Report 1 - Groundwater Monitoring Network for CCR Compliance

Public Service Company of Oklahoma
Northeastern Station 3&4
Non-Hazardous Industrial Waste (NHIW) Landfill
Permit No. FA3566010

October 2017
Project No. 35157123

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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 (40 CFR 257) and with ODEQ's (Oklahoma Department of Environmental quality) CCR rule OAC 252.517 at the Public Service Company of Oklahoma –Northeastern Stations 3 & 4 Ash Landfill (Permit No. 3566010). The Public Service of Oklahoma is a unit of American Electric Power (AEP).

2.0 Background Information

2.1 Facility Location Description

The Northeastern Power Station facility is located at the junction of U.S. Highway 169 and Oklahoma Highway 88 approximately 1 mile south of Oologah, Rogers County, Oklahoma. The facility property consists of approximately 1230 acres located in Sections 3 and 4, Township 22 North, Range 15 East, and Sections 33 and 34, Township 23 North, Range 15 East (I.M.) in Rogers County, Oklahoma. Four (4) electric generating Units are present at the facility. Units 1&2 are gas fired while Units 3&4 are coal fired units. Unit 4 ceased operation in April of 2016. A site location map and plant and CCR unit location map showing the general location of the landfill is presented in **FIGURES 1 & 2**.

2.2 Description of CCR Unit

2.2.1 Embankment Configuration

Based on the 1970 USGS topographic map (**FIGURE 1**) it appears the landfill was constructed in an area where gravel pit mining or limestone quarrying operations took place. Portions of the upper limestone rock appear to have been removed, primarily within the western portion of the landfill. A dike structure defining the south edge of the disposal facility was built as a part of initial plant construction. This dike was built to an elevation of 610 feet MSL having a crest width of 10 to 12 feet and 3:1 side slopes (**Volume 1 Major Mod 2011 Terracon Project No. 35107130**)[1]. The dike acted as a barrier between the disposal area and the Verdigris River. An additional construction event raised the dike to the current crest elevations of greater than 630 feet MSL, with a crest width of about 25 feet. Side-slopes of the dike, running down to the river basin, are on the order of 30 degrees from horizontal and consist of red-brown clay with limestone gravel mixed with varying amounts of ash material and larger rock. Limestone with some thin shale beds, followed by shale, underlies the constructed dike. The facility previously installed a slurry wall and grout curtain on the southeast side of the landfill within the constructed dike (**FIGURE 3**). The landfill embankments are constructed with 3:1 interior slopes. The outside embankment slopes vary from approximately 2.5:1 to 4:1 (**AEP, "Ash Landfill Modification – Construction Drawings", Northeastern Plant, Dated September 2014**)[2].

2.2.2 Area/Volume

The current Northeastern Ash Landfill site consists of approximately 44 acres located in the southeastern portion of the property and adjacent to the Verdigris River. The total landfill capacity for disposal is 2.463 MCY.

2.2.3 Construction and Operational History

The Ash Landfill is an existing landfill that was permitted by the Oklahoma State Department of Health in March 1978. The landfill permit has subsequently been modified and re-issued through the Oklahoma Department of Environmental Quality. The landfill currently operates in accordance with Permit No. 3566010. The landfill is located in an area that historically has been quarried. The facility has utilized this quarried depression to dispose of CCR. Currently CCR from Unit 3 is disposed of in the landfill as Unit 4 has been shut down. In 2012-2013, a landfill improvement project was completed which resulted in the construction of a 3 ft wide by 25 ft deep 2200-foot-long slurry wall followed by a 1400-foot-long grout curtain. The construction of the slurry wall involved excavating out 25 feet of overburden and keying into 0.5-1 foot of the limestone unit. The grout curtain involved the injection of bentonite to elevations of 590-595 ft amsl. As a result, this project created an imperious bentonite slurry wall/grout curtain from ground surface to depth of 590- 600 ft amsl along the southern edge of the landfill. (**Hydrogeologic Summary Report, Terracon, March 2017**)[3] This barrier system effectively prevents groundwater to flow out of the landfill. Additionally, a geosynthetic intermediate liner and a leachate collection system have been installed above existing waste in the landfill. The elevation of the liner system slopes downward from west to east (towards the leachate collection pond) from approximately 645 ft to 615 ft in elevation.

2.2.4 Surface Water Control

OAC 252:515-17 establishes standards and requirements for the management of stormwater associated CCR landfills which address the management and control of run-on and run-off stormwater derived from a 24-hour, 25-year storm event.

The Landfill perimeter ditches are generally sloped to drain to the northeast portion of the Landfill to Basin C. These perimeter ditches convey the stormwater to Basin C prior to impacting the waste disposal area. Contact stormwater is managed as part of the facility OPDES program. As designed, the run-on and run-off control systems are capable of managing and controlling a 24-hour, 25-year storm event. Stormwater discharges associated with the landfill will be managed as part of the facility OPDES program (**Volume 3 Major Mod 2011 Terracon Project No. 35107130**)[4].

2.3 Previous Investigations

Geotechnical

- 2004 – Terracon Project No. 040445147

Groundwater and Other Environmental

- 2008 – Terracon Project No. 35077150
- 2009 – Terracon Project No. 35107130

2.4 Hydrogeologic Setting

Groundwater encountered in bedrock in this region occurs in secondary openings, such as joints, fractures, and solution cavities. Groundwater occurs in most of the geologic units in the region; however, many of the units do not yield significant amounts of water.

Groundwater yields from the Oologah Formation, Labette Formation, and Fort Scott Limestone are small. The average yield of wells in the Pennsylvanian and Mississippian Age rocks is estimated to be 0.5 gallons per minute (Marcher, 1971). A review of the Oklahoma Geological Survey Hydrologic Atlas map titled *Maps Showing Principal Groundwater Resources and Recharge Areas in Oklahoma (Sheet 2 - Bedrock Aquifers and Recharge Areas, 1988)* indicates that the site is not located within a principal bedrock aquifer or recharge area.

The largest yields are found in unconsolidated material along streams and rivers. Alluvium along the lower portion of the Verdigris River can be utilized as a source of water and yields of up to 30 gallons per minute have been reported (Marcher, 1971), (**Well Install Report 2011, Terracon**)[5].

2.4.1 Climate

Oologah receives an average of 42 inches of rainfall annually. The average temperature annually ranges from 35°F to 85°F (**http://www.city-data.com/city/Oologah-Oklahoma.html**)[6].

2.4.2 Regional and Local Geologic Setting

Soils

According to the USDA Soil Survey of Rogers County, Oklahoma (July, 2007), the two predominant soils in the vicinity of the landfill are the Hector-Endshaw complex (Rs) and Claremore silt loam (CmB). The Shidler stony silty clay loam (So) and Verdigris silty clay loam (Vf) are also present near the landfill but to a lesser extent. A majority of the soils in the vicinity of the landfill have been altered or removed during site development.

The Claremore consists of a reddish brown silty clay loam approximately 19 to 24 inches thick and is underlain by bedrock. The Claremore is well drained with a low to moderately low water capacity.

The Hector-Endshaw consists of a gravelly fine sandy loam approximately 15 to 25 inches thick and is underlain by bedrock. The Hector-Endshaw is well drained with a very low to moderately high water capacity.

The landfill is located in an area underlain by the Pennsylvanian Age Oologah Formation, which is the major geologic formation outcropping in this area. Although some Quaternary Age Alluvial deposits (consisting of sand, gravel and clay) are located along the Verdigris River, alluvial deposits were not identified within the boundary of the landfill or on PSO property within the reviewed reports.

Geology

The Oologah Formation dips gently to the northwest at 30 to 50 feet per mile (Oakes, 1952) and rests conformably on the Labette Shale. The Oologah Formation consists of marine limestones and shales and is divided into three distinct members :(1) Altamont Limestone (upper), (2) Bandera Shale (middle), and (3) Pawnee Limestone (lower).

The Altamont Limestone is comprised of a carbonate marine limestone deposited on a broad offshore platform. The Altamont consists of light gray to dark gray limestone, moderately fossiliferous, and massive to thin-bedded. The Altamont Limestone is not present at this site.

The Bandera Shale was deposited during a major fluctuation in sea level which caused an influx of mud to be deposited on the normally non-turbid offshore platform. The middle shaly zone is typically only a few feet thick in the latitude of this region, but is thicker southward reaching a maximum thickness of 15 to 20 feet. The Bandera consists of gray to black shale, all more or less calcareous in fresh exposures. The Bandera is an aquitard that can produce temporary perched water table conditions within the overlying Altamont under certain conditions. The Bandera Shale is not present at this site.

The Pawnee Limestone is similar to the Altamont in composition and depositional environment. The formation consists of light gray to dark gray limestone, moderately fossiliferous and somewhat cherty with some thin beds of shale. According to the original landfill permit (Oklahoma State Department of Health - August 3, 1978), the Oologah Formation within the disposal area is represented by the lower Pawnee Limestone member. The Oologah Limestone rests conformably on the Labette shale.

The Labette Shale was deposited as muds on an offshore bank. The formation consists of clay shale and silty to sandy shale with some thin beds of sandstone and limestone. In this region, the Labette is 180 to 250 feet thick (Oakes, 1952) and rests conformably upon the Pennsylvanian Age Fort Scott Limestone. (**Volume 2 Major Mod 2011 Terracon Project No. 35107130**)[7]

Local Geologic Setting

The 1970 USGS topographic map (**FIGURE 1**) shows the area where the landfill is located prior to its inception. Cross-section A-A' (**APPENDIX 2, SHEET 2**) illustrates that the top of the limestone unit follows the local topographic surface, which has an approximate elevation of 640 ft amsl northwest of the landfill. The area where the landfill has been constructed the top of limestone ranged from 630-590 ft amsl. In two locations, where the limestone dips down to approximately 610-590 ft amsl on the southeast side of the landfill, there are 2 apparent surface water flow channels that extend to the edge of the embankment and include the location of the southeastern berm of the landfill, as seen on Figure 1. Additionally, the limestone unit is absent in various locations on the southern border of the landfill (cross-section C-C', **APPENDIX 2, SHEET 2**). This variation in the limestone unit from north to south and the lack of the limestone unit in this area is to be expected since the area was historically quarried before the **FIGURE 1** USGS topo map was prepared.

Cross-section A-A' (**APPENDIX 2, SHEET 2**) also shows the top of the shale unit rising from an elevation of approximately 583 ft amsl northwest of the landfill to an approximately elevation of 600 ft amsl southeast of the landfill, conforming to the bottom of the limestone unit. As shown on cross-section D-D' (**APPENDIX 2, SHEET 3**) the shale unit is encountered at approximately 598-605 ft amsl along the southern western edge of the landfill and then dips to approximately 583 ft amsl along the southern eastern edge of the landfill. The bottom of the shale unit has not been determined during monitoring well installation borings. Literature estimates its thickness at 180 to 250 ft.

2.4.3 Surface Water/Groundwater Interactions

The Verdigris River is adjacent to the southeast property boundary of the landfill and maintains an approximate river elevation of 542 ft amsl. River flow is controlled by the Oologah Dam (Corps of Engineers – U.S. Army) located approximately 1 mile north and east of the site. Based on the

groundwater potentiometric data collected in the shale aquifer unit, the average groundwater elevation is 585 ft amsl.

Currently not enough data has been collected to determine if there is surface to groundwater communication.

2.4.4 Water Users

According to the Oklahoma Water Resources Board map, there are no known groundwater wells within a 1 mile of the site. There is a well located approximately 2 miles from the site which has been plugged (**FIGURE 7**).

3.0 Certified Groundwater Monitoring Network

The existing monitoring well network present at the Site was evaluated to determine if any of the wells were viable for continued use as part of the groundwater monitoring well network or also retained as part of a larger groundwater hydraulic monitoring well network. The hydrogeologic conditions were also identified and evaluated to determine if the uppermost aquifer unit has an effective well network. The evaluation was completed in accordance with 40 CRF 257.91 and OAC 252:517-9-2 in establishing a monitoring well network that effectively monitors the uppermost aquifer with a downgradient monitoring system at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer.

3.1 Hydrostratigraphic Units

Hydrostratigraphic units comprise geologic units grouped together on the basis of similar hydraulic conductivity. Slug testing conducted in the limestone unit exhibits an average hydraulic conductivity of 1.87 X 10-3 cm/sec. Slug tests conducted in the shale unit exhibit an average hydraulic conductivity of 2.52 X 10-6 cm/sec (Terracon Project No. 35077150). This indicates that these units are different units. This has also been confirmed by the geophysical logging of the units (**APPENDIX 3**). Additionally, during the hydrogeological investigations at the site, little to no water was encountered within either of these units.

3.1.1 Horizontal and Vertical Position Relative to CCR Unit

Geologic data from soil borings collected at the site indicate that the first geological unit encountered is a limestone unit. However, quarrying of the limestone before the construction of the power plant has extensively removed this unit within the current footprint of the landfill. The thicknesses of the limestone unit beneath the landfill range from 10 feet to 0 feet. In the eastern, unquarried area of the landfill footprint, the limestone thickness is approximately 20 feet thick. Below the limestone unit, the top of the shale unit is encountered which conforms to the bottom

of the limestone unit. The full depth of the shale unit was not determined during monitoring well installation borings. Literature estimates its thickness at 180 ft to 250 ft.

Extensive geologic cross-sections of the Landfill area are shown in **APPENDIX 2**. The base of the landfill was determined to be at an approximate elevation of 610 ft amsl. However, the limestone unit is discontinuous along the southern edge of the landfill as seen in cross-section D-D'. This is to be expected from this quarried area. In these discontinuous areas, there are outcroppings of the shale unit.

3.1.2 Overall Flow Conditions

The average potentiometric elevation of the limestone unit is 613 ft amsl and for the shale unit it is 583 ft amsl. The potentiometric surface elevations in MWs 5D, 6D, 7D and 12D (which have screen intervals set within the shale unit) coincide with the potentiometric surface elevation in the limestone unit in the vicinity of their locations. In **FIGURE 1,** two low areas at 590 ft amsl are depicted along the southern edge of the landfill in the vicinity of MW-6D. These low areas appear to be influencing the potentiometric surface elevation (an average of 600 ft amsl) in that area and appear to serve as a localized recharge area, as seen on the neutron log. The neutron log data collected in MWs 5D and 7D, as displayed on cross-sections C-C' and B-B' (**APPENDIX 2**), respectively, show higher formation porosity in the shale unit than in the limestone unit. Therefore, the limestone in these areas could be serving as a semi-confining unit. This scenario may also exist around MW-12D located approximately 400 feet south of MW-5D. Therefore, these wells are not used to determine the general groundwater flow direction within the shale unit.

MW-8D is located northwest of the landfill and the potentiometric surface in MW-8D varies seasonally. The seasonal high for MW-8D is approximately 606 ft amsl, with a seasonal low of 567 ft amsl. MW-3D and 9D are located on the southern edge of the landfill (>2000 ft from MW-8D) and their potentiometric surfaces experience very little seasonal fluctuation. MW-3D's maximum potentiometric surface has been approximately 595 ft amsl, with a low of 592 ft amsl. MM-9D's maximum potentiometric surface has been approximately 586 ft amsl, with a low of 579 ft amsl. Therefore, predominate groundwater flow direction is considered to be from the northwest towards the southeast.

Available groundwater elevations are summarized in **TABLE 1**. There appears to be seasonal and temporal fluctuations in the groundwater flow. The most recent comprehensive groundwater data set from March 2017 is depicted on **FIGURE 6**. The general flow direction in the shale units for this particular sampling date shows a west-southwest flow direction from MW-3D.

The estimated linear groundwater velocity through the shale unit at the site is reported to be 1.57 x 10-6 cm/sec (0.53 in/day). Pump tests completed on the shale unit indicated a yield of less than 150 gallons per day.

3.2 Uppermost 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 Definitions:
"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

As shown in cross-section D-D' (**APPENDIX 2**) the limestone unit along the southern edge of the landfill is only present east of MW-6D. Additionally, the bentonite slurry wall/grout curtain along the southern edge of the landfill (**FIGURE 3**) has established an impervious wall preventing groundwater flow in the limestone unit that is present in that area.

Therefore, for the purpose of specifying the uppermost aquifer, the on-site hydrostratigraphic unit in the area of the landfill is identified to be the shale unit which is first encountered at approximately 590-600 ft amsl.

3.3 Review of Existing Monitoring Network

3.3.1 Overview

Fifteen (15) monitoring wells (MWs 1D, 3D, 5D-13D, 14, 15, 16, and 17) have been fully constructed within the shale unit around the landfill. The screen interval for MW-2D intercepts both the limestone and shale units, while the sand pack for MW4-D intercepts both the limestone and shale units.

MWs 1D, 10D, 11D, 14, 16 and 17 have not produced adequate volumes of groundwater for sampling purposes since their installation, but are helpful in determining the over-all groundwater flow pattern.

MWs 7D and 8D are geo-spatially positioned such that they can provide an indication of the background groundwater quality for the landfill. MWs 6D, 9D, 3D, 15 are considered to be positioned at the waste boundary that ensures the detection of groundwater contamination in the uppermost aquifer in the downgradient direction.

A well construction table that summarizes the location, ground surface elevation, borehole depth, installation data, and associated well construction details for the proposed monitoring well network is included in **TABLE 2**.

3.3.1.1 Well Construction Summary Table

Please refer to **TABLE 2** for a summary of existing monitoring network construction details.

3.3.1.2 Depth Ranges and Hydrostratigraphic units monitored

Please refer to **TABLE 1** for a summary of water-level data from the existing monitoring network. The hydrostratigraphic unit monitored includes the Labette Shale unit.

3.3.1.3 Key Flow Directions

Based on seasonal variations, predominate groundwater flow direction is considered to be from northwest towards southeast.

3.3.1.4 Key Users/Receptors Not Protected

Currently groundwater is not being used within a one mile radius of the facility.

3.3.2 Gaps in the Monitoring Well Network

As shown on the cross-section A-A' and B-B', existing monitoring wells 7D and 8D are fully screened in just the shale unit and because of their geo-spatial location will be utilized as the background (up gradient) wells for the landfill.

As shown on the cross-section D-D', monitoring wells 3D, 6D, 9D, and 15 are fully screened in the shale unit and will be utilized as the downgradient monitoring wells for the landfill.

With these wells in place, there are no gaps in the groundwater monitoring network for the Landfill for monitoring the uppermost aquifer unit.

3.3.3 Recommended Monitoring Well Network

The recommended groundwater monitoring well network is intended to meet specifications stated in 252:517-9-2 and 40 CFR 257.91.

Based on the available hydrogeological data presented in this report the recommended monitoring well network for the landfill CCR Unit consists of monitoring wells 7D and 8D as background monitoring wells and wells 3D, 6D, 9D, and 15 as down-gradient monitoring wells.

Additionally, other available monitoring wells screened in the shale unit may be gauged at the time of sampling the groundwater monitoring well network in order to provide a more comprehensive potentiometric groundwater map.

4.0 Certification

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: F. Owen Carpenter	Date: 16-OCT-2017	 Exp. 31-OCT-2019 Stamp
Company: Terracon	Expiration Date: 31-OCT-2019	

Bibliography

1 Volume 1 Major Mod 2011 Terracon Project No. 35107130.
2 AEP, “Ash Landfill Modification – Construction Drawings”, Northeastern Plant, Dated September 2014.
3 Hydrogeologic Summary Report, Terracon, March 2017.
4 Volume 3 Major Mod 2011 Terracon Project No. 35107130.
5 Well Installation Report, Terracon, May 2011.
6 http://www.city-data.com/city/Oologah-Oklahoma.html.
7 Volume 2 Major Mod 2011 Terracon Project No. 35107130.

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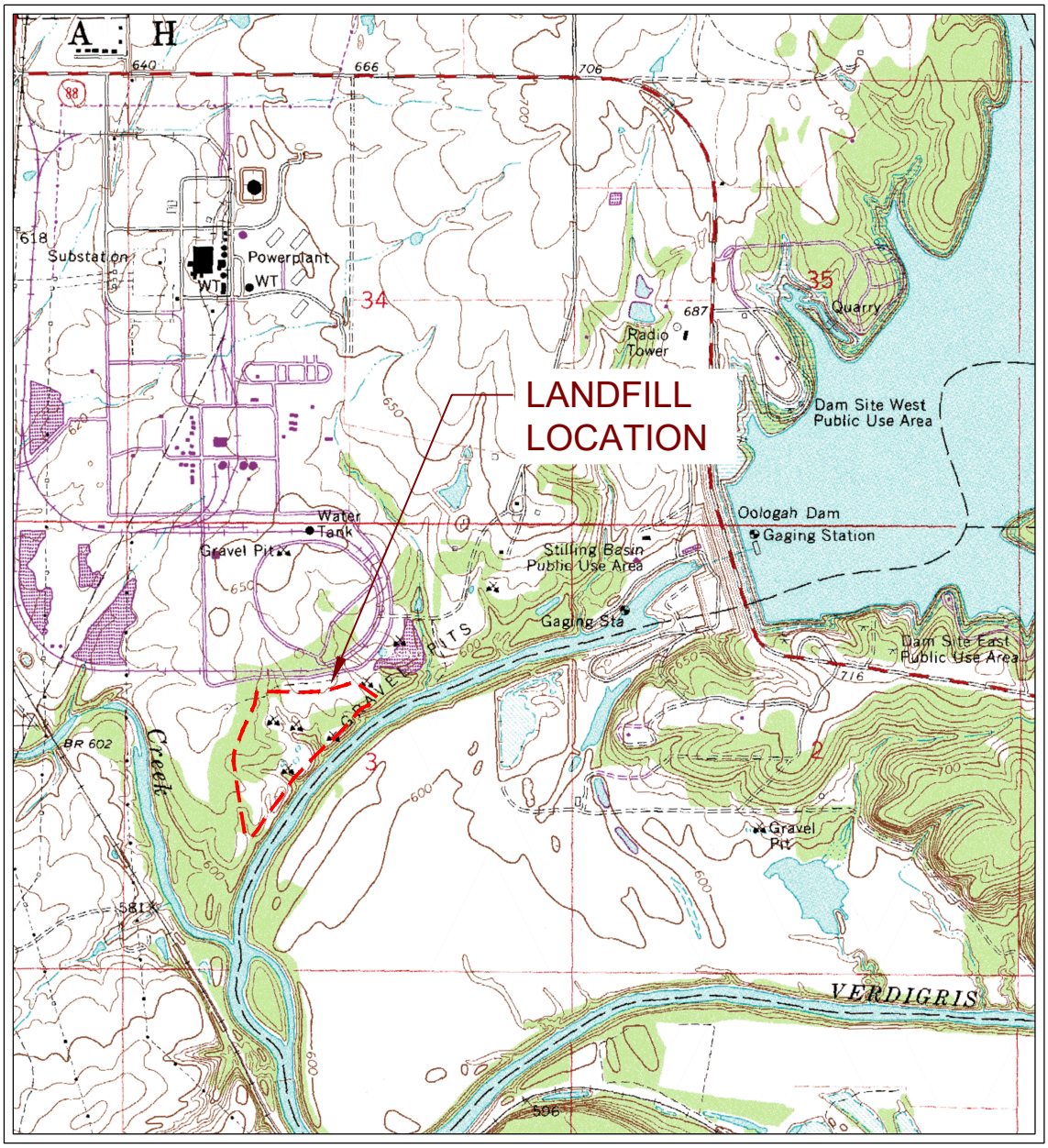

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CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

OOLOGAH, OKLAHOMA QUADRANGLE 1970 (PHOTO REVISED 1980) 7.5 MINUTE SERIES (TOPOGRAPHIC)

Project Mngr: DCM	Project No. 216-003-35157123	Terracon Consulting Engineers and Scientists	7.5 MINUTE SERIES (TOPOGRAPHIC)	FIG. No.
Drawn By: TLB	Scale: AS SHOWN	25809 I-30 SOUTH BRYANT, AR 72022	GROUNDWATER MONITORING NETWORK	1
Checked By: TLB	File No. 001	PH. (501) 847-9292 FAX. (501) 847-9210	AMERICAN ELECTRIC POWER	
Approved By: DCM	Date: 07/27/2017		NORTHEASTERN STATIONS 3 & 4	
			OOLOGAH OKLAHOMA	

HIGHWAY 88

HIGHWAY 169

UNITS 1 & 2

POWERPLANT

AMERICAN ELECTRIC POWER NORTHEASTERN STATIONS 3 & 4

UNITS 3 & 4

POND

POWERPLANT

MISSOURI PACIFIC RAILROAD

OOLOGAH LAKE

BOTTOM ASH POND

COAL STORAGE AREA

OUTFALL 005

BASIN C

VERDIGRIS RIVER

LANDFILL

MISSOURI PACIFIC RAILROAD

N

0 250 500 1000

SCALE IN FEET

FIGURE 2

DESIGNED BY:	TLB
DRAWN BY:	TLB
APPVD. BY:	DOM
SCALE:	SEE BARSCALE
DATE:	07/27/2017
JOB NO:	216-003-3515/7123
ACAD NO.	002
SHEET NO.:	2 OF 7

PLANT AND CCR UNIT LOCATION MAP

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

OOLOGAH OKLAHOMA

Terracon

Consulting Engineers and Scientists

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REV.	DATE	BY	DESCRIPTION

FIGURE 3

DESIGNED BY:	TLB
DRAWN BY:	TLB
APPVD. BY:	DOM
SCALE:	SEE BARSCALE
DATE:	10/13/2017
JOB NO.	216-003-35157123
ACAD NO.	003
SHEET NO.:	3 OF 7

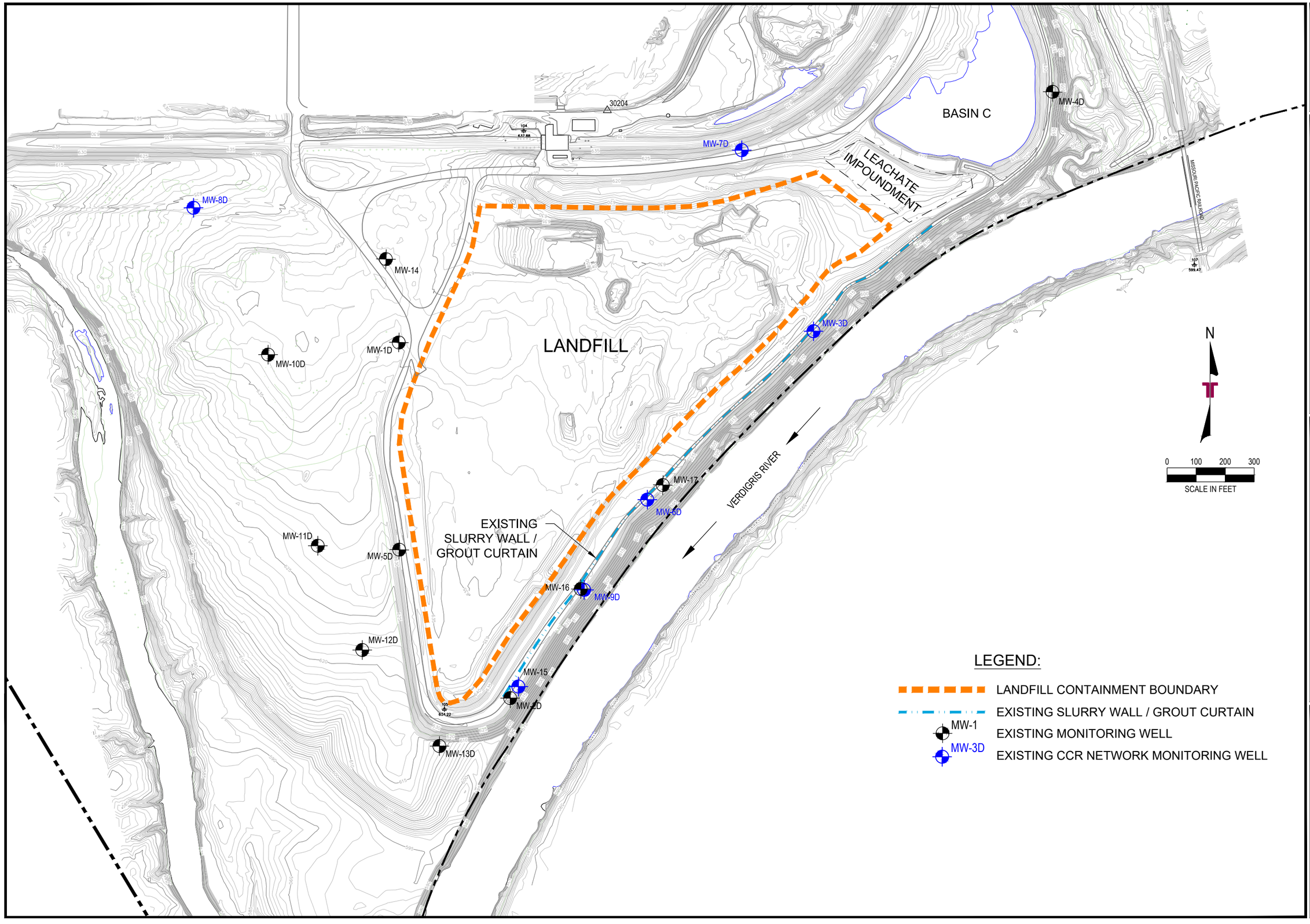
CCR UNIT LAYOUT AND WELL LOCAITONS

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

NORTHEAST STATION UNITS 3 & 4

OOLOGAH OKLAHOMA



LEGEND:

- LANDFILL CONTAINMENT BOUNDARY
- EXISTING SLURRY WALL / GROUT CURTAIN
- MW-1 EXISTING MONITORING WELL
- MW-3D EXISTING CCR NETWORK MONITORING WELL

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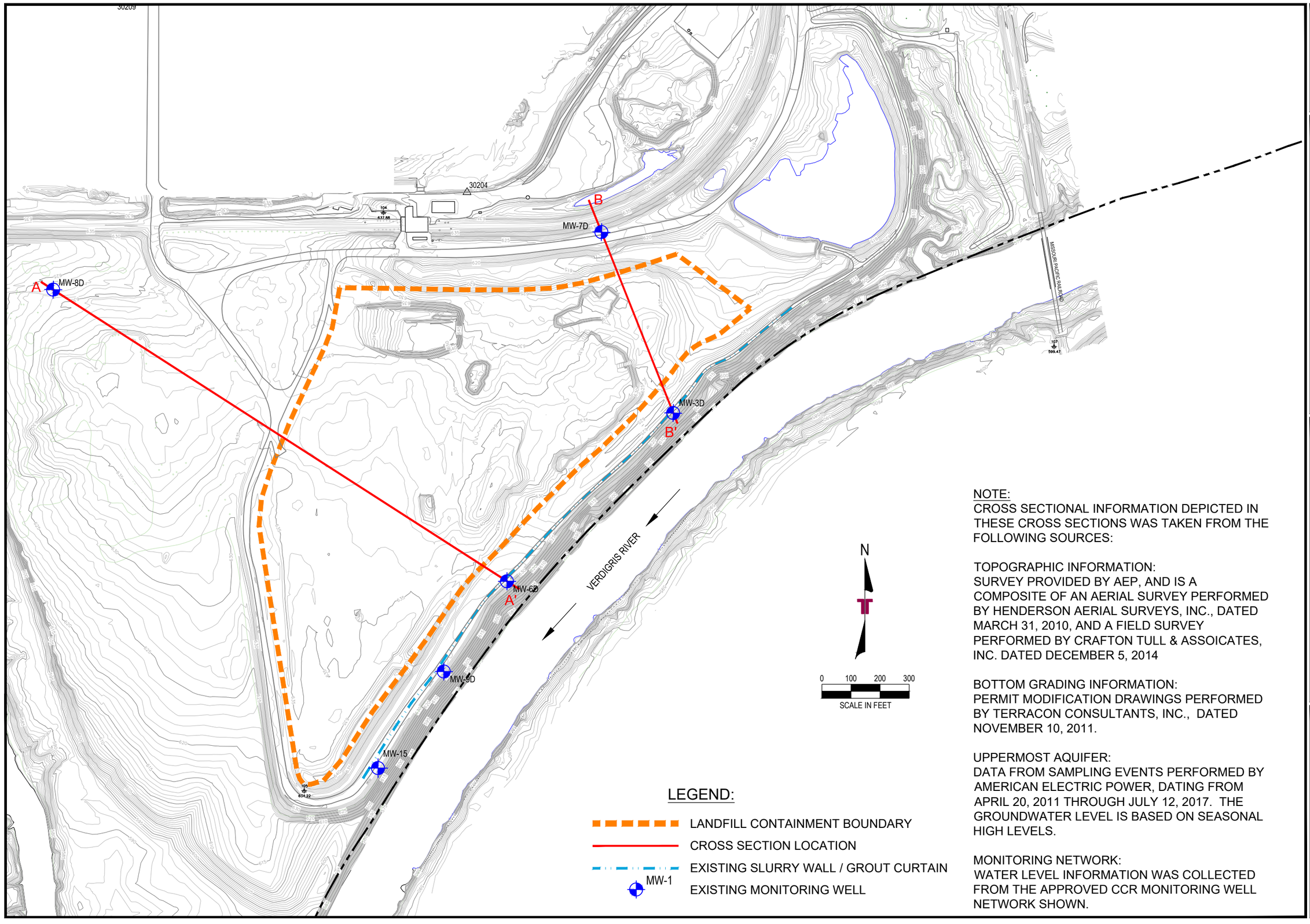
REV.	DATE	BY	DESCRIPTION



NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

UPPERMOST AQUIFER:
DATA FROM SAMPLING EVENTS PERFORMED BY AMERICAN ELECTRIC POWER, DATING FROM APRIL 20, 2011 THROUGH JULY 12, 2017. THE GROUNDWATER LEVEL IS BASED ON SEASONAL HIGH LEVELS.

MONITORING NETWORK:
WATER LEVEL INFORMATION WAS COLLECTED FROM THE APPROVED CCR MONITORING WELL NETWORK SHOWN.

FIGURE 4

DESIGNED BY:	TLB
DRAWN BY:	SRE
APPVD. BY:	DOM
SCALE:	SEE BARSCALE
DATE:	10/03/2017
JOB NO.	216-003-35157123
ACAD NO.	004
SHEET NO.:	4 OF 7

CROSS SECTION LOCATIONS MAP

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

OOLOGAH OKLAHOMA

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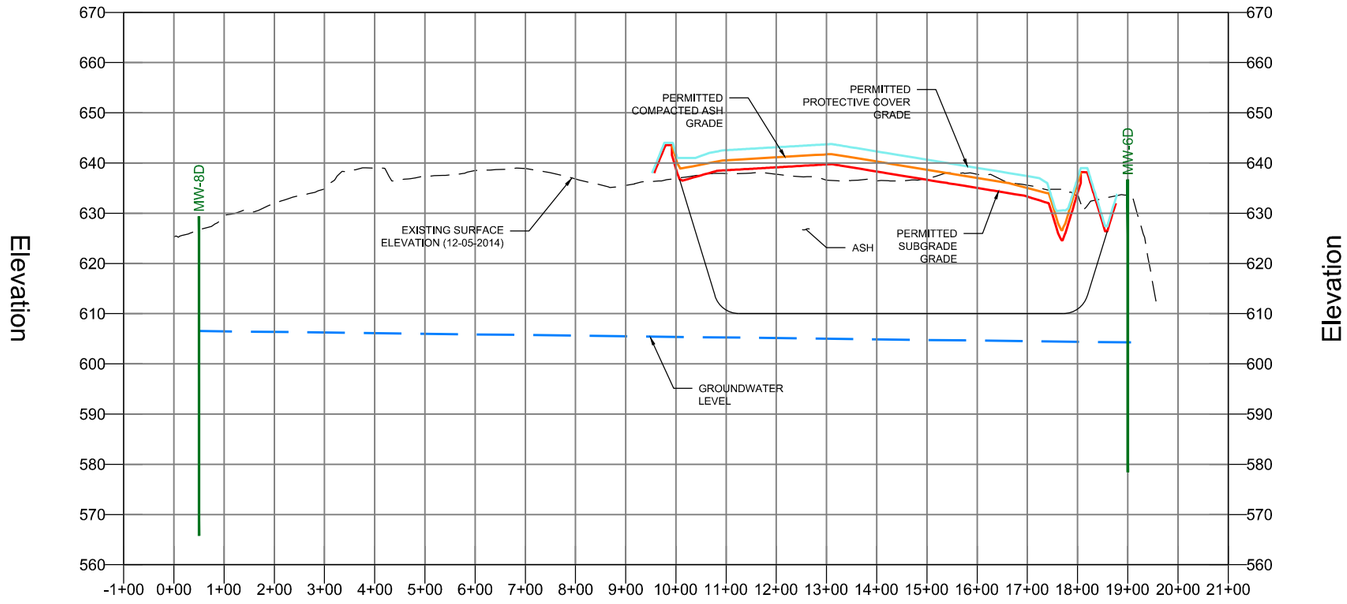
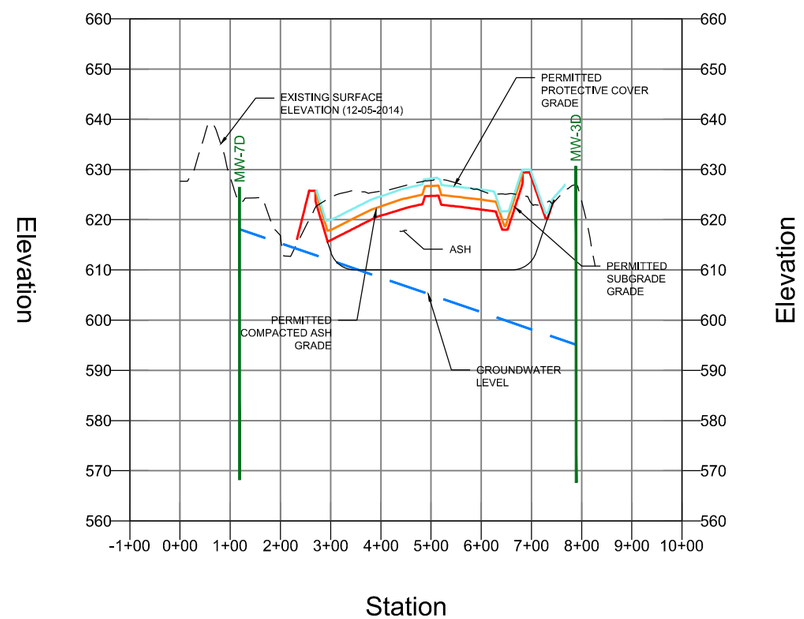
REV.	DATE	BY	DESCRIPTION

CROSS SECTION A-A'



CROSS SECTION B-B'



NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

UPPERMOST AQUIFER:
DATA FROM SAMPLING EVENTS PERFORMED BY AMERICAN ELECTRIC POWER, DATING FROM APRIL 20, 2011 THROUGH JULY 12, 2017. THE GROUNDWATER LEVEL IS BASED ON SEASONAL HIGH LEVELS.

MONITORING NETWORK:
WATER LEVEL INFORMATION WAS COLLECTED FROM THE APPROVED CCR MONITORING WELL NETWORK (SEE FIGURE 4).

FIGURE 5

DESIGNED BY:	TLB
DRAWN BY:	SRE
APPVD. BY:	DOM
SCALE:	SEE BARSCALE
DATE:	10/03/2017
JOB NO.	216-003-35157123
ACAD NO.	005
SHEET NO.:	5 OF 7

CROSS SECTIONS
GROUNDWATER MONITORING NETWORK
AMERICAN ELECTRIC POWER
NORTHEASTERN STATIONS 3 & 4
OKLAHOMA
OOLOGAH

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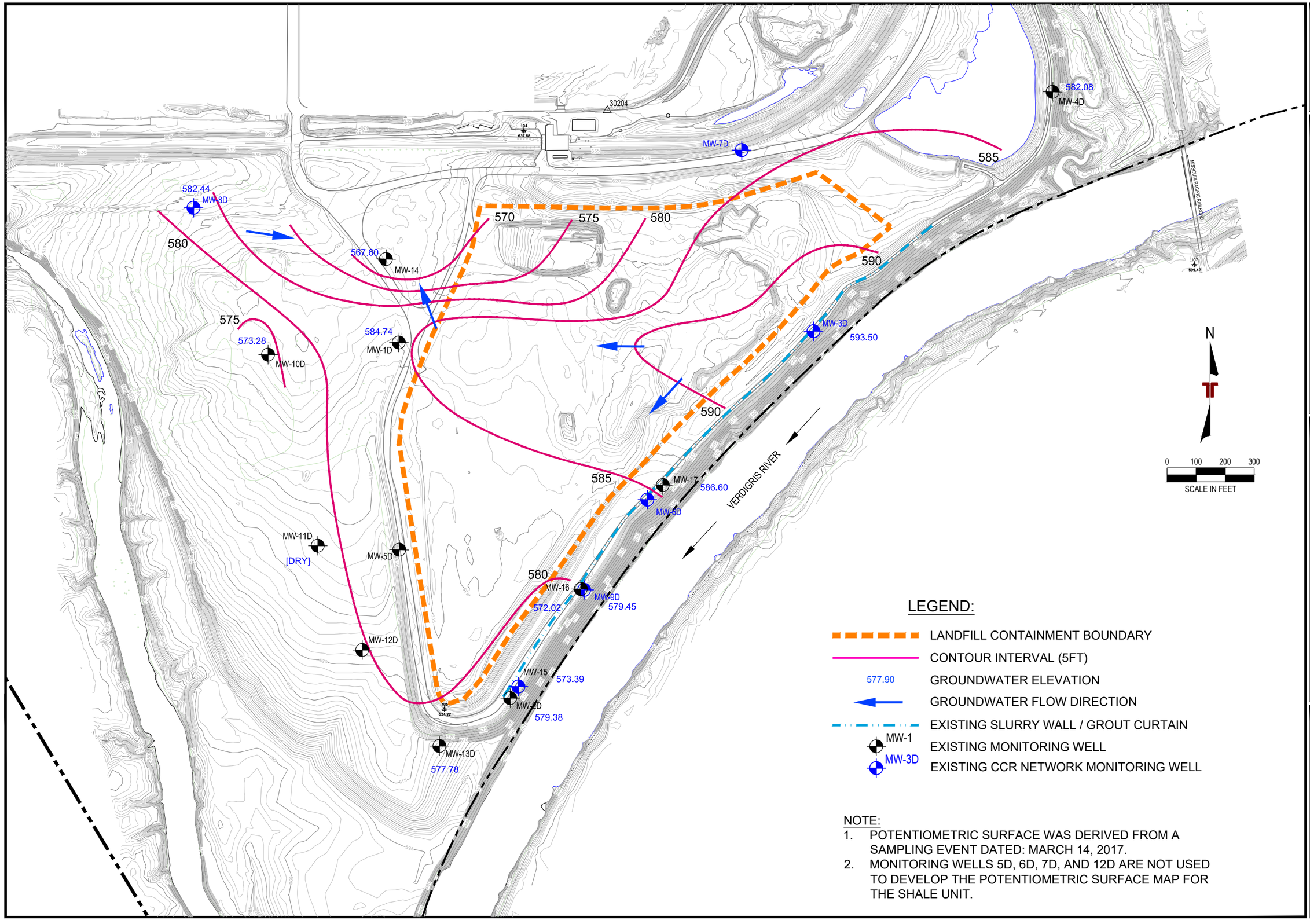
FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION



LEGEND:

- LANDFILL CONTAINMENT BOUNDARY
- CONTOUR INTERVAL (5FT)
- 577.90 GROUNDWATER ELEVATION
- GROUNDWATER FLOW DIRECTION
- EXISTING SLURRY WALL / GROUT CURTAIN
- MW-1 EXISTING MONITORING WELL
- MW-3D EXISTING CCR NETWORK MONITORING WELL

NOTE:

1. POTENTIOMETRIC SURFACE WAS DERIVED FROM A SAMPLING EVENT DATED: MARCH 14, 2017.
2. MONITORING WELLS 5D, 6D, 7D, AND 12D ARE NOT USED TO DEVELOP THE POTENTIOMETRIC SURFACE MAP FOR THE SHALE UNIT.

FIGURE 6

DESIGNED BY:	TLB
DRAWN BY:	TLB
APPVD. BY:	DOM
SCALE:	SEE BARSCALE
DATE:	10/03/2017
JOB NO.	216-003-35157123
ACAD NO.	006
SHEET NO.:	6 OF 7

POTENTIOMETRIC SURFACE MAP

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

OOLOGAH OKLAHOMA

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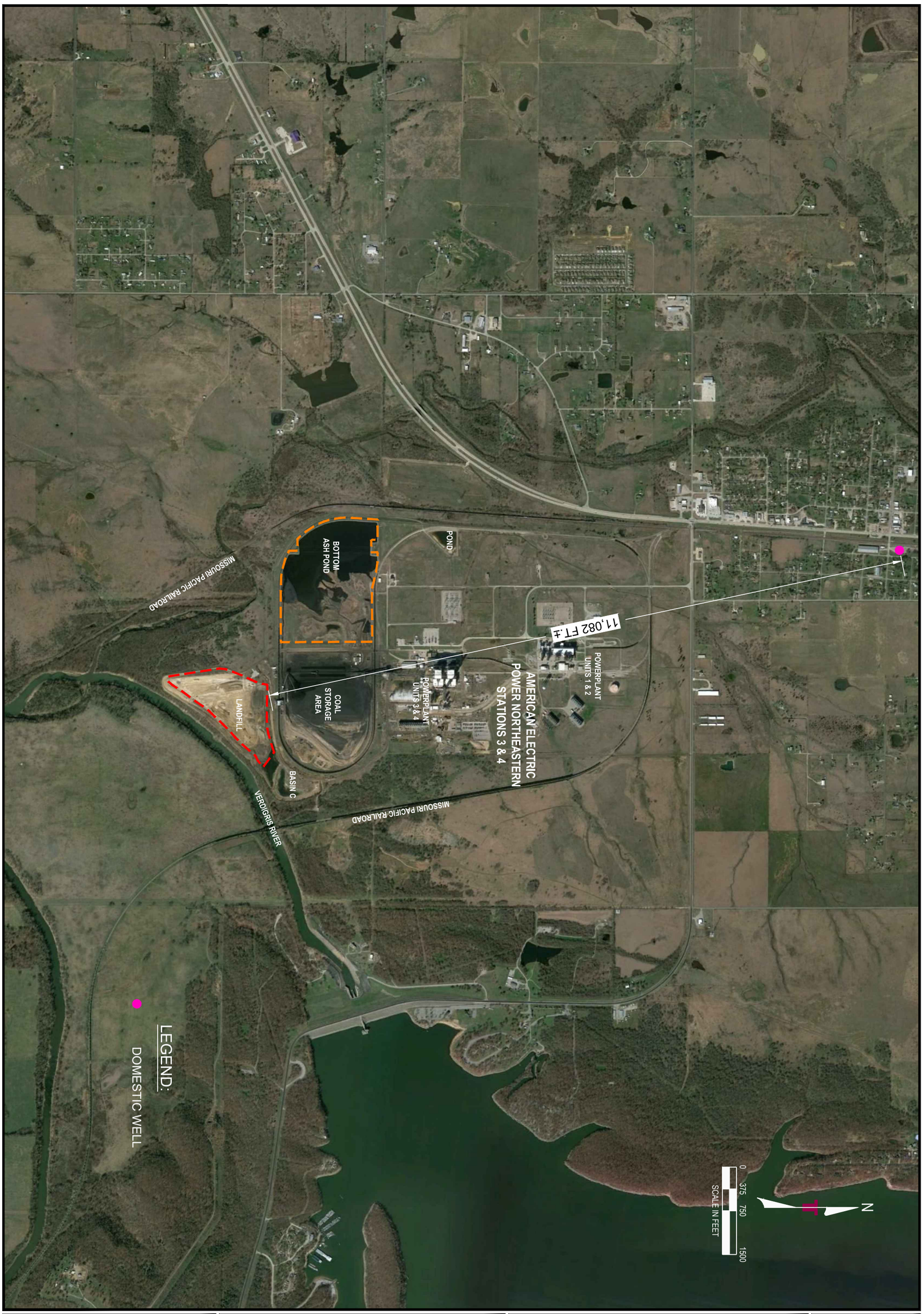
REV.	DATE	BY	DESCRIPTION



REV.	DATE	BY	DESCRIPTION

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NEAREST DOMESTIC WELL LOCATION

GROUNDWATER MONITORING NETWORK

AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

OOLOGAH OKLAHOMA

FIGURE 7

DESIGNED BY:	TLB
DRAWN BY:	TLB
APPVD. BY:	DCM
SCALE:	SEE BARSCALE
DATE:	07/27/2017
JOB NO.	216-003-35157123
ACAD NO.	008A
SHEET NO.:	7 OF 7

TABLE 1

NORTHEASTERN STATION 3 & 4

NON-HAZARDOUS INDUSTRIAL WASTE (NHIW) LANDFILL

WELL LEVEL DATA

GROUNDWATER ELEVATIONS (FMSL)

Well	MW-3D	MW-6D	MW-7D	MW-8D	MW-9D	MW-15
Date						
03/20/08	595.14					
07/01/08	594.65					
10/01/08	594.20					
11/11/08	594.10	600.51	586.54	569.47		
11/20/08	593.81	600.59	574.25	567.12		
03/13/09	593.70	599.49	581.24	574.67		
06/16/09	593.74	599.98	577.00	576.20		
09/29/09	593.53	599.83	574.77	574.36		
12/28/09	593.44	599.76	575.28	577.70		
03/09/10	593.70	599.98	571.96	576.87		
06/16/10	593.52	600.27	572.64	587.94	586.32	
09/14/10	593.04	599.53	573.57	575.19	585.01	
12/14/10	593.16	599.45	571.36	571.56	583.30	
03/08/11	593.29	599.61	571.08	578.62	583.56	
06/07/11	593.04	599.98	572.38	584.69	584.97	
09/13/11	594.45	600.18	573.44	586.35	584.25	
12/13/11	593.70	600.48	572.49	590.51	584.96	
03/13/12	593.52	600.45	573.19	603.46	584.08	
06/12/12	593.42	600.39	573.52	602.35	584.45	
09/18/12	593.30	600.01	573.25	592.89	582.42	
12/10/12	593.34	600.39	573.42	595.63	582.16	
03/12/13	593.38	600.78	575.33	600.19	582.33	
06/11/13	593.42	601.38	575.74	604.77	582.71	
09/24/13	593.36	601.93	578.97	599.83	583.58	
12/17/13	593.37	601.91	579.75	597.83	582.28	
03/05/14	593.44	601.49	583.91	606.54	581.95	
06/09/14	593.65	601.90	587.37	603.14	581.17	
09/09/14	593.51	601.90	593.30	598.66	582.00	
03/10/15	593.76	601.85	599.76	599.14	581.43	
06/15/15	593.81	604.26	618.12	589.88	582.32	
12/14/15	593.78	603.57	596.11	585.16	581.41	
03/16/16	592.57	601.89	612.87	597.03	581.63	582.77
05/16/16	593.61	603.16	596.80	586.54	581.35	581.72
07/20/16	-	-	-	583.39	-	577.33
09/19/16	592.95	602.91	603.59	577.05	581.02	576.57
10/06/16	593.00	-	-	570.72	-	576.43
03/14/17	593.50	601.86	604.65	582.44	579.45	573.39
05/18/17	576.24	603.00	576.65	568.34	578.12	591.14
06/15/17	593.39	603.44	617.31	569.53	580.75	581.95
06/27/17	593.34	603.37	598.96	567.86	576.69	579.07
07/12/17	592.63	602.60	582.74	568.45	576.68	577.90
Seasonal High	595.14	604.26	618.12	606.54	586.32	591.14

TABLE 2

NORTHEASTERN STATION 3 & 4

NON-HAZARDOUS INDUSTRIAL WASTE (NHIW) LANDFILL

MONITORING WELL/PIEZOMETER 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
MW-3D	36° 25' 00.14299"	95° 41' 44.01366"	627.66	630.65	60	2/21/2008	PVC	2	49.7	580.95	60	567.66
MW-6D	36° 24' 54.41869"	95° 41' 51.01306"	633.72	636.66	55	10/23/2008	PVC	2	44.92	591.74	55.22	578.50
MW-7D	36° 25' 06.30327"	95° 41' 47.03123"	623.74	626.46	55	10/22/2008	PVC	2	45.25	581.21	55.55	568.19
MW-8D	36° 25' 04.35228"	95° 42' 10.11303"	626.04	629.32	60	10/21/2008	PVC	2	49.95	579.37	60.25	565.79
MW-9D	36° 24' 50.88110"	95° 41' 54.22530"	633.90	637.04	60	4/6/2010	PVC	2	49.7	587.34	60	573.90
MW-15	36° 24' 48.0816"	95° 41' 56.4658"	634.34	637.71	71	2/23/2016	PVC	2	61.05	576.66	71.45	562.89

APPENDIX 1

Boring & Monitoring Well Installation Logs

Boring Logs

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FIELD BORING LOG

BORING NO.: B-1/MW-1 PAGE: 1 of 1

TOTAL DEPTH: 35 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35077150-003	DRILLING CO.: MOHAWK
LOGGED BY: MR	DRILLER: KEVIN
DATE DRILLED: 2/18/08	RIG TYPE: STRATASTAR 25

DRILLING METHOD: AIR HAMMER

SAMPLING METHOD: NX ROCK CORE

N: E: TOC:

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0'-2' CLAY, dark brown, slightly moist, some silt, firm. 2'-3.5' CLAY, red, dry, some limestone fragments.					0'-4' Hollow Stem Auger Cored 4'-35' Reamed out with 6" Air Hammer
5	3.5'-35' LIMESTONE, tan, massive bedded, micritic with some calcite crystals, some horizontal bedding plane fractures.		1 4'-14'	95	73	Penetration Rate (P.R.) = 0.5 ft/min
15	- Becoming gray, dry.		2 14'-24'	95	83	(P.R.) = 0.5 ft/min
25	- Some thin shale beds.		3 24'-34'	60	NA	Hard at 30' Wet zones at 31'-33'
35	Total Depth = 35'					NA = Not Available Core sample stuck in barrel and damaged during retrieval.

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FIELD BORING LOG

BORING NO.: B-2/MW-2 PAGE: 1 of 2

TOTAL DEPTH: 59 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35077150-004	DRILLING CO.: MOHAWK
LOGGED BY: MR	DRILLER: KEVIN
DATE DRILLED: 2/19/08	RIG TYPE: STRATASTAR 25

DRILLING METHOD: HSA / AIR HAMMER

SAMPLING METHOD: CONTINUOUS SAMPLER

Depth BGS	N: E: TOC: DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0'-9' GRAVELY CLAY, red to brown, dry, trace silt, firm.					H.S.A. 0'-28'. Air Hammer 28'-59'
5						5'-7' Pushed shelby tube. Poor recovery due to gravel.
10	9'-10' SILTY SAND, gray, dry 10'-22' SILT, tan, soft to hard bedded layers, dry to 19'.					
15						
20						Wet at 19'.
25	22'-28' GRAVELY CLAY, brown, some limestone rock fragments, wet.					Hard Limestone bed 23' to 24'.
30	28'-33' LIMESTONE, gray, massive bedded, dry.					Auger refusal at 28' (Limestone).
35	33'-55' SHALE, gray to black, hard to weathered, dry.					

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FIELD BORING LOG

BORING NO.: B-2/MW-2 PAGE: 2 of 2

TOTAL DEPTH: 59' FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35077150-004	DRILLING CO.: MOHAWK
LOGGED BY: MR	DRILLER: KEVIN
DATE DRILLED: 2/19/08	RIG TYPE: STRATASTAR 25

DRILLING METHOD: HSA/HAMMER

SAMPLING METHOD: CONTINUOUS SAMPLER

Depth BGS	N: E: TOC: DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
40						
45						
50						
55	55'-59' LIMESTONE, gray, micritic, massive bedded.					Moist thin mud beds at 50'-54'. Wet at 55'.
60	Total Depth = 59' bgs.					
65						
70						
75						

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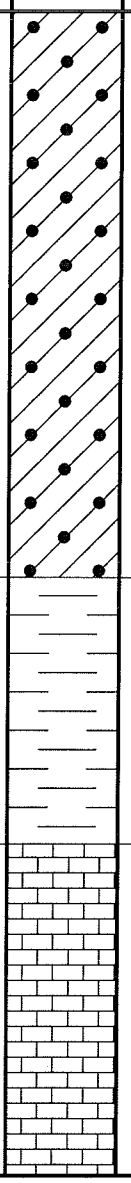
FIELD BORING LOG

BORING NO.: B-3/MW-3 PAGE: 1

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35077150-005	DRILLING CO.: MOHAWK
LOGGED BY: MR	DRILLER: KEVIN
DATE DRILLED: 2/20/08	RIG TYPE: STRATASTAR 25
DRILLING METHOD: HSA / AIR HAMMER	
SAMPLING METHOD: CONTINUOUS SAMPLER	

Depth BGS	N: E: ELEV: DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0'-17' GRAVELY CLAY, brown, dry, trace silt and fine sand.					H.S.A. 0'-20' Reamed out with 6" air hammer.
5						8'-10' Pushed shelby tube. Poor recovery.
10	10' Limestone rock fragments					
15						
20	17'-25' SHALE, hard to weathered, some thin clay beds.					Moist zone at 17.5'. Moist zone at 19.5'. Tried to core beginning at 20', but rock too hard.
25	25'-45' LIMESTONE, dark gray, some thin shale beds, dry, massive bedding.					
30						



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FIELD BORING LOG

BORING NO.: B-3/MW-3 PAGE: 2

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
40						
45	45'-60' SHALE, black, hard, dry.					No show of groundwater, but water seeped in boring overnight.
50						
55						
60	T.D. @ 60'					
65						
70						
75						

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FIELD BORING LOG

BORING NO.: B-4/MW-4 PAGE: 1

TOTAL DEPTH: 50 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35077150-006	DRILLING CO.: MOHAWK
LOGGED BY: MR	DRILLER: KEVIN
DATE DRILLED: 2/21/08	RIG TYPE: STRATASTAR 25

DRILLING METHOD: HSA / AIR HAMMER

SAMPLING METHOD: CONTINUOUS SAMPLER / NX ROCK CORE

Depth BGS	N: E: ELEV: DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
0	0'-16' GRAVELY CLAY, brown, dry, some limestone rock fragments.					H.S.A. 0'-16'. cored 16'-35'. Reamed out with 6" air hammer.
5						
10						
15	13' Some silt and fine sand.					
	16'-38' LIMESTONE, gray, massive bedding, some thin shale beds, some horizontal bedding plane features.		1 16'-20'	50	60	Rock at 16'.
20			2 20'-25'	80	50	
25			3 25'-30'	95	80	
30	2" Vertical fracture.		4 30'-35'	95	75	

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FIELD BORING LOG

BORING NO.: B-4/MW-4 PAGE: 2

TOTAL DEPTH: 50 FEET BELOW GROUND SURFACE (BGS)

Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Remarks
40	38'-40' SHALE, black, hard.					
45						Wet at 45'.
50	T.D. @ 50'					
55						
60						
65						
70						
75						

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FIELD BORING LOG

BORING NO.: MW-1D PAGE: 1 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-017

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 9/30/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 59.77" E: 95° 92' 01.47" G.S. ELEV. 635.23

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-3.5' GRAVELLY CLAY dark brown, Limestone fragments						
	5	3.5'-41' LIMESTONE gray, crystalline, some thin mud seams, some bedding plane fractures, dry		1	95	40		
	10			2	40	0		PR=0.5ft/min. Void at 9'-11.5'
	15			3	100	44		
	20			4	85	27		Wet zones 18.5'-20' PR=0.35ft/min.
	25			5	90	28		
	30			6	90	45		
	35			7	100	68		PR=0.25ft/min.
				8				

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FIELD BORING LOG

BORING NO.: MW-1D PAGE: 2 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	40							
		41'-55' SHALE dark gray to black, hard, some bedding plane fractures		8	60	64		
	45			9	80	65		
	50			10	100	48		
	55	Total Depth = 55'						
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-2S PAGE: 1 of 1

TOTAL DEPTH: 33.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-018

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 9/30/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 47.57" E: 95° 41' 56.87" G.S. ELEV. 634.45

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-9' CLAY dark brown, Limestone fragments					4-5-6 6 4-6-4 6 5-6-8 6	
	10	9'-9.5' ASH gray to dark gray, dry 9.5'-10.5' GRAVELLY CLAY brown, dry 10.5'-21' ASH tan, very fine, wet at 12'					9-6-7 6 3-3-3 6 9-17-17 6 2-8-9 6	Wet at 12'
	20	21'-25' GRAVELLY CLAY red to black, trace silt, moist					1 6	
	25	25'-28.5' LIMESTONE gray, massive bedded		1	20	70		
	30	28.5'-33.5' LIMESTONE gray with increasing thin interlayered shale beds		2	40	29		
	35	Total Depth = 33.5'						

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FIELD BORING LOG

BORING NO.: MW-3S PAGE: 1 of 1

TOTAL DEPTH: 29 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-019

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/1/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 00.05" E: 95° 41' 44.12" G.S. ELEV. 627.09

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-10.5' GRAVELLY CLAY brown, dry with Limestone cobbles					4-4-5 6 6-5-4 6 8-8-6 6 11,50+ 6	
	5							
	10							
		10.5'-29' LIMESTONE dark gray, crystalline, thick interlayered fossils present		1	20	92		
	15			2	40	29		
	20			3	95	87		
	25			4	100	90		
	30	Total Depth = 29'						
	35							

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FIELD BORING LOG

BORING NO.: MW-4S PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-020

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/2/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 08.42" E: 95° 41' 33.93" G.S. ELEV. 621.44

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-12' GRAVELLY CLAY brown, some silt, hard, dry					4-5-6 6	
	ST 5	Shelby Tube from 3'-5'					6-17-17 6 7-7-8 6	
	10							
		12'-30' LIMESTONE gray to dark gray, crystalline, dry					29-25-50+ 6	
	15			1	20	50		
	20	- Some thin mud seams, dry		2	20	71		
	25			3	95	90		
	30	Total Depth = 30'						
	35							

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FIELD BORING LOG

BORING NO.: MW-5D PAGE: 1 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-021

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/7/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 52.71" E: 95° 42' 01.46" G.S. ELEV. 633.83

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-10' GRAVELLY CLAY brown, silty with orange mottles, dry					5-6-4 6	
	ST 5	Shelby Tube from 3'-5'					5-6-4 6	
	ST 10	Shelby Tube from 8'-10'						
		10'-40' LIMESTONE gray, crystalline, some bedding plane fractures		1	60	61		PR=0.2 ft/min.
	15			2	100	39		
		- Some thin shale beds						
	20			3	100	36		
	25			4	100	58		
	30			5	90	39		
	35			6	20	31		
				7	100	58		

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FIELD BORING LOG

BORING NO.: MW-5D PAGE: 2 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	40	40'-55' SHALE dark gray, dry						
	45			8	100	75		
	50			9	100	81		
	55	Total Depth = 55'						
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-5S PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-022

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 9/30/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 52.86" E: 95° 42' 01.48" G.S. ELEV. 633.62

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-22' GRAVELLY CLAY orange, mottled, dry, some thin shale layers					4-6-4 6 5-21-9 6 9-12-13 6 3-4-5 6 8-8-4 6 5-6-8 6 4-5-1 6	Wet at 18.5'
	20	22'-30' LIMESTONE gray, crystalline, some thin shale layers		1	20	70	36-50+ 6	
	30	Total Depth = 30'						
	35							

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FIELD BORING LOG

BORING NO.: MW-6D PAGE: 1 of 2

TOTAL DEPTH: 57 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-023

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/2/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 54.41" E: 95° 41' 51.01" G.S. ELEV. 633.72

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-12' GRAVELLY CLAY red to brown with orange mottles, dry, some limestone fragments					7-6-5 6	
	ST 5	Shelby Tube from 3'-5'					8-7-8 6	
	ST 10	Shelby Tube from 8'-10'						
		12'-15' ASH tan, wet					9-10-7 6	
	15	15'-28.5' GRAVELLY CLAY red to brown, dry					5-5-16 6	
	20						12-12-13 6	
							10-13-8 6	
	25						7-7-5 6	
							50+ 6	Wet at 28'
	30	28.5'-33.5' LIMESTONE interbedded with thin shale beds		1	95	76		PR=0.25 ft/min.
	35	33.5'-57' SHALE dark gray with some thin fissile beds, hard & brittle		2	100	83		

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FIELD BORING LOG

BORING NO.: MW-6D PAGE: 2 of 2

TOTAL DEPTH: 57 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	40							
				3	100	90		
	45			4	100	67		
	50			5	100	92		
	55							
		Total Depth = 57'						
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-6S PAGE: 1 of 1

TOTAL DEPTH: 25 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-024

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/6/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 24' 54.53" E: 95° 41' 50.84" G.S. ELEV. 633.66

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-12' GRAVELLY CLAY brown, dry, limestone fragments at 9.5'					4-5-7 6	
	5						4-5-7 6	
	10						21-7-12 6	
		12'-15' ASH tan, dry					5-13-10 6	
	15	15'-25' GRAVELLY CLAY brown, dry					50+ 6	
		Limestone cobbles at 18.5'-19.5'					22-20-12 6	
	20						10-9-50+ 6	
		Limestone cobbles at 24.5'-25'					24-16-12 6	
	25	Total Depth = 25'						
	30							
	35							

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FIELD BORING LOG

BORING NO.: MW-7D PAGE: 1 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-025

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/9/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 06.30" E: 95° 41' 47.03" G.S. ELEV. 623.58

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-16.5' GRAVELLY CLAY gray and red, mottled, wet						
	5							
	ST	Shelby Tube from 8'-10', dry						
	10						12-6-6 6	Wet at 12'
	15						3-5-6 6	
		16.5'-38' LIMESTONE dark gray, fossiliferous, some thin shale bedding						
	20			1	100	79		
	25			2	100	100		
	30			3	100	96		
	35			4	90	100		
		38'-55' SHALE dark gray with intermittent limestone beds						

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FIELD BORING LOG

BORING NO.: MW-7D PAGE: 2 of 2

TOTAL DEPTH: 55 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	40							
	45	SHALE dark gray with intermittent limestone beds		5	100	88		
	50			6	100	87		
	55			7	100	91		
		Total Depth = 55'						
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-7S PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-026

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/2/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 06.32" E: 95° 41' 46.87" G.S. ELEV. 623.74

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-18' GRAVELLY CLAY orange, some silt, mottled, hard, dry					2-1-3 6	
	ST 5	Shelby Tube from 3'-5'					4-6-7 6	
	10						3-4-6 6	Wet at 13'
	ST 15	Shelby Tube from 13'-15'						
	20	18'-30' LIMESTONE dark gray, thin shale bedding, fossiliferous		1	95	70		
	25			2	95	90		
	30	Total Depth = 30'						
	35							

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FIELD BORING LOG

BORING NO.: MW-8D PAGE: 1 of 2

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-027

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/13/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 04.35" E: 95° 42' 10.11" G.S. ELEV. 626.04

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-43' LIMESTONE light gray to dark gray, crystalline, some bedding plane fractures, fossiliferous, shale beds becoming thicker at 29'					5-17-50+ 6	
				1	90	79		
	5			2	90	79		
				3	100	79		
	10			4	100	79		
	15			5	100	79		
	20			6	100	79		
	25			7	100	79		
	30			8	100	79		
	35			9	100	79		

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FIELD BORING LOG

BORING NO.: MW-8D PAGE: 2 of 2

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	40							
				10	100	66		
		43'-60' SHALE						
	45	dark gray, some mud seams, wet		11	100	68		Wet at 45'
	50			12	100	83		
	55			13	100	78		
	60	Total Depth = 60'						
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-8S PAGE: 1 of 1

TOTAL DEPTH: 40 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-028

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN

DATE DRILLED: 10/15/08

RIG TYPE: STRATASTAR 25/CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON/NX ROCK CORE

N: 36° 25' 04.37" E: 95° 42' 10.30" G.S. ELEV. 625.68

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-40' LIMESTONE light gray, crystalline, dry with bedding plane fractures		1	85	10		
	5			2	80	9		
	10			3	100	93		
	15			4	95	90		
	20							
	25							
	30							
	35	Total Depth = 40'						

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FIELD BORING LOG

BORING NO.: MW-9S PAGE: 1 of 1

TOTAL DEPTH: 33.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35107060-002	DRILLING CO.: MOHAWK
LOGGED BY: CLANCY McCLINTOCK	DRILLER: KEVIN WILKIE
DATE DRILLED: 4/7/2010	RIG TYPE: GEFco
DRILLING METHOD: HOLLOW STEM AUGER	
SAMPLING METHOD: SPLIT SPOON	

N: -8587.14 E: 1916.816 G.S. ELEV. 633.98

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
633.98	0	0'-10.5' GRAVELLY CLAY HSA brown, silty, soft, dry						
628.98	5						5' - 6.5' 5-11-20 13	
623.98	10	10.5'-20' ASH tan, slightly gravelly, soft, moist					10' - 11.5' 7-12-10 15	Moist at 10.5'
618.98	15						15' - 16.5' 18-17-50/2 15	Hard layer from 16.5' - 17'
613.98	20	20'-26' ASH tan, slightly gravelly, soft, wet					20' - 21.5' 9-13-7 18	Wet at 20'
608.98	25	26'-28.5' ASH dark brown, slightly gravelly, soft, wet					25' - 26.5' 15-40-50/4 15	
603.98	30	28.5'-33.5' HSA - SHALE						Resistance at 28.5' (shale)
	35	Total Depth of Boring = 33.5' bgs						

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FIELD BORING LOG

BORING NO.: MW-9D PAGE: 1 of 2

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35107060-001	DRILLING CO.: MOHAWK
LOGGED BY: CLANCY McCLINTOCK	DRILLER: KEVIN WILKIE
DATE DRILLED: 4/6/2010	RIG TYPE: GEFco

DRILLING METHOD: HOLLOW STEM AUGER, AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: SPLIT SPOON & WIRE LINE CORING

N: -8597.75 E: 1910.436 G.S. ELEV. 633.90

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
633.90	0	0'-5' GRAVELLY CLAY HSA brown, slightly silty, soft, dry						HSA: 0' - 30' AIR HAMMER: 30' - 60' WLC: 30' - 58'
628.90	5	5'-10.5' GRAVELLY CLAY brown, slightly silty, soft, dry (gravel becoming larger)					5' - 6.5' 3-5-7 15	
623.90	10	10.5'-12' ASH gray to tan, slightly gravelly, soft, wet					10' - 11.5' 7-7-8 16	Wet at 10.5'
618.90	15	12'-20.5' ASH tan, slightly gravelly, soft, wet					15' - 16.5' 27-22-50/0.5 18	Hard layer from 16' - 17'
613.90	20	20.5'-21' COAL black 21'-26.5' ASH tan, slightly gravelly, soft, wet					20' - 21.5' 10-10-4 18	Wet at 21'
608.90	25	26.5'-27' SANDY SHALE gray 27'-28.5' CLAY brown, slightly gravelly, soft, wet 28.5'-30' HSA - SHALE dark gray					25' - 26.5' 9-21-18 18	Resistance at 28.5' (shale)
603.90	30	30'-38' SHALE WLC dark gray, thin horizontal bedding, some fossils present		30' - 38' 1	100	93		ROP=0.5ft/min.
598.90	35	38'-40' SHALE dark gray, thin horizontal bedding, some fossils present		2	80	64		

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FIELD BORING LOG

BORING NO.: MW-9D PAGE: 2 of 2

TOTAL DEPTH: 60 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
593.90	40	40'-60' SHALE dark gray, thin horizontal bedding, some fossils present		38' - 48' 2	80	64		ROP=0.25ft/min.
588.90	45							
583.90	50			48' - 58' 3	100	96		ROP=0.5ft/min.
578.90	55							
		Over drill to 60' with air hammer						
573.90	60	Total Depth of Boring = 60' bgs						
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-10D PAGE: 1 of 2

TOTAL DEPTH: 68 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35107060-003

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN WILKIE

DATE DRILLED: 4/7/2010 thru 4/9/2010

RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -7762.059 E: 764.463 G.S. ELEV. 636.14

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
636.14	0	0'-3' TOPSOIL HSA black						HSA: 0' - 3' AIR HAMMER: 3' - 68'
631.14	5	3'-22' LIMESTONE WLC light gray, fine graded, micritic, fossils and calcite crystals present, massive bedding, mostly horizontal bedding, some angular bedding @ ~30°		3' - 13' 1	90	76		WLC: 3' - 68' Resistance at 3' ROP=0.5ft/min.
626.14	10							
621.14	15			13' - 23' 2	100	94		ROP=0.5ft/min.
616.14	20							
611.14	25	22'-32' LIMESTONE becoming more gray, fine graded, micritic, fossils and calcite crystals present, massive bedding, mostly horizontal bedding present, massive bedding, mostly horizontal bedding, some angular bedding @ ~30° 24' - 32' Becoming weathered and fossil increase 29' - 30' Highly weakend zone		23' - 33' 3	100	80		ROP=0.5ft/min. Wet at 29' - 30'
606.14	30	31' - 35' Thin shale layers in Limestone						
601.14	35	32'-46' LIMESTONE gray, crystalline, fossils and calcite crystals present, bedding becoming thinner, moist between bedding planes, some small cavities with calcite crystal growth		33' - 46' 4	80	52		ROP=0.5ft/min.

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FIELD BORING LOG

BORING NO.: MW-10D PAGE: 2 of 2

TOTAL DEPTH: 68 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
596.14	40	32'-46' LIMESTONE gray, crystalline, fossils and calcite crystals present, bedding becoming thinner, moist between bedding planes, some small cavities with calcite crystal growth		33' - 46' 4	80	52		ROP=0.5ft/min.
591.14	45	46'-68' SHALE dark gray to black, few fossils, thin bedding, H.C. odor, dry, hard		46' - 53' 5	95	61		ROP=0.5ft/min.
586.14	50							
581.14	55			53' - 63' 6	98	85		ROP=0.5ft/min.
576.14	60							
571.14	65			63' - 68' 7	95	48		ROP=0.25ft/min.
		Total Depth of Boring = 68' bgs						
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-10S PAGE: 1 of 1

TOTAL DEPTH: 33 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35107060-004	DRILLING CO.: MOHAWK
LOGGED BY: CLANCY McCLINTOCK	DRILLER: KEVIN WILKIE
DATE DRILLED: 4/12/2010 & 4/13/2010	RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -7751.238 E: 763.103 G.S. ELEV. 636.36

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
636.36	0	0'-3' TOPSOIL HSA brown with silty clay						HSA: 0' - 3' AIR HAMMER: 3' - 33'
631.36	5	3'-10' LIMESTONE WLC gray, some fossils, micritic, massive bedding, dry		3' - 13' 1	90	62		WLC: 3' - 33' Resistance at 3' ROP=0.25ft/min.
626.36	10	10'-33' LIMESTONE gray, crystalline, some fossils, micritic, massive bedding, moist between bedding planes						
621.36	15			13' - 23' 2	100	100		ROP=0.25ft/min.
616.36	20							
611.36	25	26' - 33' Becomes weathered between bedding planes and becomes a darker gray		23' - 33' 3	100	64		ROP=0.5ft/min.
606.36	30							
	35	Total Depth of Boring = 33' bgs						

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FIELD BORING LOG

BORING NO.: MW-11D PAGE: 1 of 1

TOTAL DEPTH: 48 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35107060-005

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN WILKIE

DATE DRILLED: 4/13/2010 / 4/14/2010

RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -8419.377 E: 935.471 G.S. ELEV. 625.97

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
625.97	0	0'-3' LIMESTONE WLC						AIR HAMMER: 0' - 3' & 3' - 48' WLC: 3' - 48'
		3'-27' LIMESTONE gray, crystalline, lots of fossils, calcite crystals, hard, few small cavities with crystal growth						
620.97	5			3' - 13' 1	100	75		ROP=0.25ft/min.
615.97	10							Moist at 10'
610.97	15	26' - 33' Becomes weathered between bedding planes and becomes a darker gray		13' - 23' 2	100	83		ROP=0.25ft/min.
605.97	20							
600.97	25	27'-32' LIMESTONE dark gray, some fossils, micritic, thin interlayered shale in LS		23' - 33' 3	90	33		ROP=0.25ft/min.
595.97	30							
		32'-48' SHALE dark gray to black, some fossils, thin bedding						
590.97	35			33' - 43' 4	100	71		ROP=0.25ft/min.

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FIELD BORING LOG

BORING NO.: MW-11D PAGE: 2 of 2

TOTAL DEPTH: 48 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
585.97	40			33' - 43' 4	100	71		ROP=0.25ft/min.
580.97	45			43' - 48' 5	100	91		ROP=0.25ft/min.
		Total Depth of Boring = 48' bgs						
	50							
	55							
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-11S PAGE: 1 of 1

TOTAL DEPTH: 28 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35107060-006	DRILLING CO.: MOHAWK
LOGGED BY: CLANCY McCLINTOCK	DRILLER: KEVIN WILKIE
DATE DRILLED: 4/14/2010 / 4/15/2010	RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -8429.094 E: 938.143 G.S. ELEV. 625.91

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
625.91	0	0'-1.5' LIMESTONE WLC						AIR HAMMER: 0' - 1.5' & 1.5' - 28' WLC: 1.5' - 28'
		1.5'-10' LIMESTONE gray, crystalline, lots of fossils, calcite crystals, crystal growth in cavities		1.5' - 12' 1	80	31		Water in hole while drilling with Air hammer
620.91	5							
615.91	10	10' - 18' thin bedding, increase in fossils and calcite crystals, very hard		12' - 18' 2	50	0		
610.91	15							
		18' - 28' a few thin interbedded shale layers		18' - 23' 3	25	0		ROP=0.25ft/min.
605.91	20							
600.91	25			23' - 28' 4	80	36		
		Total Depth of Boring = 28' bgs						
	30							
	35							

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FIELD BORING LOG

BORING NO.: MW-12D PAGE: 1 of 2

TOTAL DEPTH: 42 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35107060-007

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN WILKIE

DATE DRILLED: 4/15/2010 / 4/16/2010 / 4/19/2010

RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -8778.028 E: 1088.459 G.S. ELEV. 620.91

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
620.91	0	0'-2' LIMESTONE WLC						AIR HAMMER: 0' - 2' & 2' - 42'
		2'-11' LIMESTONE gray, crystalline, high fossil content, calcite crystal growth, dry		2' - 7' 1	95	15		WLC: 2' - 42'
615.91	5							
				7' - 12' 2	90	51		ROP=0.1ft/min.
610.91	10	11' - 19' Becoming a darker gray 11' - 22' Very thin shale layers interbedded in limestone						
605.91	15							
		19'-22' LIMESTONE dark gray, becoming very crystalline, thin bedding, high fossil content, brittle		12' - 22' 3	95	29		
600.91	20							
		22'-42' SHALE dark gray, few fossils, natural gas odor		22' - 28' 4	100	74		
595.91	25							
				28' - 32' 5	100	80		Water at 32'
590.91	30							
				32' - 42' 6	95	94		
585.91	35							

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FIELD BORING LOG

BORING NO.: MW-12D PAGE: 2 of 2

TOTAL DEPTH: 42 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
580.91	40							
				32' - 42' 6	95	94		ROP=0.1ft/min.
		Total Depth of Boring = 42' bgs						
	45							
	50							
	55							
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-12S PAGE: 1 of 1

TOTAL DEPTH: 20 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35107060-008	DRILLING CO.: MOHAWK
LOGGED BY: CLANCY McCLINTOCK	DRILLER: KEVIN WILKIE
DATE DRILLED: 4/19/2010	RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -8786.771 E: 1083.029 G.S. ELEV. 620.65

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
620.65	0	0'-5' LIMESTONE WLC						AIR HAMMER: 0' - 5' & 5' - 20' WLC: 5' - 20'
615.65	5	5'-13.5' LIMESTONE gray, crystalline, high fossil content, calcite crystal growth in a few cavities, dry		5' - 13' 1	38	17		
610.65	10							
605.65	15	13.5'-20' LIMESTONE dark gray, some calcite crystal growth, few fossils, few thin interbedded shale layers, dry		13' - 18' 2	80	62		
600.65	20	Total Depth of Boring = 20' bgs		18' - 20' 3	100	83		
	25							
	30							
	35							

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FIELD BORING LOG

BORING NO.: MW-13D PAGE: 1 of 2

TOTAL DEPTH: 45 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35107060-009

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN WILKIE

DATE DRILLED: 4/20/2010

RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -9108.428 E: 1354.192 G.S. ELEV. 616.11

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
616.11	0	0'-4' LIMESTONE WLC						AIR HAMMER: 0' - 4' & 4' - 45' WLC: 4' - 42'
		4'-11' LIMESTONE dark gray, crystalline, fossils present, massive bedding, calcite crystal growth, biomicritic		4' - 11' 1	95	58		
606.11	10	11'-13' LIMESTONE gray, crystalline, high fossil content, dry						Very hard at 11' - 12' Switched to small air hammer (4") at 11' - 12'
		13'-21' SHALE dark gray, HC odor, few fossils		11' - 22' 2	90	53		
596.11	20	21' - 42' Becoming darker and more fine						
				22' - 27' 3	100	90		
586.11	30			27' - 32' 4	100	100		
581.11	35			32' - 45' 5	95	78		

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FIELD BORING LOG

BORING NO.: MW-13D PAGE: 2 of 2

TOTAL DEPTH: 45 FEET BELOW GROUND SURFACE (BGS)

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
576.11	40							
				32' - 42' 5	95	78		
		Air hammer to 45'						
571.11	45	Total Depth of Boring = 45' bgs						
	50							
	55							
	60							
	65							
	70							
	75							
	80							
	85							
	90							
	95							

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FIELD BORING LOG

BORING NO.: MW-13S PAGE: 1 of 1

TOTAL DEPTH: 15 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35107060-010

DRILLING CO.: MOHAWK

LOGGED BY: CLANCY McCLINTOCK

DRILLER: KEVIN WILKIE

DATE DRILLED: 4/20/2010 & 4/21/2010

RIG TYPE: GEFco

DRILLING METHOD: AIR HAMMER, WIRE LINE CORING WITH AIR

SAMPLING METHOD: WIRE LINE CORING

N: -9107.785 E: 1344.689 G.S. ELEV. 616.20

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
616.20	0	0'-3.5' LIMESTONE WLC						AIR HAMMER: 0' - 3.5' & 3.5' - 15'
		3.5'-9' LIMESTONE gray, few fossils, micritic, calcite crystal growth, massive bedding, dry		3.5' - 8' 1	80	33		WLC: 3.5' - 15'
611.20	5							
		9' - 10' Dark gray with interbedded thin shale layers 10' - 12.5' Gray with high fossil content, crystalline		8' - 13.5' 2	90	14		
606.20	10							
		12.5'-15' SHALE dark gray, limey		13.5' - 15' 3	100	51		
601.20	15	Total Depth of Boring = 15' bgs						
	20							
	25							
	30							
	35							

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FIELD BORING LOG

BORING NO.: MW-14 PAGE: 1 of 1

TOTAL DEPTH: 76' FEET BELOW GROUND SURFACE (BGS)

CLIENT: AEP	PROJECT: NE - CCR WELL INSTALL
JOB NO.: 35157183	DRILLING CO.: AECI
LOGGED BY: RAH	DRILLER: GARY MOYERS
DATE DRILLED: 03/01/2016	RIG TYPE: CME 75 BUGGY
DRILLING METHOD: HSA / AIR ROTARY	
SAMPLING METHOD: 5' CONTINUOUS SAMPLER, LOGGED BY CUTTINGS	

N: E: G.S. ELEV.

Depth BGS	DESCRIPTION	Litho. Symbol	% Recovery	RQD	Remarks
0	0'-6' SILTY CLAY W/ LIMESTONE GRAVEL tan and gray clay w/intermitant gravel				
10	6'-43' SILTY CLAY W/ LIMESTONE GRAVEL crystalline to micritie				6' - 76' logged by cuttings
20					
30					
40					
50	43'-76' SHALE light gray to gray, hard				
60					
70					fracture @ 67' w/ moist cuttings
80	Total Depth of Boring at 76' bgs				BoB @ 76'

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FIELD BORING LOG

BORING NO.: MW-15 PAGE: 1 of 1

TOTAL DEPTH: 71' FEET BELOW GROUND SURFACE (BGS)

CLIENT: AEP	PROJECT: NE - CCR WELL INSTALL
JOB NO.: 35157183	DRILLING CO.: AECI
LOGGED BY: RAH	DRILLER: GARY MOYERS
DATE DRILLED: 02/23/2016	RIG TYPE: CME 75 BUGGY
DRILLING METHOD: HSA / AIR ROTARY	
SAMPLING METHOD: 5' CONTINUOUS SAMPLER, LOGGED BY CUTTINGS	

N: E: G.S. ELEV.

Depth BGS	DESCRIPTION	Litho. Symbol	% Recovery	RQD	Remarks
0	0'-11' SILTY, GRAVELLY, CLAY FILL brown and red				
10	11'-15' ASH tan, fine and dry				
	15'-27' SILTY CLAY W/ ZONES OF GRAVELLY CLAY stiff, brown, dry				
20					
	27'-30' WEATHERED L.S. W/ GRAVELLY CLAY				
30	30'-41' L.S. crystalline, hard, light gray to gray				30' - 71' logged by cuttings
40					
	41'-71' SHALE hard, gray to dingy				
50					water not encountered while drilling
60					
70					
	Total Depth of Boring at 71' bgs				BoB @ 71'
80					

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FIELD BORING LOG

BORING NO.: MW-16 PAGE: 1 of 1

TOTAL DEPTH: 61' FEET BELOW GROUND SURFACE (BGS)

CLIENT: AEP	PROJECT: NE - CCR WELL INSTALL
JOB NO.: 35157183	DRILLING CO.: AECI
LOGGED BY: RAH	DRILLER: GARY MOYERS
DATE DRILLED: 02/25/2016	RIG TYPE: CME 75 BUGGY

DRILLING METHOD: HSA / AIR ROTARY

SAMPLING METHOD: 5' CONTINUOUS SAMPLER, LOGGED BY CUTTING

Depth BGS	Sample Interval	N: E: ELEV: DESCRIPTION	Litho. Symbol	Split Spoon Sample Interval	Recovery	Comments
0		0'-10' SILTY CLAY W/ SOME GRAVEL dark brown				
10		10'-26' ASH tan, fine				moisture beginning @ 19'
25		26'-27' SILTY CLAY dark gray to black				28' - 61' logged by cuttings
30		27'-28' clay w/ bentonite slurry greenish gray, dry				
35		28'-61' SHALE dark gray, hard				
40						fractures w/ moist cuttings @ 30' and 52'
55						BoB @ 61'
60		Total Depth of Boring at 61' bgs				
65						

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FIELD BORING LOG

BORING NO.: MW-17 PAGE: 1 of 1

TOTAL DEPTH: 56' FEET BELOW GROUND SURFACE (BGS)

CLIENT: AEP	PROJECT: NE - CCR WELL INSTALL
JOB NO.: 35157183	DRILLING CO.: AECI
LOGGED BY: RAH	DRILLER: GARY MOYERS
DATE DRILLED: 02/29/2016	RIG TYPE: CME 75 BUGGY

DRILLING METHOD: HSA / AIR ROTARY

SAMPLING METHOD: 5' CONTINUOUS SAMPLER, LOGGED BY CUTTING

Depth BGS	Sample Interval	N: E: ELEV: DESCRIPTION	Litho. Symbol	Split Spoon Sample Interval	Recovery	Comments
0		0'-12' SILTY, GRAVELLY CLAY FILL red and brown				
5						
10						
12		12'-13' ASH tan, fine and dry				
13		13'-25' SILTY CLAY W/ L.S. GRAVEL brown				
15						
20						
25		25'-30' L.S. hard, light gray				25' - 56' logged by cuttings
30		30'-31' CLAY-FILLED ZONE moist				
31		31'-56' SHALE dark gray				
35						
40						fractures w/ moist cuttings@39',43',46',50'
45						
50						
55						
56		Total Depth of Boring at 56' bgs				BoB @ 56'
60						
65						

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FIELD BORING LOG

BORING NO.: LP-1 PAGE: 1 of 1

TOTAL DEPTH: 28 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-029

DRILLING CO.: MOHAWK

LOGGED BY: MERRICK ROTENBERRY

DRILLER: KEVIN

DATE DRILLED: 10/17/08

RIG TYPE: CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON

N: 36° 24' 53.23" E: 95° 41' 57.21" G.S. ELEV. 634.68

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-28' ASH tan to gray, alternating silty to hard layers					3,8,7 6"	
	5						6,9,7 6"	
							3,7,21 6"	
	10						3,12,9 6"	
							13,31,21 6"	
	15	Soft					6,8,8 6"	Wet at 15'
							6,5,2 6"	
	20	No recovery, soft					1,2,4 6"	
	25	No recovery, soft					1,1,1 6"	
		Total Depth = 28'						Limestone at 28'
	30							
	35							

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FIELD BORING LOG

BORING NO.: LP-2 PAGE: 1 of 1

TOTAL DEPTH: 30 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-030

DRILLING CO.: MOHAWK

LOGGED BY: MERRICK ROTENBERRY

DRILLER: KEVIN

DATE DRILLED: 10/15/08

RIG TYPE: CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON

N: 36° 24' 59.19" E: 95° 41' 56.77" G.S. ELEV. 638.10

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-29' ASH tan to gray, alternating silty to hard layers					3,5,6 6"	
	5						46,50+ 6"	
							8,8,9 6"	
	10						7,6,10 6"	
							10,9,8 6"	Very moist at 12'
	15						4,3,2 6"	
		Soft					7,6,4 6"	Wet at 18'
	20						7,6,5 6"	
	25						1,1,2 6"	
							2,2,4 6"	
		29'-30' GRAVELLY CLAY dark brown, wet						
	30	Total Depth = 30'						Limestone at 30'
	35							

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FIELD BORING LOG

BORING NO.: LP-3 PAGE: 1 of 1

TOTAL DEPTH: 40 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-031

DRILLING CO.: MOHAWK

LOGGED BY: MERRICK ROTENBERRY

DRILLER: KEVIN

DATE DRILLED: 10/16/08

RIG TYPE: CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON

N: 36° 24' 57.22" E: 95° 41' 54.31" G.S. ELEV. 649.39

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-38.5' ASH tan to gray, alternating silty to hard layers					4,3,4 6"	
							2,1,2 6"	
	5						2,2,2 6"	
							2,1,2 6"	
	10						4,8,10 6"	
							8,14,28 6"	
	15						4,2,1 6"	
							7,8,5 6"	
	20						7,10,16 6"	Wet at 24'
							26,28,10 6"	
	25						1,2,2 6"	
							1 12"	
	30	Soft					0,1,2 6"	
	35							
		38.5'-40' GRAVELLY CLAY dark brown						
		Total Depth = 40'						Limestone at 40'

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FIELD BORING LOG

BORING NO.: LP-4 PAGE: 1 of 1

TOTAL DEPTH: 21 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER

PROJECT: NE PLANT LANDFILL

JOB NO.: 216-003-35087115-032

DRILLING CO.: MOHAWK

LOGGED BY: MERRICK ROTENBERRY

DRILLER: KEVIN

DATE DRILLED: 10/15/08

RIG TYPE: CME 55

DRILLING METHOD: HOLLOW STEM AUGER

SAMPLING METHOD: SPLIT SPOON

N: 36° 25' 03.55" E: 95° 41' 51.65" G.S. ELEV. 627.79

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-20.5' ASH tan to gray, alternating silty to hard layers					16,16,12 6"	
							13,13,33 6"	
	5						27,27,29 6"	
		Soft					4,4,4 6"	Wet at 9'
	10						1,1,1 6"	
							1,2,3 6"	
	15						3,3,4 6"	
							4,6,50+ 6"	
	20	20.5'-21' GRAVELLY CLAY						Limestone at 21'
		Total Depth = 21'						
	25							
	30							
	35							

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FIELD BORING LOG

BORING NO.: LP-5 PAGE: 1 of 1

TOTAL DEPTH: 27 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35087115-033	DRILLING CO.: MOHAWK
LOGGED BY: MERRICK ROTENBERRY	DRILLER: KEVIN
DATE DRILLED: 10/16/08	RIG TYPE: CME 55
DRILLING METHOD: HOLLOW STEM AUGER	
SAMPLING METHOD: SPLIT SPOON	

N: 36° 24' 59.27" E: 95° 41' 48.05" G.S. ELEV. 634.29

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-26' ASH tan to gray, alternating silty to hard layers					6,9,35 6"	No recocvery
	5						9,4,2 6"	
							2,3,3 6"	
	10						6" 5,5,5	Wet at 9'
	15	Soft					8,9,9 6"	
							6,12,29 6"	
	20						10,12,10 6"	
							26,50+ 6"	
	25	26'-27' GRAVELLY CLAY					29,8,9 6"	
		Total Depth = 27'						Limestone at 27'
	30							
	35							

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FIELD BORING LOG

BORING NO.: LP-6 PAGE: 1 of 1

TOTAL DEPTH: 16.5 FEET BELOW GROUND SURFACE (BGS)

CLIENT: AMERICAN ELECTRIC POWER	PROJECT: NE PLANT LANDFILL
JOB NO.: 216-003-35087115-034	DRILLING CO.: MOHAWK
LOGGED BY: MERRICK ROTENBERRY	DRILLER: KEVIN
DATE DRILLED: 10/16/08	RIG TYPE: CME 55
DRILLING METHOD: HOLLOW STEM AUGER	
SAMPLING METHOD: SPLIT SPOON	

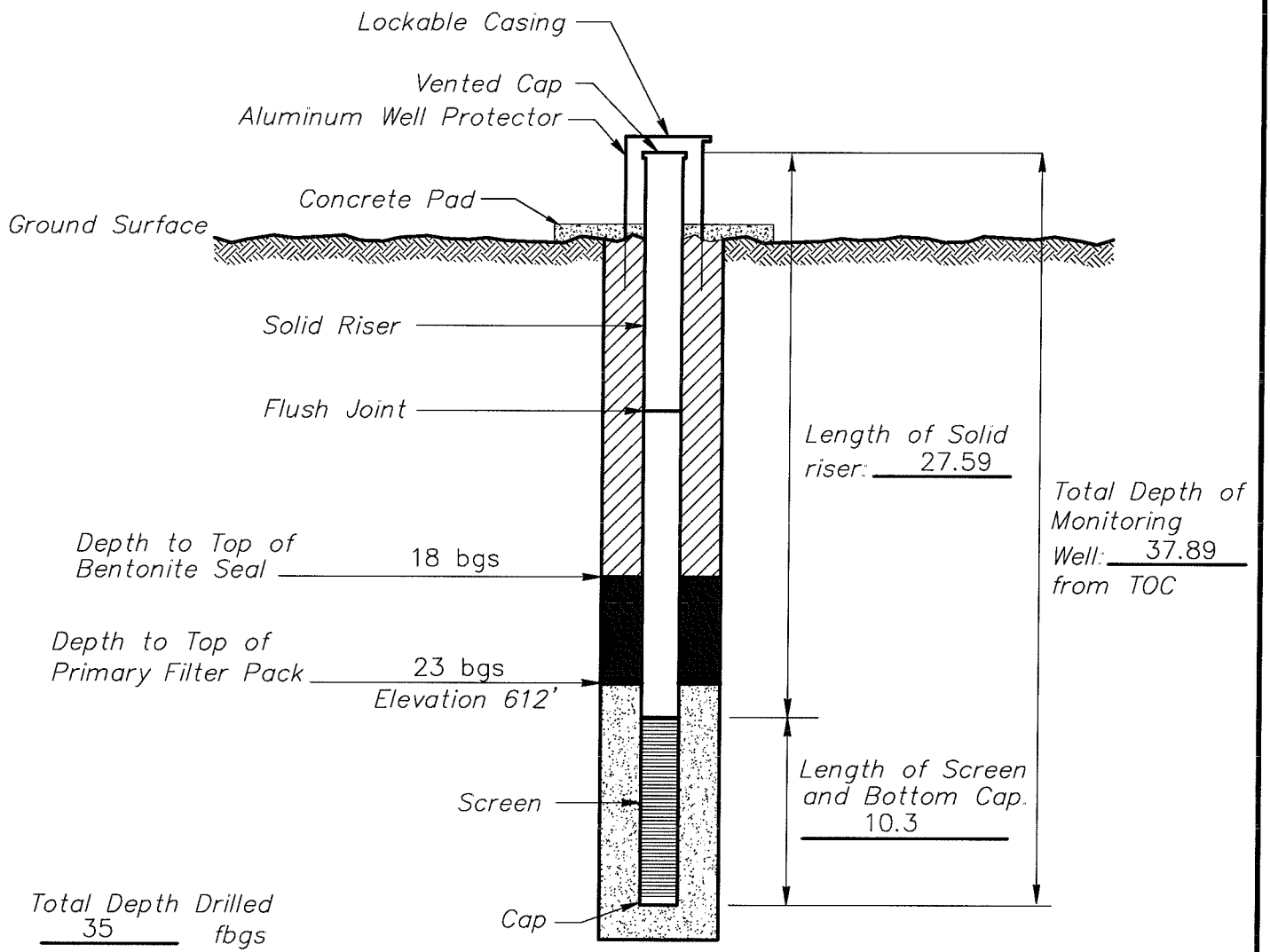
N: 36° 25' 03.97" E: 95° 41' 45.21" G.S. ELEV. 625.61

Elev.	Depth BGS	DESCRIPTION	Litho. Symbol	Run #	% Recovery	RQD	Blow Count per 0.5'	Remarks
	0	0'-15' ASH tan to gray, alternating silty to hard layers					2,5,7 / 6"	
	5						7,12,11 / 6"	
							16,50+ / 6"	
	10						4,7,7 / 6"	Wet at 12'
		Soft					4,7,16 / 6"	
	15	15'-16.5' GRAVELLY CLAY						Limestone at 16.5'
		Total Depth = 16.5'						
	20							
	25							
	30							
	35							

Monitoring Well Installation Logs

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEASTERN PLANT LANDFILL **Well Number** MW-1
Job Number 35077150 **Installation Date** 2/19/08 **Location** OOLOGAH, OK.
Datum Elevation 638.89 **Surface Elevation** 635.75
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC **Slot Size** 0.01
Riser Diameter & Material 2" PVC **Borehole Diameter** 6.25"
Granular Backfill Material 12-20 SAND **Terracon Representative** MERRICK ROTENBERRY
Drilling Method AIR ROTARY **Drilling Contractor** MOHAWK



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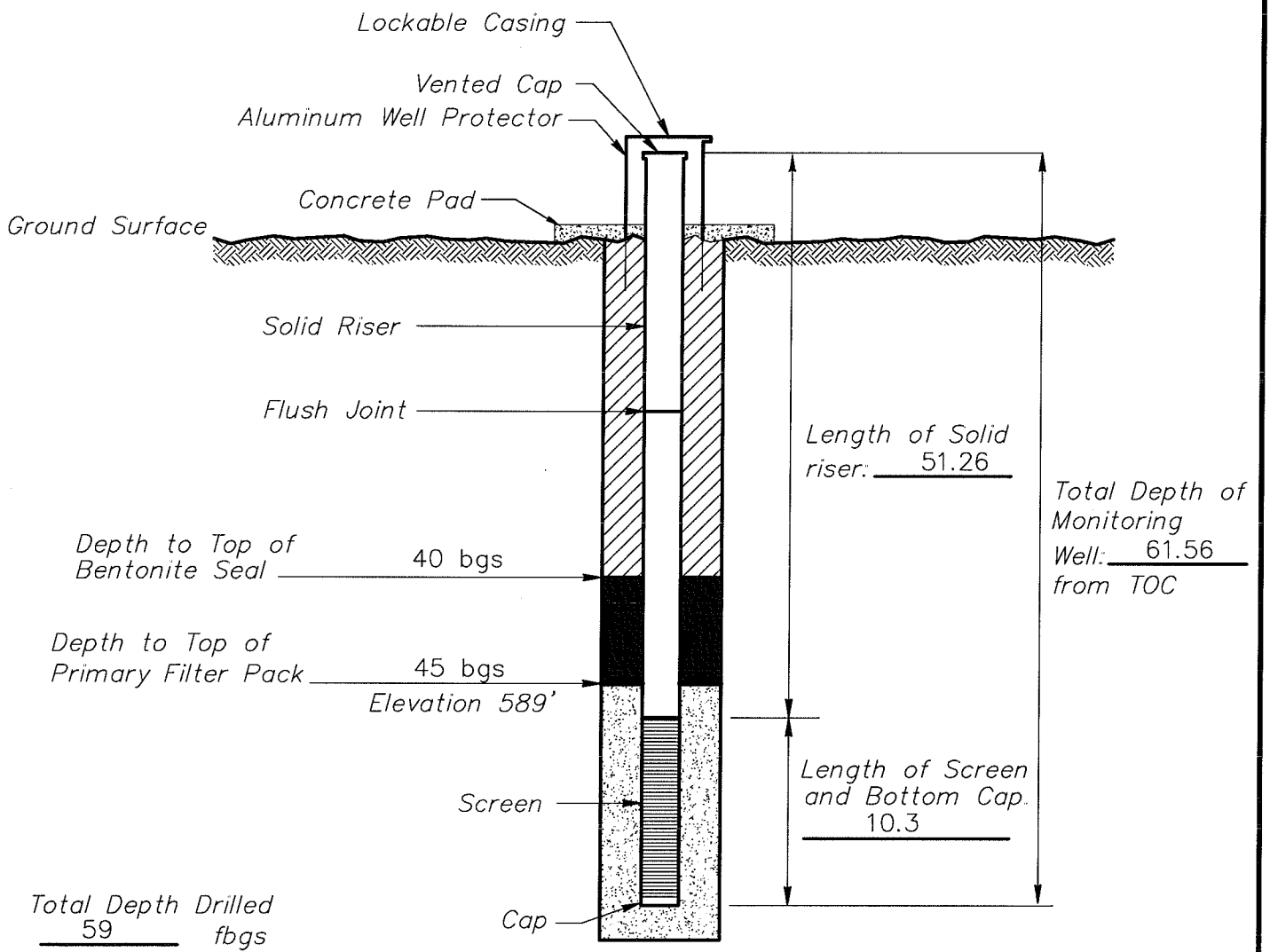
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35077150
WELL NUMBER: MW-1
DRAWING NUMBER: 015 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEASTERN PLANT LANDFILL **Well Number** MW-2
Job Number 35077150 **Installation Date** 3/4/08 **Location** OOLOGAH, OK.
Datum Elevation 638.19 **Surface Elevation** 634.82
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC **Slot Size** 0.01
Riser Diameter & Material 2" PVC **Borehole Diameter** 6.25"
Granular Backfill Material 12-20 SAND **Terracon Representative** MERRICK ROTENBERRY
Drilling Method AIR ROTARY **Drilling Contractor** MOHAWK



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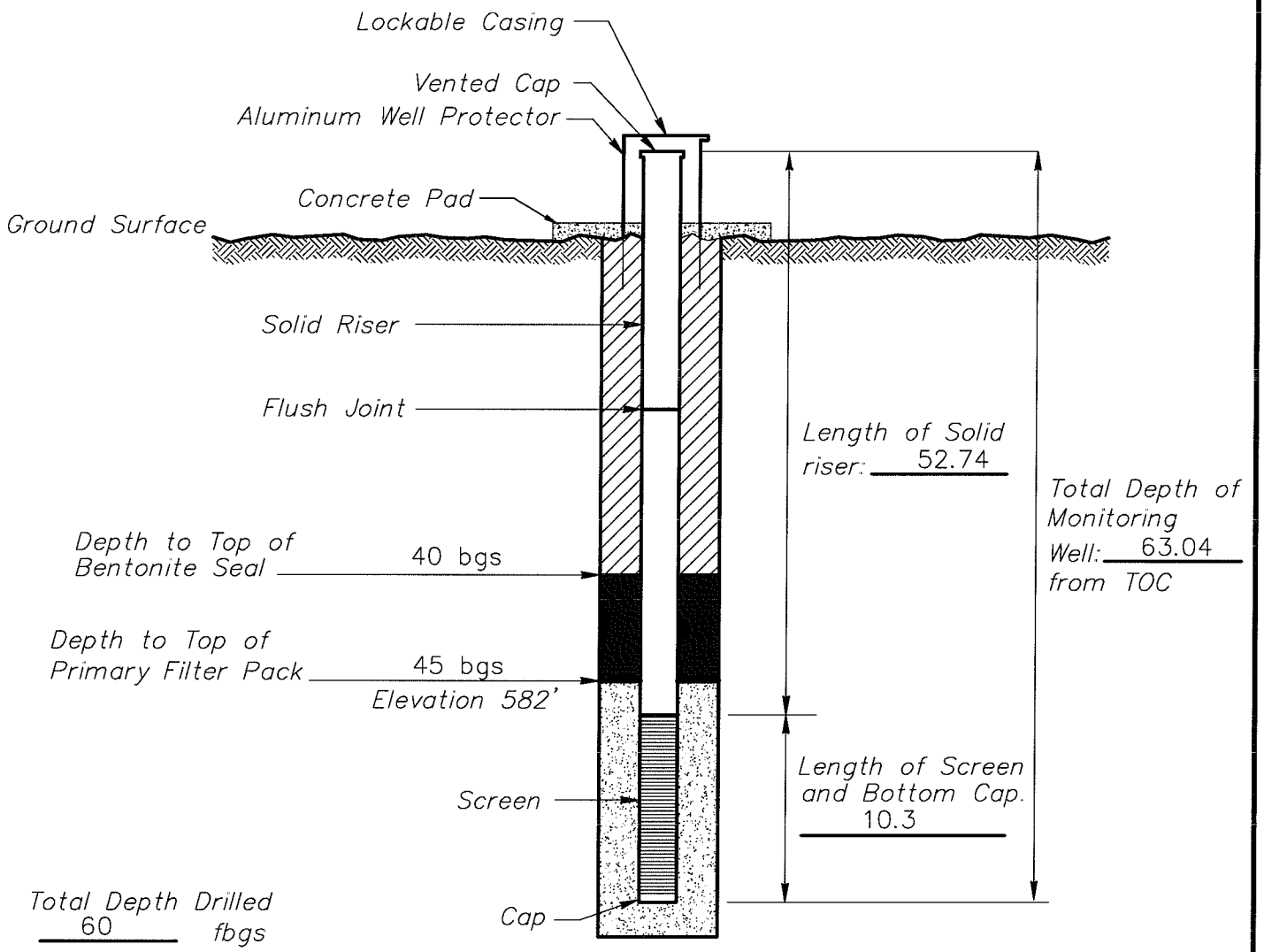
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35077150
WELL NUMBER: MW-2
DRAWING NUMBER: 016 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEASTERN PLANT LANDFILL **Well Number** MW-3
Job Number 35077150 **Installation Date** 2/21/08 **Location** OOLOGAH, OK.
Datum Elevation 630.65 **Surface Elevation** 627.66
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC **Slot Size** 0.01
Riser Diameter & Material 2" PVC **Borehole Diameter** 6.25"
Granular Backfill Material 12-20 SAND **Terracon Representative** MERRICK ROTENBERRY
Drilling Method AIR ROTARY **Drilling Contractor** MOHAWK



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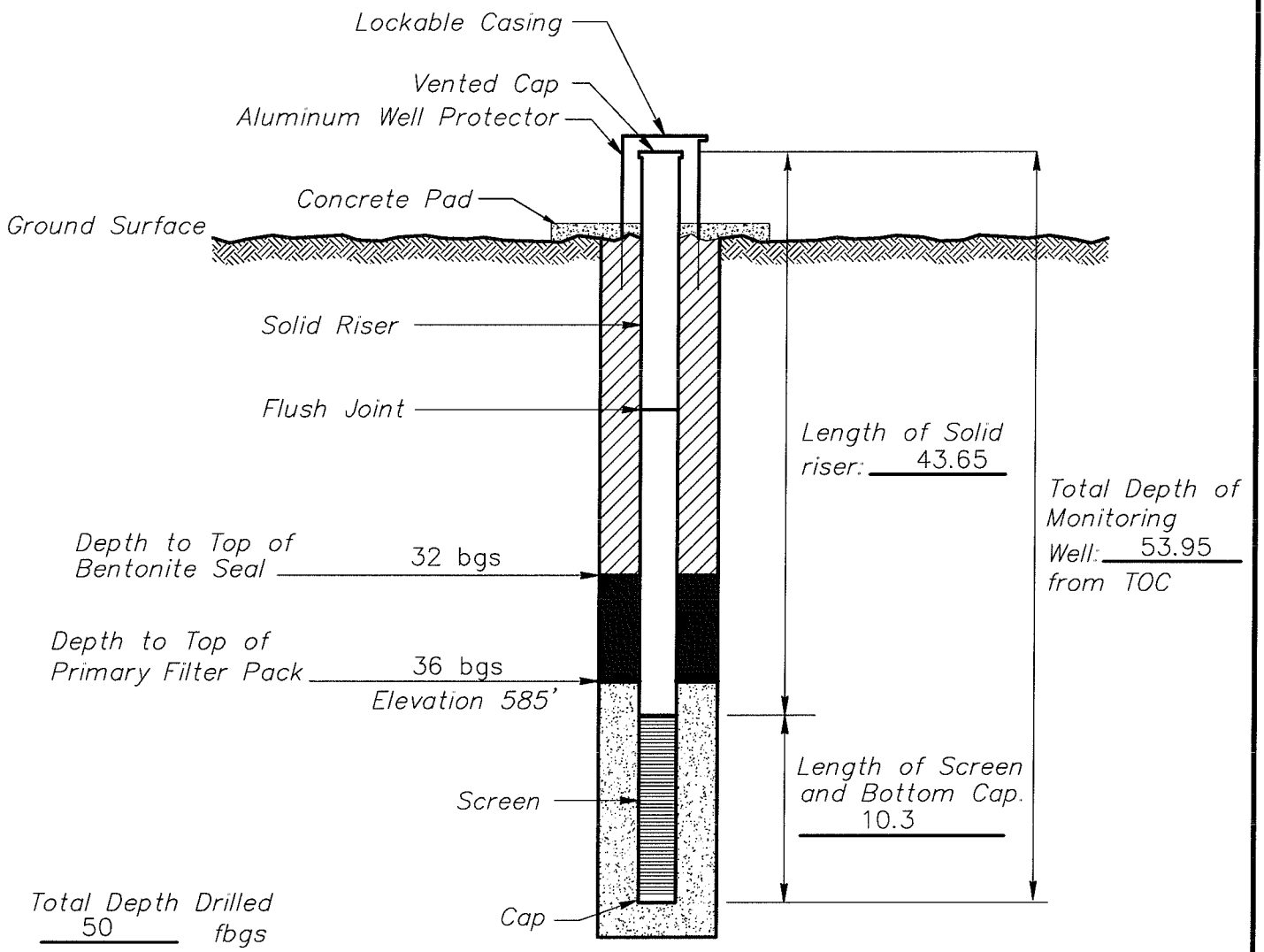
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35077150
WELL NUMBER: MW-3
DRAWING NUMBER: 017 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEASTERN PLANT LANDFILL **Well Number** MW-4
Job Number 35077150 **Installation Date** 2/22/08 **Location** OOLOGAH, OK.
Datum Elevation 625.00 **Surface Elevation** 621.93
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC **Slot Size** 0.01
Riser Diameter & Material 2" PVC **Borehole Diameter** 6.25"
Granular Backfill Material 12-20 SAND **Terracon Representative** MERRICK ROTENBERRY
Drilling Method AIR ROTARY **Drilling Contractor** MOHAWK



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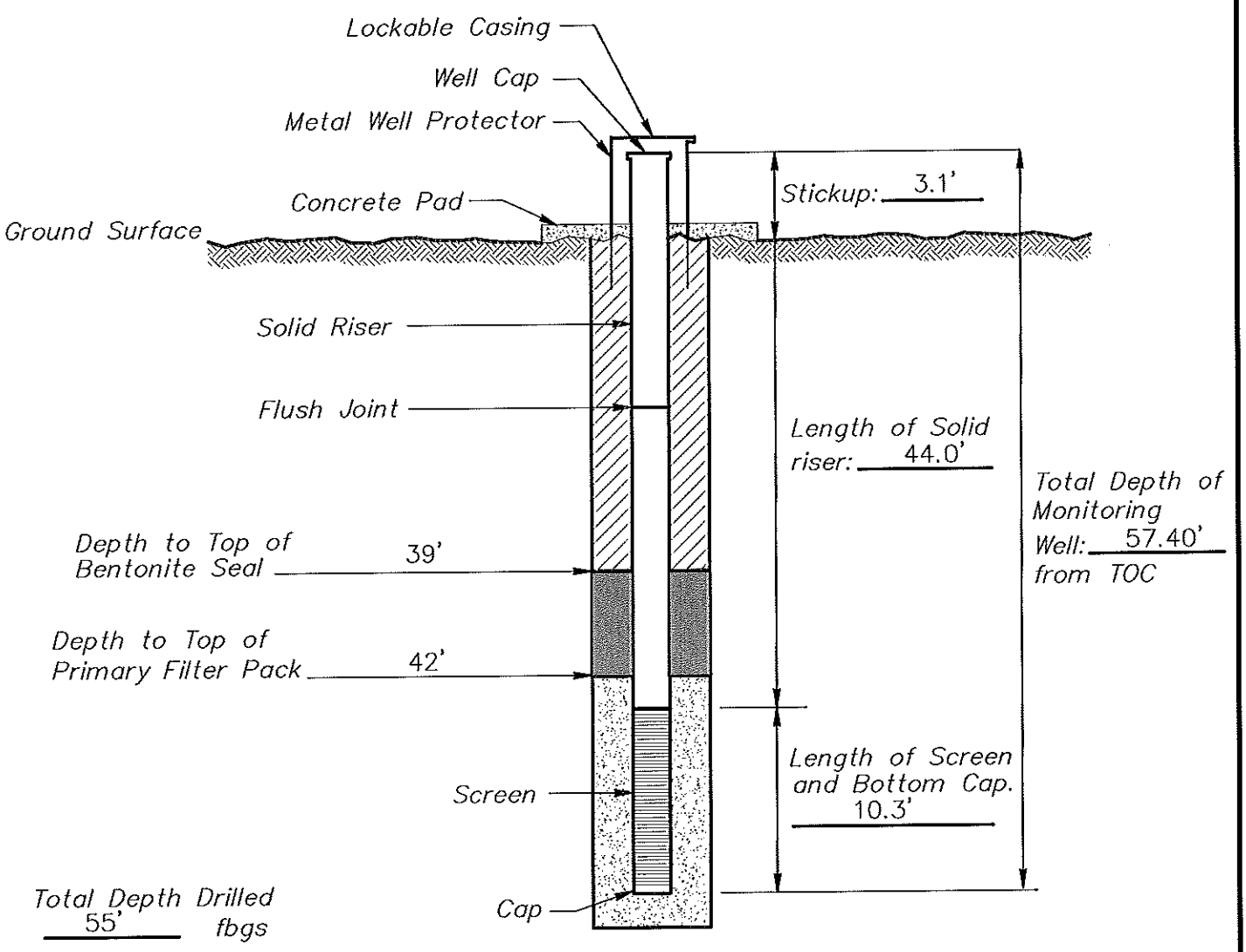
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35077150
WELL NUMBER: MW-4
DRAWING NUMBER: 018 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT | Well Number MW–1D
Job Number 35087115 | Installation Date 10/23/08 | Location OOLOGAH, OK.
Datum Elevation 638.07 | Surface Elevation 635.23
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC | Slot Size 0.01"
Riser Diameter & Material 2" PVC | Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND | Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor MOHAWK



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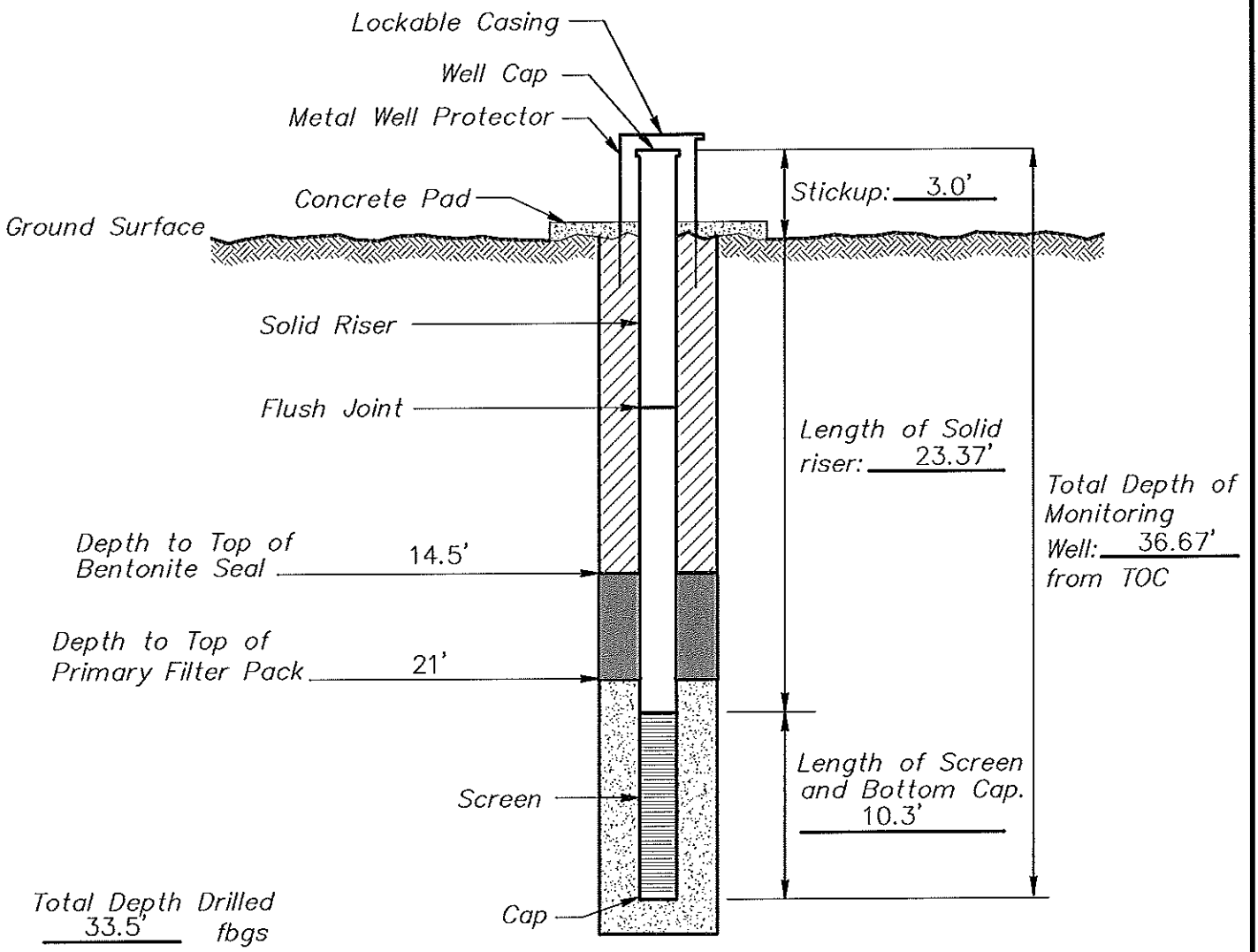
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–1D
DRAWING NUMBER: 035 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT Well Number MW-2S
Job Number 35087115 Installation Date 10/13/08 Location OOLOGAH, OK.
Datum Elevation 637.37 Surface Elevation 634.45
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6.25"
Granular Backfill Material 12-20 SAND Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY Drilling Contractor MOHAWK



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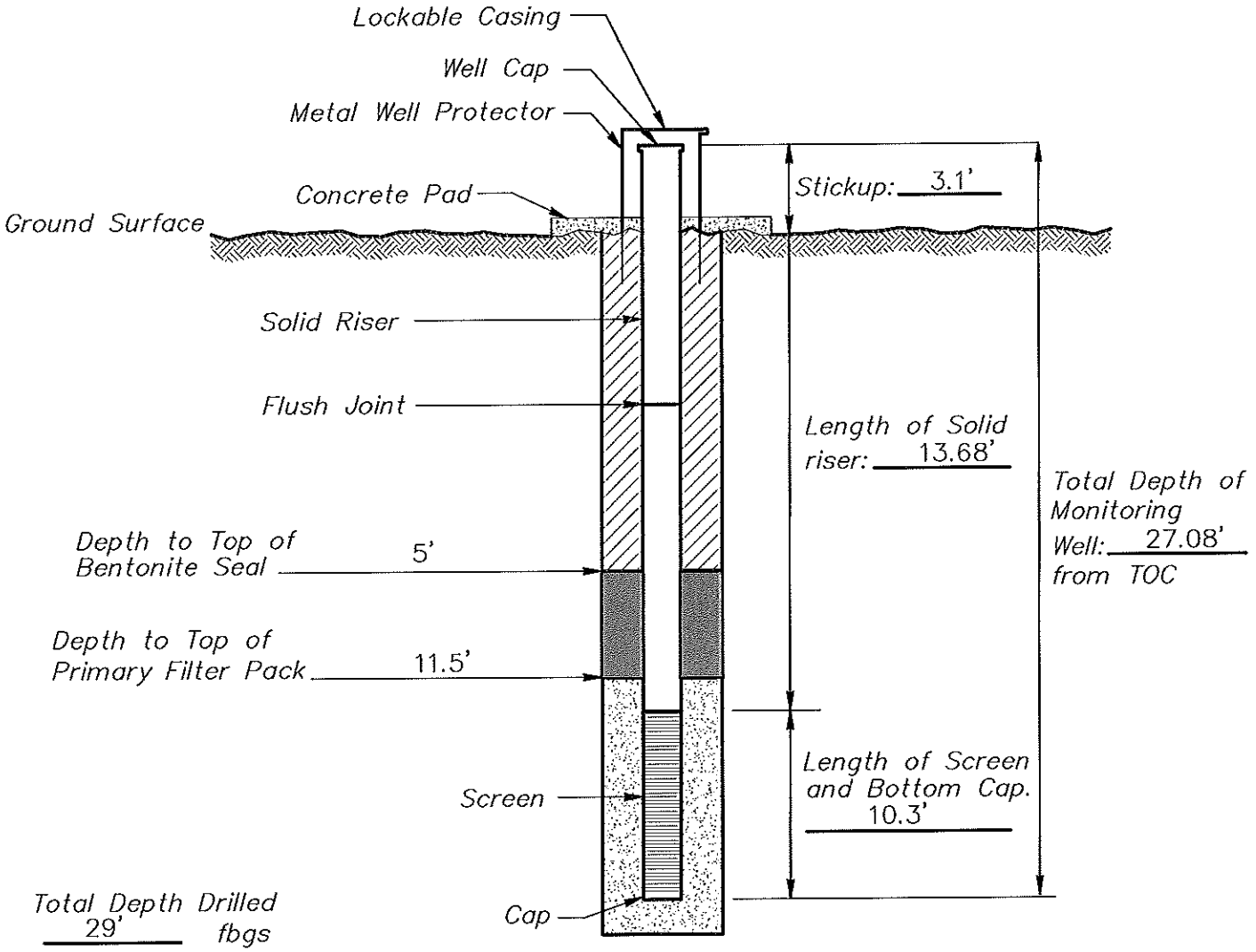
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35087115
WELL NUMBER: MW-2S
DRAWING NUMBER: 036 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT Well Number MW-3S
Job Number 35087115 Installation Date 10/13/08 Location OOLOGAH, OK.
Datum Elevation 630.19 Surface Elevation 627.09
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6.25"
Granular Backfill Material 12-20 SAND Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY Drilling Contractor MOHAWK



Portland/Bentonite Grout

Bentonite Pellets

Granular Backfill

(Not to Scale)

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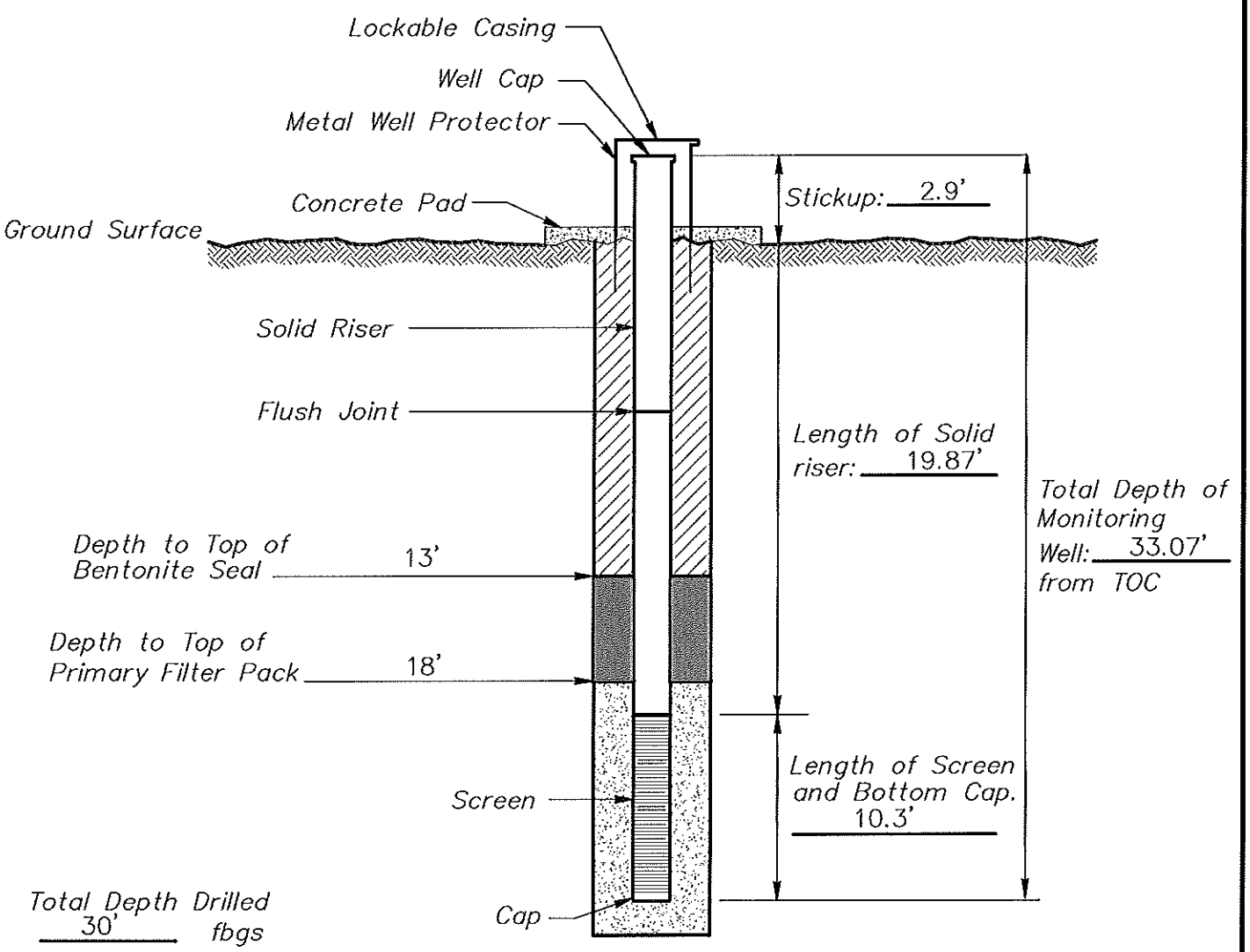
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35087115
WELL NUMBER: MW-3S
DRAWING NUMBER: 037 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT Well Number MW–4S
Job Number 35087115 Installation Date 10/13/08 Location OOLOGAH, OK.
Datum Elevation 624.54 Surface Elevation 621.44
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY Drilling Contractor MOHAWK



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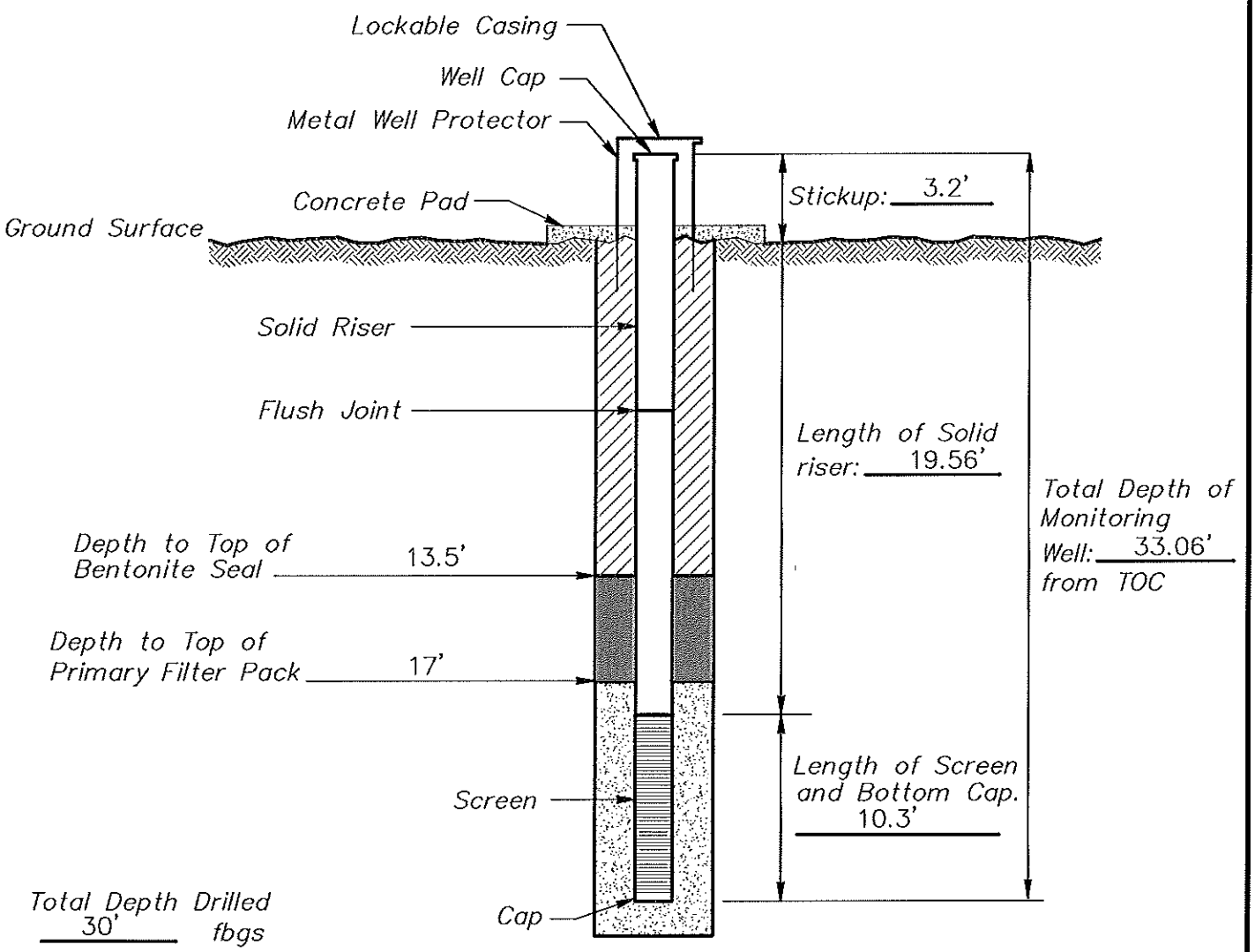
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–4S
DRAWING NUMBER: 038 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT Well Number MW–5S
Job Number 35087115 Installation Date 10/21/08 Location OOLOGAH, OK.
Datum Elevation 636.72 Surface Elevation 633.62
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY Drilling Contractor MOHAWK



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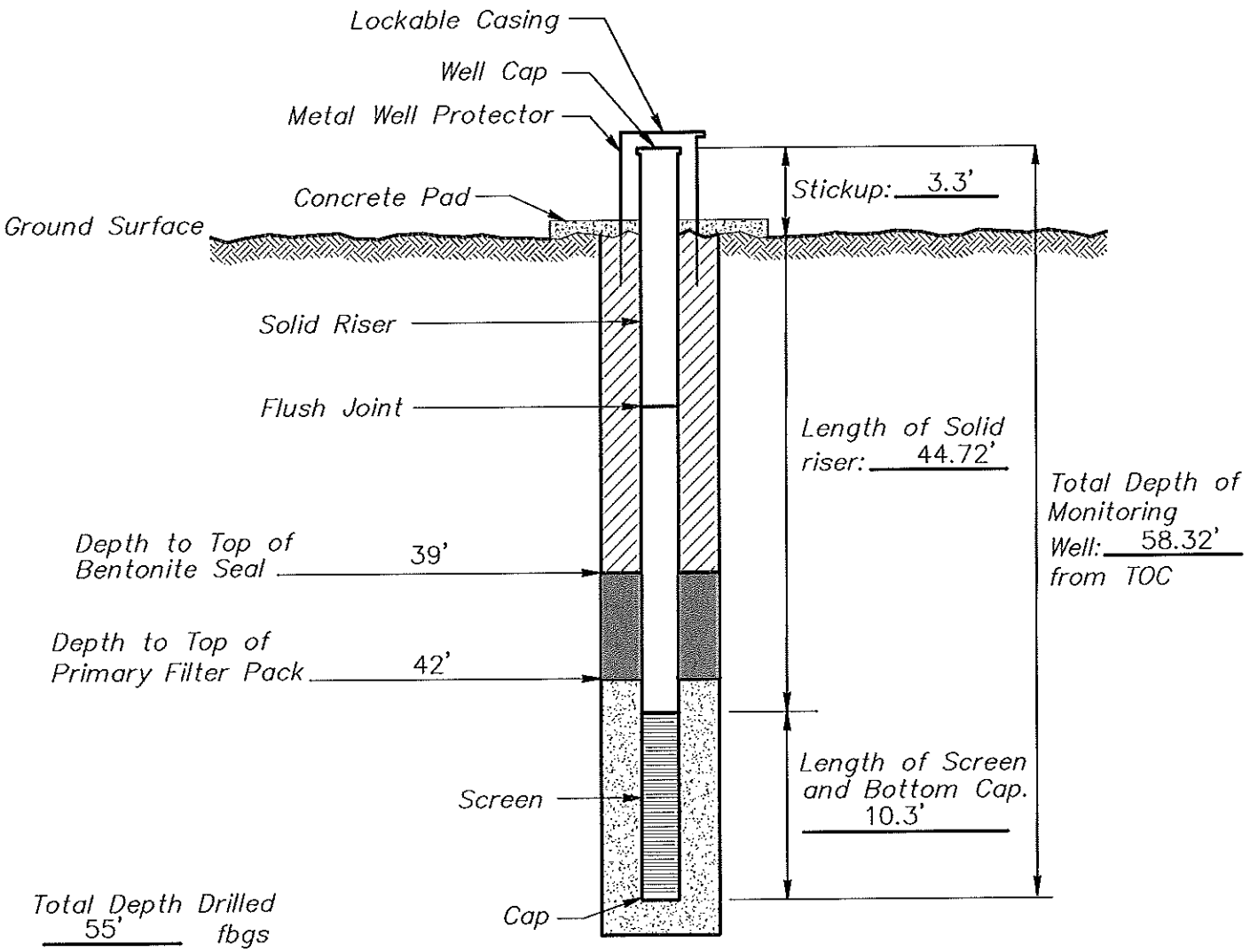
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–5S
DRAWING NUMBER: 039 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT | Well Number MW-5D
Job Number 35087115 | Installation Date 10/23/08 | Location OOLOGAH, OK.
Datum Elevation 636.84 | Surface Elevation 633.83
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC | Slot Size 0.01"
Riser Diameter & Material 2" PVC | Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND | Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor MOHAWK



Portland/Bentonite Grout

Bentonite Pellets

Granular Backfill

(Not to Scale)

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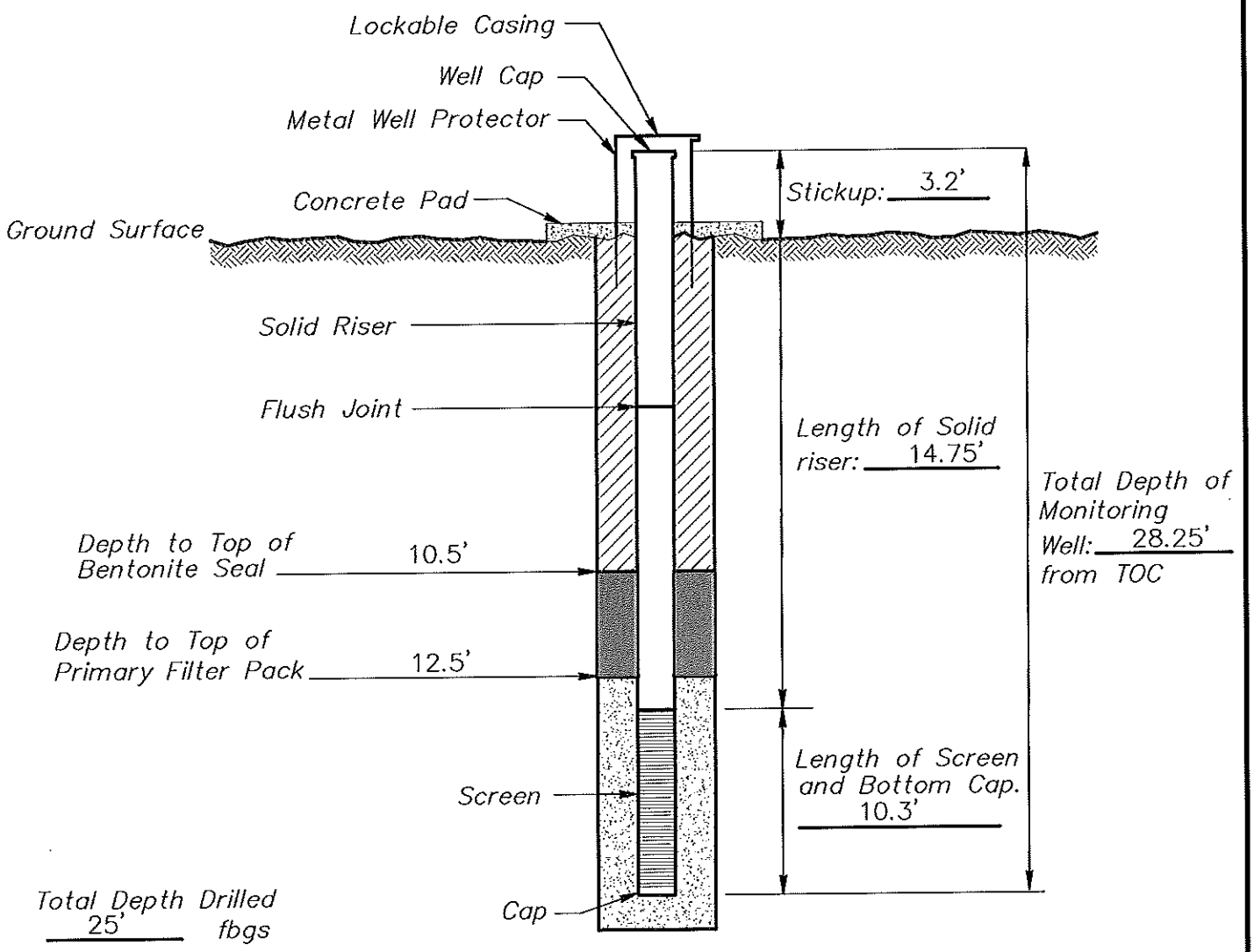
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW-5D
DRAWING NUMBER: 040 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT | Well Number MW-6S
Job Number 35087115 | Installation Date 10/6/08 | Location OOLOGAH, OK.
Datum Elevation 636.80 | Surface Elevation 633.66
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC | Slot Size 0.01"
Riser Diameter & Material 2" PVC | Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND | Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor MOHAWK



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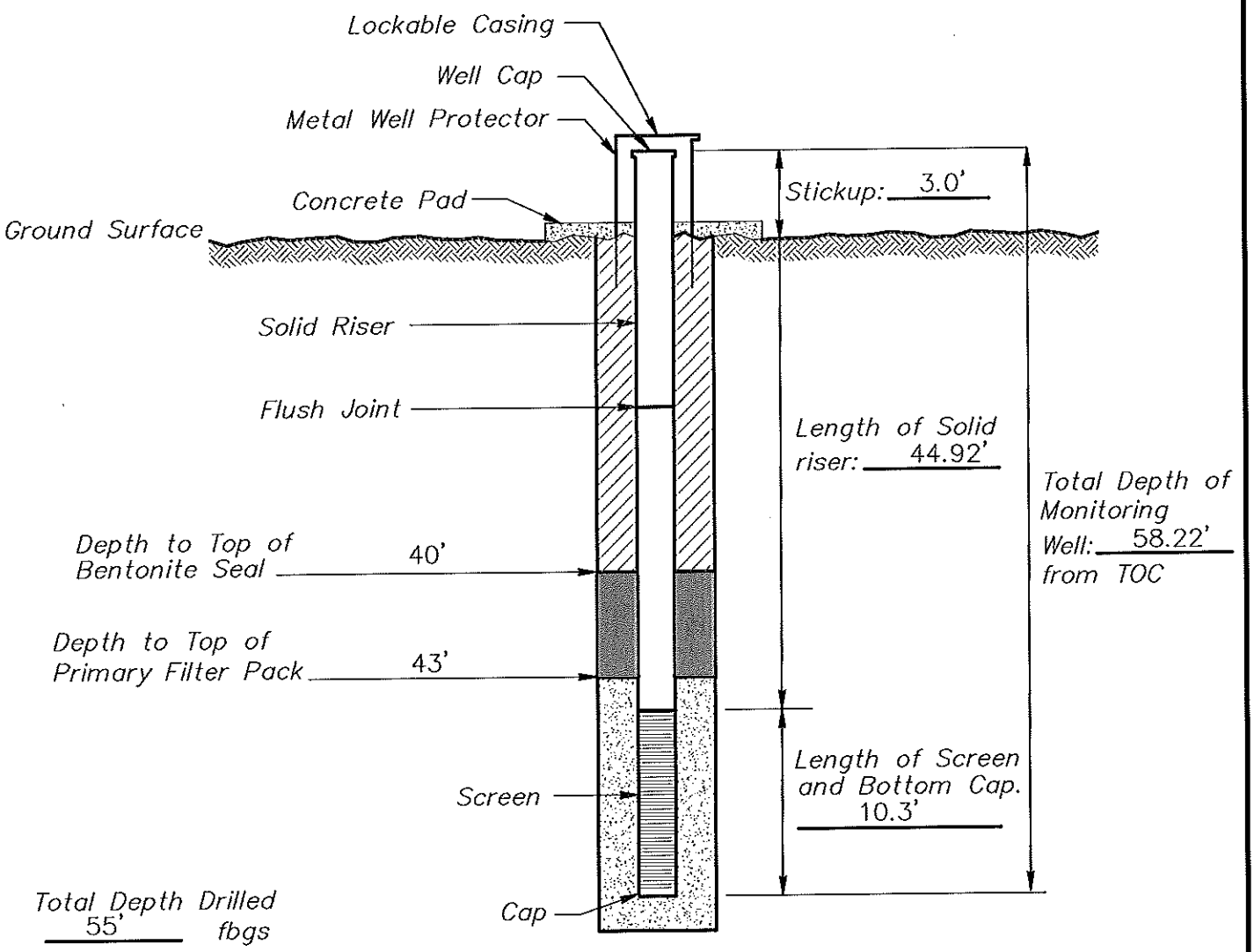
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW-6S
DRAWING NUMBER: 041 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT
Well Number MW–6D
Job Number 35087115
Installation Date 10/23/08
Location OOLOGAH, OK.
Datum Elevation 636.66
Surface Elevation 633.72
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC
Slot Size 0.01"
Riser Diameter & Material 2" PVC
Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND
Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY
Drilling Contractor MOHAWK



Portland/Bentonite Grout
Bentonite Pellets
Granular Backfill

(Not to Scale)

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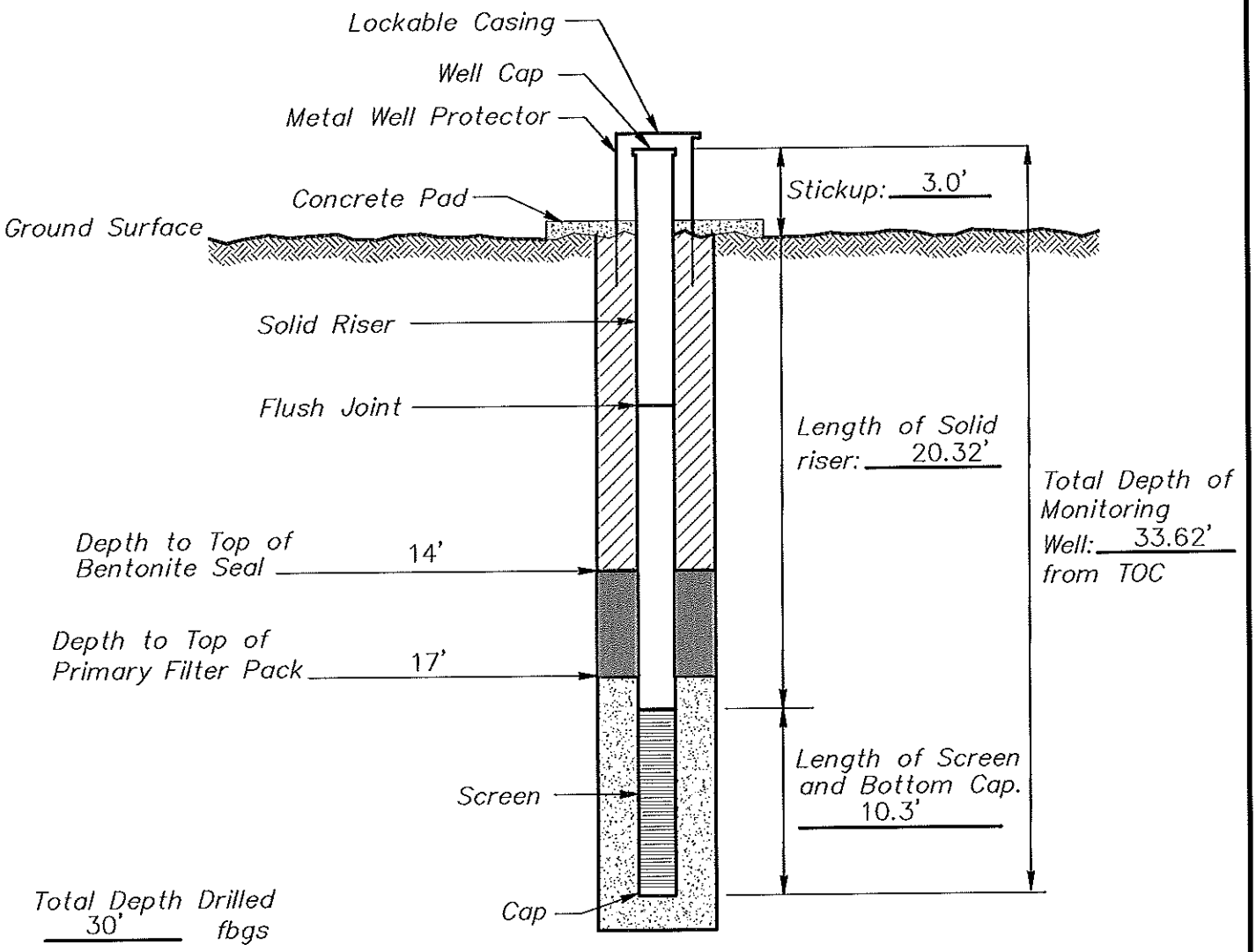
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–6D
DRAWING NUMBER: 042 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT | Well Number MW–7S
Job Number 35087115 | Installation Date 10/22/08 | Location OOLOGAH, OK.
Datum Elevation 626.45 | Surface Elevation 623.58
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC | Slot Size 0.01"
Riser Diameter & Material 2" PVC | Borehole Diameter 6.25"
Granular Backfill Material 12–20 SAND | Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor MOHAWK



Portland/Bentonite Grout

Bentonite Pellets

Granular Backfill

(Not to Scale)

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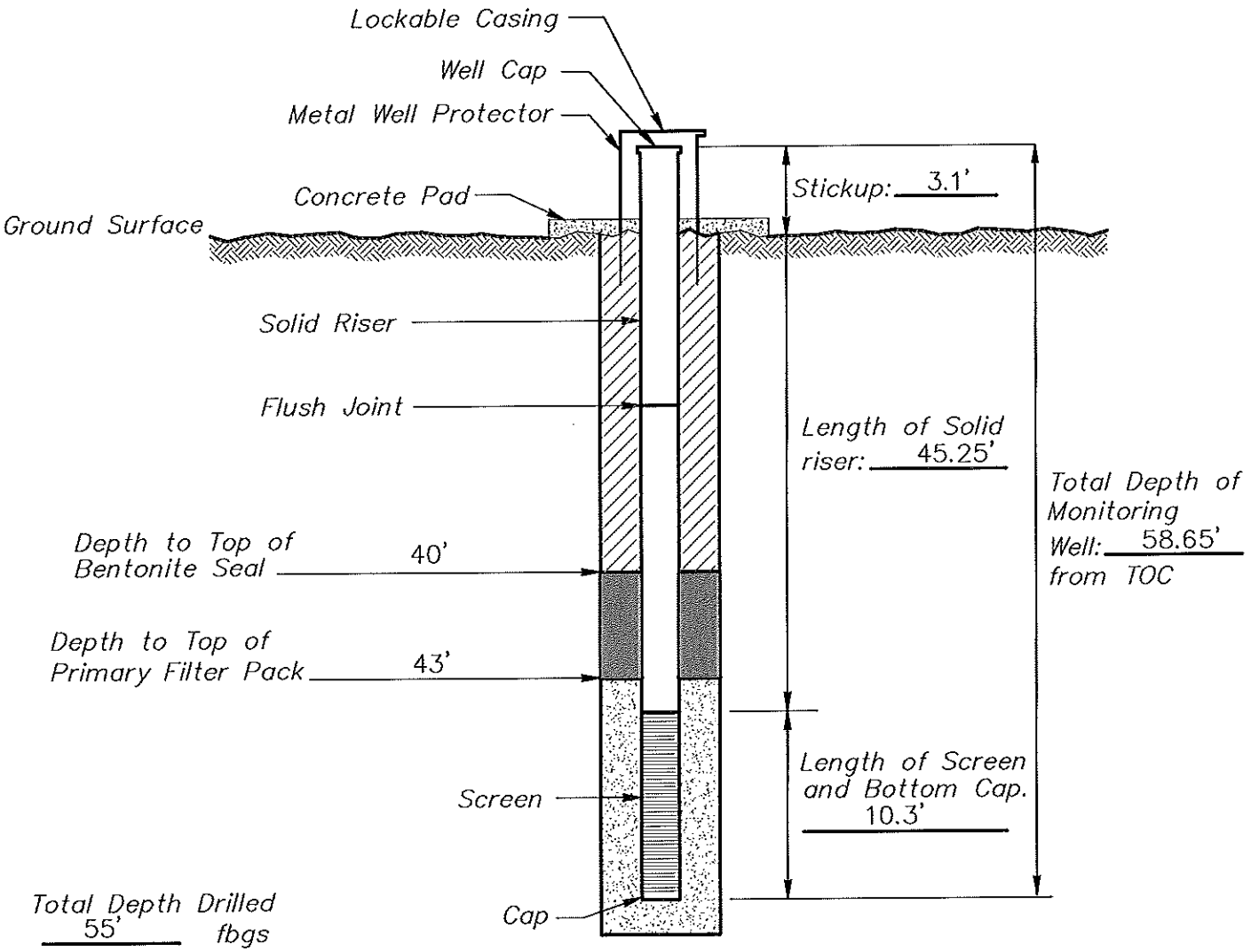
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–7S
DRAWING NUMBER: 043 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name: AMERICAN ELECTRIC POWER – NE PLANT
Well Number: MW-7D
Job Number: 35087115
Installation Date: 10/22/08
Location: OOLOGAH, OK.
Datum Elevation: 626.46
Surface Elevation: 623.74
Datum for Water Level Measurement: T.O.C.
Screen Diameter & Material: 2" PVC
Slot Size: 0.01"
Riser Diameter & Material: 2" PVC
Borehole Diameter: 6.25"
Granular Backfill Material: 12-20 SAND
Terracon Representative: MR/JA
Drilling Method: HOLLOW STEM AUGER/AIR ROTARY
Drilling Contractor: MOHAWK



Portland/Bentonite Grout

Bentonite Pellets

Granular Backfill

(Not to Scale)

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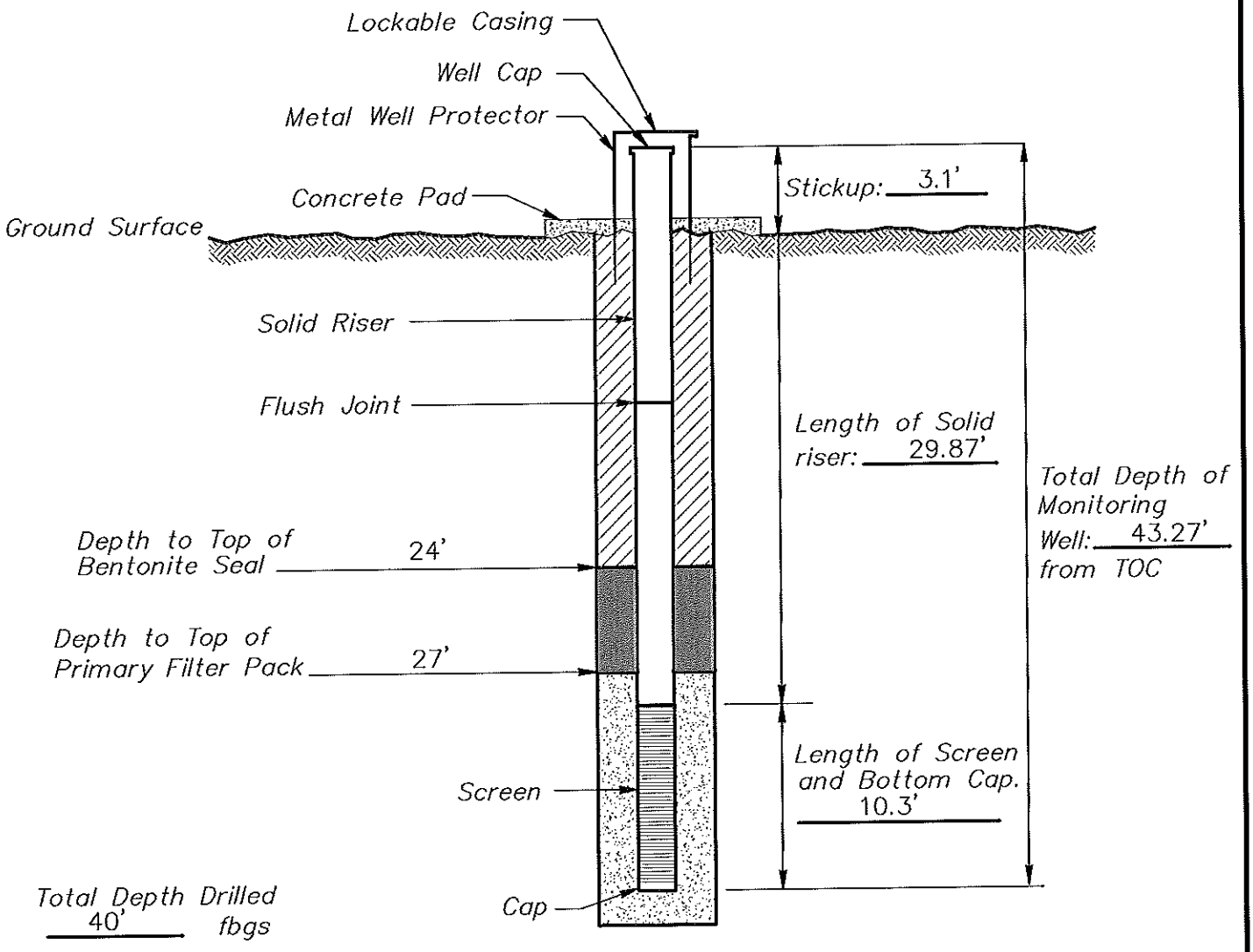
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35087115
WELL NUMBER: MW-7D
DRAWING NUMBER: 044
CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AMERICAN ELECTRIC POWER – NE PLANT | Well Number MW-8S
Job Number 35087115 | Installation Date 10/21/08 | Location OOLOGAH, OK.
Datum Elevation 628.71 | Surface Elevation 625.68
Datum for Water Level Measurement T.O.C.
Screen Diameter & Material 2" PVC | Slot Size 0.01"
Riser Diameter & Material 2" PVC | Borehole Diameter 6.25"
Granular Backfill Material 12-20 SAND | Terracon Representative MR/JA
Drilling Method HOLLOW STEM AUGER/AIR ROTARY | Drilling Contractor MOHAWK



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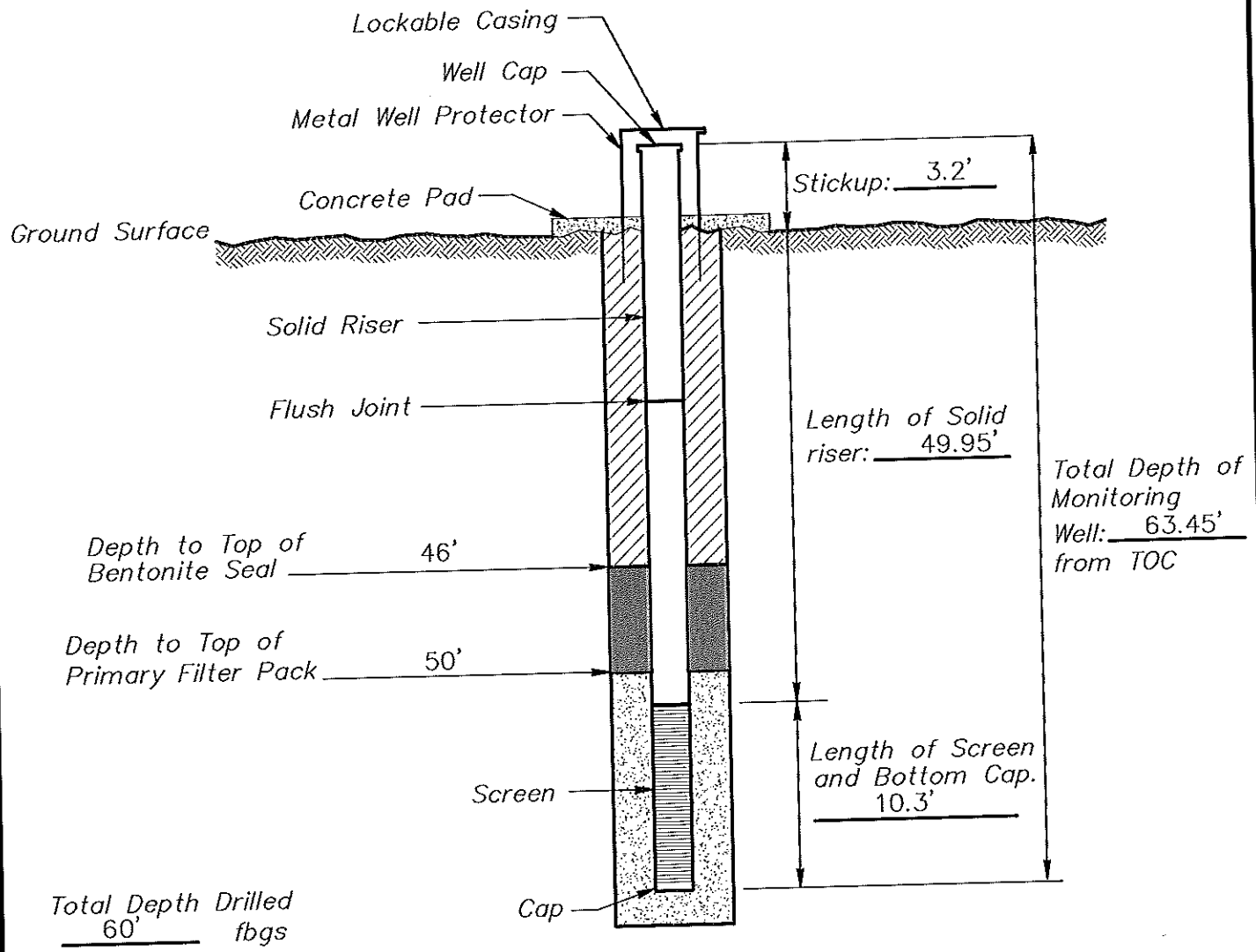
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35087115
WELL NUMBER: MW-8S
DRAWING NUMBER: 045 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name: AMERICAN ELECTRIC POWER – NE PLANT
Well Number: MW–8D
Job Number: 35087115
Installation Date: 10/21/08
Location: OOLOGAH, OK.
Datum Elevation: 629.32
Surface Elevation: 626.04
Datum for Water Level Measurement: T.O.C.
Screen Diameter & Material: 2" PVC
Slot Size: 0.01"
Riser Diameter & Material: 2" PVC
Borehole Diameter: 6.25"
Granular Backfill Material: 12–20 SAND
Terracon Representative: MR/JA
Drilling Method: HOLLOW STEM AUGER/AIR ROTARY
Drilling Contractor: MOHAWK



Portland/Bentonite Grout

Bentonite Pellets

Granular Backfill

(Not to Scale)

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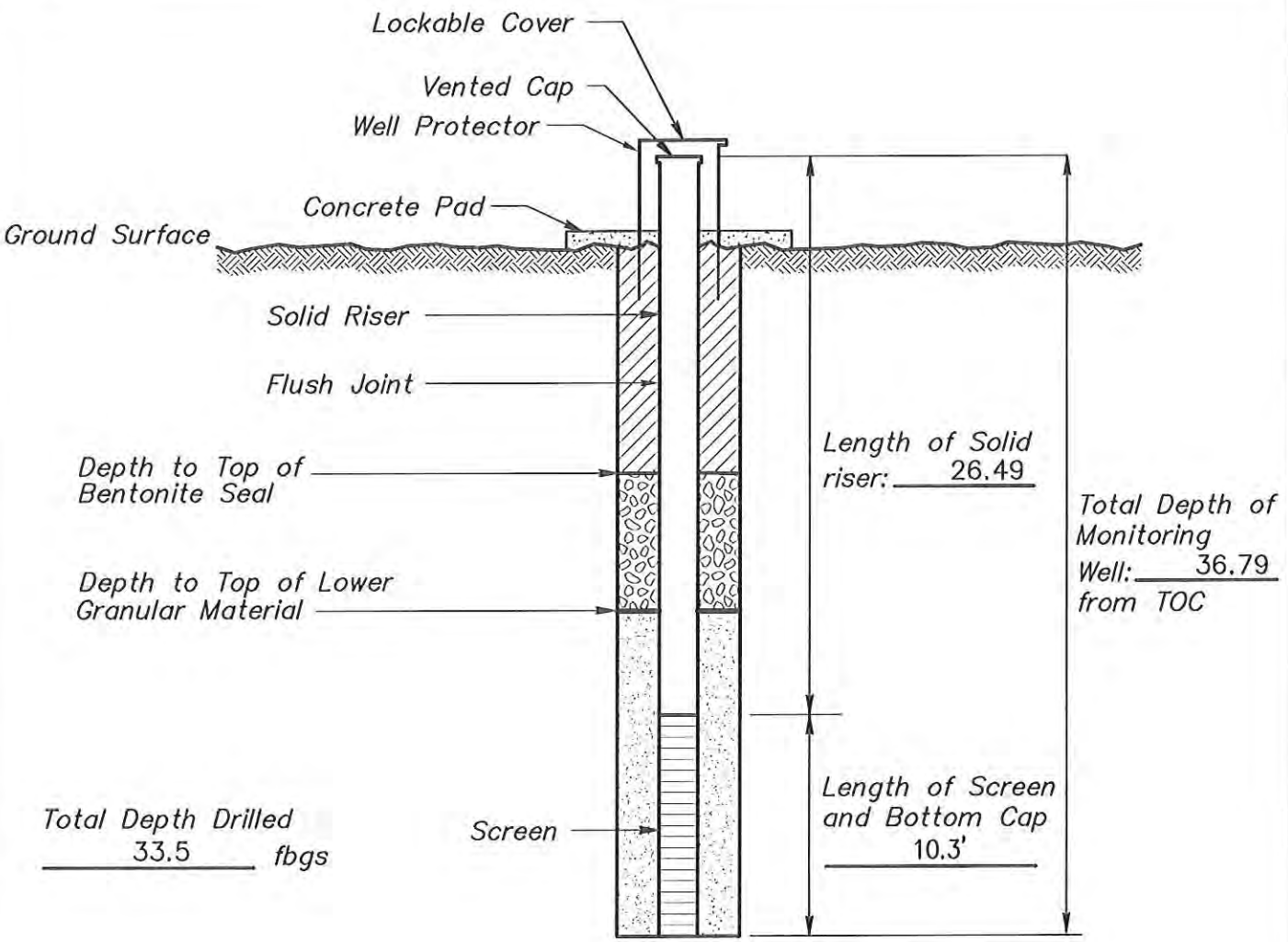
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216–003–35087115
WELL NUMBER: MW–8D
DRAWING NUMBER: 046
CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-9S
Job Number 35107060 Installation Date 4/7/2010 Location OOLOGAH, OK.
Datum Elevation 636.94' Surface Elevation 633.98'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method H.S.A., W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

(Not to Scale)

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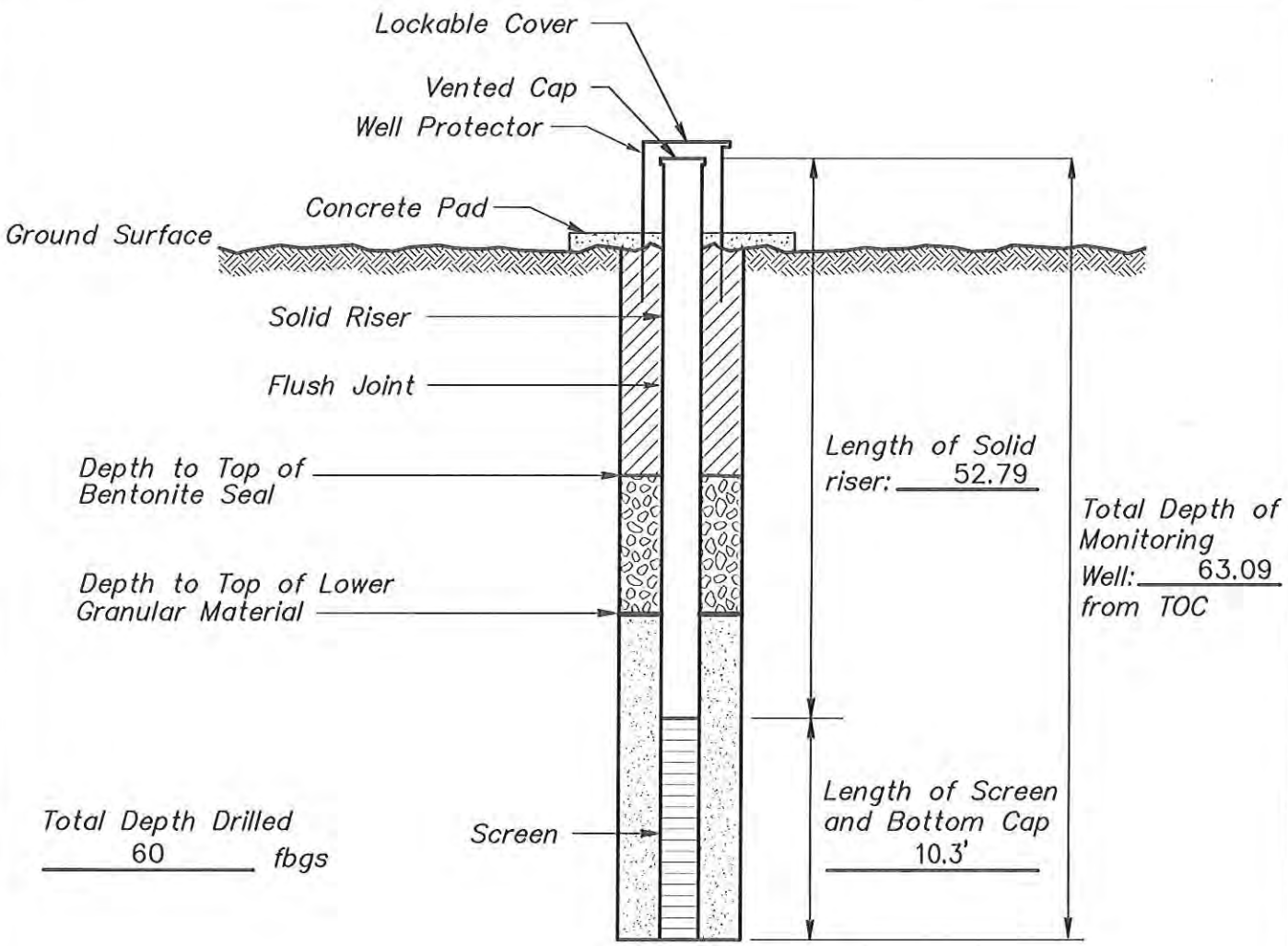
MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-9S
DRAWING NUMBER: 011 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-9D
Job Number 35107060 Installation Date 4/6/2010 Location OOLOGAH, OK.
Datum Elevation 637.04' Surface Elevation 633.90'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method H.S.A., W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

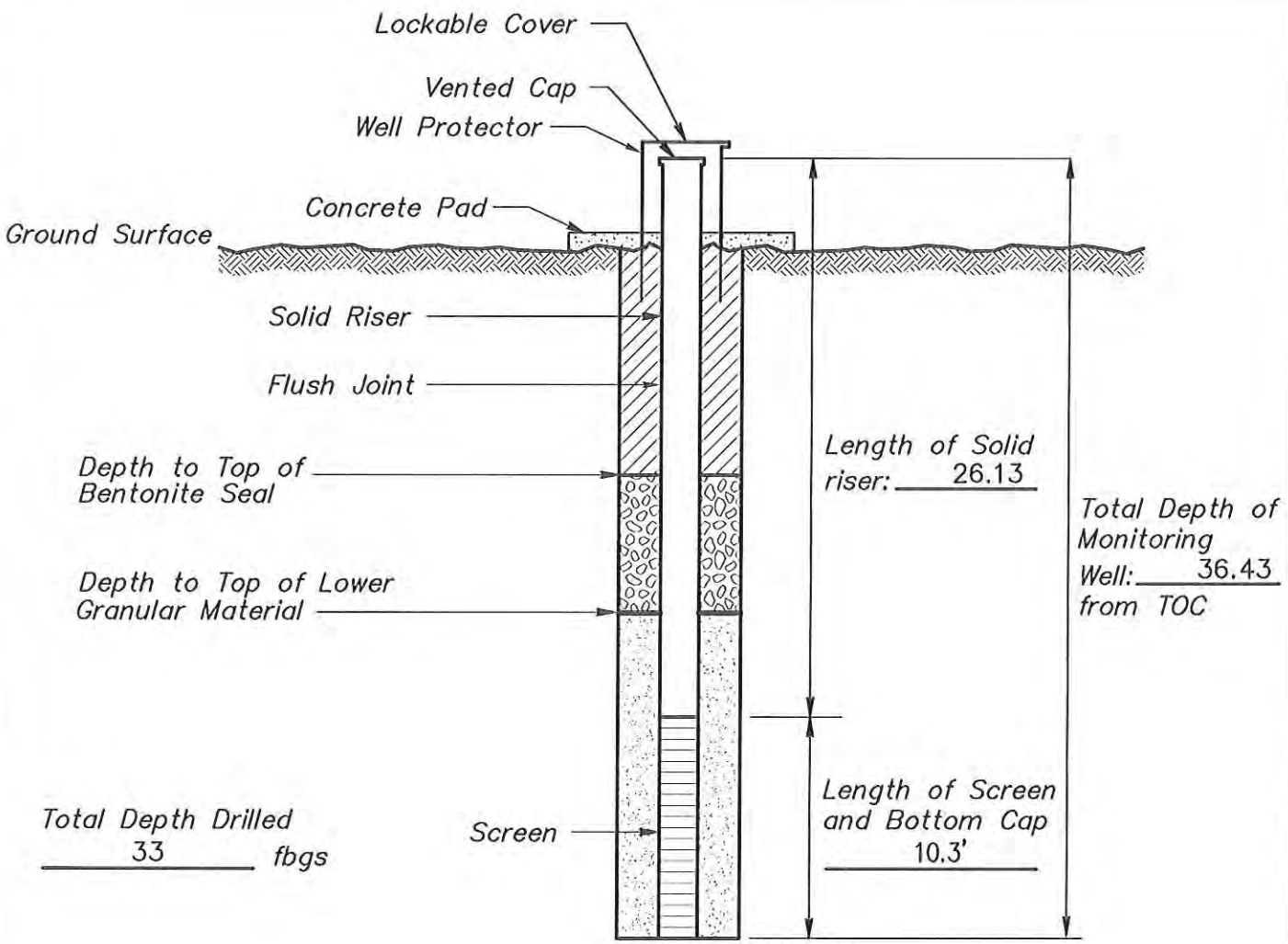
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR. 72202
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-9D
DRAWING NUMBER: 012 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-10S
Job Number 35107060 Installation Date 4/13/2010 Location OOLOGAH, OK.
Datum Elevation 639.58' Surface Elevation 636.36'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

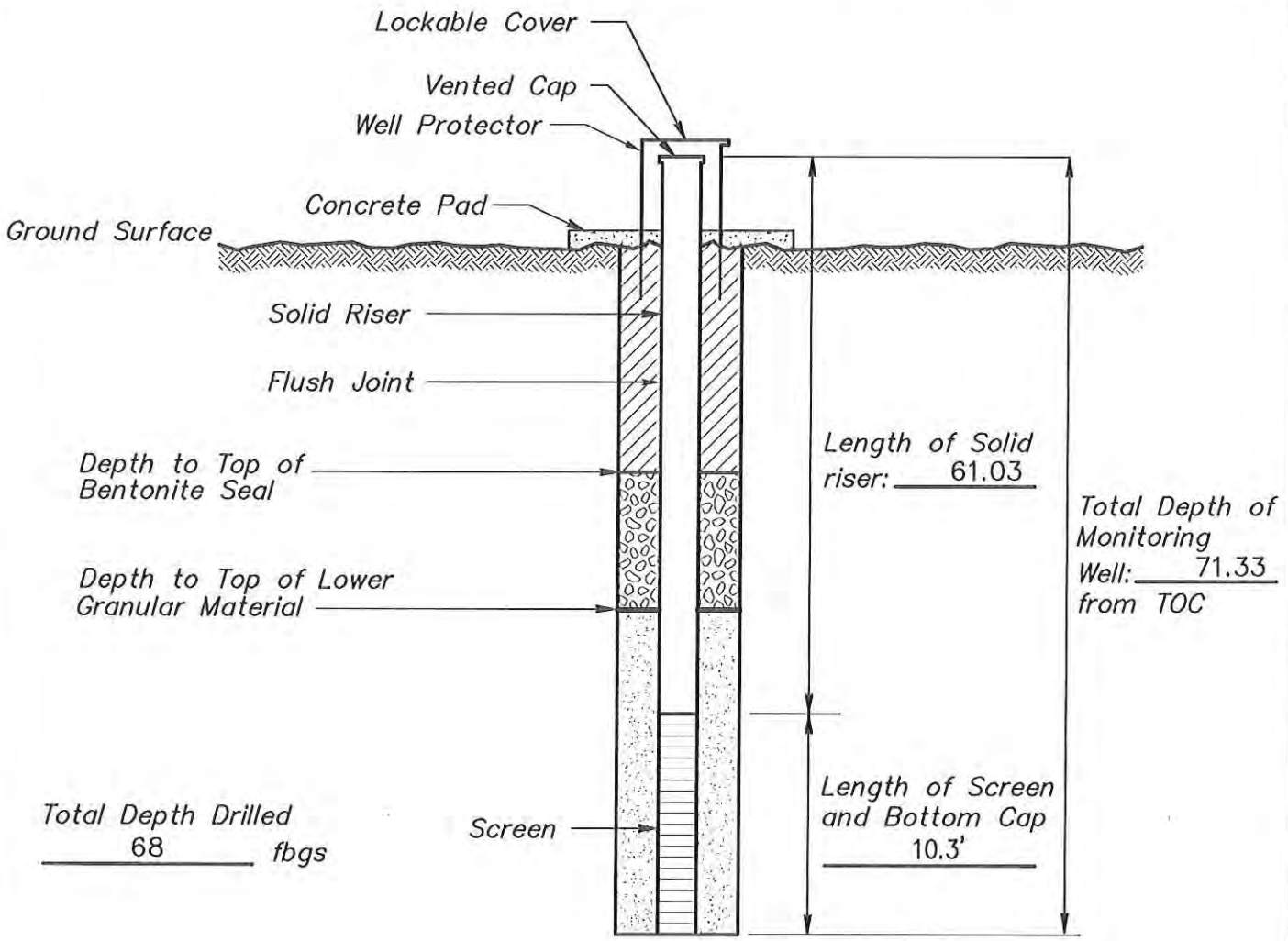
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR 72202
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-10S
DRAWING NUMBER: 013 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-10D
Job Number 35107060 Installation Date 4/12/2010 Location OOLOGAH, OK.
Datum Elevation 639.32' Surface Elevation 636.14'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

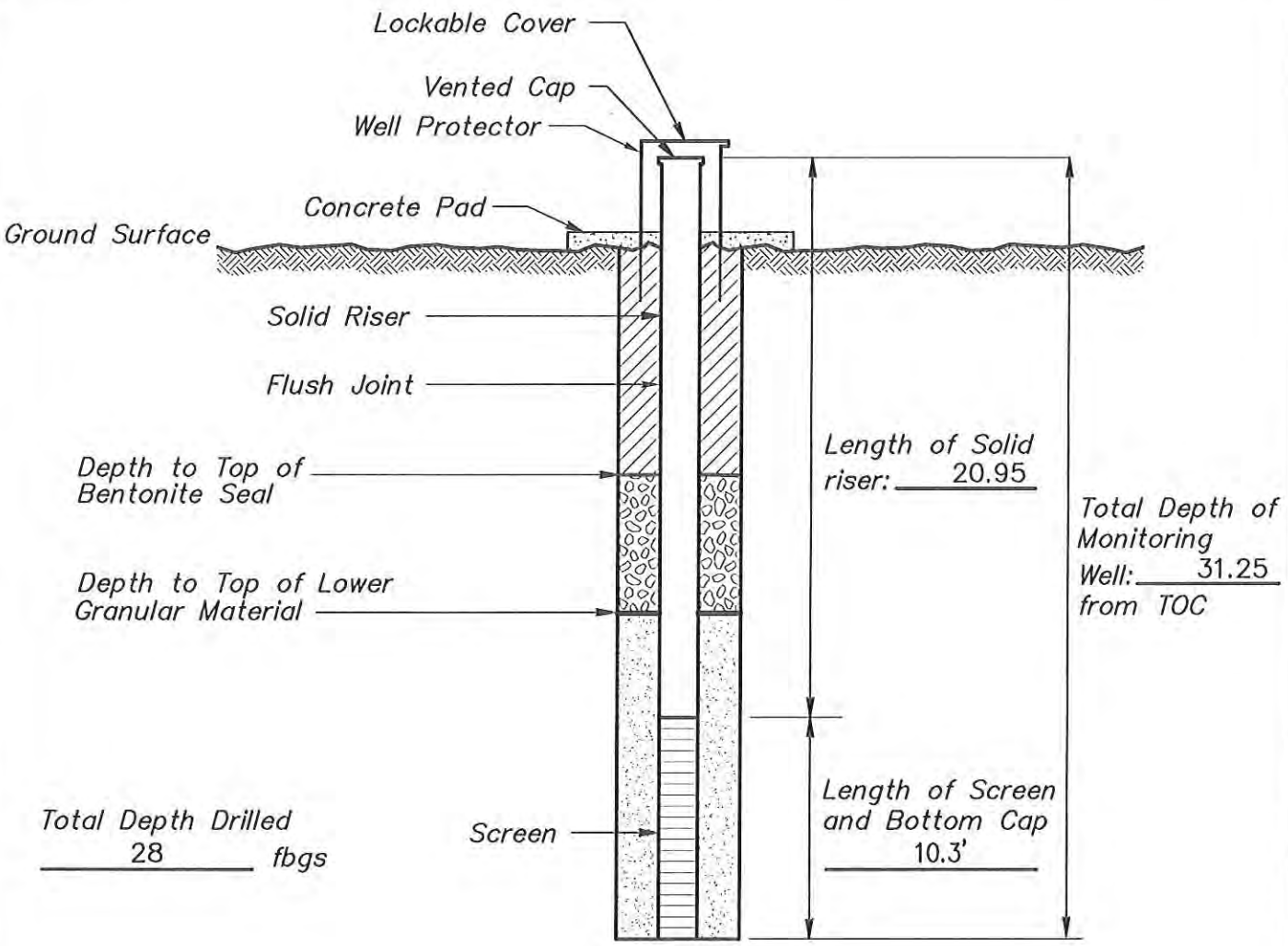
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR 72202
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-10D
DRAWING NUMBER: 014 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-11S
Job Number 35107060 Installation Date 4/15/2010 Location OOLOGAH, OK.
Datum Elevation 628.75' Surface Elevation 625.91'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

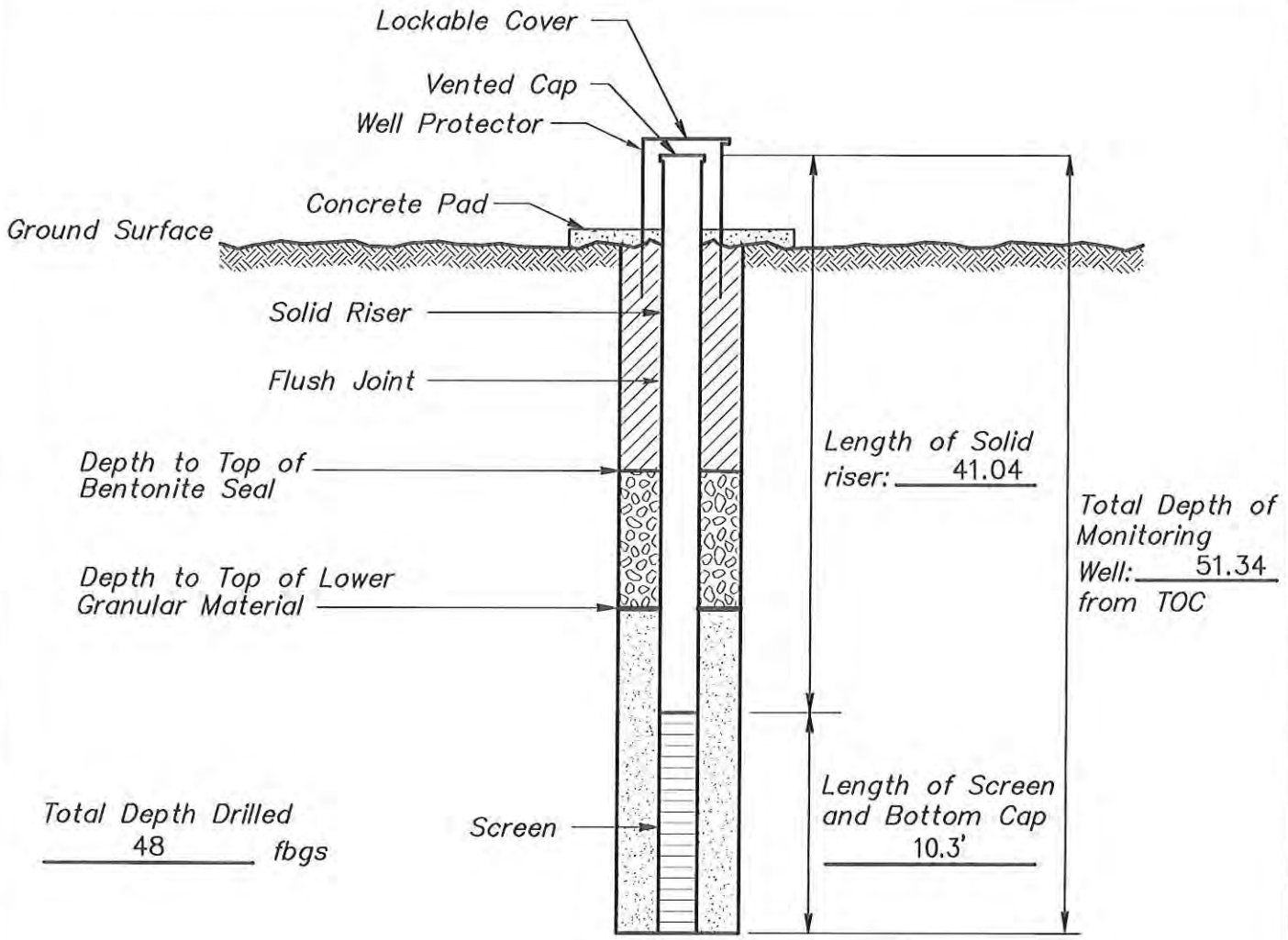
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR 72202
PH (501) 847-9292 FAX (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-11S
DRAWING NUMBER: 015 CHECKED BY: MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-11D
Job Number 35107060 Installation Date 4/14/2010 Location OOLOGAH, OK.
Datum Elevation 628.27' Surface Elevation 625.97'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

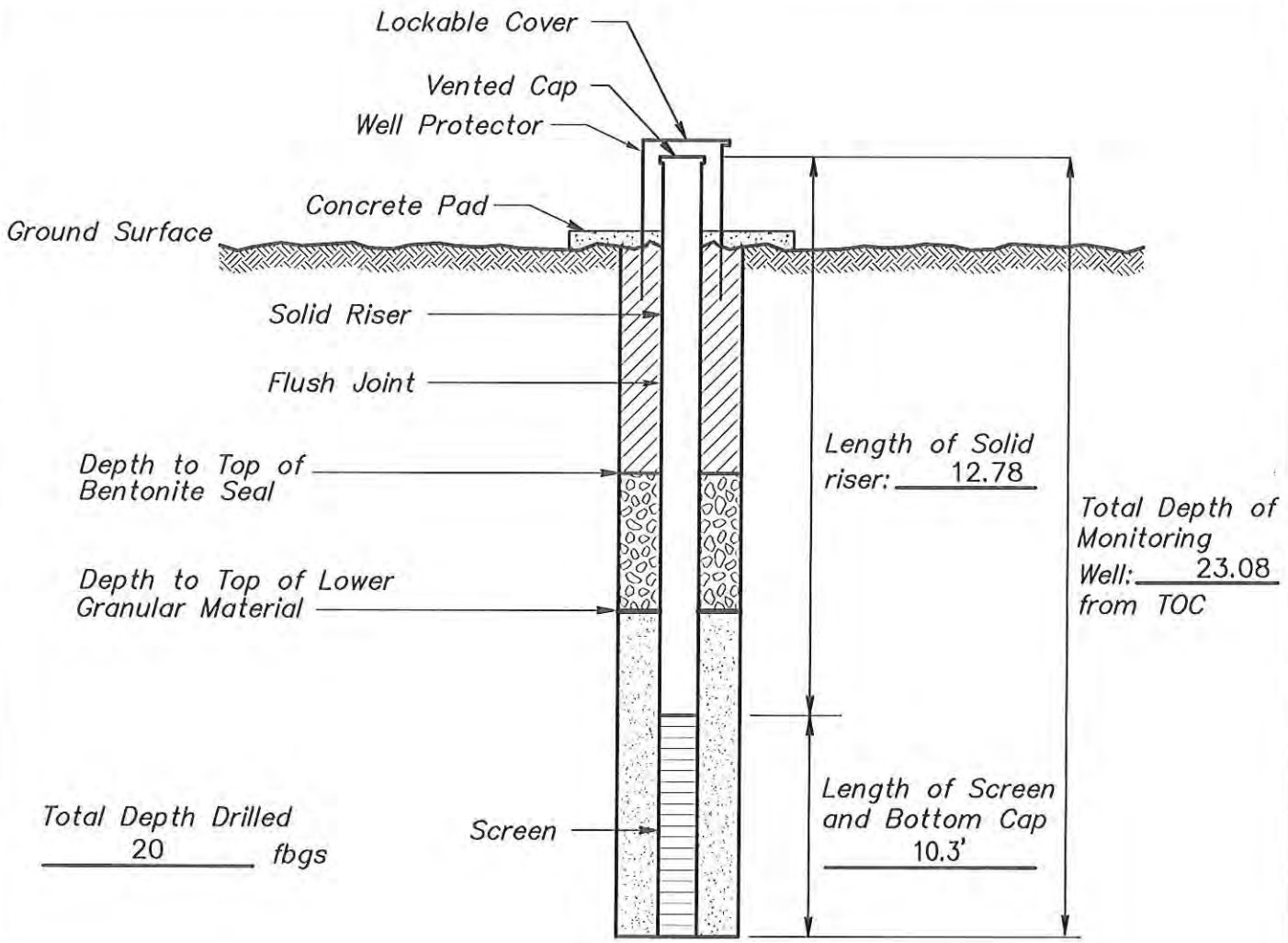
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR 72202
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-11D
DRAWING NUMBER: 016 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-12S
Job Number 35107060 Installation Date 4/19/2010 Location OOLOGAH, OK.
Datum Elevation 623.50' Surface Elevation 620.65'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

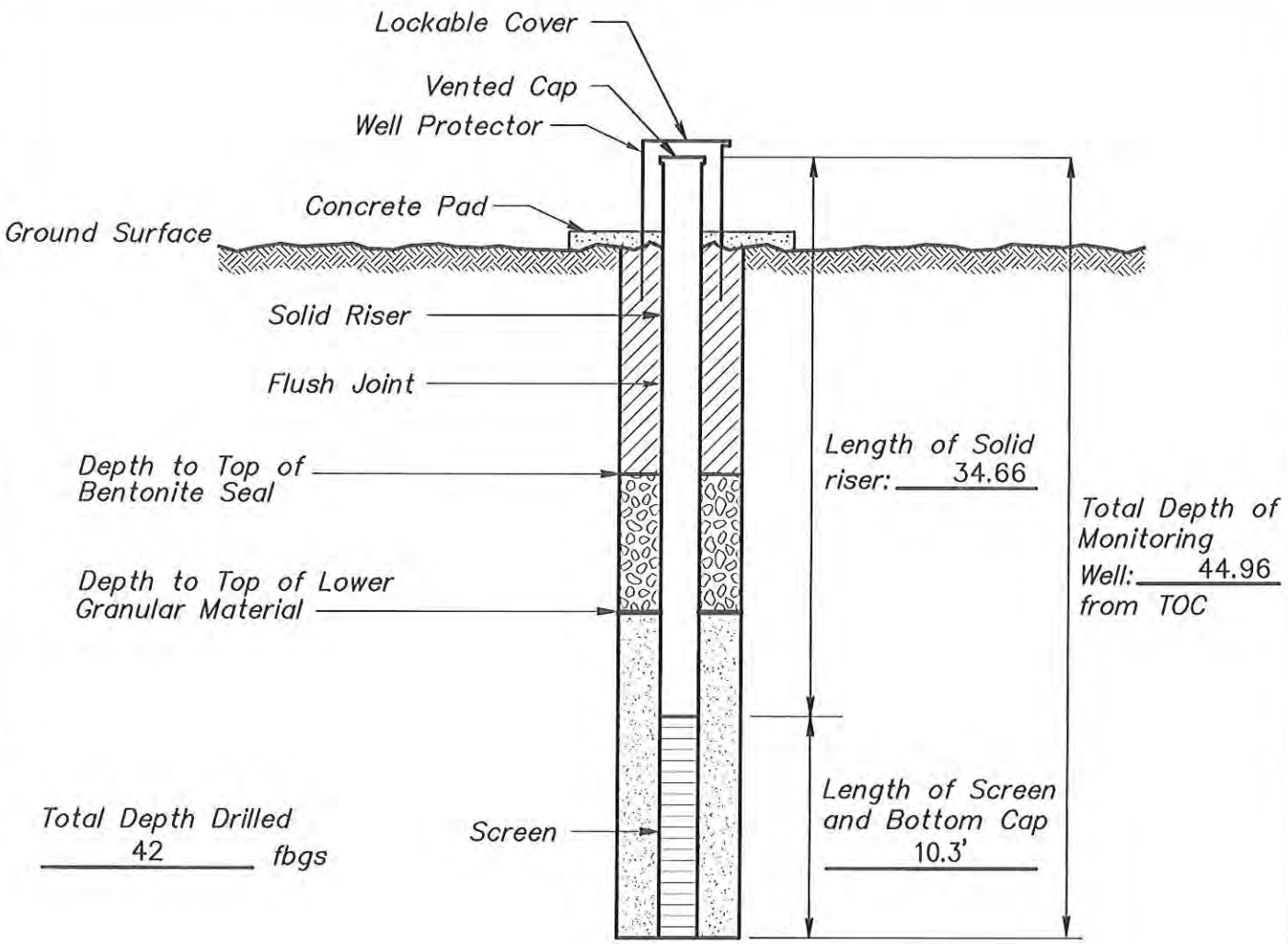
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 INTERSTATE 30 S BRYANT, AR 72202
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-12S
DRAWING NUMBER: 017 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-12D
Job Number 35107060 Installation Date 4/19/2010 Location OOLOGAH, OK.
Datum Elevation 623.67' Surface Elevation 620.91'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

(Not to Scale)

Terracon
Consulting Engineers and Scientists
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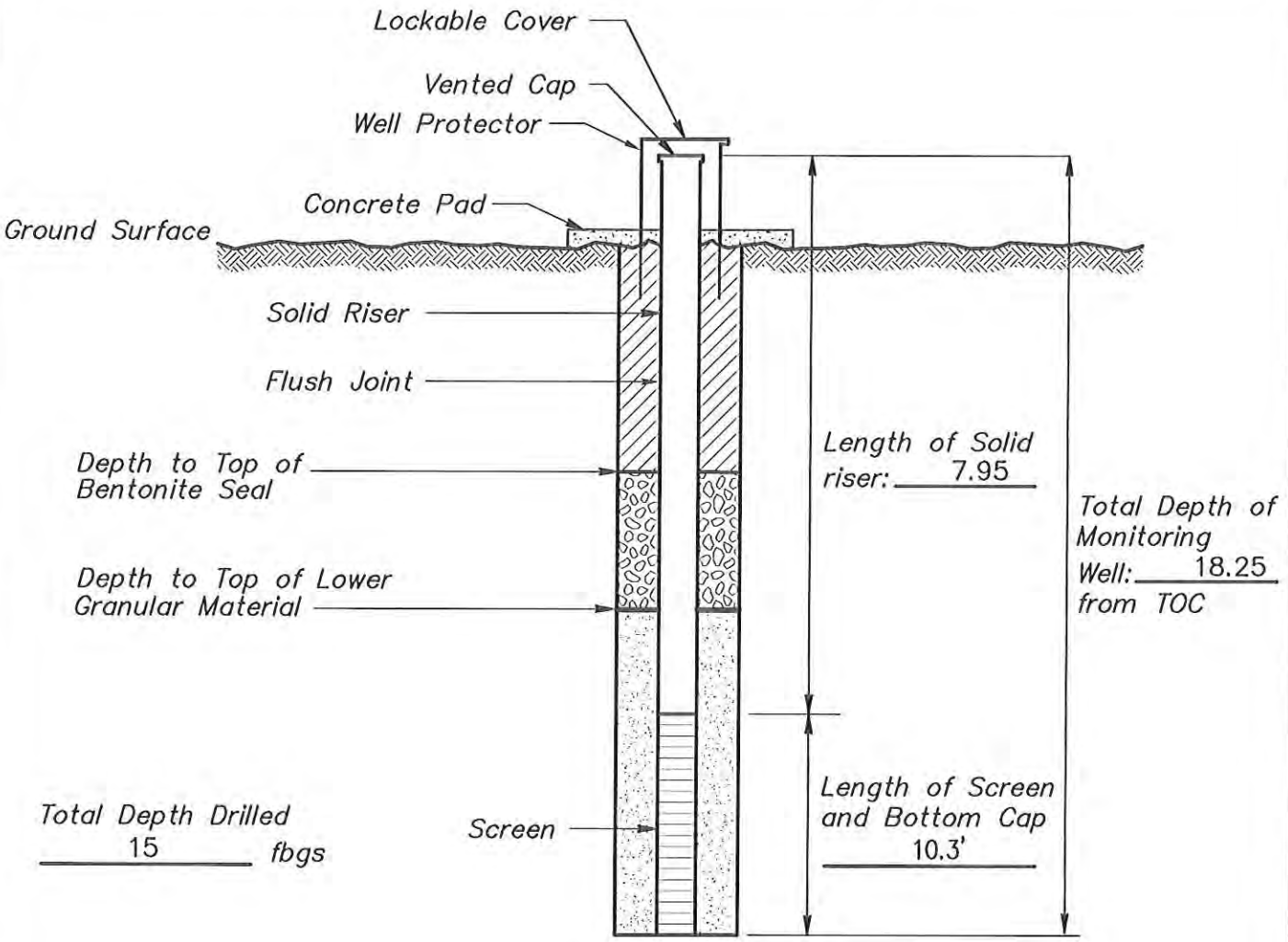
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-12D
DRAWING NUMBER: 018 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-13S
Job Number 35107060 Installation Date 4/21/2010 Location OOLOGAH, OK.
Datum Elevation 619.15' Surface Elevation 616.19'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

(Not to Scale)

Terracon
Consulting Engineers and Scientists
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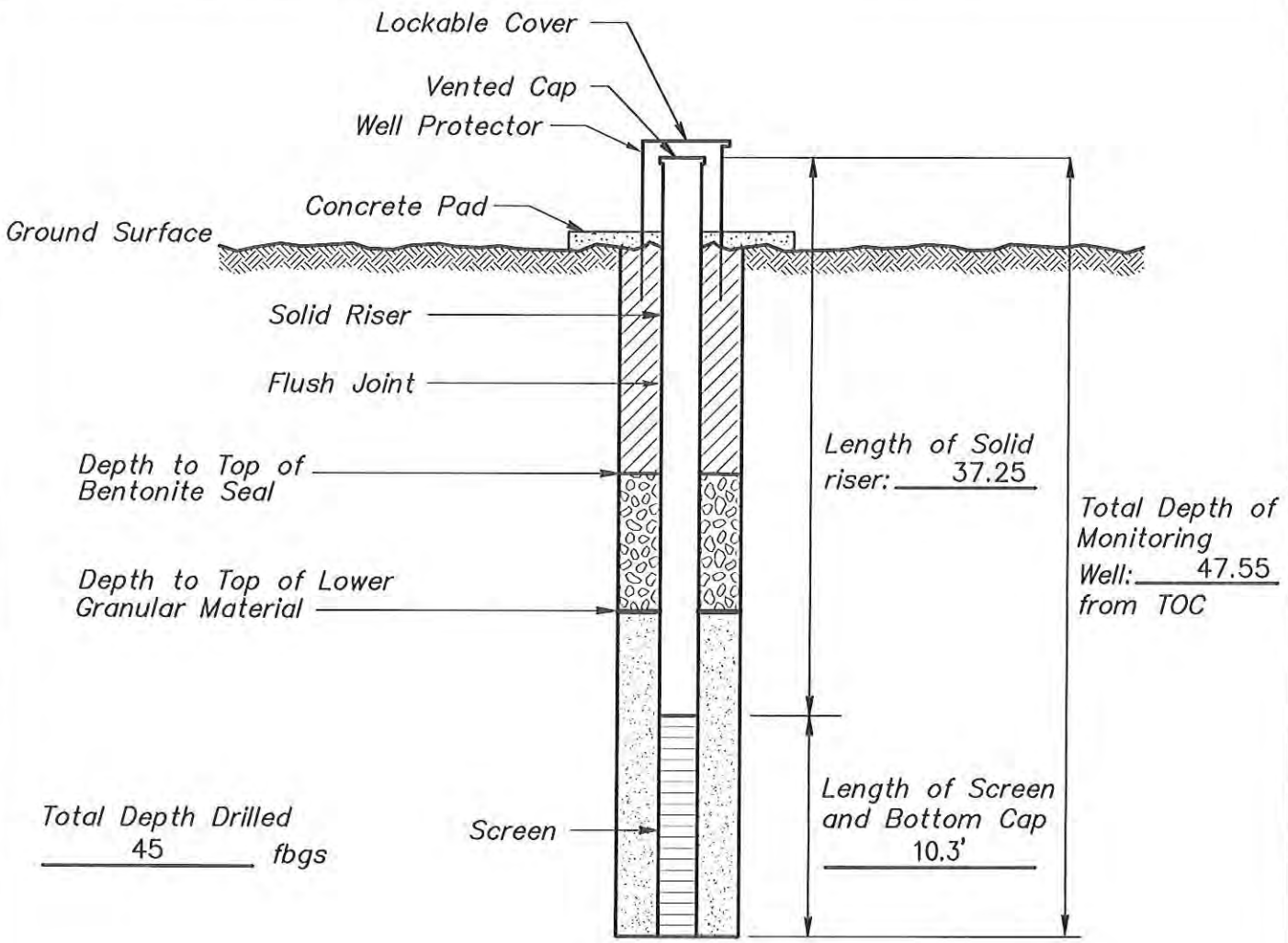
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-13S
DRAWING NUMBER: 019 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name AEP NORTHEAST STATION HYDROGEOLOGIC INVESTIGATION Well Number MW-13D
Job Number 35107060 Installation Date 4/20/2010 Location OOLOGAH, OK.
Datum Elevation 619.06' Surface Elevation 616.11'
Datum for Water Level Measurement TOP OF CASING
Screen Diameter & Material 2" PVC Slot Size 0.01"
Riser Diameter & Material 2" PVC Borehole Diameter 6"
Granular Backfill Material 12-20 SAND Terracon Representative CLANCY McCLINTOCK
Drilling Method W.L.C., AIR HAMMER Drilling Contractor MOHAWK



Portland–Bentonite Grout

Bentonite Plug

Granular Backfill Material

(Not to Scale)

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Consulting Engineers and Scientists
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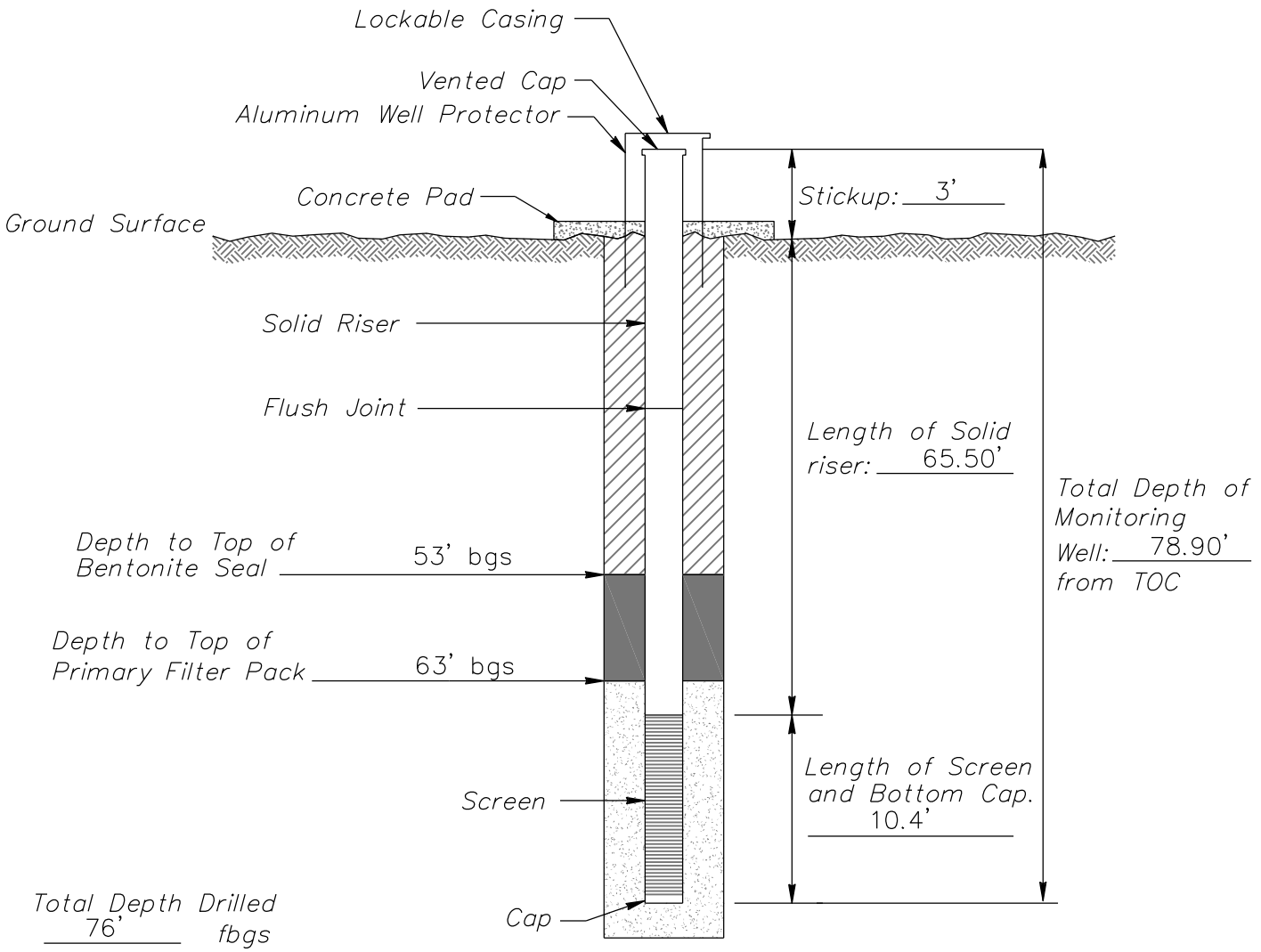
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 216-003-35107060
WELL NUMBER: MW-13D
DRAWING NUMBER: 020 **CHECKED BY:** MR

MONITORING WELL INSTALLATION RECORD

Job Name NORTHEASTERN STATIONS 3+4–CCR WELL INSTALLATION Well Number MW–14
Job Number 35157183 Installation Date 03/01/15 Location AEP–PSONE STATIONS 3+4
Datum Elevation N/A Surface Elevation N/A
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 RAH
Drilling Method HSA AND AIR ROTARY Drilling Contractor AECI



Cement/Bentonite Grout

Bentonite Pellet Plug

Granular Backfill

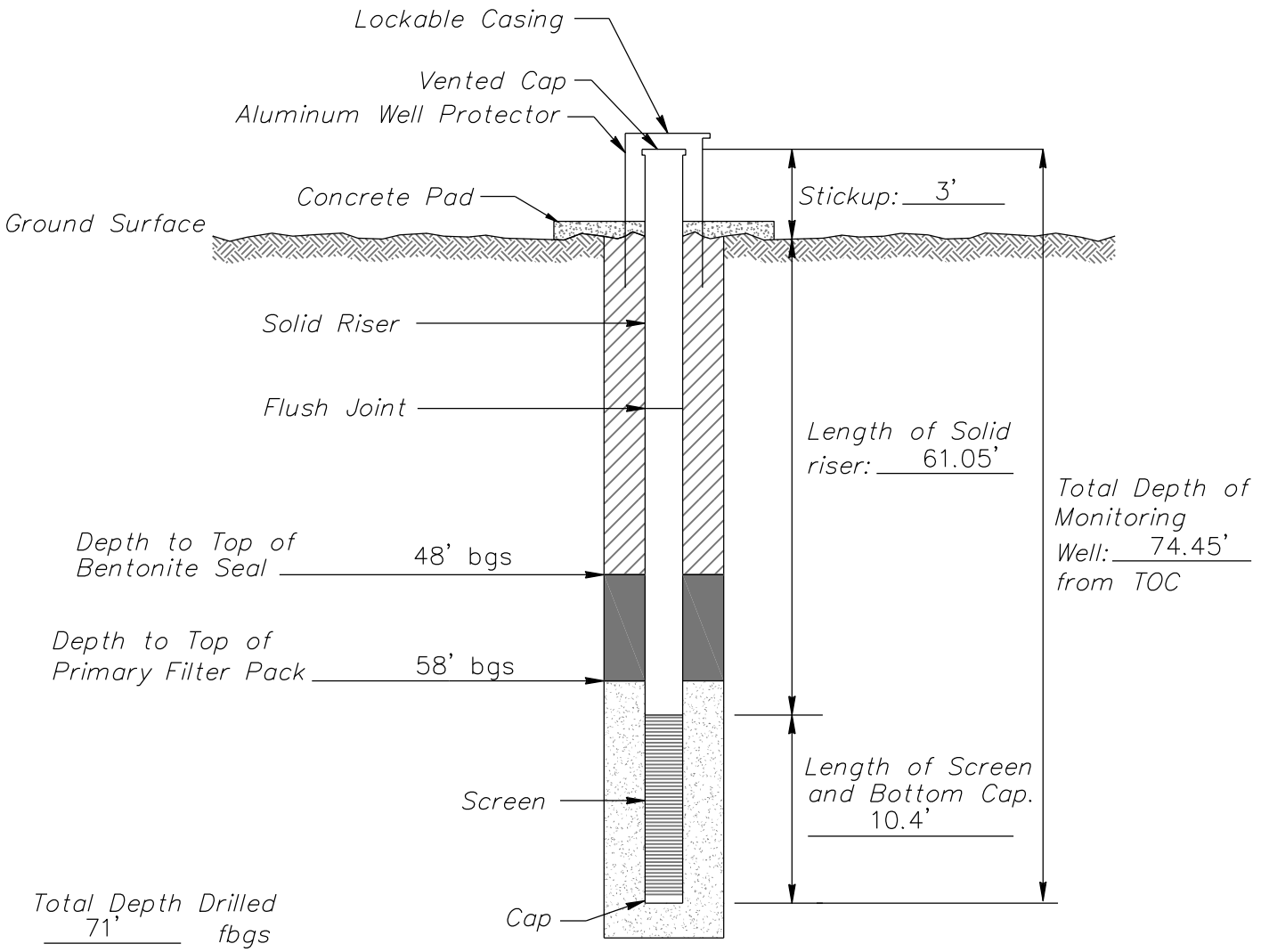
(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 I-30 South BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 35157183
WELL NUMBER: MW–14
DRAWING NUMBER: 000 CHECKED BY: 00

MONITORING WELL INSTALLATION RECORD

Job Name NORTHEASTERN STATIONS 3+4–CCR WELL INSTALLATION Well Number MW–15
Job Number 35157183 Installation Date 02/23/16 Location AEP–PSONE STATIONS 3+4
Datum Elevation N/A Surface Elevation N/A
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 RAH
Drilling Method HSA AND AIR ROTARY Drilling Contractor AECI

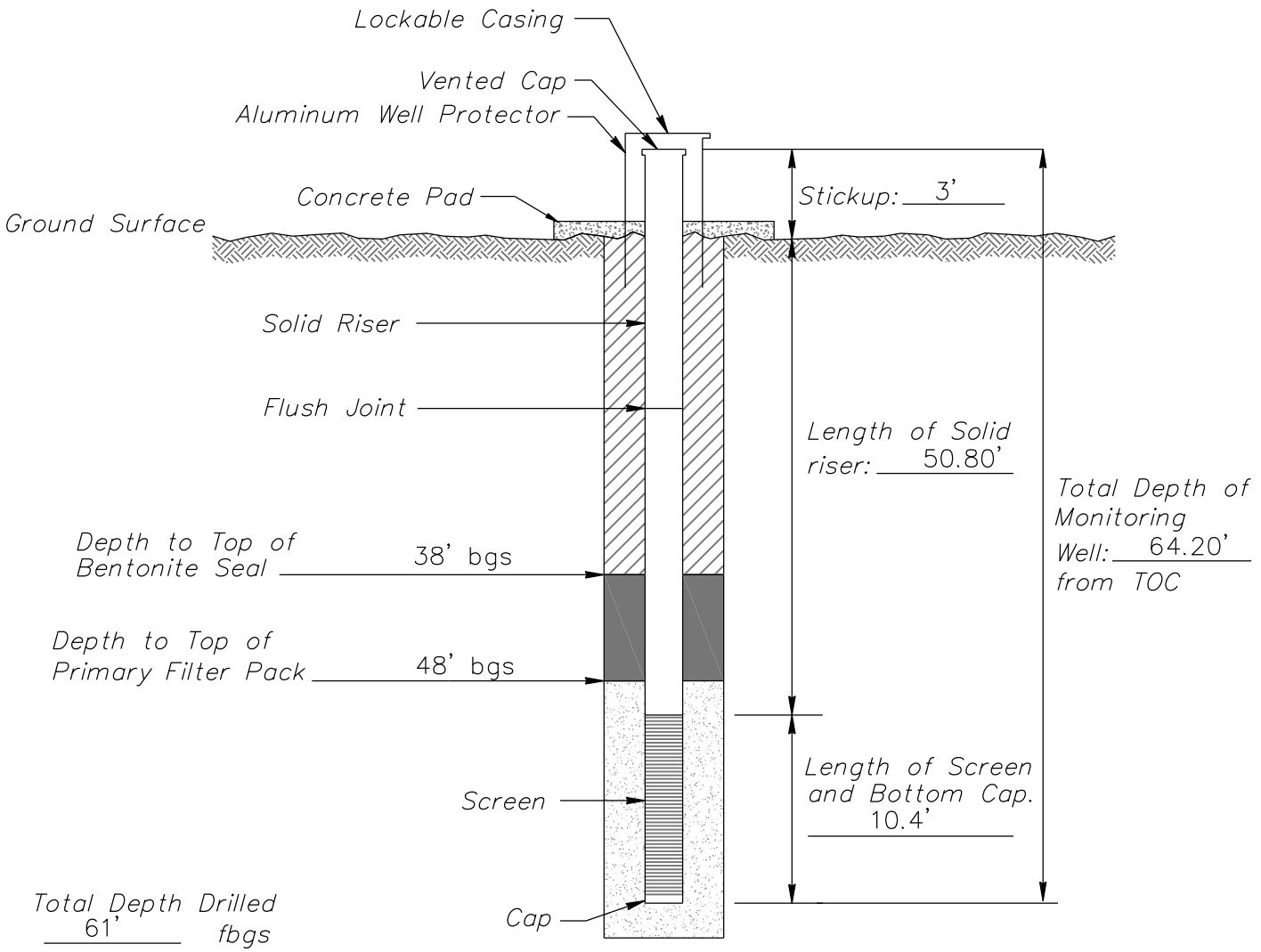


Terracon
Consulting Engineers and Scientists
25809 I-30 South BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 35157183
WELL NUMBER: MW–15
DRAWING NUMBER: 000 CHECKED BY: 00

MONITORING WELL INSTALLATION RECORD

Job Name NORTHEASTERN STATIONS 3+4–CCR WELL INSTALLATION Well Number MW–16
Job Number 35157183 Installation Date 02/25/16 Location AEP–PSONE STATIONS 3+4
Datum Elevation N/A Surface Elevation N/A
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 RAH
Drilling Method HSA AND AIR ROTARY Drilling Contractor AECI



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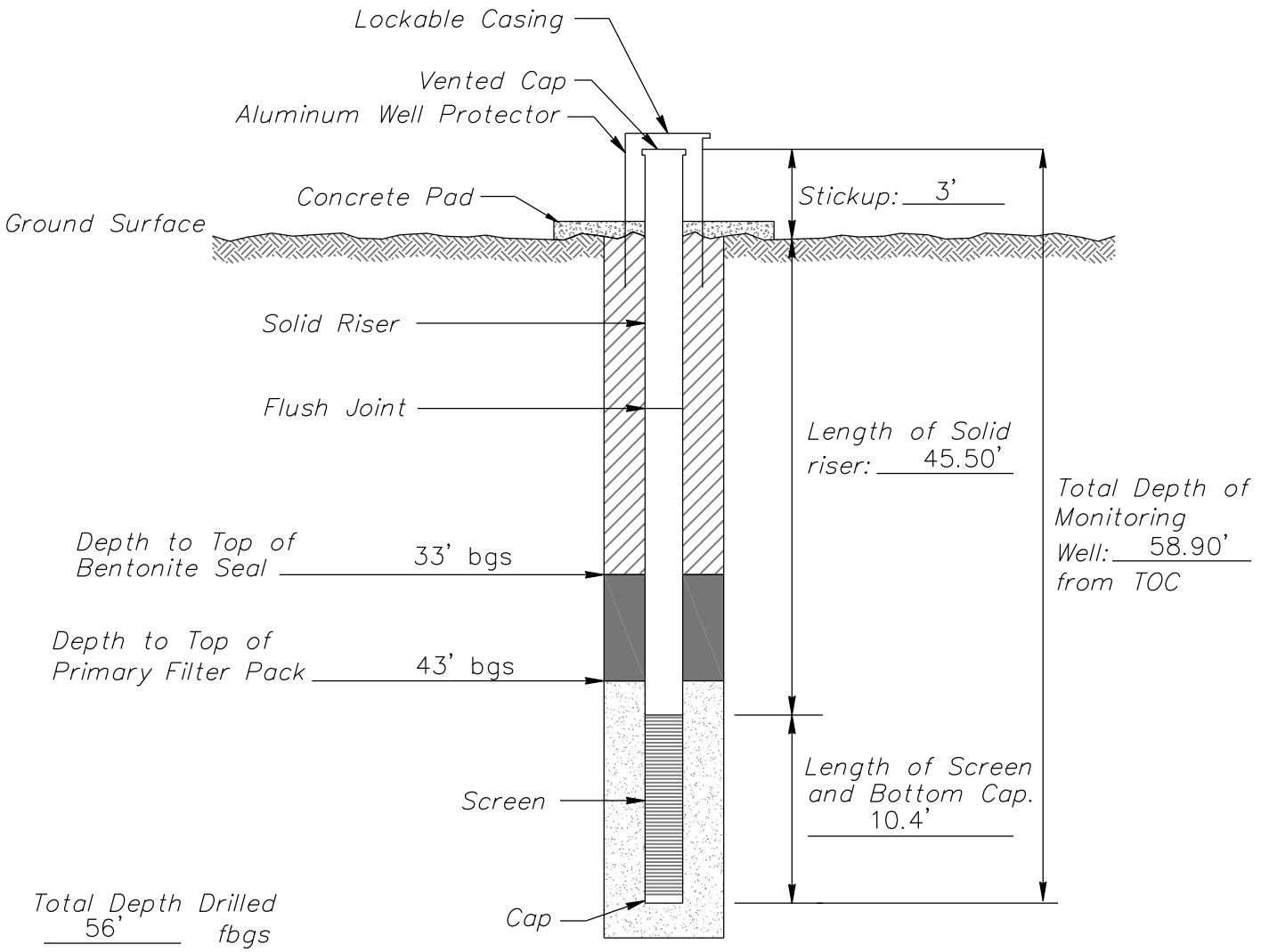
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 35157183
WELL NUMBER: MW–16
DRAWING NUMBER: 000 CHECKED BY: 00

MONITORING WELL INSTALLATION RECORD

Job Name NORTHEASTERN STATIONS 3+4–CCR WELL INSTALLATION Well Number MW–17
Job Number 35157183 Installation Date 02/29/16 Location AEP–PSONE STATIONS 3+4
Datum Elevation N/A Surface Elevation N/A
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 RAH
Drilling Method HSA AND AIR ROTARY Drilling Contractor AECI



Cement/Bentonite Grout

Bentonite Pellet Plug

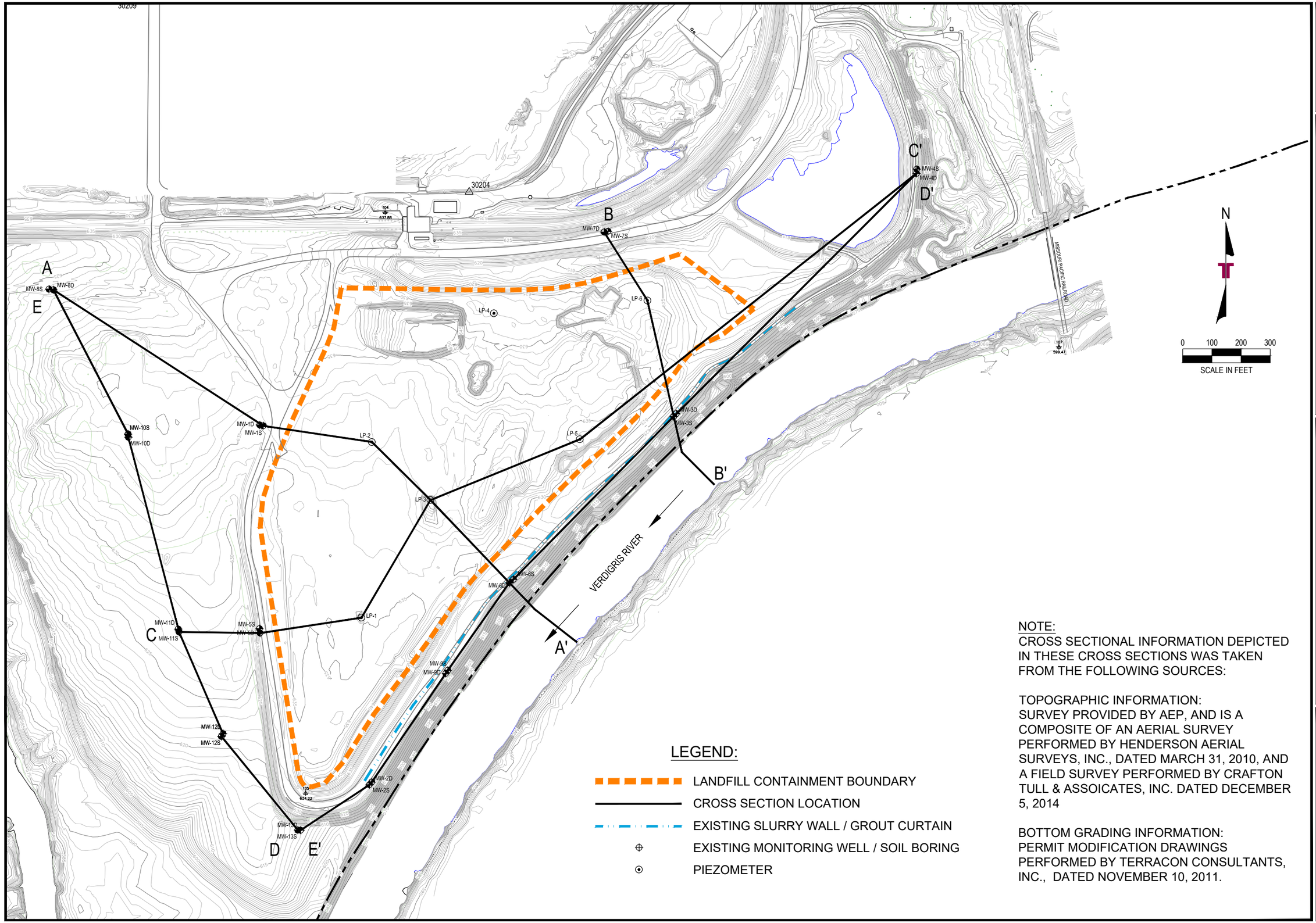
Granular Backfill

(Not to Scale)

Terracon
Consulting Engineers and Scientists
25809 I-30 South BRYANT, AR. 72022
PH. (501) 847-9292 FAX. (501) 847-9210

MONITORING WELL INSTALLATION RECORD
PROJECT NUMBER: 35157183
WELL NUMBER: MW–17
DRAWING NUMBER: 000 CHECKED BY: 00

APPENDIX 2
Geologic Cross Sections



LEGEND:

- LANDFILL CONTAINMENT BOUNDARY
- CROSS SECTION LOCATION
- EXISTING SLURRY WALL / GROUT CURTAIN
- EXISTING MONITORING WELL / SOIL BORING
- PIEZOMETER

NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

SHEET 1

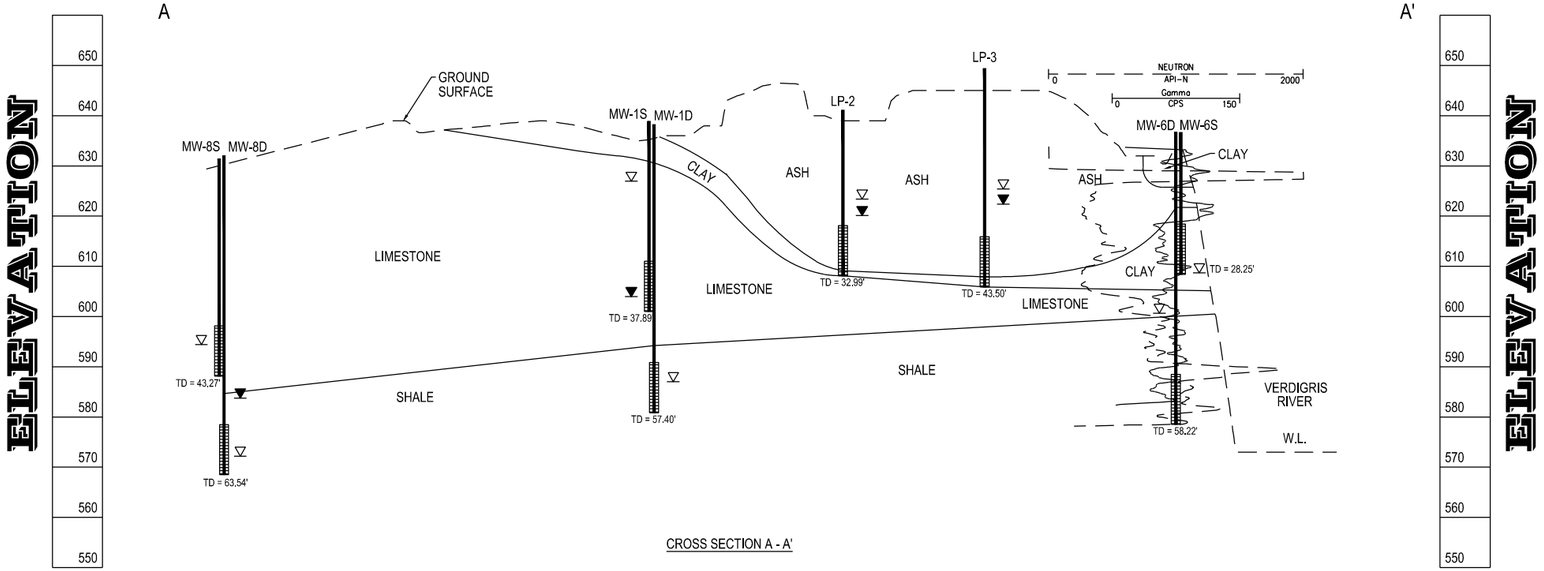
DESIGNED BY:	MR
DRAWN BY:	TLB
APPVD. BY:	MR
SCALE:	SEE BARSCALE
DATE:	10/14/2017
JOB NO.	216-003-35157123
ACAD NO.	030
SHEET NO.:	1 OF 4

CROSS SECTION LOCATIONS MAP

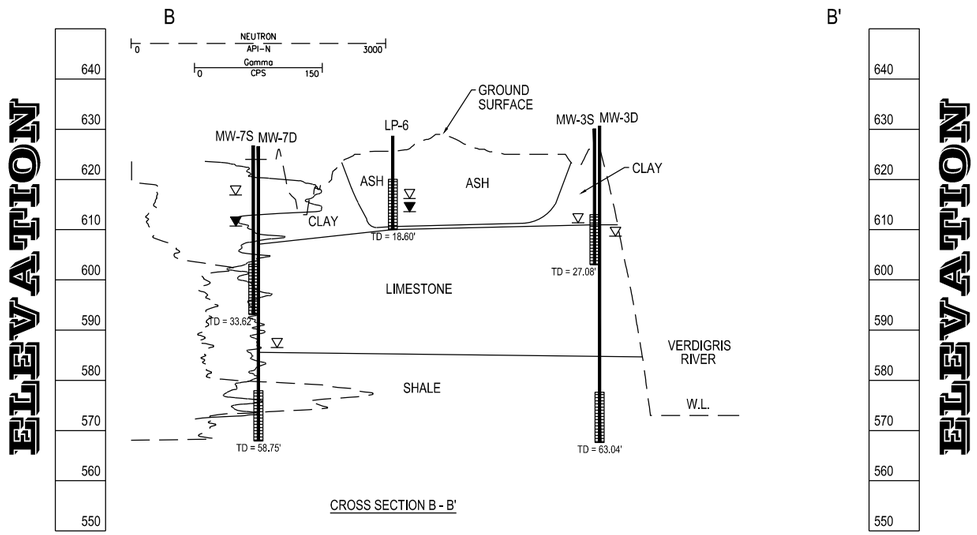
GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
NORTHEASTERN STATIONS 3 & 4
OOLOGAH OKLAHOMA

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
BRYANT, AR 72022
PH. (501) 847-9292
FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION



CROSS SECTION A - A'



CROSS SECTION B - B'

LEGEND:

- ▽ STATIC WATER LEVEL (11-11-08)
- ▼ GROUNDWATER ENCOUNTERED WHILE DRILLING
- SCREENED INTERVAL OF WELL

SCALES:

1" = 300' (HORIZONTAL)
1" = 30' (VERTICAL)
VERTICAL EXAGGERATION = x 10

NOTE: GROUNDWATER WAS NOT OBSERVED DURING DRILLING ACTIVITIES IN MW-1D, MW-3S, MW-3D, MW-6S, MW-6D, MW-7D, AND MW-8S.

NOTE: TOTAL DEPTHS ARE MEASURED FROM TOP OF CASING

NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

SHEET 2

DESIGNED BY:	MR
DRAWN BY:	TLB
APPVD. BY:	MR
SCALE:	SEE BARSCALE
DATE:	10/13/2017
JOB NO.	216-003-35157123
ACAD NO.	031
SHEET NO.:	2 OF 4

CROSS SECTIONS A-A' & B-B'

GROUNDWATER MONITORING NETWORK EVALUATION

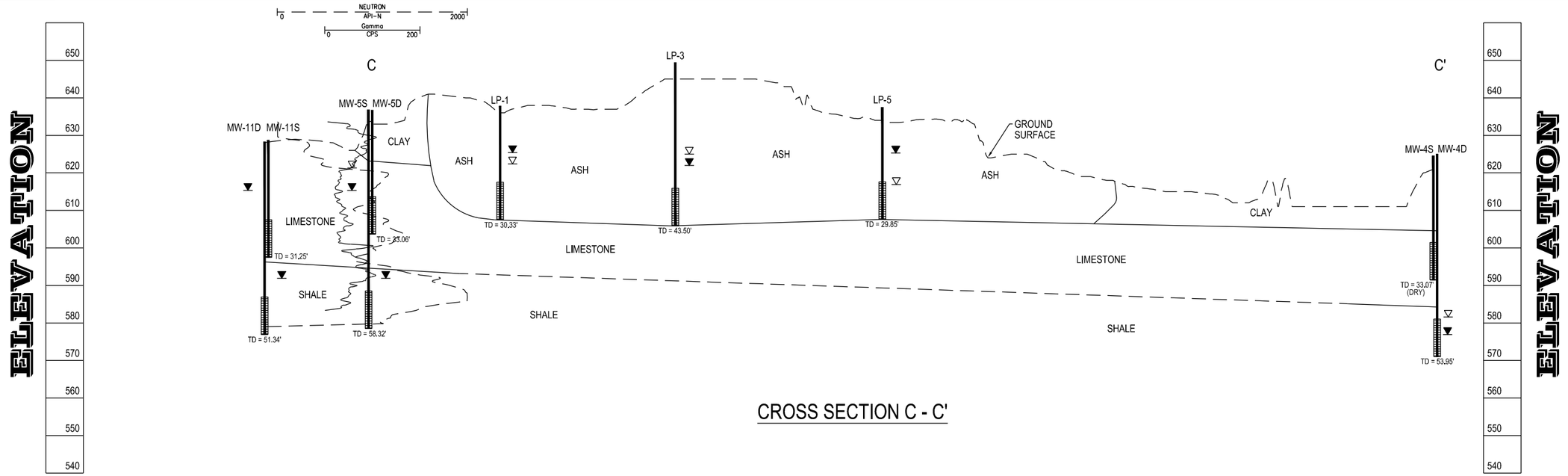
AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

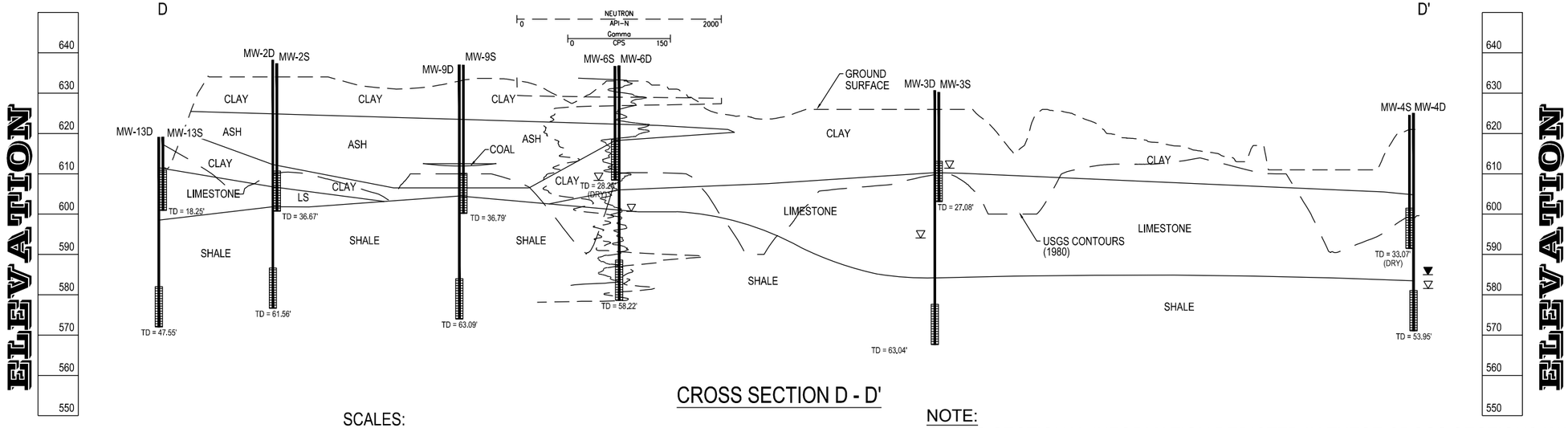
OOLOGAH OKLAHOMA

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH BRYANT, AR 72022
PH. (501) 847-9292 FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION



CROSS SECTION C - C'



CROSS SECTION D - D'

LEGEND:

- STATIC WATER LEVEL (11-11-08)
- GROUNDWATER ENCOUNTERED WHILE DRILLING
- SCREENED INTERVAL OF WELL

SCALES:

1" = 300' (HORIZONTAL)
1" = 30' (VERTICAL)
VERTICAL EXAGGERATION = x 10

NOTE: GROUNDWATER WAS NOT OBSERVED DURING DRILLING ACTIVITIES IN MW-2D, MW-3S, MW-3D, MW-4S, MW-6S, MW-6D, MW-13S, AND MW-13D

NOTE: TOTAL DEPTHS ARE MEASURED FROM TOP OF CASING

NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

USGS CONTOURS TAKEN FROM THE OOLOGAH, OKLAHOMA QUADRANGLE 1970 (REVISED 1980)

SHEET 3

DESIGNED BY:	MR
DRAWN BY:	TLB
APPVD. BY:	MR
SCALE:	SEE BARSCALE
DATE:	10/13/2017
JOB NO.:	216-003-35157123
ACAD NO.	032
SHEET NO.:	3 OF 4

CROSS SECTIONS C-C' & D-D'

GROUNDWATER MONITORING NETWORK EVALUATION

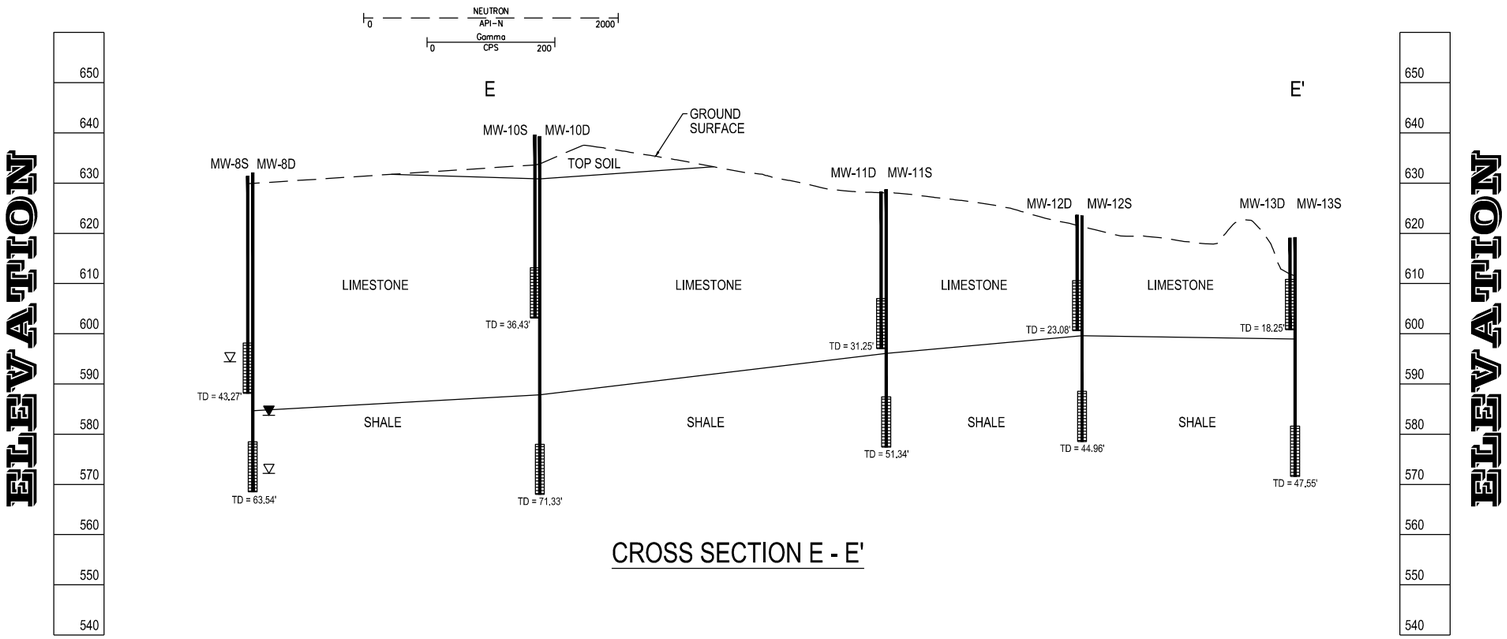
AMERICAN ELECTRIC POWER

NORTHEASTERN STATIONS 3 & 4

OOLOGAH OKLAHOMA

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
BRYANT, AR 72022
PH. (501) 847-9292
FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION



CROSS SECTION E - E'

LEGEND:

- STATIC WATER LEVEL (11-11-08)
- GROUNDWATER ENCOUNTERED WHILE DRILLING
- SCREENED INTERVAL OF WELL

SCALES:

1" = 300' (HORIZONTAL)
1" = 30' (VERTICAL)
VERTICAL EXAGGERATION = x 10

NOTE: GROUNDWATER WAS NOT OBSERVED DURING DRILLING ACTIVITIES IN MW-2D, MW-10, MW-11, MW-12, AND MW-13

NOTE: TOTAL DEPTHS ARE MEASURED FROM TOP OF CASING

NOTE:
CROSS SECTIONAL INFORMATION DEPICTED IN THESE CROSS SECTIONS WAS 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 MARCH 31, 2010, AND A FIELD SURVEY PERFORMED BY CRAFTON TULL & ASSOICATES, INC. DATED DECEMBER 5, 2014

BOTTOM GRADING INFORMATION:
PERMIT MODIFICATION DRAWINGS PERFORMED BY TERRACON CONSULTANTS, INC., DATED NOVEMBER 10, 2011.

SHEET 4

DESIGNED BY:	MR
DRAWN BY:	TLB
APPVD. BY:	MR
SCALE:	SEE BARSCALE
DATE:	10/13/2017
JOB NO.	216-003-35157123
ACAD NO.	033
SHEET NO.:	4 OF 4

CROSS SECTIONS E-E'

GROUNDWATER MONITORING NETWORK EVALUATION
AMERICAN ELECTRIC POWER
NORTHEASTERN STATIONS 3 & 4
OOLOGAH OKLAHOMA

Terracon
Consulting Engineers and Scientists
25809 I-30 SOUTH
PH. (501) 847-9292
BRYANT, AR 72022
FAX. (501) 847-9210

REV.	DATE	BY	DESCRIPTION

APPENDIX 3
Downhole Geophysics

Century WIRELINE SERVICES

AMERICAN ELECTRIC POWER
GAMMA-CONDUCTIVITY-NEUTRON
MW-14

COMPANY	AMERICAN ELECTRIC POWER
WELL	MW-14
WELL EXT	
FIELD	NA
COUNTY	ROGERS
STATE	OKLAHOMA
COUNTRY	USA
API NO.	N/A

COMPANY	: AMERICAN ELECTRIC POWER
WELL	: MW-14
WELL EXT	:
FIELD	: NA
COUNTY	: ROGERS
STATE	: OKLAHOMA
COUNTRY	: USA
API NO.	: N/A
UNIQ ID	: N/A
LOCATION	: N/A SECTION: N/A TOWNSHIP: N/A RANGE: N/A
LATITUDE	: N/A
LONGITUDE	: N/A

DISPLAY7_JL38

PERMANENT DATUM	N/A		Elevations:		
DRL MEASURED FROM	GL		KB	N/A	FT
LOG MEASURED FROM	GL		DF	N/A	FT
ELEV. PERM. DATUM	N/A	FT	GL	N/A	FT

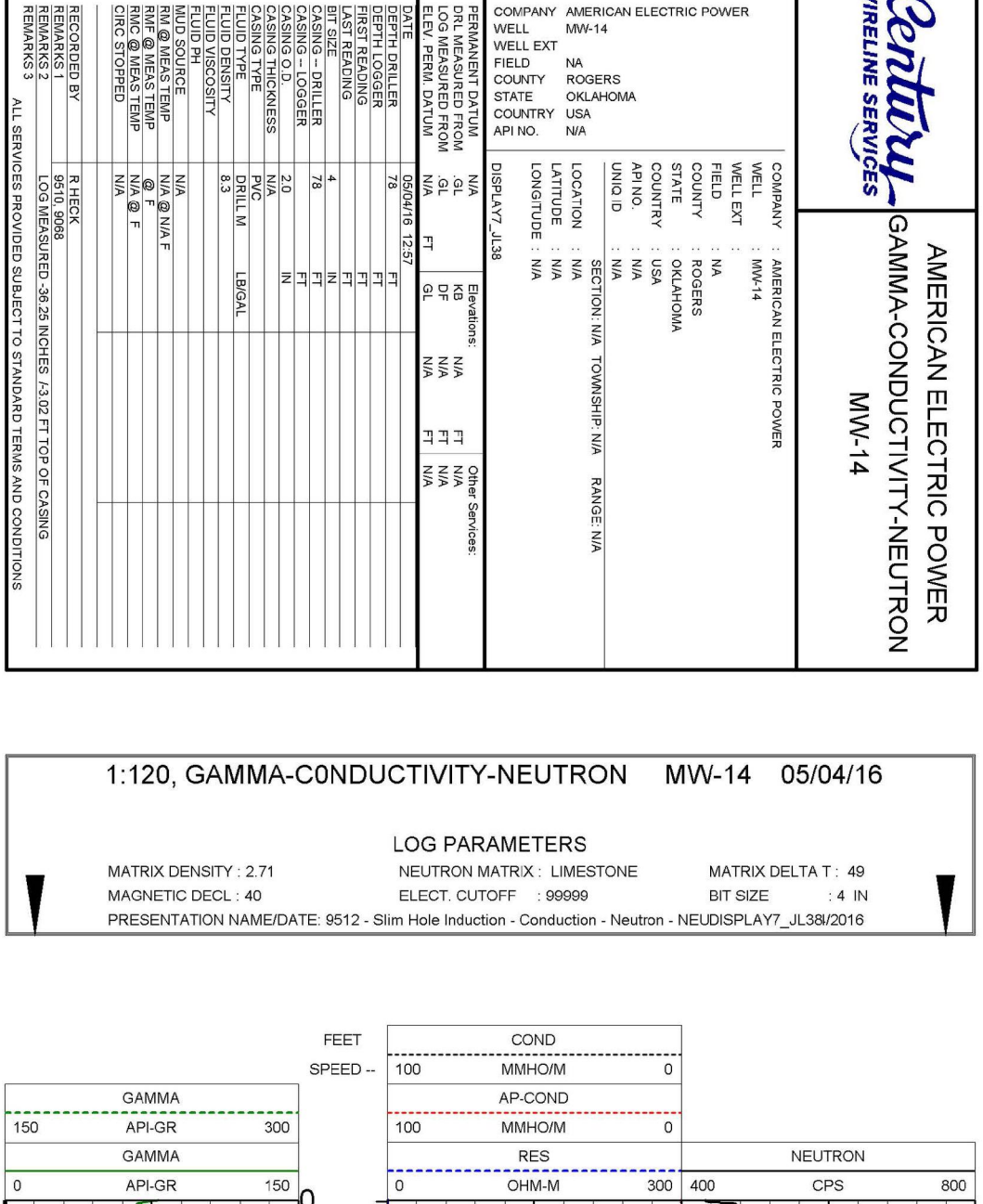
Other Services: N/A N/A N/A

DATE	05/04/16 12:57	
DEPTH DRILLER	78	FT
DEPTH LOGGER		FT
FIRST READING		FT
LAST READING		FT
BIT SIZE	4	IN
CASING -- DRILLER	78	FT
CASING -- LOGGER		FT
CASING O.D.	2.0	IN
CASING THICKNESS	N/A	
CASING TYPE	PVC	
FLUID TYPE	DRILL M	LB/GAL
FLUID DENSITY	8.3	
FLUID VISCOSITY		
FLUID PH		
MUD SOURCE	N/A	
RM @ MEAS TEMP	N/A @ N/A F	
RMF @ MEAS TEMP	@ F	
RMC @ MEAS TEMP	N/A @ F	
CIRC STOPPED	N/A	
RECORDED BY	R.HECK	
REMARKS 1	9510, 9068	
REMARKS 2	LOG MEASURED -36.25 INCHES /-3.02 FT TOP OF CASING	
REMARKS 3	ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS	

1:120, GAMMA-C0NDUCTIVITY-NEUTRON MW-14 05/04/16

LOG PARAMETERS

MATRIX DENSITY : 2.71 NEUTRON MATRIX : LIMESTONE MATRIX DELTA T : 49
MAGNETIC DECL : 40 ELECT. CUTOFF : 99999 BIT SIZE : 4 IN
PRESENTATION NAME/DATE: 9512 - Slim Hole Induction - Conduction - Neutron - NEUDISPLAY7_JL38I/2016



1:120, GAMMA-C0NDUCTIVITY-NEUTRON MW-14 05/04/16

LOG PARAMETERS

MATRIX DENSITY : 2.71 NEUTRON MATRIX : LIMESTONE MATRIX DELTA T : 49
MAGNETIC DECL : 40 ELECT. CUTOFF : 99999 BIT SIZE : 4 IN
PRESENTATION NAME/DATE: 9512 - Slim Hole Induction - Conduction - Neutron - NEUDISPLAY7_JL38I/2016

TOOL CALIBRATION MW-14 05/04/16 12:57
TOOL 9510A TM VERSION 2002
SERIAL NUMBER 747

	DATE	TIME	SENSOR		STANDARD Point1	STANDARD Point2	RESPONSE [CPS] Point1	RESPONSE [CPS] Point2
1	Nov13,13	15:12:07	GAMMA	[API-GR]	1.000	340.000	0.000	335
2	May04,16	12:57:22	AP-COND	[MMHO/M	0.000	690.000	52789	88982
3	Sep25,14	13:19:22	TEMP	[DEG-F]	39.500	132.600	26556	31296
4	Sep25,14	13:26:21	A	[]	0.350		0.000	
5	Mar27,03	10:28:37	B	[CPS]	Default		Default	

TOOL CALIBRATION MW-14 Mar27,03 10:28:37
TOOL 9068A TM VERSION 2002
SERIAL NUMBER 642

	DATE	TIME	SENSOR		STANDARD Point1	STANDARD Point2	RESPONSE [CPS] Point1	RESPONSE [CPS] Point2
1	Apr28,16	10:26:20	NEUTRON	[UNKNOW	1.000		0.000	

Century WIRELINE SERVICES

AMERICAN ELECTRIC POWER
GAMMA-CONDUCTIVITY-NEUTRON
MW-16

COMPANY	AMERICAN ELECTRIC POWER
WELL	MW-16
WELL EXT	
FIELD	NA
COUNTY	ROGERS
STATE	OKLAHOMA
COUNTRY	USA
API NO.	N/A

COMPANY : AMERICAN ELECTRIC POWER
WELL : MW-16
WELL EXT :
FIELD : NA
COUNTY : ROGERS
STATE : OKLAHOMA
COUNTRY : USA
API NO. : N/A
UNIQ ID : N/A

LOCATION : N/A SECTION: N/A TOWNSHIP: N/A RANGE: N/A
LATITUDE : N/A
LONGITUDE : N/A

DISPLAY7_JL38

PERMANENT DATUM	N/A
DRL MEASURED FROM	.GL
LOG MEASURED FROM	.GL
ELEV. PERM. DATUM	N/A FT

Elevations:		
KB	N/A	FT
DF	N/A	FT
GL	N/A	FT

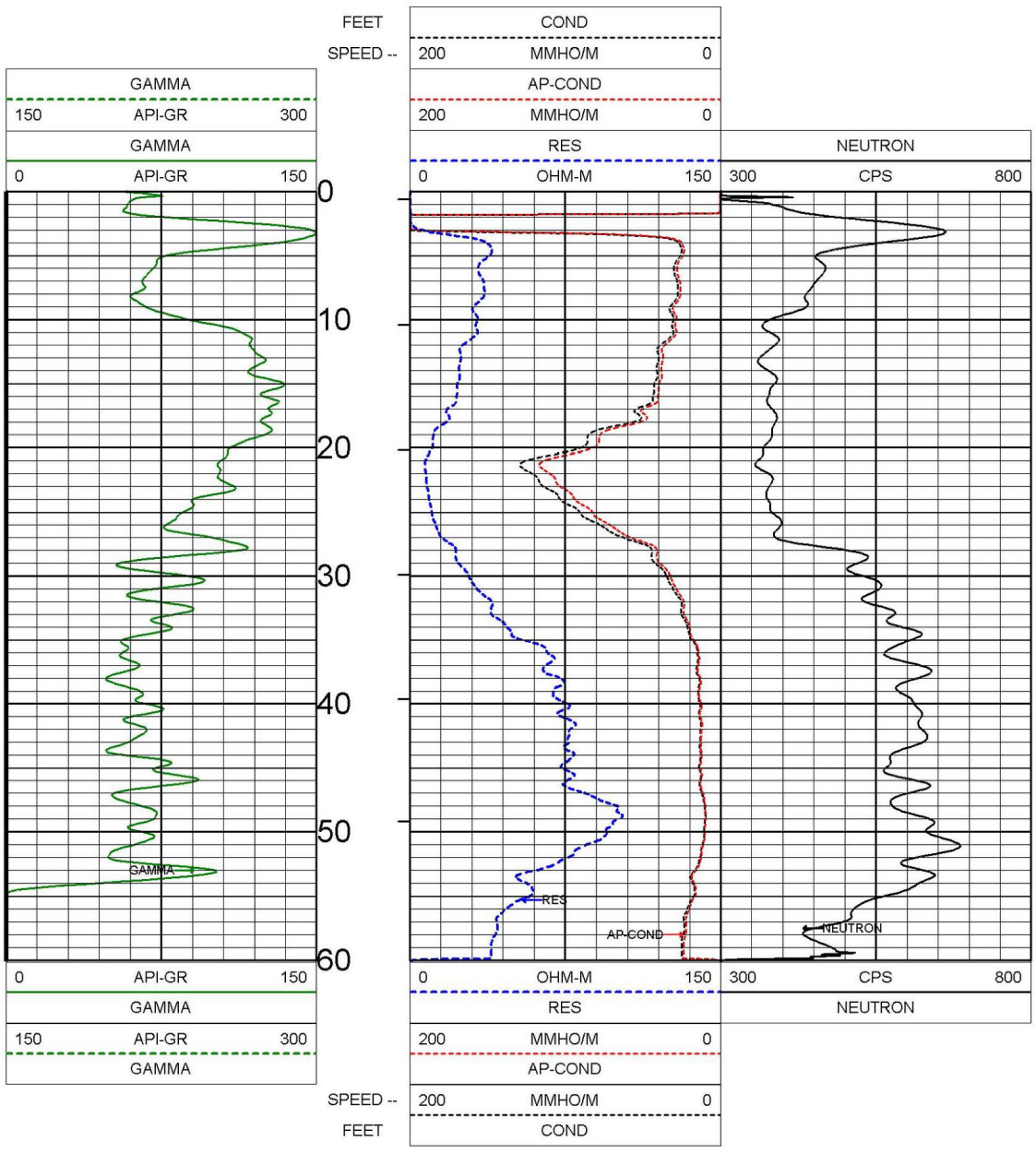
Other Services:
N/A
N/A
N/A

DATE	05/04/16 14:01		
DEPTH DRILLER	75	FT	
DEPTH LOGGER		FT	
FIRST READING		FT	
LAST READING		FT	
BIT SIZE	4	IN	
CASING -- DRILLER	75	FT	
CASING -- LOGGER		FT	
CASING O.D.	2.0	IN	
CASING THICKNESS	N/A		
CASING TYPE	PVC		
FLUID TYPE	DRILL M	LB/GAL	
FLUID DENSITY	8.3		
FLUID VISCOSITY			
FLUID PH			
MUD SOURCE	N/A		
RM @ MEAS TEMP	N/A @ N/A F		
RMF @ MEAS TEMP	@ F		
RMC @ MEAS TEMP	N/A @ F		
CIRC STOPPED	N/A		
RECORDED BY	R.HECK		
REMARKS 1	9510_9068		
REMARKS 2	LOG MEASURED -35.00 INCHES /-2.92 FT TOP OF CASING		
REMARKS 3	ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS		

1:120, GAMMA-CONDUCTIVITY-NEUTRON MW-16 05/04/16

LOG PARAMETERS

MATRIX DENSITY : 2.71 NEUTRON MATRIX : LIMESTONE MATRIX DELTA T : 49
MAGNETIC DECL : 40 ELECT. CUTOFF : 99999 BIT SIZE : 4 IN
PRESENTATION NAME/DATE: 9512 - Slim Hole Induction - Conduction - Neutron - NEUDISPLAY7_JL38l/2016



1:120, GAMMA-CONDUCTIVITY-NEUTRON MW-16 05/04/16

LOG PARAMETERS

MATRIX DENSITY : 2.71 NEUTRON MATRIX : LIMESTONE MATRIX DELTA T : 49
MAGNETIC DECL : 40 ELECT. CUTOFF : 99999 BIT SIZE : 4 IN
PRESENTATION NAME/DATE: 9512 - Slim Hole Induction - Conduction - Neutron - NEUDISPLAY7_JL38l/2016

TOOL CALIBRATION MW-16 05/04/16 14:01
TOOL 9510A TM VERSION 2002
SERIAL NUMBER 747

	DATE	TIME	SENSOR		STANDARD Point1	STANDARD Point2	RESPONSE [CPS] Point1	RESPONSE [CPS] Point2
1	Nov13,13	15:12:07	GAMMA	[API-GR]	1.000	340.000	0.000	335
2	May04,16	17:47:50	AP-COND	[MMHO/M	0.000	690.000	52809	88982
3	Sep25,14	13:19:22	TEMP	[DEG-F]	39.500	132.600	26556	31296
4	Sep25,14	13:26:21	A	[]	0.350		0.000	
5	Mar27,03	10:28:37	B	[CPS]	Default		Default	

TOOL CALIBRATION MW-16 Mar27,03 10:28:37
TOOL 9068A TM VERSION 2002
SERIAL NUMBER 642

	DATE	TIME	SENSOR		STANDARD Point1	STANDARD Point2	RESPONSE [CPS] Point1	RESPONSE [CPS] Point2
1	Apr28,16	10:26:20	NEUTRON	[UNKNOV\	1.000		0.000	