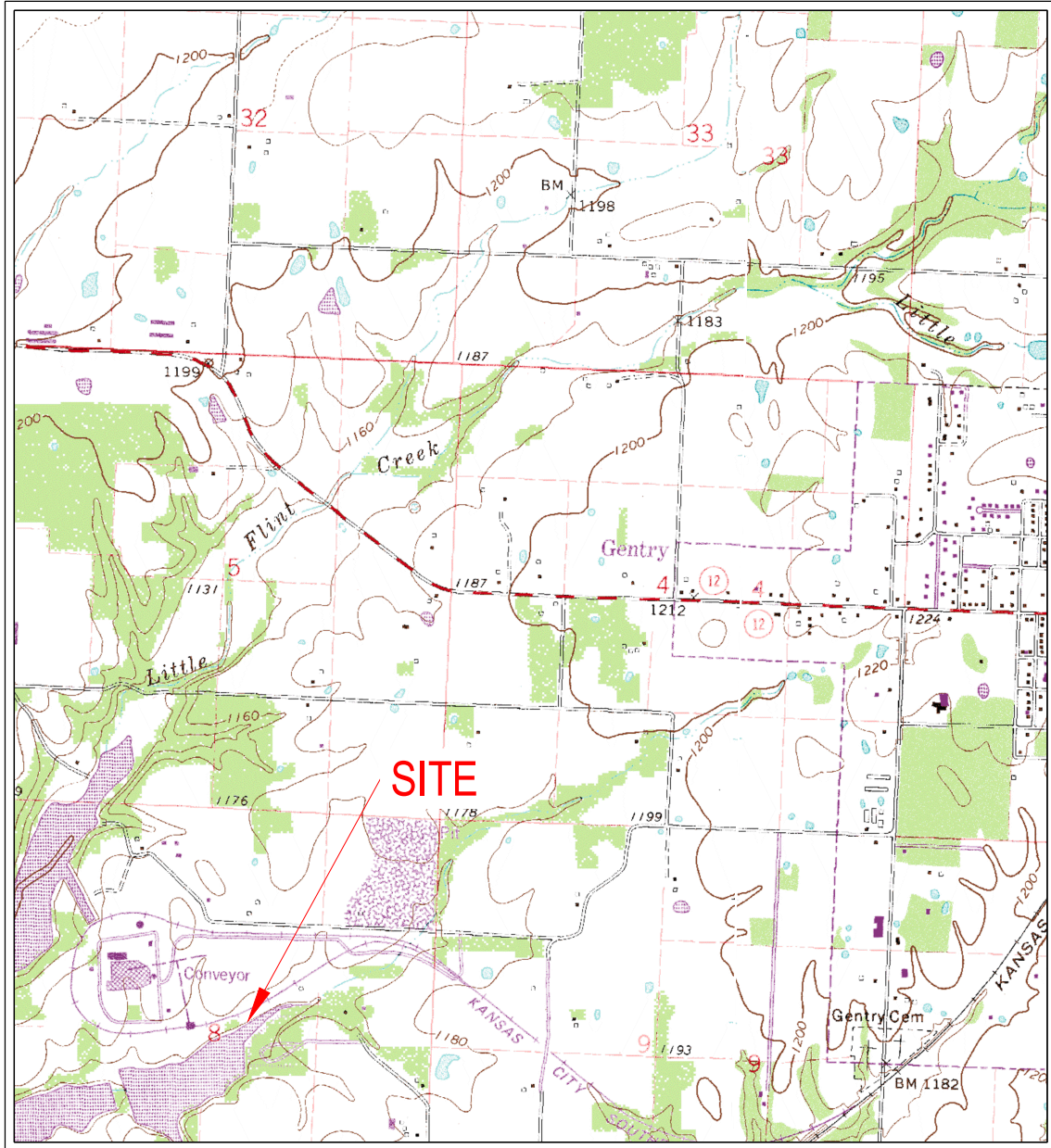
The findings and conclusions resulting from this investigation are based upon information derived from the on-site activities and other services performed under the scope of work as described in this report; such information is subject to change over time if additional information is obtained. Please note that Terracon does not warrant the work of laboratories, regulatory agencies or other third parties supplying information used in the preparation of the report.

4.2 PE Certification

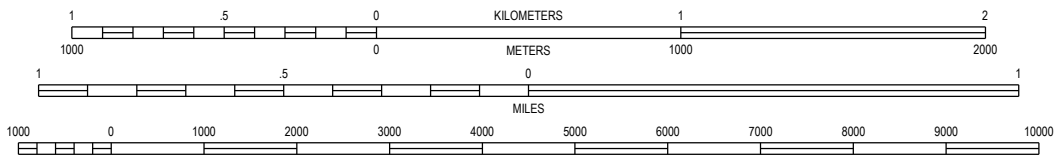
Name: 	Date: 10/17/17	 <p style="text-align: center;">Stamp</p>
Company: Terracon LDA #223	Expiration Date: 12/31/17	

Bibliography

- 1 Golder Associates Inc., Inspection of the Ash Ponds at Little Flint Creek, November 2015
- 2 E TTL Engineers and Consultants Inc., Slope Stability Report, Revised August 2010
- 3 Dewberry & Davis LLC, Coal Combustion Residue Impoundment Round 9 – Dam Assessment Report, December 2011
- 4 Major Modification, Appendix N-I, March 2014 - Rev2, page N-I, ADEQ Doc ID# 65699
- 5 Terracon Well Installation Report, August 2011, pg. 7
- 6 Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 20
- 7 Arkansas State Water Plan, Arkansas River Basin, pg. 3
- 8 USCS, Soil Survey of Benton County, Arkansas, January 1977
- 9 Nature and Extent Groundwater Monitoring Well Installation Report, Terracon. August 2011
- 10 Burns & McDonnell Engineers-Architects-Consultants, Hydrogeologic Site Characterization, February 1992, Page 21
- 11 Arkansas State Water Plan, Arkansas River Basin, pg. 121



SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

CHEROKEE CITY
QUADRANGLE
1982

7.5 MINUTE SERIES (TOPOGRAPHIC)



Project Mngr:	DCM
Drawn By:	TLB
Checked By:	DCM
Approved By:	DCM

Project No.	216-001-35157124
Scale:	AS SHOWN
File No.	001
Date:	10-17-17

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Consulting Engineers and Scientists

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SITE LOCATION MAP

GROUNDWATER MONITORING NETWORK EVALUATION

AMERICAN ELECTRIC POWER

SWPECO FLINT CREEK POWER PLANT BOTTOM ASH POND

GENTRY ARKANSAS

FIG. No.	1
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* - OUTFALL 001
LOCATED APPROX.
9,525 FT SOUTHWEST

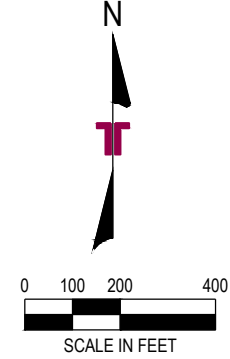
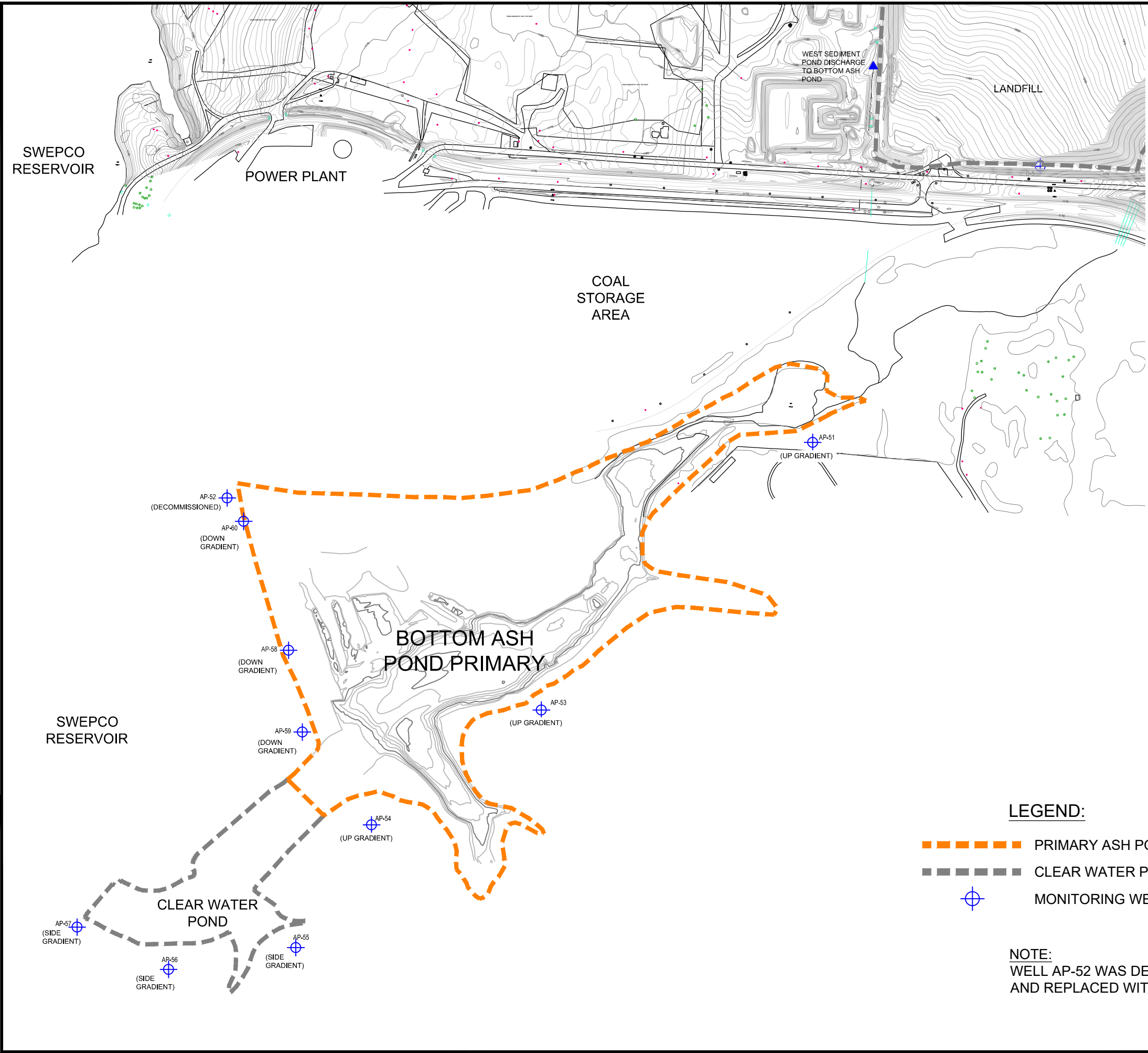
FIGURE 2

DESIGNED BY:	TLB
DRAWN BY:	TLB
APPROV. BY:	DCM
SCALE:	SEE BARS/SCALE
DATE:	10-17-2017
JOB NO.	216-001-3515712
ACAD. NO.	002
SHEET NO.:	2 OF 7

PLANT AND CCR UNIT LOCATION MAP
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPco FLINT CREEK POWER PLANT BOTTOM ASH POND
 GENTRY ARKANSAS

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REV.	DATE	BY	DESCRIPTION



LEGEND:

- PRIMARY ASH POND BOUNDARY (THIS REPORT)
- CLEAR WATER POND/LANDFILL BOUNDARY (NEARBY OTHERS)
- +
 MONITORING WELL

NOTE:
WELL AP-52 WAS DECOMMISSIONED IN DECEMBER OF 2016 AND REPLACED WITH AP-60.

FIGURE 3

DESIGNED BY: TLB	ACAD NO.: 003
DRAWN BY: TLB	SHEET NO.: 3
APP'D BY: DCM	OF 7
SCALE: SEE BARSCALE	
DATE: 10-17-2017	
JOB NO. 216-001-35157124	

CCR UNIT AND WELL LOCATIONS

GROUNDWATER MONITORING NETWORK EVALUATION

AMERICAN ELECTRIC POWER

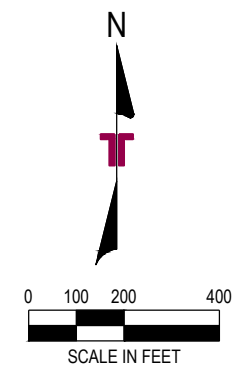
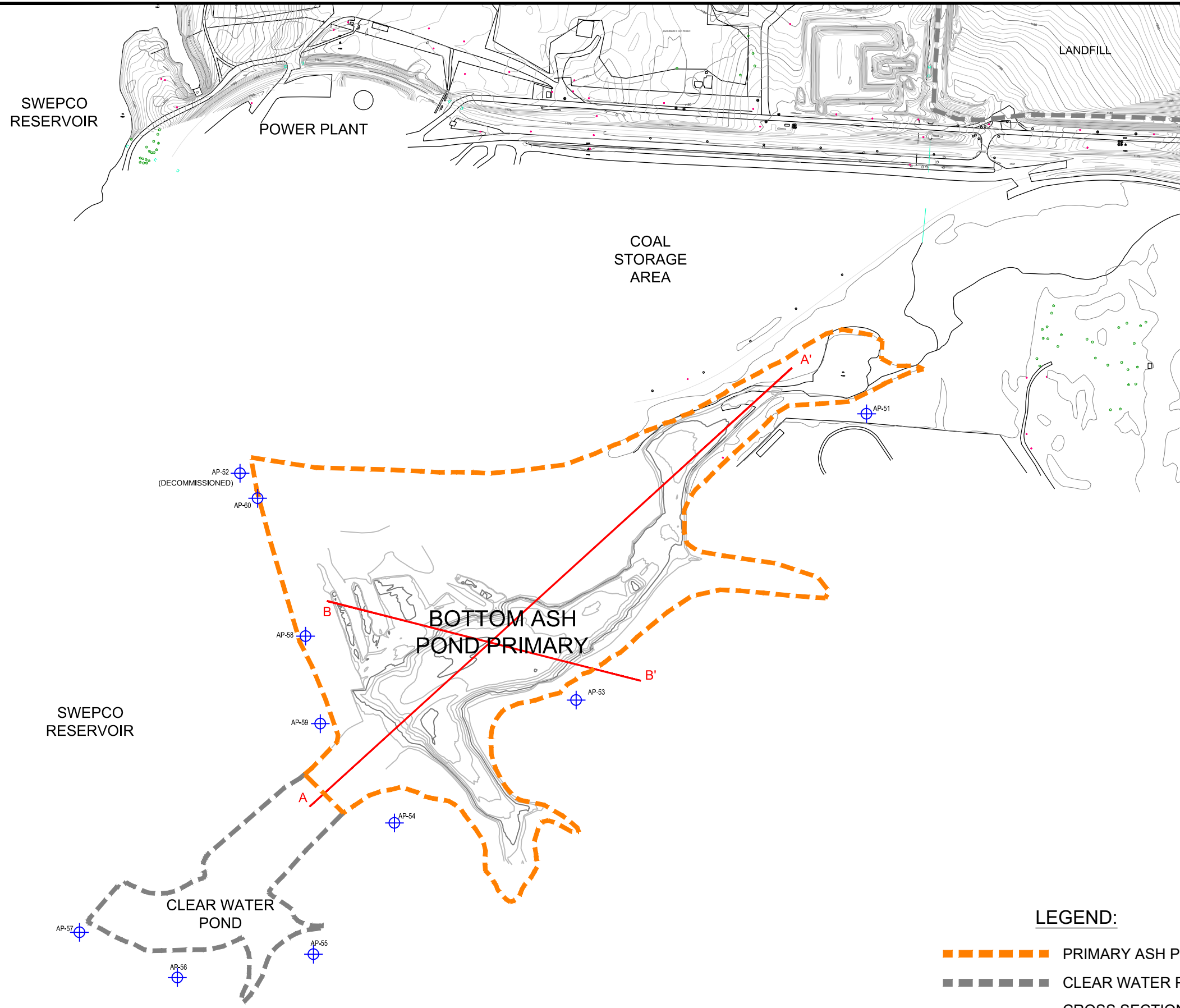
SWEPco FLINT CREEK POWER PLANT BOTTOM ASH POND

GENTRY ARKANSAS

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PH. (501) 847-9292 FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION



NOTE:
 CROSS SECTIONAL INFORMATION DEPICTED
 IN THESE CROSS SECTIONS WERE TAKEN
 FROM THE FOLLOWING SOURCES:

TOPOGRAPHIC INFORMATION:
 SURVEY PROVIDED BY AEP, AND IS A
 COMPOSITE OF AN AERIAL SURVEY
 PERFORMED BY HENDERSON AERIAL
 SURVEYS, INC., DATED APRIL 30, 2015 AND A
 HYDROGRAPHIC SURVEY PERFORMED BY
 AEP, DATED AUGUST 12, 2004.

UPPERMOST AQUIFER:
 DATA FROM SAMPLING EVENTS PERFORMED
 BY TERRACON CONSULTANTS, INC., DATING
 FROM JUNE 8, 2011 THROUGH
 MARCH 15, 2016.

WELL AP-52 WAS DECOMMISSIONED IN
 DECEMBER 2016 AND REPLACED WITH AP-60.

LEGEND:

- PRIMARY ASH POND BOUNDARY (THIS REPORT)
- CLEAR WATER POND/LANDFILL BOUNDARY (NEARBY OTHERS)
- CROSS SECTION LOCATION
- ⊕ MONITORING WELL

FIGURE 4

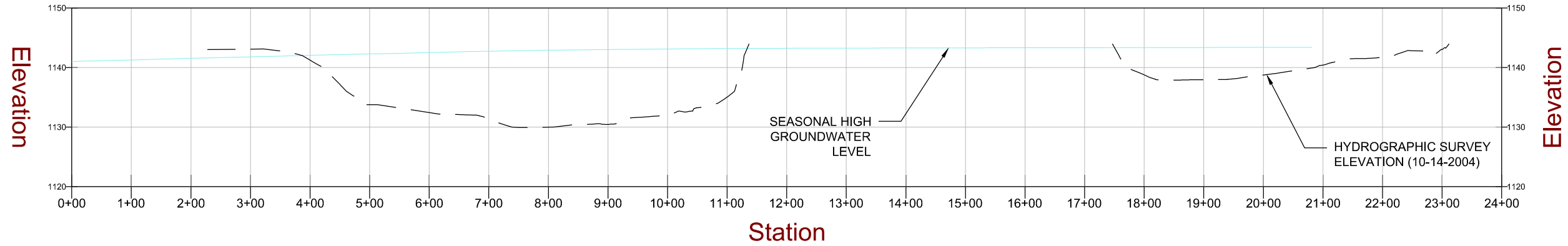
DESIGNED BY: TLB	DRAWN BY: SRE
APPRD. BY: DCM	SCALE: SEE BARSCALE
DATE: 10-17-2017	JOB NO: 216-001-35157124
ACAD NO: 004	SHEET NO: 4 OF 7

CROSS SECTION LOCATION MAP
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPCO FLINT CREEK POWER PLANT BOTTOM ASH POND
 GENTRY ARKANSAS

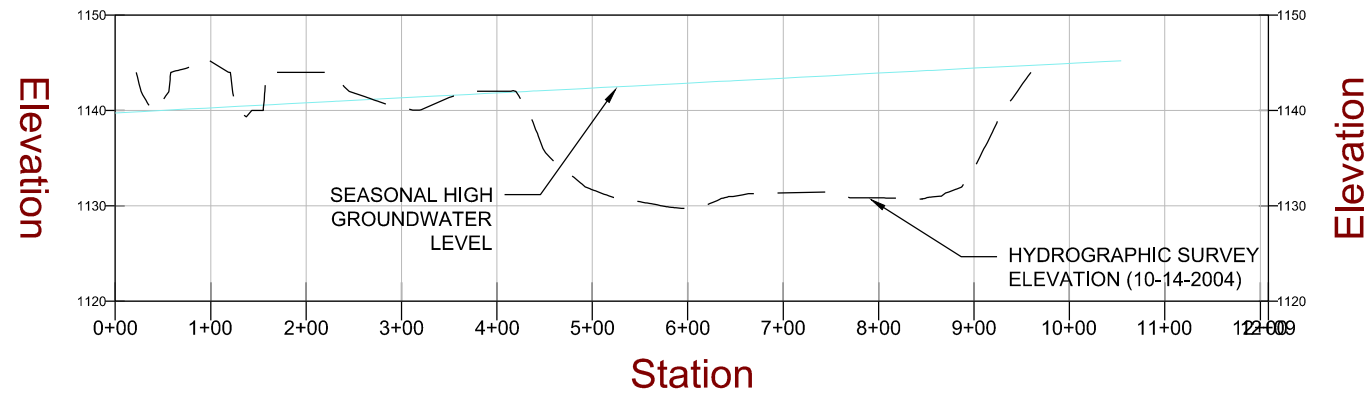
Terracon
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REV.	DATE	BY	DESCRIPTION

SECTION A-A'



SECTION B-B'



NOTE:
 CROSS SECTIONAL INFORMATION DEPICTED
 IN THESE CROSS SECTIONS WERE TAKEN
 FROM THE FOLLOWING SOURCES:

TOPOGRAPHIC INFORMATION:
 SURVEY PROVIDED BY AEP, AND IS A
 COMPOSITE OF AN AERIAL SURVEY
 PERFORMED BY HENDERSON AERIAL
 SURVEYS, INC., DATED APRIL 30, 2015 AND A
 HYDROGRAPHIC SURVEY PERFORMED BY
 AEP, DATED AUGUST 12, 2004.

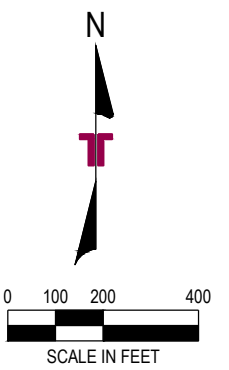
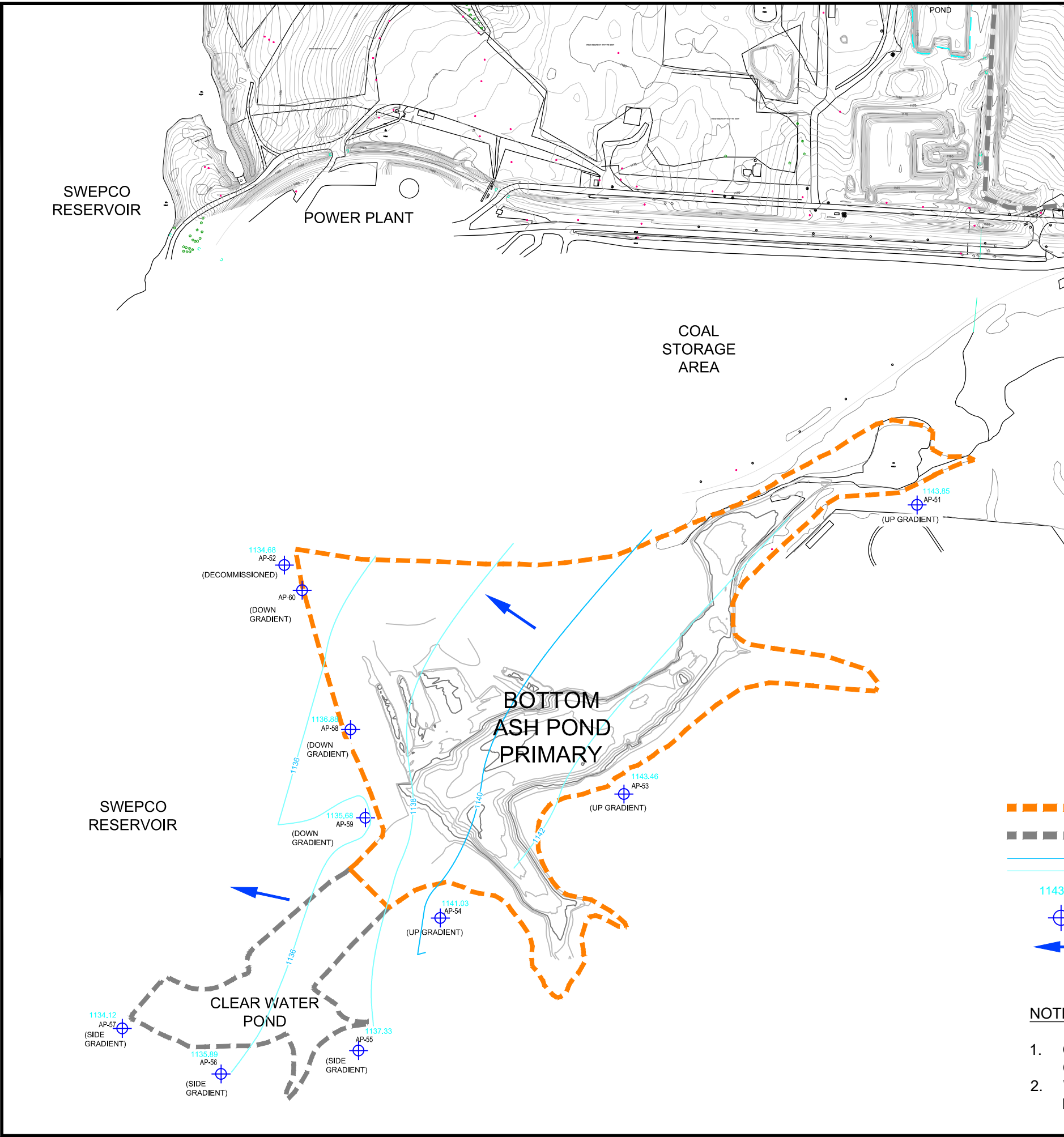
UPPERMOST AQUIFER:
 DATA FROM SAMPLING EVENTS PERFORMED
 BY TERRACON CONSULTANTS, INC., DATING
 FROM JUNE 8, 2011 THROUGH MARCH 15, 2016.

FIGURE 5	
DESIGNED BY: TLB	
DRAWN BY: SRE	
APPROV. BY: DCM	
SCALE: SEE BARSCALE	
DATE: 10-17-2017	
JOB NO. 216-001-35157124	
ACAD NO. 005	
SHEET NO. 5	OF 7

CROSS SECTIONS
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPSCO FLINT CREEK POWER PLANT BOTTOM ASH POND
 GENTRY ARKANSAS

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REV.	DATE	BY	DESCRIPTION



LEGEND:

- PRIMARY ASH POND BOUNDARY (THIS REPORT)
- CLEAR WATER POND/LANDFILL BOUNDARY (OTHERS NEARBY)
- GROUNDWATER CONTOURS
- 1143.46 GROUNDWATER ELEVATION
- MONITORING WELL
- GROUNDWATER FLOW DIRECTION

NOTE:

1. GROUNDWATER ELEVATIONS TAKEN FROM SAMPLING EVENT ON MARCH 15, 2016.
2. WELL AP-52 WAS DECOMMISSIONED IN DECEMBER 2016 AND REPLACED WITH AP-60.

FIGURE 6					
DESIGNED BY:	TLB	DRAWN BY:	SRE	APP'D BY:	DCM
SCALE:	SEE BARSCALE	DATE:	10-17-2017	JOB NO.	216-001-35157124
ACAD NO.	006	SHEET NO.:		6	OF 7

POTENTIOMETRIC SURFACE MAP - UPPERMOST AQUIFER
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPKO FLINT CREEK POWER PLANT BOTTOM ASH POND
 GENTRY ARKANSAS

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REV.	DATE	BY	DESCRIPTION



FIGURE 7	
DESIGNED BY: TLB	
DRAWN BY: TLB	
APPROV. BY: DCM	
SCALE: SEE BARSCALE	
DATE: 10-17-2017	
JOB NO. 216-001-35157124	
ACAD NO. 009	
SHEET NO. 7	OF 7

NEAREST DOMESTIC WELL LOCATION
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPCO FLINT CREEK POWER PLANT BOTTOM ASH POND
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REV.	DATE	BY	DESCRIPTION

TABLE 1
AEP – Flint Creek
Primary Bottom Ash Pond
Groundwater Elevations (FMSL)

Well	AP-51	AP-52	AP-53	AP-54	AP-55	AP-56	AP-57	AP-58	AP-59	AP-60
Date										
7/20/2011	1144.38	1134.59	1145.13	1142.71	1139.16	1136.90	1134.72			
10/26/2011	1143.72	1131.70	1142.57	1140.03	1136.80	1133.71	1131.37			
1/24/2012	1144.41	1134.85	1145.28	1141.57	1139.01	1136.53	1134.95			
4/25/2012	1144.23	1137.08	1142.88	1140.79	1138.74	1087.86	1137.24			
7/31/2012	1143.60	1133.35	1143.19	1140.75	1136.59	1134.94	1133.27			
10/24/2012	1142.56	1131.67	1141.35	1137.99	1135.18	1132.36	1130.20			
1/29/2013	1141.08	(dry)	1139.86	1136.43	1133.83	1130.78	1129.74			
4/23/2013	1145.20	1136.01	1143.28	1141.11	1140.83	1139.10	1136.30			
8/13/2013	1143.67	1133.40	1143.29	1140.59	1138.25	1137.03	1135.92			
10/21/2013	1143.48	1134.74	1144.49	1142.07	1137.29	1135.89	1134.96			
1/29/2014	1144.12	1134.68	1143.69	1141.30	1138.76	1137.30	1135.80			
4/30/2014	1142.45	1135.04	1140.98	1137.81	1135.77	1135.72	1135.25			
7/23/2014	1144.04	1134.64	1143.57	1140.99	1138.56	1137.23	1135.71			
10/16/2014	1143.87	(dry)	1144.42	1142.71	1142.13	1138.36	1135.32			
1/20/2015	1143.45	(dry)	1144.19	1142.82	1141.87	1137.80	1134.75			
4/28/2015	1144.27	(dry)	1142.73	1140.23	1138.55	1137.23	1136.50			
7/22/2015	1145.15	1138.77	1143.23	1140.90	1139.87	1138.75	1137.35			
10/20/2015	1140.13	(dry)	1143.70	1141.39	1136.91	1135.73	1133.83			
3/15/2016	1143.85	1134.68	1143.46	1141.03	1137.33	1135.89	1134.12	1136.88	1135.68	
Seasonal High	1145.20	1138.77	1145.28	1142.82	1142.13	1139.10	1137.35	1136.88	1135.68	-

Note: AP-52 was decommissioned in December, 2016 and replaced with AP-60.

TABLE 2
AEP - FLINT CREEK
Primary Bottom Ash Pond
MONITORING WELL CONSTRUCTION DETAILS

Well Number	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole Depth ft. bls	Date Installed	Screen Material	Well Diameter inches	Top of Screen Depth ft. bls	Top of Screen Elevation ft. msl	Bottom of Screen Depth ft. bls	Bottom of Screen Elevation ft. msl
AP-51	36° 15' 15.04552"	94° 31' 00.57349"	1160.10	1163.23	35	6/12/2011	PVC	2	17	1143.10	32.4	1130.83
AP-52	36° 15' 12.25697"	94° 31' 29.06821"	1155.90	1158.89	26	6/13/2011	PVC	2	9.2	1146.70	24.6	1134.29
AP-53	36° 15' 04.97559"	94° 31' 13.55592"	1156.40	1159.34	30	6/12/2011	PVC	2	13.8	1142.60	29.05	1130.29
AP-54	36° 15' 00.19114"	94° 31' 31.64012"	1164.70	1167.71	31.5	6/11/2011	PVC	2	14.6	1150.10	30	1137.71
AP-55	36° 14' 55.13143"	94° 31' 25.45525"	1153.80	1156.86	26.5	6/9/2011	PVC	2	8.75	1145.05	24.15	1132.71
AP-56	36° 14' 54.52789"	94° 31' 31.04075"	1155.60	1158.77	36	6/8/2011	PVC	2	19.5	1136.10	34.9	1123.87
AP-57	36° 14' 55.97604"	94° 31' 36.16662"	1154.10	1157.31	25	6/8/2011	PVC	2	9.6	1144.50	25	1132.31
AP-58	36° 15' 06.5928"	94° 31' 26.6690"	1155.02	1154.65	69	2/16/2016	PVC	2	58.45	1096.57	68.85	1085.80
AP-59	36° 15' 06.7003"	94° 31' 26.7060"	1151.83	1155.14	30	2/4/2016	PVC	2	19.89	1131.94	30.29	1124.85
AP-60	36° 15' 11.6378"	94° 31' 29.0189"	1154.01	1156.93	48.5	12/8/2016	PVC	2	38.15	1115.86	48.45	1108.48

Note: AP-52 was decommissioned in December, 2016 and replaced with AP-60.

APPENDIX 1
Boring & Monitoring Well Installation Logs

Boring Logs



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FIELD BORING LOG

BORING NO.: AP-51

PAGE: 1 of 1

TOTAL DEPTH: 35 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-008

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/12/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 708,641.27	E: 1,257,949.01	G.S. ELEV. 1,160.10	Litho. Symbol	Run #	% Recovery	RQD	Remarks
	DESCRIPTION							
0	0' - 2' <u>SILTY GRAVEL</u> brown with boulders							Refusal at 8' bgs (Started air rotary at 8')
	2' - 4' <u>GRAVELLY CLAY</u> reddish brown							
5	4' - 5.5' <u>CHERTY LIMESTONE</u> white							
	5.5' - 8' <u>GRAVELLY CLAY</u> reddish brown				1	2"		
	8' - 10' <u>LIMESTONE</u> gray							
10	10' - 11' <u>CLAY</u> reddish brown							
	11' - 11.5' <u>LIMESTONE</u> gray							
	11.5' - 13' <u>CLAY</u> reddish brown							
	13' - 13.5' <u>LIMESTONE</u> gray							
15	13.5' - 35' <u>CLAY</u> reddish brown with intermittent gray limestone layers, limestone layers are approximately 0.6' to 1' thick							
20	Moist at 21'							
25								
30								
35	Total Depth of Boring at 35' bgs							Stopped at 35' for 1 hr. Water recharged to 17.8' bgs
40								

LOGGED BY CUTTINGS
↓



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FIELD BORING LOG

BORING NO.: AP-52

PAGE: 1 of 1

TOTAL DEPTH: 26 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-009

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/13/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 708,419.12 E: 1,255,608.60 G.S. ELEV. 1,155.90	Litho. Symbol	Run #	% Recovery	RQD	Remarks
	DESCRIPTION					
0	0' - 2' <u>GRAVELLY CLAY</u> reddish brown					
	2' - 4.5' <u>CLAY</u> reddish brown					
5	4.5' - 8' <u>CHERTY LIMESTONE</u> white and gray with small (~ 3") intermittent reddish brown and white heavily weathered limestone		1	0		
10	8' - 13' <u>LIMESTONE</u> reddish brown, very heavily weathered with cherty limestone layers (<3" thick)		2			Water observed at 10' bgs while drilling
15	13' - 16' <u>LIMESTONE</u> gray, hard					Refusal at 13.5' bgs (Started air rotary at 13.5')
	16' - 18' <u>LIMESTONE</u> heavily weathered					
20	18' - 20.5' <u>Void</u> , wet					Void at 18' - 20.5'
25	20.5' - 26' <u>LIMESTONE</u> gray					
	Total Depth of Boring at 26' bgs					Allowed boring to sit open for 1 hr. at 26'. Water recharged to 17' bgs
30						
35						
40						



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FIELD BORING LOG

BORING NO.: AP-53

PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-010

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/9/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 707,650.49	E: 1,256,859.93	G.S. ELEV. 1,156.40	Litho. Symbol	Run #	% Recovery	RQD	Remarks
	DESCRIPTION							
0	0' - 3' <u>SILTY GRAVEL</u> cobble size gravel				1	4"	10"	Water observed at 14.5' bgs while drilling
5	3' - 8' <u>GRAVELLY CLAY</u> reddish brown							
10	8' - 10.5' <u>LIMESTONE</u> reddish brown, heavily weathered, soft drilling, moist				2			
15	10.5' - 11' <u>CHERTY LIMESTONE</u> gray 11' - 30' <u>LIMESTONE</u> reddish brown, very heavily weathered with thin (<5") layers of cherty limestone							
30	Total Depth of Boring at 30' bgs							Allowed boring to sit open overnight at 30' bgs. water at 12.2' bgs on 6/10/11
35								
40								



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FIELD BORING LOG

BORING NO.: AP-54

PAGE: 1 of 1

TOTAL DEPTH: 31.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-011

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/9/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 707,183.78 E: 1,256,185.57 G.S. ELEV. 1,164.70	Litho. Symbol	Run #	% Recovery	RQD	Remarks
DESCRIPTION						
0	0' - 3' <u>GRAVELLY CLAY</u> reddish brown		1	13"		
5	3' - 10.5' <u>GRAVELLY CLAY</u> reddish brown, more clay					
10	10.5' - 11' <u>LIMESTONE</u> gray		2	4"		
15	11' - 12' <u>SILTY CLAY</u> tan and gray, very hard		3	15"		
12.5'	12' - 12.5' <u>LIMESTONE</u> white					
20	12.5' - 26' <u>LIMESTONE</u> reddish brown, heavily weathered with intermittent (<4" thick) hard cherty limestone layers					
25	26' - 27' <u>LIMESTONE</u> 27' - 28.5' <u>LIMESTONE</u> heavily weathered, soft drilling					
30	28.5' - 31.5' <u>LIMESTONE</u> intermittent hard and soft beds, cherty		4	2"		Water observed at 20.5' bgs while drilling
	Total Depth of Boring at 31.5' bgs					Allowed boring to sit open for 30 min. at 25' water recharged to 22.5' bgs Refusal at 26' bgs Boring sat open at 26' for 15 min. water recharged to 23.2' bgs
35						6-11-11 water at 21' bgs
40						



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FIELD BORING LOG

BORING NO.: AP-55

PAGE: 1 of 1

TOTAL DEPTH: 26.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-012

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/9/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 706,680.30 E: 1,255,860.06 G.S. ELEV. 1,153.80	Litho. Symbol	Run #	% Recovery	RQD	Remarks
	DESCRIPTION					
0	0' - 4' <u>SILTY GRAVEL</u> gray					
5	4' - 7' <u>GRAVELLY CLAY</u> reddish brown		1	8"		
10	7' - 12.5' <u>CLAY</u> reddish brown with black mottles		2	18"		
15	12.5' - 14' <u>LIMESTONE</u> weathered		3	15"		
20	14' - 22' <u>LIMESTONE</u> weathered, alternating and reddish brown gravelly clay, wet		4	18"		
25	22' - 26.5' <u>GRAVELLY CLAY</u> reddish brown		5	18"		
30	Total Depth of Boring at 26.5' bgs					Allowed boring to sit open for 45 min. at 26.5' bgs water recharged to 12.8' bgs.
35						
40						



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FIELD BORING LOG

BORING NO.: AP-56

PAGE: 1 of 1

TOTAL DEPTH: 36 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-013

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/8/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 706,631.02	E: 1,255,401.11	G.S. ELEV. 1,155.60	Litho. Symbol	Run #	% Recovery	RQD	Remarks
	DESCRIPTION							
0	0' - 18' <u>GRAVELLY CLAY</u> reddish brown							
5					1	15"		
10					2	2"		
15				3	10"			
20	18' - 24' <u>CLAY</u> tan and gray, some silt, firm				4	18"		
25	24' - 24.5' Rock 24.5' - 31' <u>CLAY</u> tan, gray and reddish brown, mottled, firm, wet				5	18"		
30	31' - 36' <u>LIMESTONE</u> weathered with interbedded clay, wet							Allowed boring to sit open for 20 min. at 30' bgs water recharged to 29' bgs.
35	Total Depth of Boring at 36' bgs							
40								



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FIELD BORING LOG

BORING NO.: AP-57

PAGE: 1 of 1

TOTAL DEPTH: 25 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER - FLINT CREEK

PROJECT: ASH POND WELLS

JOB NO.: 216-001-35117108-014

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: JODY ADAMS

DRILLER: GARRY MOYERS

DATE DRILLED: 6/8/11

RIG TYPE: ATV

DRILLING METHOD: HOLLOW STEM AUGER, AIR ROTARY

SAMPLING METHOD: SPLIT SPOON

Depth BGS	N: 706,788.18	E: 1,254,985.13	G.S. ELEV. 1,154.10	Litho. Symbol	Run #	% Recovery	RQD	Remarks	
	DESCRIPTION								
0	0' - 2' <u>GRAVELLY CLAY</u> brown							Refusal at 10' bgs Started air rotary at 10'	
	2' - 3.5' <u>GRAVELLY CLAY</u> reddish brown								
5	3.5' - 9.5' <u>SILTY CLAY</u> reddish brown				1	13"			
10	9.5' - 25' <u>LIMESTONE</u> bedrock				2				
15									
20									
25	(void at 23'-23.5') (fractured limestone at 24'-25')								
25	Total Depth of Boring at 25' bgs								Allowed boring to sit open for 20 min. at 25' bgs water recharged to 15' bgs.
30									
35									
40									



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FIELD BORING LOG

BORING NO.: AP-58

PAGE: 1 of 2

TOTAL DEPTH: 69 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: FLINT CREEK - CCR WELL INSTALLATION

JOB NO.: 216-001-35157182-002

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: ADAM HOOPER

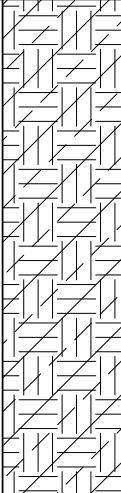
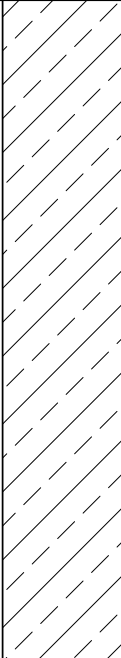
DRILLER: GARY MOYERS

DATE DRILLED: 2/16/2016

RIG TYPE: CME 75 BUGGY

DRILLING METHOD: HOLLOW STEM AUGER /AIR ROTARY

SAMPLING METHOD: 5' CONTINUOUS SAMPLER - LOGGED BY CUTTINGS

Depth BGS	N: N/A	E: N/A	G.S. ELEV.	N/A	Litho. Symbol	Remarks
	DESCRIPTION					Flush - mounted boring
0	0'-15' SILTY CLAY - FILL brown and red, poor sample return					
15	15'-56' SILTY CLAY red, moist zones at 30' - 40' and 45' - 50'					



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FIELD BORING LOG

BORING NO.: AP-59

PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: FLINT CREEK - CCR WELL INSTALLATION

JOB NO.: 216-001-35157182-001

DRILLING CO.: ANDERSON ENGINEERING

LOGGED BY: ADAM HOOPER

DRILLER: GARY MOYERS

DATE DRILLED: 2/3/2016

RIG TYPE: CME 75 BUGGY

DRILLING METHOD: HOLLOW STEM AUGER /AIR ROTARY

SAMPLING METHOD: 5' CONTINUOUS SAMPLER - LOGGED BY CUTTINGS

Depth BGS	N: N/A	E: N/A	G.S. ELEV.	N/A	Litho. Symbol	Remarks
DESCRIPTION						
0						
0-8.5'	SILTY CLAY - FILL					
	red and brown					
5						
8.5-14.5'	LIMESTONE and SILTY CLAY					
	hard while drilling					
10						
14.5-17'	SILTY CLAY					
	red					
15						Moisture at top of rock at 17' bgs
17-30'	LIMESTONE					
	light gray, crystalline, thin fracture/void at 22' bgs					
20						
						Water at 22' bgs
25						17' - 30' Logged by cuttings
30	Total Depth of Boring at 30' bgs					





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FIELD BORING LOG

BORING NO.: AP-60

PAGE: 1 of 1

TOTAL DEPTH: 48.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: FLINT CREEK - GENTRY, AR.
JOB NO.: 216-001-35167278-001	DRILLING CO.: ANDERSON ENGINEERING
LOGGED BY: JODY ADAMS	DRILLER: DOMENIC TORANO
DATE DRILLED: 12/6/2016	RIG TYPE: TRUCK MOUNTED CME-55

DRILLING METHOD: HOLLOW STEM AUGER/AIR ROTARY

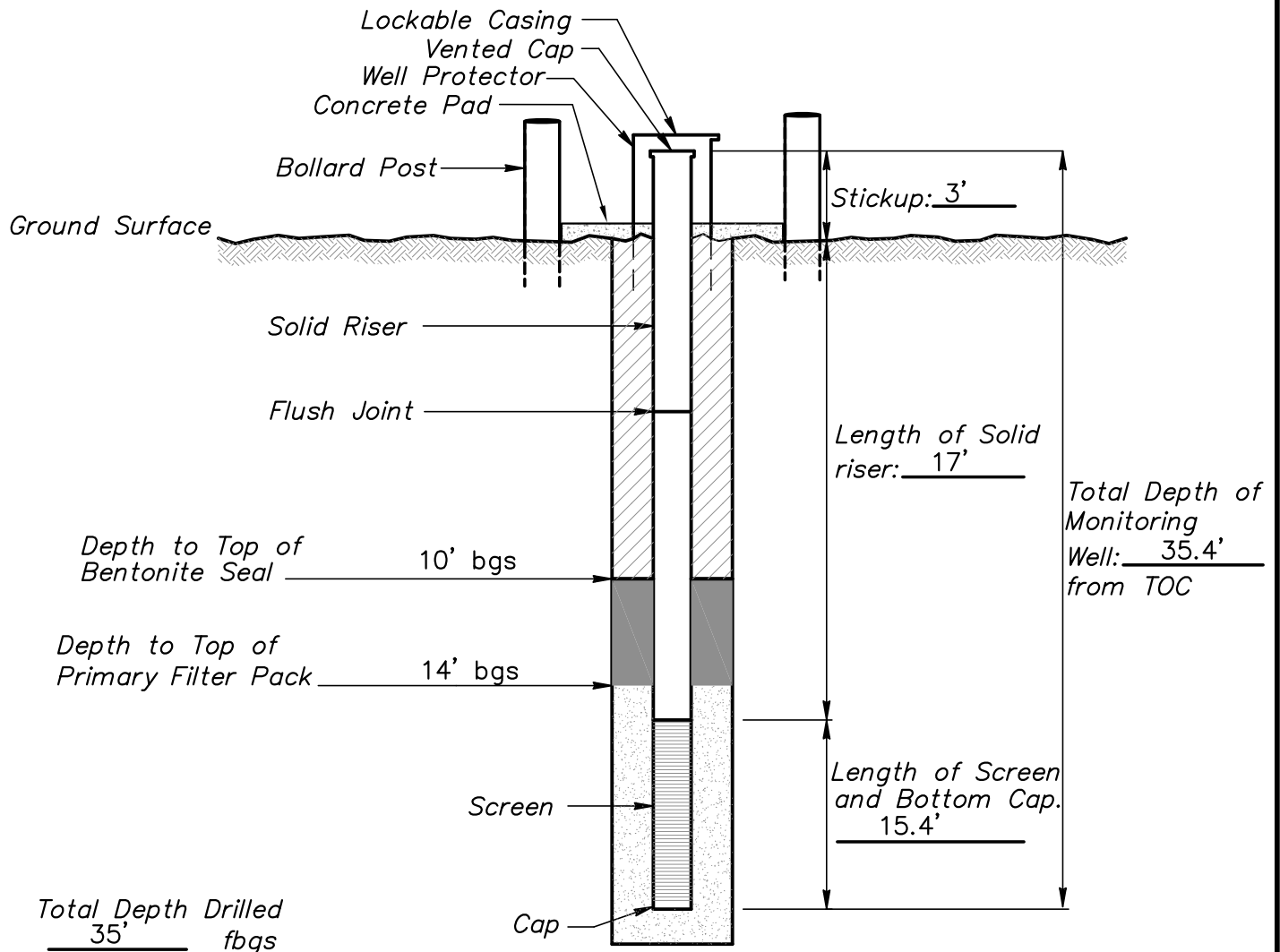
SAMPLING METHOD: SPLIT SPOON/CUTTINGS




Depth BGS	Sample Interval	N: 708325.63 E: 1255674.34 TOC: 1156.93	DESCRIPTION	Litho. Symbol	Sample Interval	Comments
0			0'-1' Gravel			
1			1'-4' CLAY brown, gravelly			Hand auger from 1'-2' bgs at AEP request.
5			4'-18' CLAY reddish brown, gravelly with intermittent chert layers		5'-6.5' SS	
10					10'-11.5' SS	
18			18'-23.5' LIMESTONE interbedded and weathered with reddish brown clay, moist			Auger refusal at 23.5' bgs. Started air rotary
23.5			23.5'-40' LIMESTONE intermittent weathered layers			
40			40'-46' LIMESTONE			
46			46'-46.5' LIMESTONE weathered, wet			Paused drilling at 38' bgs for 20 minutes to observe for water. Water came up to 36' bgs but is still believed to be perched water from the top of bedrock. Wet at 46' bgs
46.5			46.5'-48.5' LIMESTONE			
48.5			Total Depth of Boring at 48.5' bgs			

Monitoring Well Installation Logs

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-51
 Job Number 35117108 Installation Date 6/12/2011 Location GENTRY, AR.
 Datum Elevation 1,163.23 Surface Elevation 1,160.10
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER, AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)

Terracon
Consulting Engineers and Scientists

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BRYANT, AR. 72022
FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

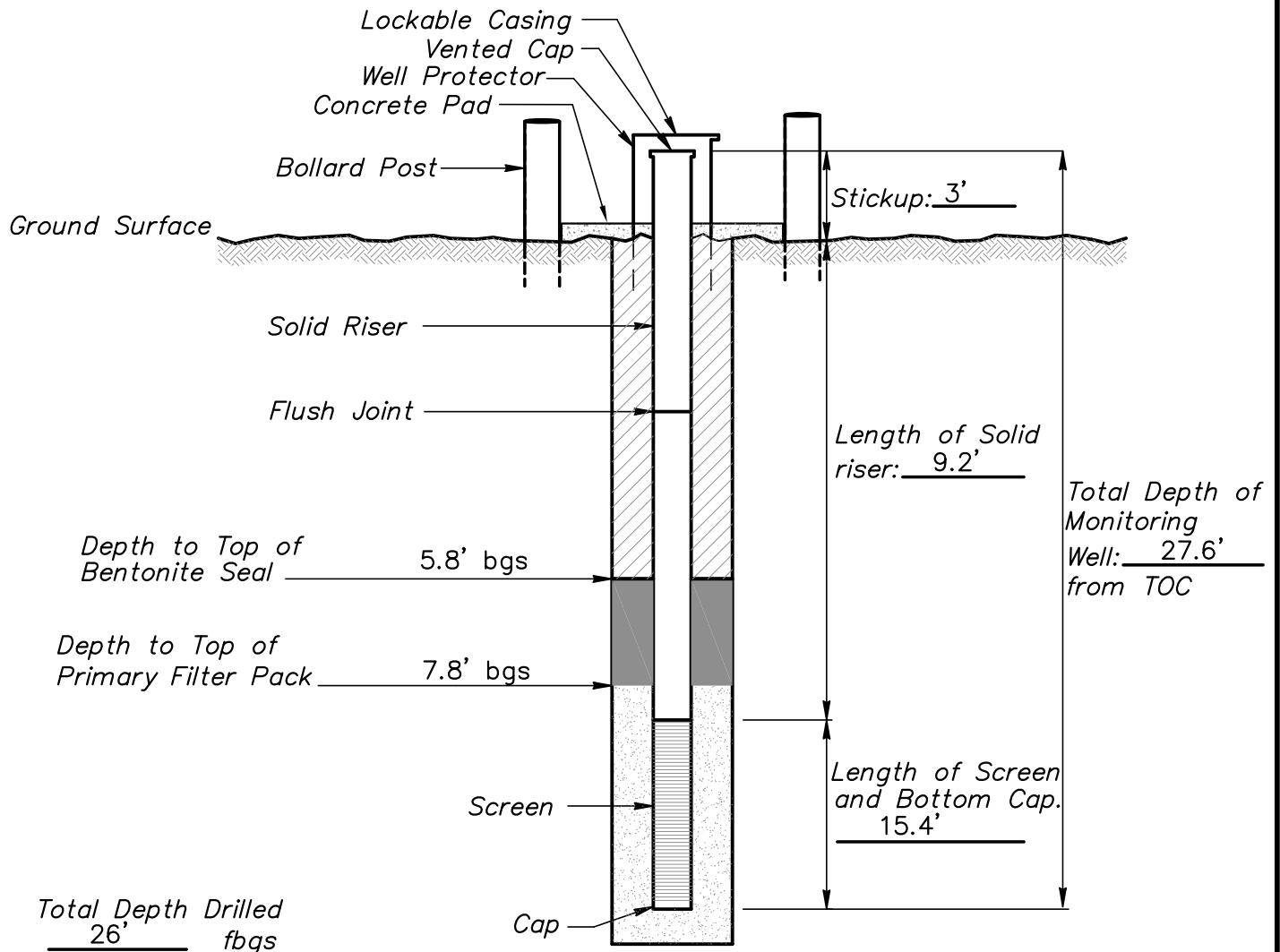
WELL NUMBER: AP-51




DRAWING NUMBER: 021

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-52
 Job Number 35117108 Installation Date 6/13/2011 Location GENTRY, AR.
 Datum Elevation 1,158.89 Surface Elevation 1,155.90
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER, AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

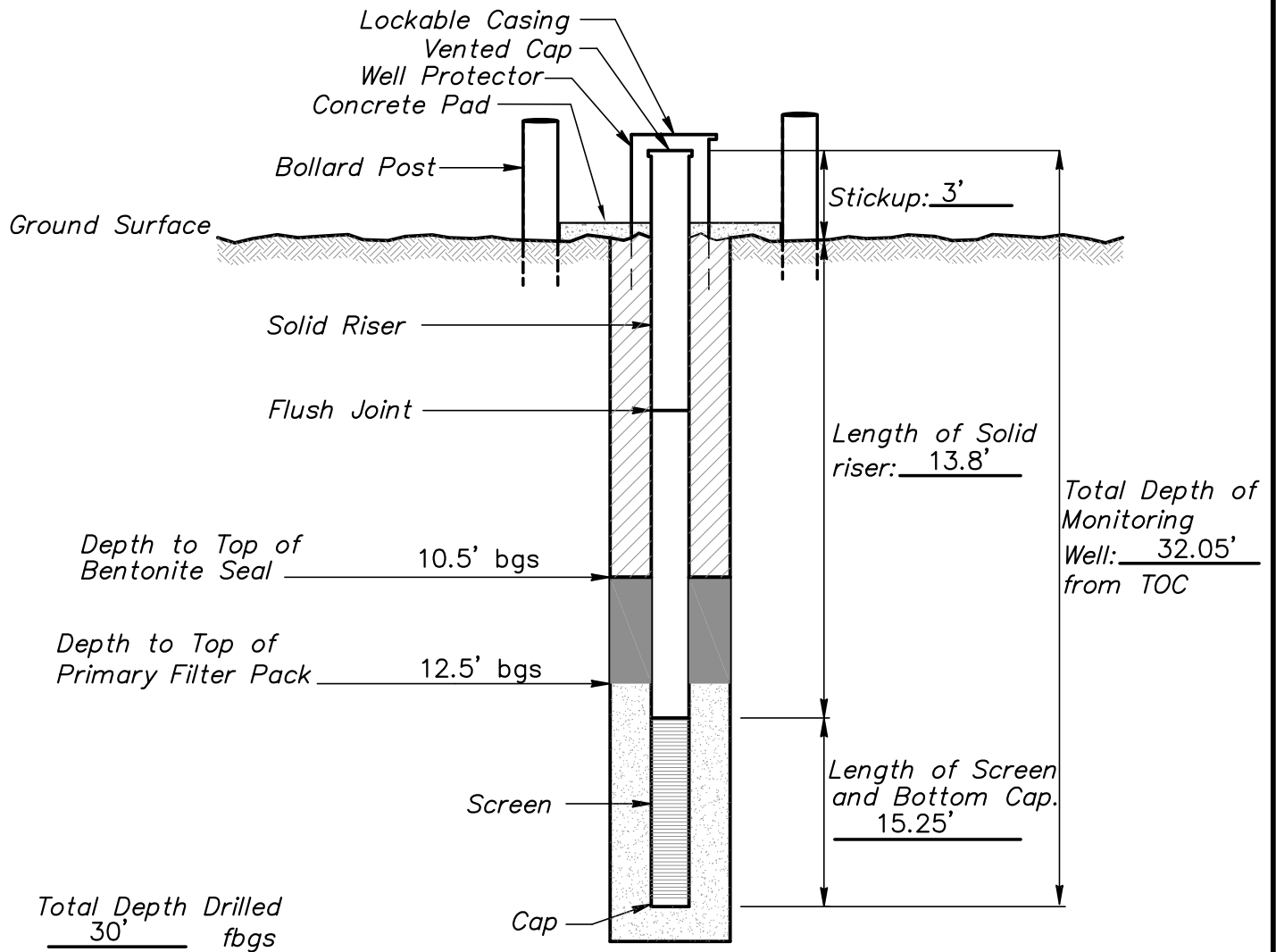
WELL NUMBER: AP-52




DRAWING NUMBER: 022

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-53
 Job Number 35117108 Installation Date 6/12/2011 Location GENTRY, AR.
 Datum Elevation 1,159.34 Surface Elevation 1,156.40
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)

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FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

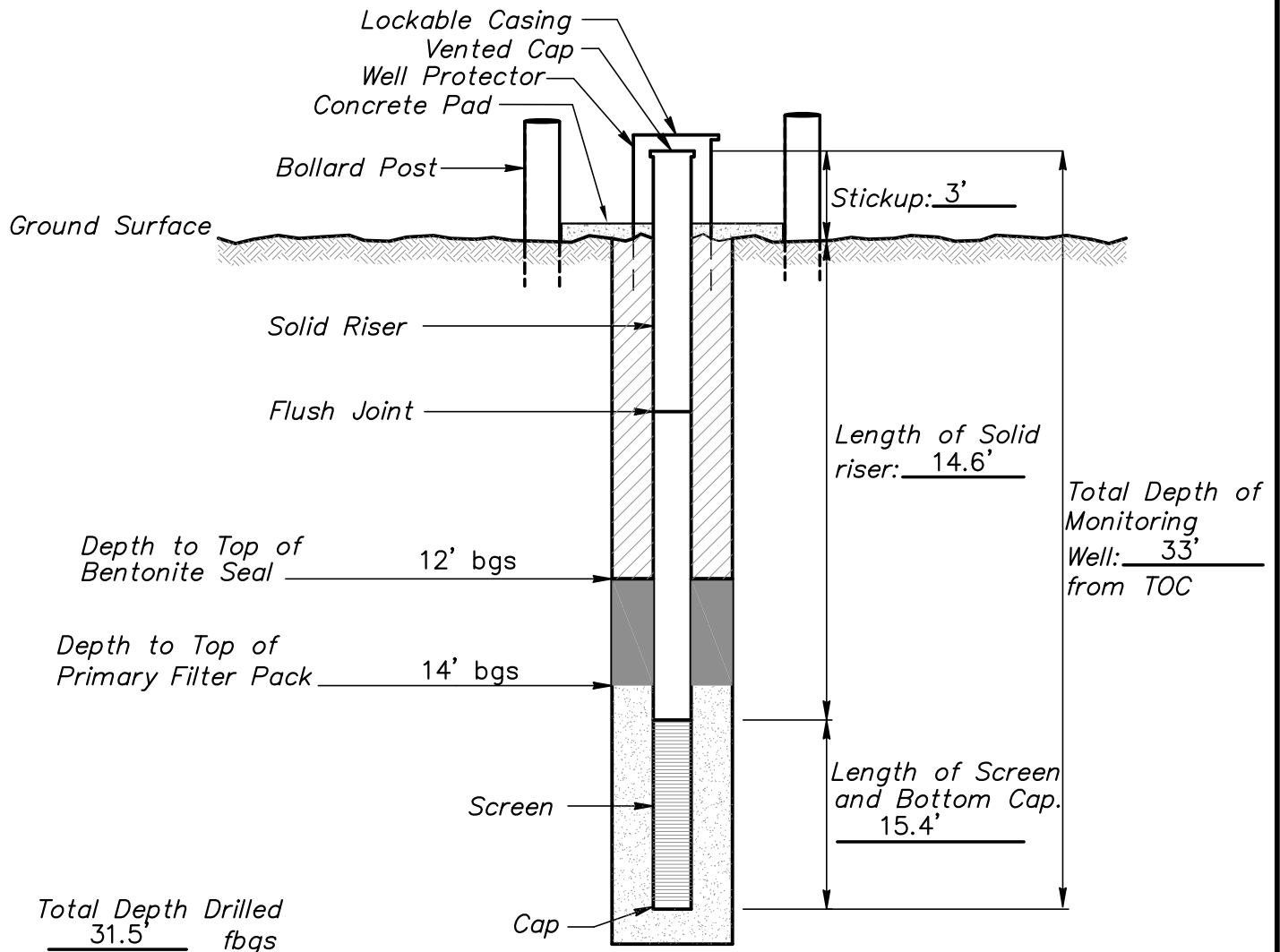
WELL NUMBER: AP-53




DRAWING NUMBER: 023

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-54
 Job Number 35117108 Installation Date 6/11/2011 Location GENTRY, AR.
 Datum Elevation 1,167.71 Surface Elevation 1,164.70
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER, AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

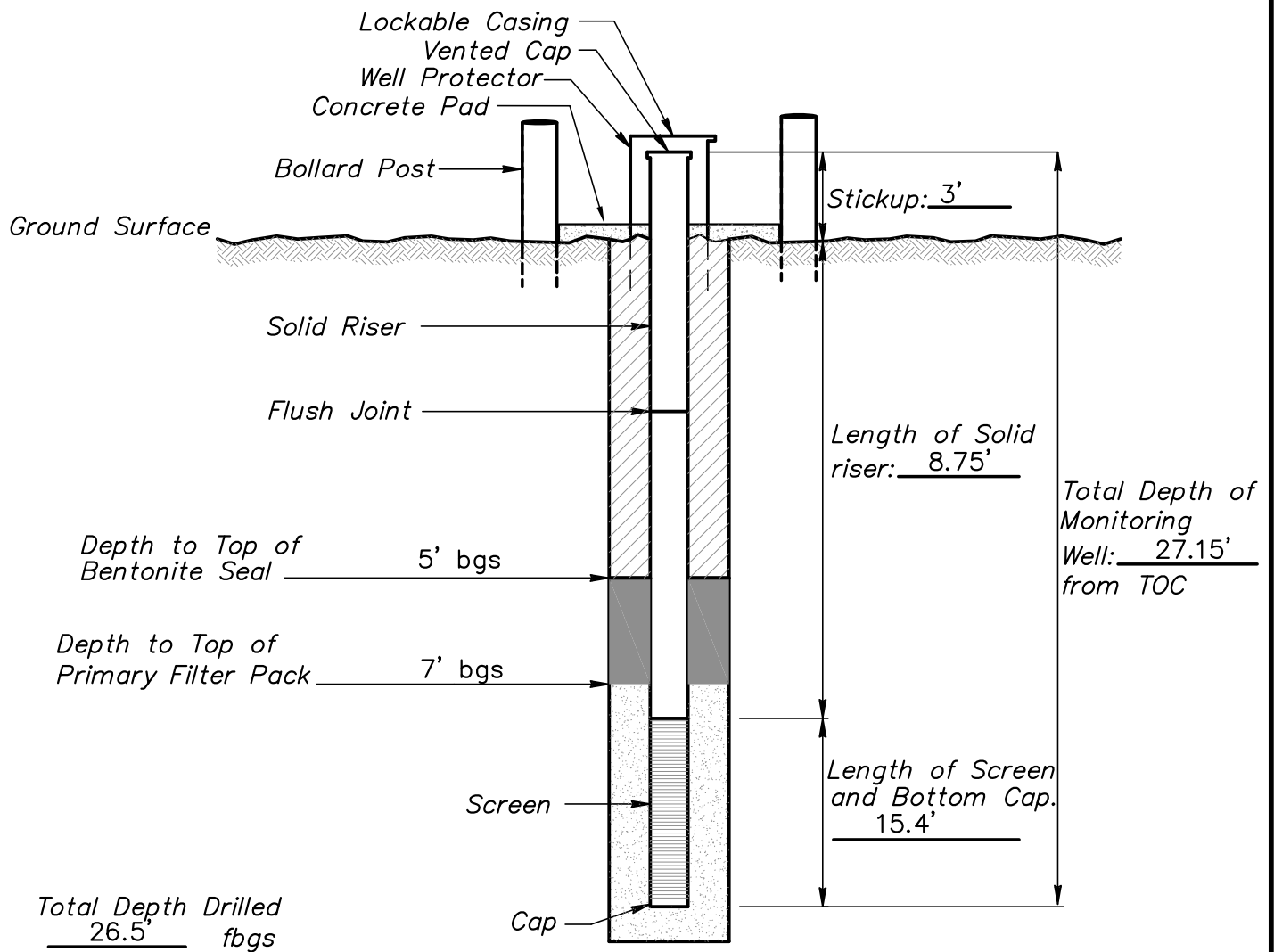
WELL NUMBER: AP-54




DRAWING NUMBER: 024

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-55
 Job Number 35117108 Installation Date 6/9/2011 Location GENTRY, AR.
 Datum Elevation 1,156.86 Surface Elevation 1,153.80
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)



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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

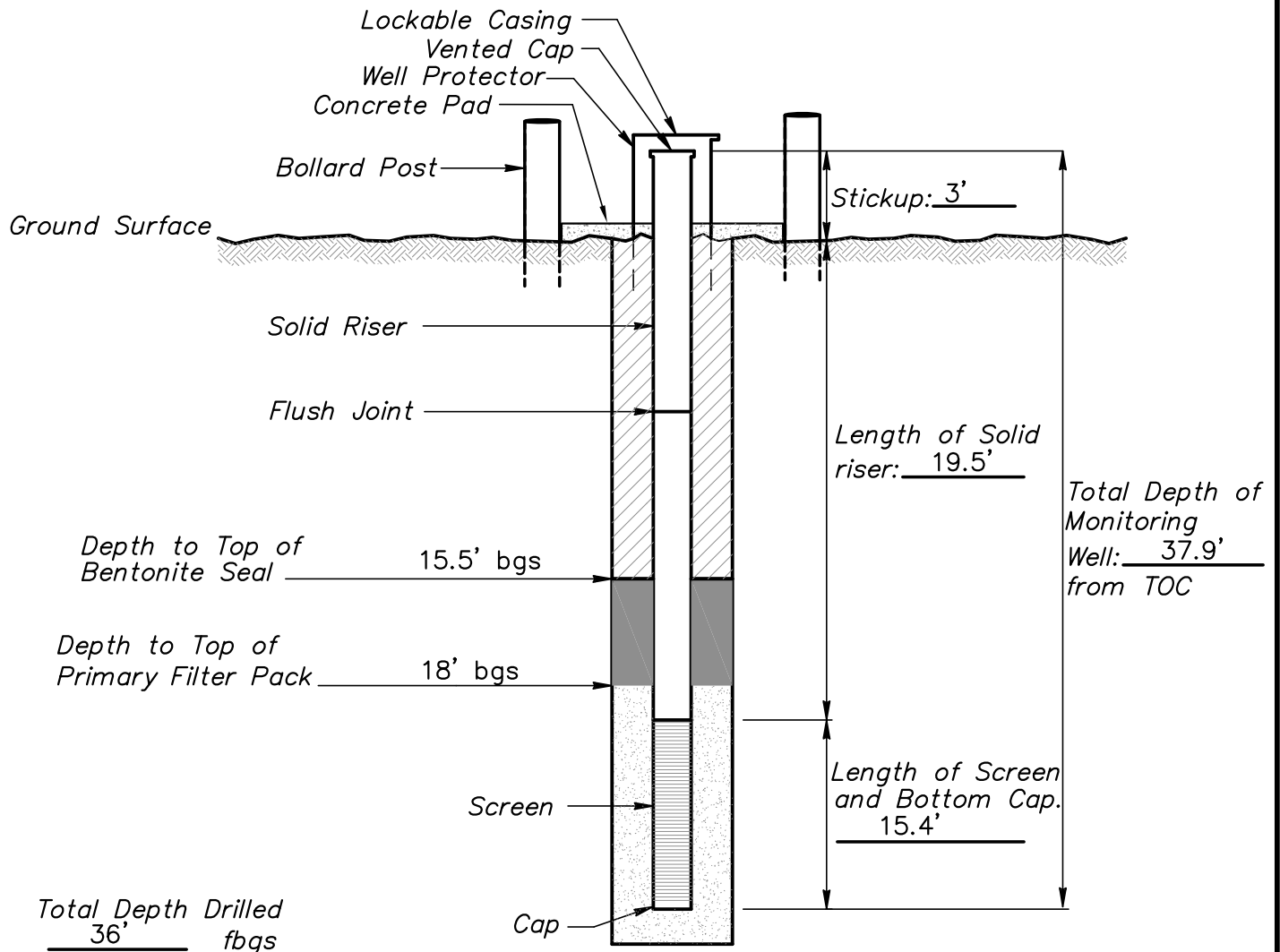
WELL NUMBER: AP-55




DRAWING NUMBER: 025

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-56
 Job Number 35117108 Installation Date 6/8/2011 Location GENTRY, AR.
 Datum Elevation 1,158.77 Surface Elevation 1,155.60
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER Drilling Contractor ANDERSON ENGINEERING



-  Bentonite Grout
-  Bentonite Plug
-  Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

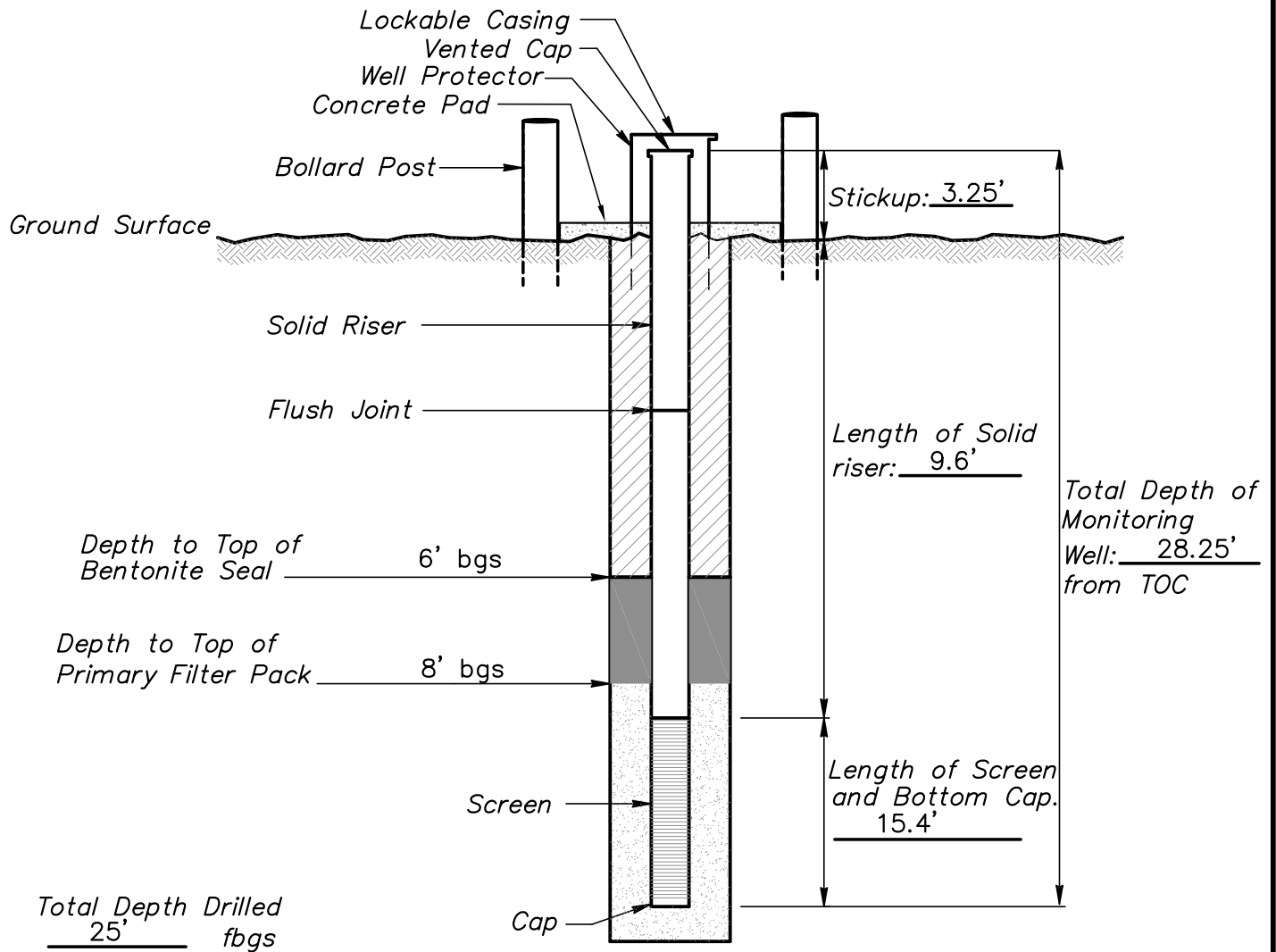
WELL NUMBER: AP-56

DRAWING NUMBER: 026

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name AEP FLINT CREEK – ASH POND WELLS Well Number AP-57
 Job Number 35117108 Installation Date 6/8/2011 Location GENTRY, AR.
 Datum Elevation 1,157.31 Surface Elevation 1,154.10
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010"
 Riser Diameter & Material 2" PVC Borehole Diameter 8", 3.25"
 Granular Backfill Material 12-20 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER Drilling Contractor ANDERSON ENGINEERING



- Bentonite Grout
- Bentonite Plug
- Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35117108

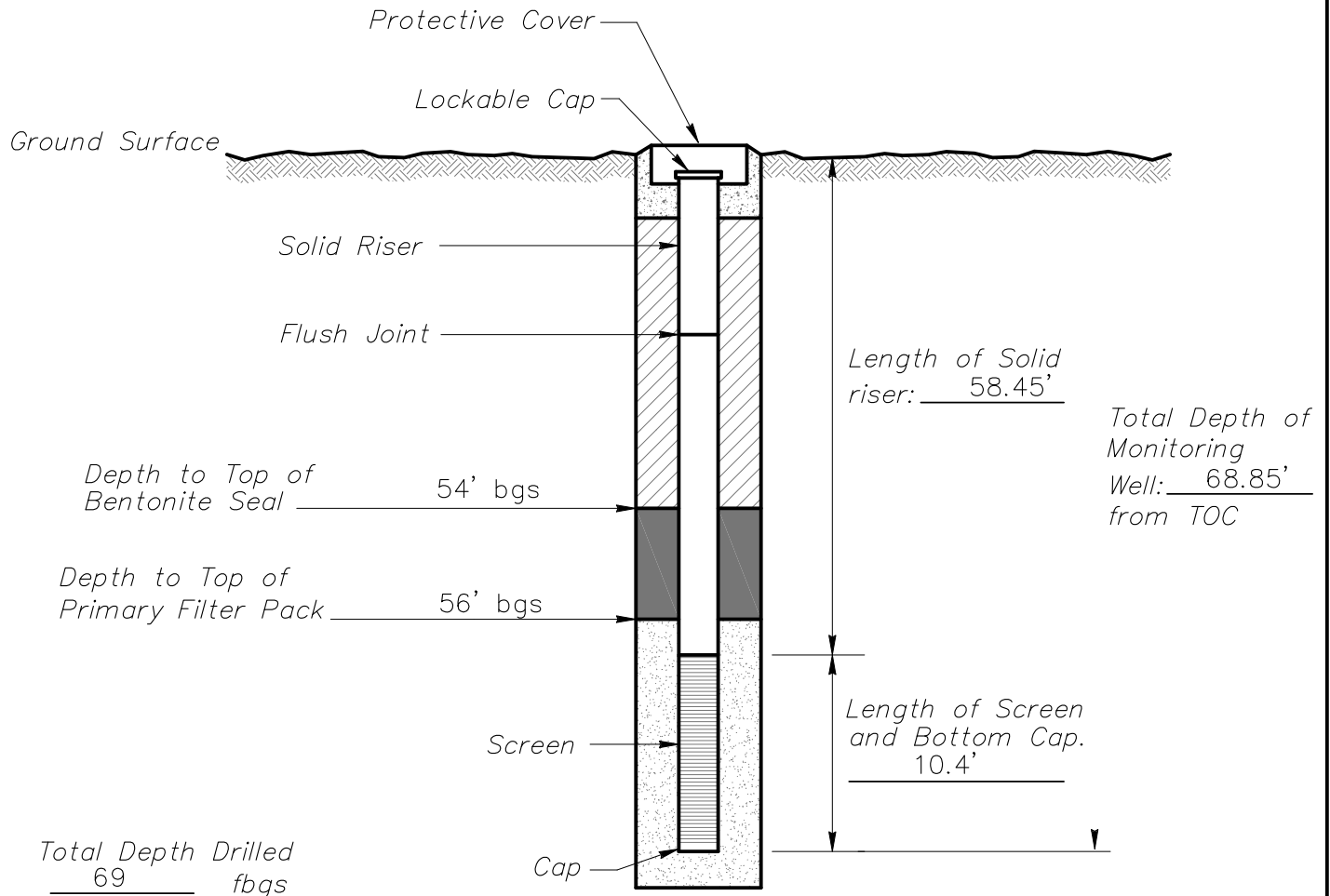
WELL NUMBER: AP-57

DRAWING NUMBER: 027

CHECKED BY: QEB

MONITORING WELL INSTALLATION RECORD

Job Name FLINT CREEK – CCR WELL INSTALLATION Well Number AP-58
 Job Number 35157182 Installation Date 2/16/2016 Location AEP-FLINT CREEK –GENTRY, AR.
 Datum Elevation NA Surface Elevation NA
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010
 Riser Diameter & Material 2" PVC Borehole Diameter 8"
 Granular Backfill Material 16-30 SAND Terracon Representative ADAM HOOPER
 Drilling Method HOLLOW STEM AUGER AND AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



- Portland/Bentonite Grout
- Bentonite Pellet Plug
- Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35157182

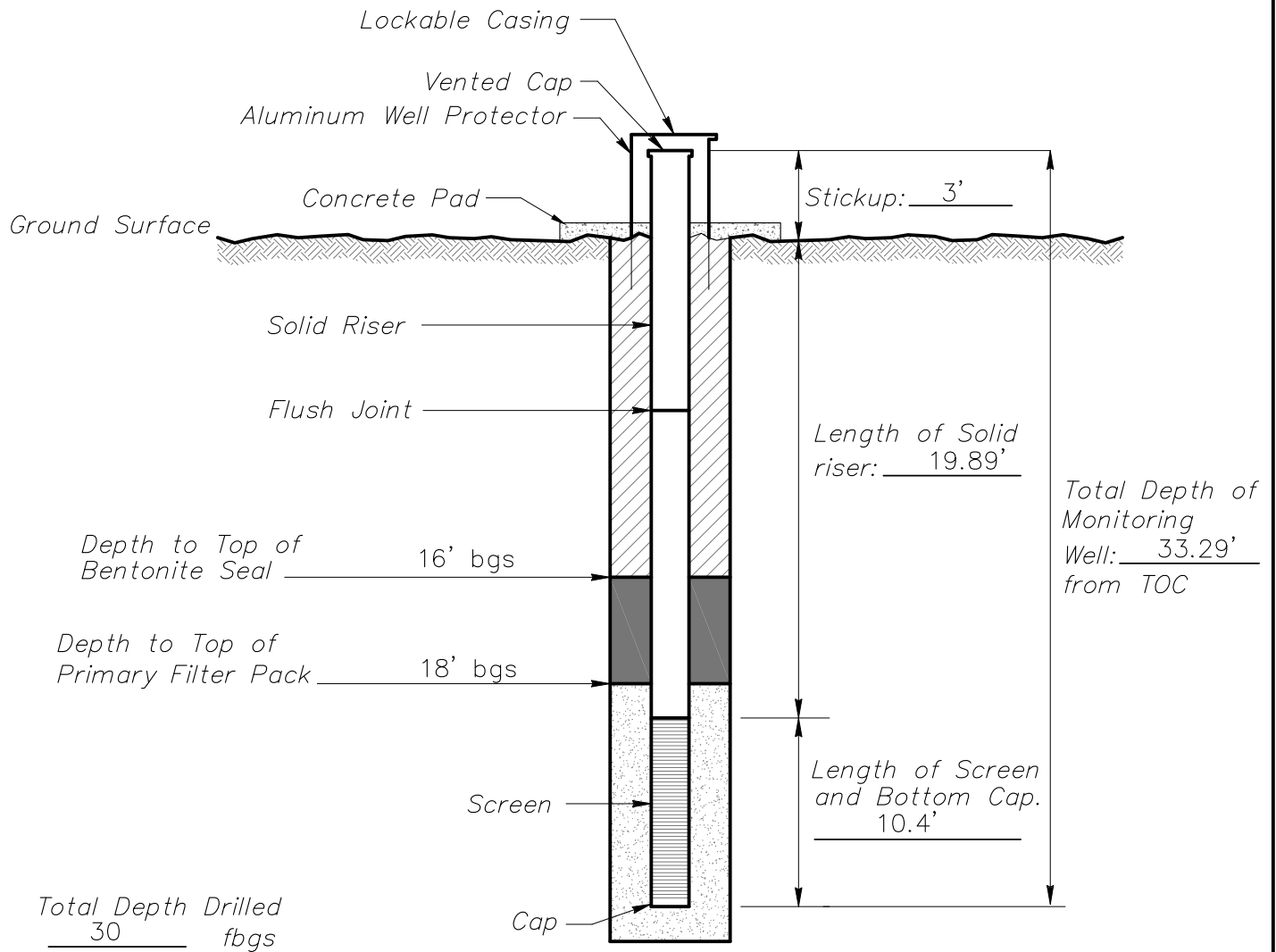
WELL NUMBER: AP-58

DRAWING NUMBER: 006

CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name FLINT CREEK – CCR WELL INSTALLATION Well Number AP-59
 Job Number 35157182 Installation Date 2/4/2016 Location AEP-FLINT CREEK –GENTRY, AR.
 Datum Elevation NA Surface Elevation NA
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010
 Riser Diameter & Material 2" PVC Borehole Diameter 8"
 Granular Backfill Material 16-30 SAND Terracon Representative ADAM HOOPER
 Drilling Method HOLLOW STEM AUGER AND AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



- Portland/Bentonite Grout
- Bentonite Pellet Plug
- Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35157182

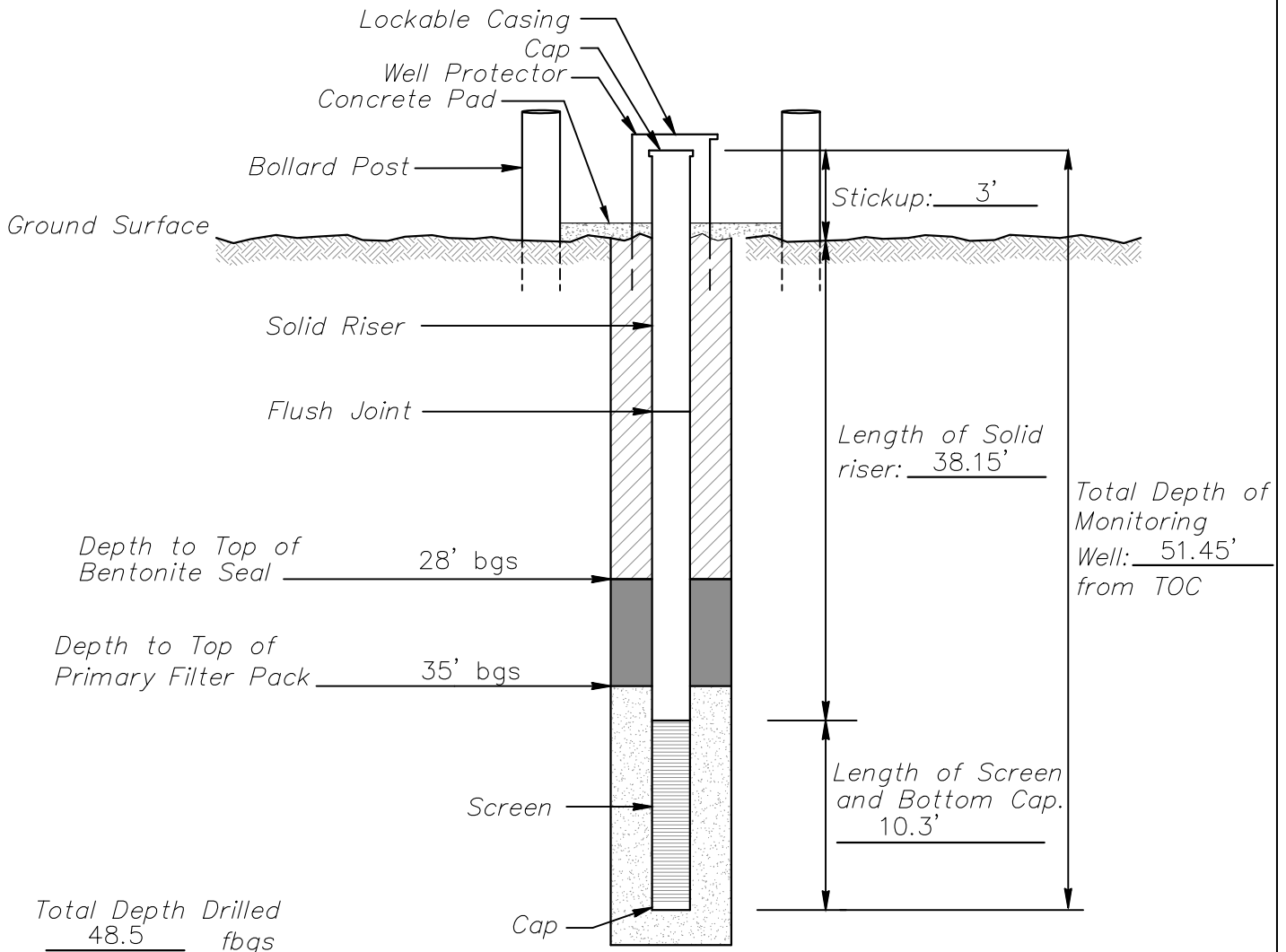
WELL NUMBER: AP-59

DRAWING NUMBER: 005

CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP – FLINT CREEK WELL INSTALLATION Well Number AP-60
 Job Number 35167278 Installation Date 1/9/2017 Location AEP-FLINT CREEK-GENTRY, AR.
 Datum Elevation 1156.93 Surface Elevation 1154.01
 Datum for Water Level Measurement T.O.C.
 Screen Diameter & Material 2" PVC Slot Size 0.010
 Riser Diameter & Material 2" PVC Borehole Diameter 8"
 Granular Backfill Material 16-30 SAND Terracon Representative JODY ADAMS
 Drilling Method HOLLOW STEM AUGER/AIR ROTARY Drilling Contractor ANDERSON ENGINEERING



- Cement/Bentonite Grout
- Bentonite Plug
- Granular Backfill

(Not to Scale)

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MONITORING WELL INSTALLATION RECORD

PROJECT NUMBER: 216-001-35167278

WELL NUMBER: AP-60

DRAWING NUMBER: 002

CHECKED BY: JBA

APPENDIX 2
Geologic Cross Sections

SWEPCO RESERVOIR

POWER PLANT

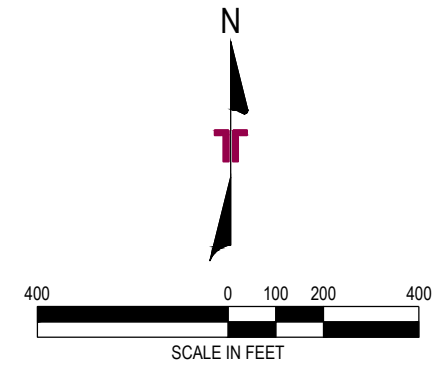
LANDFILL

COAL STORAGE AREA

BOTTOM ASH POND PRIMARY

SWEPCO RESERVOIR

CLEAR WATER POND



NOTE:
 CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WERE TAKEN FROM THE FOLLOWING SOURCES:

TOPOGRAPHIC INFORMATION:
 SURVEY PROVIDED BY AEP, AND IS A COMPOSITE OF AN AERIAL SURVEY PERFORMED BY HENDERSON AERIAL SURVEYS, INC., DATED APRIL 30, 2015 AND A HYDROGRAPHIC SURVEY PERFORMED BY AEP, DATED AUGUST 12, 2004.

UPPERMOST AQUIFER:
 DATA FROM SAMPLING EVENTS PERFORMED BY TERRACON CONSULTANTS, INC., DATING FROM JUNE 8, 2011 THROUGH MARCH 15, 2016.

WELL AP-52 WAS DECOMMISSIONED IN DECEMBER OF 2016 AND REPLACED WITH AP-60.

LEGEND:

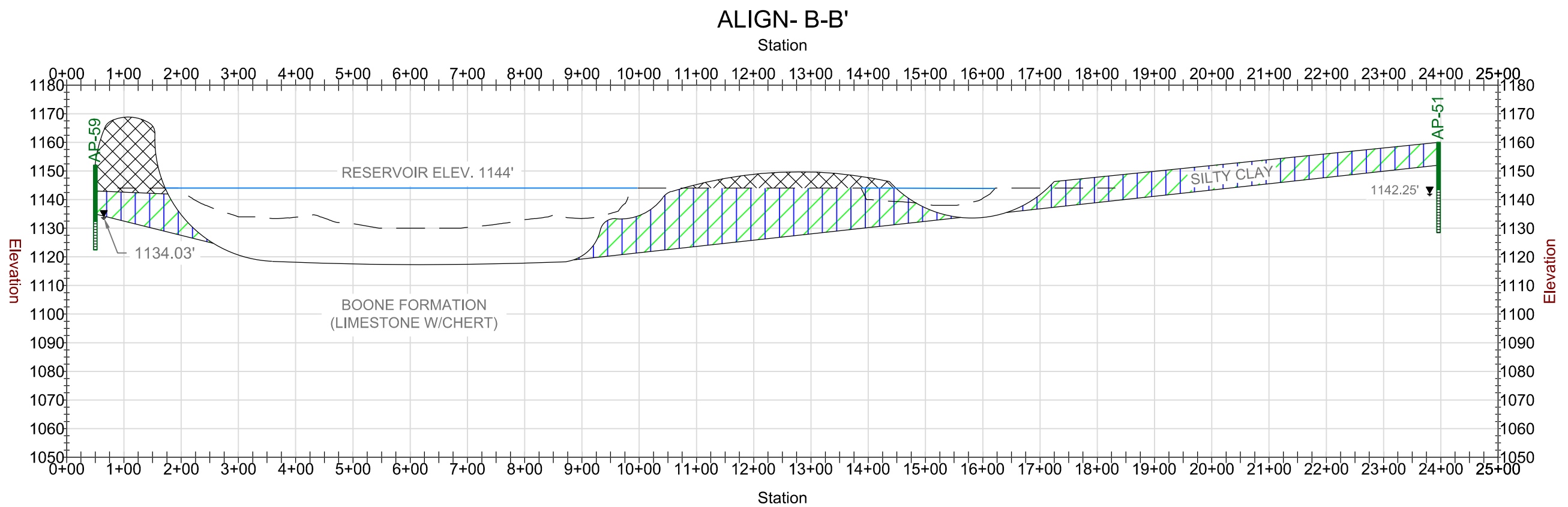
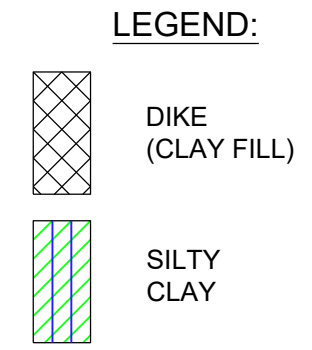
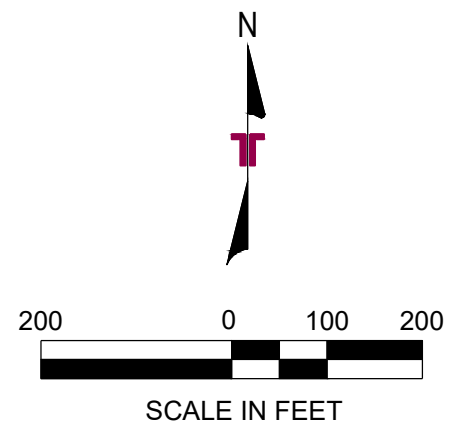
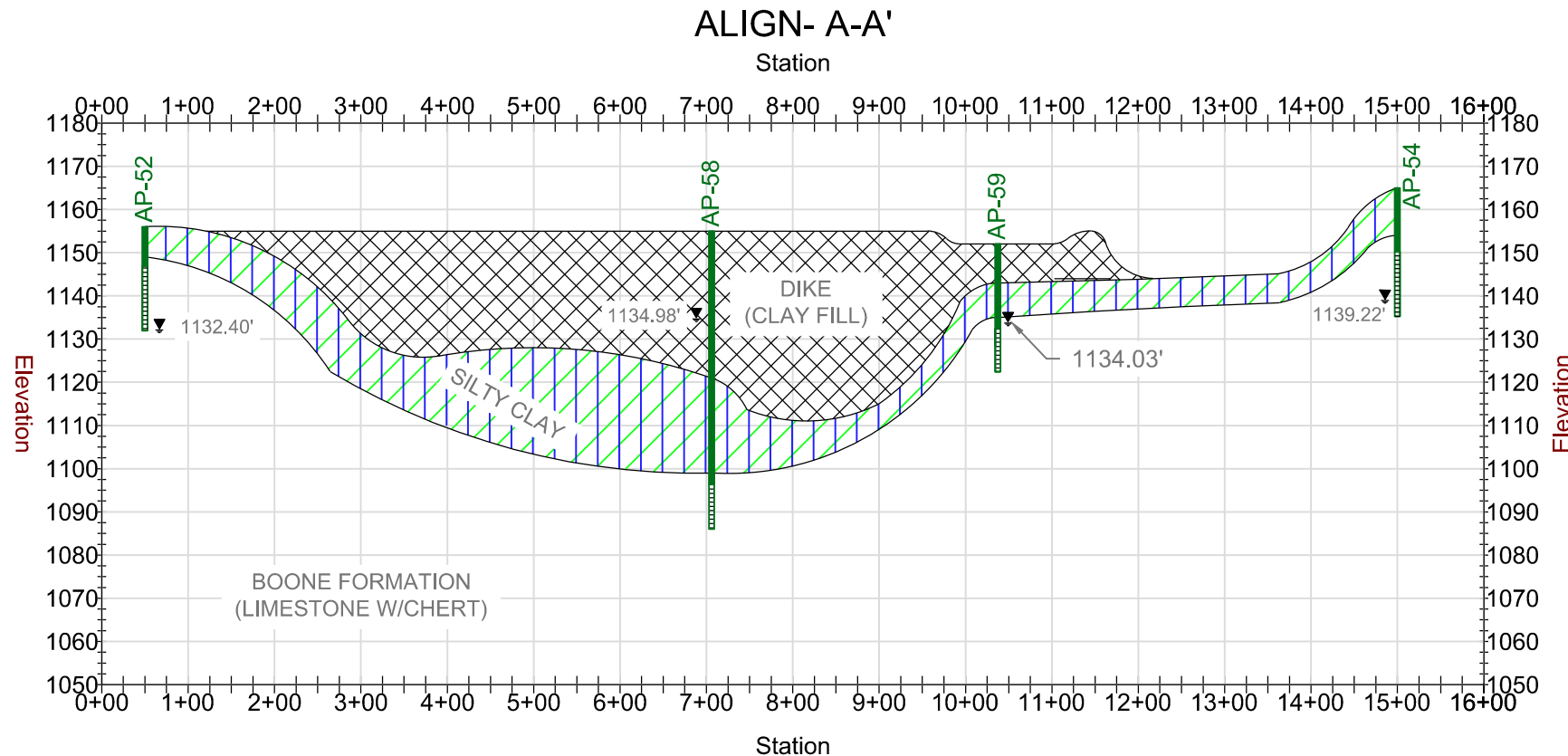
- PRIMARY ASH POND BOUNDARY (THIS REPORT)
- CLEAR WATER POND/LANDFILL BOUNDARY (NEARBY OTHERS)
- CROSS SECTION LOCATION
- MONITORING WELL

SHEET 1	
DESIGNED BY: TLB	ACAD NO.: 001
DRAWN BY: SRE	SHEET NO.: 1 OF 2
APPRD. BY: DCM	
SCALE: SEE BARSCALE	
DATE: 10-17-2017	
JOB NO. 216-001-35157124	

CROSS SECTION LOCATION MAP
 GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
 SWEPCO FLINT CREEK POWER PLANT BOTTPOND ASH GENTRY ARKANSAS

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REV.	DATE	BY	DESCRIPTION



SHEET 2

DESIGNED BY: TLB	216-001-35157124
DRAWN BY: SRE	001
APP'D BY: DCM	001
SCALE: SEE BARSCALE	
DATE: 10-17-2017	
JOB NO.	
ACAD NO.	
SHEET NO.	2 OF 2

CROSS SECTION A-A' & B-B'

GROUNDWATER MONITORING NETWORK EVALUATION

AMERICAN ELECTRIC POWER

SWPCO FLINT CREEK POWER PLANT BOTTPOND ASH GENTRY ARKANSAS

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REV.	DATE	BY	DESCRIPTION