Ash Ponds Closure

# Hydrogeologic Site Investigation

Hutsonville Power Station
AmerenEnergy Medina Valley Cogen, L.L.C.
Crawford County, Illinois

September 8, 2014

NATURAL RESOURCE TECHNOLOGY

HANSON
Engineering | Planning | Allied Services

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# 1. Introduction

The AmerenEnergy Medina Valley Cogen, L.L.C. Hutsonville Power Station (Site) is situated on the west bank of the Wabash River, and approximately one and one-half miles north of the Village of Hutsonville in Crawford County, Illinois. The Site is located generally in the Southwest ¼ of Section 17, Township 8 North, Range 11 West of the Second Principal Meridian (see Figure 1). The focus of this investigation is for the water treatment devices at the Site known as Ash Pond A, Ash Pond B, Ash Pond C and the Bottom Ash Sluice Pond. Ash Pond D, the largest and oldest of the four ash sluice ponds at the Site, was covered and closed in 2012-13 under the Title 35, Illinois Admin. Code (IAC), Part 840 rules (Illinois PCB, 2011). The layout of the Site and the ash ponds are depicted on Figure 2.

In consultation with the Illinois Environmental Protection Agency (Illinois EPA), Ameren pursued an additional rulemaking before the Illinois Pollution Control Board (IPCB) to provide for sequential corrective actions and/or closure of other Ameren Energy Resources (AER) Company ash ponds. The IPCB issued a stay on AER's proposed rulemaking and in October 2013, Illinois EPA filed a rule of general applicability for coal combustion waste surface impoundments at power generating facilities. It sets forth a process to monitor ash ponds and groundwater, as well as a process for preventive response, corrective action and closure (Illinois PCB, 2013). That rulemaking is continuing.

This Hydrogeologic Site Investigation report generally conforms to 35 IAC 840.110 and the proposed rule at Section 841.200 (when judged appropriate) that is currently under development. This Investigation provides information to define the hydrogeology and assess any groundwater impacts associated with the Site, to evaluate a Groundwater Management Zone (GMZ), and to establish a groundwater monitoring system for the Site.

# 2. Project Background

## *2.1 Physical Setting*

The Site is located at the eastern margin of the Springfield Plain of the Till Plain Section of the Central Lowland (Physiographic) Province (Leighton et al., 1948). The topography consists of generally flat agricultural land with shallow, entrenched drainage.

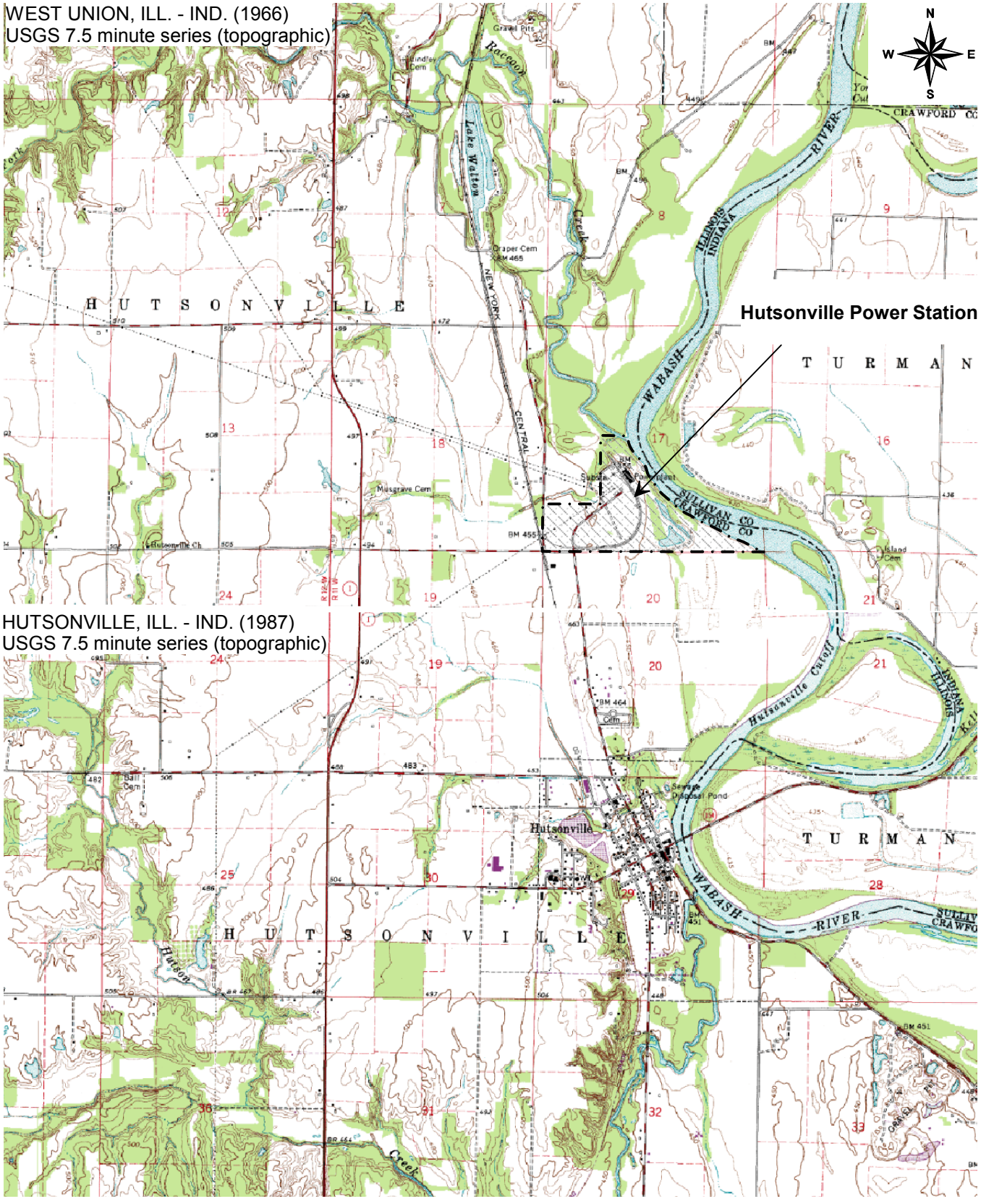
## *2.2 Geologic Setting*

The Site geology consists primarily of Wisconsinan Stage fluvial deposits with some Illinoian Stage diamictons overlying Pennsylvanian bedrock. The surficial (unlithified) materials consist of the Cahokia Formation (fluvial deposits), Henry Formation (glacial outwash deposits), and diamictons of the Glasford Formation (Willman et al., 1975; Hansel & Johnson, 1996).

Regional bedrock is composed of Pennsylvanian Age shale, sandstone, limestone and coal of the Desmoinesian Stage Modesto Formation of the McLeansboro Group (Willman et al., 1975). There are no active geologic structures or faults in the vicinity of the Site (Nelson, 1995).

## *2.3 Climate Data*

Climatic data was obtained from the Indiana State Climate Office (ISCO, 2014). The data was recorded between 1954 and 2014 in Terre Haute, Indiana, which is located approximately 30 miles northeast of the Site. The average values of the data are summarized in Table 1.






**EXPLANATION**

Property limits (approximate)

SCALE: 1 in. = 1,000 ft.

0 ft. 500 ft. 1,000 ft.

SOURCE:
http://www.isgs.uiuc.edu/nsdihome/webdocs/drgs/

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# SITE LOCATION MAP

## ASH PONDS CLOSURE
## HUTSONVILLE POWER STATION
## HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 1

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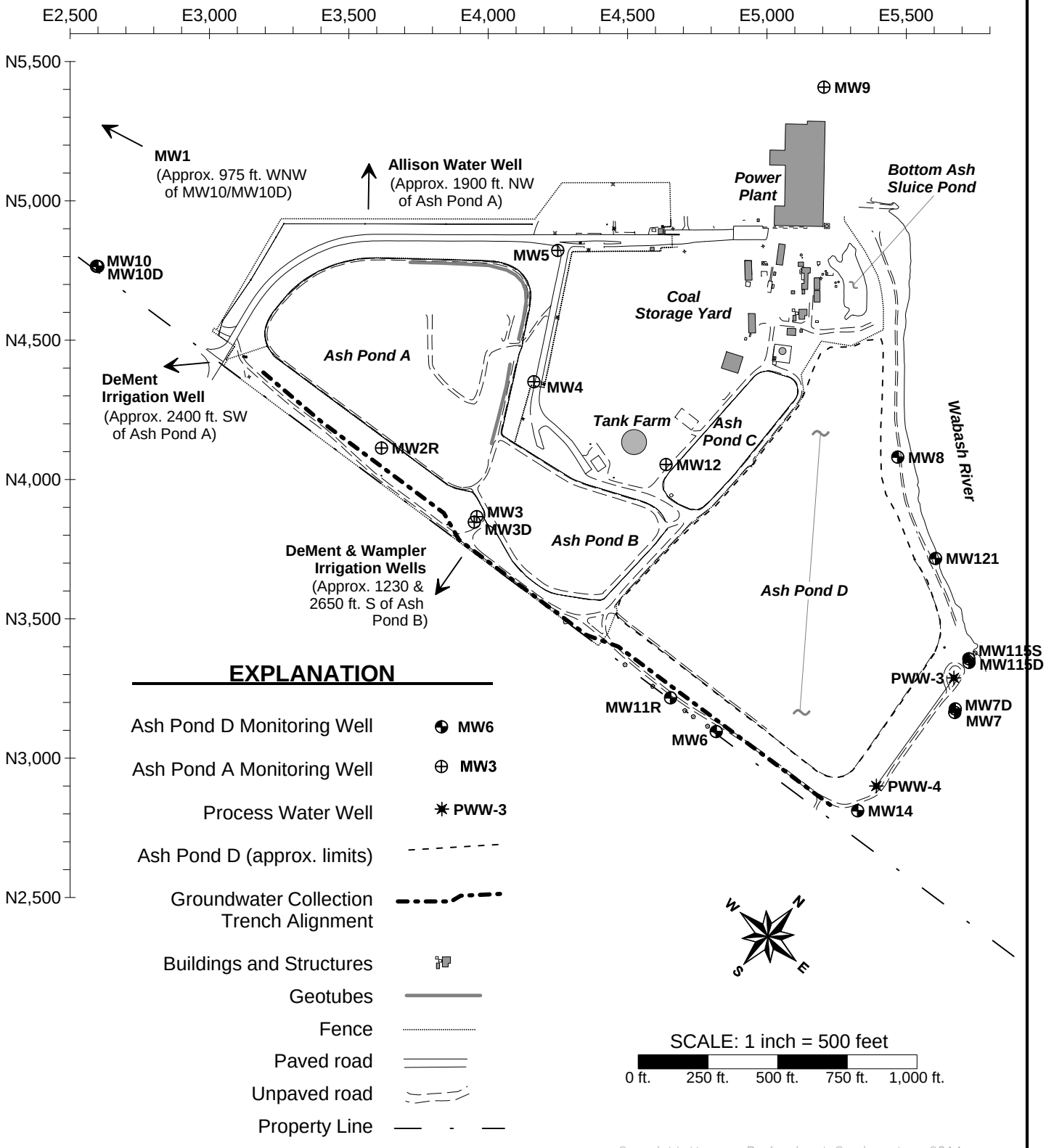




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# SITE MAP

## ASH PONDS CLOSURE
## HUTSONVILLE POWER STATION
## HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 2

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\Figure2_SiteMap.srf

**Table 1: Average Annual Climate Data for Terre Haute, IN**

| | | | |
|---|---|---|---|
| Avg. Annual Max. Temp.-°F | 63.1 | Avg. Annual Mean Temp.-°F | 52.1 |
| Avg. Annual Min. Temp.-°F | 41.7 | Avg. Annual Precip.-in. | 41.77 |

SOURCE: http://iclimate.org/data_archive_v3.asp?rdatatype=cn

## 3. Previous Investigations

Several subsurface investigations previously completed at the Site are summarized below. A map, depicting the location of the various borings and wells, is included in Appendix A. Boring logs for the various field investigations are also included in Appendix A. All borings drilled as part of the various investigations would have been abandoned (sealed) to the standard of the day. Monitoring wells and piezometers installed as part of an investigation but have since been abandoned/sealed are noted at the end of each sub-section and highlighted on the Boring Location Map in Appendix A.

### *3.1 Hanson 1983*

Hanson Professional Services Inc. (Hanson) completed a geotechnical evaluation for a proposed lined ash pond (Ash Pond A) in August 1983, when the power plant was owned by Central Illinois Public Service Company (CIPS). This investigation advanced 4 borings around the proposed Ash Pond A, and one boring near the southwest corner of the existing, unlined ash pond (Ash Pond D). All borings were advanced to bedrock using hollow stem augers, and two borings were cored approximately 10 feet into bedrock.

### *3.2 Hanson 1984a*

A series of monitoring wells were installed in February 1984. These wells (MW1 through MW9) continue to be used at the Site, and are located around Ash Ponds A and D. Samples of the coarse-grained materials above the bedrock were collected during the installation of these wells. MW2 was replaced in 2012 by MW2R due to its proximity to the Groundwater Collection Trench.

### *3.3 Hanson 1984b*

The 1983 geotechnical investigation was augmented during July 1984 to provide additional information for the berm design around Ash Pond A. Six borings to bedrock were planned. During the course of the investigation, boring SW-2 encountered bedrock at a much lower elevation than in other borings (31 feet versus less than 10 feet). Two additional borings were drilled on either side of SW-2 (SW-2A and SW-2B) to determine the extent of the bedrock feature. Based on the borings, Hanson interprets the bedrock feature as an erosional cut, likely caused by post-glacial outwash events.

### *3.4 STMI 1998*

Due to elevated readings of boron and sulfate in several monitoring wells at the Site, Ameren* directed that an extensive environmental assessment be performed by Science & Technology Management Inc. (STMI). The first phase was performed during August 1998, when 23 locations were investigated using direct-push sampling methods. Two temporary piezometers were also installed in Ash Pond A and have since been removed.

* In 1995, CIPS merged with Union Electric of St. Louis, Missouri. Ameren Corporation (Ameren) was incorporated in August 1995 to be the holding company for the two merged utilities.

The second phase of STMI's investigation was the installation of seven new monitoring wells. One shallow well (MW10) was added to augment the upgradient water quality data. MW11, MW12 and MW13 were added to characterize aquifer properties/groundwater flow and further delineate the extent of impacts that appeared to be associated with the ash ponds. MW3D, MW7D and MW10D (up-gradient well) were added to determine if the sandstone bedrock was a potential pathway for the apparent impacts identified by the shallow monitoring wells. MW13 was sealed shortly after installation to allow construction of the new, lined ash ponds (Ash Pond B and Ash Pond C).

### *3.5 NRT 2001*

Two more wells (MW14 and TW, now called MW121) were installed on the east side of Ash Pond D during October 2001 as part of an investigation completed for Ameren by Natural Resource Technology, Inc. (NRT). These wells were installed to evaluate potential migration pathways to the deep fluvial sands identified in the bedrock valley below the current Wabash River. MW11 was also replaced with MW11R at this time.

### *3.6 NRT 2004*

Seven additional wells were installed to the east and south of Ash Pond D during late-April and early-May of 2004 (TW-115S, TW-115D, and TW-116 through TW-120). These wells were installed to evaluate potential off-site migration pathways in the shallow and the deep fluvial sands.

### *3.7 Geotechnology 2010*

Four borings were advanced and two piezometers were installed near the northeast side of Ash Pond D during June 2010 by Geotechnology, Inc. The data collected during this field investigation was used as part of a global stability evaluation of the perimeter embankment of Ash Pond D.

### *3.8 Hanson 2011*

As part of the activities necessary to implement the closure of Ash Pond D required under the promulgated rules at the Illinois Pollution Control Board [Illinois IPCB, 2011], additional subsurface information was obtained for the final cover and the groundwater collector trench design required by the rulemaking. Four additional borings were advanced on the south-side of the Site to provide additional bedrock elevation and geotechnical data adjacent to Ash Pond D. Two additional borings were drilled in Ash Pond D to evaluate the ash and the subsurface material. A temporary piezometer was installed in the northeast ash pond boring (B11-6) to monitor ash pond water levels before and during the proposed construction activities. B11-6 was removed during Ash Pond D cover construction.

# 4. Site Geology

## *4.1 Stratigraphic Units*

Based on information from the Site subsurface investigations summarized above, and published reports, the geology of the Site consists primarily of Wisconsinan Stage fluvial deposits with some Illinoian Stage diamictons overlying Pennsylvanian bedrock. There are various fill materials along with three surficial (unlithified) units identified at the Site (oldest to youngest): silty/clayey diamictons of the Glasford Formation, poorly sorted, outwash sands and gravels of the Henry Formation, and fine-grained fluvial deposits classified as Cahokia Alluvium (Willman et al., 1975; Hansel & Johnson, 1996; Fafalios & Hensel, 1999). Cross sections illustrating the geologic interpretation of the Site are presented in Figure 3, Figure 4, Figure 5, and Figure 6. Site geology was also confirmed using the ISGS ILWATER database and review of nearby water well records (see Appendix A). The Allison (2007) water well log confirms this reports stratigraphic interpretation. Figure 7 depicts the expected Site stratigraphy to a depth of approximately 100 ft.

## *4.2 Bedrock Deposits*

Bedrock at the Site is composed of Pennsylvanian Age rock of the Missourian Series Mattoon Formation of the McLeansboro Group. Two lithologies are present at the Site. To the west, the upper bedrock is composed of sandstone of the Merom Sandstone Member (Willman et al., 1975). Closer to the Wabash River, there is a well incised bedrock valley [depths to bedrock vary from 10-15 feet below ground surface (ft. bgs) in the uplands on the western parts of the Site to over 90 ft. bgs in the southeast corner of the Site (Fafalios & Hensel, 1999)]. In the bedrock valley (below elevation 405 ft.), post-glacial erosion has exposed the lithified silts and clays of an undifferentiated shale[†] of the Mattoon Formation. A bedrock surface contour map based on the information from the site boring and monitoring wells is shown on Figure 8.

## *4.3 Unlithified Materials*

### *4.3.1 Glasford Formation*

Several borings contained silty clay with sand and gravel (e.g., MW2, GP-7, GP-8, GP-13, GP-20, and GP-21). This material is interpreted to be Illinoian Stage diamictons of the Glasford Formation (either undifferentiated or part of the Vandalia Till Member). The spotty presence of the till is likely due to post-glacial erosion. It is generally located in the southern portion of the Site, and can be found in excess of 5 feet thick down to a few inches in thickness.

### *4.3.2 Henry Formation*

The Henry Formation is a Wisconsinan Stage glacial outwash sand and gravel, and is the predominant unit in the upland ash pond areas and deep portions of the Wabash River bedrock valley (Berg & Kempton, 1987). These fluvial deposits can range from a few feet to over 65 feet thick. The Henry Formation was not observed in the northern portion of the Site near the Plant.

[†] The sandstone/shale unconformity has been placed at 405 ft. based on information from B11-4. Other borings (e.g., TW-116, TW-117, etc.) encountered the shale at a deeper elevation, but these borings were located in the Wabash River valley. The contact has been eroded at these locations.

**A** — **West**

**A'** — **East**

B11-1 MW-2 MW-3D B11-2 B11-3 MW-11 MW-11R MW-6 B11-4 MW-14

455 450 445 440 435 430 425 420 415 410 405 400

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400 2500 2600 2700 2800 2900 3000

[ Coarse-grained sediments ]

dry

[ Sandstone ]

[ Fine-grained sediments ]

[ Coarse-grained sediments ]

?

?

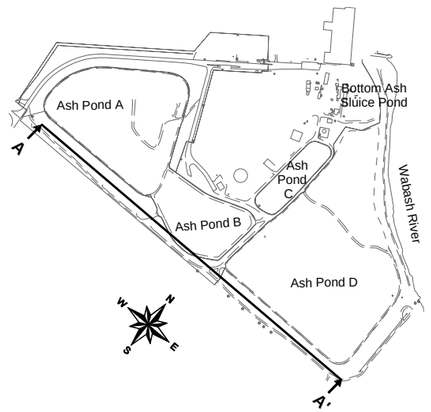
[ Shale ]

## EXPLANATION

- Historic monitoring well high/low groundwater level
- Borehole groundwater level
- Approx. fine-grained (silty clay) / coarse-grained (sands) boundary
- Estimated bedrock surface
- Ground surface

NOTE: Stratigraphy is interpreted between boring locations.
Lithologies may differ at other locations than those depicted.

Sandstone/Shale unconformity is inferred from B11-4.




## CROSS SECTION LOCATION MAP (not to scale)

## CROSS SECTION SCALE

1 inch = 200 feet (horizontal)
1 inch = 10 feet (vertical)
Vertical enhancement = 20x



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GEOLOGIC CROSS SECTION A-A'

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 3

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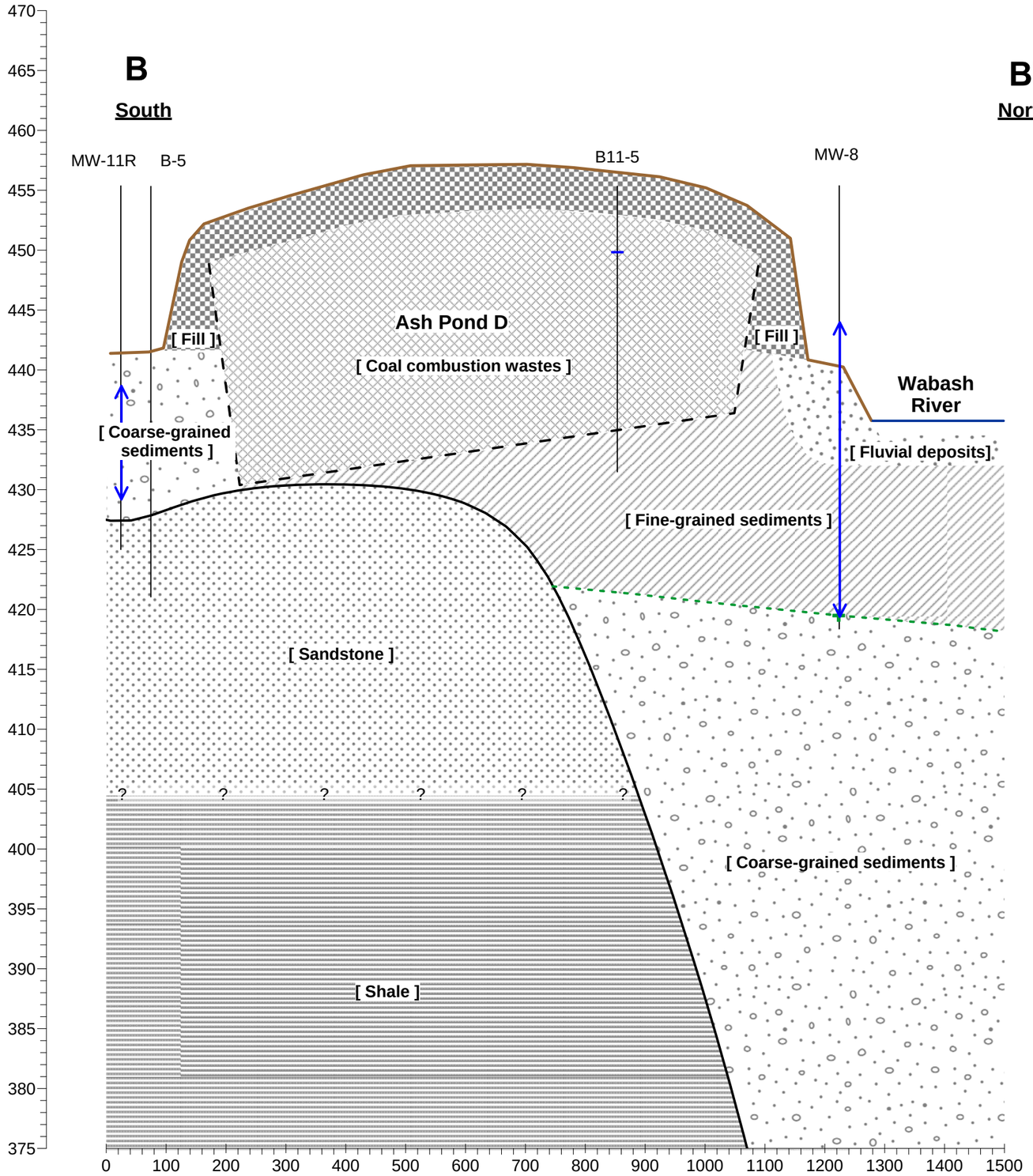



## EXPLANATION

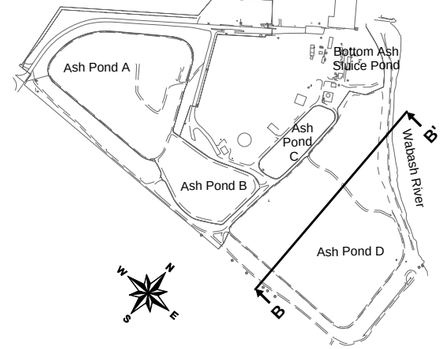
- Historic monitoring well high/low groundwater level
- Borehole groundwater level
- Approx. fine-grained (silty clay) / coarse-grained (sands) boundary
- Estimated bedrock surface
- Base of Ash Pond (estimated from drawings and boring logs)
- Ground surface

NOTE: Stratigraphy is interpreted between boring locations.
Lithologies may differ at other locations than those depicted.

Sandstone/Shale unconformity is inferred from B11-4.

## CROSS SECTION SCALE

1 inch = 200 feet (horizontal)
1 inch = 10 feet (vertical)
Vertical enhancement = 20x




## CROSS SECTION LOCATION MAP (not to scale)



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GEOLOGIC CROSS SECTION B-B'

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 4

C

South

C'

North

MW-3D GP3 MW-13 MW-12 GP9 GP22

Ash Pond B

Ash Pond C

Ash Pond D

[ Fill ]

[ Coal combustion wastes ]

[ Fill ]

[ Fluvial deposits]

[ Coarse-grained sediments ]

[ Fill ]

[ Coal combustion wastes ]

[ Sandstone ]

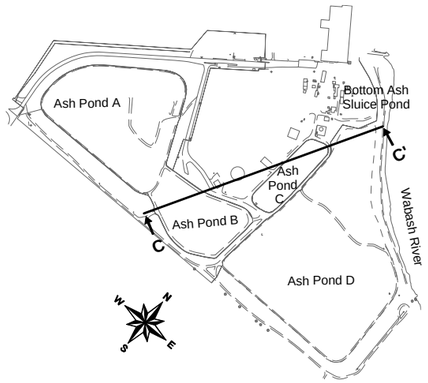
465 460 455 450 445 440 435 430 425 420 415

0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500

## EXPLANATION

- Historic monitoring well high/low groundwater level
- Borehole groundwater level
- Approx. fine-grained (silty clay) / coarse-grained (sands) boundary
- Estimated bedrock surface
- Ground surface

NOTE: Stratigraphy is interpreted between boring locations.
Lithologies may differ at other locations than those depicted.




CROSS SECTION LOCATION MAP (not to scale)

## CROSS SECTION SCALE

1 inch = 100 feet (horizontal)
1 inch = 10 feet (vertical)
Vertical enhancement = 10x



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GEOLOGIC CROSS SECTION C-C'

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 5

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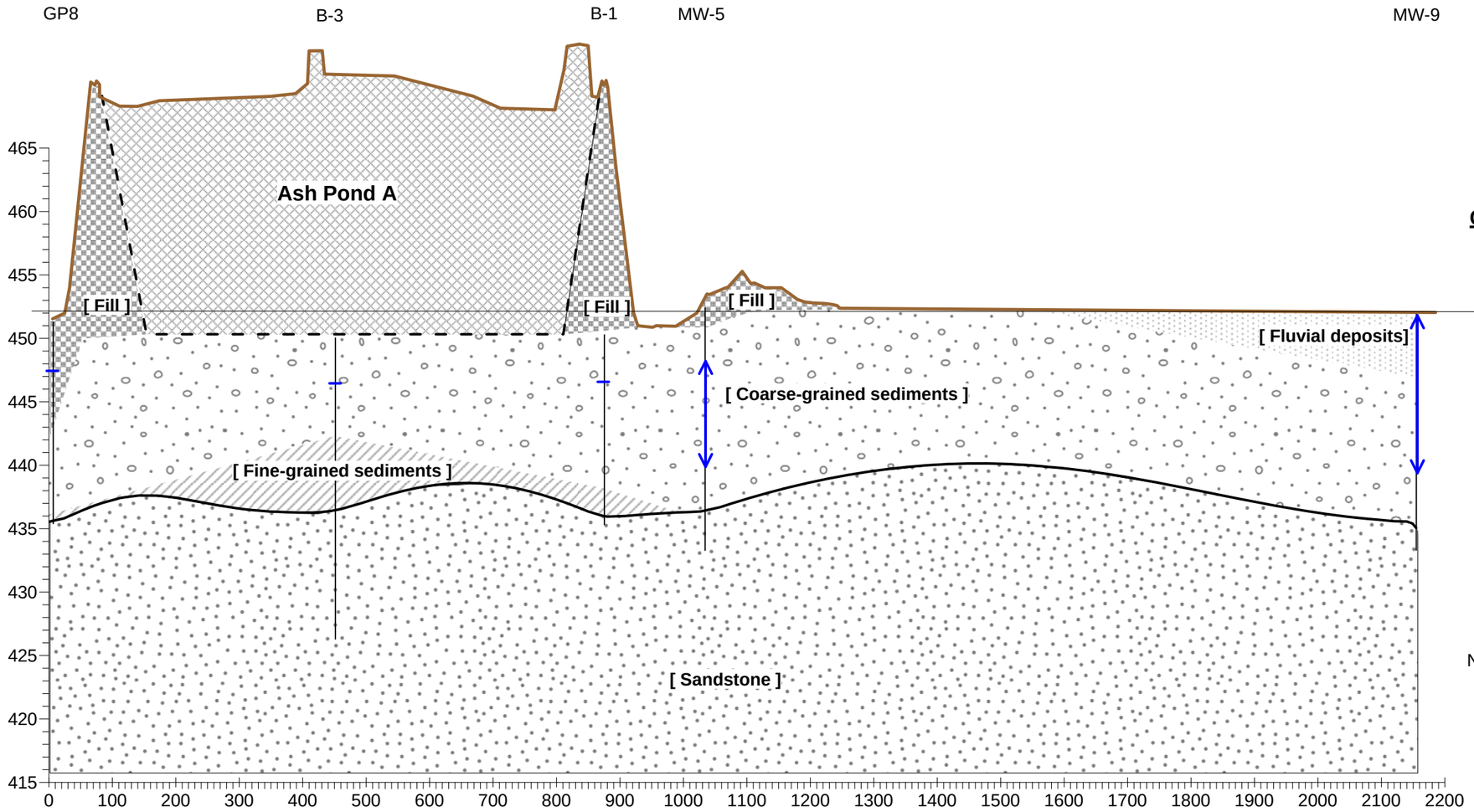
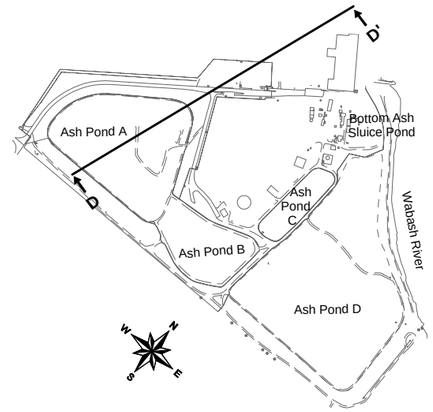
**D**

**South**

**D'**

**North**




**CROSS SECTION LOCATION MAP (not to scale)**

## EXPLANATION

- Historic monitoring well high/low groundwater level
- Borehole groundwater level
- Approx. fine-grained (silty clay) / coarse-grained (sands) boundary
- Estimated bedrock surface
- Ground surface

NOTE: Stratigraphy is interpreted between boring locations. Lithologies may differ at other locations than those depicted.

## CROSS SECTION SCALE

1 inch = 200 feet (horizontal)
1 inch = 10 feet (vertical)
Vertical enhancement = 20x



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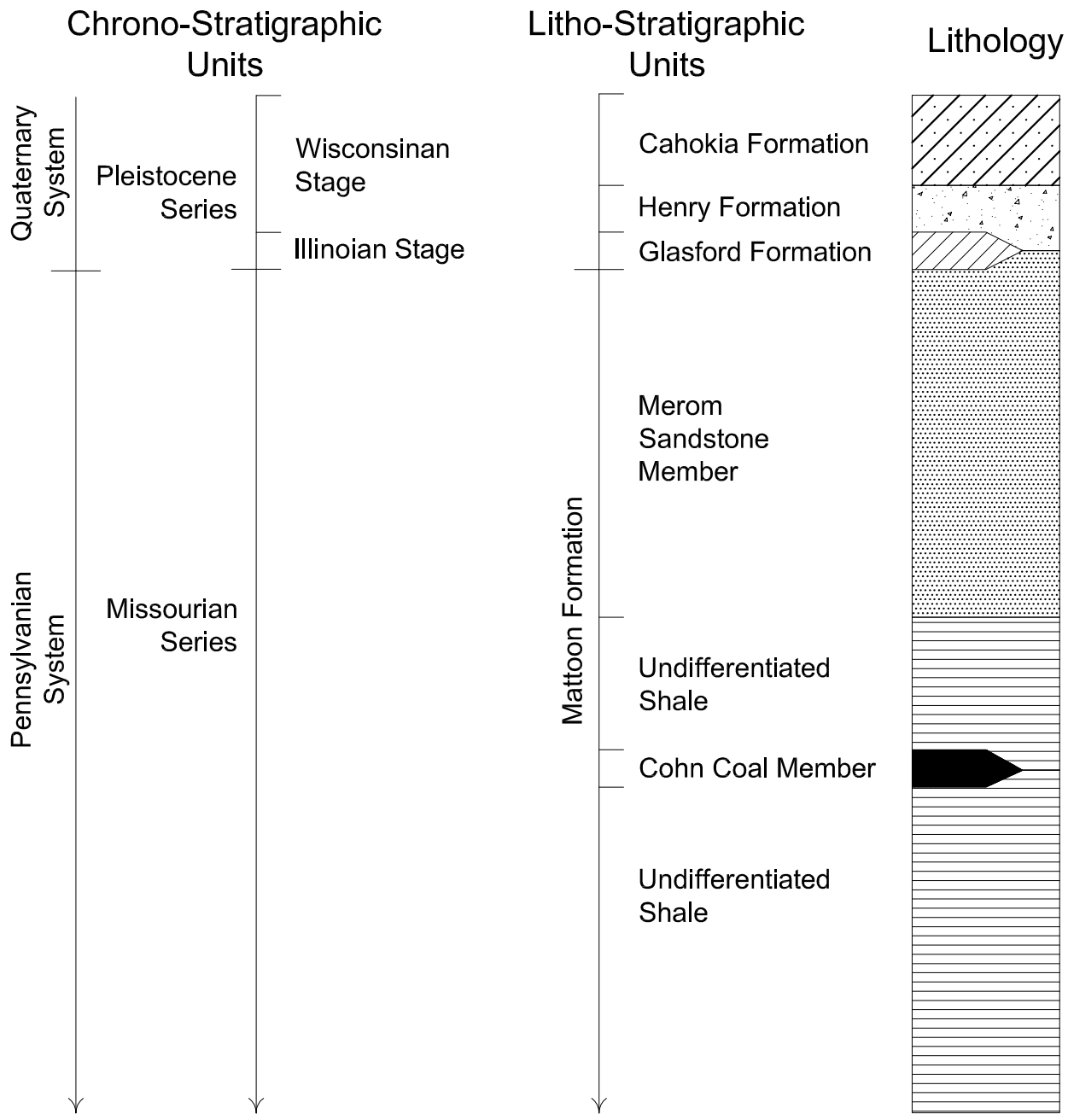
GEOLOGIC CROSS SECTION D-D'

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 6




after Willman et al., 1975.



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GENERALIZED STRATIGRAPHIC COLUMN

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE 7

E2,400 E2,600 E2,800 E3,000 E3,200 E3,400 E3,600 E3,800 E4,000 E4,200 E4,400 E4,600 E4,800 E5,000 E5,200 E5,400 E5,600 E5,800

N5,000 N4,800 N4,600 N4,400 N4,200 N4,000 N3,800 N3,600 N3,400 N3,200 N3,000 N2,800 N2,600 N2,400

MW-10D
MW-10
B-2
SW-6
SW-5
MW-5
B-1
GP-10
GP-11
B-3
SW-1
SW-7
SW-4
MW-4
GP-12
B11-1
GP-8
B-4
GP-7
SW-2A
SW-2
SW-2B
MW-2
SW-3
MW-13
GP-6
GP-3
GP-4
GP-5
MW-3D
MW-3
B11-2
GP-2
GP-1
B11-3
MW-11
B-5
MW-11R
MW-6
B11-4
GP-15
GP-13
GP-17
GP-18
GP-22
GP-9
GP-23
MW-12
GP-20
B11-5
B11-6
MW-8
MW-121(TW)
GP-21
MW-115D
MW-115S
PWW-1
MW-7D
MW-7
MW-14
PWW-2

Ash Pond A
Ash Pond B
Ash Pond C
Ash Pond D
Bottom Ash Sluice Pond
Wabash River

440 ft.
430 ft.
420 ft.
410 ft.
400 ft.
390 ft.
380 ft.
370 ft.
360 ft.
350 ft.

## EXPLANATION

Contour (5 ft.)

Contour (1 ft.)

| | |
|---|---|
| PWW-2 | Process water well |
| B-3 | Hanson 1983 |
| MW-11 | Hanson 1984a |
| SW-2 | Hanson 1984b |
| GP-2 | STMI 1998 |
| MW-12 | NRT 2001 |
| MW-14 | NRT 2004 |
| B11-4 | Hanson 2011 |

NOTES:
Aerial information taken from a photogrammetric data provided by Continental Mapping Consultants as flown April, 2010.

Original drawing prepared by Massmann Surveying, Clayton, MO

SCALE: 1 inch = 300 feet

0 ft. 150 ft. 300 ft. 450 ft. 600 ft.

N W S E



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BEDROCK SURFACE MAP

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. 8

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### *4.3.3 Cahokia Formation*

The Cahokia Formation was derived from post-glacial erosion of the surficial loess and tills and can be found in the flood plains and channels of modern rivers and streams (Berg & Kempton, 1987; Hansel & Johnson, 1996). At the Site, this alluvium is composed of silts, clays and clayey sands with occasional wood and/or shell fragments. Localized lenses or coarser materials (sands) may occur within the alluvium, but these lenses are not laterally extensive. At the Site, the thickness of the alluvial deposits can range from 0 to 15 feet, but can reach 25 feet in the bedrock valley per the NRT report (Fafalios & Hensel, 1999).

### *4.3.4 Fill Materials*

#### 4.3.4a Earthen Fill

Earthen Fill is present across much of the site, and consists of sandy silts and silty sands that were likely created from on-site or nearby excavations. Fill has been used to elevate depressions and construct the berms surrounding the various ash ponds and structures on Site. Where present, the earthen fill can range from less than 2 to over 10 feet thick.

#### 4.3.4b Coal Combustion Wastes

Coal combustion waste (CCW) is a term for several types of materials, typically bottom ash, fly ash and/or flue gas desulfurization (scrubber) sludge. At the Site, the CCW present are bottom and fly ash. CCW is primarily found in the Site's ash ponds. A total of six borings were completed in Ash Pond D (4 direct push borings by STMI and two recent auger borings by Hanson). The thickness of CCW in these borings ranged from about 12 feet (north-end) to 31 feet (center).

CCW is also stored in the lined Ash Pond A and Ash Pond B. Prior to construction of Ash Pond B, the area was the CCW laydown location, and ash in this area could be up to 12 feet thick at times (Fafalios & Hensel, 1999). It is believed that no CCW remains after construction of the liner for Ash Pond B.

## 5. Site Hydrogeology

### *5.1 Hydrogeologic Characteristics*

Shallow groundwater in the surficial deposits and the upper bedrock are controlled by the Wabash River, a regional groundwater sink or discharge zone. Groundwater elevations have been measured and recorded at the Site since 1984. Groundwater flow beneath the Site discharges toward and is controlled by the Wabash River within the surficial deposits and upper bedrock in the vicinity of the Site.

### *5.1.1 Hydraulic Conductivity*

Fafalios & Hensel (1999) completed an analysis of hydraulic conductivity for eleven monitoring wells at the Site using the Bouwer and Rice (1976; Bouwer, 1989) slug test analysis method. Results of the slug tests range from a minimum of $2.6 \times 10^{-4}$ cm/sec to a maximum of $4.8 \times 10^{-2}$ cm/sec (see Table 2). The calculated geometric mean of the hydraulic conductivity of the sediments is $6.5 \times 10^{-3}$ cm/sec, and the arithmetic mean of the two sandstone bedrock test results is $4.7 \times 10^{-4}$ cm/sec.

**Table 2. Monitoring Well Slug Test Results**

| Well ID | Hydraulic Conductivity (in cm/sec) | Geologic Material |
|---|---|---|
| MW3 | $2.7 \times 10^{-2}$ | Silty sand & gravel |
| MW3D | $5.4 \times 10^{-4}$ | Sandstone |
| MW5 | $8.0 \times 10^{-3}$ | Silty sand & gravel |
| MW6 | $3.2 \times 10^{-2}$ | Clayey gravel, silty sand & sandstone |
| MW7 | $2.6 \times 10^{-4}$ | Sandy silt, sand & gravel |
| MW7D | $4.8 \times 10^{-2}$ | Silty sand & gravel |
| MW9 | $8.3 \times 10^{-4}$ | Silt, silty sand & gravel |
| MW10 | $6.2 \times 10^{-4}$ | Silty sand & gravel |
| MW10D | $4.0 \times 10^{-4}$ | Sandstone |
| MW12 | $2.6 \times 10^{-2}$ | Sand |
| MW13 | $1.8 \times 10^{-2}$ | Clayey sand & gravel |

### *5.1.2 Groundwater Flow Direction/Gradient*

Groundwater flow was evaluated as part of the NRT study (Fafalios & Hensel, 1999). The NRT study further subdivided the groundwater regime into two zones, the shallow and deep groundwater zones. The shallow groundwater zone is comprised of the surficial and shallow materials and the upper, permeable portions of the sandstone bedrock. The deep groundwater zone was defined as the alluvium found in the Wabash River valley.

Several potentiometric surface maps were included in the NRT report. Five of the more recent, complete potentiometric data sets (5 shallow and 4 deep groundwater zone plots from 2007, 2010, 2012 and 2013) along with 4 potentiometric surface maps using the NRT data sets (2 shallow and 2 deep groundwater zone plots from November 1998 and April 1999) have been plotted for this report and are included in Appendix B.

Groundwater flow within the shallow zone generally flows from west to east, based on the plotted potentiometric surface data included in Appendix B. Groundwater in the deep zone generally flows from southwest to northeast, almost perpendicular to the banks of the Wabash River. From the maps in Appendix B, gradients were calculated in the vicinity of the Ash Ponds. Values for the shallow groundwater zone ranged from 0.0104 to 0.0183, with an average gradient of 0.0156. Gradients in the deep zone range from 0.0067 to 0.0152, with an average gradient of 0.0114. Table 3 lists the flow direction and gradient values calculated for each plotted monitoring event and monitoring zone presented in Appendix B. Groundwater velocities, based on these gradients, are of the same order of magnitude as described in the NRT report (Fafalios & Hensel 1999).

### *5.2 Groundwater Classification*

Illinois EPA requires that groundwater at regulated sites be classified in accordance with 35 IAC 620.210(a)(4)(B)(ii). The groundwater at the Site has been classified as a Class I: Potable Resource Groundwater. This classification is based on:

1. Groundwater is greater than 10 feet bgs;
2. Hydraulic conductivities can exceed $1 \times 10^{-4}$ cm/sec; and
3. No criteria are met that would classify groundwater as a Special Resource (Class III) or Other (Class IV) Groundwater.

**Table 3. Flow Direction and Gradients**

| Monitoring Event | Flow Direction | Gradient | Monitoring Zone |
|---|---|---|---|
| 18 Nov 1998 | Northeast | 0.0106 | Shallow |
| 30 Apr 1999 | East | 0.0104 | Shallow |
| 2 July 2007 | East | 0.0168 | Shallow |
| 2 Oct 2007 | East | 0.0175 | Shallow |
| 13 Apr 2010 | East | 0.0172 | Shallow |
| 13 Apr 2012 | East | 0.0182 | Shallow |
| 10 Aug 2013 | East | 0.0183 | Shallow |
| 18 Nov 1998 | Northeast | 0.0123 | Deep |
| 30 Apr 1999 | Northeast | 0.0067 | Deep |
| 2 July 2007 | Northeast | 0.0116 | Deep |
| 2 Oct 2007 | Northeast | 0.0152 | Deep |
| 13 Apr 2010 | Northeast | 0.0119 | Deep |
| 10 Oct 2013 | Northeast | 0.0106 | Deep |

### *5.3 Nearby Groundwater Users*

Water well logs for the sections surrounding the Site were previously obtained from the Illinois State Geological Survey and/or Illinois State Water Survey and referenced in the NRT report. The process water wells, PWW-3 and PWW-4[‡], on the Site are located in the Southeast ¼ of Section 17 (depths of 88 and 90 feet bgs, respectively) and just east of Ash Pond D (see Figure 2). The next nearest water supply wells are a trio of irrigation wells, which obtain irrigation water from the coarse-grained sediments located in the bedrock valley. These irrigation wells provide water to the Dement and Wampler farms in Section 20, just south of the Site. A more recent potable water well was installed at the Allison residence, located approximately 1900 ft. northwest of Ash Pond A. These water well records are included in Appendix A.

### *5.4 Groundwater Quality*

Groundwater quality was assessed in NRT's 1999 report (Fafalios & Hensel, 1999), which identified the parameters of concern (POCs): boron, sulfate, iron, manganese, pH and total dissolved solids (TDS), and the wells (MW2, MW3, MW3D, MW6, MW8, MW9, & MW11) with concentrations that exceeded the Class I Potable Resource groundwater standard (35 IAC 620.410). Additional data collected at the Site since 1999 is included in the analysis for this report. The POC data, from 1999 to 2012, is summarized as a series of box-whisker plots in Appendix C. The 1999-2012 monitoring data is overlain by another set of box-whisker plots representing the most recent four quarters of data (July 2013 – June 2014). In general, the 2013-2014 data trend is toward lower median values relative to the older data.[§]

A comparison of Class I standard to the median POC concentrations (1999-2012 data) is presented in Table 4 for the Site monitoring wells. The 16 wells in Table 4 (2 upgradient and 14 downgradient) are the monitoring points that are located to provide early indication of possible impacts by the Ash Ponds, based on the groundwater flow directions and gradients depicted on the potentiometric surface maps in Appendix B, and summarized in Table 3.

[‡] In the previous Hydrogeologic Site Investigation (Hanson, 2011a), PWW-3 and PWW-4 were identified as PWW-1 and PWW-2, respectively. These wells were re-numbered for this report to match the numbering on the ISGS well records located in Appendix A.

[§] The recent (2013-2014) data is limited (typically only 4 data points). As such, the interquartile ranges may be small, misrepresenting any outlier values in the dataset.

**Table 4. Ash Pond Monitoring Wells – Historic Median Concentrations (1999-2012)**

| Well ID | Boron [1] (2 mg/L) | Sulfate (400 mg/L) | Iron (5 mg/L) | Manganese (0.15 mg/L) | pH (6.5 < x < 9.0) | TDS (1,200 mg/L) |
|---|---|---|---|---|---|---|
| MW1 [‡] | 0.12 | 29 | 0.031 | 0.057 | 7.20 | 278 |
| MW2(R) [2] | ***5.10*** | 340 | 0.020 | 0.008 | 7.32 | 790 |
| MW3 | ***3.40*** | ***1300*** | 0.020 | ***0.710*** | 6.73 | ***2300*** |
| MW3D | ***4.20*** | ***1700*** | 0.020 | ***2.4*** | 6.10 | ***2650*** |
| MW4 | 0.25 | 67 | 0.020 | 0.003 | 7.20 | 390 |
| MW5 | 0.22 | 47 | 0.020 | 0.002 | 6.93 | 238 |
| MW6 | ***16.00*** | ***499*** | 0.031 | ***0.420*** | 6.84 | 980 |
| MW7 | 1.95 | 270 | 0.028 | 0.051 | 6.90 | 850 |
| MW7D | 0.220 | 56.75 | 1.130 | ***0.620*** | 7.20 | 380 |
| MW8 | ***15.70*** | ***810*** | 0.700 | ***2.5*** | 6.99 | ***1600*** |
| MW10 [‡] | 0.12 | 26 | 0.072 | 0.057 | 7.03 | 370 |
| MW10D [‡] | 0.098 | 32 | 0.020 | 0.009 | 7.21 | 270 |
| MW11(R) [2] | ***10.75*** | ***600*** | 0.020 | 0.074 | 6.81 | 1200 |
| MW14 | 0.774 | 180 | 0.120 | ***0.525*** | 6.90 | 750 |
| MW115S | 0.081 | 33 | 1.088 | ***0.749*** | 7.30 | 330 |
| MW115D | 0.077 | 37 | 3.265 | ***0.517*** | 7.30 | 385 |
| MW121 | 0.090 | 105 | 1.479 | ***0.820*** | 7.31 | 340 |

[1] parameter's name with Class I groundwater standard value below. Median values exceeding the Class I Std. are italic and bold.
[2] data from MW2 / MW2R and MW11 / MW11R may be combined.
[‡] upgradient monitoring well.
[3] Ash Pond A Deep Zone monitoring wells not recently sampled.

A similar comparison of median groundwater concentrations to Class I standards are also made in Table 5 for the data from July 2013 through June 2014. The red highlighted median concentrations are those values that exceeded the median values for the long-term concentration presented in Table 4. The limited data for the recent monitoring results (4 quarters) versus the data used to calculate the historic median does slightly skew the data presentation. The percent increase from historic to present median values is generally less than 10% for TDS, Sulfate, and some of the Boron values. The high percent change for the Iron and Manganese median values may be indicative of a change in RedOx (oxidation-reduction) potential in the groundwater as a result of the capping of Ash Pond D. Although the concentrations are increasing, this may actually be a positive sign.

**Table 5. Ash Pond Monitoring Wells – Recent Median Concentrations (2013-14)**

| Well ID | Boron [1] (2 mg/L) | Sulfate (400 mg/L) | Iron (5 mg/L) | Manganese (0.15 mg/L) | pH (6.5 < x < 9.0) | TDS (1,200 mg/L) |
|---|---|---|---|---|---|---|
| MW1 [‡] | 0.0158 | 17.35 | 0.292 | 0.040 | 7.29 | 218 |
| MW2(R) [2] | ***1.76*** | 111 | 0.426 | 0.005 | 7.28 | 491 |
| MW3 | ***4.585*** | ***1135*** | 0.698 | 0.009 | 6.90 | ***1745*** |
| MW3D[3] | -- | -- | -- | -- | -- | -- |
| MW4 | 0.231 | 51.65 | 0.320 | 0.002 | 7.30 | 245 |
| MW5 | 0.168 | 25.05 | 0.271 | 0.002 | 7.09 | 186 |
| MW6 | ***4.76*** | 298.5 | 0.663 | 0.118 | 6.96 | 785 |
| MW7 | 1.435 | 245.5 | 0.683 | 0.028 | 6.94 | 758 |
| MW7D | 0.389 | 58.95 | 1.208 | ***0.572*** | 7.07 | 415 |
| MW8 | ***17.05*** | ***560.5*** | 1.995 | ***3.43*** | 7.77 | ***1345*** |
| MW10 [‡] | 0.097 | 23.2 | 0.334 | 0.001 | 7.07 | 380 |
| MW10D [‡3] | -- | -- | -- | -- | -- | -- |
| MW11(R) [2] | ***6.805*** | ***610.5*** | 0.874 | ***0.369*** | ***6.49*** | ***1210*** |
| MW14 | 0.832 | 196.5 | 0.622 | ***0.446*** | 6.92 | 815 |
| MW115S | 0.124 | 27.05 | 0.921 | ***1.285*** | 7.60 | 359 |
| MW115D | 0.062 | 31.75 | 0.802 | ***0.414*** | 7.67 | 320 |
| MW121 | 0.044 | 28.05 | 1.612 | ***1.275*** | 7.39 | 388 |

[1] parameter's name with Class I groundwater standard value below. Median values exceeding the Class I Std. are italic and bold.
[2] data from MW2 / MW2R and MW11 / MW11R may be combined.
[‡] upgradient monitoring well.
[3] Ash Pond A Deep Zone monitoring wells not recently sampled.

### *5.4.1 Parameters of Concern (POCs)*

The following observations have been made for each POC:

Boron – MW2/MW2R, MW3, MW3D, MW6, MW8, and MW11R have concentrations historically above the Class I standard. Recent monitoring indicates that wells along the south property boundary, MW11R, MW6, MW2(R), appear to have improving water quality since the capping of Ash Pond D.

Sulfate – MW3, MW3D, MW8 and MW11R have historically been above the Class I standard, and MW6 had an inter-quartile range that straddle the Class I standard. Sulfate concentrations have displayed improvement in the past 4 quarterly sampling events.

Iron – minimal data available at some wells, but no well has historic concentrations above the Class I standard.

Manganese – minimal data available at some wells. MW1, MW3, MW3D, MW6, MW7D, MW8, MW11R, MW14, MW115D, MW115S, MW117 and MW121 have concentrations historically above the Class I standard. Recent data indicates generally higher Manganese concentration from wells adjacent to the Wabash River (MW7, MW7D, MW8, MW115S, MW115D, and MW121) appear higher than historically observed.

TDS – MW3, MW3D and MW8 are above the Class I standard, and like Sulfate display stable to improving recent concentrations.

pH – All wells show at least one pH reading below the lower limit Class I standard, but only MW3D shows consistent readings (3rd quartile and below) less than the lower limit Class I standard.

As shown in Appendix C, Table 4, and Table 5, five of the monitoring wells have had readings of the POCs generally trending above the Class I standards. Wells MW3, MW3D, MW6, MW8, and MW11/MW11R have generally shown elevated levels of boron, sulfate, pH and TDS. However, recent monitoring results indicate that water quality appears to be improving at these wells, especially for Boron, Sulfate and TDS. These wells, and the other Ash Pond monitoring wells, will continue to be evaluated as part of the ongoing Ash Pond monitoring activities (Hanson, 2014).

### *5.4.2 Other Parameters*

Several other parameters have had intermittent exceedances of the Class I groundwater standards over the past several years (monitoring for these parameters began in 2011). These parameters are listed in Table 6.

**Table 6. Additional Detections Above Class I Standards**

| Parameter | Well ID | Comment |
|---|---|---|
| dissolved Arsenic | MW1, MW115D, MW115S, MW121 & MW7D | Found in upgradient well<br>Concentrations now below Class I limit |
| total Cyanide | MW1 | Found in upgradient well |
| dissolved Lead | MW115S, MW121, & MW7 | Not confirmed the following period |
| dissolved Nickel | MW7 & MW7D | Not confirmed the following period |
| dissolved Nitrate | MW6 | Only one detect (Fall 2013) |
| dissolved Thallium | MW1, MW10, MW115D, MW14, MW7 & MW7D | Found in upgradient wells<br>Not confirmed the following period |

The six parameters identified in Table 6 are not considered POCs for purposes of this report. Concentration exceedances are either intermittent or have an upgradient (detection) component.

### *5.5 Hydrostatic Equilibrium of Ash Ponds*

An estimate of the time for the groundwater beneath Ash Pond D to reach hydrostatic equilibrium was required by 35 IAC 840.130(l). However, evaluating hydrostatic equilibrium within the HDPE-lined Ash Pond A is not required. Instead, the groundwater flow model used to evaluate conditions associated with the Groundwater Management Zone will be used to evaluate ash pond to groundwater interactions.

## 6. Summary and Conclusions

The NRT report (Fafalios & Hensel, 1999) presented several conclusions, including:

- Upland hydro-stratigraphy consists of a thin layer of sand-rich material overlying sandstone and siltstone bedrock;
- There are three areas with CCW, the unlined Ash Pond D, the lined Ash Pond A, and the former ash laydown area now located beneath Ash Pond B;

- Water samples collected during the STMI investigation were high in boron, sulfate, manganese, and TDS in ash leachate, but only manganese concentrations were high in Ash Pond D leachate;
- No evidence of impacts was detected in direct push samples south of the impoundments;
- High iron and nickel were observed in locations where coal was present near the ground surface.

Hanson has reviewed the earlier studies, and based on our analyses concur with the NRT conclusions summarized above. In addition, Hanson has the following supplemental conclusions:

- Boron concentrations above the Class I groundwater standard continue to be observed in the shallow wells immediately downgradient of the Ash Ponds (MW2, MW3, MW3D, MW6, MW8, and MW11R), but recent monitoring results show an improving trend;
- Manganese concentrations above the Class I groundwater standard continue to be observed in the Site monitoring wells (MW1, MW3, MW3D, MW6, MW7D, MW8, MW11R, MW115S, MW115D, and MW121). Fafalios & Hensel (1999) indicated that elevated manganese and nickel may be indicative of coal or coal stockpile impacts. Hanson concurs, and also notes that Manganese has been observed above the Class I standard at upgradient well MW1;
- Recent (2013-2014) Iron (median) concentrations appear to be higher than those observed historically (1999-2012). Hanson believes that this increase is groundwater chemistry-related and not an indication of further impairment.
- Concentrations of the other POCs in the deep monitoring zone (monitoring wells MW7D, MW14, and MW115D) continue to be below Class I standards; and
- Based on the hydrogeologic information summarized in this report, the installed groundwater collector trench required under 35 IAC 840.120, the impermeable cap placed on Ash Pond D, the proposed cap for Ash Pond A, and the clean closure of Ash Pond B, Ash Pond C and the Bottom Ash Sluice Pond provide the best alternative for reducing off-site impacts to groundwater in the vicinity of the Site.

## 7. Licensed Professional Acknowledgement

The geological work product contained in this document has been prepared under my personal supervision and has been prepared and administered in accordance with the standards of reasonable professional skill and diligence.

Rhonald W. Hasenyager, P.G.
Hanson Professional Services Inc.
1525 South Sixth Street
Springfield, IL 62703-2886
(217) 788-2450
Registration No. 196-000246

Seal:


Expires 3/31/2015

Signature: _____ Date: 2 Sept 2014

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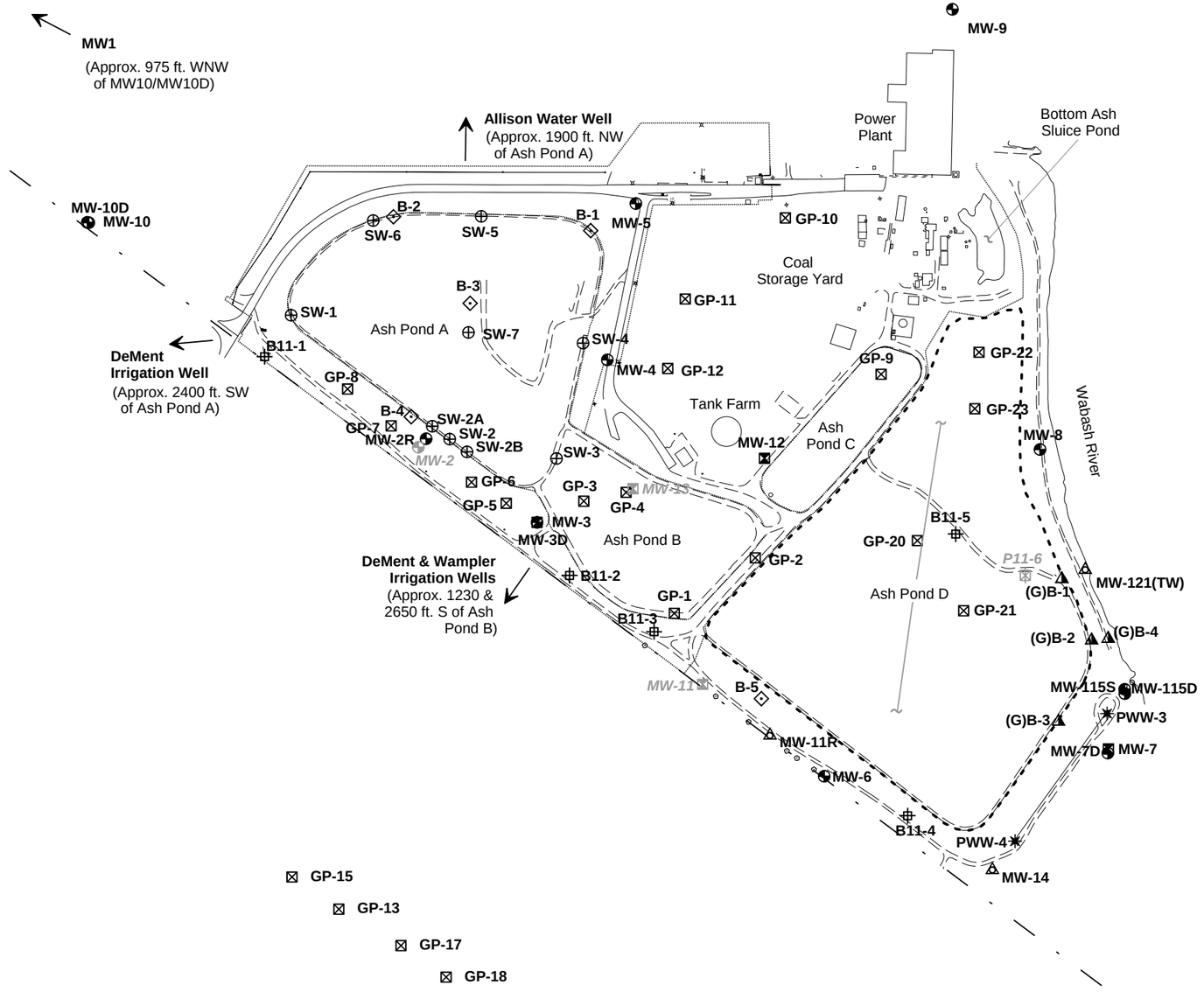
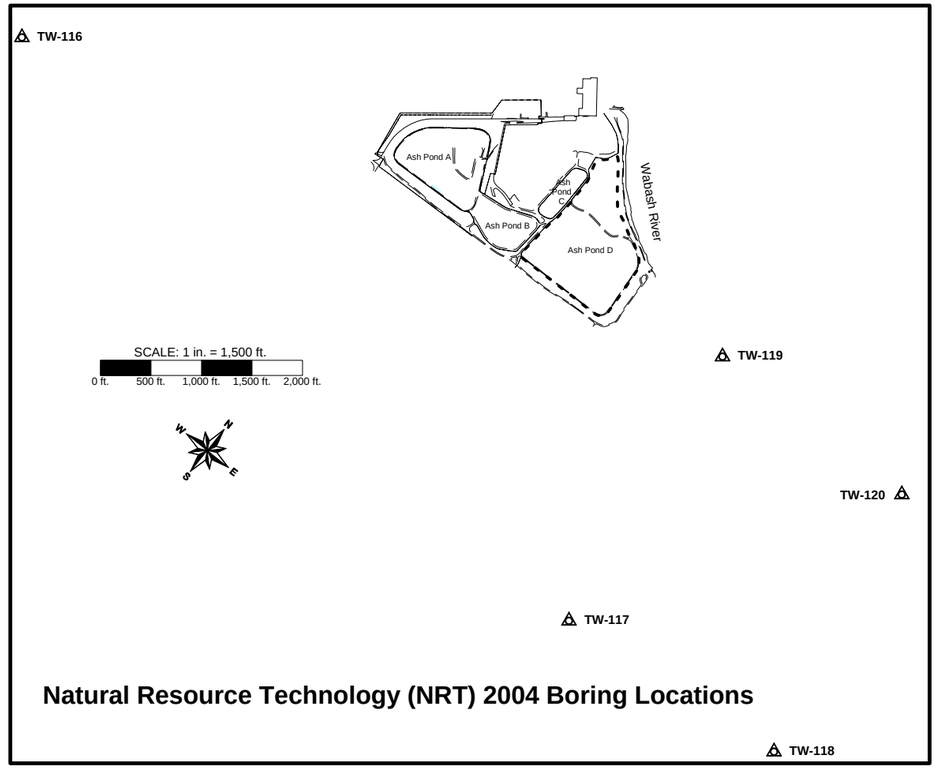
# Appendix A

## Boring Location Map, Field Boring Logs and Water Well Records

# Appendix A-1

## Boring Location Map




## EXPLANATION

| | |
|---|---|
| PWW-3 | Process water well |
| B-3 | Hanson 1983 |
| MW-11 | Hanson 1984a |
| SW-2 | Hanson 1984b |
| GP-2 | STMI 1998 |
| MW-12 | NRT 2001 |
| MW-14 | NRT 2004 |
| (G)B-1 | Geotechnology 2010 |
| B11-4 | Hanson 2011 |
| MW-13 | Sealed Well / Piezometer |
| | Ash Pond limits (approx.) |
| | Fence |
| | Property Line |

SCALE: 1 in. = 400 ft.
0 ft. 200 ft. 400 ft. 600 ft. 800 ft.

NOTES:
Aerial information taken from a photogrammetric data provided by Continental Mapping Consultants as flown April, 2010.

Original drawing prepared by Massmann Surveying, Clayton, MO



HANSON
Hanson Professional Services Inc.

# BORING LOCATION MAP

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO, ILLINOIS

HANSON NO. 14E0016 FIGURE NO. A-1

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureA1_BoringMap.srf

# Appendix A-2

## Hanson 1983 Boring Logs

# Canonie Construction Co.

**Canonie** Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

| | |
|---|---|
| Job No. | DD-0162 |
| Date | 8-9-83 |
| Total Footage | 25'6" |
| Foreman | Steve Berlin |
| Classification By | Foreman |

Client Hanson Engineers

Geographic Location Hutsonville, IL

## Boring No. B-1

O.G. EL.

Coordinates

| | | |
|---|---|---|
| Ground Surface | | 0'0" |
| Black TOPSOIL | | 1'0" |
| Brown fine SAND with small to medium gravel and some clay. | 4-3-5 | 3'6" |
| Wet brown SAND and small to medium gravel. | 2-2-3 | |
| | 3-3-4 | |
| | 1-1-2 | |
| | 3-3-3 | 13'0" |
| Gray silty CLAY with organic material. | | |
| Blue and Black SAND-STONE. | 9-12-71 | 14'8" 15'0" |
| End of Boring | | |
| Water level is 3'6" below ground surface 1.0 hours after completion. | | |
| Water discovered at 3'6" | | |

## Boring No. B-2

O.G. EL.

Coordinates

| | | |
|---|---|---|
| Ground Surface | | 0'0" |
| Black TOPSOIL. | | 1'2" |
| Gray & brown SAND with clay and small to medium gravel. | 3-5-7 | 3'6" |
| Very dense gray and brown fine SAND with small gravel and clay. | 7-23-32 | 5'6" |
| Very dense brown SAND with small gravel. | 37-70-91 | 10'0" |
| Brown SANDSTONE. | 100/6" | 10'6" |
| End of Boring | | |
| Water level is 5'6" below ground surface 1/2 hours after completion. | | |
| Water at 8'0" | | |

A....All borings are plotted to a scale of 1"=....4... ft., using ground surface.... as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon ( 6" u.n.o.), using a 140 lb. weight falling 30 inches.

# Canonie Construction Co.

**Canonie** Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

| | |
|---|---|
| Job No. | DD-0162 |
| Date | 8-9-83 |
| Total Footage | 33'0" |
| Foreman | Steve Berlin |
| Classification By | Foreman |

Client Hanson Engineers — Geographic Location Hutsonville, IL

## Boring No. B-3

O.G. EL. —

Coordinates —

| | | |
|---|---|---|
| Ground Surface | | 0'0" |
| Black TOPSOIL | | 1'0" |
| Gray SAND with small gravel. | 2-2-3 | 3'0" |
| Brown and gray SAND with trace of clay and small gravel. | 3-3-3 | |
| | 3-4-7 | 9'6" |
| Brown and gray silty CLAY with trace of small gravel. | 7-12-36 | |
| | 32-35-61 | 12'6" |
| Gray clayey SAND with small gravel. | | 13'6" |
| Gray & brown SANDSTONE | 100/4" | 14'0" |
| Gray and brown SAND-STONE. Cored 10'0" Recovered 8'2" (81%) | | 24'0" |
| End of Boring | | |

Water level is 5'6" below ground surface 1/2 hour after completion.

Installed Piezometer at 10'0" & 24'0".

Water at 3'6"

## Boring No. B-4

O.G. EL. —

Coordinates —

| | | |
|---|---|---|
| Ground Surface | | 0'0" |
| Black TOPSOIL | | 1'0" |
| Gray SAND and gravel (small) | 8-5-4 | 2'0" |
| Brown and gray sandy CLAY with small to medium gravel. | 3-4-3 | 3'0" |
| Gray fine SAND with small to medium gravel and clay. | 100/6" | 5'6" |
| Brown fine SAND with small gravel and sandstone. | 100/5" | 8'2" |
| Gray SANDSTONE. | | 9'0" |
| End of boring | | |

Water level is 5'0" below ground surface 1/2 hour after completion.

Water at 3'6"

A.... All borings are plotted to a scale of 1"= 4 ft., using ground surface as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon ( 6" u.n.o.), using a 140 lb. weight falling 30 inches.



B-157C

# Canonie Construction Co.

**Canonie** Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

| | |
|---|---|
| Job No. | DD-0162 |
| Date | 8-9-83 |
| Total Footage | 20'0" |
| Foreman | Steve Berlin |
| Classification By | Foreman |

Client Hanson Engineers,

Geographic Location Hutsonville, IL

| Boring No. B-5 | O.G. EL. | Boring No. | O.G. EL. |
|---|---|---|---|
| Coordinates | | Coordinates | |
| | | | |

| | | |
|---|---|---|
| Ground Surface | | 0'0" |
| Black TOPSOIL with black coal. | | 1'0" |
| Brown silty CLAY with fine sand and small to medium gravel. | 7-7-7 | 3'0" |
| Brown SAND with small gravel. | 4-4-5 | 5'6" |
| Brown SAND with small to medium gravel. | 1-1-2 | |
| | 1-2-2 | 11'0" |
| Brown SANDSTONE<br>Cored 9'0"<br>Recovered 7'3" | 81% | 20'0" |
| End of Boring<br>Water level is 5'6" below ground surface 1/2 hour after completion.<br>Water at 5'6" | | |

A.... All borings are plotted to a scale of 1"=..4.... ft., using ..ground..surface. as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon ( 6" u.n.o.), using a 140 lb. weight falling 30 inches.



B-157C

OPERATOR CMP MRH

DATE 8-23-83

JOB NO. 8353045

HANSON ENGINEERS INCORPORATED

**LABORATORY SOIL TEST DATA**

PROJECT NAME AND LOCATION
Flyash Pond
Hutsonville Power Station
Central Illinois Public Service Co

| BOR. | SAMP. | DEPTH | ELEV. | N | STRENGTH TESTS Qu | M | P | W | $\gamma_W$ | $\gamma_D$ | SPECIAL TESTS | SAMPLE DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Surface Elev = 450.7 | | | | | | | | | | | |
| 1 | 1 | 2'-6" | 448.2 | 8 | | | | 6 | | | | Brn. sl. f. sa. |
| | 2 | 5'-0" | 445.7 | 5 | | | | 17 | | | | " " " - c. sa. / pebs. |
| | 3 | 7'-6" | 443.2 | 7 | | | | 18 | | | | " " " - " " / " |
| | 4 | 10'-0" | 440.7 | 3 | | | | 23 | | | | " " " - " " / " |
| | 5 | 12'-6" | 438.2 | 6 | | | | 12 | | | | " " " - " " / " |
| | 6 | 15'-0" | 435.7 | 83 | | | 3.0 | 18 | | | | Gr. " cl. (tr. c. sa. sm. pebs.). |
| | Ground Surface Elev = 450.6 | | | | | | | | | | | |
| 2 | 1 | 2'-6" | 448.1 | 12 | | | 4.5+ | 12 | | | | Brn. cl. sl. / sa. c. sa. & sm. pebs. |
| | 2 | 5'-0" | 445.6 | 55 | | | | 15 | | | | Yel. brn. sl. f. sa. (tr. cl.). |
| | 3 | 7'-6" | 443.1 | 161 | | | | 13 | | | | " " " " " (" ") |
| | 4 | 10'-0" | 440.6 | 100/6" | | | | 16 | | | | " " " " " (" ") |
| | Ground Surface Elev = 450.0 | | | | | | | | | | | |
| 3 | 1 | 2'-6" | 447.5 | 5 | | | | 10 | | | | Brn cl. sl / sa. c. sand |
| | 2 | 5'-0" | 445.0 | 6 | | | | 20 | | | | Brn gray clayey f-c. sand |
| | 3 | 7'6" | 442.5 | 11 | | | | 22 | | | | " " f-c. sand w/ sa clay. |
| | 4 | 10'-0" | 440.0 | 48 | | | 2.2 | 17 | | | | Yel. brn. sl. cl. / sa. c. sa. & pebs |
| | 5 | 12'-6" | 437.5 | 96 | | | 4.5+ | 23 | | | | Mix. colored. v. f. sa. cl. sl. |
| | 6 | 15'-0" | 435.0 | 100/4" | | | | 19 | | | | Brn. gr. sl. f. sa. |
| | Ground Surface Elev = 451.8 | | | | | | | | | | | |
| 4 | 1 | 2'-6" | 449.3 | 9 | | | | 8 | | | | Brn. v. f. sa. sl. (tr. cl. / sa. c. sa. & pebs.). |
| | 2 | 5'-0" | 446.8 | 7 | | | 1.5 | 17 | | | | " gr. cl. f-c. sa. |
| | 3 | 7'-6" | 444.3 | 100/5" | | | | 12 | | | | " f. sa. sl. & sl. f. sa. |
| | 4 | 10'-0" | 441.8 | 100/3" | | | | 12 | | | | " gr. sl. f. sa. |

OPERATOR _____

DATE 8-23-83

JOB NO. 8353045

HANSON ENGINEERS INCORPORATED

# LABORATORY SOIL TEST DATA

PROJECT NAME AND LOCATION
Flyash Pond
Hutsonville Power Station
Central Illinois Public Service Co.

| BOR. | SAMP. | DEPTH | ELEV. | N | STRENGTH TESTS Qu | M | P | W | $\gamma_W$ | $\gamma_D$ | SPECIAL TESTS | SAMPLE DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ground Surface Elev = 441.0 | | | | | | | | | | | |
| S | 1 | 2'6" | 438.5 | 14 | | | 4.5+ | 23 | | | | Brn. f. sa. sl. cl. |
| | 2 | 5'0" | 436.0 | 9 | | | | 9 | | | | " cl. f-m sa. / so. sl. |
| | 3 | 7'6" | 433.5 | 3 | | | | 21 | | | | " f-m sa. / so. c. sa. |
| | 4 | 10'0" | 431.0 | 4 | | | | 21 | | | | " " - " " |
| | 5 | 12'6" | 428.5 | 19 | | | | 19 | | | | " " - " " |

SHEET 2 OF 3

# Appendix A-3

## Hanson 1984a Boring Logs

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-1
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-14-84 — COMPLETED 2-14-84 — DRILLING METHOD HSA

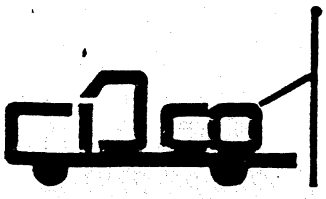
| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| 456.5 | | 0.0 | 30 | | | | | | | |
| 455.6 | See #A | 0.9 | | | | | | | | |
| 453.4 | Lt. brn. sandy silt, wf. clay, occas. f-c sand, occas. f. gravel roots moist-v. moist | 3.1 | | 1-2-3 | 1 | ss | 18" | 1.0<br>2.4 | | |
| 450.1 | Lt. br. m-c sand, wf. occas. f-m gravel tr. silt<br>wet | 6.4 | 5 | 6-5-7 | 2 | ss | 17 | -- | | |
| 448.4 | Lt. brn. sandstone moist | 8.1 | | 6-54-40/2" | 3 | ss | 14 | 2.2 | | |
| 447.4 | Lt.-gray sandstone | 9.1 | | 65-35/1" | 4 | ss | 7 | -- | | WATER 2-14-84 |
| | END OF BORING 9.1' | | 10 | | | | | | | DD 6.0 8:30am<br>BAR 7.0 8:55am<br>AAR--<br>WL 6.5 9:05am<br><br>F-c gravel 5.9'-6<br><br>Screen 9.0'-4.0'<br>2" PVC Pipe 4.0'-<br>Gravel 9.1'-3.0'<br>Bentonite 3.0'-1.<br>Plug 1.5'-surface<br><br>Water level 4.0 9 am 2-1 8<br><br>#A Blk. clayey si wf. tr. f. sand, occas. organic fibers torsoil moist |
| | | | 15 | | | | | | | |

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-2
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-10-84 — COMPLETED 2-10-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 453.3 | | 0.0 | 30 | | | | | | |
| 452.9 | See #A | 0.4 | | | | | | | |
| 451.2 | Brn. silty sand fill v. moist | 2.1 | | 8-8-6 | 1 | ss | 18" | 2.4 | |
| | Brn. m-c sand, wf. m-c gravel tr. silt v. moist | | 5 | 7-5-3 | 2 | ss | 17 | -- | |
| | | | | 3-3-3 | 3 | ss | 16 | -- | WATER 2-10-84 |
| 444.9 | | 8.4 | | | | | | | DD 8.0 8:00am BAR 11.0 10:30a AAR --- WL 7.0 2:10pm |
| | Brn.-gray m-c sand, wf. m. gravel wet | | 10 | 3-4-7 | 4 | ss | 14 | -- | Screen 18.0-5.0 2"PVC pipe 5.0' 3.0' surface |
| | | | | 8-7-9 | 5 | ss | 17 | -- | Gravel 21.5'-18 Bentonite 4.0'- Plug 2.0'-surf. |
| 439.2 | | 14.1 | | | | | | | |
| | Brn.-gray m-c sand, wf. f-m gravel wet | | 15 | 6-8-10 | 6 | ss | 17 | -- | #A Blk. coal refuse 4" wf. occas. silt fil wet |
| 436.0 | | 17.3 | | 10-13-13 | 7 | ss | 17 | -- | |
| | Gray silty clay, wf. tr. f. sand, occas. f. gravel till moist | | 20 | 5-10-13 | 8 | ss | 18 | 4.2 | |



# LOG OF BORING

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-2
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION Per PLan
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-10-84 COMPLETED 2-10-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 453.3 | | 0.0 | 30 | | | | | | |
| 431.8 | | 21.5 | | 5-7-11 | 9 | ss | 18" | 4.0 | |
| | END OF BORING 21.5' | | | | | | | | |

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-3
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-9-84 COMPLETED 2-9-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| 452.1 | | 0.0 | 30 | | | | | | | |
| 451.7 | See #A | 0.4 | | | | | | | | |
| | | | | 4-6-8 | 1 | ss | 14" | -- | | |
| | Rust brn. silty sand, fill v. moist | | 5 | 4-3-4 | 2 | ss | 16 | -- | | |
| 445.8 | | 6.3 | | | | | | | | |
| 444.5 | Brn. f-c gravel, wf. m-c sand, occas. sandstone wet | 7.6 | | 8-19-11 | 3 | ss | 18 | -- | | WATER 1-9-84 DD 5.5' 2:30pm BAR 6.0' 2:45pm AAR WL 5.0' 4:45pm |
| 443.2 | F-m sand v. moist | 8.9 | | | | | | | | |
| 442.7 | See #B | 9.4 | | 15-85/5" | 4 | ss | 17 | -- | | |
| | END OF BORING 9.4' | | 10 | | | | | | | |
| | | | 15 | | | | | | | #A Blk. coal refuse, 4" cind wf. silt fill v. moist |
| | | | | | | | | | | #B Brn. sandsto wf. f-m sand we |
| | | | | | | | | | | Screen 9.4'-4. 2"PVC Pipe 4.4 3.5 Gravel 9.4'-4. Bentonite 4.0' 2.5' Plug 1.5'-surf Grout 2.5'-1.5 4"standpipe 3. 3.9' st |

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-4
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-13-84 — COMPLETED 2-13-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 454.4 | | 0.0 | 30 | | | | | | |
| | Blk. asphalt 1.0" F-m gravel 1.0", brn, clayey silt wf. f-m gravel pavement materials moist | 1.3 | | 5-5-7 | 1 | ss | 16" | -- | |
| 451.3 | Blk. silt, wf. f-c gravel fill moist | 3.1 | | | | | | | |
| | Brn. silty sand, wf. occas. f-m gravel moist | | 5 | 4-3-3 | 2 | ss | 18 | 0.9 | |
| 448.5 | | 5.9 | | | | | | | |
| | Br. f-m sand wf. silt v. moist | | | 3-3-4 | 3 | ss | 18 | -- | WATER 2-13-84 |
| 446.2 | | 8.2 | | | | | | | DD 8.0 9:45am |
| | Br. f-m gravel, wf. c-m sand, silt wet | | 10 | 3-3-3 | 4 | ss | 17 | 0.6 | BAR 8.0 10:30am<br>AAR ---<br>WL 7.5 11:45am |
| 443.5 | | 10.9 | | | | | | | |
| | Lt.-br. sandstone | | | 23-77/5" | 5 | ss | 11 | -- | Screen 12.5'-5.( |
| 441.0 | | 13.4 | | 100/4" | 6 | ss | 4 | 4.5t | 2"PVC Pipe 5.0'. 3.0'<br>Gravel 13.4'-4.(<br>Bentonite 4.0'- 2.0' |
| | END OF BORING 13.4' | | 15 | | | | | | Plug 2.0'-surfa( |

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1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-5
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-13-84 — COMPLETED 2-13-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 452.3 | | 0.0 | 30 | | | | | | |
| 451.1 | 1" coal refuse, brn. clayey silt, wf. f.c gravel occas. organic fibers fill moist | 1.2 | | | | | | | |
| | | | | 4-5-5 | 1 | ss | 14" | -- | |
| 449.2 | See #A | 3.1 | | | | | | | |
| 446.4 | Brn. f. sand, wf. occas. c. sand, f. gravel moist v. moist | 5.8 | 5 | 3-2-4 | 2 | ss | 17 | 0.4 | WATER 2-13-84<br>DD 8.0 2:50pm<br>BAR 11.0 3:50pm<br>AAR -------<br>WL 6.5' 5:45pm |
| 443.9 | Br. f-m sand, wf/ c sand wet | 8.4 | | 3-3-4 | 3 | ss | 18 | 0.6 | |
| 441.7 | Brn. m-c sand, wf. f-c gravel occas. blk. coal refuse mottling | 10.6 | 10 | 3-4-4 | 4 | ss | 18 | 0.9<br>1.6 | Old metal drainage pipe 1.0' west of boring running from road to station |
| 436.1 | Brn.-gray m-c sand, wf. f-m gravel wet | 16.2 | 15 | 0-3-3 | 5 | ss | 16 | -- | Screen 18.0'-5.0'<br>2" PVC pipe 5.0'<br>3.0' stick up<br>Gravel 18.0'-4.0'<br>Bentonite 4.0'-2.0'<br>Backfilled 19.2'-18.0' wf. gravel<br>Plug 2.0'-surface<br>1-4" standpipe |
| | | | | 5-6-11 | 6 | ss | 12 | -- | |
| 435.4 | Brn.-gray sandstone, wf f-c gravel occas. m-c sand v. moist | 16.9 | | 16-15-27 | 7A<br>7B | ss | 12<br>6 | --<br>-- | #A Brn. gray silt m-c sand, wf. f-c gravel, occ white rock fill wet |
| 433.1 | Gray sandstone | 19.2 | | 30-70/2" | 8 | ss | 8 | 4.5t | |
| | END OF BORING 19.2' | | 20 | | | | | | |

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. m-6
PROJECT NAME HUTSONVILLE POWER STSTION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-9-84 COMPLETED 2-9-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 438.9 | | 0.0 | 30 | | | | | | |
| 437.7 | Brn. clayey silt wf. tr. f-m sand, occas. organic fibers moist | 1.2 | | | | | | | |
| | Brn. clayey silt, wf. f-m sand, occas. f gravel moist | | | 1-2-4 | 1 | ss | 13" | 1.2 | |
| 435.5 | | 3.4 | | | | | | | |
| | Gray-brn. silty clay, wf. tr. f. sand, occas. f. gravel moist | | | | | | | | WATER 2-9-84 |
| 433.3 | | 5.6 | 5 | 3-4-5 | 2 | ss | 16 | -- | DD 8.0 9:20am |
| | Brn. f-c gravel wf. clay, c. sand moist | | | | | | | | BAR 9.0 10:30am |
| 431.6 | | 7.3 | | 8-8--- | 3A | ss | 12 | -- | AAR ---- |
| 431.0 | Br. sand, tr. sandstone | 8.0 | | ----15 | 3B | ss | 6 | -- | WL 6.0 1:00pm |
| 430.5 | Br. f-m sand wet | 8.4 | | | | | | | Screen 11.4'-5.0 |
| | Lt. br. sandstone, wf. f. sand | | | 80-20/1" | 4 | ss | 7 | -- | 2" PVC pipe 5.0'. 5.0' stick |
| | | | 10 | | | | | | Gravel 11.4'-4.0 |
| 427.5 | | 11.4 | | 100/4. | 55 | ss | 4.5 | -- | Bentonite 4.0'-2 |
| | END OF BORING 11.4' | | | | | | | | Plug 2.0'-surfac |
| | | | | | | | | | Standpipe 3.0'-5 |
| | | | 15 | | | | | | |
| | | | 20 | | | | | | |

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-7
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-8-84 COMPLETED 2-8-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 437.9 | | 0.0 | 30 | | | | | | |
| 436.5 | Br. clayey silt, wf. tr. f. sand, occas. organic fibers moist | 1.4 | | | | | | | |
| | Br. clayey silt, sand, wf. occas. blk. cinders fill moist | | | 3-2-7 | 1 | ss | 17" | -- | |
| 434.0 | | 3.9 | | | | | | | |
| | Lt. brn.-brn. sandy silt, wf. clay | | 5 | 2-3-4 | 2 | ss | 14 | -- | |
| | moist | | | 3-3-5 | 3 | ss | 16 | 1.7 | WATER 2-8-84 |
| 429.8 | | 8.1 | | | | | | | DD 11.5 11:45am |
| | Brn. sandy silt, wf. tr. clay | | 10 | 2-2-3 | 4 | ss | 14 | 1.2 | BAR 11.5 3:00pm<br>AAR ----<br>WL 11.5 5:15pm |
| | very moist | | | | | | | | Screen 25.0'-15 |
| | | | | 0-0-3 | 5 | ss | 15 | 1.3 | 2" PVC pipe 15.<br>5.0' stick up |
| 425.0 | | 12.9 | | | | | | | Gravel 25.0'-14 |
| | Brn. silt, wf. f. sand | | | | | | | | Bentonite 14.0'<br>12.0' |
| | | | 15 | 2-2-4 | 6 | ss | 16 | 1.7 | Plug 2.0'-surfa |
| | very moist-wet | | | | | | | | Bentonite-clay-<br>12.0'-2.0' |
| | | | | | | | | | Standpipe 3.0'-<br>5.1' stick- |
| 420.3 | | 17.6 | | 2-2-3 | 7 | ss | 18 | 1.4 | |
| | | | 20 | 0-1-3 | 8 | ss | 17 | 1.2 | |

CENTRAL ILLINOIS DRILLING COMPANY
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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-7
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-8-84 COMPLETED 2-8-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| 437.9 | | 0.0 | 30 | | | | | | | |
| 416.5 | Brn. sandy silt wf. | 21.4 | | | | | | | | |
| | lenses, f. sand wet | | | | | | | | | |
| | Brn. f. sand | | | | | | | | | |
| 414.5 | wet | 23.4 | | | | | | | | |
| | Brn. f-c gravel, wf. | | | | | | | | | |
| 412.9 | m-c sand, tr. silt wet | 25.0 | | 7-7-9 | 9 | ss | 12" | -- | | |
| | END OF BORING 25.0' | | | | | | | | | |

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-8
PROJECT NAME HUTSONVILLE POWER PLANT — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-7-84 — COMPLETED 2-7-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 439.4 | | 0.0 | 30 | | | | | | |
| 438.1 | Brn. clayey silt, wf. tr. f. sand, occas. organic fibers moist | 1.3 | | | | | | | |
| 436.3 | Brn. silty sand | 3.1 | | 2-5-7 | 1 | ss | 18" | 1.6 | |
| | Brn. silty sand, wf. tr. f. sand moist | | 5 | 2-3-5 | 2 | ss | 17 | 1.4 | |
| 431.0 | | 8.4 | | 3-5-5 | 3 | ss | 18 | 3.2 | WATER 2-7-83 |
| | Brn. clayey silt, wf. tr. f. sand moist | | 10 | 2-3-3 | 4 | ss | 18 | 1.8 | DD 13.0 11:45am<br>BAR 19.0 3:45pm<br>AAR ------<br>WL 12.0 8:30am 2-8-84 |
| 428.5 | | 10.9 | | | | | | | |
| | Brn. gray clayey silt, wf. tr. f. sand, sm. gray silt pockets moist | | | 2-2-2 | 5 | ss | 18 | 1.2 | Screen 21.5'-16<br>Gravel 21.5'-15<br>Bentonite 15.5' 13.5'<br>Clay & Bentonit 13.5'-4.0' |
| | | | 15 | 2-2-3 | 6 | ss | 18 | 1.7 | 2" PVC pipe 16.<br>4.9' stick up<br>Bentonite cemen |
| 422.0 | | 17.4 | | 1-2-2 | 7 | ss | 18 | 1.2 | grout 4.0'-2.0'<br>Plug 2.0'-surfa<br>Standpipe 3.0'- |
| | Brn. sandy silt, wf. occas. f. sand lens | | | | | | | | |
| 419.6 | wet very moist | 19.8 | 20 | 0-1-2 | 8 | ss | 18 | 1.2 | Baled well at 5:15pm 2-9-84<br>11.0' water lev |

# LOG OF BORING

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-8
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-7-84 COMPLETED 2-8-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 439.8 | | 0.0 | 30 | | | | | | |
| 417.9 | Br. silty sand wet | 21.5 | | 0-0-0 | 9 | ss | 18" | 1.1 | |
| | END OF BORING 21.5' | | | | | | | | |

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-9
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION 33.0' E. OF STAKE
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-14-84 — COMPLETED 2-14-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 452.0 | | 0.0 | 30 | | | | | | |
| 451.2 | See #A | 0.8 | | | | | | | |
| 450.7 | See #B | 1.3 | | | | | | | |
| 448.6 | Brn. silty sand, wf. coal refuse, occas. f. gravel fill moist | 3.4 | | 5-10-10 | 1 | ss | 18" | 2.3 | #A Brn.-blk f-( |
| 446.1 | Brn. sandy silt, wf. f-m gravel concrete fill moist | 5.9 | 5 | 4-19-18 | 2 | ss | 14 | -- | sand, wf. coal refuse, 5.0" si wf. f. sand, occ organic fibers fill wet |
| 443.9 | Brn. sandy silt, wf. ash coal refuse, tr. clay fill moist | 8.1 | | 2-1-2 | 3 | ss | 16 | 2.2 | #B Brn. f-m sa wf. silt fill moist Water 2-14-84 |
| 441.4 | Gray sandy silt, wf. occas. f. gravel wet | 10.6 | 10 | 2-2-1 | 4 | ss | 10 | 1.0 | DD 8.0 1:15pm BAR 17.0 2:30pm AAR --- WL 9.0 4:15pm |
| 438.6 | Brn. f. sand saturated | 13.4 | | 0-1-1 | 5 | ss | 8 | -- | Concrete fragme 3.5'-4.0' |
| 436.5 | Gray clayey silt, wf. f. sand, occas. f. gravel | 15.5 | 15 | 0-3-3 | 6 | ss | 14 | 2.3 | Cobbles, concre 2.6'-3.0. Screen 18.5'-8. 2" PVC pipe 8.5 3.0 stick u |
| 435.6 | Br. m-c sand, wf. f-c gravel wet | 16.4 | | | | | | | Gravel 18.0'-8.( |
| 433.2 | Brn. sandstone | 18.8 | | 18-72-22/1" | 7 | ss | 13 | 4.5 | Bentonite 8.0'-( Cement Grout 6.( 4.( |
| | END OF BORING 18.8' | | 20 | 100/3" | 8 | ss | 0 | -- | Plug 2.0'-surfa Standpipe |

HANSON ENGINEERS INCORPORATED

## MONITORING WELLS

M-1

ELEVATION 456.5

PIPE & SCREEN

| | |
|---|---|
| 7' pipe | 459.5 - 452.5 |
| 5' screen | 452.5 - 447.5 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 456.5 - 455.0 |
| bentonite seal | 455.0 - 453.5 |
| 1/8" gravel pack | 453.5 - 447.4 |

M-2

ELEVATION 453.3

PIPE & SCREEN

| | |
|---|---|
| 8' pipe | 456.3 - 448.3 |
| 13' screen | 448.3 - 435.3 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 453.3 - 451.3 |
| bentonite seal | 451.3 - 449.3 |
| 1/8" gravel pack | 449.3 - 431.8 |

HANSON ENGINEERS INCORPORATED

## MONITORING WELLS

M-3

ELEVATION 452.1

PIPE & SCREEN

| | |
|---|---|
| 7.9' pipe | 455.6 - 447.7 |
| 5' screen | 447.7 - 442.7 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 452.1 - 450.1 |
| bentonite seal | 450.1 - 448.1 |
| 1/8" gravel pack | 442.7 - 448.1 |

M-4

ELEVATION 454.4

PIPE & SCREEN

| | |
|---|---|
| 8' pipe | 457.4 - 449.4 |
| 7.5' screen | 449.4 - 441.9 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 454.4 - 452.4 |
| bentonite seal | 452.4 - 450.4 |
| 1/8" gravel pack | 450.4 - 441.0 |

HANSON ENGINEERS INCORPORATED

## MONITORING WELLS

M-5

ELEVATION 452.3

PIPE & SCREEN

| | |
|---|---|
| 8' pipe | 455.3 - 447.3 |
| 13' screen | 447.3 - 434.3 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 452.3 - 450.3 |
| bentonite seal | 450.3 - 448.3 |
| 1/8" gravel pack | 448.3 - 433.1 |

M-6

ELEVATION 438.9

PIPE & SCREEN

| | |
|---|---|
| 10' pipe | 443.9 - 433.9 |
| 6.4' screen | 433.9 - 427.5 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 438.9 - 436.9 |
| bentonite seal | 436.9 - 434.9 |
| 1/8" gravel pack | 434.9 - 427.5 |

HANSON ENGINEERS INCORPORATED

## MONITORING WELLS

M-7

ELEVATION 437.9

PIPE & SCREEN

| | | |
|---|---|---|
| 20' | pipe | 442.9 - 422.9 |
| 10' | screen | 422.9 - 412.9 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 437.9 - 435.9 |
| bentonite & auger cutting | 435.9 - 425.9 |
| bentonite seal | 425.9 - 423.9 |
| 1/8" gravel pack | 423.9 - 412.9 |

M-8

ELEVATION 439.4

PIPE & SCREEN

| | | |
|---|---|---|
| 21.4' | pipe | 444.3 - 422.9 |
| 5.0' | screen | 422.9 - 417.9 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 439.4 - 437.4 |
| bentonite & auger cutting | 437.4 - 425.9 |
| bentonite seal | 425.9 - 423.9 |
| 1/8" gravel pack | 423.9 - 417.9 |

HANSON ENGINEERS INCORPORATED

## MONITORING WELLS

M-9

ELEVATION 452.0

PIPE & SCREEN

| | | |
|---|---|---|
| 11.5' | pipe | 455.0 - 443.5 |
| 10' | screen | 443.5 - 433.5 |

BACKFILL MATERIALS

| | |
|---|---|
| concrete grout collar | 452 - 450 |
| bentonite, cement & sand | 450 - 446 |
| bentonite seal | 446 - 444 |
| 1/8" gravel pack | 444 - 433.2 |

# Appendix A-4

## Hanson 1984b Boring Logs

CENTRAL ILLINOIS DRILLING COMPAN
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-1
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION 0 + 80 CENTERLINE
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-24-84 COMPLETED 7-24-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Brn. silty f. sand, wf. occas. organic fibers fill dry | 1.1 | | | | | | | |
| | Gray-brn. sandy silt wf. occas. f. gravel fill moist | 3.3 | | 3-4-4 | 1 | ss | 13" | 4.5+ | |
| | Gray-brn. f-c silty sand wf. f-c gravel fill very moist | 4.9 | 5 | 3-3-4 | 2 | ss | 17 | 2.0 | WATER 7-24-84 DD 4.0 10:20am BAR surface 0.0 3:45pm AAR 3.5 3:55pm |
| | Brn. f. sand wf. sandstone moist | 5.6 | | 21-33-67/3/1/2 | 3 | ss | 16 | 4.5+ | |
| | Lt. brn. brn. silty f. sand, wf. tr. sandstone occas. mica specks | 8.2 | | | | | | | |
| | Blue gray f. sand, wf. tr. silt, tr. sandstone, occas. brn. mottling wet | 10.8 | 10 | 45-18-82/4/1/2 | 4 | ss | 17 | -- | Packer pressure test ran at 9.0 & below within HSA & core hole wf. nitrogen & water. To meas permeability 11 16.5. Packer permeability te in 2nd 5' core hole 16.5-21.5. |
| | Gray sandstone moist | 15.3 | 15 | 100/4/1/2 | 5 | ss | 5" | -- | |
| | | | | ----- | 6 | NX | 59/1/2 | 4.5+ | |
| | Gray sandstone, wf. blk. coal seams | | 20 | | | | | | |

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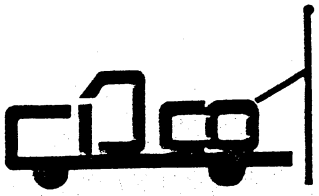

# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-1
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-24-84 COMPLETED 7-24-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | moist | 21.5 | | ----- | 2 | NX | 60" | 4.5+ | |
| | END OF BORING 21.5' | | - | | | | | | |
| | | | - | | | | | | |
| | | | - | | | | | | |
| | | | 25 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-2
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-24-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Blk. sandy cinders fill moist | 0.8 | | | | | | | |
| | Brn. silty sand, wf. f-m gravel, occas. blue gray silty sand pockets fill moist | 2.4 | | 3-3-2 | 1 | ss | 15" | 2.5 | |
| | Reddish brn. silty f-c sand, wf. f-m gravel fill moist | 5.6 | 5 | 4-3-3 | 2 | ss | 18 | -- | WATER 7-24-84 & 7-25-84 |
| | Brn. m-c sand, wf. occas. f. gravel wet | | | 1-2-2 | 3 | ss | 17 | -- | DD 6.5 4:20pm BAR 6.0 8:20am AAR 6.0 8:45am |
| | | | 10 | 1-1-2 | 4 | ss | 17 | -- | |
| | | 13.1 | | 3-4-5 | 5 | ss | 16 | -- | |
| | Brn. f-m sand, wf. occas. f. gravel wet | 15.4 | 15 | 5-7-10 | 6 | ss | 18 | -- | |
| | Brn. m-c sand, wf. f-m gravel wet | 17.5 | | 5-10-14 | 7 | ss | 17 | -- | |
| | Gray silty clay, wf. tr. f. sand, occas. f. gravel, wood, | | 20 | 8-11-20 | 8 | ss | 18 | 4.5+ | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. SW-2
PROJECT NAME PROPOSED FLYASH DISPOSAL POND — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"/
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 7-24-84 — COMPLETED 7-24-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | branches<br>till mcist | | | 6-10-13 | 9 | ss | 18" | 4.5+ | |
| | ~~Blue gray sandstone~~<br>wf. f. sand moist | 24.6<br>25.5 | 25 | 2-11-20 | 10 | ss | 18 | 4.5+ | |
| | Blue gray f-m sand, wf. occas. f. gravel, tr. sandstone, silt<br>wet | | | 7-7-10 | 11 | ss | 18 | -- | |
| | | | 30 | 8-11-16 | 12 | ss | 18 | -- | Clay wf. c gravel 33.5-33.8 |
| | ~~Olive brn. sandstone~~<br>moist | 31.0<br>31.9 | | | | | | | |
| | Blk. gray cemented gravel<br>moist | 34.1 | | | | | | | |
| | White dk. gray limestone<br>moist | 36.0 | 35 | ----- | 13 | NX | 55 | -- | |
| | END OF BORING 36.0' | | | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. SW-2A
PROJECT NAME PROPOSED FLYASH DISPOSAL POND — CONTRACT NO.
LOCATION 50.0' W. OF SW-2
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"/NX
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 7-25-84 — COMPLETED 7-25-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Blk. f. sand, wf. cinders f-m gravel, gray silt, organic fibers fill | 0.9 | | | | | | | |
| | Brn. f. sand, wf. occas. f. gravel, tr. silt fill moist | 3.1 | | | | | | | |
| | Brn. silty f. sand, wf. occas. f-m gravel fill moist | 5.9 | 5 | | | | | | WATER 7-25-84 DD 6.0 8:55am BAR 6.0 10:00am AAR 6.0 10:10am |
| | Brn. f-c sand,, wf. f-m gravel wet | 13.5 | 10 | | | | | | Coal seam 32.0-32.1 |
| | Brn. f-c sand, occas. f. gravel wet | 17.2 | 15 | | | | | | |
| | Gray silty clay,, wf. tr. f. sand, occas. f. gravel | | 20 | | | | | | |

# LOG OF BORING

CENTRAL ILLINOIS DRILLING COMPA
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CONTRACTED WITH HANSON ENGINEERS
PROJECT NAME PROPOSED FLYASH DISPOSAL POND — BORING NO. SW-2A
LOCATION 50.0' W. OF SW-2 — CONTRACT NO.
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"/NX
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 7-25-84 — COMPLETED 7-25-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | till moist | 0.0 | 30 | | | | | | |
| | | 21.6 | | | | | | | |
| | Gray silty clay, wf. sandstone, tr. shale occas. wood | | | | | | | | |
| | | | 25 | ------ | 1 | NX | 30" | -- | |
| | moist | | | | | | | | |
| | | 27.4 | | | | | | | |
| | Gray sandstone wf. occas. blk. coal seams | | | | | | | | |
| | moist | | | | | | | | |
| | | | 30 | ------ | 2 | NX | 59 | -- | |
| | | 31.3 | | | | | | | |
| | Wh. limestone wf. cemented gravel, tr. coal seams moist | 32.1 | | | | | | | |
| | END OF BORING 32.1' | | | | | | | | |
| | | | 35 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-2B
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION 50.0' E. OF SW-2
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-25-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | | |
| | Blk. silty sand, wf. cinders occas. f. gravel, organic fibers fill dry | 1.7 | | | | | | | | |
| | Brn. silty f. sand, wf. occas. f. gravel fill moist | 3.5 | | | | | | | | |
| | Reddish brn. f. sand, wf. f. gravel fill moist | 5.6 | 5 | | | | | | | |
| | Brn. m-c sand, wf. f-m gravel wet | | | | | | | | | WATER 7-25-84<br>DD 6.0 10:25am<br>BAR 6.0 11:20am<br>AAR 6.0 11:50am<br>Sm. cobbles 15.3-15.7 |
| | | | 10 | | | | | | | |
| | | 15.7 | 15 | | | | | | | |
| | Gray silty clay, wf. tr. f. sand, occas. f. gravel | | | | | | | | | |
| | | | 20 | | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-2B
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION 50.0' E. OF SW-2
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8" ?NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-25-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | till moist | 23.5 | | | | | | | |
| | Blue-gray sandstone wf. occas. brn. mottling wood wet | 26.2 | 25 | | | | | | |
| | Gray sandstone wf. blk. coal seams moist | 27.8 | | | | | | | |
| | Gray brn. sandstone moist | 29.4 | | | | | | | |
| | Gray sandstone wf. blk. coal seams moist | 31.5 | 30 | ----- | 1 | NX | 59" | -- | |
| | END OF BORING 31.5' | | 35 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-3
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-25-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Lt. brn. f. sand dry | 0.8 | | | | | | | |
| | Reddish brn. f. sand wf. occas. f. gravel dry | 3.1 | | 3-4-3 | 1 | ss | 18" | -- | |
| | Reddish brn. silty f. sand very moist | 2.4 | 5 | 3-4-5 | 2 | ss | 18 | -- | WATER 7-25-84<br>DD 5.5 11:45am<br>BAR 6.5 2:45pm<br>AAR 6.5 3:05pm |
| | | | | 2-3-4 | 3 | ss | 18 | -- | |
| | Brn. m-c sand, wf. f-m gravel wet | 10.6 | 10 | 2-2-2 | 4 | ss | 17 | -- | Water loss 13.6-18.6 |
| | Brn. f. sand, wf. occas. f. gravel wet | 13.3 | | 3-4-8 | 5 | ss | 12 | -- | |
| | Tan lt. gray sandstone moist | 15.6 | 15 | | | | | | |
| | Brn. sandstone moist | 18.6 | | ----- | 6 | NX | 60 | -- | |
| | Tan & brn. sandstone | | 20 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-3
PROJECT NAME PROPOSED FLYASH DISPOSAL POND CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-25-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | | |
| | moist | 23.6 | | ----- | 7 | NX | 60" | -- | | |
| | | | 25 | | | | | | | |
| | END OF BORING 23.6' | | | | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-4
PROJECT NAME PROPOSED FLY ASH DISPOSAL POND CONTRACT NO.
LOCATION +16 + 00
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-25-84 COMPLETED 7-25-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Lt. brn. f. sand, wf. silt fill dry | 1.4 | | | | | | | |
| | Reddish brn. silty sand, wf. occas. f. gravel | | | 4-3-3 | 1 | ss | 17" | 1.5 | |
| | fill moist | 4.3 | | | | | | | |
| | Lt. brn. brn. sandy silt wet | 5.6 | 5 | 2-2-2 | 2 | ss | 18 | -- | |
| | Brn. m-c sand | | | | | | | | WATER 7-25-84 |
| | wet | 7.9 | | 3-3-4 | 3 | ss | 18 | -- | DD 4.0 3:25pm |
| | Brn. f-m gravel, wf. m-c sand wet | 9.7 | | | | | | | BAR 3.0 5:45pm |
| | Lt. reddish sandstone moist | 10.9 | 10 | 1-2-25 | 4 | ss | 17 | -- | AAR 4.5 7:20pm |
| | Lt. brn. sandstone | | | 100/3" | 5 | ss | 3 | -- | Permeability pack pressure test ran at 13.5' wf. wate & nitrogen in rock core hole |
| | moist | | | ----- | 6 | NX | 56 | -- | |
| | | | 15 | | | | | | |
| | | 17.9 | | ----- | 7 | NX | 40 | -- | |
| | Gray sandstone wf. blk. coal seams moist | 19.6 | | | | | | | |
| | | | 20 | | | | | | |
| | END OF BORING 19.6' | | | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. SW-5
PROJECT NAME PROPOSED FLYASH DISPOSAL POND — CONTRACT NO.
LOCATION 8 + 50 PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8" /NX
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 7-26-84 — COMPLETED 7-26-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Lt. brn. silty sand, wf. organic fibers | | | | | | | | |
| | ~~fill dry~~ | 1.8 | | | | | | | |
| | Brn. f-m gravel, wf. f-c sand, tr. silt | | | 5-7-7 | 1 | ss | 17" | -- | |
| | ~~fill dry~~ | 3.6 | | | | | | | |
| | Reddsih brn. m-c sand, wf. occas. f. gravel tr. silt fill | 5.5 | 5 | 5-4-7 | 2 | ss | 18 | -- | |
| | Gray brn. m-c sand, wf. occas. f. gravel wet | 6.9 | | | | | | | WATER 7-26-84 |
| | Reddish lt. brn. sandstone moist | | | 3-11-53 | 3 | ss | 18 | -- | DD 6.0 7:40am<br>BAR 2.0 10:20am<br>AAR 2.5 10:25am |
| | | | | ----- | 4 | NX | 9 | -- | |
| | ~~Gray sandstone wf. blk.~~ | 9.1 | | | | | | | |
| | coal bands moist | 9.8 | | | | | | | |
| | | | 10 | | | | | | |
| | Gray sandstone wf. occas. blk. coal seams | | | | | | | | |
| | moist | | | ----- | 5 | NX | 58 | -- | Permeability packer pressure test ran at 9.5' wf. water & nitrogen in 1st rock core hole. Also permeability test at 12.8' in 2nd core hole |
| | | | 15 | | | | | | |
| | | | | ----- | 6 | NX | 62 | -- | |
| | | 18.5 | | | | | | | |
| | END OF BORING 18.5' | | 20 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-6
PROJECT NAME PROPOSED FLY ASH DISPOSAL POND CONTRACT NO.
LOCATION 8 + 50 PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-26-84 COMPLETED 7-26-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | Brn. sand, silt wf. ~~clas.~~ organic fibers fill | 0.8 | | | | | | | |
| | Tan brn. silty clay, wf. f-c sand, f-m gravel | | | 3-3-5 | 1 | ss | 18" | 2.5 | |
| | fill very moist | 4.8 | 5 | 3-5-8 | 2 | ss | 17 | 0.5 | |
| | Brn. sandstone ~~moist~~ | 5.9 | | | | | | | |
| | Reddish brn. sandstone moist | 8.1 | | 25-45-55/4" | 3 | ss | 16 | -- | Water 7-26-84 |
| | Lt. brn. sandstone moist | 11.5 | 10 | 24-30-48 | 4 | ss | 18 | -- | DD 4.0 10:35am<br>BAR 6.0 1:00pm<br>AAR 5.5 1:15pm<br>Bag Sampled<br>#1 0.5-1.0<br>#2 1.0-2.0 |
| | Reddish brn. sandstone tr. coal seams moist | 13.2 | | ----- | 5 | NX | 49 | -- | |
| | ~~Gray sandstone wf.~~ occas. coal seams | 14.0 | | | | | | | |
| | END OF BORING 14.0 | | 15 | | | | | | |
| | | | 20 | | | | | | |

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# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. SW-7
PROJECT NAME PROPSED FLY ASH DISPOSAL POND CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"/NX
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 7-26-84 COMPLETED 7-26-84 DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | | |
| | Brn. sandy silt fill moist | 1.5 | | | | | | | | |
| | Lt. brn. silty f. sand moist fill | 3.4 | | | | | | | | |
| | Reddish brn. silty f-m sand, occas. f. gravel wet | | 5 | | | | | | | |
| | | | 10 | | | | | | | WATER 7-26-84 DD 3.5 1:20pm BAR 1.5 3:35pm AAR 3.0 3:45pm |
| | Gray silty clay, wf. tr. f. sand, occas. f. gravel till moist | 12.3 13.6 | | | | | | | | |
| | Gray sandstone wf. blk. coal seams moist | 15.7 | 15 | ----- | 1 | NX | 59" | -- | | Bag Sampled 0.5-1.0 |
| | Gray sandstone wf. tr. blk. coal seams | | 20 | | | | | | | 3 soft rock laye: 17.5-22.5 Ran permeability packer pressure test at 18.5' in 2nd rock core run 17.5-22.5 |

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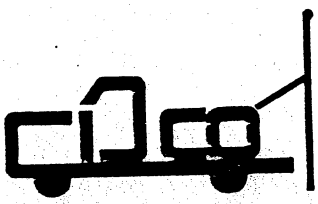


# LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. SW-7
PROJECT NAME PROPOSED FLY ASH DISPOSAL POND — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"/NX
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 7-26-84 — COMPLETED 7-26-84 — DRILLING METHOD HSA

| ELEV. | DESCRIPTION | STRATA DEPTH | DEPTH SCALE | SAMPLES BLOWS FT. | NO. | TYPE | RECOV. | QP | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | | 0.0 | 30 | | | | | | |
| | moist | 22.5 | | ----- | 2 | NX | 60" | -- | |
| | END OF BORING 22.5' | | | | | | | | |
| | | | 25 | | | | | | |

# Appendix A-5

## STMI 1998 Boring Logs

| Project Name/No. | Boring No. | Start Date | Page |
|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | GP-1 | 8/25/98 | 1 |

| Driller | Logged by: | End Date | Depth to Water |
|---|---|---|---|
| AEC, Indianapolis, IN | Steve Mueller/STMI | 8/25/98 | 16.8 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 17.3 Feet | 2.2 Inches | 459.8 Feet | Geoprobe | 3585.650 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4366.050 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | Coal Ash | ASH, silty texture, trace coal fragments, dark gray, moist (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 100 | | SP | SAND, well sorted/rounded, medium-grained, quartz, trace silt, trace coarse subangular sand of non-quartz lithology, light brown, moist (Fill) | | |
| | na | 10 | 100 | | CL | SILTY CLAY, roots in top 1 foot, trace to little coarse sand to fine subangular gravel, olive gray to brown, moist | | |
| | na | | 75 | | SM | SILTY SAND, fine- to medium-grained, trace fine gravel, dark gray, moist | | |
| | na | 15 | 100 | | SC | CLAYEY SAND, fine- to medium-grained, trace fine gravel, light gray, saturated | | insufficient water, no sample collected |
| | | 20 | | | | END OF BORING - 17.3 feet (bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-2 | 8/25/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/25/98 | 9 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 20.0 Feet | 2.2 Inches | 457.3 Feet | Geoprobe | 3753.193 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4610.447 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 87.5 | | Coal Ash | ASH, silty texture, trace cinder gravel, olive to dark gray, moist (Fill) | | Geoprobe boring, no well installed |
| | | 5 | | | SP | SAND, well sorted/rounded, medium-grained, quartz, light brown, moist, with little gravel, mottled olive gray & light brown below 3.5 ft. (Fill) | | |
| | na | | 100 | | | ASH, silty texture, trace coal fragments and cinder gravel, coarsens below 12 ft., saturated below 9 ft. (Fill) | | |
| | na | 10 | 100 | | Coal Ash | | | |
| | na | | 100 | | | | | |
| | | 15 | | | Coal Ash | ASH & SAND, coarse sand-size ash granules, coarse-grained quartz sand, trace cinder pebbles (1/2-1"), black, saturated (Fill) | | |
| | na | | 100 | | SW-GW | CLAYEY SAND & GRAVEL, poorly sorted/subrounded, fine- to coarse-grained sand, fine-grained gravel, yellow orange, moist | | Groundwater sample collected from 15-19 ft. bgs. |
| | | 20 | | | | END OF BORING - 20.0 feet (Bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-3 | 8/25/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/25/98 | 11 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 16.0 Feet | 2.2 Inches | 459.3 Feet | Geoprobe | 3924.268 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4092.856 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | SM | SILTY SAND, fine-grained, yellow orange, damp (Fill) | | Geoprobe boring, no well installed |
| | | | | | Coal Ash | ASH, silty texture, olive gray, wet below 3 ft. (Fill) | | |
| | na | 5 | 100 | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, light brown, moist (Fill) | | |
| | | | | | Coal | COAL, sand/gravel size, black, damp (Fill) | | |
| | na | 10 | 100 | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, light brown, saturated below 11 ft. | | |
| | na | | 100 | | SW-GW | SAND & GRAVEL, poorly sorted, fine- to medium-grained, quartz sand, fine-grained subangular gravel, light brown, saturated | | Groundwater sample collected from 12-16 ft. bgs. |
| | | 15 | | | | END OF BORING - 16.0 feet (Bedrock) | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-4 | 8/25/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/25/98 | 10 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 17.0 Feet | 2.2 Inches | 459.4 Feet | Geoprobe | 3950.707 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4220.706 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 68.8 | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, little ash cinder gravel 0-1 ft, light brown, moist (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 81.2 | | | SAND, well sorted/rounded, fine- to medium-grained, quartz, dark brown 5.5-7 ft (old ground surface), light brown below, saturated below 10 ft. | | |
| | na | 10 | 87.5 | | SP | | | |
| | na | | 56.2 | | | | | Groundwater sample collected from 12-16 ft. bgs. |
| | na | 15 | 100 | | SW-GW | CLAYEY SAND & GRAVEL, poorly sorted, fine- to coarse-grained sand, fine-grained subanguler gravel, light brown, saturated | | |
| | | 20 | | | | END OF BORING - 17.0 feet (Bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-5 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 6 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 11.25 Feet | 2.2 Inches | 453.2 Feet | Geoprobe | 3917.782 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3858.831 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | SM | SILTY SAND, silty topsoil with grass 0-1/2 ft, piece of concrete, 1-in coal-rich layer at 1.75 ft, brown, moist (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 100 | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, trace to little coarse subangular to subround sand, light brown, saturated below 6 ft. | | |
| | na | 10 | 100 | | SW-GW | SILTY SAND & GRAVEL, poorly sorted, medium- to coarse-grained subrounded sand, fine-grained subanguler to subround gravel, light gray, saturated | | Groundwater sample collected from 7-11 ft. bgs. |
| | | 15 | | | | END OF BORING - 11.25 feet (Bedrock) | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-6 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 6 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 10.5 Feet | 2.2 Inches | 453.0 Feet | Geoprobe | 3981.359 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3754.280 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 62.5 | | SM | SILTY SAND, fine- to medium-grained, silty topsoil with grass 0-1/2 ft, little gravel, little coal fragments 2-2.25 ft, glass fragements, dark brown, moist (Fill) | | Geoprobe boring, no well installed |
| | | 5 | | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, light brown, moist | | |
| | na | | 100 | | SW | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, light brown, saturated below 6 ft. | | |
| | na | 10 | 100 | | | | | Groundwater sample collected from 6-10 ft. bgs. |
| | | | | | | END OF BORING - 10.5 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-7 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 4 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 18.0 Feet | 2.2 Inches | 452.0 Feet | Geoprobe | 4151.460 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3511.572 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 75 | | SM | SILTY SAND, fine- to medium-grained, silty topsoil with grass 0-1/2 ft, little gravel, dark brown, moist (Fill) | | Geoprobe boring, no well installed |
| | | | | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, light brown, moist | | |
| | na | 5 | 50 | | | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, light brown, saturated below 4 ft. | | |
| | na | 10 | 100 | | SW | | | Groundwater sample collected from 6-10 ft. bgs. |
| | na | 15 | 100 | | | | | |
| | na | | 100 | | ML | CLAYEY SILT, very stiff to hard, nonplastic, trace angular to subangular coarse sand to fine gravel, olive gray, moist | | |
| | | 20 | | | | SANDSTONE, fine-grained, quartz, friable, light green<br>END OF BORING - 18.0 feet (Bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | Boring No. | Start Date | Page |
|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | GP-8 | 8/26/98 | 1 |

| Driller | Logged by: | End Date | Depth to Water |
|---|---|---|---|
| AEC, Indianapolis, IN | Steve Mueller/STMI | 8/26/98 | Est. 4 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 16.0 Feet | 2.2 Inches | 451.3 Feet | Geoprobe | 4262.600 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 2-ft split-spoon | 3380.239 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | SM | SILTY SAND, fine- to medium-grained, silty topsoil with grass 0-3/4 ft, little gravel, dark brown, moist (Fill) | | Geoprobe boring, no well installed |
| | | | | | ML | CLAYEY SILT, plant stem fragments and trace coal particles at top, black, moist (topsoil) | | |
| | na | 5 | 100 | | CL | SILTY CLAY, stiff, medium plasticity, fine vertical roots, little to some medium to coarse sand, trace subangular fine gravel, mottled light brown & gray, moist, estimated water level at 4 ft. | | |
| | na | 10 | 100 | | SW | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, light brown, saturated | | No groundwater sample collected; geology boring only |
| | na | 15 | 100 | | CL | SILTY CLAY, stiff, medium plasticity, sandstone pebble, light to greenish gray, moist | | |
| | | 20 | | | | END OF BORING - 16.0 feet (Bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-9 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 7 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 21.0 Feet | 2.2 Inches | 453.4 Feet | Geoprobe | 4306.991 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4990.027 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 50 | | ML | SILT, vegetated with grass, brown, dry (Topsoil) | | |
| | | | | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, trace coal fragments at top, trace coarse sand, light brown, moist | | Geoprobe boring, no well installed |
| | na | 5 | 56.2 | | | | | |
| | | | | | | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, pale brown, saturated | | |
| | na | 10 | 100 | | | | | Groundwater sample collected from 8-12 ft. bgs. |
| | na | | 100 | | SW | | | |
| | | 15 | | | | | | |
| | na | | 100 | | | | | |
| | na | 20 | 100 | | | | | |
| | | | | | | END OF BORING - 21.0 feet (Bedrock) | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-10 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 6 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 14.25 Feet | 2.2 Inches | 453.8 Feet | Geoprobe | 4778.861 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4700.947 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | Coal | COAL, sand/gravel size, black, damp (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 75 | | SP | SAND, well sorted/rounded, fine-grained, quartz, some silt 2.5-3.5 ft, light brown, saturated below 6 ft. | | |
| | na | 10 | 50 | | SW | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, grade to well sorted medium to coarse sand below 13 ft, light brown, saturated | | Groundwater sample collected from 8-12 ft. bgs. |
| | na | | 100 | | | END OF BORING - 14.25 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-11 | 8/26/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/26/98 | 5 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 13.0 Feet | 2.2 Inches | 452.5 Feet | Geoprobe | 4534.018 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4398.796 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | Coal | COAL, sand/gravel size, black, damp (Fill) | | |
| | na | | 87.5 | | SM | SILTY SAND, fine- to medium-grained, quartz, trace coarse-grained, light brown, moist (Fill) | | Geoprobe boring, no well installed |
| | | 5 | | | SP | SAND, well sorted/rounded, fine- to medium-grained, quartz, light brown, saturated below 5 ft. | | |
| | na | | 68.8 | | SW | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, light brown, saturated | | |
| | na | 10 | 100 | | | | | Groundwater sample collected from 6-10 ft. bgs. |
| | na | | 100 | | | END OF BORING - 13.0 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-12 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | 4 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 9.5 Feet | 2.2 Inches | 450.8 Feet | Geoprobe | 4324.544 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 4346.394 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 0 | 62.5 | | Coal | COAL, silty texture, soft, black, wet (coal pile runoff sediment) | | |
| | | | | | | SAND, well sorted/rounded, quartz, fine- to medium-grained grading to coarse-grained below 8 ft, light brown, saturated and pale brown below 4 ft. | | Geoprobe boring, no well installed |
| | na | 5 | 50 | | SP | | | Groundwater sample collected from 5-9 ft. bgs. |
| | na | | 100 | | | | | |
| | | 10 | | | | END OF BORING - 9.5 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-13 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | 4 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 10.0 Feet | 2.2 Inches | 447.0 Feet | Geoprobe | 2693.143 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3353.985 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 50 | | ML | SILT, sandy, clayey, trace to little gravel, vegetated with farm crops, brown, moist (Topsoil) | | Geoprobe boring, no well installed |
| | na | 5 | 62.5 | | SP | SAND, poorly sorted, fine- to coarse-grained, subanguler to subround, trace to little gravel, light brown, saturated | | |
| | na | | 100 | | ML | CLAYEY SILT, very stiff to hard, nonplastic, trace root/stem fragments, trace angular to subangular coarse sand to fine gravel, greenish to olive gray, moist | | Groundwater sample collected from 5-9 ft. bgs. |
| | | 10 | | | | END OF BORING - 10.0 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-14 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 10 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 40.0 Feet | 2.2 Inches | 439.9 Feet | Geoprobe | 1104.830 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 5752.447 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 87.5 | | | CLAYEY SILT, increasing clay content with depth from trace near surface, medium plasticity, stiff above 10 ft to soft below, brown, saturated below ~10 ft | | Geoprobe boring, no well installed |
| | na | 5 | 87.5 | | | | | |
| | na | 10 | 100 | | ML | | | |
| | na | | 100 | | | | | |
| | na | 15 | 100 | | | | | |
| | | 20 | | | | Drove sampler point to 40 ft. Noted increased resistance to penetration at ~25 ft and ~30 ft, but no soil recovery using 2-ft discrete sampler at 26-28 ft. | | |
| | na | 25 | 0 | | | | | Partial groundwater sample (~50% volume) collected from 28-32 ft. bgs. |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-15 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 4 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 18.0 Feet | 2.2 Inches | 449.8 Feet | Geoprobe | 2790.223 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3212.610 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5, 10, 15, 20, 25, 30 | ns | | ML/SM | TOPSOIL/SAND/SILT materials similar to GP-13. | | Geoprobe boring, no well installed. Groundwater sample collected from 8-12 ft. bgs. |
| | | | | | ML/CL | CLAY/SILT materials similar to GP-13, based on increased resistance to penetration. | | |
| | | | | | | END OF BORING - 18.0 feet (Bedrock) | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-16 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 4 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 28.0 Feet | 2.2 Inches | 453.7 Feet | Geoprobe | 2886.789 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3064.602 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5, 10, 15, 20, 25, 30 | ns | | ML/SM | TOPSOIL/SAND/SILT materials similar to GP-13. | | Geoprobe boring, no well installed. Groundwater sample collected from 8-12 ft. bgs. |
| | | | | | ML/CL | CLAY/SILT materials similar to GP-13, based on increased resistance to penetration. | | |
| | | | | | | END OF BORING - 28.0 feet (Bedrock) | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-17 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 4 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 12.0 Feet | 2.2 Inches | 445.6 Feet | Geoprobe | 2582.997 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3541.335 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5 | ns | | ML/SM | TOPSOIL/SAND/SILT materials similar to GP-13. | | Geoprobe boring, no well installed. Groundwater sample collected from 4-8 ft. bgs. |
| | | 10 | | | ML/CL | CLAY/SILT materials similar to GP-13, based on increased resistance to penetration. | | |
| | | | | | | END OF BORING - 12.0 feet (Bedrock) | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-18 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 4 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 23.75 Feet | 2.2 Inches | 446.0 Feet | Geoprobe | 2488.262 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 3677.480 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5, 10, 15, 20, 25, 30 | ns | | ML/SM | TOPSOIL/SAND/SILT materials similar to GP-13. | | Geoprobe boring, no well installed. Groundwater sample collected from 8-12 ft. bgs. |
| | | | | | ML/CL | CLAY/SILT material similar to GP-13, based on increased resistance to penetration. | | |
| | | | | | | END OF BORING - 23.75 feet (Bedrock) | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-19 | 8/27/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/27/98 | Est. 10 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 40.0 Feet | 2.2 Inches | Feet | Geoprobe | |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | not sampled | |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5, 10, 15, 20, 25, 30 | ns | | ML/ CL | CLAY/SILT materials similar to GP-14.<br><br>Increased resistance to penetration at ~18 ft. Attempted groundwater sample collection at 20-24 ft and 28-32 ft., but no yield.<br><br>END OF BORING - 32.0 feet | | Geoprobe boring, no well installed. No groundwater samples; insuffient yield. |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-20 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/28/98 | 3 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 21.0 Feet | 2.2 Inches | 450.7 Feet | Geoprobe | 3805.064 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 5099.419 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | | ASH, silty texture, soft, dark gray, ~3/4-ft layer of cinder gravel at 9 ft, saturated below 3 ft (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 100 | | | | | |
| | na | 10 | 100 | | Coal Ash | | | |
| | na | 15 | 50 | | | | | |
| | na | | 100 | | | | | Groundwater sample collected from 17-21 ft. bgs. |
| | na | 20 | 100 | | CL | SILTY CLAY, trace coarse sand, trace fine subangular to subround gravel, stiff, medium plasticity, mottled yellow orange & light gray, moist | | |
| | | 25 | | | | END OF BORING - 21.0 feet (Bedrock) | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-21 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/28/98 | 3 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 36.5 Feet | 2.2 Inches | 450.7 Feet | Geoprobe | 3593.599 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 5239.017 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 100 | | | ASH, silty texture, soft, dark gray,saturated below 3 ft (Fill) | | Geoprobe boring, no well installed |
| | na | 5 | 50 | | | | | |
| | na | 10 | 0 | | Coal Ash | | | |
| | na | 15 | 0 | | | | | |
| | na | | 0 | | | | | Groundwater sample collected from 18-22 ft. bgs. |
| | na | 20 | 50 | | | | | |
| | na | 25 | 50 | | CL | SILTY CLAY, stiff, medium plasticity, brown, moist | | |
| | | 30 | | | CL | SILTY CLAY (estimated based on resistance to penetration)<br>END OF BORING - 36.5 feet (Bedrock) | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-22 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/28/98 | >11.5 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 11.5 Feet | 2.2 Inches | 458.7 Feet | Geoprobe | 4373.353 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 5285.420 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 81.2 | | ML | SANDY SILT, fine sand, vegetated with grass, brown, moist (Topsoil) | | Geoprobe boring, no well installed |
| | na | 5 | 100 | | Coal Ash | ASH, silty to very fine-grained texture, trace fine cinder gravel, coarsens below 8 ft, dark gray, moist with wet interval 6-7 ft (Fill) | | |
| | na | 10 | 100 | | Coal Ash | ASH, coarse sand to fine gravel size, some silt, several 1/4-5/8" pyrite pebbles | | No groundwater sample collected; no water in sampler. |
| | | 15 | | | | END OF BORING - 11.5 feet (Bedrock) | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | GP-23 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 8/28/98 | 7 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 34.0 Feet | 2.2 Inches | 460.7 Feet | Geoprobe | 4203.035 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | 4-ft Macro-Core | 5272.661 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | | 93.8 | | SM | SILTY SAND, fine-grained, quartz, trace to little clay, fine sand, vegetated with grass, yellow orange, moist (Fill) | | Geoprobe boring, no well installed |
| | | | | | | ASH, silty to very fine-grained texture, trace cinder gravel up to 1/2", coarsens below 13.5 ft, dark gray, wet below 7 ft (Fill) | | |
| | na | 5 | 100 | | Coal Ash | | | |
| | na | 10 | 100 | | | | | |
| | na | | 100 | | | ASH, coarse sand to fine gravel size, some silt | | |
| | | 15 | | | Coal Ash | | | |
| | na | | 100 | | | | | Groundwater sample collected from 18-22 ft. bgs. |
| | | 20 | | | CL | SILTY CLAY, stiff, medium plasticity, dark olive green, moist | | |
| | na | | 100 | | | ASH (same as 13.5-19.8 ft). Increased resistance to penetration at 31 ft. | | |
| | | 25 | | | Coal Ash | | | Jammed liner in Macro-Core sampler; used 1-in I.D. by 2-ft, piston-tip discrete sampler to collect soil sample near bedrock surface. |
| | | 30 | | | | | | |
| | na | | 100 | | SP | SILTY SAND, well sorted/rounded, fine-grained, quartz, yellow orange to light brown, saturated. Top 2-3" were light olive green, indicating proximity of ash bottom. | | |
| | | | | | | END OF BORING - 34.0 feet (Bedrock) | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | LP-1 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| STMI | Steve Mueller/STMI | | 8/28/98 | 0.25 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 7.3 Feet | 2.37 Inches | 465.9 Feet | Hand-driven | 4405.098 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | not sampled | 3961.179 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5 | na | | Coal Ash | ASH, silty to very fine-grained texture, wet below 0.25 ft (Fill) | | Temporary well-point with filter sock installed, leachate sample collected from 3.3-7.3 ft. |
| | | 10 | | | | END OF BORING - 7.3 feet | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | Removed well point 8/28/98 |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville Plant 249.03 | | LP-2 | 8/28/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| STMI | Steve Mueller/STMI | | 8/28/98 | 0.25 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 8.0 Feet | 2.37 Inches | 466.24 Feet | Hand-driven | 4502.022 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| na | na | na | not sampled | 3815.305 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | na | 5 | na | | Coal Ash | ASH, silty to very fine-grained texture, wet below 0.25 ft (Fill) | | Temporary well-point with filter sock installed, leachate sample collected from 4.0-8.0 ft. |
| | | 10 | | | | END OF BORING - 8.0 feet | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | Removed well point 8/28/98. |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-3D | 10/6/98 | 1 |

| Driller | Logged by: | End Date | Depth to Water |
|---|---|---|---|
| AEC, Indianapolis, IN | Steve Mueller/STMI | 10/6/98 | ~6 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 25.5 Feet | 8* Inches | 453.7 Feet | HSA/air-rotary | 3860.230 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 25.1 Feet | 2-in I.D. | 455.28 Feet | 2-ft. split-spoon | 3952.034 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | 1, 2, 3, 6 | | 75 | | ML | SANDY SILT, little fine-grained gravel, trace coal fragments, medium stiff, dark brown, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~1.8 ft; concrete seal 0-3 ft. |
| | 4, 4, 6, 4 | | 88 | | SP | SAND, well sorted/rounded, fine-grained, quartz, loose, light brown, to medium brown, saturated below 6 ft | | |
| | 1, 2, 3, 5 | 5 | 75 | | | | | |
| | 2, 2, 2, 10 | | 63 | | SW-GW | SILTY SAND & GRAVEL, poorly sorted, medium-grained sand, fine-grained subangular to subround gravel, loose, light gray, saturated | | Bentonite/cement grout 3-16 ft; 1/4-in bentonite chips 16-17 ft. |
| | 2, 2, 3, 5 | | 50 | | | | | |
| | | 10 | | | | SANDSTONE, fine-grained, quartz | | |
| | | 15 | | | Ss | | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 20.1-25.1 ft; #7 fine silica sand 17-18 ft; #5 silica sand pack 18-25.5 ft. |
| | | 20 | | | | | | |
| | | 25 | | | | END OF BORING - 25.5 feet | | * 4-in diam. borehole drilled 16-25.5 ft using air-hammer. |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-7D | 10/5/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/5/98 | ~10 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 45.0 Feet | 8 Inches | 437.5 Feet | HSA | 3175.915 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 44.3 Feet | 2-in I.D. | 438.45 Feet | 2-ft. split-spoon | 5676.110 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CLAYEY SILT, medium plasticity, trace roots fibers, soft, medium brown, moist, saturated below 10 ft. | | |
| | 1, 1, 2, 3 | 5 | 75 | | | | | 5-ft by 4-in square steel stick-up casing to ~1.3 ft; concrete seal 0-3 ft. |
| | 1, 1, 1, 2 | 10 | 100 | | ML | | | |
| | 1, 1, 2, 3 | 15 | 100 | | | | | |
| | 0, 0, 1, 2 | 20 | 100 | | | | | |
| | | | | | SP | SILTY SAND, well sorted/rounded, fine-grained, quartz, grades from clayey silt above, loose, medium brown, saturated | | |
| | 3, 3, 4, 9 | 25 | 75 | | | | | Bentonite/cement grout 3-35 ft. |
| | | | | | | SILTY SAND & GRAVEL, well sorted medium-grained quartz sand, trace coarse sand, fine-grained angular to subangular gravel, medium dense, pale brown, saturated | | |
| | 5, 8, 6, 8 | 30 | 75 | | | | | |
| | | | | | SP-GP | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-7D | 10/5/98 | 2 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/5/98 | ~10 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 45.0 Feet | 8 Inches | 437.5 Feet | HSA | 3175.915 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 44.3 Feet | 2-in I.D. | 438.45 Feet | 2-ft. split-spoon | 5676.110 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | sand heave | | 0 | | | | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 39.3-44.3 ft; #7 fine silica sand 35-38 ft; #5 silica sand pack 38-45 ft. |
| | sand heave | 40 | 0 | | | | | |
| | 16, 25, 7, 11 | 45 | 75 | | ML | CLAYEY SILT, medium plasticity, trace sand, stiff, brown, moist<br>END OF BORING - 45 feet | | |
| | | 50 | | | | | | |
| | | 55 | | | | | | |
| | | 60 | | | | | | |
| | | 65 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-10 | 10/7/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/7/98 | ~2.5 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 11 Feet | 8 Inches | 452.9 Feet | HSA | 4730:478 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 10.7 Feet | 2-in I.D. | 454.23 Feet | 2-ft. split-spoon | 2559.807 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | 1, 2, 2, 2 | | 50 | | ML | CLAYEY SILT, vegetated with grass, soft, dark brown to black, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~1.5 ft. |
| | 1, 2, 2, 6 | | 50 | | SP | SILTY SAND, well sorted/rounded, fine-grained, quartz, loose, yellowish orange with dark orange lamina (2-3 mm), saturated below ~2.5 ft | | Bentonite/cement grout 0-3 ft; 1/4-in bentonite chips 3-4 ft. |
| | 1, 2, 6, 25 | 5 | 100 | | | | | |
| | 5, 20, 25, 50 | | 63 | | SP | SILTY SAND, well sorted/rounded, fine-grained, quartz, laminated, dense, light gray to rust colored, predominantly light gray below 7.5 ft, saturated (weathered bedrock) | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 5.7-10.7 ft; #5 silica sand pack 4-11 ft. |
| | | 10 | | | Ss | SANDSTONE, fine-grained, quartz | | |
| | | | | | | END OF BORING - 11 feet | | |
| | | 15 | | | | | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-10D | 10/7/98 | 1 |

| Driller | Logged by: | End Date | Depth to Water |
|---|---|---|---|
| AEC, Indianapolis, IN | Steve Mueller/STMI | 10/7/98 | ~2.5 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 21.5 Feet | 8 Inches | 452.9 Feet | HSA | 4729.427 |

| Well Depth | Well Diameter | TOC Elev. | Sample Method | Easting |
|---|---|---|---|---|
| 21.3 Feet | 2-in I.D. | 454.65 Feet | see MW-10 log | 2564.715 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | ML | CLAYEY SILT*, vegetated with grass, soft, dark brown to black, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~2.0 ft. |
| | | | see MW-10 | | SP | SILTY SAND*, well sorted/rounded, fine-grained, quartz, loose, yellowish orange with dark orange lamina (2-3 mm), saturated below ~2.5 ft | | Bentonite/cement grout 0-13 ft; 1/4-in bentonite chips 13-14 ft. |
| | | 5 | | | SP | SILTY SAND*, well sorted/rounded, fine-grained, quartz, laminated, dense, light gray to rust colored, predominantly light gray below 7.5 ft, saturated (weathered bedrock) | | |
| | | 10 | | | | SANDSTONE, fine-grained, quartz, becomes medium-grained, trace gravel clasts, increasingly well cemented/hard (very difficult to auger) below 20 ft. | | |
| | | 15 | drill cuts | | Ss | | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 16.3-21.3 ft; #7 silica sand 14-15 ft; #5 silica sand pack 15-21.5 ft. |
| | 50 (1") | 20 | 1" | | | END OF BORING ~21.5 feet | | * based on MW-10 boring log |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-11 | 10/6/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/7/98 | ~6 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 15.0 Feet | 8 Inches | 443.8 Feet | HSA | 3371.329 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 14.5 Feet | 2-in I.D. | 445.45 Feet | 2-ft. split-spoon | 4451.486 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | 1, 2, 3, 4 | | 63 | | ML | SANDY SILT, little fine-grained gravel, trace coal fragments, medium stiff, medium brown, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~2.0 ft. |
| | 1, 2, 6, 8 | | 63 | | SM | SILTY SAND, medium- to coarse-grained, quartz, loose, light brown, moist | | |
| | 3, 5, 25, 50 | 5 | 75 | | SW-GW | SILTY SAND & GRAVEL, poorly sorted, dense, light brown, saturated | | Bentonite/cement grout 0-3 ft; 1/4-in bentonite chips 3-4 ft. |
| | | | | | | SANDSTONE | | |
| | | 10 | | | Ss | | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 4.5-14.5 ft; #5 silica sand pack 4-15 ft. |
| | | 15 | | | | END OF BORING - 15 feet | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-12 | 10/8/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/8/98 | ~12 Feet |

| Boring Depth | Boring Diameter | Surface Elevation | Drill Method | Northing |
|---|---|---|---|---|
| 17 Feet | 8 Inches | 455.5 Feet | HSA | 4053.583 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 16.9 Feet | 2-in I.D. | 456.74 Feet | 2-ft. split-spoon | 4637.976 |

| Sample | Blows/6 Inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | 1, 1, 1, 1 | | 63 | | ML | SANDY SILT, little clay, soft, dark brown, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~1.5 ft. |
| | 2, 3, 10, 8 | | 100 | | Coal Ash | ASH, silty texture, soft, olive gray, moist | | |
| | | | | | GM | SILTY SAND & GRAVEL, poorly sorted, medium dense, light brown, moist (fill) | | |
| | 1, 1, 2, 3 | 5 | 63 | | SP | SAND, well sorted/rounded, fine-grained, quartz, loose, light brown, moist | | |
| | 2, 2, 4, 3 | | 75 | | | | | |
| | 1, 2, 3, 2 | | 50 | | SW | SAND, poorly sorted, fine- to coarse-grained, subangular to subround, quartz, trace fine gravel, loose, light brown, saturated below ~12 ft | | Bentonite/cement grout 0-3.5 ft; 1/4-in bentonite chips 3.5-5 ft. |
| | 1, 1, 1, 2 | 10 | 75 | | | | | |
| | 1, 2, 2, 3 | | 75 | | | | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 6.9-16.9 ft; #7 fine silica sand 5-6 ft; #5 silica sand pack 6-17 ft. |
| | 2, 3, 3, 4 | 15 | 100 | | | | | |
| | 10, 10, 35, 50 | | 50 | | ML | SILT, stiff, light brown, moist | | |
| | | | | | | END OF BORING - 17 feet (bedrock) | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | |
| | | 30 | | | | | | |

| Project Name/No. | | Boring No. | Start Date | Page |
|---|---|---|---|---|
| AmerenCIPS - Hutsonville | 249-3 | MW-13 | 10/6/98 | 1 |
| **Driller** | **Logged by:** | | **End Date** | **Depth to Water** |
| AEC, Indianapolis, IN | Steve Mueller/STMI | | 10/6/98 | ~7 Feet |
| **Boring Depth** | **Boring Diameter** | **Surface Elevation** | **Drill Method** | **Northing** |
| 16.5 Feet | 8 Inches | 456.4 Feet | HSA | 3961.759 |
| **Well Depth** | **Well Diameter** | **TOC Elev.** | **Sample Method** | **Easting** |
| 16.0 Feet | 2-in I.D. | 458.03 Feet | 2-ft. split-spoon | 4241.200 |

| Sample | Blows/6 inches | Sample Depth (ft) | Recovery (%) | Graphic Log | Classification | Description | Well Completion | Comments |
|---|---|---|---|---|---|---|---|---|
| | 1, 2, 3, 5 | | 25 | | SM | SILTY SAND, with gravel, loose, dark brown, moist (topsoil) | | 5-ft by 4-in square steel stick-up casing to ~2.0 ft; concrete 0-3 ft. |
| | | 5 | | | SP | SAND*, well sorted/rounded, fine- to medium-grained, quartz, light brown, saturated below ~9 ft.<br>* based on drill cuttings and geologic log for geoprobe GP-4 | | Bentonite/cement grout 3-6.3 ft; 1/4-in bentonite chips 6.3-7 ft. |
| | | 10 | | | | | | |
| | 1, 2, 2, 2 | | 50 | | SW-GW | CLAYEY SAND & GRAVEL, poorly sorted, fine- to coarse-grained sand, fine-grained subangular gravel, loose, light brown, saturated | | Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 9-14 ft; #7 fine silica sand 7-8 ft; #5 silica sand pack 8-16.5 ft. |
| | | 15 | | | Ss | SANDSTONE | | |
| | | | | | | END OF BORING - 16.5 feet | | |
| | | 20 | | | | | | |
| | | 25 | | | | | | Unslotted casing/sediment sump 14-16 ft. |
| | | 30 | | | | | | |

# Appendix A-6

## NRT 2001 Boring Logs

Natural Resource Technology, Inc.
Standard Soil Boring Log

SOIL BORING LOG INFORMATION
Form - General Use Rev. 8-2000



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| REN Energy Generating - Hutsonville Power Plant | | MW-11R |

| Boring Drilled By (Firm name and name of crew chief) | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Boart Longyear<br>Randy Radke | 10/03/01 | 10/03/01 | HSA |

| Facility Well No. | Unique Well No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | | Feet MSL | 440.920 Feet MSL | 8.25 inches |

| Boring Location | | | Lat | Local Grid Location (if applicable) |
|---|---|---|---|---|
| State Plane | 3217.083 | Feet N | Long | ☐ N ☐ E ☐ S ☐ W |
| | 4654.729 | Feet E | | |

| County | Civil Town/City/ or Village |
|---|---|
| Crawford | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-11R 0-2 | 18 | 2 3<br>4 6 | 0 | 0'-5' FILL, gray with orange mottling, coarse sand with clay, dry friable | FILL | | | | | | | | | |
| MW-11R 2.5-4.5 | 18 | 3 4<br>6 6 | 2 | grades to sand with gravel, coarse | | | | | | | | | | |
| 11R 7 | 20 | 3 4<br>4 5 | 4 | 5'-8' SAND, orange, poorly graded, coarse | SP | | | | | | | | | |
| MW-11R 7.5-9.5 | 14 | 2 3<br>4 3 | 6 | 8'-10' SAND with GRAVEL, brown, poorly graded, rounded, fine gravel/coarse sand | SP | | | | | | | | | |
| MW-11R 10-12 | 18 | 2 2<br>3 2 | 8 | 10'-11'6" SAND, poorly graded, medium to coarse | SP | | | | | | | | | |
| MW-11R 12.5-14.5 | 20 | 2 3<br>3 3 | 10 | 11'6"-16' SAND with GRAVEL, brown, poorly graded, rounded, fine gravel/coarse sand | SP | | | | | | | | | |
| MW-11R 15-17 | 3 | 50/3 | 12 | EOB @ 16' Auger Refusal | | | | | | | | | | |
| | | | 14 | | | | | | | | | | | |
| | | | 16 | | | | | | | | | | | |
| | | | 18 | | | | | | | | | | | |
| | | | 20 | | | | | | | | | | | |
| | | | 22 | | | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm Natural Resource Technology, Inc.

Natural Resource Technology, Inc.
Standard Soil Boring Log

**SOIL BORING LOG INFORMATION**
Form – General Use Rev. 8-2000



| | | | | | |
|---|---|---|---|---|---|
| **Facility/Project Name**<br>*AMEREN Energy Generating – Hutsonville Power Plant* | | | **License/Permit/Monitoring Number** | | **Boring Number**<br>*MW-14* |
| **Boring Drilled By (Firm name and name of crew chief)**<br>*Boart Longyear*<br>*Randy Radke* | | | **Date Drilling Started**<br>*10/03/01* | **Date Drilling Completed**<br>*10/03/01* | **Drilling Method**<br>*HSA* |
| **Facility Well No.** | **Unique Well No.** | **Common Well Name** | **Final Static Water Level**<br>*Feet MSL* | **Surface Elevation**<br>*440.930 Feet MSL* | **Borehole Diameter**<br>*8.25 inches* |
| **Boring Location**<br>**State Plane** | *2811.508* Feet N<br>*5325.781* Feet E | | **Lat**<br>**Long** | **Local Grid Location (If applicable)**<br>☐ N ☐ E<br>☐ S ☐ W | |
| **County**<br>*Crawford* | | | **Civil Town/City/ or Village**<br>*Hutsonville* | | |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | 0'-7'6" SILT, brown (10YR 4/3), moist, non-plastic | | | | | | | | | | |
| MW-14 2.5-4.5 | 18 | 2 3<br>2 3 | 2<br>4 | | ML | | | | | | | | | |
| MW-14 5-7 | 18 | 1 1<br>2 2 | 6 | | | | | | | | | | | |
| MW-14 7.5-9.5 | 18 | 1 2<br>1 2 | 8 | 7'6"-12'6" SILT with SAND, brown (10YR 4/3), low plasticity, moist | | | | | | | | | | |
| MW-14 10-12 | 24 | 1 1<br>1 1 | 10<br>12 | yellowish brown (10YR 5/4), increase plasticity to medium | ML | | | | | | | | | |
| MW-14 12.5-14.5 | 18 | 1 1<br>1 2 | 14 | 12'6"-18'6" LEAN CLAY, brown (7.5YR 4/2), 10-15% grey/orange mottling, medium plasicity | | | | | | | | | | |
| MW-14 15-17 | 22 | 1 1<br>1 1 | 16 | | CL | | | | | | | | | |
| MW-14 17.5-19.5 | 18 | 1 1<br>1 1 | 18 | | | | | | | | | | | |
| MW-14 20-22 | 18 | 1 1<br>1 1 | 20<br>22 | 18'6"-26' SAND with SILT, wet, non-plastic | SM | | | | | | | | | |
| MW-14 22.5-24.5 | 20 | 2 2<br>3 3 | | 23'6"-24' SAND seam, medium | SP SM | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

| Signature | Firm |
|---|---|
| *Allen Sykes* | Natural Resource Technology, Inc. |

| Sample Num. and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Soil Properties: Moisture Content | Soil Properties: Liquid Limit | Soil Properties: Plasticity Index | Soil Properties: P 200 | ROD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 20 | | 26 | 24'-26' SAND with SILT, as above | SM | | | | | | | | | |
| MW-14 25-27 | 18 | 1 2 2 3 | | 26'-38' SAND with GRAVEL, coarse sand, platy fine gravel, poorly graded | | | | | | | | | | |
| MW-14 27.5-29.5 | 18 | 2 3 3 4 | 28 | gravel becomes rounded | SP | | | | | | | | | |
| MW-14 30-32 | 20 | 3 3 4 5 | 30 | 4" LEAN CLAY with Gravel seam, gray (5Y 5/1), rounded, fine, 2-7% shell fragments | CL | | | | | | | | | |
| MW-14 32.5-34.5 | 18 | 3 3 5 5 | 32 | | SP | | | | | | | | | |
| | | | 34 | | | | | | | | | | | |
| | | | 36 | | SP | | | | | | | | | Advance Hydropunch discrete water sampler |
| | | | 38 | | | | | | | | | | | |
| | | | 40 | *EOB @ 39'* | | | | | | | | | | Drillers note: sand and gravel as above |
| | | | 42 | | | | | | | | | | | |
| | | | 44 | | | | | | | | | | | |
| | | | 46 | | | | | | | | | | | |
| | | | 48 | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | |
| | | | 52 | | | | | | | | | | | |
| | | | 54 | | | | | | | | | | | |
| | | | 56 | | | | | | | | | | | |
| | | | 58 | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | |
| | | | 62 | | | | | | | | | | | |

Natural Resource Technology, Inc.
Standard Soil Boring Log

**SOIL BORING LOG INFORMATION**
Form – General Use Rev. 8-2000



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| *AMEREN Energy Generating – Hutsonville Power Plant* | | *TW* |

| Boring Drilled By (Firm name and name of crew chief) | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| *Boart Longyear*<br>*Randy Radke* | *10/02/01* | *10/02/01* | *HSA* |

| Facility Well No. | Unique Well No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | | *Feet MSL* | *437.814 Feet MSL* | *8.25 inches* |

| Boring Location / State Plane | | | Lat / Long | Local Grid Location (if applicable) |
|---|---|---|---|---|
| | *3717.203* | Feet N | | ☐ N ☐ E |
| | *5605.471* | Feet E | | ☐ S ☐ W |

| County | Civil Town/City/or Village |
|---|---|
| *Crawford* | *Hutsonville* |

| Sample Number and Type | Length Att. & Recovered (In) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | RQD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | 0'-5'8" SILT with SAND, very dark brown (10YR 2/2), grades from topsoil, trace organics throughout | ML | | | | | | | | | |
| TW 2.5-4.5 | 20 | 2 2<br>3 3 | 2<br>4 | | | | | | | | | | | |
| TW 5-7 | 18 | 2 1<br>2 4 | 6 | 5'8"-23' LEAN CLAY, brown (10YR 4/3), medium plasticity, moist | | | | | | | | | | |
| TW 7.5-9.5 | 16 | 1 1<br>1 2 | 8 | weak red (2.5Y 5/3), trace orange mottling | | | | | | | | | | |
| TW 10-12 | 20 | 1 1<br>1 1 | 10<br>12 | | | | | | | | | | | |
| TW 12.5-14.5 | 18 | 1 1<br>1 1 | 14 | trace horizontal fracture, wet | CL | | | | | | | | | |
| TW 15-17 | 18 | 1 1<br>1 1 | 16 | 5-10% fine sand | | | | | | | | | | |
| TW 17.5-19.5 | 20 | 1/24 | 18 | very dark gray (2.5Y 3/1), trace wood and white shell fragments | | | | | | | | | | |
| TW 20-22 | 24 | 1/24 | 20<br>22 | | | | | | | | | | | |
| TW 22.5-24.5 | 10 | 1/24 | | 23'-25'6" SAND, very dark gray (2.5Y 3/1), | SP | | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

| Signature | Firm |
|---|---|
| | Natural Resource Technology, Inc. |

| Sample Num and Type | Length Att. & Recovered (in) | Blow Counts | Depth in Feet | Soil/Rock Description And Geologic Origin For Each Major Unit | USCS | Graphic Log | Well Diagram | PID/FID | Soil Properties: Compressive Strength | Moisture Content | Liquid Limit | Plasticity Index | P 200 | ROD/ Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 1/24 | | medium, loose, wet | SP | | | | | | | | | |
| TW 25-27 | 18 | 2 2<br>2 2 | 26 | 25'6"–26' LEAN CLAY, as above | CL | | | | | | | | | |
| | | | | 26'–27'6" SAND with GRAVEL, poorly graded, coarse sand, fine gravel, rounded | SP | | | | | | | | | |
| TW 27.5-29.5 | 20 | 3 5<br>9 10 | 28 | 27'6"–31' SAND, gray/black and white, poorly graded, medium to coarse, increased coarsness with depth | SP | | | | | | | | | |
| TW 30-32 | 20 | 4 6<br>9 9 | 30 | | | | | | | | | | | |
| | | | | 31'–32'6" SAND and GRAVEL, coarse sand, poorly graded, fine gravel, rounded | SP | | | | | | | | | |
| TW 32.5-34.5 | 12 | 11<br>11 | 32 | 32'6"–39'6" SAND, gray, poorly graded, medium to coarse, 5–15% gravel | | | | | | | | | | |
| TW 35-37 | 24 | 2 2<br>3 4 | 34 | | SP | | | | | | | | | |
| | | | 36 | | | | | | | | | | | |
| TW 37.5-39.5 | 24 | 3 6<br>6 10 | 38 | | | | | | | | | | | |
| | | | 40 | *EOB @ 39'6"* | | | | | | | | | | |
| | | | 42 | | | | | | | | | | | |
| | | | 44 | | | | | | | | | | | |
| | | | 46 | | | | | | | | | | | |
| | | | 48 | | | | | | | | | | | |
| | | | 50 | | | | | | | | | | | |
| | | | 52 | | | | | | | | | | | |
| | | | 54 | | | | | | | | | | | |
| | | | 56 | | | | | | | | | | | |
| | | | 58 | | | | | | | | | | | |
| | | | 60 | | | | | | | | | | | |
| | | | 62 | | | | | | | | | | | |

# Appendix A-7

## NRT 2004 Boring Logs

Natural Resource Technology

N R T

# SOIL BORING LOG

Page 1 of 1

| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-115s |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boart Longyear | 5/1/2004 | 5/1/2004 | hollow stem auger |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-115s | Feet MSL | 438.4 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ — State Plane N, E S/C/N — 1/4 of 1/4 of Section , T R — Lat ° ' " Long ° ' " — Local Grid Location ☒ N ☒ E 898046.72 Feet ☐ S 1176886.34 Feet ☐ W

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0 | 0'-36' Drilled without sampling-see log TW-115d for complete description. | | | CL | | | | |
| | | | 5 | | | | SC | | | | |
| | | | 10 | | | | | | | | |
| | | | 15 | | | | CH | | | | |
| | | | 20 | | | | | | | | |
| | | | 25 | | | | CL | | | | |
| | | | 30 | | | | GP | | | | |
| | | | 35 | | | | SW | | | | |
| | | | | | | | SW | | | | |
| | | | | END OF BORING AT 36' Well set at 35' | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.


Signature: Paula Richardson — Firm: Natural Resource Technology, Inc. — 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 — Tel: (262) 523-9000 — Fax: (262) 523-9001


Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-115d |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boart Longyear | 4/29/2004 | 5/1/2004 | hsa, core |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-115d | Feet MSL | 438.4 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ — State Plane N, E S/C/N — 1/4 of 1/4 of Section , T R — Lat ° ' " — Long ° ' " — Local Grid Location ☒ N ☒ E 398052.56 Feet ☐ S 1176882.3 Feet ☐ W

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 12 | | | 0'-3.5' SANDY CLAY, very dark greyish brown (10 YR 3/2), very fine sand, moist | | | CL | | | | |
| | 24 24 | | | | | | | | | | |
| 3 SS | 24 24 | | 5 | 3.5'-6' CLAYEY SAND mottled grey-brown to tan, very fine sand, moist | | | SC | | | | |
| 4 SS | 24 24 | | | 6'-22' FAT CLAY, brown (10 YR 4/3), soft, plastic, moist | | | CH | | | | |
| 5 SS | 24 24 | | | | | | | | | | |
| 6 SS | 24 4 | | 10 | | | | | | | | |
| 7 SS | 24 24 | | | wet at 13' | | | | | | | |
| 8 SS | 24 24 | | 15 | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson — Paula Richardson — Firm Natural Resource Technology, Inc. — 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 — Tel: (262) 523-9000 — Fax: (262) 523-9001

Template: NRT BORING LOG - Project: 1373 LOGS.GPJ

Natural Resource Technology

N R T

Boring Number TW-115d Page 2 of 5

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 SS | 24 24 | | | 6'-22' FAT CLAY, brown (10 YR 4/3), soft, plastic, moist at 16' color change to olive grey (5Y 5/2) | | | CH | | | | |
| 10 SS | 24 24 | | | | | | | | | | |
| 11 SS | 24 24 | | 20 | at 19.8' 2" sand seam, very fine sand 20'-22' trace very fine sand | | | | | | | |
| 12 SS | 24 24 | | | 22'-22.9' SANDY CLAY | | | CL | | | | |
| 13 SS | 24 0 | | | 22.9'-32' POORLY GRADED GRAVEL WITH SAND, olive grey (5Y 5/2), rounded, very fine to fine sand | | | GP | | | | |
| 14 SS | 24 8 | | 25 | | | | | | | | |
| 15 SS | 24 7 | | | | | | | | | | |
| 16 SS | 24 4 | | 30 | | | | | | | | |
| 17 SS | 24 5 | | | 32'-33' WELL GRADED SAND fine to coarse, trace rounded gravel | | | SW | | | | |
| 18 SS | 24 14 | | 35 | 33'-36' WELL GRADED SAND WITH GRAVEL, very fine to coarse sand, fine to medium gravel, rounded | | | SW | | | | |
| 19 SS | 24 8 | | | 36'-39' POORLY GRADED SAND very fine to medium, trace gravel, rounded | | | SP | | | | |
| 20 SS | 24 14 | | | | | | | | | | |
| 21 SS | 24 11 | | 40 | 39'-40' WELL GRADED SAND WITH GRAVEL, fine to coarse gravel and sand | | | SW GW | | | | |

Natural Resource Technology

N R T

Boring Number TW-115d Page 3 of 5

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 SS | 24 12 | | | 40'-42' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded | | | GW | | | | |
| | | | | 42'-58' WELL GRADED SAND fine to coarse sand, trace gravel, rounded | | | | | | | |
| 23 SS | 24 12 | | | 2" gravelly sand seam, fine to coarse gravel at 44' | | | | | | | |
| | | | 45 | | | | | | | | |
| 24 SS | 24 13 | | | | | | | | | | |
| 25 SS | 24 14 | | | | | | | | | | |
| | 24 13 | | 50 | | | | SW | | | | |
| 27 SS | 24 16 | | | | | | | | | | |
| 28 SS | 24 15 | | | | | | | | | | |
| | | | 55 | | | | | | | | |
| 29 SS | 24 9 | | | | | | | | | | |
| 30 SS | 24 3 | | | 58'-70' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded | | | | | | | |
| | | | 60 | | | | | | | | |
| 31 SS | 24 7 | | | | | | | | | | |
| 32 SS | 24 24 | | | | | | GW | | | | |
| 33 SS | 24 12 | | | | | | | | | | |
| | | | 65 | | | | | | | | |
| 34 SS | 24 4 | | | | | | | | | | |

TSD 000107

Natural Resource Technology

N R T

Boring Number TW-115d Page 4 of 5

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 SS | 24 0 | | | 58'-70' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded | | | GW | | | | |
| 36 SS | 24 6 | | 70 | 70'-74' WELL GRADED SAND fine to coarse | | | SW | | | | |
| 37 SS | 24 4 | | | | | | | | | | |
| 38 SS | 24 0 | | | 74'-88' Logged from cuttings, WELL GRADED GRAVEL WITH SAND fine to coarse sand, fine to coarse gravel - | | | | | | | Gravel starts coming up in cuttings. |
| 39 SS | 24 0 | | 75 | | | | | | | | |
| 40 SS | 24 0 | | | | | | | | | | |
| 41 SS | 24 0 | | 80 | | | | GW | | | | |
| 42 SS | 24 0 | | | | | | | | | | |
| 43 SS | 24 0 | | 85 | | | | | | | | |
| 44 SS | 24 0 | | | | | | | | | | |
| 45 SS | 24 12 | | | 88'-90' WELL GRADED SAND very fine to medium | | | SW | | | | |
| 46 CORE | 180 | | 90 | 90'-105' SHALE, grey-blue, friable, moist | | | SHALE | | | | |

TSD 000108

Natural Resource Technology

N R T

Boring Number TW-115d Page 5 of 5

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 90 | 90'-105' SHALE, grey-blue, friable, moist | | | | | | | |
| | | | 95 | | | | | | | | |
| | | | | | | | SHALE | | | | |
| | | | 100 | | | | | | | | |
| | | | 105 | END OF BORING AT 105' Well set at 87' | | | | | | | |

TSD 000109

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-116 |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boart Longyear | 4/26/2004 | 4/28/2004 | hsa, core |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-116 | Feet MSL | 437.5 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ — Lat ___ ° ___ ' ___ " Long ___ ° ___ ' ___ "

Local Grid Location ☒ N ☒ E

State Plane N, E S/C/N — 896034.1384 Feet ☐ S 1175442.33 Feet ☐ W

1/4 of 1/4 of Section , T R

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 24 | | | 0'-3.5' SILT, very dark greyish brown (10 YR 3/2), rootlets to 6", firm, slightly moist | | | ML | | | | |
| 2 SS | 24 12 | | | | | | | | | | |
| | | | | 3.5'-4.8' SILTY CLAY, very dark greyish brown, firm, slightly moist | | | CL/ML | | | | |
| 3 SS | 24 24 | | 5 | 4.8'-16' FAT CLAY, dark yellowish brown (10YR 4/4), soft, moist | | | | | | | |
| 4 SS | 24 24 | | | | | | | | | | |
| 5 SS | 24 24 | | | | | | | | | | |
| 6 SS | 24 24 | | 10 | | | | CH | | | | |
| 7 SS | 24 24 | | | | | | | | | | |
| 8 SS | 24 24 | | | at 14' very moist | | | | | | | |
| | | | 15 | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson — Firm Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 — Tel: (262) 523-9000 Fax: (262) 523-9001

Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

Boring Number TW-116 Page 2 of 4

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 SS | 24 24 | | | 16'-20.5' SANDY LEAN CLAY, olive brown (2.5 Y 4/3), very fine sand, soft, wet | | | CL | | | | |
| 10 SS | 24 24 | | 20 | color change to dark grey (2.5 Y 4/1) | | | | | | | |
| | | | | 20.5'-26.5' CLAYEY SAND dark grey, very fine sand, wet | | | SC | | | | |
| SS | 24 24 | | 25 | | | | | | | | |
| | | | | 26.5'-30' CLAYEY GRAVEL, fine gravel, few shell fragments, wet | | | GC | | | | |
| 12 SS | 24 18 | | 30 | 30'-60' WELL GRADED SAND olive brown (2.5 Y 4/4), fine to coarse, subangular to rounded, wet | | | | | | | |
| 13 SS | 24 12 | | 35 | | | | SW | | | | |
| 14 SS | 24 0 | | 40 | | | | | | | | |

TSD 000111

Natural Resource Technology

N R T

Boring Number TW-116 Page 3 of 4

| Sample Number and Type | Length An. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 30'-60' WELL GRADED SAND olive brown (2.5 Y 4/4), fine to coarse, subangular to rounded, wet | | | | | | | |
| 15 SS | 24 10 | | 45 | | | | | | | | |
| 16 SS | 24 12 | | 50 | | | | SW | | | | |
| 17 SS | 24 6 | | 55 | | | | | | | | |
| 18 SS | 24 2 | | 60 | 60'-79' SHALE, grey-blue, slightly moist, friable | | | SHALE | | | | |
| 19 CORE | 180 | | 65 | | | | | | | | |

TSD 000112

Natural Resource Technology

N R T

Boring Number TW-116 Page 4 of 4

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 70 | 60'-79' SHALE, grey-blue, slightly moist, friable | | | SHALE | | | | |
| | | | 75 | coal seam at 79', bit plugged-no water circulation for coring | | | COAL | | | | |
| | | | | END OF BORING AT 79.2' Well set at 30' - | | | | | | | |

TSD 000113

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-117 |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boarl Longyear | 4/28/2004 | 4/29/2004 | hollow stem auger |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-117 | Feet MSL | 435.0 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ State Plane N, E S/C/N

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E 895267.78 Feet ☐ S 1179053.33 Feet ☐ W

1/4 of 1/4 of Section , T R

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 12 | | | 0'-6' SANDY LEAN CLAY, dark olive brown (2.5 Y 3/3), very fine sand, slightly moist | | | CL | | | | |
| 2 SS | 24 24 | | | | | | | | | | |
| 3 SS | 24 0 | | 5 | | | | | | | | |
| 4 SS | 24 24 | | | 6'-7.8' FAT CLAY, dark olive brown, high toughness and plasticity, moist | | | CH | | | | |
| 5 SS | 24 10 | | | 7.8'-25' POORLY GRADED SAND dark yellowish brown (10 YR 4/4), very fine, wet | | | SP | | | | |
| 6 SS | 24 12 | | 10 | | | | | | | | |
| 7 SS | 24 10 | | 15 | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson

Paula Richardson
Firm Natural Resource Technology, Inc.
23713 W. Paul Road, Unit D, Pewaukee, WI 53072
Tel: (262) 523-9000
Fax: (262) 523-9001

Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

Boring Number TW-117 Page 2 of 4

| Sample Number and Type | Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 7.8'-25' POORLY GRADED SAND dark yellowish brown (10 YR 4/4), very fine, wet trace shell fragments at 16' | | | | | | | |
| 8 SS | 24 0 | | 20 | | | | SP | | | | |
| 9S | 24 8 | | 25 | 25'-26' WELL GRADED SAND fine to medium, coarsens downward | | | SW | | | | |
| | | | | 26'-35' WELL GRADED GRAVEL, trace sand and shell fragments, rounded | | | | | | | |
| 10 SS | 24 4 | | 30 | grey clay in shoe of split spoon | | | GW | | | | |
| 11 SS | 24 6 | | 35 | 35'-60' WELL GRADED SAND fine to coarse | | | SW | | | | |
| 12 SS | 24 5 | | 40 | | | | | | | | |

Natural Resource Technology

N R T

Boring Number TW-117 Page 3 of 4

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 35'-60' WELL GRADED SAND fine to coarse | | | | | | | |
| 13 SS | 24 14 | | 45 | | | | | | | | |
| 14 SS | 24 17 | | 50 | | | | SW | | | | |
| 15 SS | 24 0 | | 55 | | | | | | | | |
| 16 SS | 24 0 | | 60 | 60'-75' Logged from drill cuttings POORLY GRADED GRAVEL, coarse, rounded | | | GP | | | | Went to larger sample interval due to drilling conditions. |
| | | | 65 | | | | | | | | |

TSD 000116

Natural Resource Technology

N R T

Boring Number TW-117 Page 4 of 4

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 70 | 60'-75' Logged from drill cuttings POORLY GRADED GRAVEL, coarse, rounded | | | GP | | | | |
| '7 | 24 0 | | 75 | 75'-90' Logged from drill cuttings WELL GRADED SAND WITH GRAVEL | | | | | | | No samples attempted after 77 feet due to drilling conditions. |
| | | | 80 | | | | SW | | | | |
| | | | 85 | | | | | | | | |
| 18 SS | 6 2 | | 90 | 90'-90.5' SHALE | | | SHALE | | | | |
| | | | | END OF BORING AT 90.5' Well set at 20' | | | | | | | |

TSD 000117

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-118 |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve<br>Boart Longyear | 5/4/2004 | 5/4/2004 | hollow stem auger |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-118 | Feet MSL | 437.0 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐ ) or Boring Location ☐

State Plane N, E S/C/N

1/4 of 1/4 of Section , T R

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E

898090.86 Feet ☐ S 1177978.73 Feet ☐ W

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 24 | | | 0'-3' SILT, brown (7.5 YR 4/2) | | | | | | | |
| 2 SS | 24 24 | | | | | | ML | | | | |
| | | | | 3'-5' dark reddish grey (5 YR 4/2), trace sand | | | | | | | |
| 3 SS | 24 24 | | | wet at 4' | | | | | | | |
| | | | 5 | 5'-6' WELL GRADED SAND light reddish brown (5 YR 6/3), medium to fine | | | SW | | | | |
| 4 SS | 24 24 | | | 6'-7.5' SILT, brown (7.5 YR 4/2) | | | ML | | | | |
| 5 SS | 24 18 | | | 7.5'-10' POORLY GRADED SAND WITH SILT | | | SP-SM | | | | |
| | | | 10 | 10'-26' POORLY GRADED SAND brown (7.5 YR 5/2), medium grained | | | | | | | |
| 6 SS | 24 24 | | | | | | | | | | |
| 7 SS | 24 24 | | | | | | SP | | | | |
| 8 SS | 24 16 | | | | | | | | | | |
| | | | 15 | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

| Signature | | Firm | | |
|---|---|---|---|---|
| Paula Richardson | Paula Richardson | Natural Resource Technology, Inc.<br>23713 W. Paul Road, Unit D, Pewaukee, WI 53072 | Tel: (262) 523-9000<br>Fax: (262) 523-9001 |

Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

TSD 000118

Natural Resource Technology

N R . T

Boring Number TW-118 Page 2 of 2

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 10'-26' POORLY GRADED SAND brown (7.5 YR 5/2), medium grained | | | | | | | |
| 9 SS | 24 12 | | 20 | | | | SP | | | | |
| 10 SS | 24 12 | | | @ 22' coarse sand with few gravel | | | | | | | |
| | | | 25 | | | | | | | | |
| | | | | END OF BORING AT 26' Well set at 25' | | | | | | | |

TSD 000119

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-119 |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boart Longyear | 5/1/2004 | 5/3/2004 | hsa, core |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-119 | Feet MSL | 435.4 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location. ☐ State Plane N, E S/C/N

1/4 of 1/4 of Section , T R

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E

396030.54 Feet ☐ S 1181339.05 Feet ☐ W

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 18 | | | 0'-4' SILTY CLAY, very dark greyish brown (10 YR 3/2), firm, moist | | | | | | | |
| 2 SS | 24 20 | | | color change to dark greyish brown (2.5 Y 4/2) | | | CL/ML | | | | |
| 3 SS | 24 24 | | 5 | 4'-11.7' FAT CLAY, dark greyish brown, soft, moist | | | | | | | |
| 4 SS | 24 21 | | | at 6' very moist | | | CH | | | | |
| 5 SS | 24 24 | | | at 9' wet | | | | | | | |
| 6 SS | 24 24 | | 10 | | | | | | | | |
| 7 SS | 24 16 | | | 11.7'-41' POORLY GRADED SAND mottled orange brown and grey brown, very fine, wet at 12' color change to dark yellowish brown (10 YR 4/4) | | | SP | | | | |
| | | | 15 | | | | | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

| Signature | | Firm | | |
|---|---|---|---|---|
| Paula Richardson | Paula Richardson | Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 | Tel: (262) 523-9000 Fax: (262) 523-9001 | |

Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

TSD 000120

Natural Resource Technology

N R T

Boring Number TW-119 Page 2 of 5

| Sample Number and Tyne | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U.S.C.S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 11.7'-41' POORLY GRADED SAND mottled orange brown and grey brown, very fine, wet | | | | | | | |
| 8 SS | 24 6 | | 20 | | | | | | | | |
| SS | 24 0 | | 25 | | | | | | | | |
| | | | | | | | SP | | | | |
| 10 SS | 24 11 | | 30 | very fine to medium sand | | | | | | | |
| 11 SS | 24 12 | | 35 | very fine to fine sand | | | | | | | |
| 12 SS | 24 22 | | 40 | | | | | | | | |

Natural Resource Technology

N R T

Boring Number TW-119 Page 3 of 5

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 41'-45' WELL GRADED SAND very fine to coarse, trace rounded gravel | | | SW | | | | |
| 13 SS | 24 17 | | 45 | 45'-60' POORLY GRADED SAND very fine to medium | | | | | | | |
| 14 SS | 24 12 | | 50 | | | | SP | | | | |
| 15 SS | 24 0 | | 55 | | | | | | | | |
| 16 SS | 24 0 | | 60 | 60'-80' Logged by drill cuttings, WELL GRADED SAND WITH GRAVEL to WELL GRADED GRAVEL WITH SAND | | | SW | | | | Gravel starts coming up in cuttings |
| 17 SS | 24 0 | | 65 | | | | | | | | |

TSD 000122

Natural Resource Technology

N R T

Boring Number TW-119 Page 4 of 5

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 70 | 60'-80' Logged by drill cuttings, WELL GRADED SAND WITH GRAVEL to WELL GRADED GRAVEL WITH SAND | | | SW | | | | |
| 18 SS | 24 0 | | | | | | | | | | |
| | | | 75 | | | | | | | | |
| 19 SS | 24 0 | | | | | | | | | | |
| | | | 80 | 80'-100' SHALE, grey to black, laminated, poorly lithified, no circulation of drilling water | | | | | | | |
| 20 CORE | 84 24 | | | | | | | | | | |
| | | | 85 | | | | | | | | |
| 21 CORE | 72 30 | | | | | | | | | | |
| | | | 90 | | | | | | | | |

TSD 000123

Natural Resource Technology

N R T

Boring Number TW-119 Page 5 of 5

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 CORE | 84 54 | | 95 | 80'-100' SHALE, grey to black, laminated, poorly lithified, no circulation of drilling water | | | | | | | |
| | | | 100 | END OF BORING AT 100' Well set at 20' | | | | | | | |

TSD 000124

Natural Resource Technology

N R T

# SOIL BORING LOG



| Facility/Project Name | License/Permit/Monitoring Number | Boring Number |
|---|---|---|
| Ameren Hutsonville Power Station Drilling | | TW-120 |

| Boring Drilled By: Name of crew chief (first, last) and Firm | Date Drilling Started | Date Drilling Completed | Drilling Method |
|---|---|---|---|
| Steve Boart Longyear | 5/3/2004 | 5/4/2004 | hollow stem auger |

| Unique Well No. | Well ID No. | Common Well Name | Final Static Water Level | Surface Elevation | Borehole Diameter |
|---|---|---|---|---|---|
| | | TW-120 | Feet MSL | 446.8 Feet MSL | 8.3 inches |

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ | Lat ° ' " | Local Grid Location ☒ N ☒ E

State Plane N, E S/C/N | Long ° ' " | 1/4 of 1/4 of Section , T R | 808614.91 Feet ☐ S 1180157.14 Feet ☐ W

| Facility ID | County | State | Civil Town/City/ or Village |
|---|---|---|---|
| | | | Hutsonville |

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | USCS Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 SS | 24 17 | | | 0'-0.5' TOPSOIL<br>0.5'-14' POORLY GRADED SAND brownish yellow (10 YR 6/6), medium | | | | | | | |
| 2 SS | 24 15 | | | | | | | | | | |
| 3 SS | 24 15 | | 5 | | | | SP | | | | |
| 4 SS | 24 12 | | 10 | color change to reddish yellow (7.5 YR 6/6), moist | | | | | | | |
| 5 SS | 24 10 | | 15 | 14'-36' POORLY GRADED SAND WITH GRAVEL, reddish yellow, medium sand, rounded gravel, moist | | | SP | | | | |

I hereby certify that the information on this form is true and correct to the best of my knowledge.

| Signature | Firm | Tel: |
|---|---|---|
| Paula Richardson | Natural Resource Technology, Inc.<br>23713 W. Paul Road, Unit D, Pewaukee, WI 53072 | (262) 523-9000<br>Fax: (262) 523-9001 |

Template: NRT BORING LOG - Project: 1375 LOGS.GPJ

TSD 000125

Natural Resource Technology

N R T

Boring Number TW-120 Page 2 of 2

| Sample Number and Type | Sample Length Att. & Recovered (in) | Blow Counts | Depth From Surface (feet) | Soil/Rock Description And Geologic Origin For Each Major Unit | Hand Pen (tsf) | Field Moisture Condition | U S C S Symbol | Graphic Log | PID/FID (ppm) | Well Diagram | RQD/ Comments/ Lab Test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 14'-36' POORLY GRADED SAND WITH GRAVEL, reddish yellow, medium sand, rounded gravel, moist | | | | | | | |
| 6 SS | 24 24 | | 20 | wet at 19' | | | | | | | |
| 7 SS | 24 24 | | 25 | | | | SP | | | | |
| 8 SS | 24 24 | | 30 | | | | | | | | |
| 9 SS | 24 24 | | 35 | 34'-36' coarse sand | | | | | | | |
| | | | | END OF BORING AT 36' Well set at 35' | | | | | | | |

TSD 000126

# Appendix A-8

## Geotechnology 2010 Boring Logs

Surface Elevation: 451.5 | Completion Date: 6/23/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | FILL: brown and gray, silty clay, trace gravel and sand | | | |
| | | | 3-5-7 | SS1 |
| | | | 3-3-5 | SS2 |
| 5 | | | 3-4-7 | SS3 |
| | | | 3-4-5 | SS4 |
| 10 | | | | |
| | Stiff to very soft, brown, silty CLAY - CL | | 3-6-5 | SS5 |
| 15 | | | | |
| | | | 1-2-3 | SS6 |
| 20 | | | | |
| | ▽ | | 0-0-0 | SS7 |
| 25 | | | | |
| | Very loose, brown, clayey SAND - SC | | 0-0-1 | SS8 |
| 30 | | | | |
| | Very loose, brown, fine SAND, trace gravel - SP | | 0-1-1 | SS9 |
| 35 | | | | |
| | | | 0-1-1 | SS10 |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

**GROUNDWATER DATA**

ENCOUNTERED AT 23.5 FEET ▽

**DRILLING DATA**

__ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 40 FEET

MVU DRILLER BGF LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

**REMARKS:** Datum: IL State Plane Coordinates, East Zone. N: 898196.177' E: 1176545.269'

| Drawn by: KA | Checked by: SVR | App'vd. by: DVR |
|---|---|---|
| Date: 6/29/10 | Date: 1/3/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

**Hutsonville Power Station**
**Hutsonville, Illinois**

**LOG OF BORING: B-1**

**Project No. J017150.01**

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J017150.02 - HUTSONVILLE.GPJ GTINC.0638301.GPJ 12/13/10

Surface Elevation: 451.5 | Completion Date: 6/23/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | Very loose, brown, fine SAND, trace gravel - SP *(continued)* | | | |
| | Dense, brown, fine SAND with gravel - SP | | | |
| 45 | | | 9-14-14 | SS11 |
| | | | 15-20-20 | SS12 |
| 50 | Boring terminated at 50 feet. | | | |
| 55 | | | | |
| 60 | | | | |
| 65 | | | | |
| 70 | | | | |
| 75 | | | | |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150 02 - HUTSONVILLE.GPJ GTINC 0638301.GPJ 12/13/10

**GROUNDWATER DATA**

ENCOUNTERED AT 23.5 FEET ▽

**DRILLING DATA**

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 40 FEET

MVU DRILLER BGF LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

**REMARKS:** Datum: IL State Plane Coordinates, East Zone. N: 898196.177' E: 1176545.269'

| Drawn by: KA | Checked by: SK | App'vd. by: BMR |
|---|---|---|
| Date: 6/29/10 | Date: 1/3/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

Hutsonville Power Station
Hutsonville, Illinois

CONTINUATION OF
LOG OF BORING: B-1

Project No. J017150.01

Surface Elevation: 452.5 | Completion Date: 6/24/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | FILL: brown and gray, silty clay | | 3-6-8 | SS1 |
| | | | 3-6-7 | SS2 |
| 5 | some sand | | 106 | ST3 |
| | | | 101 | ST4 |
| 10 | | | | |
| | | | 2-5-8 | SS5 |
| 15 | Very stiff, gray CLAY - (CH) | | 108 | ST6 |
| | | | 85 | ST7 |
| 20 | | | | |
| | Very soft to soft, brown and gray, silty CLAY - CL | | 0-0-0 | SS8 |
| 25 | | | | |
| | | | 1-1-2 | SS9 |
| 30 | with sand | | | |
| | | | 0-0-1 | SS10 |
| 35 | Boring terminated at 35 feet. | | | |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

64 >>

**GROUNDWATER DATA**

ENCOUNTERED AT 18 FEET ▽

**DRILLING DATA**

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

MVU DRILLER BGF LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

**REMARKS:** Datum: IL State Plane Coordinates, East Zone. N: 898098.106' E: 1176717.207'

| Drawn by: KA | Checked by: SU | App'vd. by: DM |
|---|---|---|
| Date: 6/29/10 | Date: 1/3/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

Hutsonville Power Station
Hutsonville, Illinois

LOG OF BORING: B-2

Project No. J017150.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.02 - HUTSONVILLE.GPJ GTINC 0638301.GPJ 12/13/10

Surface Elevation: 452.3 | Completion Date: 6/24/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | FILL: gray, silty clay, trace gravel and sand | | 4-6-7 | SS1 |
| | | | 3-4-7 | SS2 |
| 5 | | | 2-3-4 | SS3 |
| | | | 3-3-3 | SS4 |
| 10 | | | 2-5-8 | SS5 |
| 15 | Medium stiff to soft, gray, silty CLAY - (CL) | | 2-3-4 | SS6 |
| | | | 92 | ST7 |
| 20 | | | 0-2-2 | SS8 |
| 25 | | | 0-1-1 | SS9 |
| 30 | Very loose, brown, clayey SAND - SP | | 0-2-2 | SS10 |
| 35 | Very loose, brown, fine SAND - SP | | | |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.02 - HUTSONVILLE.GPJ GTINC.0638301.GPJ 12/13/10

**GROUNDWATER DATA**

X FREE WATER NOT ENCOUNTERED DURING DRILLING

**DRILLING DATA**

___ AUGER ___ HOLLOW STEM

WASHBORING FROM 25 FEET

MVU DRILLER BGF LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

**REMARKS:** Datum: IL State Plane Coordinates, East Zone. N: 897908.736' E: 1176769.952'

| Drawn by: KA | Checked by: SLC | App'vd. by: DW |
|---|---|---|
| Date: 6/29/10 | Date: 1/3/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

**Hutsonville Power Station**
**Hutsonville, Illinois**

**LOG OF BORING: B-3**

**Project No. J017150.01**

Surface Elevation: 452.3 | Completion Date: 6/24/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | Very loose, brown, fine SAND - SP *(continued)* | | | |
| 45 | | | 3-2-2 | SS11 |
| | Medium dense to dense, brown, gravelly SAND - SP | | | |
| 50 | | | 7-10-9 | SS12 |
| | | | 10-15-17 | SS13 |
| 55 | | | | |
| | | | 10-12-14 | SS14 |
| 60 | Boring terminated at 60 feet, | | | |
| 65 | | | | |
| 70 | | | | |
| 75 | | | | |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.02 - HUTSONVILLE.GPJ GTINC 0638301.GPJ 12/13/10

**GROUNDWATER DATA**

X FREE WATER NOT ENCOUNTERED DURING DRILLING

**DRILLING DATA**

___ AUGER ___ HOLLOW STEM

WASHBORING FROM 25 FEET

MVU DRILLER BGF LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

**REMARKS:** Datum: IL State Plane Coordinates, East Zone. N: 897908.736' E: 1176769.952'

| Drawn by: KA | Checked by: SEZ | App'vd. by: PMV |
|---|---|---|
| Date: 6/29/10 | Date: 1/3/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

Hutsonville Power Station
Hutsonville, Illinois

CONTINUATION OF
LOG OF BORING: B-3

Project No. J017150.01

Surface Elevation: 437 | Completion Date: 9/14/10

Datum msl

| DEPTH IN FEET | DESCRIPTION OF MATERIAL | GRAPHIC LOG | DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD | SAMPLES |
|---|---|---|---|---|
| | FILL: gray, silty clay and rock fragments | | 20-19-12 | SS1 |
| | Medium stiff, gray, silty CLAY - CL | | 2-3-3 | SS2 |
| 5 | Soft, gray CLAY - (CH) | | 86 | ST3 |
| | | | 93 | ST4 |
| 10 | Very soft to soft, brown and gray, silty CLAY - CL | | | |
| | | | 0-0-0 | SS5 |
| 15 | | ▽ | 95 | ST6 |
| | | | 90 | ST7 |
| 20 | | | | |
| | Very soft, gray, sandy CLAY - CL | | 0-0-1 | SS8 |
| 25 | Boring terminated at 25 feet. | | | |
| 30 | | | | |
| 35 | | | | |

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - TV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

62 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.02 - HUTSONVILLE.GPJ GTINC.0638301.GPJ 12/17/10

**GROUNDWATER DATA**

ENCOUNTERED AT 16 FEET ▽

**DRILLING DATA**

___ AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

MB DRILLER AMS LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

| Drawn by: KA | Checked by: SAR | App'vd. by: DAV |
|---|---|---|
| Date: 9/17/10 | Date: 1/31/11 | Date: 1/4/11 |

GEOTECHNOLOGY INC
FROM THE GROUND UP

Hutsonville Power Station
Hutsonville, Illinois

LOG OF BORING: B-4

Project No. J017150.01

# BORING LOG: TERMS AND SYMBOLS

## GENERAL NOTES

1. *Information on each boring log is a compilation of subsurface conditions based on soil or rock classifications obtained from the field as well as from laboratory testing of samples. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those ob - served at the times and places indicated, and may vary with time, geologic condition or construction activity.*
2. *Relative composition and Unified Soil Classification designations are based on visual estimates and are approximate only. If laboratory tests were performed to classify the soil, the unified designation is show in parenthesis.*
3. *Value given in Unit Dry Weight/SPT Column is either a unit dry weight in pounds per cubic foot, if adjacent to a ST sample designation, or blows per 6-inch increment if adjacent to a SS sample designation.*

## ABBREVIATIONS

| | |
|---|---|
| UU/2 | *Shear Strength from Unconsolidated – Undrained Triaxial Test (ASTM D2850)* |
| QU/2 | *Shear Strength from Unconfined Compression Test (ASTM D2166)* |
| SV | *Shear Strength from Field Vane (ASTM D2573)* |
| PL | *Plastic Limit (ASTM D4318)* |
| LL | *Liquid Limit (ASTM D4318)* |

## LEGEND

| | |
|---|---|
| CS | Continuous Sampler |
| GB | Grab Sample Taken From Auger Cuttings Or Wash Water Return |
| NX 100/42 | NX Rock Core with Percent Recovery/R.Q.D. Given In Adjacent Column |
| PST | Three Inch Diameter Piston Tube Sample |
| SS | Split Spoon Sample (Standard Penetration Test) |
| ST | Three Inch Diameter Shelby Tube Sample |
| * | Sample Not Recovered |
| SV | Field Vane Test |

## SPLIT – BARREL SAMPLER DRIVING RECORD

| *Blow Per Foot (N-Value)* | *Description* |
|---|---|
| *25* | *25 blows drove sampler 12 inches after initial 6 inches of seating.* |
| *75/10”* | *75 blows drove sampler 10 inches after initial 6 inches of seating.* |
| *50/S3”* | *50 blows drove sampler 3 inches during initial 6 inch seating interval.* |

*NOTES: 1. To avoid damage to sampling tools, driving is limited to 50 blows during any six inch interval.*
*2. N-Value (Blow Count) is the standard penetration resistance based on the total number of blows, using a 140-lb hammer with 30-inch free fall, required to drive a split spoon the last two of three, 6-inch drive increments. (Example: 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on grid plot and may be shown as 4/7/9 in Unit Dry Weight – SPT column.*

## RELATIVE COMPOSITION

*Trace……..0-10 %*
*With/Some……..11-35 %*
*Soil modifier such……. > 35 %*
*As silty, clayey, sandy, etc.*

## DENSITY OF GRANULAR SOILS

| ***Descriptive Term:*** | ***N—Value*** |
|---|---|
| *Very Loose* | *0 - 4* |
| *Loose* | *5 - 10* |
| *Medium Dense* | *11 - 30* |
| *Dense* | *31 - 50* |
| *Very Dense* | *> 50* |

## STRENGTH OF COHESIVE SOILS

| **Consistency** | **Undrained Shear Strength Tons Per Sq. Ft.** | **Field Test** | **Approximate N-Value Range** |
|---|---|---|---|
| *Very Soft* | *less than 0.12* | *Thumb will penetrate soil more than 1”* | *0 - 1* |
| *Soft* | *13 to 0.25* | *Thumb will penetrate soil about 1”* | *2 - 4* |
| *Medium Stiff* | *0.26 to 0.50* | *Thumb will penetrate soil about ¼”* | *5 – 8* |
| *Stiff* | *0.51 to 1.00* | *Thumb hardly indents soil* | *9 – 15* |
| *Very Stiff* | *1.01 to 2.00* | *Thumb will not indent soil, but readily indented with thumbnail* | *16 – 30* |
| *Hard* | *greater than 2.00* | *Thumbnail will not indent soil* | *> 30* |

## SOIL GRAIN SIZE

U.S. STANDARD SIEVE

| 12” | 3” | ¾“ | 4 | 10 | 40 | 200 | | |
|---|---|---|---|---|---|---|---|---|
| BOULDERS | COBBLES | GRAVEL | | SAND | | | SILT | CLAY |
| | | COARSE | FINE | COARSE | MEDIUM | FINE | | |
| 300 | 76.2 | 19.1 | 4.76 | 2.00 | 0.42 | 0.074 | 0.002 | |

SOIL GRAIN SIZE IN MILLIMETERS

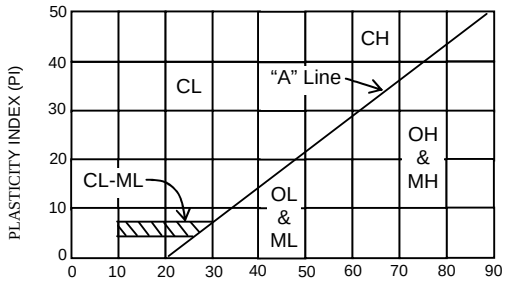
## SOIL STRUCTURE

***Calcareous*** *– Having appreciable quantities of carbonate.*
***Fissured*** *– Containing shrinkage or relief cracks, often filled with sand or silt; usually more or less vertical.*
***Slickensided*** *– Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along those planes.*
***Layer*** *-- Inclusion greater than 3 inches thick.*
***Seam*** *– Inclusion 1/8 inch to 3 inches thick extending through the sample*
***Parting*** *– Inclusion less than 1/8 inch thick.*
***Pocket*** *– Inclusion of material of different texture that is smaller than the diameter of the sample.*
***Interlayered*** *– Soil samples composed of alternating layers of different soil types.*
***Intermixed*** *– Soil samples composed of pockets of different soil types and a layered or laminated structure is not evident.*
***Laminated*** *– Soil sample composed of alternating partings or seams of different soil type.*

# UNIFIED SOIL CLASSIFICATION SYSTEM

| MAJOR DIVISIONS | | | SYMBOL | DESCRIPTION |
|---|---|---|---|---|
| Coarse-Grained Soils (More than 50% Larger than No 200 Sieve Size) | Gravel and Gravelly Soils | Clean Gravels Little or no Fines | GW | Well-Graded Gravel, Gravel-Sand Mixture |
| | | | GP | Poorly –Graded Gravel, Gravel-Sand Mixture |
| | | Gravels with Appreciable Fines | GM | Silty Gravel, Gravel-Sand-Silt Mixture |
| | | | GC | Clayey-Gravel, Gravel-Sand-Clay Mixture |
| | Sand and Sandy Soils | Clean Sands Little or no Fines | SW | Well-Graded Sand, Gravelly Sand |
| | | | SP | Poorly Graded Sand, Gravelly Sand |
| | | Sands with Appreciable Fines | SM | Silty Sand, Sand-Silt Mixture |
| | | | SC | Clayey Sand, Sand-Clay Mixture |
| Fine-Grained Soils (More than 50% Smaller than No 200 Sieve Size) | Silts and Clays | Liquid Limit Less Than 50 | ML | Silt, Clayey Silt, Silty or Clayey Very Fine Sand, Slight Plasticity |
| | | | CL | Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity |
| | | | OL | Organic Silts, or Silty Clays of Low Plasticity |
| | Silts and Clays | Liquid Limit More Than 50 | MH | Silt, Fine Sandy or Silt Soil with High Plasticity |
| | | | CH | Clay, High Plasticity |
| | | | OH | Organic Clay of Medium to High Plasticity |
| | Highly Organic Soils | | PT | Peat, Humus, Swamp Soil |

PLASTICITY CHART




RELATIVE PLASTICITY

| | |
|---|---|
| Nonplastic | Cannot Roll Into Ball |
| Trace Plasticity | Barely Roll Into Ball |
| Medium Plastic | Can be Rolled Into Ball |
| Highly Plastic | No Rupture by Kneading |

# VISUAL DESCRIPTION CRITERIA*

*TABLE 1: CRITERIA FOR DESCRIBING ANGULARITY OF COARSE-GRAINED PARTICLES*

| Description | Criteria |
|---|---|
| Angular | Particles have sharp edges and relatively plane sides with unpolished surfaces |
| Subangular | Particles are similar to angular description but have rounded edges |
| Subrounded | Particles have nearly plane sides but have well-rounded corners and edges |
| Rounded | Particles have smoothly curved sides and no edges |

*TABLE 2: CRITERIA FOR DESCRIBING PARTICLE SHAPE*

| Description | Criteria |
|---|---|
| Flat | Particles with width/thickness X3 |
| Elongated | Particles with length/width X3 |
| Flat and Elongated | Particles meet criteria for both flat and elongated |

*TABLE 3: CRITERIA FOR DESCRIBING MOISTURE CONDITION*

| Description | Criteria |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp, but no visible water |
| Wet | Visible free water, usually soil is below the water table |

*TABLE 4: CRITERIA FOR DESCRIBING REACTION WITH HCL*

| Description | Criteria |
|---|---|
| None | No visible reaction |
| Weak | Some reaction, with bubbles forming slowly |
| Strong | Violent reaction, with bubbles forming rapidly |

*TABLE 6: CRITERIA FOR DESCRIBING CEMENTATION*

| Description | Criteria |
|---|---|
| Weak | Crumbles or breaks with handling or little finger pressure |
| Moderate | Crumbles or breaks with considerable finger pressure |
| Strong | Will not crumble or break with finger pressure |

*NOTES: 1. Tables adapted from ASTM D2488 "Description and identification of Soils" (Visual-Manual Procedure)
2. Tables 5, 7 and 11 incorporated into other information on this plate.

*TABLE 8: CRITERIA FOR DESCRIBING DRY STRENGTH*

| Description | Criteria |
|---|---|
| None | The dry specimen crumbles into powder with mere pressure of handling |
| Low | The dry specimen crumbles into powder with some finger pressure |
| Medium | The dry specimen breaks into pieces or crumbles with considerable finger pressure |
| High | The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface. |
| Very High | The dry specimen cannot be broken between the thumb and a hard surface |

*TABLE 9: CRITERIA FOR DESCRIBING DILATANCY*

| Description | Criteria |
|---|---|
| None | No visible change in the specimen |
| Slow | Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing. |
| Rapid | Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing. |

*TABLE 10: CRITERIA FOR DESCRIBING TOUGHNESS*

| Description | Criteria |
|---|---|
| Low | Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft. |
| Medium | Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness |
| High | Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness |

*TABLE 12: IDENTIFICATION OF INORGANIC FINE-GRAINED SOILS FROM MANUAL TESTS*

| Soil Symbol | Dry Strength | Dilatancy | Toughness |
|---|---|---|---|
| ML | None to low | Slow to rapid | Low or thread cannot be formed |
| CL | Medium to high | None to slow | Medium |
| MH | Low to medium | None to slow | Low to medium |
| CH | High to very high | none | High |

# Appendix A-9

## Hanson 2011 Boring Logs

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny,mild (60's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼" Hollow Stem Auger w/ Split Spoon
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-1
**Well ID:** n/a
**Surface Elev:** 450.5 ft. MSL
**Completion:** 14.7 ft. BGS
**Station:** 4,360.00N
3,130.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 4.00 - durring drilling
▼ = 6.30 - 13:45 (6 Apr 11)
▽ =

| SAMPLE Number | Recov / Total (in) % Recovery | Type | TESTING Blows / 6 in N - Value RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Elevation ft. MSL | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 0 | Very dark grayish brown (10YR3/2), moist, soft, silty, fine- to very coarse-grained, SAND with trace gravel. | 450 | |
| 1A | 22/24 92% | ss | 3-3 3-2 N=6 | 17 | | 2.20 | | | | |
| 1B | | | | 17 | | 1.30 | 2 | Yellowish brown (10YR5/4), moist, soft, clayey, fine- to very coarse-grained SAND with trace gravel. | 448 | |
| 2A | 19/24 79% | ss | 1-2 2-4 N=4 | 19 | | | | | | |
| | | | | | | | 4 | Yellowish brown (10YR5/4), wet, loose, very fine- to coarse-grained SAND with slight trace gravel. | 446 | |
| 3A | 18/24 75% | ss | 1-2 4-9 N=6 | 16 | | | | | | |
| | | | | | | | 6 | Yellowish brown (10YR5/8), very moist, dense, silty, very fine- to fine-grained SAND with slight trace clay. Bedding laminations present. | 444 | |
| 4A | 22/23 96% | ss | 15-35 34-50/5" N=69 | 11 | | | | | | |
| 4B | | | | 12 | | | 8 | Black (10YR2/1), moist, very hard, SILTSTONE. | | |
| 5A | 8/8 100% | ss | 14-50/2" | 15 | | 2.50 | | Yellowish brown (10YR5/8), moist, very hard, silty, very fine- to fine-grained SANDSTONE. | 442 | |
| 5B | | | | 13 | | | | Very pale brown (10YR8/2), moist, very hard, silty, very fine- to fine-grained SANDSTONE. | | |
| | | | | | | | | Yellowish brown (10YR5/6), moist, very hard, silty, very fine- to fine-grained SANDSTONE. | | |
| 6A | 5/5 100% | ss | 50/5" | 13 | | 3.50 | 10 | Black (10YR2/1), moist, very hard, SILTSTONE | 440 | |
| | | | | | | | | Gray (10YR6/1), moist, very hard, silty, very fine- to fine-grained SANDSTONE. | | |
| 7A | 9/9 100% | ss | 15-50/3" | 16 | | 1.40 | 12 | Brown (10YR5/3), wet, hard, silty, very fine- to fine-grained, weathered SANDSTONE. | 438 | |
| 7B | | | | 16 | | 3.80 | | | | |
| | | | | | | | | Gray (10YR6/1), moist, very hard, silty, very fine- to fine-grained SANDSTONE. | | |
| 8A | 6/8 75% | ss | 45-50/2" | 13 | | | 14 | | 436 | |

**End of Boring = 14.7 ft. BGS**

**NOTE(S):** Borehole abandoned with auger cuttings.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny,mild (60's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼" Hollow Stem Auger w/ Split Spoon
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-2
**Well ID:** n/a
**Surface Elev:** 456.0 ft. MSL
**Completion:** 15.4 ft. BGS
**Station:** 3,700.00N
4,050.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = Dry - dry during drilling
▼ = Dry - dry @14:20 (6 Apr 11)
▽ =

| SAMPLE | | | | TESTING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Number | Recov / Total (in) *% Recovery* | Type | | *Blows / 6 in* N - Value **RQD** | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) *Qp* (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks |
| | 0/60 *0%* | BD | | | | | | 0 | | | 456 | |
| | | | | | | | | 2 | | | 454 | |
| | | | | | | | | 4 | | | 452 | |
| | | | | | | | | 6 | | | 450 | |
| | 0/60 *0%* | BD | | | | | | 8 | Yellowish brown (10YR5/6), moist, loose, silty, very fine- to medium-grained SAND with slight trace gravel. *Description logged from auger cuttings.* | | 448 | |
| | | | | | | | | 10 | | | 446 | |
| | | | | | | | | 12 | | | 444 | |
| | 0/60 *0%* | BD | | | | | | 14 | | | 442 | |
| 4A | 5/5 *100%* | SS | | *50/5"* | 16 | | | | Yellowish brown (10YR5/8, wet, hard, silty, very fine- to medium-grained SANDSTONE with laminated bedding. | | | |

**End of Boring = 15.4 ft. BGS**

**NOTE(S):** Borehole abandoned with auger cuttings.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny,mild (60's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼" Hollow Stem Auger w/ Split Spoon
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-3
**Well ID:** n/a
**Surface Elev:** 455.0 ft. MSL
**Completion:** 15.4 ft. BGS
**Station:** 3,530.00N
4,305.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 10.00 - durring drilling
▼ = 7.60 - 14:55 (6 Apr 11)
▽ =

| SAMPLE Number | Recov / Total (in) % Recovery | Type | TESTING Blows / 6 in N - Value RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0/60 0% | BD | | | | | 0 | | | 455 | |
| | | | | | | | 2 | Black (10YR2/1), moist, loose, silty very fine- to medium-grained SAND with slight trace gravel. *Description logged from auger cuttings.* | | 454 | |
| | | | | | | | 4 | | | 452 | |
| | | | | | | | 6 | | | 450 | |
| | 0/60 0% | BD | | | | | 8 | Yellowish brown (10YR5/6), moist, loose, silty, very fine- to fine-grained SAND with slight trace gravel. *Description logged from auger cuttings.* | | 448 | |
| 3A | 6/9 67% | SS | 37-50/5" | 17 | | | 10 | | | 446 | |
| | 0/51 0% | BD | | | | | 12 | Yellowish brown (10YR5/6), moist, dense, silty, very fine- to fine-grained, weathered SANDSTONE | | 444 | |
| 5A | 5/5 100% | SS | 50/5" | 14 | | | 14 | | | 442 | |
| | | | | | | | | Yellowish brown (10YR5/6), wet, hard, silty, very fine- to medium-grained SANDSTONE with laminated bedding. | | 440 | |

**End of Boring = 15.4 ft. BGS**

**NOTE(S):** Borehole abandoned with auger cuttings.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

HANSON

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny,mild (60's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼ Hollow Stem Auger w/ Split Spoon and Shelby tubes
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-4
**Well ID:** n/a
**Surface Elev:** 440.8 ft. MSL
**Completion:** 35.4 ft. BGS
**Station:** 2,975.00N
5,070.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 16.00 - durring drilling
▼ = 14.90 - 17:35 (6 Apr 11)
▽ =

| SAMPLE Number | Recov / Total (in) % Recovery | Type | TESTING Blows / 6 in N - Value RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Elevation ft. MSL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Very dark grayish brown (10YR3/2), moist, soft, very silty CLAY with trace sand. | 440 |
| 1A | 23/24 96% | SS | 1-2 3-3 N=5 | 21 | | 0.97 SP | 2 | Dark brown (10YR3/3) with 10% dark yellowish brown (10YR4/4) mottles, moist, soft, very silty CLAY with trace sand. | 438 |
| 2A | 20/24 83% | SS | 1-2 2-2 N=4 | 36 | | 0.73 B | 4 | Dark grayish brown (10YR4/2), moist, soft, very silty CLAY with trace sand. | 436 |
| 3-1 | | | | | | | | | |
| 3-2 | 12/24 50% | SH | | | | | | | |
| 3-3 | | | | | | | 6 | Dark grayish brown (10YR4/2), moist, soft, silty CLAY with slight trace sand. | 434 |
| 4A | 19/24 79% | SS | 3-3 3-4 N=6 | 32 | | 1.36 B | | | |
| 5A | 24/24 100% | SS | 1-2 3-4 N=5 | 31 | | 1.24 B | 8 | Dark yellowish brown (10YR4/4), moist, soft, silty CLAY with slight trace sand. | 432 |
| 6A | 22/24 92% | SS | 1-2 3-4 N=5 | 48 | | | | Dark yellowish brown (10YR4/4), wet, very soft, silty CLAY with slight trace sand. | 430 |
| 6B | | | | 31 | | 1.65 BSh | 10 | | |
| 7A | 22/24 92% | SS | 4-5 4-4 N=9 | 31 | | 1.16 BSh | 12 | Dark yellowish brown (10YR4/4), moist, soft, silty CLAY with trace sand. | 428 |
| 8A | 20/24 83% | SS | 2-3 3-3 N=6 | 33 | | 1.24 BSh | 14 | | |
| | | | | | | | ▽ | Dark yellowish brown (10YR4/4) with 10% gray (10YR6/1) mottles, moist, soft, silty CLAY with slight trace sand. | 426 |
| | | | | | | | ▼ 16 | | |
| 9A | 24/24 100% | SS | 4-5 6-4 N=11 | 48 | | | | Dark yellowish brown (10YR4/4), wet, very soft, silty CLAY with trace sand. | 424 |
| 9B | | | | 35 | | 1.03 BSh | 18 | Dark yellowish brown (10YR4/4) with 10% gray (10YR6/1) mottles, moist, soft, silty CLAY with trace sand. | 422 |
| 10-1 | | | | | | | | | |
| 10-2 | 9/24 38% | SH | | | | | 20 | | |

**NOTE(S):** Borehole abandoned with high-solids bentonite grout placed by tremie near borehole bottom.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny,mild (60's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼ Hollow Stem Auger w/ Split Spoon and Shelby tubes
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-4
**Well ID:** n/a
**Surface Elev:** 440.8 ft. MSL
**Completion:** 35.4 ft. BGS
**Station:** 2,975.00N
5,070.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 16.00 - durring drilling
▼ = 14.90 - 17:35 (6 Apr 11)
▽ =

| SAMPLE Number | Recov / Total (in) % Recovery | Type | TESTING Blows / 6 in N - Value RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11A | 24/24 100% | ss | woh-woh woh-woh | 31 | | 0.23 B | 22 | Yellowish brown (10YR5/4), very moist, very soft, SILT with some clay and trace sand. | | 420 | |
| 12A | 22/24 92% | ss | woh-woh 1-1 | 30 | | 0.44 B | 24 | Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, very moist, very soft, SILT with some clay and trace sand. | | 418 | |
| 13A | | | | 44 | | | | | | 416 | |
| 13B | 17/24 71% | ss | 1-5 6-11 N=11 | 12 | | | 26 | Yellowish brown (10YR5/4), wet, loose, very fine- to very coarse-grained SAND with trace gravel. | | 414 | |
| 14A | 19/24 79% | ss | 11-16 18-22 N=34 | 10 | | | 28 | | | 412 | |
| 15A | 18/24 75% | ss | 10-30 24-15 N=54 | 8 | | | 30 | Gray (10YR5/1), wet, medium dense, SILT with trace very fine-grained sand. | | 410 | |
| 16A | 8/24 33% | ss | 4-6 8-6 N=14 | 28 | | | | Black (10YR2/1), moist, hard, layered, COAL and weathered SHALE. | | | |
| 17A | 17/17 100% | ss | 10-33 50/5" | 15 | | | 32 | Gray (10YR5/1), wet, dense, silty, very fine- to very coarse-grained, weathered SANDSTONE. | | 408 | |
| 18A | 17/17 100% | ss | 20-42 50/5" | 15 | | 5.99 Sh | 34 | Gray (10YR5/1), moist, hard, SHALE. | | 406 | |

**End of Boring = 35.4 ft. BGS**

**NOTE(S):** Borehole abandoned with high-solids bentonite grout placed by tremie near borehole bottom.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/06/2011
**Finish:** 04/06/2011
**WEATHER:** Sunny, warm (70's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼" Hollow Stem Auger w/ Split Spoon
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-5
**Well ID:** n/a
**Surface Elev:** 452.5 ft. MSL
**Completion:** 22.0 ft. BGS
**Station:** 3,825.00N
5,215.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 3.00 - during drilling
▼ =
▽ =

| SAMPLE Number | Recov / Total (in) / % Recovery | Type | TESTING Blows / 6 in / N - Value / RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1A | 17/24 *71%* | ss | *1-2* *11-12* N=13 | | | | 0 | | | 452 | |
| 2A | 18/24 *75%* | ss | *6-6* *4-4* N=10 | | | | 2 | | | 450 | |
| 3A | 20/24 *83%* | ss | *2-2* *1-1* N=3 | | | | 4 | | | 448 | |
| 4A | 24/24 *100%* | ss | *1-1* *1-1* N=2 | | | | 6 | | | 446 | |
| 5A | 24/24 *100%* | ss | *woh-woh* *2-1* | | | | 8 | | | 444 | |
| 6A | 15/24 *63%* | ss | *woh-woh* *woh-1* | | | | 10 | Black (10YR2/1) very moist to wet, ASH and yellowish red (5YR5/6) CINDERS. *Found layered or mixed.* | | 442 | |
| 7A | 17/24 *71%* | ss | *2-1* *3-4* N=4 | | | | 12 | | | 440 | |
| 8A | 18/24 *75%* | ss | *1-0* *1-0* N=1 | | | | 14 | | | 438 | |
| 9A | 24/24 *100%* | ss | *1-0* *0-0* N=0 | | | | 16 | | | 436 | |
| 10A | 20/24 *83%* | ss | *woh-woh* *2-5* | | | | 18 | | | 434 | |
| 11A | 12/24 *50%* | ss | *3-3* *4-5* N=7 | | | | 20 | Gray (10YR5/1), moist, stiff, silty CLAY with slight trace sand. | | 432 | |
| | | | | | | | 22 | | | | |

**End of Boring = 21.0 ft. BGS**

**NOTE(S):** Borehole abandoned with bentonite chips (bottom 1 ft.) and auger cuttings to surface.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# FIELD BORING LOG

**CLIENT:** Ameren Corp.
**Site:** Hutsonville Power Station
**Location:** 15142 East 1900 Ave, Hutsonville, IL 62433
**Project:** 10E0035
**DATES:** **Start:** 04/07/2011
**Finish:** 04/07/2011
**WEATHER:** Sunny, warm (70's)

**CONTRACTOR:** Testing Service Corp.
**Rig mfg/model:** CME-550 ATV Drill
**Drilling Method:** 3¼" Hollow Stem Auger w/ Split Spoon
**FIELD STAFF:** **Driller:** B. Williamson
**Helper:** D. Crump
**Eng/Geo:** R. Hasenyager

**BOREHOLE ID:** B11-6
**Well ID:** P11-6
**Surface Elev:** 453.00 ft. MSL
**Completion:** 24.00 ft. BGS
**Station:** 3,700.00N
5,425.00E

**TOPOGRAPHIC MAP INFORMATION:**
**Quadrangle:** West Union, ILL. - IND.
**Township:** Hutsonville
**Section** 17, **Tier** 8N.; **Range** 11W.

**WATER LEVEL INFORMATION:**
▼ = 3.50 - durring drilling
▼ = 3.50 - 19:30 (7 Apr 11)
▽ =

| SAMPLE Number | Recov / Total (in) / % Recovery | Type | TESTING Blows / 6 in / N - Value / RQD | Moisture (%) | Dry Den. (lb/ft³) | Qu (tsf) Qp (tsf) Failure Type | Depth ft. BGS | Lithologic Description | Elevation ft. MSL | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1A | 20/24 83% | ss | 2-6 21-29 N=27 | | | | 0 | | 452 | |
| 2A | 24/24 100% | ss | 12-19 17-23 N=36 | | | | 2 | | 450 | |
| 3A | 24/24 100% | ss | 11-14 16-12 N=30 | | | | 4 | | 448 | |
| 4A | 24/24 100% | ss | 26-13 25-15 N=38 | | | | 6 | | 446 | |
| 5A | 20/24 83% | ss | 3-6 8-8 N=14 | | | | 8 | | 444 | |
| 6A | 24/24 100% | ss | 4-6 7-8 N=13 | | | | 10 | Black (10YR2/1) very moist to wet, ASH and yellowish red (5YR5/6) CINDERS. *Found layered or mixed.* | 442 | |
| 7A | 24/24 100% | ss | 8-14 10-12 N=24 | | | | 12 | | 440 | |
| 8A | 22/24 92% | ss | 7-8 8-9 N=16 | | | | 14 | | 438 | |
| 9A | 22/24 92% | ss | 7-7 8-9 N=15 | | | | 16 | | 436 | |
| 10A | 22/24 92% | ss | 22-9 9-7 N=18 | | | | 18 | | 434 | |
| 11A 11B | 16/24 67% | ss | 11-7 3-4 N=10 | | | | 20 | | 432 | |
| 12A | 16/24 67% | ss | 1-2 2-2 N=4 | | | | 22 | Yellowish brown (10YR5/4) with 10% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with slight trace sand. | 430 | |
| | | | | | | | 24 | | | |

**End of Boring = 24.0 ft. BGS**

**NOTE(S):** Piezometer P11-6 installed in borehole.
Coordinates (northing & easting) and elevation were estimated from topographic map pending field survey.

# Appendix A-10

## Illinois State Geological Survey Water Well Records

# ILLINOIS STATE GEOLOGICAL SURVEY

| Water Well | Top | Bottom |
|---|---|---|
| brown clay,very soft | 0 | 20 |
| gray clay very soft | 20 | 25 |
| crs sand & gravel w/bldr @ 40'(wtr brg) | 25 | 54 |
| gravel w/boulders very loose(wtr brg) | 54 | 75 |
| medium/fine sand very loose (wtr brg) | 75 | 90 |
| bedrock at | 90 | 90 |
| **Total Depth** | | **90** |

Casing: 42" from -1' to 30'
26" from -1' to 57'
Screen: 30' of 26" diameter 6 slot
Water from sand & gravel at 25' to 87'.
Static level 18' below casing top which is 2' above GL
Pumping level 24' when pumping at 825 gpm for 3 hours

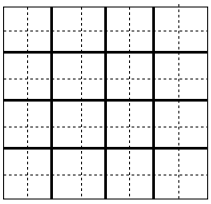
Remarks: see logbook for further location info

Driller's Log filed
Sample set # 60350 (0' - 85') Received: June 1, 1976

Owner Address: ,
Location source: Location from permit

**Permit Date:** May 18, 1976 **Permit #:** 47367

**COMPANY** owner
**FARM** C.I.P.S.-Hutsonville Unit
**DATE DRILLED** May 25, 1976 **NO.** 3
**ELEVATION** 440TM **COUNTY NO.** 29913
**LOCATION** 350'S line, 1630'E line of SE
**LATITUDE** 39.129678 **LONGITUDE** -87.654686
**COUNTY** **Crawford** **API 120332991300** **17 - 8N - 11W**



# ILLINOIS STATE GEOLOGICAL SURVEY

| Industrial Water Well | Top | Bottom |
|---|---|---|
| cinders, sand & clay | 0 | 5 |
| med to soft clay | 5 | 22 |
| soft gray clay | 22 | 26 |
| f-med s, gvl & bld | 26 | 88 |
| **Total Depth** | | **88** |

Casing: 26" .375 WALL from 0' to 57'
42" .375 WALL from -22' to 30'

Screen: 30' of 26" diameter .5 slot

Grout: CEMENT from 5 to 30.

Size hole below casing: 42"

Water from alluvial at 25' to 97'.
Static level 15' below casing top which is 0' above GL
Pumping level 22' when pumping at 826 gpm for 5 hours

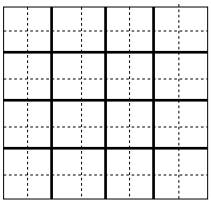
Permanent pump installed at 60'
on , with a capacity of 600 gpm

Driller's Log filed

Owner Address: Hutsonville Power Generator St Hutsonville, IL
Location source: Location from permit

**Permit Date:** August 26, 1983 **Permit #:** 109053

**COMPANY** Ruester, John T.
**FARM** Central Il Public Serv.Co.
**DATE DRILLED** October 28, 1983 **NO.** 4
**ELEVATION** 440GL **COUNTY NO.** 33867
**LOCATION** 350'S line, 150'W line of SE SW SE
**LATITUDE** 39.129677 **LONGITUDE** -87.654832
**COUNTY Crawford** **API 120333386700** **17 - 8N - 11W**



# ILLINOIS STATE GEOLOGICAL SURVEY

| Private Water Well | Top | Bottom |
|---|---|---|
| sandy clay | 0 | 5 |
| sand & gravel | 5 | 8 |
| gray hardpan | 8 | 15 |
| gray sandstone | 15 | 51 |
| gry shale | 51 | 64 |
| coal | 64 | 68 |
| gray shale | 68 | 90 |
| **Total Depth** | | **90** |

Casing: 5" PVC SDR 21 from -2' to 90'

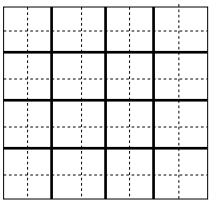
Grout: BENTONITE from 0 to 30.

Water from sandstone at 15' to 51'.
Static level 11' below casing top which is 2' above GL
Pumping level 85' when pumping at gpm for 5 hours
Permanent pump installed at 85'
on December 24, 2007, with a capacity of 10 gpm

Owner Address: 19470 N 1500 Hutsonville, IL
Address of well: same as above
Location source: Location from permit

**Permit Date:** December 17, 2007 **Permit #:** 033-7-0

**COMPANY** Van Gilder, Richard E.
**FARM** Allison, Jim
**DATE DRILLED** December 20, 2007 **NO.**
**ELEVATION** **COUNTY NO.** 37411
**LOCATION** NE NE SE
**LATITUDE** 39.135033 **LONGITUDE** -87.66725
**COUNTY** **Crawford** **API 120333741100** **18 - 8N - 11W**



# ILLINOIS STATE GEOLOGICAL SURVEY

| Irrigation Well | Top | Bottom |
|---|---|---|
| dark clay | 0 | 2 |
| sand & gravel | 2 | 47 |
| coarse sand | 47 | 61 |
| **Total Depth** | | **61** |

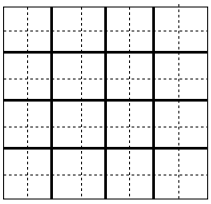
Casing: 16" PVC SCH 40 from -1' to 31'
16" PVC SAWED SCREEN from 31' to 61'
Screen: 30' of 16" diameter 32 slot
Grout: BENSEAL from 3 to 20.
Grout: GRAVEL PACK from 20 to 61.

Static level 9' below casing top which is 1' above GL

Owner Address: 1008 N. Pleasant St. Hutsonville, IL
Location source: Location from permit

**Permit Date:** June 7, 2002 **Permit #:**

**COMPANY** Speth, James
**FARM** DeMent, Margaret
**DATE DRILLED** June 12, 2002 **NO.**
**ELEVATION** 0 **COUNTY NO.** 36898
**LOCATION** NE NE NW
**LATITUDE** 39.127799 **LONGITUDE** -87.658791
**COUNTY** **Crawford** **API 120333689800** **20 - 8N - 11W**



# ILLINOIS STATE GEOLOGICAL SURVEY

| Irrigation Well | Top | Bottom |
|---|---|---|
| topsoil | 0 | 3 |
| silty dark clay | 3 | 20 |
| gray clay | 20 | 25 |
| coarse gray sand with fine-med gravel | 25 | 66 |
| gray clay at | 66 | 66 |
| **Total Depth** | | **66** |

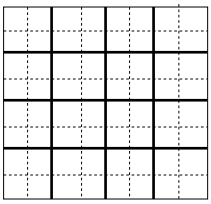
Casing: 12" SCH 40 PVC from 0' to 32'
Screen: 3' of 12" diameter .06 slot
Grout: BENTONITE from 0 to 25.

Water from sand & gravel at 25' to 66'.
Static level 11' below casing top which is 1' above GL
Pumping level 0' when pumping at 1000 gpm for 0 hours

Owner Address: R.R. #1 Sullivan, IN
Address of well:
Hutsonville, IL
Add'l loc. info: FALSE
S of CIPS Power Plant
Location source: Location from permit

**Permit Date:** January 15, 1997 **Permit #:** 033-1-9

**COMPANY** Hacker, Tim
**FARM** Wampler, Duane
**DATE DRILLED** January 29, 1998 **NO.** 1
**ELEVATION** 0 **COUNTY NO.** 36667
**LOCATION** NE NE NW
**LATITUDE** 39.127799 **LONGITUDE** -87.658791
**COUNTY** **Crawford** **API 120333666700** **20 - 8N - 11W**



# ILLINOIS STATE GEOLOGICAL SURVEY

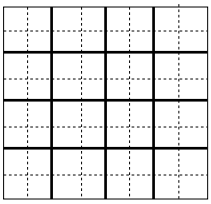
| Irrigation Well | Top | Bottom |
|---|---|---|
| SS #66941 (0'-65') | 0 | 0 |
| top soil | 0 | 1 |
| fine brown sand | 1 | 13 |
| coarse brown sand | 13 | 45 |
| gravel & sand | 45 | 64 |
| **Total Depth** | | **64** |

Casing: 16" PVC WC SCH 80 from 2' to 64'
Screen: 30' of 16" diameter .12 slot
Grout: BENTONITE from 0 to 0.
Water from sand & gravel at 0' to 0'.

Sample set # 66941 (0' - 65') Received: June 2, 1989
Owner Address: R.R. #1 Box #3 Hudsonville, IL
Location source: Location from permit

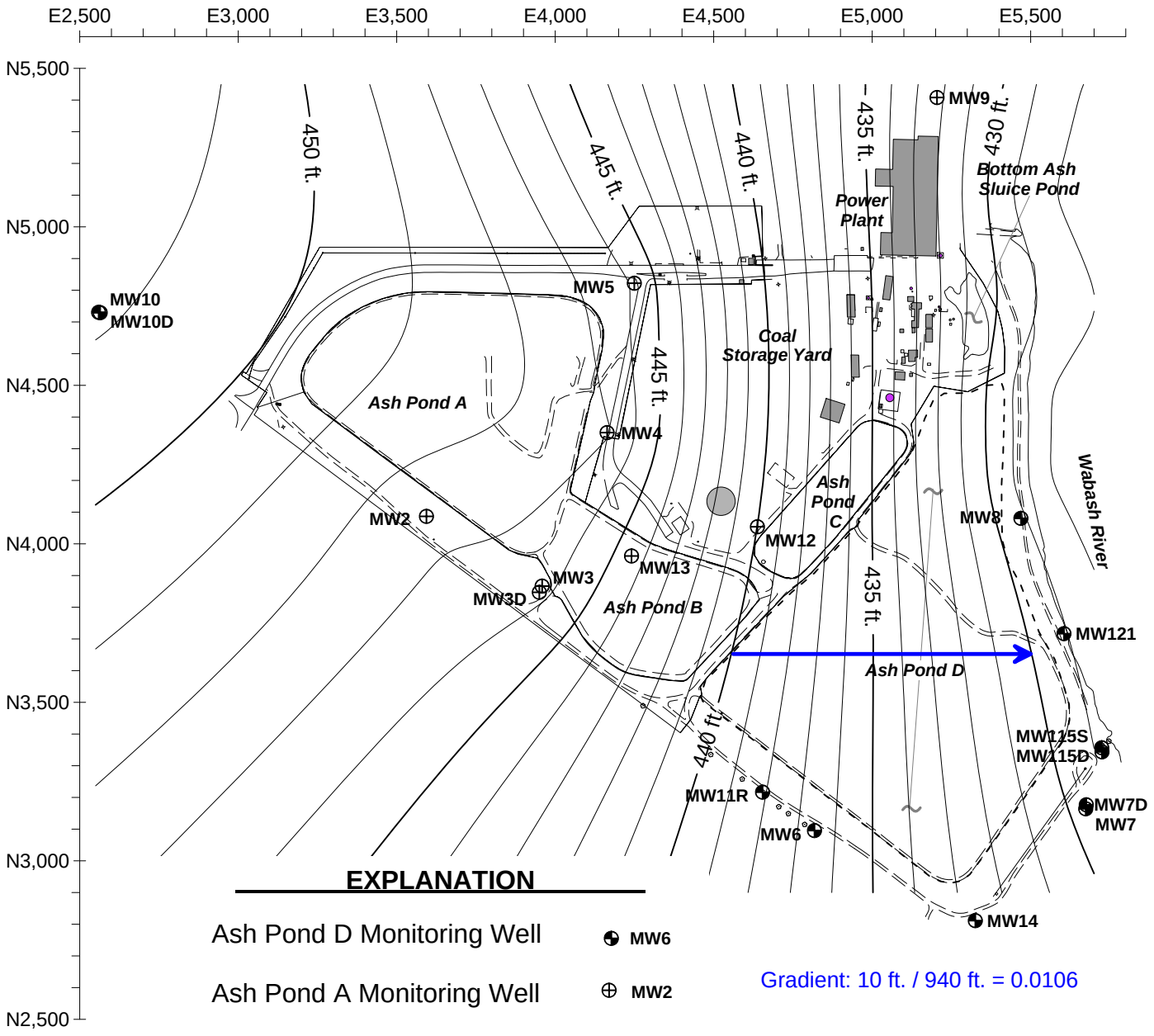
**Permit Date:** February 10, 1989 **Permit #:** 139628

**COMPANY** Erwin, Harold E.
**FARM** Dement, Margaret R.
**DATE DRILLED** March 24, 1989 **NO.**
**ELEVATION** 0 **COUNTY NO.** 35196
**LOCATION** NW NW NW
**LATITUDE** 39.12778 **LONGITUDE** -87.665637
**COUNTY** **Crawford** **API 120333519600** **20 - 8N - 11W**



# Appendix B

## Potentiometric Surface Maps




## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits)

Gradient: 10 ft. / 940 ft. = 0.0106

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 16-18 November 1998



HANSON
Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - NOV. 1998

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-1

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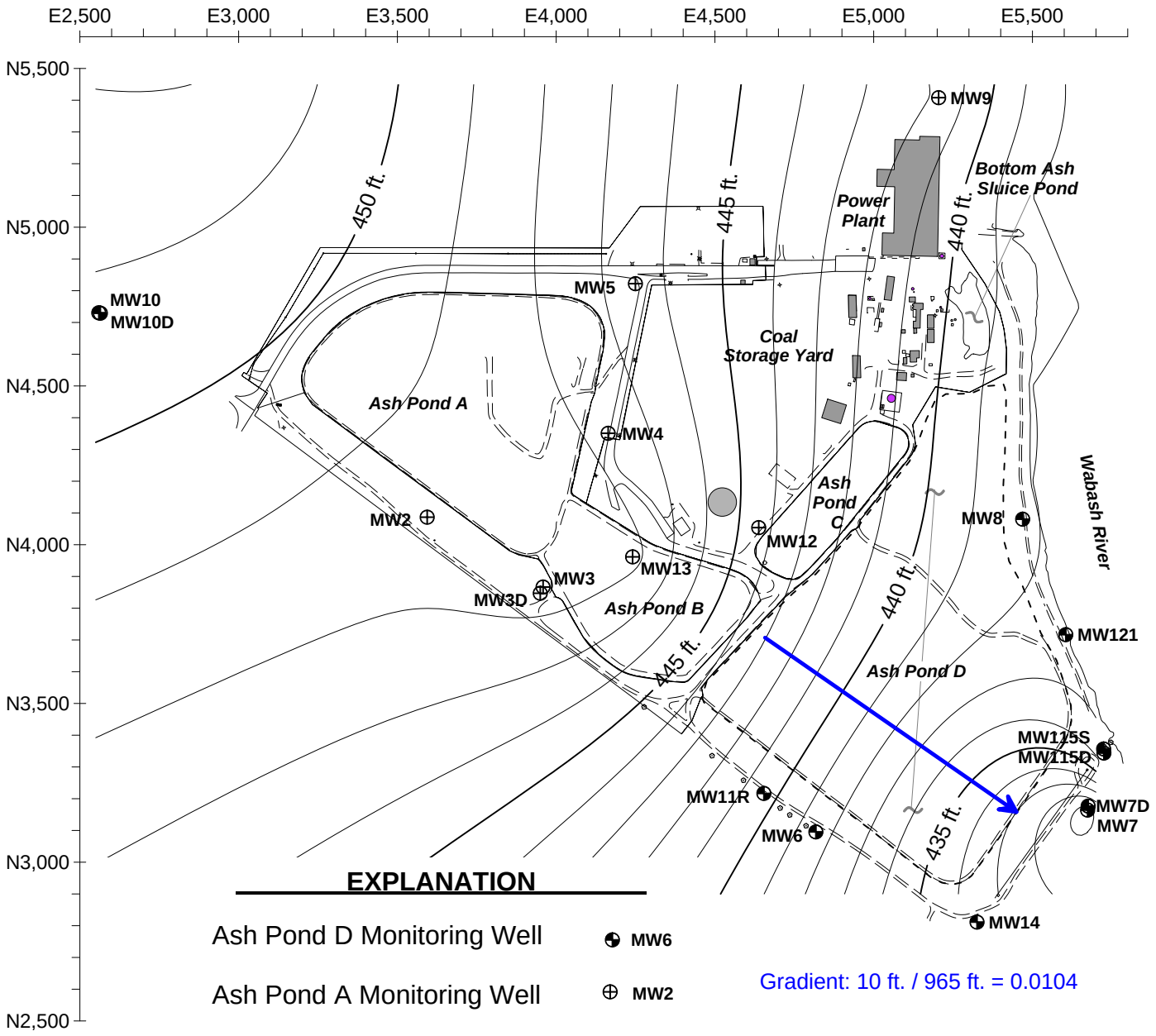


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits)

Gradient: 10 ft. / 965 ft. = 0.0104

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 29-30 April 1999



Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - APRIL 1999

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-2

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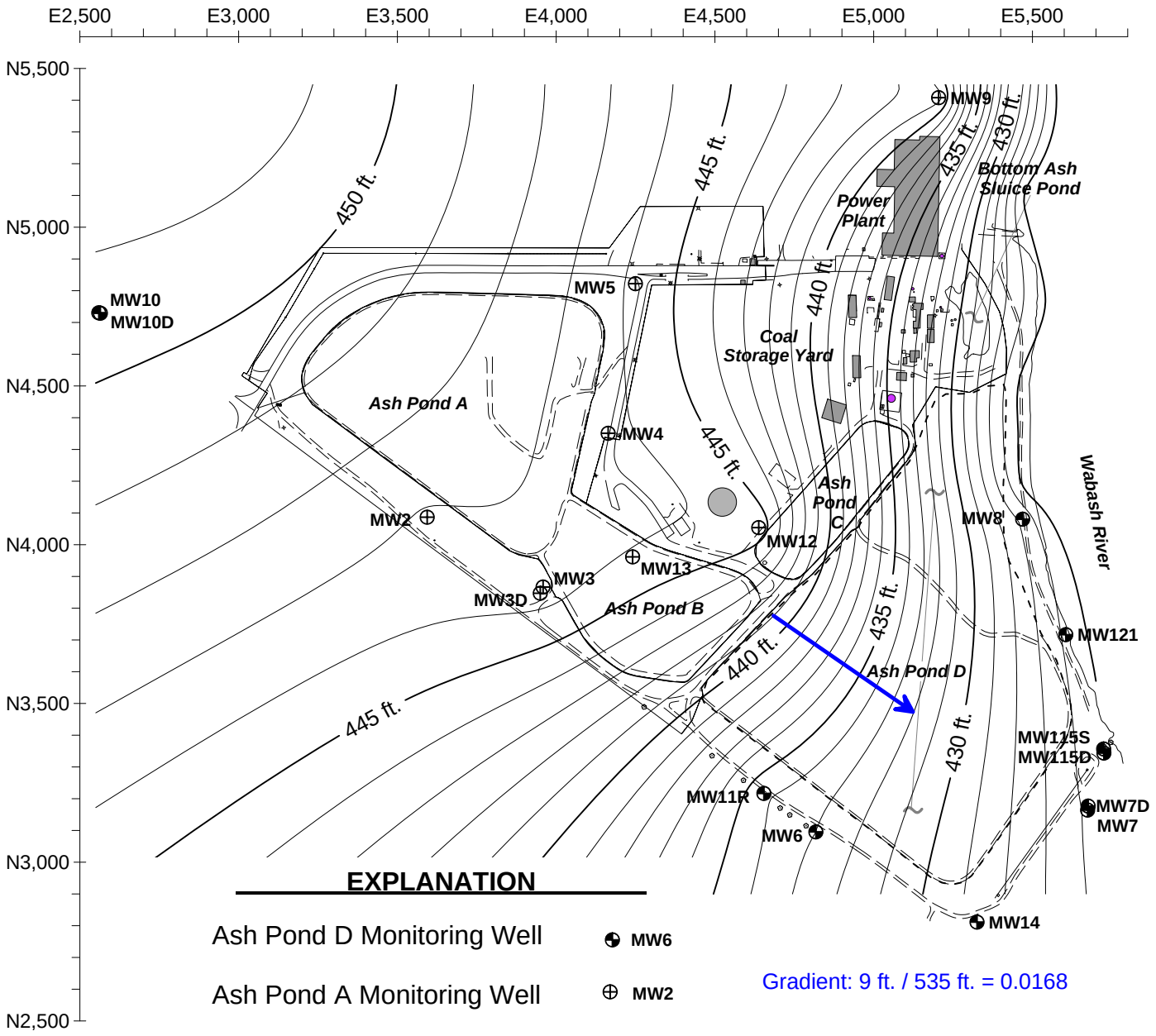


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 9 ft. / 535 ft. = 0.0168

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 2 July 2007



HANSON
Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - JULY 2007

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-3

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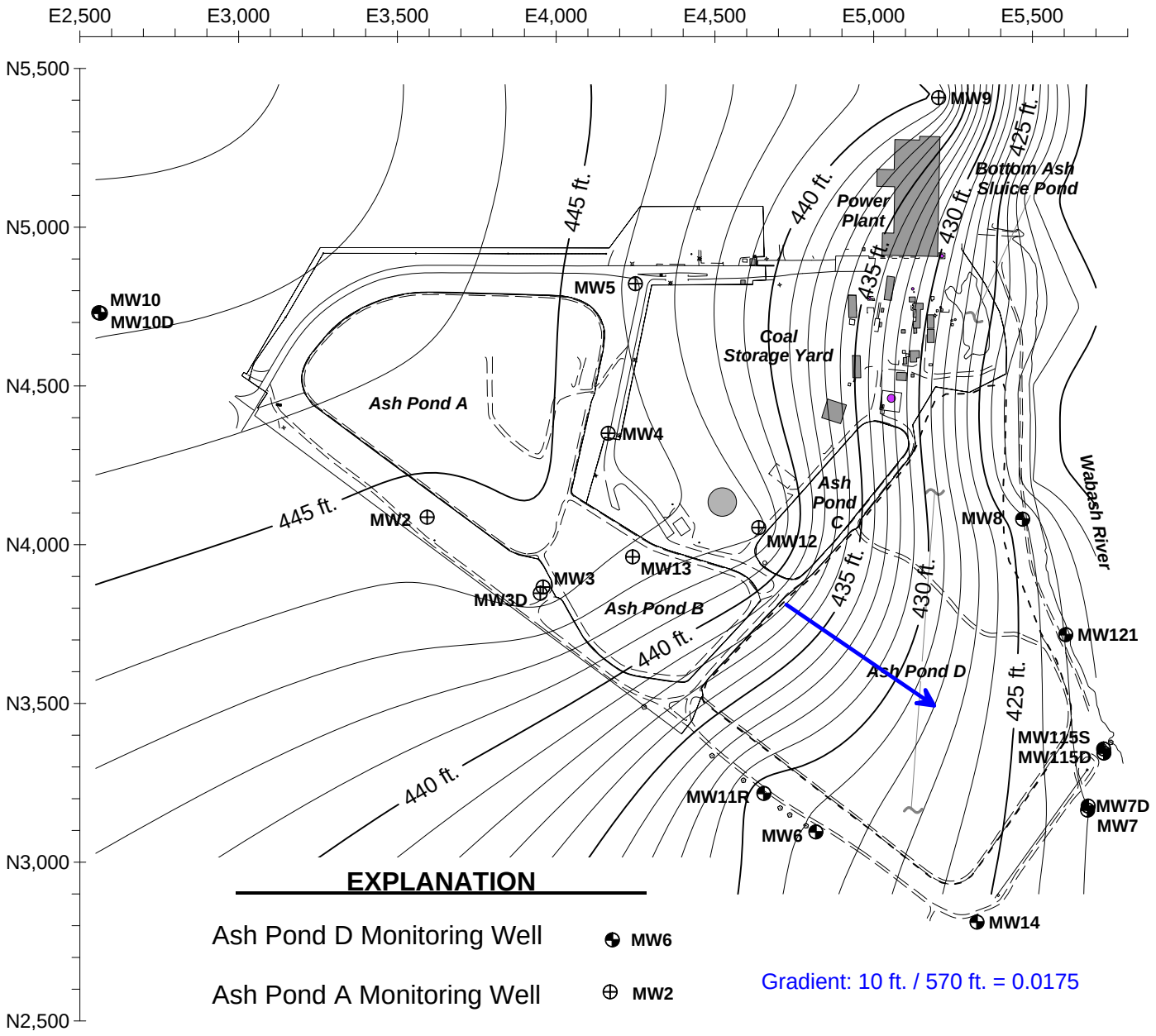


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits)

Gradient: 10 ft. / 570 ft. = 0.0175

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 2 October 2007



HANSON
Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - OCT. 2007

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-4

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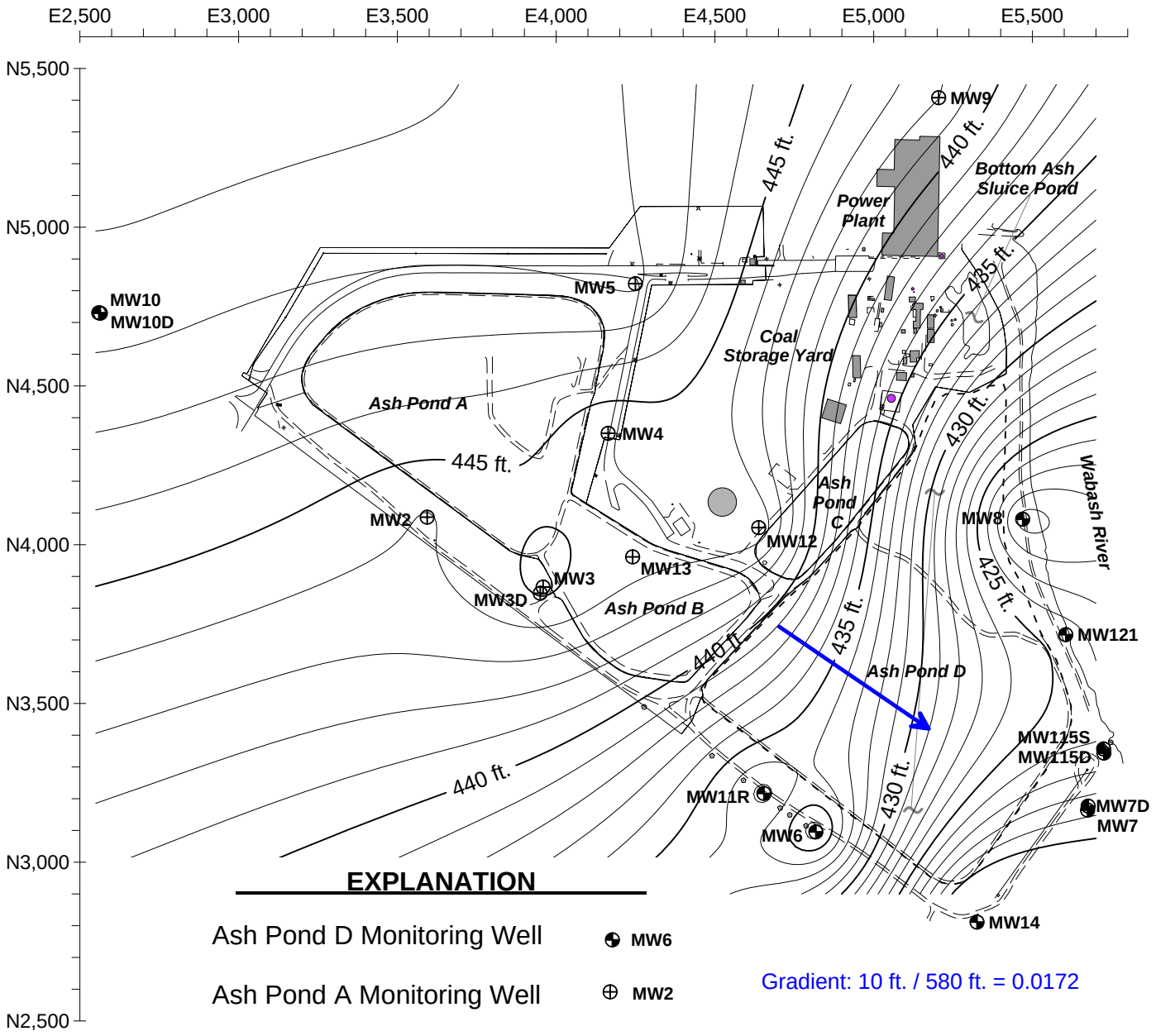


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 10 ft. / 580 ft. = 0.0172

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 13 April 2010



HANSON
Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - APR. 2010

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-5

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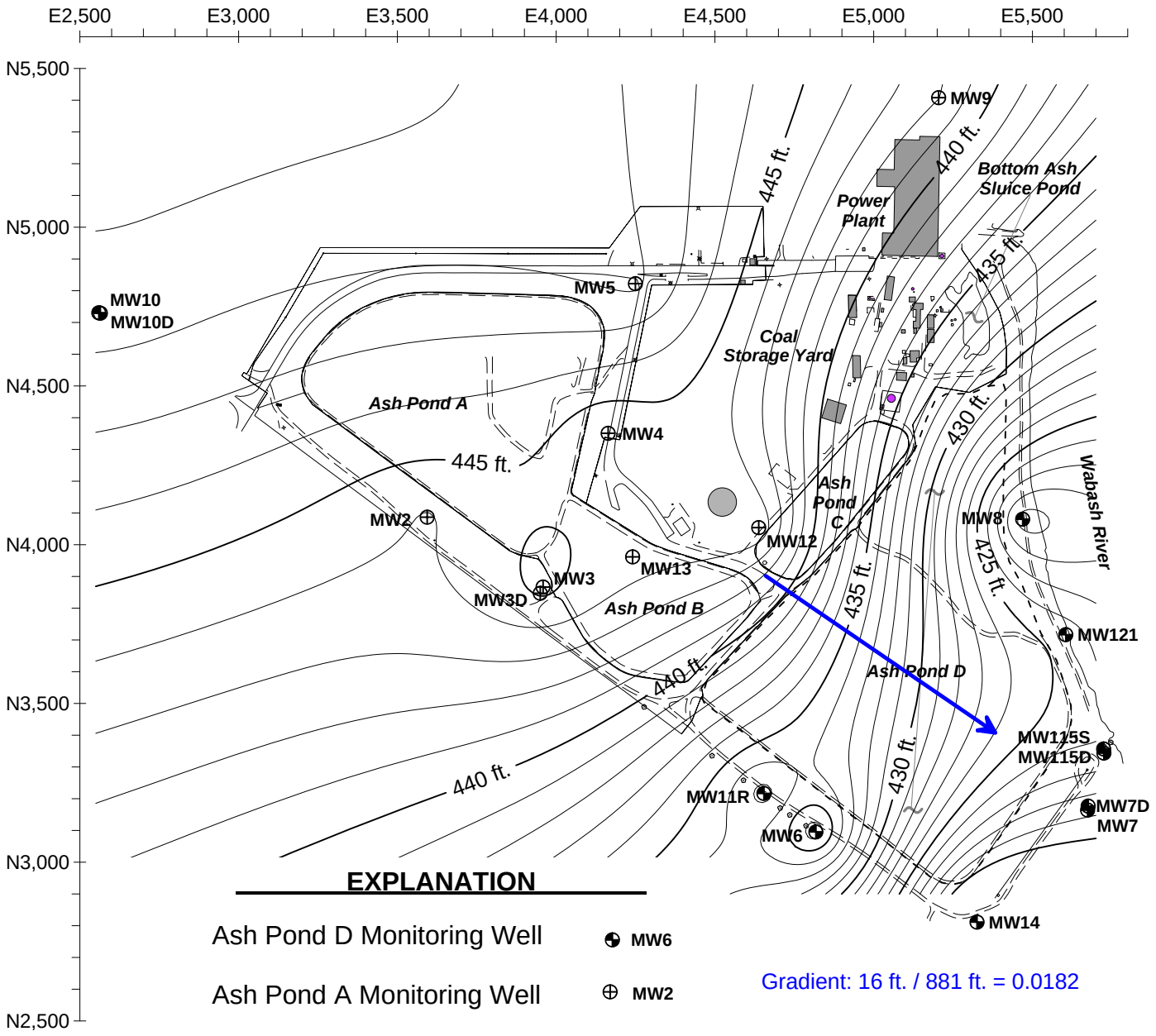


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 16 ft. / 881 ft. = 0.0182

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 13 April 2012



Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - APR. 2012

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-6

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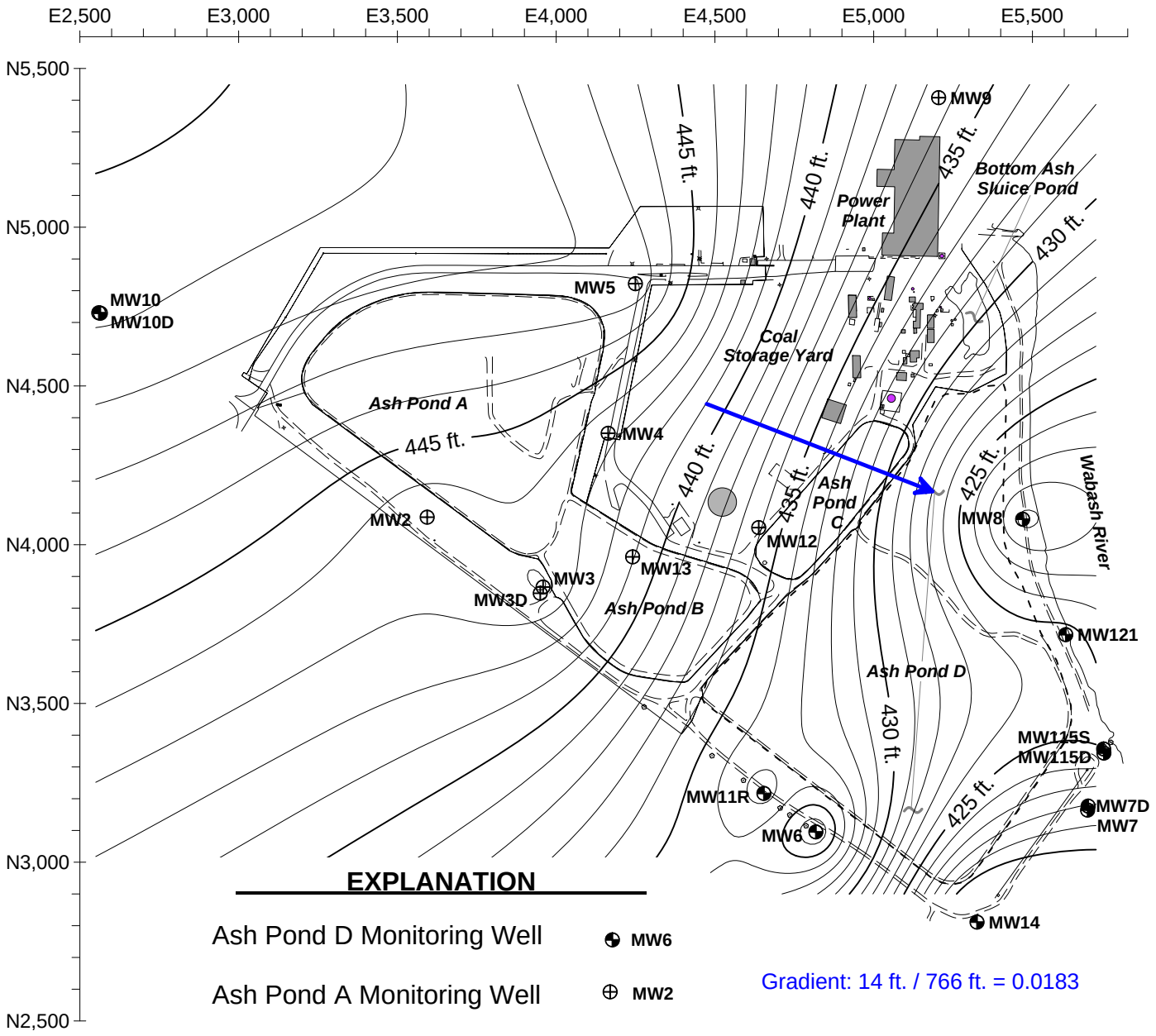


## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 14 ft. / 766 ft. = 0.0183

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 10 October 2013



HANSON
Hanson Professional Services Inc.

SHALLOW POTENTIOMETRIC SURFACE - AUG. 2013

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-7

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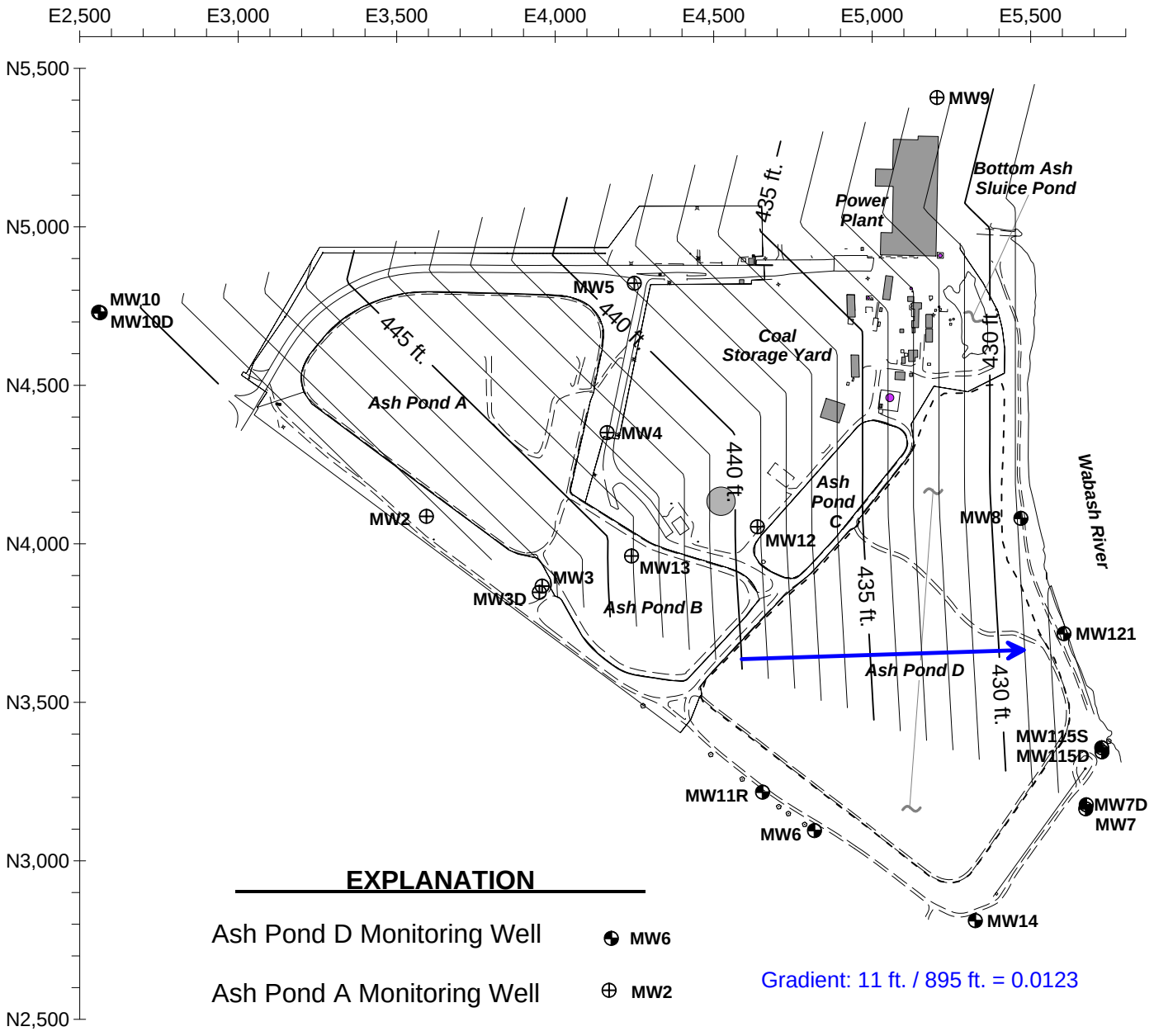



## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits)

Gradient: 11 ft. / 895 ft. = 0.0123

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 16-18 November 1998

NOTE: Potentiometric surfaces created with 3 or fewer data points use Triangulation. This method constrains the surface to the limits of the data points and does not extrapolate the surface beyond these limits.



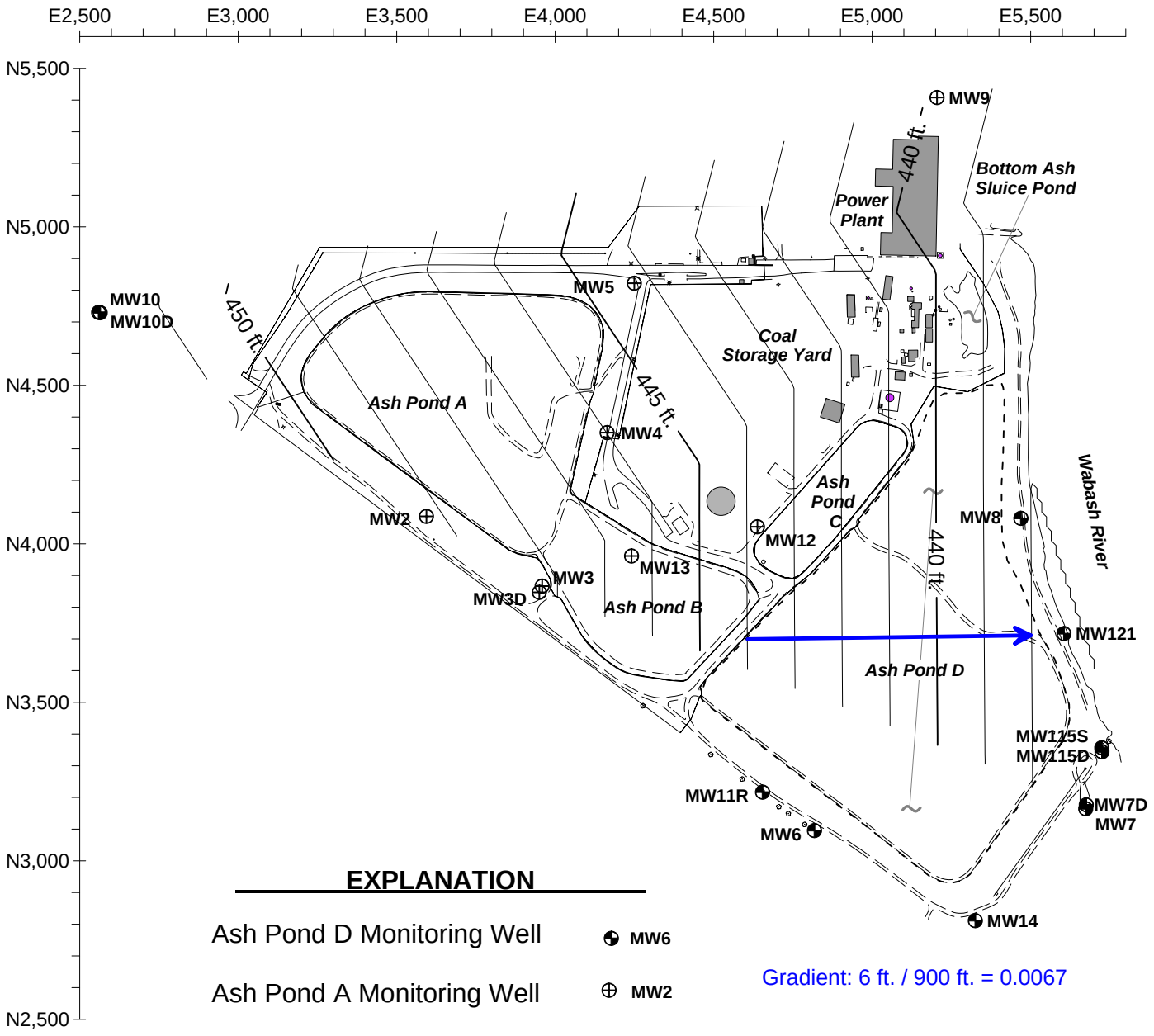
HANSON
Hanson Professional Services Inc.

DEEP POTENTIOMETRIC SURFACE - NOV. 1998

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-8

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureB8_PZ981118D.srf




## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 6 ft. / 900 ft. = 0.0067

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 29-30 April 1999

NOTE: Potentiometric surfaces created with 3 or fewer data points use Triangulation. This method constrains the surface to the limits of the data points and does not extrapolate the surface beyond these limits.



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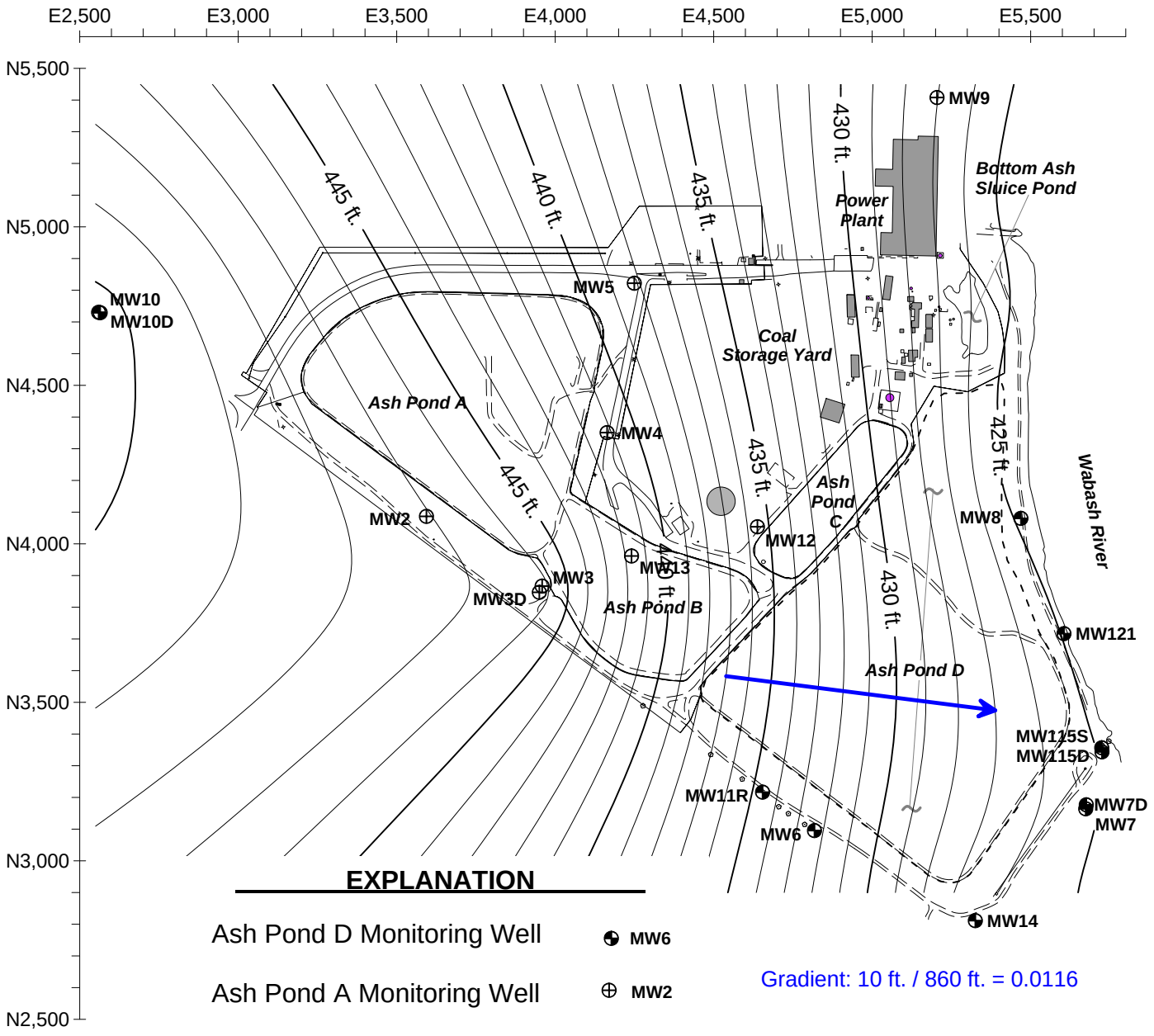
DEEP POTENTIOMETRIC SURFACE - APRIL 1999

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-9

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureB9_PZ990430D.srf




## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits)

Gradient: 10 ft. / 860 ft. = 0.0116

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 2 July 2007



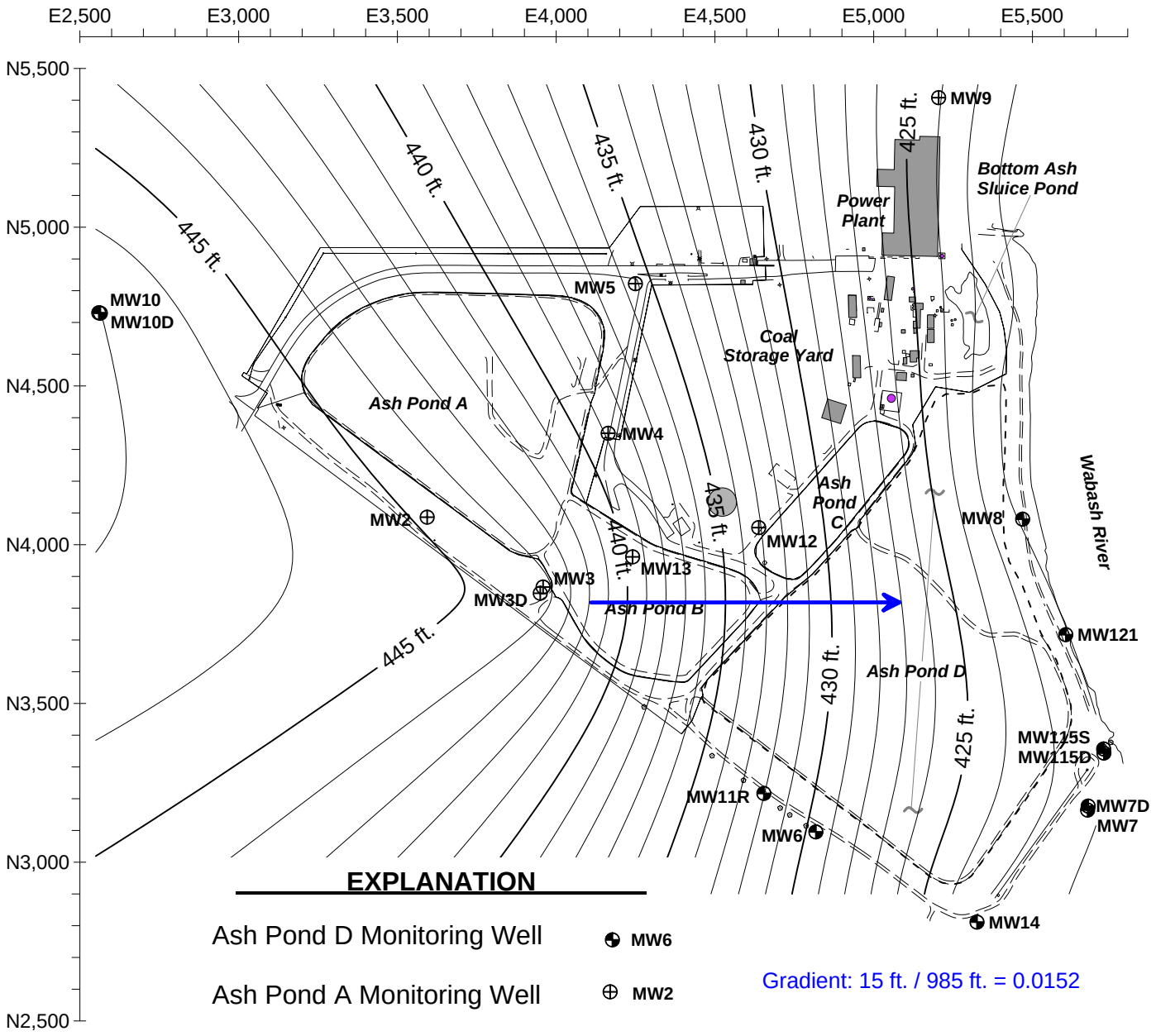
HANSON
Hanson Professional Services Inc.

DEEP POTENTIOMETRIC SURFACE - JULY 2007

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-10

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureB10_PZ070702D.srf




Sample dates: 2 October 2007



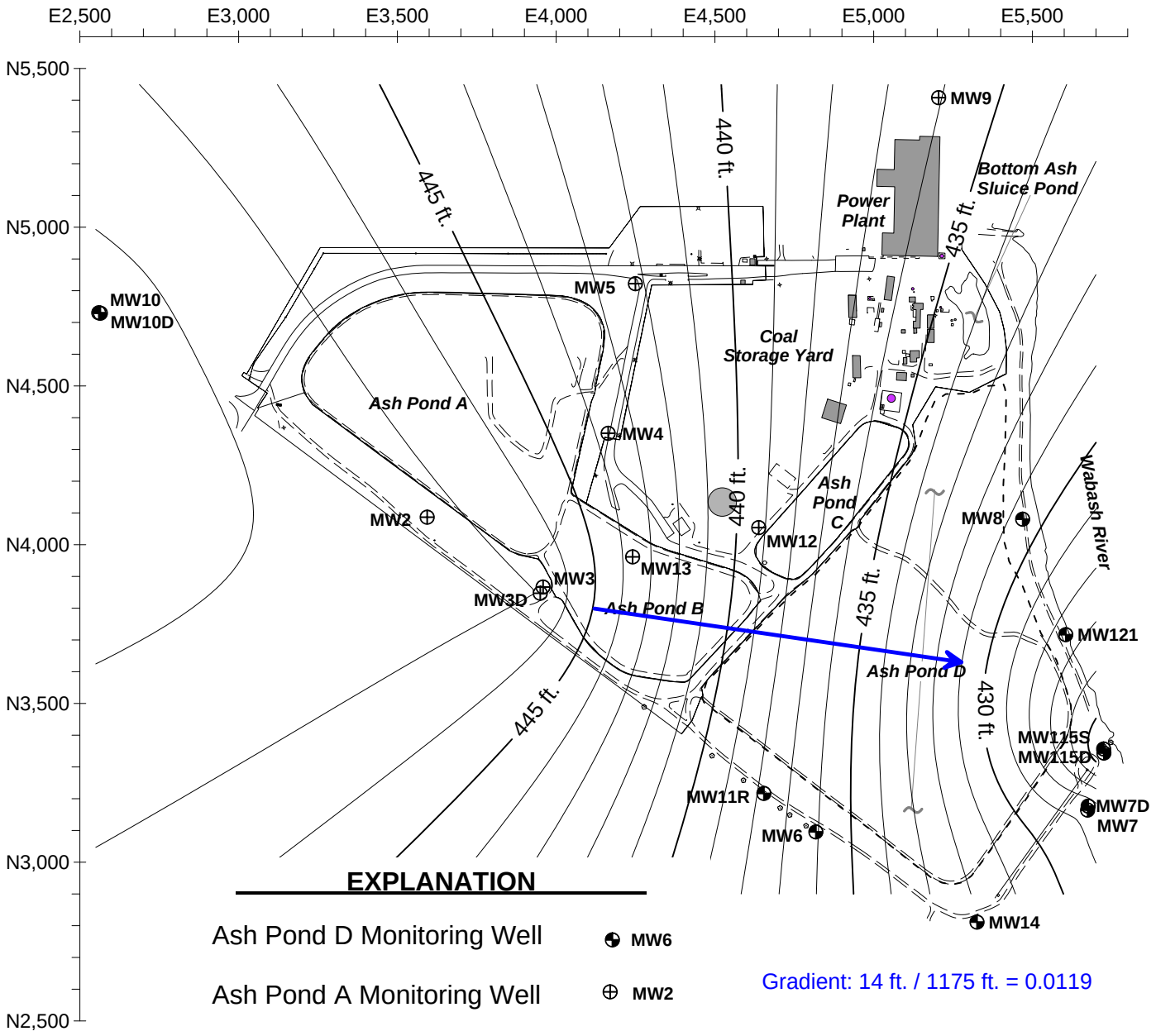
HANSON
Hanson Professional Services Inc.

DEEP POTENTIOMETRIC SURFACE - OCT. 2007

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-11

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureB11_PZ071002D.srf




Sample dates: 13 April 2010



HANSON
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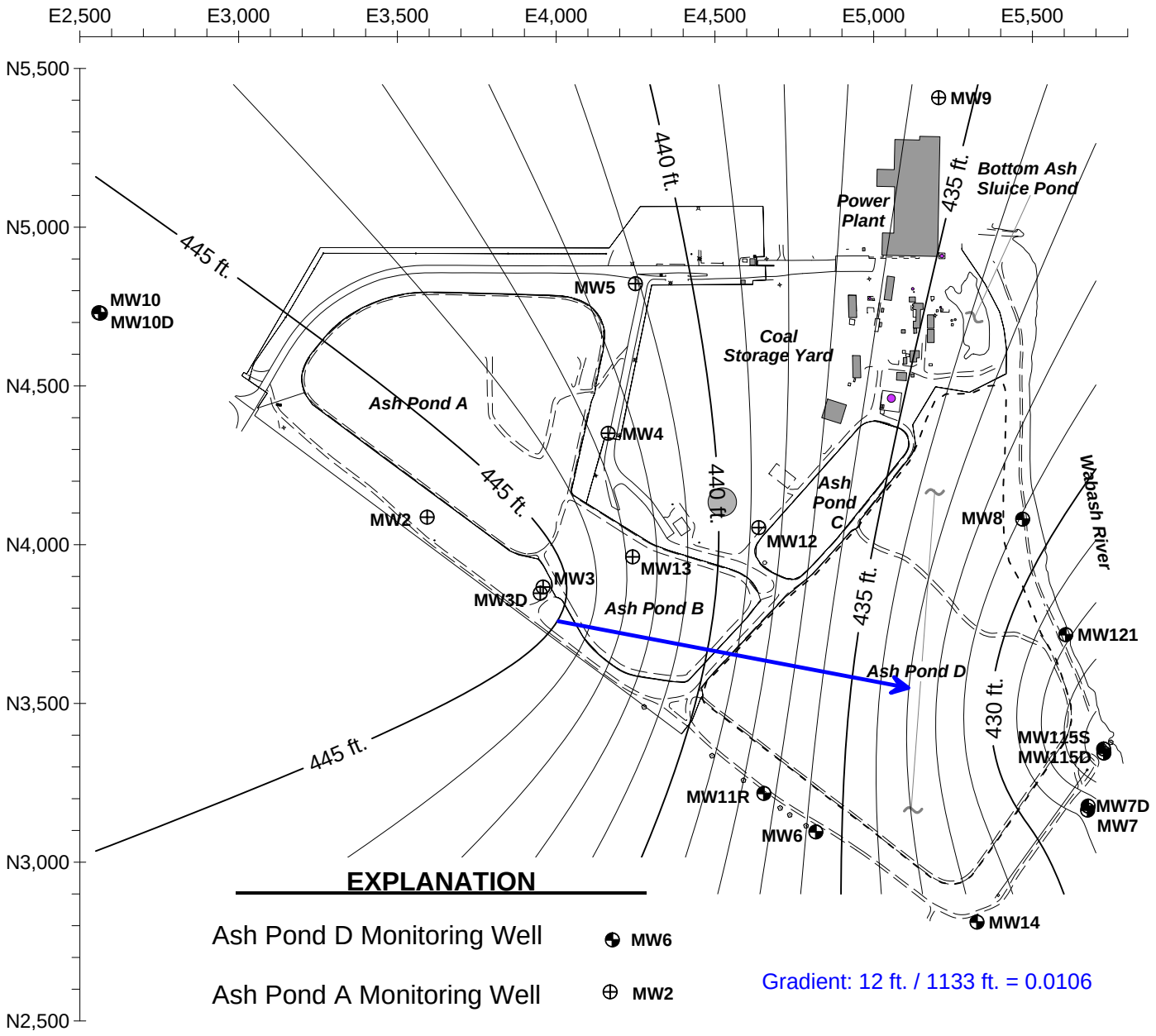
DEEP POTENTIOMETRIC SURFACE - APR. 2010

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-12

I:\14jobs\14E0016\Admin\14-Reports\HydroGeo\FigureB12_PZ100413D.srf




## EXPLANATION

Ash Pond D Monitoring Well — MW6

Ash Pond A Monitoring Well — MW2

Ash Ponds (approx. limits) - - - - - - -

Gradient: 12 ft. / 1133 ft. = 0.0106

SCALE: 1 inch = 500 feet
CONTOUR INTERVAL = 1 foot

0 ft. 250 ft. 500 ft. 750 ft. 1,000 ft.

Sample dates: 10 October 2013



HANSON
Hanson Professional Services Inc.

DEEP POTENTIOMETRIC SURFACE - OCT. 2013

ASH PONDS CLOSURE
HUTSONVILLE POWER STATION
HUTSONVILLE, CRAWFORD CO., ILLINOIS

HANSON NO. 14E0016 FIGURE NO. B-13

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# Appendix C

## Groundwater Quality Information

# Hutsonville Ash Ponds
## Boron Concentration Comparison (1999-2014)

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*

1999-2012 Data

7/2013-6/2014 Data

**Boron Concentrations (in ug/L)**

40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0

**Boron Class I Groundwater Standard (= 2 mg/L)**

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2(R) MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C1Boron1999-2012(2013)_140815.grf

# Hutsonville Ash Ponds
## Sulfate Concentration Comparison (1999-2013)

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*

1999-2012 Data

7/2013-6/2014 Data

**Sulfate Concentrations (in mg/L)**

2,500
2,000
1,500
1,000
500
0

**Sulfate Class I Groundwater Standard (= 400 mg/L)**

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2(R) MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C2Sulfate1999-2012(2013)_140815.grf

# Hutsonville Ash Ponds

## Total Dissolved Solids (TDS) Concentration Comparison (1999-2013)

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*
- 1999-2012 Data
- Jun-Dec 2013 Data

**TDS Class I Groundwater Standard (= 1,200 mg/L)**

**TDS Concentrations (in mg/L)**

3,500
3,000
2,500
2,000
1,500
1,000
500
0

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2 MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C3TDS1999-2012(2013)_140605.grf

# Hutsonville Ash Ponds

## Iron Concentration Comparison (1999-2013)

**Iron Class I Groundwater Standard (= 5.0 mg/L)**

**Iron Concentrations (in ug/L)**

5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*

1999-2012 Data

7/2013-6/2014 Data

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2(R) MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C4Iron1999-2012(2013)_140815.grf

# Hutsonville Ash Ponds
## Manganese Concentration Comparison (1999-2013)

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*

1999-2012 Data

7/2013-6/2014 Data

**Manganese Class I Ground-water Standard (= 0.15 mg/L)**

**Manganese Concentrations (in ug/L)**

5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2(R) MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C5Manganese1999-2012(2013)_140815.grf

# Hutsonville Ash Ponds
## Field pH Concentration Comparison (1999-2013)

**Explanation**

- *Data outlier [<max+1.5*IQR]*
- *Data maximum*
- *Data median*
- *1st - 3rd quartile [inter-quartile range (IQR)]*
- *Data minimum*
- *Data outlier [<min-1.5*IQR]*

1999-2012 Data

7/2013-6/2014 Data

**pH (upper limit) Class I Groundwater Standard (= 9.0 SU)**

**pH (lower limit) Class I Groundwater Standard (= 6.5 SU)**

**pH Concentrations (in SU)**

11
10
9
8
7
6
5

MW1 MW10 MW10D MW11 MW115D MW115S MW117 MW11R MW12 MW121 MW13 MW14 MW2(R) MW3 MW3D MW4 MW5 MW6 MW7 MW7D MW8 MW9

**Monitoring Well IDs**

I:\14jobs\14E0016\Admin\15-Field-Laboratory Data\GRF_C6pH1999-2012(2013)_140815.grf