Report of Dam Safety Assessment of Coal Combustion Surface Impoundments
Interstate Power and Light Company
Sutherland Generating Station
Marshalltown, IA

AMEC Project No. 3-2106-0191

Prepared By:

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Prepared For:

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Office of Resource Conservation and Recovery
1200 Pennsylvania Ave., NW
MC: 5304P
Washington, DC 20460

July 2011

I certify that the management units referenced herein:

Interstate Power and Light Company's Sutherland Power Station North and South Primary Settling Ponds (Primaries) and Main (Secondary and Polishing) Ash Settling Ponds were assessed on June 14, 2011. I further certify that this report was prepared under my direct personal supervision.

Signature ____
Don W. Dotson, PE
Senior Geotechnical Engineer

List of AMEC Participants who have participated in the assessment of the management units and in preparation of the report:

- Chris Eger
  CADD Technician
- Daniel Conn
  GIS Specialist
- Mary Sawitzki, PE
  Civil/Environmental Engineer
- James Black, PE
  Civil Engineer

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1.0 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

AMEC was contracted by the United States Environmental Protection Agency (EPA) contract BPA EP09W001702, to perform assessments of selected coal combustion byproducts surface impoundments. AMEC was directed by EPA, through the provided scope of work and verbal communications, to utilize the following resources and guidelines to conduct a site assessment and produce a written assessment report for the coal combustion waste facilities and impoundments.

- Coal Combustion Waste (CCW) Impoundment Inspection forms (hazard rating, found in Report Appendix A)
- Coal Combustion Dam Inspection Checklist (found in Report Appendix A)
- Impoundment Design Guidelines of the Mining Safety and Health Administration (MSHA) Coal Mine Impoundment Inspection and Plan Review Handbook (hydrologic, hydraulic, and stability conditions)
- National Dam Safety Review Board Condition Assessment Definitions (condition rating)

As part of this contract with EPA, AMEC was assigned to perform an assessment of Interstate Power and Light Company's (IPL) Sutherland Generating Station (Sutherland), which is located in Marshalltown, Iowa as shown on Figure 1, the Site Location and Vicinity Map. (This figure is presented on the next page and in the figures section of this report.)

A site visit to Sutherland was made by AMEC on June 14, 2011. The purpose of the visit was to perform visual observations, to inventory coal combustion waste (CCW) surface impoundments, assess the containment dikes, and to collect relevant historical impoundment documentation.

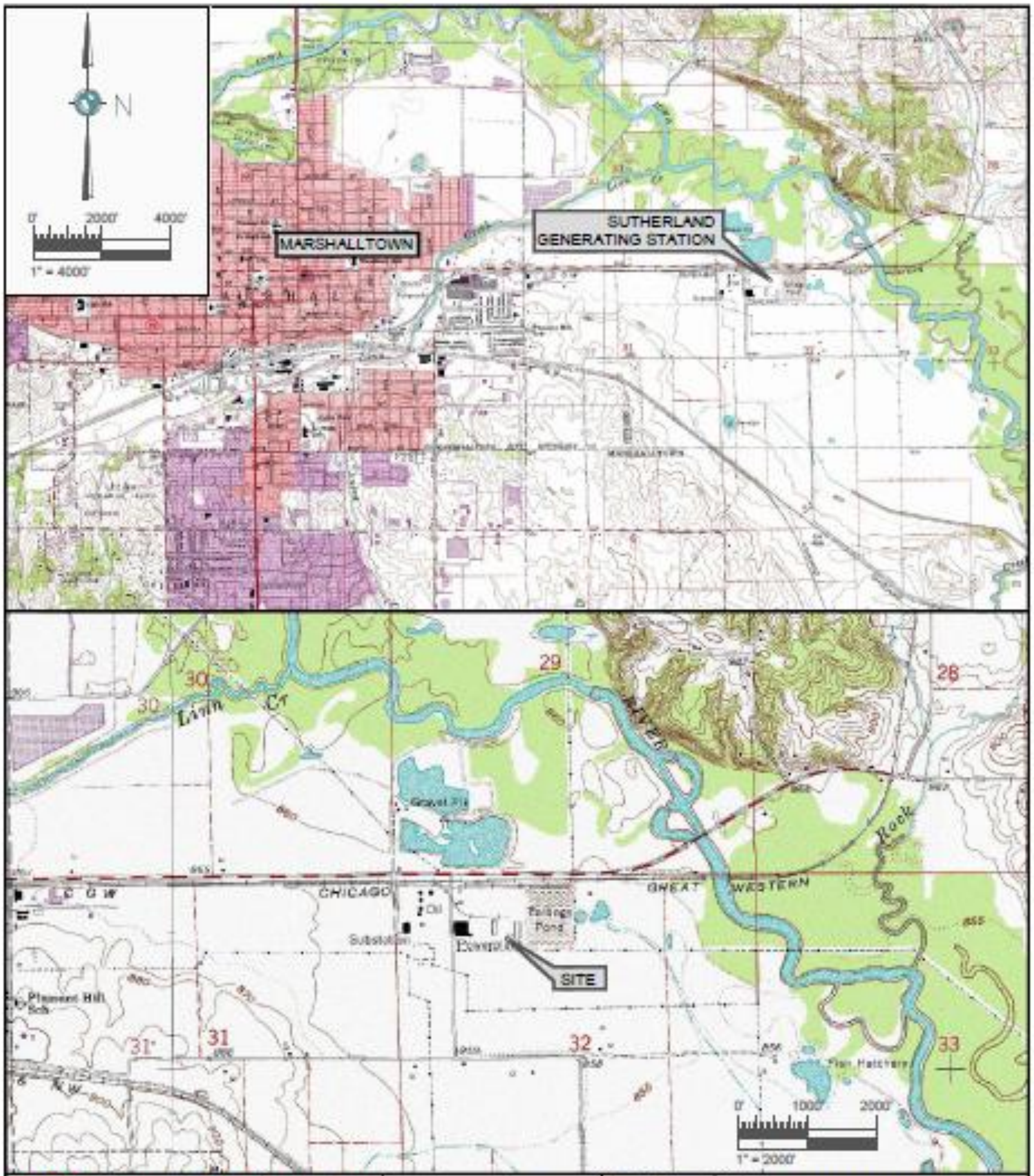
AMEC engineers, Don Dotson, PE and James Black, PE, were accompanied during the site visit by the individuals listed on Table 1.

Table 1. Site Visit Attendees

Company or Organization	Name and Title
Interstate Power and Light Company	Nichol Toomire, Plant Manager
Interstate Power and Light Company	George Kueny, Environmental and Safety Specialist
Alliant Energy Corporate Services, Inc.	Tony Morse, Environmental Specialist II
Alliant Energy Corporate Services, Inc.	William Skalitzky, Senior Environmental Specialist

1.2 Project Background

Coal fired power plants, like IPL's Sutherland Generating Station, produce CCW as a result of the power production process. At Sutherland, impoundments (dams) were designed and constructed to provide storage and disposal for the CCW that is produced. CCW impoundment areas at the Sutherland facility are referred to as the North Primary Settling Pond (Unit 1 & 2 Initial Settling Pond), South Primary Settling Pond (Unit 3 Initial Settling Pond) and Main Ash Pond (Main Pond). Based on historic drawings, these ponds are located within the footprint of the original "ash pond" for the facility. At some time, the original ash pond was modified to include the primary ponds (North and South Primary Settling Ponds) to aid in the separation and removal of ash. This and other improvements, including the latest in 2006, have transformed



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UNITED STATES
ENVIRONMENTAL
PROTECTION AGENCY

PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SITE LOCATION & VICINITY MAP

DWN BY: CAE	DATUM:	DATE: 7/13/11
CHKD BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191.0001.****
PROJECTION:	SCALE: AS SHOWN	FIGURE No. 1

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\April 2011 Round 10\Alliant Sutherland\CAD\[illegible].dwg — Layout1 — Jul. 13, 2011 10:32am — [illegible] the original “ash pond” to the current configuration to improve the detention time in the Main Pond by construction of fingers to increase the flow length and creating divisions within the basin to provide secondary and tertiary settlement areas. The original ash pond, current North Primary Settling Pond and Main Pond, was commissioned with Generating Units 1 and 2 at the plant in 1955. The current South Primary Settling Pond was commissioned with Generating Unit 3 in 1961.

The National Inventory of Dams (NID), administered by the U.S. Army Corps of Engineers (USACE), provides a hazard rating for many dams within the United States. The Ash Settling Ponds at Sutherland are not included in the NID.

1.2.1 Coal Combustion Dam Inspection and Checklist Forms

As part of the observations and evaluations performed at Sutherland, AMEC completed EPA’s Coal Combustion Dam Inspection Checklists and CCW Impoundment Inspection Forms. Inspection forms for each pond are presented in Appendix A. The Impoundment Inspection Forms include a section that assigns a “Hazard Potential” that is used to indicate what would occur following failure of an impoundment. “Hazard Potential” choices include “Less than Low,” “Low,” “Significant,” and “High.” As defined on the Inspection Form, dams assigned a “Significant Hazard Potential” are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. “Significant Hazard Potential” classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.” “Low Hazard Potential” classification definition is reserved for dams where “failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.” “Less than Low Hazard Potential” classification is reserved for dams where “failure or misoperation results in no probable loss of human life and no economic or environmental losses.”

Based on the site visit evaluation of the impoundments, AMEC engineers assigned a “Less than Low Hazard” potential to the North and South Primary Settling Ponds, and a “Low Hazard” potential to the Main Pond. A breach of the North and/or South Primary Settling Ponds would discharge to the Main Pond. A breach of the Main Pond would be confined to the owner’s property.

1.2.2 State Issued Permits

The Iowa Department of Natural Resources issued an Iowa National Pollution Discharge Elimination System (NPDES) Permit to IPL. The current permit identification number is Iowa 6469103. This NPDES Permit authorizes IPL to discharge decant from the Main Ash Pond through Outfall 001 to an unnamed tributary to the Iowa River. The effective date of the permit is November 13, 2006. The permit date of expiration is November 12, 2011. The required date to file for renewal of the permit was May 16, 2011. IPL reported they had filed for permit renewal.

1.3 Site Description and Location

The Sutherland Generating Station is located in the city of Marshalltown, Marshall County, Iowa. The station is located on the east side of the city, adjacent and south of Main Street Road (County Highway E35) in a rural setting. Sutherland is atypical from other plants as water to cool the boilers is not obtained from an adjacent river, but from on-site wells. The ash pond area is located at the east end of the station. The Iowa River is located approximately one-half mile to the east of the site.

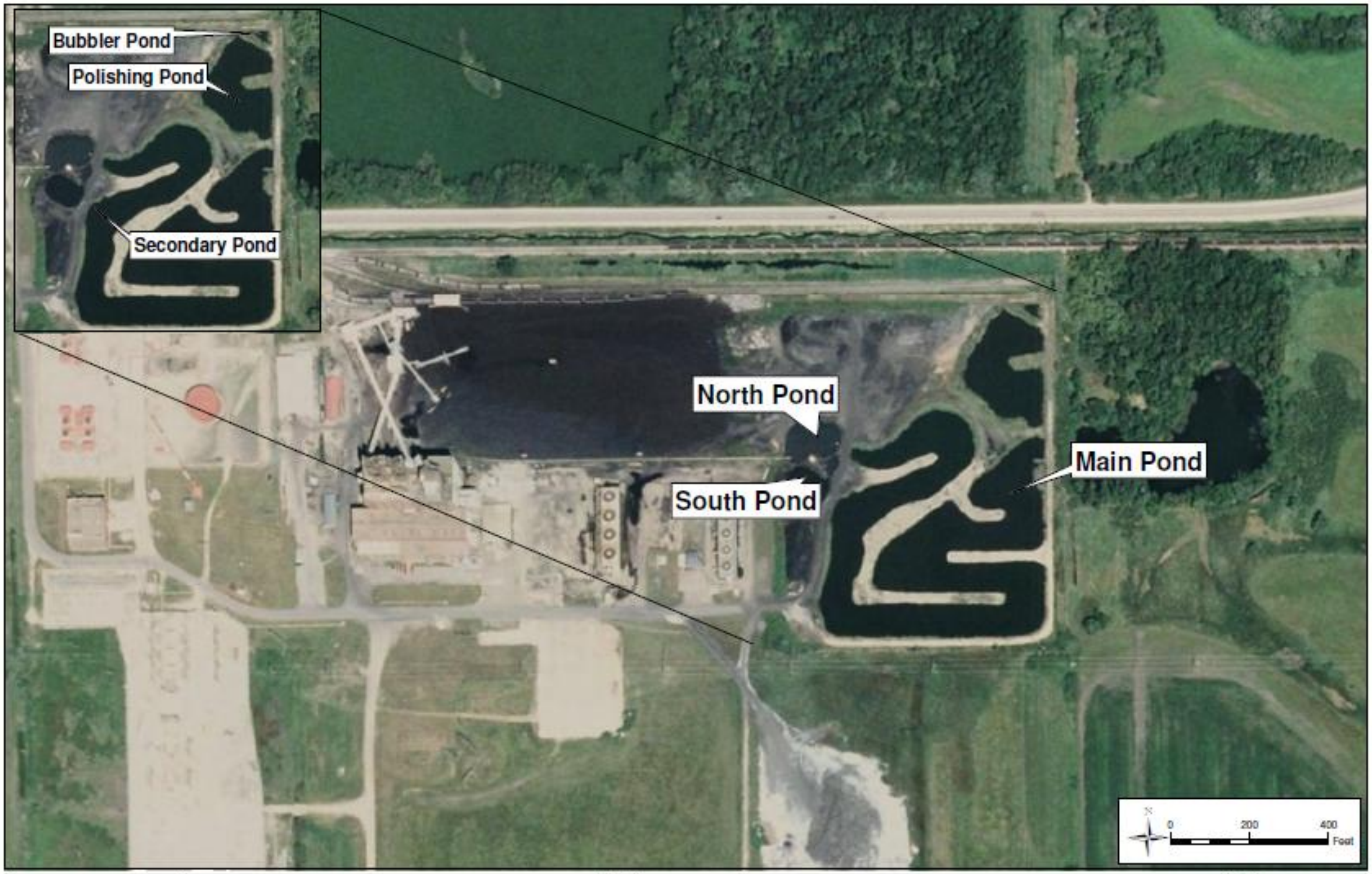
Figure 3, the Critical Infrastructure Map, provides an aerial view of the region and indicates the location of the Sutherland ash ponds in relation to schools, hospitals, and other critical infrastructure that is located within approximately 5 miles down gradient of the impoundments. A table that provides names and coordinate data for the infrastructure is included on the map. A Topographic Site Map is included in Figure 1. The Aerial Site Plan, shown on the next page and included in the figures section as Figure 2, provides a view of the pond areas.

1.4 Ash Ponds

The Sutherland Station consists of three coal-fired steam generating units rated at approximately 170 MW. Units 1 &2 were started in 1955 and Unit 3 started in 1962. Unit 2 has recently been retired at the end of 2010.

The ash pond discharge has an NPDES permit for ash sluice water, cooling tower blowdown, boiler blowdown, low volume source leachate from a closed ash landfill, metal cleaning waste, coal pile runoff, and storm water associated with industrial activity. Bottom ash from the steam units is sluiced to the ash pond. Fly ash captured in the electrostatic precipitators is conveyed dry to temporary on-site storage. If the dry conveying system malfunctions, there is an emergency by-pass system that uses water to convey fly ash to the ash pond. Cooling water for the generating units is provided by several water wells on the site, and two cooling towers provide cooling for the circulating water system. A blowdown waste stream for the towers is used in the ash handling system and eventually ends up in the ash pond. Storm water in the coal handling and storage area drains through and underground tiling system, and is pumped to the ash pond. Other low-volume waste water streams in the plant are directed to the ash pond through a ground-floor sump pump.

All of the waste water enters the ash pond at the same location at a small dipping pond (North Primary Settling Pond). Unit 3 is a cyclone boiler, and its bottom ash produces a hard glass-like slag which can be sold for other uses. If desired, the ash sluicing water for Unit 3 can be directed to a second adjacent dipping pond (South Primary Settling Pond). The small dipping ponds are dredged out two to three times a week with a long-reach back hoe. The material is scooped out of the dipping ponds, allowed to dewater, and then moved with an end-loader to a temporary storage pile. The small dipping ponds remove the majority of the ash material. In this way, the larger Main Ash Pond is reserved for settling out the fine-grained suspended solids in the water streams. The Main Ash Pond includes a Secondary Pond, Polishing Pond and small Discharge Pond with decant water conveyed through the system by gravity. The outlet of the main ash pond is monitored with a parshall flume for flow quantity and other NPDES permit parameters. From this outlet, the water flows westward for several hundred yards through an open grassy ditch between the rail-road tracks. At the end of the ditch, an underground culvert directs the stream under the rail-road tracks towards the north and into the un-named drainage ditch, NPDES outfall 001, parallel to Main Street Road (County Highway E35), eventually emptying towards the east at the Iowa River. The ash handling summary detailed above was



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amec

DWN BY: DJC
CKD BY: MS
Datum: NAD 83
Projection: UTM 15
Scale: As Shown

ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION,
MARSHALLTOWN, IA
SITE MAP

REV. No.: A
Date: 9-15-10
Project No: 3-2106-0191
Figure No: 2

based on review of provided documentation as well as communication with Alliant Energy personnel who are knowledgeable concerning the facility's operational processes.

A May 18, 2009 document, written by Alliant Energy in response to EPA's Request for Information under Section 104(e) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C 9604(e), provided the following general background for the ash ponds.

- Both Primary and Main Ash Settling Ponds temporarily or permanently contain fly ash, bottom ash, slag, and other materials including slag and/or ash transport water, boiler water wash, air heater wash (fly ash), steam grade water water production wastewaters, cooling tower blowdown, boiler blowdown, coal pile runoff, plant floor drains, and site storm water runoff.
- Based on its review of readily available records, IPL was unable to determine whether the Primary Ash Ponds were initially designed by and constructed under the supervision of a professional Engineer. The Main Ash Ponds was designed by and constructed under the supervision of a professional engineer. Modifications made in 2006 were designed by and constructed under the supervision of a professional engineer.
- The Primary and Main Ash Ponds are not presently inspected or monitored by a professional engineer.

IPL's March 18, 2009 response to EPA's Request for Information and other provided documentation, as well as recent communications with Alliant Energy personnel, provided the following additional information that is specific to each ash pond. Current descriptive information resulting from the site visit, as well as photographic references, are provided in Section 2 of this Assessment Report.

As previously stated, the CCW impoundment areas at the Sutherland facility are referred to as the North Primary Settling Pond, South Primary Settling Pond and Main Ash Pond. Based on historic drawings (1959 and 1961), these ponds are located within the footprint of the original "ash pond" for the facility. The provided drawings only show the location of the "ash pond" and no other original details are known. It is presumed the original was one large ash pond. At some time, the original ash pond was modified to include the primary ponds (North and South Primary Settling Ponds). This and other improvements, including the latest in 2006, have transformed the original "ash pond" to the current configuration and include improvements to the Main Pond by construction of fingers to increase the flow length and creating divisions within the basin to provide secondary and tertiary settlement areas. The North Primary Settling Pond and Main Pond are presumed to be commissioned with generating Units 1 and 2 at the plant in 1955. The South Primary Settling Pond is presumed as commissioned with generating Unit 3 in 1961.

1.4.1 North Primary Settling Pond

The North Primary Settling Pond is located between the coal pile and Main Ash Pond. It is our understanding the actual construction date is unknown and there are no formal plans or details for the basin. The pond is presumed to be commissioned with the startup of generating Units 1 and 2 in 1955. CCW, other plant wastewaters and surface runoff water from the facility is sluiced or pumped into the North Pond. Bottom ash settles in the pond while the finer particles pass through to the Secondary Pond. The bottom ash material is regularly cleaned from the pond and stockpiled to the north to allow for dewatering and possible sale for beneficial reuse or transport to an off-site landfill. Decant from the North Pond flows by gravity through a pipe to the Main Ash Secondary Settling Pond. Table 2 provides a summary of surface area, height, storage capacity, and stored material volumes for this pond.

1.4.2 South Primary Settling Pond

The South Primary Settling Pond is located south of the North Pond and west of the Main Ash Pond. It is our understanding the actual construction date is unknown and there are no formal plans or details for the basin. The pond is presumed to be commissioned with the startup of generating Unit 3 in 1961. CCW from Unit 3 of the facility consisting of bottom ash, or "slag" can be sluiced to the South Pond by pipe. The slag is regularly cleaned from the pond and stockpiled to allow for dewatering and possible sale for beneficial reuse. Decant from the South Pond flows by gravity through a pipe to the Main Ash Secondary Settling Pond. Table 2 provides a summary of surface area, height, storage capacity, and stored material volumes for this pond.

1.4.3 Main Ash Pond

The Main Ash Settling Pond is located at the east end of the plant facilities and east of the two primary ponds. The area was commissioned in 1955 at startup of the plant (Units 1 and 2). The Main Ash Pond receives CCW decant from the North and South Primary Ponds and local surface runoff. The Main Ash Pond represents the major portion of the original ash pond for the facility. There are no original construction drawings for the main ash pond.

In 2005, the Main Ash Pond consisted of one large pond with a finger on the west side directing flow to the southwest corner then into the large Secondary Pond. The Secondary Settling Pond contained an overflow through a metering flume to the discharge structure in the Discharge Pond. In 2006, dredging, the stabilization of fingers, addition of fingers and formation of a polishing pond were constructed to allow access to the entire pond area, increase the detention path, and provide a tertiary settling area. Decant from the primary ponds to the Main Ash Pond is conveyed by gravity through pipes to the Secondary Settling Pond. Flow from the Secondary Ash Pond to the Polishing Pond is conveyed by a flume constructed with a mixing channel to allow chemical addition to reduce algae. Flow from the Polishing Pond to the Discharge Pond is conveyed by the previously mentioned metering flume. Flow is released from the Discharge Pond through a discharge manhole and 24-inch pipe. Table 2 provides a summary of surface area, height, storage capacity, and stored material volumes for these ponds.

Table 2. Ash Settling Pond Size and Storage Data

Area	Surface Area (acre)	Maximum Height of Management Unit (feet)	Storage Capacity (cubic yards)	Store Material Volume (cubic yards)
Primary Ash Settling Ponds				
North	0.30	7	2,440[1]	490[1]
South	0.13	7	1,050[1]	210[1]
Main Ash Settling Pond				
Secondary, Polishing and Discharge Settling Ponds	5.75	13[2]	83,500[1]	4,640[1]

Measurements, unless otherwise noted, are reported from the 2009 IPL response letter to EPA.

[1] Measured in April 2009.

[2] Although reported as 7 feet in response letter to EPA, the 2011 *Ash Pond Slope Stability and Hydraulic Analysis* report by Aether dbs states "the specified height of the dike for the idealized cross-section is 13 feet based on the maximum depth to native soils reported in the 2006 field investigation" (by Hard Hat Services).

1.5 Previously Identified Safety Issues

Discussions with plant personnel and review of provided documentation indicate that there are no current or previously identified safety issues from the previous 5 years at the Sutherland Generating Station.

1.6 Site Geology

Based on research on the internet, the Sutherland Generating Station is located within the Kinderhook geologic formation. The 2011 *Ash Pond Slope Stability and Hydraulic Analysis* report by Aether, dbs reports the "surface soil in the ash management area is Zook Clay (low plasticity clay with 5-7% organic content) USCS Marshall County Soil Survey." The 2011 stability and hydraulic report also reports the depth to bedrock in the area to be over 250 feet as referenced by a provided well record for Well 6A.

1.7 Inventory of Provided Materials

IPL provided documents to AMEC that pertained to the design and operation of the Sutherland Generating Station. These documents were used in the preparation of this report and are listed in Appendix C, Inventory of Provided Materials.

2.0 FIELD ASSESSMENT

2.1 Visual Observations

AMEC performed visual assessments of Sutherland's Ash Ponds, including the North Primary Settling Pond, South Primary Settling Pond and Main Ash Pond, on June 14, 2011. Assessment of the ash ponds was completed in general accordance with FEMA's *Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams,* April 2004. The EPA Coal Combustion Dam Inspection Checklist and Coal Combustion Waste (CCW) Impoundment Inspection Form were completed for each ash pond during the site visit and provided to EPA via email within five business days following the site visit. Appendix A contains copies of the completed checklist forms. A Photo Location Map (B-1), as well as descriptive photos, can be found in Appendix B. Rainfall data for the Marshalltown, Iowa area was collected for thirty days prior to the site visit. Table 3, below, summarizes the rainfall data for the days and month immediately preceding AMEC's site visit.

Table 3. Sutherland Rainfall Data

Rainfall Prior to Site Visit	
Date	**Rainfall (in.)**
June 5, 2011	0.01
June 6, 2011	0.00
June 7, 2011	0.00
June 8, 2011	0.28
June 9, 2011	1.54
June 10, 2011	0.60
June 11, 2011	0.00
June 12, 2011	0.06
June 13, 2011	0.05
Total (9 days prior to visit)	2.54
June Rainfall (13 days prior to visit)	2.55
Total (30 days prior to visit)	5.54

2.2 Visual Observations - North Primary Settling Pond

The North Primary Settling Pond is located within the ash management area at the east end of fenced facility building area. The North Pond is situated near the center of the west edge of the ash management area. Features surrounding the pond include the ash sediment storage area to the north, coal pile storage area to the northwest, plant cooling towers and buildings to the southwest, South Primary Settling Pond to the south and the Main Ash Pond to the east. The slope of the adjacent area to the North Pond is either to the pond itself or to the east and southeast toward the Main Pond. CCW and other plant wastewaters enter the North Pond from pipes on its west boundary (Photo NP-1). The outlet pipe of the North Pond leaves on its east dike (Photo NP-2) and enters the Main Pond on its west dike (Photo NP-3).

2.2.1 North Primary Settling Pond - Embankments and Crest

The North Pond is separated from the South Pond by a common dike with an approximate width of 5 feet, or less. The North Pond is separated from the Main Ash Pond with a dividing dike that serves as a road with an approximate width of 25 feet. The North Pond is generally incised within ash of the ash management area (Photo NP-2). Drawings indicate the land surface elevation at the top of the north and east embankment of the North Pond is 870 feet. Drawings show the water elevation in the pond at 862.9 feet, presumed to coincide with the approximate elevation of the inlet of the outlet pipe. Settled ash is removed regularly and placed in the stockpile area to the north. Being incised within ash and regularly dredged, the upstream slopes and crest area surrounding the pond are ash and generally void of any vegetative cover (Photos NP-1 and NP-2). The lowest freeboard appears to be at the inlet of the sluice pipes. Photo NP-1 indicates a couple of feet of freeboard in this location. Any overflow back to the plant would collect to the surface water sump to be returned to the pond.

2.2.2 North Primary Settling Pond - Outlet Control Structures

The North Primary Pond discharges flow from its east dike to the Main Ash Pond (Secondary Pond) by gravity through a CMP culvert pipe located in the internal divider dike (Photos NP-2 and NP-3). The inlet and outlet elevations of the pipe are reported to be 862.6 and 861.6 feet, respectively.

2.3 Visual Observations - South Primary Settling Pond

The South Primary Settling Pond is located within the ash management area at the east end of fenced facility building area. The South Pond is situated immediately adjacent to the North Primary Settling Pond therefore its location, surrounding features and slope of adjacent area are similar to the North Pond. CCW bottom ash or slag from generating Unit 3 enters the South Pond on its north boundary (Photo SP-1). The outlet pipe from the South Pond is located on its east dike (Photo SP-2) and the discharge enters the Main Pond on the West Dike (Photo SECP-2).

2.3.1 South Primary Settling Pond - Embankments and Crest

The South Pond is separated from the North Pond by a common dike with an approximate width of 5 feet, or less. The South Pond is separated from the Main Ash Pond with a dividing dike that serves as a road with an approximate width of 20 feet (See Figure B-1 and SECP-12). The South Pond is generally incised within ash of the ash management area. Drawings indicate the land surface elevation of the immediate area surrounding the South Pond is about 869 to 867 feet. Drawings show the water elevation in the pond at 862.6 feet, presumed to coincide with the approximate elevation of the inlet of the outlet pipe. Settled slag is removed regularly and placed in the stockpile area to the south. Being incised within ash and regularly dredged, the upstream slopes and crest area surrounding the pond are ash and void of any vegetative cover (Photos SP-1 and SP-2).

2.3.2 South Primary Settling Pond - Outlet Control Structures

The South Primary Pond discharges flow from its east dike to the Main Ash Pond (Secondary Pond) by gravity through a CMP culvert pipe located in the internal divider dike (Photos SP-2, SECP-12 and SECP-2). The inlet and outlet elevations of the pipe are 862.6 and 861.8 feet, respectively.

2.4 Visual Observations - Main Ash Pond (Secondary and Polishing ponds and Discharge Basin)

The Main Ash Settling Pond area is located at the east end of the plant facility. The pond area includes a Secondary Pond, Polishing Pond and Discharge Basin. The Main Pond is bordered by a open grass field to the south, the North and South Primary Ponds and plant cooling towers and buildings to the west, the ash storage area to the northwest, a roadside ditch and Main Street Road to the north, and a wooded with open grass field area (south) to the east.

The existing three pond series system in the Main Ash Settling Pond area was originally constructed as a single settling pond. The original ash management area is shown on historic drawing as a rectangular area encompassing all of the ponds and the ash storage area. The exact configuration of the original pond is unknown. Prior to 2006, the Main Ash Pond area consisted of two ponds consisting of a Secondary Settling Pond and a Discharge basin. In 2006, improvements were constructed primarily to lower solids leaving the ash pond area. The improvements included dredging of the existing pond, excavation and strengthening of existing fingers and construction of new fingers within the Secondary Pond to lengthen the flow path and allow equipment access to all areas of the pond. A Polishing Pond was constructed from the northeast end of the Secondary Pond to provide an additional settlement area. Figure 2, the Aerial Site Plan, illustrates the extent of the current three pond configuration.

The North and South Primary Ponds are used to settle and remove ash on a regular basis. The Main Ash Pond is used to settle the finer ash and finer materials in other plant wastewaters or surface runoff that flow through the primary ponds. CCW and plant overflow from the North and South Primary Ponds enter through separate pipes at the west end of the Secondary Pond. Flow is directed south to the southwest corner, then east to the southeast corner, around a half loop to the west then back to the east edge, then north to the northeast corner of the pond to the divider dike and the Polishing Pond. At the Polishing Pond, flow is directed north around a small half loop to the west then back to the east to the northeast corner to the discharge flume to the small (0.04 acre) Discharge Pond. The flow exits the Discharge Pond to a ditch. The open to piped ditch travels west along the north edge of the property approximately 1300 feet then turns north through an embankment to the Main Street Road roadside ditch. This ditch travels back to the east about 4000 feet to the Iowa River.

2.4.1 Main Ash Pond (Secondary and Polishing Ponds and Discharge Basin) - Embankments and Crest

Secondary Settling Pond

It is presumed all or a good portion of the area of the ash stockpile to the northwest, the remaining west side of the Main Ash Pond and old interior fingers consist of ash from the original ash pond (Photos SECP-1 through SECP-8, NP-1 through NP-3, and SP-1 through SP-3). The interior embankments were generally in good to fair shape with steep and exposed slopes observed at isolated locations and in reaches. Notable reaches include the following locations:

- Area beginning at the inlet from the North Pond extending northeast along the embankment below the ash stockpile area. See photo below presented as SECP-1 in Appendix B.

- Area in the vicinity of the inlet from the South Pond and to the north. See Photo SECP-2, below, and Photo SECP-3 presented in Appendix B.

- Local area located to the north of the southwest corner. See Photo below presented as Photo SECP-4 in Appendix B.

Stabilized and new fingers are primarily constructed of shot rock and/or recycled aggregate materials. Surface cover on the other areas of the interior embankments was generally good consisting of rip-rap and or grasses (Photos SECP-9 through SECP-11). Minor small woody vegetation was observed in isolated locations. Except for the areas at the North and South Primary Ponds, extensive at-grade areas exist behind the upstream embankment slopes and therefore there are no downstream slopes on the northwest and west portions of the pond (Photos SECP-1 and SECP-12). The road/crest separating the primary from the secondary pond is 20 to 25 feet wide. Any collapse of the embankments would only join the smaller primary pond to the much larger secondary pond (See Figure B-1 and SECP-12).

The south and east embankments of the Secondary Pond appear to be the original embankments. Tall grass covered the upstream slopes on these embankments which prevented observations of the surface of the slopes. Based on our observations under these restrictions, the east upstream slope appeared generally to be in fair condition (Photo SECP-13). The south upstream slope was generally in fair condition, but isolated locations of surface slough failures were observed (Photo SECP-4 and SECP-14). The number of locations seemed to increase from east to west. The downstream slopes of the east and south embankment had tall grass which prevented viewing the surface of the slopes (Photos SECP-15 through SECP-18). Based on our observations under these restrictions, the downstream slopes generally appeared to be in fair condition with one exception. The exception consisted of ponded water in an area against the downstream toe on the east embankment. See the following photo presented as Photo SECP-16 in appendix B.

Ponded water was also present to the east of this location (Photo SECP-19). The open field area to the east of the east embankment included wet area vegetation and further east a pond (Photo SECP-20).

Since the southwest and northwest embankments are situated well inside the original embankment, the crests consisted of ash. The area at the crest/entrance road near the southwest corner of the secondary pond appeared to be low and sloped to the west and away from the ash management area (Photo SECP-4). The crests of the east and south dikes were covered with gravel and appeared to be in good condition (Photos SECP-15, SECP-21, and SECP-18). Observations and survey information indicate the east and south crest heights maintain or exceed the idealized design elevation of 865 feet. The northwest and west crest generally exceeds this height and grade to the southeast toward the ponds (Photos SECP-1 and SECP-12).

Polishing Pond

The Polishing Pond was constructed in 2006 from the northeast end of the Secondary Pond. Other than the dividing structure to make a separate pond, the only change to the embankments consisted of placing fill at the northwest corner. The west slopes were observed to be the highest and appeared very steep. Isolated areas of surface sloughing on the south, west and internal finger upstream embankment slopes of the Polishing Pond exposed ash and indicate they were formed from cuts within the original ash pond (Photos PP-1 through PP-4). Tall grasses and some brushy vegetation on these slopes prevented observation of the surface of these slopes. Based on our observations under these restricted conditions and exceptions noted above, the upstream slopes generally appeared to be in fair condition. There are at-grade conditions for some distance behind these slopes and therefore no downstream slopes. More moderate upstream slopes covered with rip-rap were observed on the south half of the east embankment. This indicates a recent repair and the slopes are in good condition (Photo PP-4). The upstream slopes on the north half of the east embankment were covered with tall grass which prevented observation of the surface of the slopes. Although restricted by these conditions, the upstream slopes viewed from across the pond appeared to be steep and in fair condition (Photo PP-5). The downstream slopes on the east embankment were covered with tall grass which prevented observations of the surface of the slopes. Although restricted by these conditions, no evidence of surface sloughing or other failures were observed on the downstream slopes (Photos SECP-15 and SECP-21).

Discharge Pond

The area at the discharge pond was covered in tall grasses which prevented viewing of the upstream and downstream slopes (Photos DP-1 and PP-4). Although restricted by these conditions, no evidence of surface sloughing or other failures were observed on the slopes.

2.4.2 Main Ash Pond (Secondary and Polishing ponds and Discharge Basin) - Outlet Control Structures

Secondary Settling Pond

Flow is discharged from the northeast corner of the Secondary Pond into the southeast corner of the Polishing Pond. The two ponds are separated by a lower elevation dike with a static mixing channel/flume. The Secondary Settling Pond overflows at elevation 862.4 feet. During an extreme hydrological event, the small dike separating the two ponds will overtop and the two ponds will work as a single pond with an approximate surface area of 6 acres (Photos SECP-13 and PP-6). At the time of our field visit, there was flow through the flume.

Polishing Pond

Flow is discharged from the northeast corner of the Polishing Pond into the southeast corner of the Small Discharge Pond through a flow monitoring flume. The flume is equipped with a solar recorder. The Polishing Pond overflows at elevation 861.6 feet. During a severe storm, the water may overtop the internal weir and flow to the Discharge Pond (Photos PP-1 and DP-1). At the time of field visit, there was flow through the flume.

Discharge Pond

Flow is discharged from the northeast corner of the Discharge Pond into a ditch at the north end of the property. Improvements were made to this outlet in 2006. The outlet consists of a inverted 24-inch diameter pipe. The pipe is “J” shaped. At the time of our field assessment, the pipe was flowing. The outlet to the ditch was submerged and could not be seen (Photos DP-1, DP-3 and DP-4). Flow travels west along the north edge of the property in an open ditch and pipe system (Photos OP-1 and OP-2) approximately 1300 feet then turns north through an embankment to the Main Street Road roadside ditch at NPDES Outfall 001 (Photo OP-3). Flow in the roadside ditch travels back to the east (Photo OP-4) about 4000 feet to discharge into the Iowa River.

2.5 Monitoring Instrumentation

A partial flume at the outlet of the Polishing Pond monitors flow and other NPDES permit parameters (Photo DP-2). There is no geotechnical or groundwater monitoring instrumentation located at the Sutherland Power Station.

3.0 DATA EVALUATION

3.1 Design Assumptions

AMEC has reviewed provided documentation related to design assumptions regarding both hydraulic adequacy and dike stability.

3.2 Hydrologic and Hydraulic Design

3.2.1 Long Term Hydrologic Design Criteria

The Mine Safety and Health Administration provides minimum hydrologic criteria relevant to CCW impoundments in Impoundment Design Guidelines of the Mining Safety and Health Administration (MSHA) Coal Mine Impoundment Inspection and Plan Review Handbook (Number PH07-01) published by the U.S. Department of Labor, Mine Safety and Health Administration, Coal Mine Safety and Health, October 2007.

When detailing impoundment design storm criteria, MSHA states that dams need “to be able to safely accommodate the inflow from a storm event that is appropriate for the size of the impoundment and the hazard potential in the event of failure of the dam.” Additionally, MSHA notes that sufficient freeboard, adequate factors of safety for embankment stability, and the prevention of significant erosion to discharge facilities, are all design elements that are required for dam structures under their review. Additional impoundment and design storm criteria are as shown in Table 4, MSHA Minimum Long Term Hydrologic Design Criteria.

Table 4. MSHA* Minimum Long Term Hydrologic Design Criteria

Hazard Potential	Impoundment Size	
	< 1000 acre-feet < 40 feet deep	≥ 1000 acre-feet ≥ 40 feet deep
Low - Impoundments located where failure of the dam would result in no probable loss of human life and low economic and/or environmental losses.	100 - year rainfall**	½ PMF
Significant/Moderate - Impoundments located where failure of the dam would result in no probably loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities.	½ PMF	PMF
High - Facilities located where failure of the dam will probably cause loss of human life.	PMF	PMF

*Mining Safety and Health Administration (MSHA) Coal Mine Impoundment Inspection and Plan Review Handbook (Number PH07-01) published by the U.S. Department of Labor, Mine Safety and Health Administration, Coal Mine Safety and Health, October 2007

**Per MSHA, the 24-hour duration shall be used with the 100-year frequency rainfall.

Probable maximum flood (PMF) is, per MSHA, “the maximum runoff condition resulting from the most severe combination of hydrologic and meteorological conditions that are considered reasonably possible for the drainage area.” Additionally, MSHA notes the designer should consider several components of the PMF that are site specific. These components are said to include: “antecedent storm; principal storm; subsequent storm; time and spatial distribution of the rainfall and snowmelt; and runoff conditions." Basic agreement, it was noted, exists between dam safety authorities regarding "combinations of conditions and events that comprise the PMF;" however, there are "differences in the individual components that are used." MSHA provided the following as a "reasonable set of conditions for the PMF:

- Antecedent Storm: 100-year frequency, 24 hour duration, with antecedent moisture condition II (AMC II), occurring 5 days prior to the principal storm.

- Principal Storm: Probable maximum precipitation (PMP), with AMC III. The principal storm rainfall must be distributed spatially and temporally to produce the most sever conditions with respect to impoundment freeboard and spillway discharge.

- Subsequent Storm: A subsequent storm is considered to be handled by meeting the "storm inflow drawdown criteria," as described subsequently in the document.

With regard to storm influent drawdown criteria, MSHA Impoundment Design Guidelines noted that:

> *Impoundments must be capable of handling the design storms that occur in close succession. To accomplish this, the discharge facilities must be able to discharge, within 10 days, at least 90 percent of the volume of water stored during the design storm above the allowable normal operating water level. The 10-day drawdown criterion begins at the time the water surface reaches the maximum elevation attainable for the design storm. Alternatively, plans can provide for sufficient reservoir capacity to store the runoff from two design storms, while specifying means to evacuate the storage from both storms in a reasonable period of time - generally taken to be at a discharge rate that removes at least 90% of the second storm inflow volume within 30 days………When storms are stored, the potential for an elevated saturation level to affect the stability of the embankment needs to be taken into account.*

In, Mineral Resources, Department of Labor, Mine Safety and Health Administration, Title *30 CFR § 77.216-2 Water, sediment, or slurry impoundments and impounding structures; minimum plan requirements; changes or modifications, certification*, information relevant to the duration of the probable maximum precipitation is given. Sub-section *(10)* of *77.216-2* states that a "statement of the runoff attributable to the probable maximum precipitation of 6-hour duration and the calculations used in determining such runoff" shall be provided at minimum in submitted plans for water, sediment or slurry impoundments and impounding structures.

The definition of design freeboard, according to the MSHA Guidelines, is "the vertical distance between the lowest point on the crest of the embankment and the maximum water surface elevation resulting from the design storm." Additionally, the Handbook states that "Sufficient documentation should be provided in impoundment plans to verify the adequacy of the freeboard." Recommended items to consider when determining freeboard include "potential wave run-up on the upstream slope, ability of the embankment to resist erosion, and potential for embankment foundation settlement." Lastly, the Handbook states, "Without documentation, and absent unusual conditions, a minimum freeboard of 3 feet is generally accepted for impoundments with a fetch of less than 1 mile."

The CCW impoundments at the Sutherland Power Station fall within the smallest storm event designation category on Table 4. Using MSHA long term hydrologic criteria, design for the 100-year, 24-hour rainfall event would be recommended.

3.2.2 Hydrologic Design Criteria - Primary Ash Settling Ponds

Hydrologic and Hydraulic information was not specifically provided for the Primary Ash Settling Ponds, however, the pond area and inflow from the plant was included in the Main pond analysis.

3.2.3 Hydrologic Design Criteria - Main Ash Settling Ponds

AMEC was provided with an *Ash Pond Slope Stability and Hydraulic Analysis*, completed by aether dbs and dated June 17, 2011. The Analysis stated that, with respect to stormwater runoff, the “total area contributing to the ponds is 57 acres.” Areas noted as routed to the ash ponds include “the plant area, the ash management area and coal pile stormwater.” These areas are shown on Figure 4. Additionally, the Analysis noted that a small dike with a static mixing channel exists between the secondary ash and polishing ponds and that “during an extreme hydrological event, the small dike…….will overtop and the two ponds will work together as a single pond with an approximate surface area of 6 acres.” Outer dike heights were reported as 865 feet for the Secondary Settling Pond and 864 feet for the Polishing Pond. Further, “the secondary ash settling pond overflows at elevation 862.4 feet” and “the polishing pond overflows at elevation 861.6 feet.” The discharge structure for the Discharge Pond is a 24-inch diameter vertical riser pipe.

Other provided design input included:

- A current topographical map file, dated April 19, 2006, of the Primary and Main Ash Settling Pond areas, showing the Main Settling Pond reconfiguration;

- A 100-year, SCS Type 2, 24-hour storm event rainfall for Marshall County, Iowa of 6.6 inches was used in the runoff calculations. The chosen rainfall amount was based on the United States Department of Commerce, Rainfall Frequency Analysis of the United States;

- Hydraflow by Intelisolve (2002) was used to generate and route the storm hydrograph through the Main Ash Ponds (secondary settling, polishing, and small discharge ponds). A hydrograph report was included as part of the Analysis (Attachment B);

Design assumptions included:

- Starting pond elevation for the secondary ash pond was specified at the normal water surface elevation of 862.4 feet;

- Starting pond elevation for the polishing pond was specified at the normal water surface elevation of 861.6 feet;

The hydrograph routing output, as presented in the Analysis, indicates that the 100-year 24-hour rainfall event (6.6 inches) will result in a water surface elevation in the Secondary Settling Pond of 864.4 feet, “leaving a freeboard or slightly more than 6-inches.” The Discharge Pond was noted to reach “a storm elevation of 862.5 feet which is 1.5 feet below the outer dike height of 864 feet.”

The 2011 report notes a report from plant personnel that “the site received four inches of rainfall on November 4, 2003 and the water level in the secondary ash pond rose only 6 to 7 inches above the normal operating elevation. The historical event indicates that the analysis is conservative.” The 2006 improvements to the pond have changed conditions since 2003, therefore this event in effect cannot be used to prove conservatism.

3.3 Structural Adequacy & Stability

EPA policy for conventional minimum recommended factors of safety for different loading conditions are shown in Table 5 below.

Table 5. Minimum Stability Factors of Safety

Loading Condition	Minimum Factor of Safety
Rapid Drawdown	1.3
Long-Term Steady Seepage	1.5
Earthquake Loading (pseudo-static method)	1.0

To consider the structural adequacy and stability of the ash ponds at the Sutherland Generating Station, AMEC reviewed stability analysis material provided by IPL.

AMEC reviewed the June 17, 2011 report entitled *Ash Pond Slope Stability and Hydraulic Analyses* prepared by Aether, dbs, for the Sutherland Generating Station prepared for Interstate Power and Light (Alliant Energy). The recently completed stability analyses are summarized in Section 3.3.1. The Aether analysis included a study of a section of the south embankment of the Secondary Settling Pond dike, which is within the original ash management dike. The report presented a summary of the data that was reviewed including a previous geotechnical exploration that was performed in 2006 by Hard Hat Services entitled *Field Investigation Report, Sutherland Generating Station, Bottom ash Settling Pond*, as well as the results of the structural stability analyses performed for one cross-section.

Aether evaluated the overall stability of the dam by reviewing previously collected drilling data for their study. The report states:

> *Field characterizations of the clay unconfined compressive strength made with a pocket penetrometer are shown on the five boring logs from the outer dike of the ash pond. The cohesive strength of the clay (unconfined compressive strength divided by 2) is charted versus depth in Attachment C. All five borings produced similar strength results showing a strong crust (very stiff to hard clay above a depth of 4 feet) with stiff to firm clay underneath*.

The study notes the section analyzed is a “conservative idealized section” that corresponds best with the outer dike along the south edge of the active fly ash management area”. The report states the south dike is a little narrower and presumed higher because natural topography of the area slopes slightly to the south. Two to one side slopes were used for both the upstream and downstream slopes due to specifications for reconstruction of the upstream slopes and topographic information for the downstream slopes. The embankment height of 13 feet was based on the maximum depth to native soils reported in the geotechnical investigation. With a crest elevation of 865 feet the toe of both slopes were placed at 862 feet. The study noted the bottom of pond elevations adjacent to the southernmost dike ranges between 851 to 855 feet. The top width of 13 feet was the narrowest width measured on the Settling Pond Reconfiguration Drawing for the 2006 improvements. The location of the section selected for analysis is shown on Figure 4 and a graphical representation of the section is shown on Figure 5. The analysis assumed the clay cohesion in the dike was the lowest strength measured above a depth of 14 feet, 1,250 psf, and the cohesion below the dike was the lowest measured below a depth of 13 feet, 1,000 psf. The report noted:

> *Fine to medium sand with silt is present below the clay in the five nearest deep borings at elevations ranging from 848 feet to 852 feet, Attachment E and F. The search for failure surfaces in the Zook Clay was limited to a depth of 9 feet below the toe of the dike to avoid the stronger sand below that depth. The sand is relatively dense and will not liquefy in a low intensity earthquake.*

The report substantiated the depth to bedrock in the area was over 250 feet by providing a copy of a well record. The slope stability analyses were performed using STABL5M (1966) from Purdue University. The report states “Because the dike foundation soils are considered weaker than the dike, the most critical surface mode is a sliding block failure….”

Aether stated in their report:

> *Only two loading cases / failure scenarios were analyzed because in the case of a clay dike, the rapid drawdown case on the inside of the pond is essentially the same as the stability of the outside of the dike. (Clay soils cannot drain quickly; hence short term seepage forces are not a concern.)*
>
> > *1.) Ash pond water elevation at the normal elevation (862.6 feet) with a steady state seepage face emerging above the toe of the slope. Because a cohesion only strength is considered using undrained clay strength, the location of the seepage face does not influence the Factor of Safety calculation. However, water pressure on the inside of the dike can contribute to instability and it was included in the model.*
> >
> > *2.) The small ponds at Sutherland Station do not pose a significant risk and contain minimum volumes of coal combustion residue. The procedures of FEMA suggest that the structures rate as low risk dams. For low risk structures, a probability of 10% in 50 years (return period of 475 years) is an acceptable standard. Consequently, a pseudostatic earthquake analysis was completed using the effective peak ground acceleration for a 475 year return period. With dense soil under the site, a Site Class “D” was selected for soil amplification giving a probable maximum horizontal earthquake acceleration of 0.019g for the ash ponds. The vertical earthquake force is specified as 2/3 of the horizontal earthquake force.”*

Table 6 provides a summary of the soil properties utilized in Aether’s report.

Table 6. Soil Properties for Stability Analysis

Material	Unit Weight γ (lb/ft^3)	Friction Angle, σ' (Degrees)	Cohesion, c' (lb/ft^2)
Dike Fill (Cohesive)	130	0	1,250
Clay (Original)	126	0	1,000

3.3.1 Primary Ash Settling Ponds - Structural Adequacy & Stability

No static or seismic analyses were provided for the North and South Primary Ponds.

3.3.2 Main Ash Pond (Secondary Pond) - Structural Adequacy & Stability

Static and Seismic Analysis

The static and seismic analyses performed by Aether contain method and procedure errors that render their results invalid and therefore are not presented in this section. AMEC agrees with Aether that generally the most critical section is on the south dike. (Generally was used in the preceding sentence because ponding water was observed at the toe in a location on the east dike and if left for a long period of time may be the more critical section.) We also agree that the minimum width of the embankment on the south dike is about 13 feet. However, measurements from the drawings indicate a much shorter width and lead to question any other measurements or derived slopes or elevations from the drawings. In addition, surface sloughing observed on the upstream slopes during the field visit indicate nice 2H:1V slopes are not the case. We also agree that the pond is a low risk structure and resulting derivation of earthquake forces. Method and procedure errors in the analysis include:

(1) The use of pocket penetrometer tests for direct assignment of strength parameters for a stability analysis is not an acceptable method. The most widely used acceptable method to determine strength parameters is triaxial tests to determine total (short term) and effective (long term) shear strength parameters. Confined and unconfined compressive strength tests, SPT N-values and pocket penetrometer/torvane tests are used (in the same order of accuracy) to confirm the triaxial results and provide supplemental data for any indications of softer soils. The supplemental data may influence the evaluating engineer to reduce the triaxial test values. Alternatively, extremely conservative values could be used based more on the type of soils and SPT values.

(2) Based on our review of the SPT and CPT borings on the south dike, the clay and ash layer from a depth of 4 to 6 feet in SPT 5 is suspect and CPT 6 indicates very soft material from a depth of 5 to 8 feet. A conservative effective stress parameter for the cohesion of this layer would be 0 pounds per square foot.

(3) The SPT and CPT borings performed during the geotechnical exploration extended to a maximum depth of 15 feet. Records from surrounding deep borings indicate sand at a depth of about 17 feet below the ash management area and about 4 feet below the toe of the embankment. Aether's extension of the clay layer below the embankment would be conservative if extremely low strength parameters were used. However, results of the analyses show deep failure surfaces. Steeper slopes, like 2H:1V modeled here, are more prone to failure at shallower depths especially given the underlying sand foundation. It appears Aether placed the minimum depth of slices too deep and is subsequently getting factors of safety results higher than actually exist.

(4) Procedural errors were made in the assignment of strength parameters in the analyses. The strength parameters assigned were total stress and the stability results represent factors of safety for the short term or immediately after construction condition. The south dike has been in place for over 50 years. Effective strength parameters relying on the drained shear strength with the friction angle controlling should be used for long term analyses.

(5) A rapid drawdown case was not performed for the upstream slope. This analysis should be performed to assess the stability of the slope.

In the assessing engineer's opinion, the method and procedural errors described above render the Aether results unacceptable. We would also like to note the attachments with the STABL5M stability results were confusing. A circular and block analysis was evaluated for both cases, but another block analyses was presented with different results and no designation or explanation provided on the plots or in the report text.

3.4 Foundation Conditions

Attachments to the June 17, 2011 report entitled *Ash Pond Slope Stability and Hydraulic Analyses* prepared by Aether, dbs, for the Sutherland Generating Station prepared for Interstate Power and Light (Alliant Energy) provides the most information concerning the foundation conditions at the site. The attachments include a geotechnical report dated March 2006 by Hard Hat Services (Attachment A) with borings performed by Cabeno, selected deep soil borings performed by Black & Veatch (Attachment E) and Team (Attachment F), and a deep well record/log for Well 6A performed in 1994 by Layne-Western.

The March 2006 geotechnical report by Hard Hat Services includes borings performed to a depth of 15 feet within the ash management area. The borings primarily characterize the embankment soils, but do penetrate the top of the foundation soils for a few feet. The borings indicate the top layer of the foundation soils consist of clay. The selected deep borings confirm a clay foundation to a depth of about 8 feet in the plant area. It appears Shelby Tubes were obtained in some of the borings, but testing results are not listed. Pocket Penetrometer tests results included two at 1500 and one at 2500 lbs per square foot. The borings show fine to coarse grained, generally loose to medium dense sands underlying the clay. The water table was noted to be at or slightly above the start of the sand layer. Very stiff clay/glacial till was encountered at depths of about 45 to 50 feet. The deep well record for Well 6A indicates the depth to bedrock in the plant area is about 250 feet. Based on the limited provided information for the foundation soils, there is no evidence the exterior embankments of the North and South Primary Ponds and the Main Pond are built over wet ash, slag or other unsuitable materials.

3.5 Operations and Maintenance

3.5.1 Safety Assessments

IPL reported daily inspections of the plant grounds, including the ash management area, are performed daily but not documented. Documented inspections were reported to be performed bi-annually by plant environmental personnel. Based on provided documents, IPL personnel performed and recorded visual inspections of the ash ponds in November 2010 and April 2011. Each inspection report includes a title page with inspection details (site, date, weather, etc.) and a description section where a summary of recent plant operation and inspection causes/results in sentence form. Following the title page is a one page checklist to guide the site inspection to evaluate dike integrity, specifically the presence of animal activity, seepage, erosion, trees/vegetation, ponding, leakage from valving or piping, or damage due to heavy equipment use. Outfall structures are also inspected for the presence of many of the same issues. The dike walls and discharge structures are also checked for the presence of any settled ash. The final page of the report is a cumulative work items list which tracks issues; what has been, and is scheduled to be performed; and completion dates.

The visual inspection performed in November 2010 noted a tree had re-grown on the berm of the Main (Secondary) Ash Pond and fill needed on the west wall of the Unit 1 & 2 (North Primary) Pond due to recent work on the piping rack. The provided recommendations were to re-cut the tree and replace the material on the west wall. No issues were reported for the Unit 3 (South Primary) Pond.

Visual inspections performed in April 2011 noted a contractor had cut down several brush trees located outside and near the fence line of the pond (prior to the inspection). Issues observed during the inspection included animal activity on the east dike wall and the inside of the east dike wall had a small area that had sloughed off above the water level. Recommendations included setting traps for the animal problem and to repair the slough area. The attached work items page noted tree removal work completed on the outside of the east and south walls, traps set and two muskrats caught, and a due date of 6/1 for the east wall repair with no completion date listed. During AMEC's site visit, we observed a repair to the upstream slope of the east dike of the Polishing Pond.

No other plant or subcontractor inspection documentation was provided.

3.5.2 Instrumentation

There is no geotechnical or groundwater monitoring instrumentation located at the Sutherland Power Station.

3.5.3 State or Federal Inspections

No State or Federal inspections regarding the condition of the ponds have taken place at the Sutherland Power Station. A wastewater inspection was performed by Field Office #5 for the State of Iowa Department of Natural resources in September, 2010. This inspection specifically addressed NPDES effluent/monitoring details and did not address the condition of the embankments. The report did note the solar powered 4210 Ultrasonic Flow Meter had not been calibrated in quite some time and recommended calibration at least annually if not semi-annually.

4.0 COMMENTS AND RECOMMENDATIONS

Condition assessment definitions, as accepted by the National Dam Safety Review Board, are as follows:

SATISFACTORY

No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.

FAIR

No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.

POOR

A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

UNSATISFACTORY

A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

NOT RATED

The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

4.1 Acknowledgement of Management Unit Conditions

I certify that the management units referenced hereinafter were personally assessed by me and was found to be in the following condition:

North Primary Settling Pond (Units 1&2): Poor

South Primary Settling Pond (Unit 3): Poor

Main Ash Settling Pond (Secondary, Polishing and Discharge Ponds): Poor

4.2 Recommendations

In the assessing engineers opinion the north and south primary settling ponds are rated in poor condition due to the lack of stability analyses for the ponds which reflect the fact that uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

The Poor rating for the Main Ash Pond reflects the fact that, uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary. In addition, vegetation on the embankments was too high to inspect the embankments closely.

4.2.1 Hydrologic and Hydraulic

Primary Settling Ponds

Although specific hydrologic and hydraulic information was not provided for these ponds, it is AMEC's opinion that, based on the site visit, these ponds are operated with a water surface well below (2 feet to 4 feet) the dikes and would be capable of handling the 100-year 24-hour storm event runoff from the area that appears to be tributary to them, while maintaining sizeable freeboard.

Main Ash Settling Ponds

Although the small discharge pond was reported to maintain a freeboard of 1.5 feet while passing the 100-year 24-hour design storm (condition rating of Fair), the other two components of the Main Ash Settling Ponds (the Secondary Settling and Polishing Ponds) were inundated and operated as a single pond during the 100-year 24-hour storm event. Additionally, the resulting freeboard of their combined condition, indicated by the storm routing, was just over 6 inches. AMEC recommends that the freeboard be increased through reconfiguration of the pond(s) such that the 100-year 24-hour storm does not cause the pond(s) to cease operating as individual structures.

4.2.2 Geotechnical and Stability Recommendations

Conventional minimum factor of safety criteria are 1.5 for static long-term stability and 1.0 for earthquake stability (by pseudo-static method). Likewise, if the dam does not meet the above seismic factor of safety, then the stability of the embankment should be analyzed and the amount of embankment deformation or settlement that may occur should be evaluated to assure that sufficient section of the crest will remain intact to prevent a release from the impoundment.

A June 2011 report by Aether, dbs, titled *Ash Pond Slope Stability and Hydraulic Analysis,* for the Sutherland Generating Station presents stability analyses for Main Ash Pond. One cross section was analyzed for short term and short term seismic conditions. The location of the cross section was selected to represent the "most critical" area on the south dike.

In the opinion of the assessing professional engineer, the analysis should:

- Be revised to represent long term conditions. Pocket Penetrometer tests should not be used alone to assign strength parameters. Additional borings and lab testing should be performed to obtain sufficient data or the use of conservative values should be evaluated by a geotechnical engineer to determine if their use is sufficient or additional data is needed.
- Be revised to include actual measurements across sections of the south dike to confirm representation of the section. Steep banks were observed on the upstream slope,

steeper downstream slopes are represented by the topographic mapping and observations toward the west end of the south dike, and the south dike appeared higher toward the west end.
- Evaluate the conditions on the east dike where water is against the toe of the embankment. If the water is not removed, this section should also be analyzed in relation to the high phreatic surface and soft foundation conditions.
- Consider all critical stages over the life of the pond including pond full conditions. These conditions would need to be determined in conjunction with the hydraulic recommendations above. The hydrologic and hydraulic analysis will provide maximum water levels in the pond and a phreatic surface through the embankment.
- A rapid-drawdown should be performed for the upstream embankment in relation to conditions when the pond would be drained.
- Consideration should be given for lowering strength values to account for inconsistencies within the fill or foundation materials.

The vegetation on the embankment slopes of the Main Ash Pond was too tall to inspect the embankment closely. No visible signs of major slope failures were observed. AMEC recommends IPL periodically mow the area to allow inspection of the embankments. One of the formal plant inspections could be performed in the winter/early spring months when the vegetation is low and the embankments are more visible. Mowing may be needed at the time of the other inspection and/or inspection by an engineer as recommended below, ideally preceding or following the normal season of heavier rainfall. Mowing should extend at least to the fence on the downstream embankments. Mowing beyond the fence may need to be coordinated with or approved by a regulatory agency as adjacent areas could be classified as wetlands. Maintenance issues such as steep and exposed slopes, and water against the toe of the slope as described in Section 2.4.1 and other issues discovered after mowing should be promptly addressed to maintain the structural integrity of the embankments.

No stability analyses were presented for the primary ponds. Stability analyses should be performed for the North and South Primary Ponds.

4.2.3 Inspection Recommendations

Inspection procedures at the Sutherland station include daily, undocumented inspection of the grounds by plant personnel and bi-annual, documented inspections by plant environmental staff.

AMEC recommends that Alliant Energy, IPL, revise the bi-annual inspection to reflect the changes in 2006 by completing forms for each impoundment of the Main Pond. AMEC suggests a map be included to maintain a record of the approximate locations of any identified problems. A map could also be used to maintain a record of work performed cumulatively or since the last inspection. AMEC recommends annual visual inspections of each management unit should be performed by a Professional Engineer, either by a consultant or by internal, off-site personnel. Inspection reports are and should be maintained by the facility. Additionally, routine inspections (daily or weekly) performed by facility O&M personnel could be supported by an inspection checklist to serve as documentation of the inspection.

Vegetation on the impoundments should continue to be aggressively managed. We further recommend that vegetation be managed based on guidance in (a) Corps of Engineers EM 1110-2-301, *Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams* and (b) FEMA 534, *Technical Manual for Dam Owners:*

Impacts of Plants on Earthen Dams. Additionally, animal impact should be mitigated based on guidance in FEMA 473, *Technical Manual for Dam Owners: Impacts of Animals on Earthen Dams*.

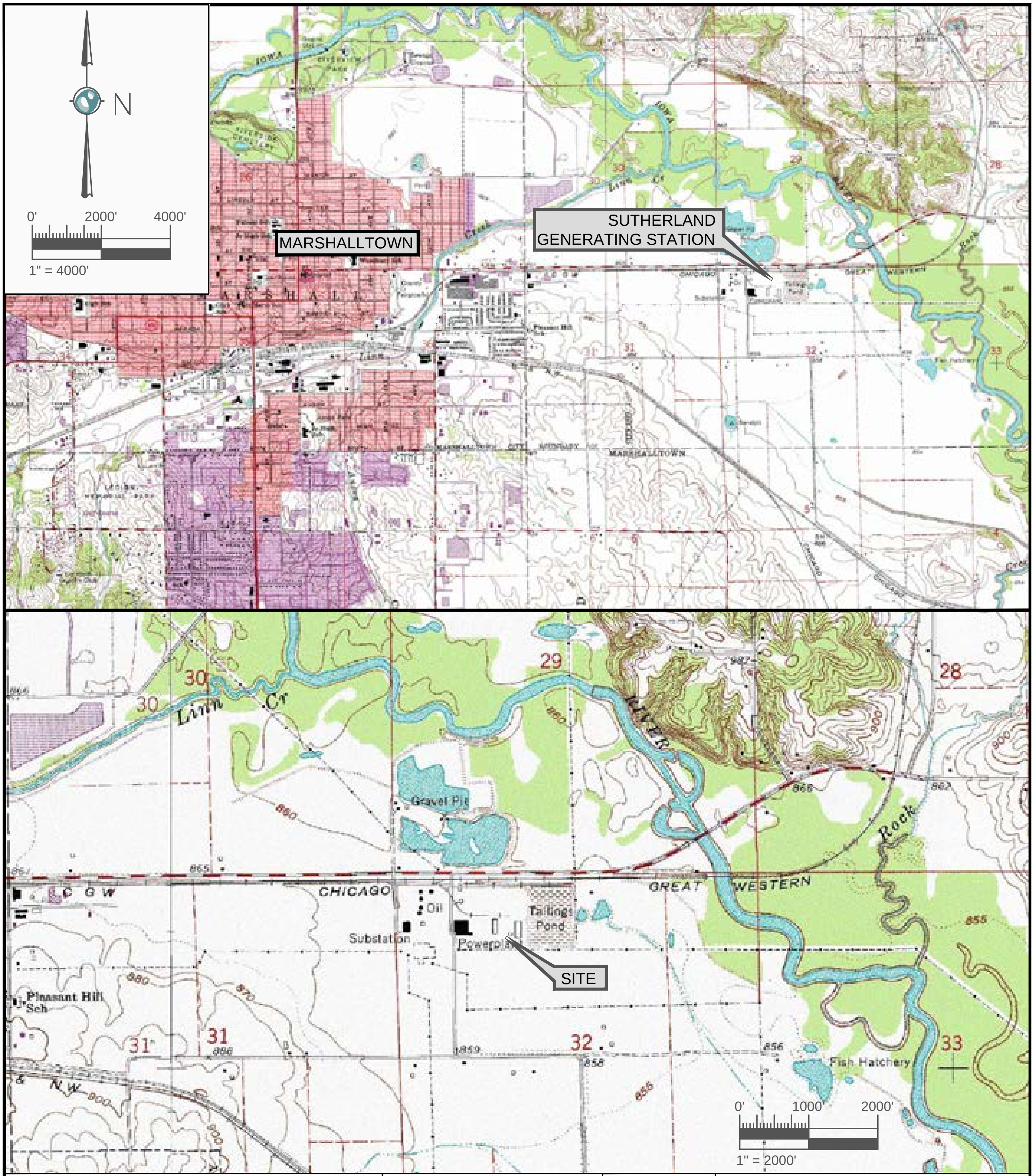
5.0 CLOSING

This report is prepared for the exclusive use of the Environmental Protection Agency for the site and criteria stipulated herein. This report does not address regulatory issues associated with storm water runoff, the identification and modification of regulated wetlands, or ground water recharge areas. Further, this report does not include review or analysis of environmental or regional geo-hydrologic aspects of the site, except as noted herein. Questions or interpretation regarding any portion of the report should be addressed directly by the geotechnical engineer.

Any use, reliance on, or decisions to be made based on this report by a third party are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions and recommendations given in this report are based on visual observations, our partial knowledge of the history of Sutherland's impoundments, and information provided to us by others. This report has been prepared in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

FIGURES



AMEC Environment & Infrastructure
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO

CLIENT
UNITED STATES
ENVIRONMENTAL
PROTECTION AGENCY

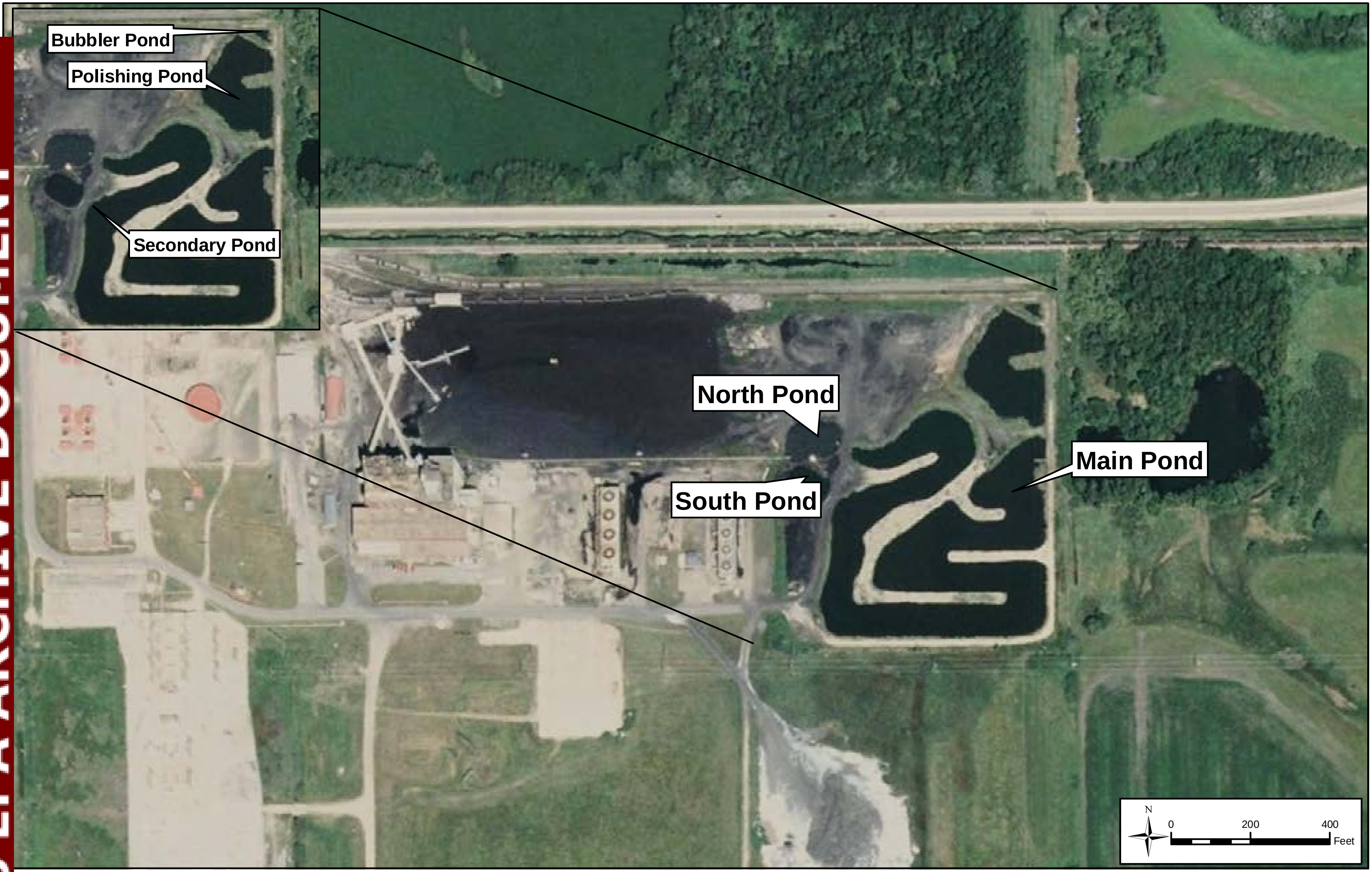
PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

DWN BY: CAE
DATUM:
DATE: 7/13/11

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SITE LOCATION & VICINITY MAP

CHK'D BY: JHB
REV. NO.:
PROJECT NO: 3-2106-0191.0001.****
PROJECTION:
SCALE: AS SHOWN
FIGURE No. 1

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\April 2011 Round 10\Alliant Sutherland\CAD\marshalltownfig1.dwg — Layout1 — Jul. 13, 2011 10:52am — chris.eger



UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

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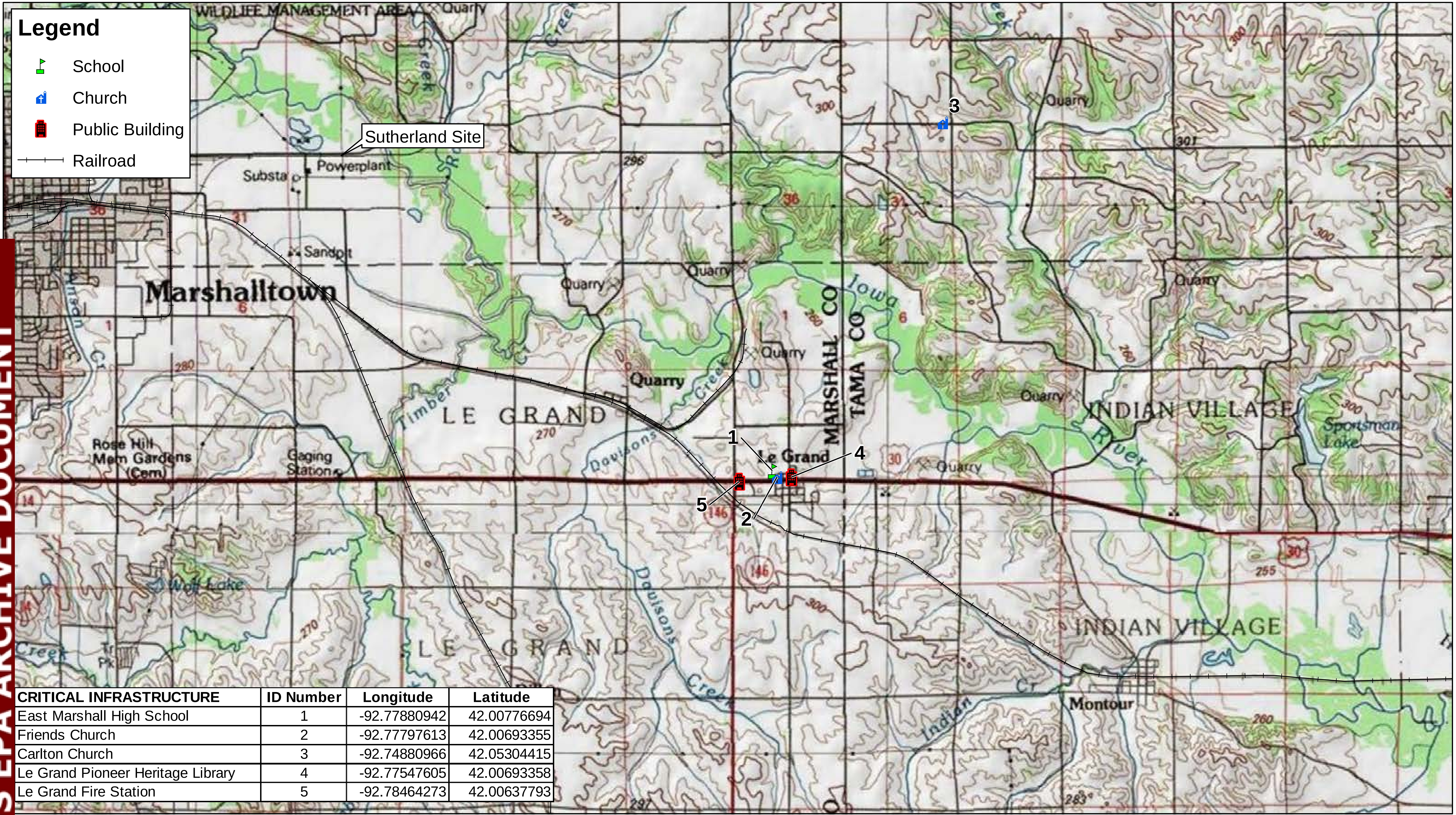
DWN BY:	DJC
CKD BY:	MS
Datum:	NAD 83
Projection:	UTM 15
Scale:	As Shown

ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION,
MARSHALLTOWN, IA
SITE MAP

REV. No.:	A
Date:	9-15-10
Project No:	3-2106-0191
Figure No:	2



CRITICAL INFRASTRUCTURE	ID Number	Longitude	Latitude
East Marshall High School	1	-92.77880942	42.00776694
Friends Church	2	-92.77797613	42.00693355
Carlton Church	3	-92.74880966	42.05304415
Le Grand Pioneer Heritage Library	4	-92.77547605	42.00693358
Le Grand Fire Station	5	-92.78464273	42.00637793

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1003 Bluegrass Parkway
ouisville, KY 40299

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

DRAWN BY: DJC
CHK'D BY: MS
DATUM: NAD83
PROJECTION: Albers
SCALE: AS SHOWN
DATE: 7/14/2011

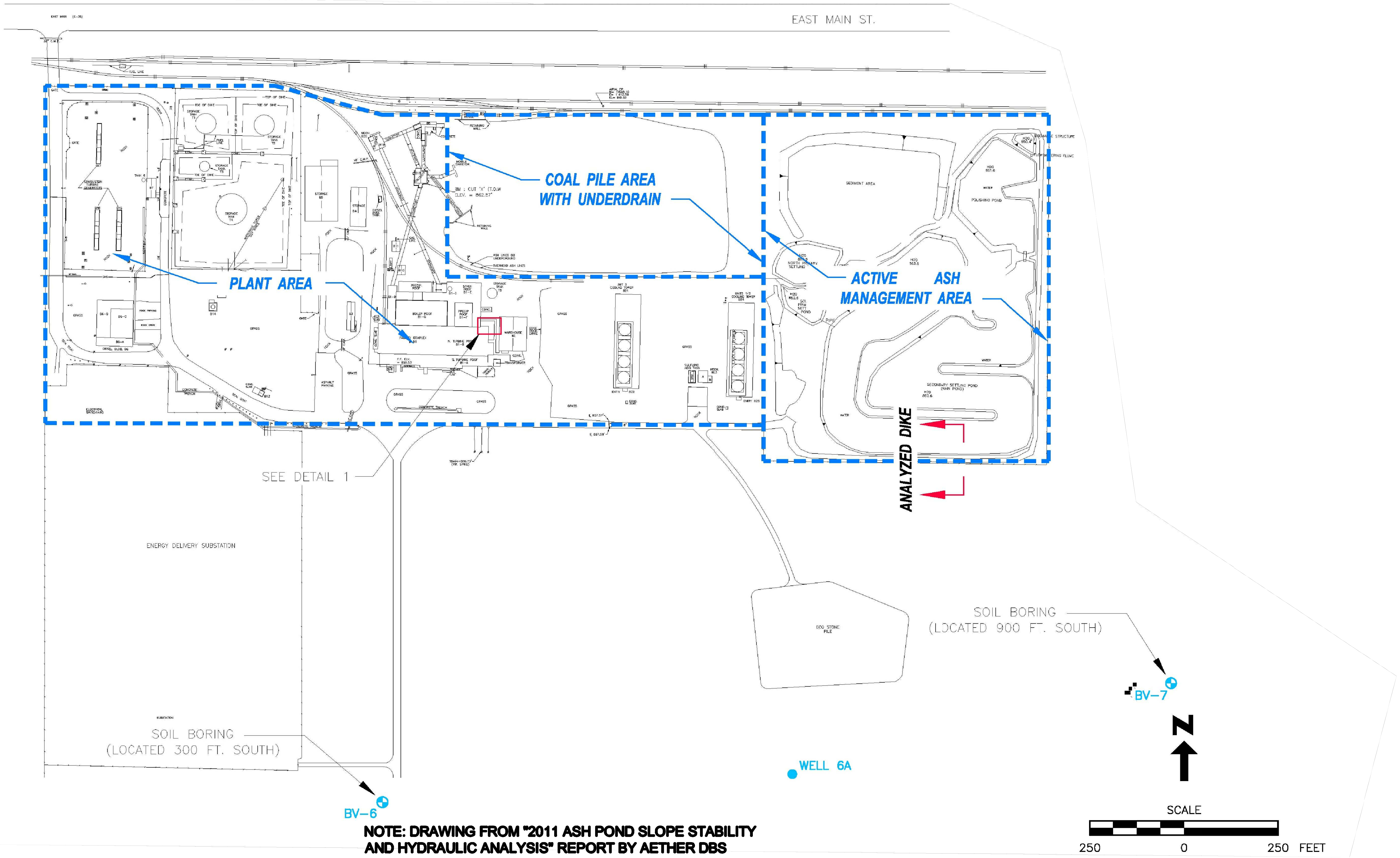
ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
CRITICAL INFRASTRUCTURE

N
0 1 Miles
0 1 Kilometers

Notes: Critical infrastructure data provided by ESRI

FIGURE
3



NOTE: DRAWING FROM "2011 ASH POND SLOPE STABILITY AND HYDRAULIC ANALYSIS" REPORT BY AETHER DBS

NOTE: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE AMEC EARTH & ENVIRONMENTAL REPORT

CLIENT LOGO

CLIENT:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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amec

DWN BY: DNP
CHK'D BY: MOS
DATUM:
PROJECTION:
SCALE: AS SHOWN

PROJECT **ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS**

TITLE **INTERSTATE POWER AND LIGHT COMPANY SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA DRAINAGE AREA TO PONDS AND LOCATION OF ANALYZED STABILITY SECTION**

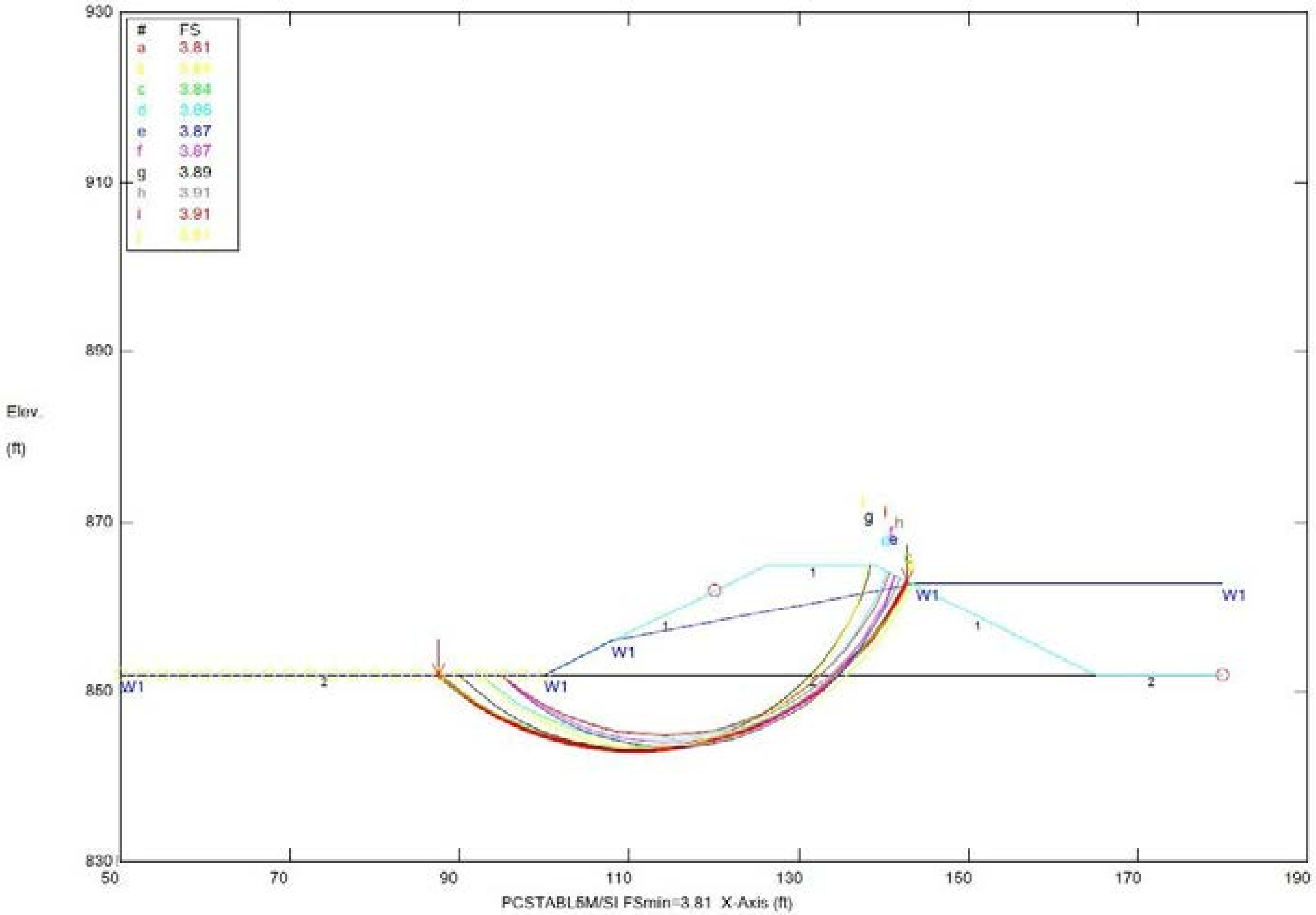
DATE: 7/15/11
PROJECT NO: 3-2106-0191
REV. NO.:
FIGURE No. 4

S:\Geosciences\Proposals\EPA Coal Impoundment Inspection\April 2011 Round 10\Alliant Sutherland\CAD\pondstabilityfig4.dwg — Layout1 — Jul. 15, 2011 4:10pm — chris.eger

CONFIDENTIAL BUSINESS INFORMATION

Alliant Energy - Marshalltown, Iowa Static Case

Ten Most Critical. C:MARSH01.PLT By: TCW 06-15-11 4:09pm



#	FS
a	3.81
b	3.84
c	3.84
d	3.86
e	3.87
f	3.87
g	3.89
h	3.91
i	3.91
j	3.91

Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Dike	130	130	1250	0	0	0	W1
2	Clay	126	126	1000	0	0	0	W1

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
CRITICAL CROSS-SECTION SECONDARY POND

DWN BY: CAE	DATUM:	DATE: 7/13/11
CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191.0001.****
PROJECTION:	SCALE:	FIGURE NO. 5

APPENDIX A

EPA COAL COMBUSTION DAM INSPECTION CHECKLISTS AND COAL COMBUSTION WASTE IMPOUNDMENT INSPECTION FORMS DATA - JUNE 2010

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # 64-69-1-03 INSPECTOR Dotson/Black
Date 06/14/2011

Impoundment Name North Primary Settling Pond
Impoundment Company Interstate Power & Light - Sutherland Generating Station
EPA Region VII
State Agency (Field Office) Address ______

Name of Impoundment ______
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Receives CCW from Units 1 & 2, surface runoff from plant and coal pile, and other plant waste streams.

-

Nearest Downstream Town : Name La Grand
Distance from the impoundment 5 miles
Impoundment
Location: Longitude -92 Degrees 51 Minutes 18 Seconds
Latitude 42 Degrees 02 Minutes 51 Seconds
State IA County Marshall

Does a state agency regulate this impoundment? YES ______ NO X

If So Which State Agency? N/A

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Sutherland

Date: 6/14/2011

Unit Name: North Primary Settling Pond

Operator's Name: Alliant Energy (IPL)

Unit I.D.:

Hazard Potential Classification: High Significant [✓ Low]

Inspector's Name: Don Dotson/James Black, PE

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	See Comment		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	862.9		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	862.6				
4. Open channel spillway elevation (operator records)?	861.6		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	870		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trash racks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. Bi-annual documented inspection of pond system by on-site Environmental and Safety Specialist; plant personnel perform daily inspection - not documented.

EPA FORM -XXXX

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

__X__ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

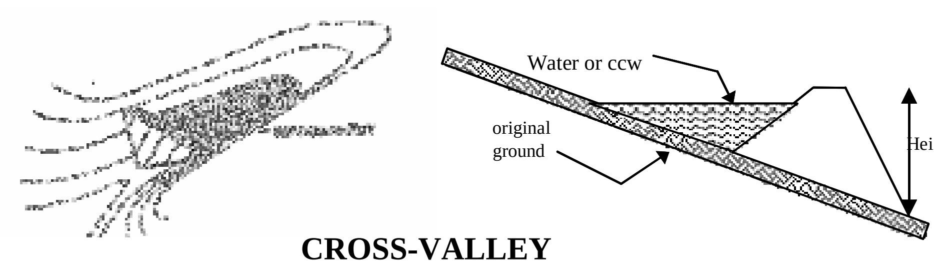
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

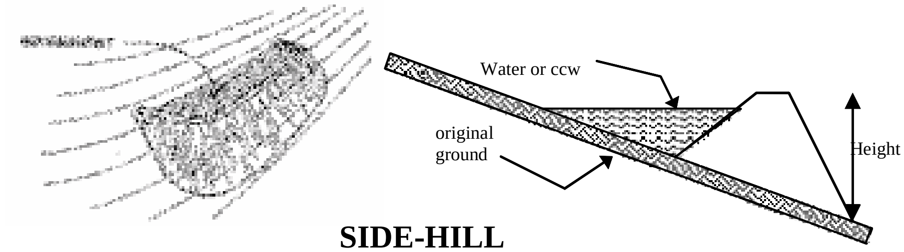
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

North Primary Pond is only 0.3 acres in area. Failure would be to Main Pond (Secondary Pond) with only minimal impact.

CONFIGURATION:

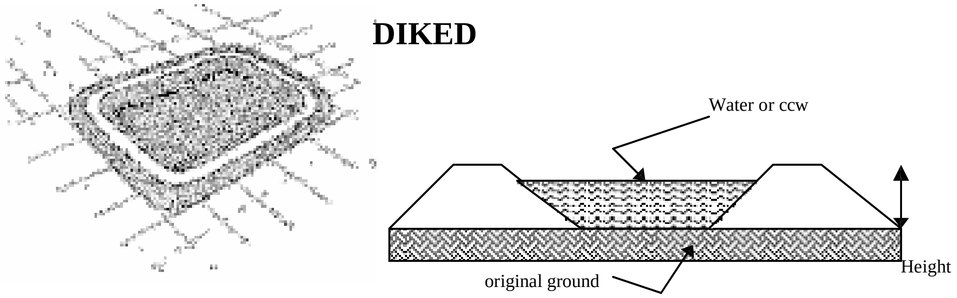


CROSS-VALLEY

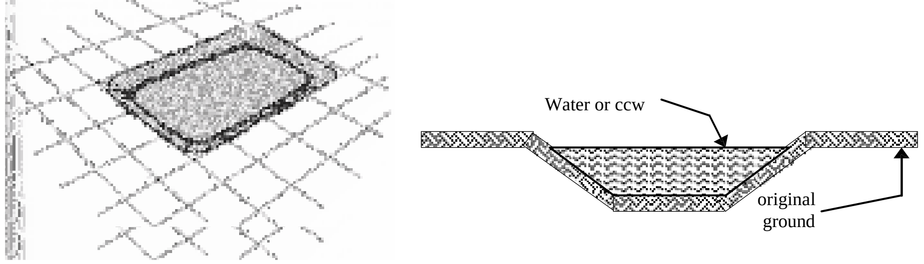


SIDE-HILL

DIKED



INCISED



______Cross-Valley

______Side-Hill

__X__Diked (Construction within former ash management area)

______Incised (form completion optional)

______Combination Incised/Diked *Obtained from topo

Embankment Height 870* feet Embankment Material Ash

Pool Area 0.3 acres Liner None

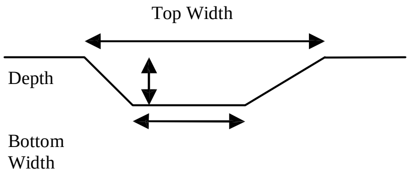
Current Freeboard 7 feet Liner Permeability N/A

TYPE OF OUTLET (Mark all that apply)

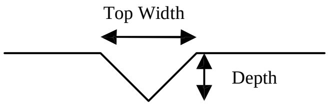
______**Open Channel Spillway**
____Trapezoidal
_______Triangular
_______Rectangular
_______Irregular

_______depth
_______bottom (or average) width
______top width

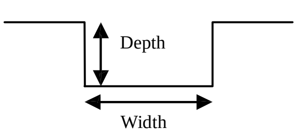
TRAPEZOIDAL



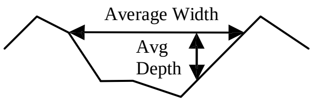
TRIANGULAR



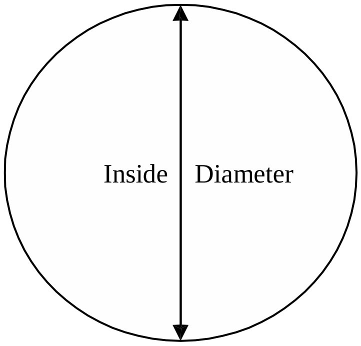
RECTANGULAR



IRREGULAR



______**Outlet**



Material
___X___corrugated metal
_______welded steel
_______concrete
_______plastic (hdpe, pvc, etc.)
_______other (specify)

Is water flowing through the outlet? YES ___X___ NO _______

______**No Outlet**

______**Other Type of Outlet** (specify) ________________________________

The Impoundment was Designed By N/A ________________________________

Has there ever been a failure at this site? YES ____________NO ___X________

If So When? _______________________________

If So Please Describe: ____

Has there ever been significant seepages at this site? YES ________NO __X___

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO ___X____

If so, which method (e.g., piezometers, gw pumping,...)? ______________________

If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Sutherland
Date: 6/14/2011
Unit Name: South Primary Settling Pond
Operator's Name: Alliant Energy (IPL)
Unit I.D.:
Hazard Potential Classification: High Significant [✓ Low]
Inspector's Name: Don Dotson/James Black, PE

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	See Comment		18. Sloughing or bulging on slopes?		X
2. Pool elevation (operator records)?	862.6		19. Major erosion or slope deterioration?		X
3. Decant inlet elevation (operator records)?	862.6				
4. Open channel spillway elevation (operator records)?	861.8		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	867		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?		X
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trash racks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?		X	23. Water against downstream toe?		X
17. Cracks or scarps on slopes?		X	24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. Bi-annual documented inspection of pond system by on-site Environmental and Safety Specialist; plant personnel perform daily inspection - not documented.

EPA FORM -XXXX

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # 64-69-1-03 INSPECTOR James Black, PE
Date 06/14/2011

Impoundment Name South Primary Settling Pond
Impoundment Company Interstate Power & Light - Sutherland Generating Station
EPA Region VII
State Agency (Field Office) Address ____________

Name of Impoundment ____________
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ____

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X*	

*CCW is pumped to the pond but was not being pumped at the time of site visit.

IMPOUNDMENT FUNCTION: Receives CCW from Unit 3, slag from Unit 3 is removed from this pond and can be sold for beneficial reuse of disposed.

Nearest Downstream Town : Name La Grand
Distance from the impoundment 5 miles
Impoundment
Location: Longitude -92 Degrees 51 Minutes 18 Seconds
Latitude 42 Degrees 02 Minutes 51 Seconds
State IA County Marshall

Does a state agency regulate this impoundment? YES ____ NO X

If So Which State Agency? N/A

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

__X__ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

______ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

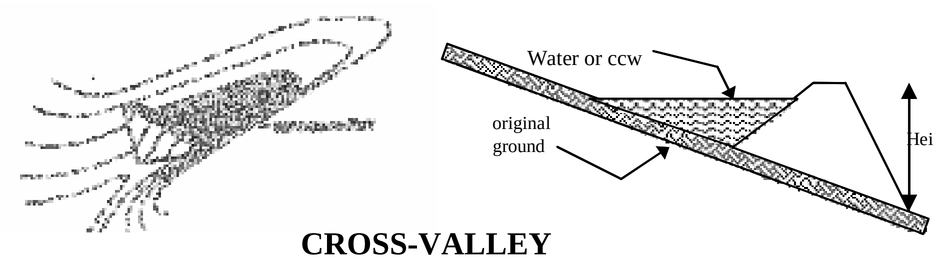
______ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

______ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

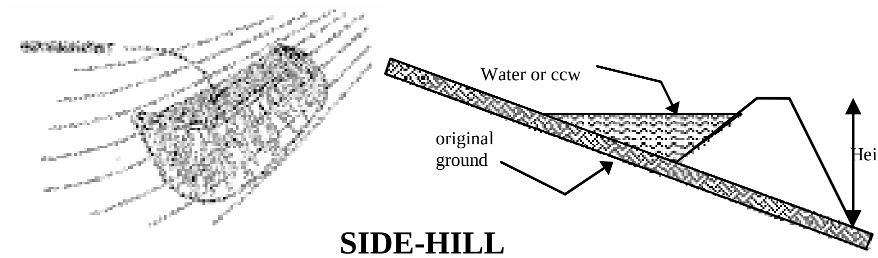
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

South Primary Pond is only 0.13 acres in area. Failure would be to Main Pond (Secondary Pond) with only minimal impact.

CONFIGURATION:

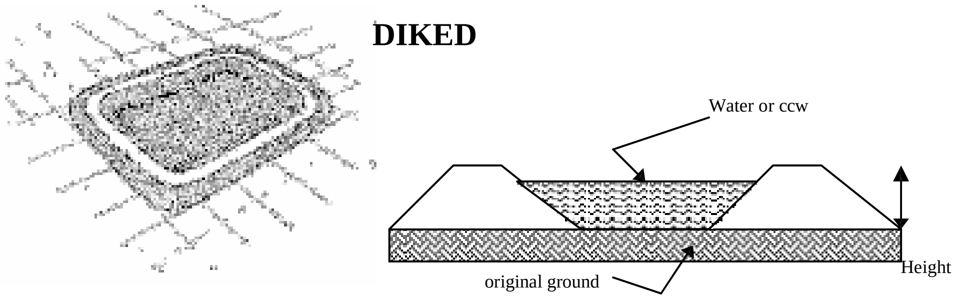


CROSS-VALLEY

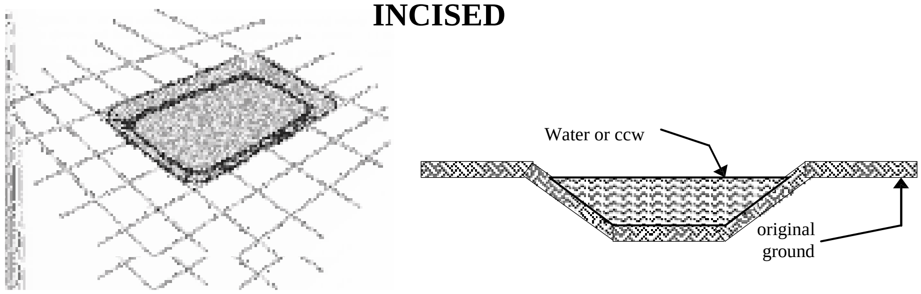


SIDE-HILL

DIKED



INCISED



______Cross-Valley
______Side-Hill
__X__Diked (Construction within former ash management area)
______Incised (form completion optional)
______Combination Incised/Diked

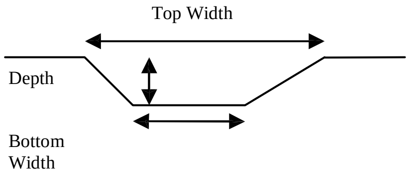
Embankment Height ____867____feet Embankment Material____Ash_________
Pool Area ________0.13________ acres Liner None__________________________
Current Freeboard _4__________ feet Liner Permeability _N/A______________

TYPE OF OUTLET (Mark all that apply)

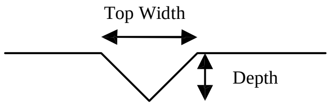
______Open Channel Spillway
____Trapezoidal
_______Triangular
_______Rectangular
_______Irregular

_______depth
_______bottom (or average) width
______top width

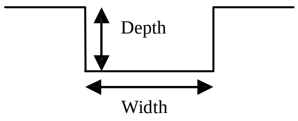
TRAPEZOIDAL



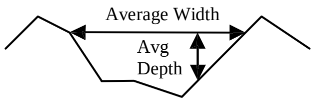
TRIANGULAR



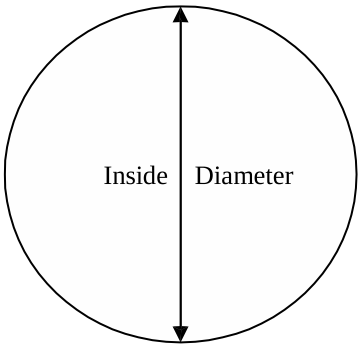
RECTANGULAR



IRREGULAR



______Outlet



Material
___X___corrugated metal
_______welded steel
_______concrete
_______plastic (hdpe, pvc, etc.)
_______other (specify)

Is water flowing through the outlet? YES ________ NO ___X*___
* Pond water elevation below outlet pipe

______No Outlet

______Other Type of Outlet (specify) ____________________________________

The Impoundment was Designed By N/A ______________________________________

____

Has there ever been a failure at this site? YES ___________NO ___X_______

If So When? ____________________________

If So Please Describe: ____

Has there ever been significant seepages at this site? YES ________NO ___X___

If So When? ______________________________

IF So Please Describe: ____

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES ________NO ___X____

If so, which method (e.g., piezometers, gw pumping,...)? ______________________

If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental
Protection Agency

Site Name: Sutherland
Date: 6/14/2011
Unit Name: Main Ash Pond *
Operator's Name: Alliant Energy (IPL)
Unit I.D.:
Hazard Potential Classification: High Significant [✓ Low]
Inspector's Name: Don Dotson/James Black, PE

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

*** Includes Secondary, Polishing and Discharge Pond.**

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	See Comment		18. Sloughing or bulging on slopes?	See Comment	
2. Pool elevation (operator records)?	852.6		19. Major erosion or slope deterioration?	See Comment	
3. Decant inlet elevation (operator records)?	859.6				
4. Open channel spillway elevation (operator records)?	N/A		Is water entering inlet, but not exiting outlet?		X
5. Lowest dam crest elevation (operator records)?	865		Is water exiting outlet, but not entering inlet?		X
6. If instrumentation is present, are readings recorded (operator records)?	N/A		Is water exiting outlet flowing clear?	X	
7. Is the embankment currently under construction?		X	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation, stumps, topsoil in area where embankment fill will be placed)?	N/A		From underdrain?		X
9. Trees growing on embankment? (If so, indicate largest diameter below)		X	At isolated points on embankment slopes?		X
10. Cracks or scarps on crest?		X	At natural hillside in the embankment area?		X
11. Is there significant settlement along the crest?		X	Over widespread areas?		X
12. Are decant trash racks clear and in place?	N/A		From downstream foundation area?		X
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		X	"Boils" beneath stream or ponded water?		X
14. Clogged spillways, groin or diversion ditches?		X	Around the outside of the decant pipe?		X
15. Are spillway or ditch linings deteriorated?		X	22. Surface movements in valley bottom or on hillside?		X
16. Are outlets of decant or underdrains blocked?	See Comment		23. Water against downstream toe?	X	X
17. Cracks or scarps on slopes?	see Comment		24. Were Photos taken during the dam inspection?	X	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1. Bi-annual documented inspection of pond system by on-site Environmental and Safety Specialist; plant personnel perform daily inspection - not documented.

2. Secondary pond pool elevation (highest) listed.

3. Pipe in discharge pond listed.

9, 17 & 18. Vegetation too tall to inspect embankment closely.

23. Locations on East Dike of Secondary Pond.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # 64-69-1-03 INSPECTOR Dotson/Black

Date 06/14/2011

Impoundment Name Main ash pond (Secondary, Polishing & Discharge Ponds)

Impoundment Company Interstate Power & Light - Sutherland Generating Station

EPA Region VII

State Agency (Field Office) Address ____________________

Name of Impoundment ____________________

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New X Update ______

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Secondary & Tertiary Settling of CCW, surface runoff and other plant waste streams.

Nearest Downstream Town : Name La Grand

Distance from the impoundment 5 miles

Impoundment

Location: Longitude -92 Degrees 51 Minutes 18.13 Seconds

Latitude 42 Degrees 02 Minutes 50.83 Seconds

State IA County Marshall

Does a state agency regulate this impoundment? YES ______ NO X

If So Which State Agency? N/A

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

______**LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

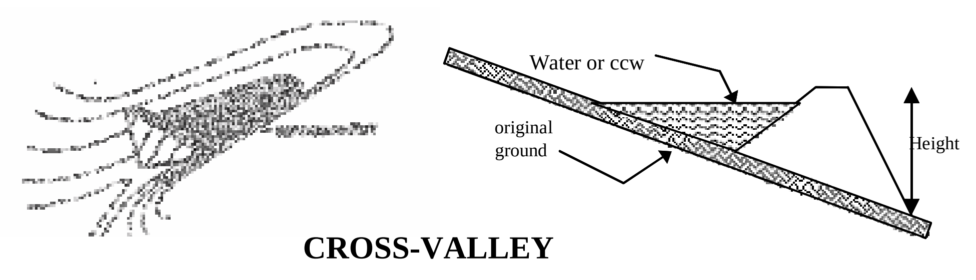
__X__**LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

______**SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

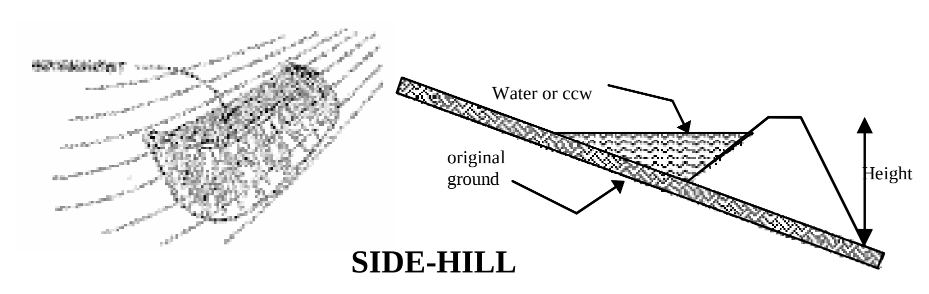
______**HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:
Release would stay within plant (IPL) property. (No adjacent major river or stream, operation water obtained from wells.)

CONFIGURATION:

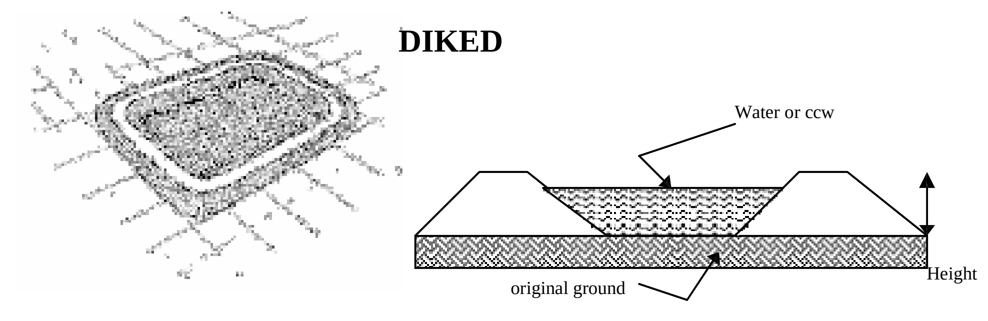


CROSS-VALLEY

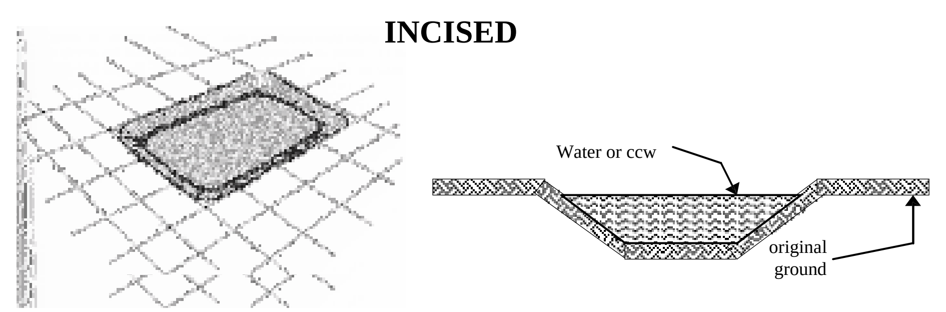


SIDE-HILL

DIKED



INCISED



______Cross-Valley
______Side-Hill
__X__Diked (Construction within former ash management area)
______Incised (form completion optional)
______Combination Incised/Diked

Embankment Height ___7___feet
Embankment Material___Clay___
Pool Area ___6.18 acres___ acres
Liner None
Current Freeboard ___3.4___ feet
Liner Permeability ___N/A___

TYPE OF OUTLET (Mark all that apply)

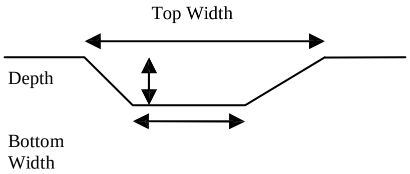
______Open Channel Spillway
__X__Trapezoidal
______Triangular
______Rectangular
______Irregular

Partial Flume from Secondary and Polishing Pond

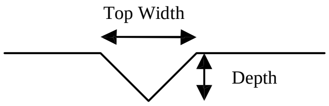
______depth
______bottom (or average) width
______top width

__X__ Drop inlet pipe from Discharge pond

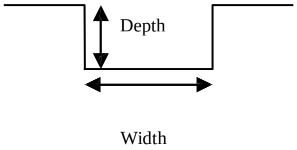
TRAPEZOIDAL



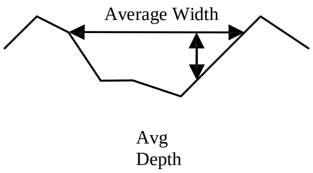
TRIANGULAR



RECTANGULAR

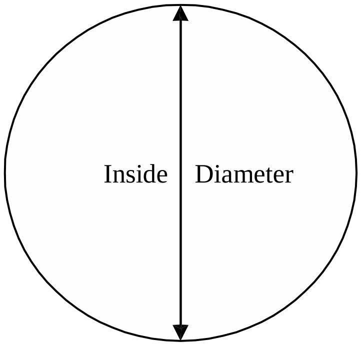


IRREGULAR



______Outlet

24"___ inside diameter



Material
______corrugated metal
______welded steel
__X__concrete* * w/metal cap
______plastic (hdpe, pvc, etc.)
______other (specify)

Is water flowing through the outlet? YES __X__ NO ______

______No Outlet

______Other Type of Outlet (specify) ____________________

The Impoundment was Designed By Hard Hat Services, Inc.____________

____

Has there ever been a failure at this site? YES ____________NO ___X________

If So When? ______________________________

If So Please Describe: ____

Has there ever been significant seepages at this site? YES ________NO ___X___

If So When? ______________________________

IF So Please Describe: ____

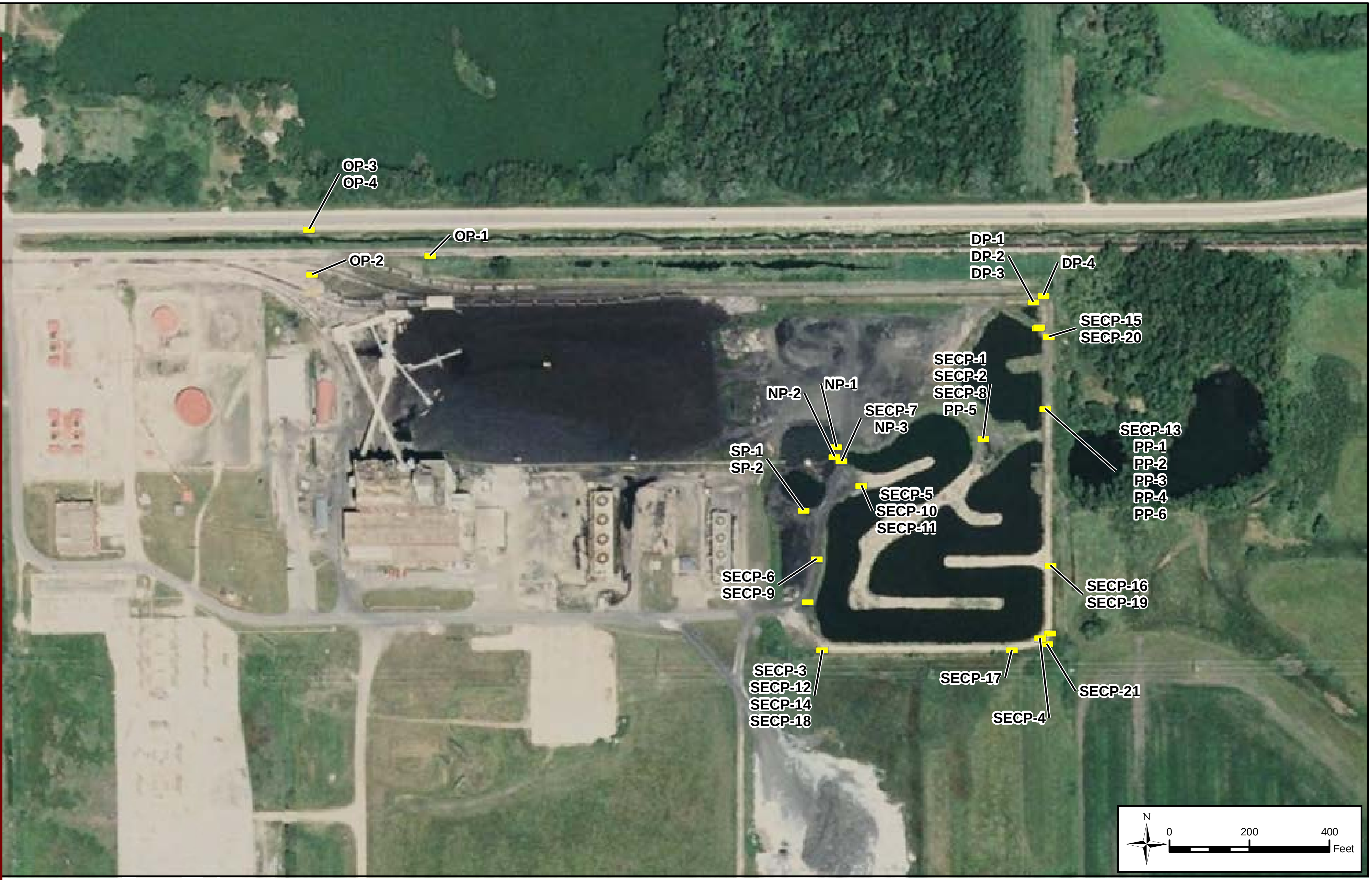
Has there ever been any measures undertaken to monitor/lower
Phreatic water table levels based on past seepages or breaches
at this site? YES ________NO __X____

If so, which method (e.g., piezometers, gw pumping,...)? ____________________

If so Please Describe :

APPENDIX B

SITE PHOTO LOG MAP AND SITE PHOTOS



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DWN BY: DJC

CKD BY: MS

Datum: NAD 83

Projection: UTM 15

Scale: As Shown

ASSESSMENT OF DAM SAFETY OF
COAL COMBUSTION SURFACE IMPOUNDMENTS

INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION,
MARSHALLTOWN, IA
SITE MAP

REV. No.: A

Date: 7-14-11

Project No: 3-2106-0191

Figure No: B-1

NP-1
LOOKING WEST AT CCW AND OTHER
WASTESTREAM INLET PIPES FROM PLANT

NP-2
LOOKING NORTH AT INLET OF OUTLET PIPE

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ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
NORTH POND SITE PHOTOS

DWN BY: CAE
DATUM:
DATE: 7/13/11
CHK'D BY: JHB
REV. NO.:
PROJECT NO: 3-2106-0191
PROJECTION:
SCALE:
PAGE NO.: B-2

NP-3
LOOKING EAST AND DOWN AT OUTLET OF PIPE
FROM NORTH POND TO SECONDARY POND

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DWN BY: CAE
DATUM:
DATE: 7/13/11

TITLE
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SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
NORTH POND SITE PHOTOS

CHK'D BY: JHB
REV. NO.:
PROJECT NO: 3-2106-0191
PROJECTION:
SCALE:
PAGE NO.: B-3

SP-1
LOOKING NORTH AT CCW INLET PIPE TO SOUTH POND.
NORTH POND ABOVE AND TO THE RIGHT

SP-2
FROM SOUTH CREST LOOKING EAST AT
INLET OF OUTLET PIPE FROM SOUTH POND

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SOUTH POND SITE PHOTOS

DWN BY: CAE
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REV. NO.:
PROJECT NO: 3-2106-0191
PROJECTION:
SCALE:
PAGE NO.. B-4

SECP-1
LOOKING WEST AT START OF SECONDARY POND. STEEP/BARE SLOPES ON NORTH INTERIOR EMBANKMENT. NOTE GRADE (TRUCK) TO NORTH

SECP-2
LOOKING SOUTHWEST AT INTERIOR OF SECONDARY POND. STEEP AND BARE SLOPE AREA AT SOUTH POND INLET IN BACKGROUND

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TITLE INTERSTATE POWER AND LIGHT COMPANY SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA SECONDARY POND SITE PHOTOS	CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
	PROJECTION:	SCALE:	PAGE NO.. B-5

SECP-3
LOOKING NORTH AT INTERIOR AND WEST DIKE US SLOPES OF SECONDARY POND, STEEP/BARE AREA AT INLET FROM SOUTH POND (TOP LEFT)

SECP-4
LOOKING WEST AT US SLOPES OF SOUTH DIKE OF SECONDARY POND. TALL VEGETATION, SLOUGHS OBSERVED ON US SLOPE

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SECONDARY POND SITE PHOTOS

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SECP-5
LOOKING SOUTH AT INTERIOR AND WEST EMBANKMENT OF SECONDARY POND

SECP-6
LOOKING NORTHEAST AT WEST UPPER SECTION OF SECONDARY POND. ROCK AT TOE OF INTERIOR SLOPES

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DATUM:
DATE: 7/13/11

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SECONDARY POND SITE PHOTOS

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REV. NO.:
PROJECT NO: 3-2106-0191
PROJECTION:
SCALE:
PAGE NO.. B-7

SECP-7
LOOKING NORTHEAST AT INTERIOR OF START OF SECONDARY POND. STEEP SLOPES AND TALL GRASSES ON NORTH BANK

SECP-8
LOOKING SOUTHEAST AT INTERIOR OF SECONDARY POND

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TITLE INTERSTATE POWER AND LIGHT COMPANY SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA SECONDARY POND SITE PHOTOS	CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
	PROJECTION:	SCALE:	PAGE NO.. B-8

SECP-9
LOOKING EAST AT SOUTH INTERIOR OF SECONDARY POND.
INTERIOR FINGERS COMPLETED IN 2006 IN BACKGROUND

SECP-10
LOOKING EAST-SOUTHEAST AT INTERIOR OF SECONDARY POND.
WEST (START) IN FOREGROUND, EAST (END) IN BACKGROUND

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TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SECONDARY POND SITE PHOTOS

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PAGE NO.. B-9

SECP-11
FROM START OF FINGER ACROSS FROM SOUTH POND
LOOKING EAST AT INTERIOR OF POND

SECP-12
LOOKING NORTH AT US SLOPES OF WEST DIKE OF SECONDARY POND,
TALL VEGETATION, STEEP/BARE AREA AT INLET FROM SOUTH POND

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TITLE INTERSTATE POWER AND LIGHT COMPANY SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA SECONDARY POND SITE PHOTOS		CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
		PROJECTION:	SCALE:	PAGE NO.. B-10

SECP-13
LOOKING SOUTH AT US SLOPES OF EAST DIKE, INTERIOR, AND OVERFLOW DIKE BETWEEN SECONDARY AND POLISHING PONDS, TALL VEGETATION

SECP-14
LOOKING EAST AT US SLOPES OF SECONDARY POND, TALL VEGETATION AND ISOLATED ERODED AREAS

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SECP-15
LOOKING SOUTH AT EAST DIKE CREST AND DOWNSTREAM EMBANKMENT

SECP-16
LOOKING SOUTH AT CREST AND DS SLOPE OF EAST DIKE OF SECONDARY POND, WATER AT TOE OF DOWNSTREAM SLOPE

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SECP-17
LOOKING WEST AT DS SLOPES AND CREST OF SOUTH DIKE OF SECONDARY POND, TALL VEGETATION

SECP-18
LOOKING EAST AT CREST OF SOUTH DIKE OF SECONDARY POND, TALL VEGETATION ON US AND DS SLOPES

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TITLE
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SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SECONDARY POND SITE PHOTOS

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SECP-19
LOOKING SOUTHEAST FROM SECONDARY POND,
WATER AT AND BEYOND TOE OF DS SLOPE

SECP-20
LOOKING SOUTHEAST AT POND TO EAST OF EAST DIKE

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SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
SECONDARY POND SITE PHOTOS

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SECP-21
LOOKING NORTH AT CREST AND SLOPES OF SECONDARY AND POLISHING PONDS, TALL VEGETATION ON SLOPES

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PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 7/13/11
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PP-1
LOOKING SOUTHWEST AT INTERIOR AND WEST DIKE OF POLISHING POND.
STEEP SLOPES, SLOUGH AREAS, AND TALL VEGETATION

PP-2
LOOKING NORTHWEST ACROSS POLISHING POND,
STEEP SLOPES, TALL AND SOME BRUSHY VEGETATION

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PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
POLISHING POND SITE PHOTOS

DWN BY: CAE
CHK'D BY: JHB
PROJECTION:
DATUM:
REV. NO.:
SCALE:
DATE: 7/13/11
PROJECT NO: 3-2106-0191
PAGE NO.: B-16

PP-3
LOOKING NORTHWEST ACROSS POLISHING POND, STEEP/BARE INTERIOR SLOPES, RECENT REPAIR (RIP-RAP) ON EAST DIKE

PP-4
LOOKING NORTH AT CREST AND US SLOPE OF EAST DIKE OF POLISHING POND, RECENT REPAIR (RIP-RAP) ON EAST DIKE

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TITLE
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SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
POLISHING POND SITE PHOTOS

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PP-5
LOOKING NORTHEAST AT TOP END OF POLISHING POND.
BRUSHY VEGETATION ON INTERIOR SLOPES

PP-6
LOOKING SOUTHWEST AT WEIR AND OVERFLOW AREA
BETWEEN SECONDARY AND POLISHING POND

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POLISHING POND SITE PHOTOS

DWN BY: CAE	DATUM:	DATE: 7/13/11
CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
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DP-1
DISCHARGE POND OUTLET STRUCTURE AND EMERGENCY OVERFLOW INLET

DP-2
LOOKING SOUTH AT DISCHARGE POND PARTIAL FLUME INLET WITH SOLAR POWERED FLOW METER

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ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

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INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
DISCHARGE POND SITE PHOTOS

DWN BY: CAE	DATUM:	DATE: 7/13/11
CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
PROJECTION:	SCALE:	PAGE NO.: B-19

DP-3
DISCHARGE POND OUTLET STRUCTURE

DP-4
BUBBLER POOL/OUTLET DITCH

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO

CLIENT
UNITED STATES
ENVIRONMENTAL
PROTECTION AGENCY

PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

DWN BY: CAE
DATUM:
DATE: 7/13/11

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
DISCHARGE POND SITE PHOTOS

CHK'D BY: JHB
REV. NO.:
PROJECT NO: 3-2106-0191
PROJECTION:
SCALE:
PAGE NO.. B-20

OP-1
TREE MARKS LOCATION OF INLET OF OUTLET DITCH PIPE FROM PROPERTY

OP-2
SURFACE DRAINAGE CATCH BASIN AND MANHOLE FOR POND OUTLET DITCH ON WEST SIDE OF PLANT PROPERTY

AMEC Earth & Environmental
690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

CLIENT LOGO

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UNITED STATES
ENVIRONMENTAL
PROTECTION AGENCY

PROJECT ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS	DWN BY: CAE	DATUM:	DATE: 7/13/11
TITLE INTERSTATE POWER AND LIGHT COMPANY SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA OUTLET PIPE/DITCH SITE PHOTOS	CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
	PROJECTION:	SCALE:	PAGE NO.. B-21

OP-3

LOOKING SOUTH AT OUTLET PIPE TO ROADSIDE DITCH, CORRODED CMP PIPE

OP-4

LOOKING EAST AND DOWNSTREAM OF ROADSIDE DITCH

AMEC Earth & Environmental

690 Commonwealth Center
11003 Bluegrass Parkway
Louisville, Ky 40299
(502) 267-0700

amec

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CLIENT
UNITED STATES
ENVIRONMENTAL
PROTECTION AGENCY

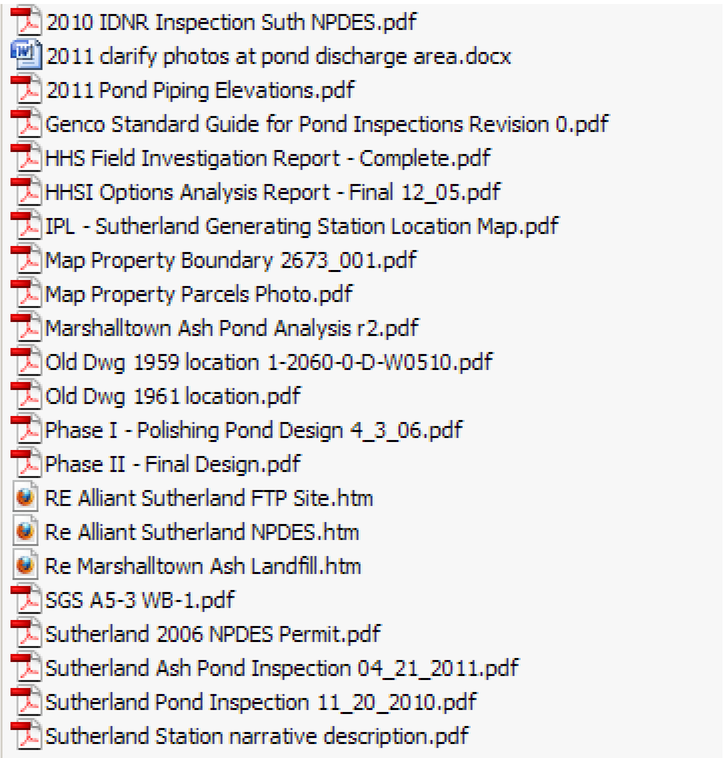
PROJECT
ASSESSMENT OF DAM SAFETY OF COAL COMBUSTION SURFACE IMPOUNDMENTS

DWN BY: CAE	DATUM:	DATE: 7/13/11
CHK'D BY: JHB	REV. NO.:	PROJECT NO: 3-2106-0191
PROJECTION:	SCALE:	PAGE NO.. B-22

TITLE
INTERSTATE POWER AND LIGHT COMPANY
SUTHERLAND GENERATING STATION, MARSHALLTOWN, IA
OUTLET PIPE/DITCH SITE PHOTOS

APPENDIX C

INVENTORY OF PROVIDED MATERIALS



2010 IDNR Inspection Suth NPDES.pdf
2011 clarify photos at pond discharge area.docx
2011 Pond Piping Elevations.pdf
Genco Standard Guide for Pond Inspections Revision 0.pdf
HHS Field Investigation Report - Complete.pdf
HHSI Options Analysis Report - Final 12_05.pdf
IPL - Sutherland Generating Station Location Map.pdf
Map Property Boundary 2673_001.pdf
Map Property Parcels Photo.pdf
Marshalltown Ash Pond Analysis r2.pdf
Old Dwg 1959 location 1-2060-0-D-W0510.pdf
Old Dwg 1961 location.pdf
Phase I - Polishing Pond Design 4_3_06.pdf
Phase II - Final Design.pdf
RE Alliant Sutherland FTP Site.htm
Re Alliant Sutherland NPDES.htm
Re Marshalltown Ash Landfill.htm
SGS A5-3 WB-1.pdf
Sutherland 2006 NPDES Permit.pdf
Sutherland Ash Pond Inspection 04_21_2011.pdf
Sutherland Pond Inspection 11_20_2010.pdf
Sutherland Station narrative description.pdf

APPENDIX D

SLOPE STABILITY AND HYDRAULIC ANALYSIS

aether dbs
elemental design build solutions

CONFIDENTIAL BUSINESS INFORMATION

June 17, 2011

Mr. William Skalitzky
Alliant Energy
4902 N. Biltmore Lane
Madison, WI 53718

154.006.005

Re: Ash Pond Slope Stability and Hydraulic Analysis
Sutherland Generating Station – Marshalltown, IA

Mr. Skalitzky;

Aether dbs, reports our findings from the Ash Pond Slope Stability and Hydraulic Analysis performed for the Sutherland Generating Station. The purpose of the study is evaluation of the stability of the bottom ash settling ponds under 100-year storm flow and for both seismic and rapid drawdown induced loadings. The analysis is based on existing data on the generating station subsurface conditions, ash pond dike conditions, and surface drainage arrangements. The data pertinent to the evaluation is provided in the attachments.

The ash ponds are capable of routing a SCS Type II, 24-hour, 100 year storm without overtopping. The outer dikes of the ash pond have a factor of safety greater than the standard acceptable factor of safety of 1.5 for static stability and 1.0 for earthquake stability. The exterior dikes are constructed of clay and there is no rapid drawdown stability issue.

Background

The Sutherland Generating Station is a fossil-fueled electric generating plant consisting of three steam electric generators, three combustion turbine units, and two diesel oil generators. Coal is the primary fuel and each unit has the capability to use natural gas as a secondary fuel. The power plant's three units have a total rated capacity of 146 megawatts. The generating station including the coal stockpile and ash management facility are shown on Figure 1.

Bottom ash and fly ash from the coal fired boilers are sluiced to settling ponds east of the power plant at a flow rate of 700 gallons per minute. In addition, smaller quantities of cooling tower blow down, air compressor cooling water, and boiler blow down flow to the ash ponds. Bottom ash and fly ash settle in the ponds and are removed for beneficial reuse or disposal. The water from the ponds discharges through a 24-inch diameter circular overflow weir in the Northeast corner of the ash management area.

During storm events the pond also receives storm water runoff from the generating station and the coal storage pile.

In 2006, the secondary ash settling pond was reconfigured with the addition of a polishing pond at the Northeast corner and internal dikes were added within the main pond to lengthen the travel path and facilitate fly ash removal, Attachment A. The primary settling ponds are used to settle and remove ash on a regular basis. The secondary pond is used to settle the finer ash with less frequent removals. Discharge is through an NPDES permitted outfall.

Drainage

The coal pile has underground drain tiles which direct infiltration to the ash settling ponds. Storm water runoff from the powerhouse and the surrounding area is also directed to the ash ponds. For assessment of the storm water inflow to the ash pond, the plant area, the ash management area and the coal pile storm water is routed to the ash ponds. The storage lag that occurs in the coal pile underdrain system is not modeled and some areas of the plant that may not discharge directly to the ash ponds are included in the inflow to the ponds. The total area contributing to the ponds is 57 acres, Figure 1.

Hydrology and Hydraulics

The secondary ash settling pond overflows at elevation 862.4 feet. The polishing pond overflows at elevation 861.6 feet. The two ponds are separated by a lower elevation dike with a static mixing channel, Attachment A. During an extreme hydrological event, the small dike separating the secondary ash settling pond from the polishing pond will overtop and the two ponds will work together as a single pond with an approximate surface area of 6 acres.

After the polishing pond, water discharges through a flow monitoring flume to a small discharge pond with a circular overflow weir at elevation 860.4 feet. During a severe storm the water may overtop the internal weir of the small discharge pond to reach the overflow weir.

A 100-year, SCS Type 2, 24-hour storm for Marshall County, Iowa is 6.6 inches of precipitation[1]. A runoff Curve Number of 89 was used in the storm hydrograph calculation. The curve number is based on weighting the relative percentages of ash, coal, grass, and industrial uses at the generating station. A hydraulic length of 1920 feet was used for the longest flow path to the ponds, Attachment B.

Hydraflow by Intelisolve[2] was used to generate and route the storm hydrograph through the secondary settling pond, the polishing pond and finally the small discharge pond. The starting pond elevation was specified as the normal water elevation of 862.4 feet in the secondary ash pond and 861.6 feet in the polishing pond. The reservoir routing model predicts a maximum rise to water elevation 864.4 feet during the storm leaving a freeboard of slightly more than 6-inches, Attachment B. The discharge pond reaches a storm elevation of 862.5 feet which is 1.5 feet below the outer dike height of 864 feet.

---

[1] United States Department of Commerce, Rainfall Frequency Analysis of the United States,

[2] Intelisolve. Pond Routing Software Hydraflow, 2002

Sutherland Generating Station Personnel[3] report that the site received four inches of rainfall on November 4, 2003 and the water level in the secondary ash pond rose only 6 to 7 inches above the normal operating elevation. The historical event indicates that the analysis is conservative.

Ash Pond Dike Stability

Surface soil in the ash management area is Zook Clay (low plasticity clay with 5-7% organic content) USCS Marshall County Soil Survey[4]. During an investigation of the ash pond dikes in 2006 by Hard Hat Services the dikes were found to be constructed of the Zook Clay, Attachment A. Field characterizations of the clay unconfined compressive strength made with a pocket penetrometer are shown on the five boring logs from the outer dike of the ash pond. The cohesive strength of the clay (unconfined compressive strength divided by 2) is charted versus depth in Attachment C. All five borings produced similar strength results showing a strong crust (very stiff to hard clay above a depth of 4 feet) with stiff to firm clay underneath.

Two dimensional limit equilibrium slope stability analyses were performed on a conservative idealized cross-section that corresponds best with the outer dike along the southern edge of the active fly ash management area, Figure 1. The southern dike is a little narrower than the eastern outer dike and presumed higher, because the natural topography slopes slightly to the south, Attachment D. Two to one side slopes were specified for the reconstruction of the inside of the secondary ash pond and the available topographic information indicates that the outside dike slopes were also built at a two horizontal to one vertical slope.

The specified height of the dike in the idealized cross-section is 13 feet based on the maximum depth to native soils reported in the 2006 field investigation. The crest of the dike is at 865 feet and the toe is at 852 feet for a 13 foot height. The bottom of the ash pond adjacent to the southernmost dike is within the range of 851 feet to 855 feet. The 13 foot top width of the idealized dike is the narrowest width measured on the Settling Pond Reconfiguration Drawing, Attachment A.

The slope stability analysis assumes that the clay cohesion in the dike is the lowest strength measured above a depth of 14 feet, 1,250 pounds per square foot (psf), and the cohesion below the dike is the lowest strength measured below a depth of 13 feet, 1,000 psf, Attachment C.

Fine to medium sand with silt is present below the clay in the five nearest deep borings at elevations ranging from 848 feet to 852 feet, Attachment E and F. The search for failure surfaces in the Zook Clay was limited to a depth of 9 feet below the toe of the dike to avoid the stronger sand below that depth. The sand is relatively dense and will not liquefy in a low intensity earthquake.

---

[3] Correspondence with Mr. George Kueny of Sutherland Generating Station sent February 13, 2006.
[4] Soil Survey, Marshall County, Iowa, United States Soil Conservation Service

The depth to rock is over 250 feet as shown by the Well Record for Well Number 6A, Attachment G. Well Number 6A is located on Figure 1.

Program STABL5M (1996) from Purdue University[5] was used to analyze hundreds of potential slip surfaces for each loading case. The program calculates a factor of safety based on the ratio of the driving forces to the resisting forces along each potential slip surface. A calculated factor of safety greater than one indicates stability along the surface analyzed. Because the dike foundation soils are considered weaker than the dike, the most critical surface mode is a sliding block failure as shown in Attachment H.

Only two loading cases / failure scenarios were analyzed because in the case of a clay dike, the rapid drawdown case on the inside of the pond is essentially the same as the stability of the outside of the dike. (Clay soils cannot drain quickly; hence short term seepage forces are not a concern.)

1.) Ash pond water elevation at the normal elevation (862.6 feet) with a steady state seepage face emerging above the toe of the slope. Because a cohesion only strength is considered using undrained clay strength, the location of the seepage face does not influence the Factor of Safety calculation. However, water pressure on the inside of the dike can contribute to instability and it was included in the model.

2.) The small ponds at Sutherland Station do not pose a significant risk and contain minimum volumes of coal combustion residue. The procedures of FEMA[6] suggest that the structures rate as low risk dams. For low risk structures, a probability of 10% in 50 years (return period of 475 years) is an acceptable standard. Consequently, a pseudo-static earthquake analysis was completed using the effective peak ground acceleration for a 475 year return period[7]. With dense soil under the site, a Site Class "D" was selected for soil amplification giving a probable maximum horizontal earthquake acceleration of 0.019g for the ash ponds. The vertical earthquake force is specified as $^{2}/_{3}$ of the horizontal earthquake force[8].

The ten most critical potential failure surfaces for each loading case are shown in Attachment H. The lowest Factor of Safety for each case is:

---

[5] STABL User Manual, By Ronald A. Siegel, Purdue University, June 4, 1975 and STABL5 …The SPENCER Method of Slices: Final Report, By J.R.Carpenter, Purdue University, August 28, 1985

[6] Federal Emergency Management Agency, "Federal Guidelines for Dam Safety", May 2005

[7] U.S. Army Engineer Research and Development Center, Vicksburg, MS., "DEQAS-R: Standard response spectra and effective peak ground accelerations for seismic design and evaluation" Yule, D. E. Kala, R., and Matheu, E. E. (2005),

[8] N.M.Newmark and W.J.Hall, "Procedures and Criteria for Earthquake Resistant Design", Building Science Series No. 46, National Bureau of Standards, U.S. Dept. of Commerce, Washington, D.C., 1973

Dike Stability Loading Case	Minimum Factor of Safety
Static Conditions with Seepage Face	**3.4**
Earthquake with Seepage Face	**3.2**
Rapid Draw Down	**NA**

Conclusion

The secondary ash pond working in conjunction with the polishing pond can pass a 100-year 24-hour storm without overtopping.

The stability of the outer dike on the ponds is greater than the acceptable Factor of Safety standard of 1.5 for static conditions[9]. The outer dike also shows a Factor of Safety greater than the normally acceptable standard for Earthquake conditions (factor of safety greater than 1.0).

Respectfully Submitted,

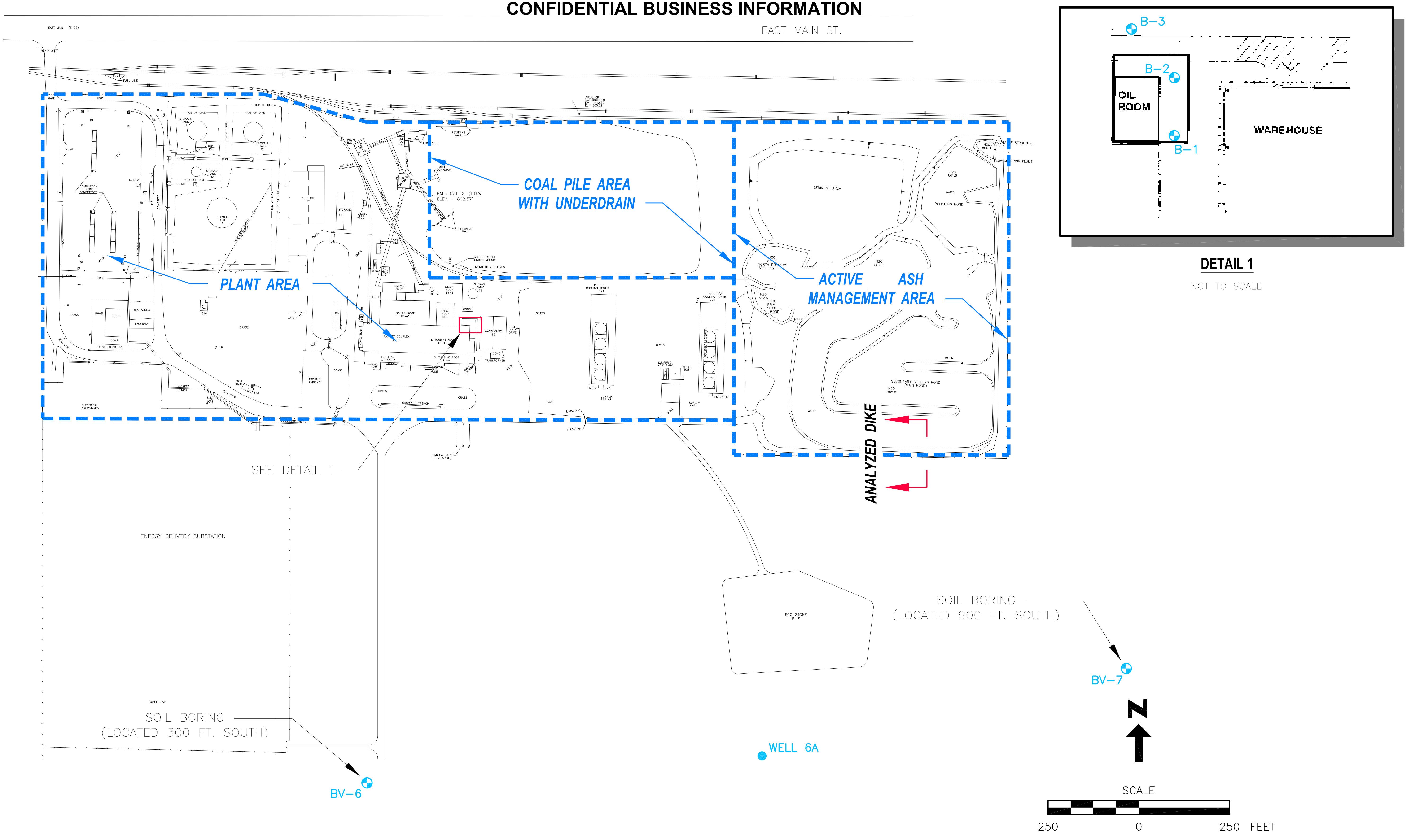
Thomas C. Wells, P.E.

Timothy J. Harrington, P.E.

---

[9] USACE,"Engineering Design Slope Stability, EM 1110-2-1902", Table 3-1

CONFIDENTIAL BUSINESS INFORMATION



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REV	DATE	BY	DESCRIPTION
5			
4			
3			
2			
1			

aetherdbs
www.aetherdbs.com

SCALE: AS SHOWN
DATE: 12-29-2010
DRAWN BY: MM
CHKD. BY: TCW
APPROVED: 12-29-2010

CLIENT / LOCATION
ALLIANT ENERGY
SUTHERLAND GENERATING STATION
MARSHALLTOWN, IOWA

DRAWING DESCRIPTION
SITE PLAN

JOB 154
SHT. 1
DWG. SITE PLAN

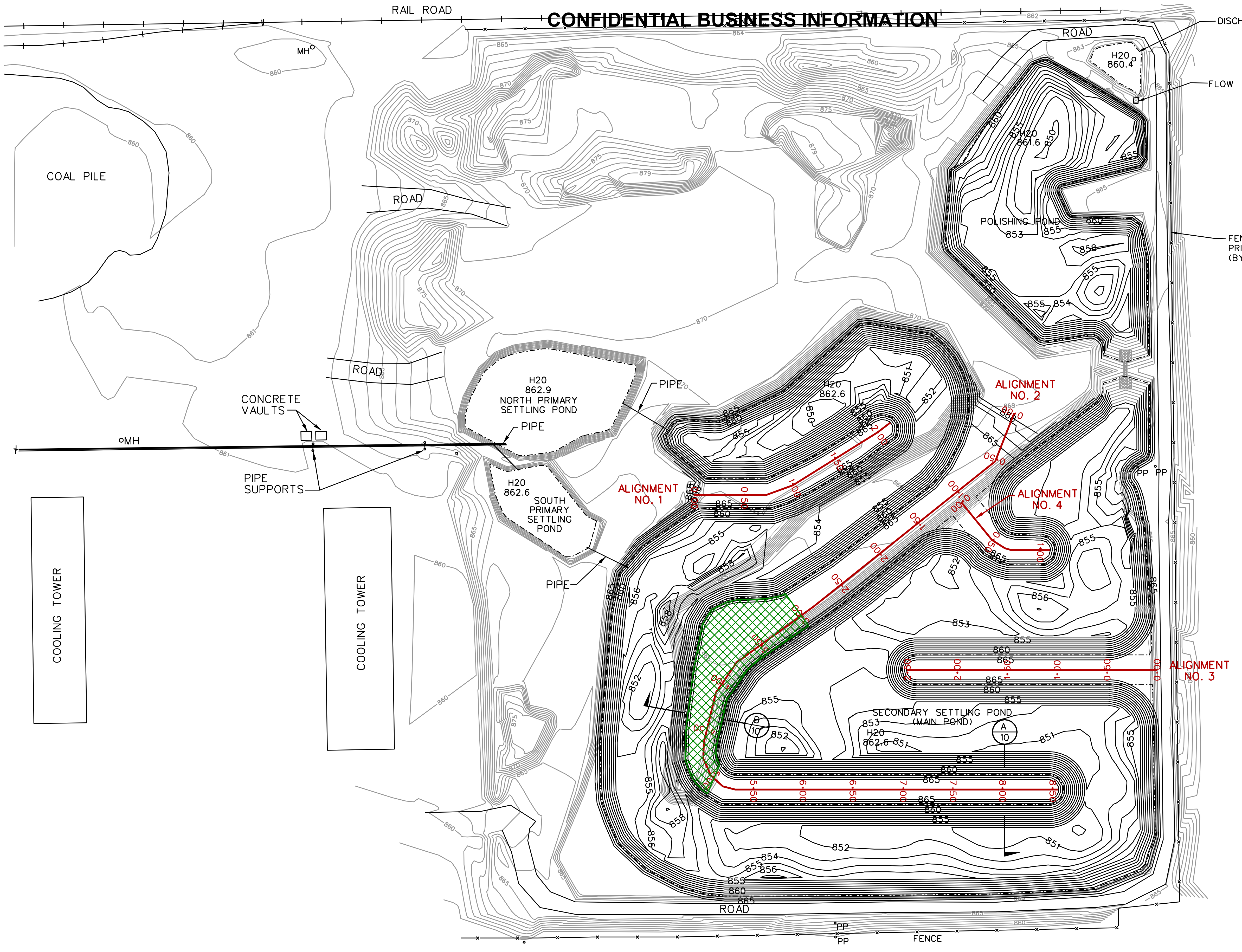
CONFIDENTIAL BUSINESS INFORMATION

Attachment A

Field Investigation Report
Sutherland Generating Station
Bottom Ash Settling Pond

Source:
Hard Hat Services, March 31, 2006

CONFIDENTIAL BUSINESS INFORMATION



N

LEGEND:

MH○	MANHOLE
PP○	POWER POLE
— 860 —	CONTOUR FROM GROUND SURVEY (NOV, 2005)
-·-·-	WATER LINE
— 855 —	POND RECONFIGURATION AND POST DREDGING CONTOURS
▨	EXISTING BERM TO BE STABILIZED (APPROX. 10,000 SQ FT) (SEE DETAIL B ON SHEET 10)
0+00	ALIGNMENT

NOTE:

1. QUANTITIES OF MATERIALS ARE LOCATED ON SHEET 12.

DRAWING NUMBER: 1-2060-0-D-C5001-003

REV	DATE	BY	DESCRIPTION

SCALE: 0 50 100
SCALE IN FEET
DESIGNED: M. Loerop
DRAWN: HHSI
CHECKED: T. Blair

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

940 E. Diehl Rd, Suite 150
Naperville, IL 60563
(630) 637-9470

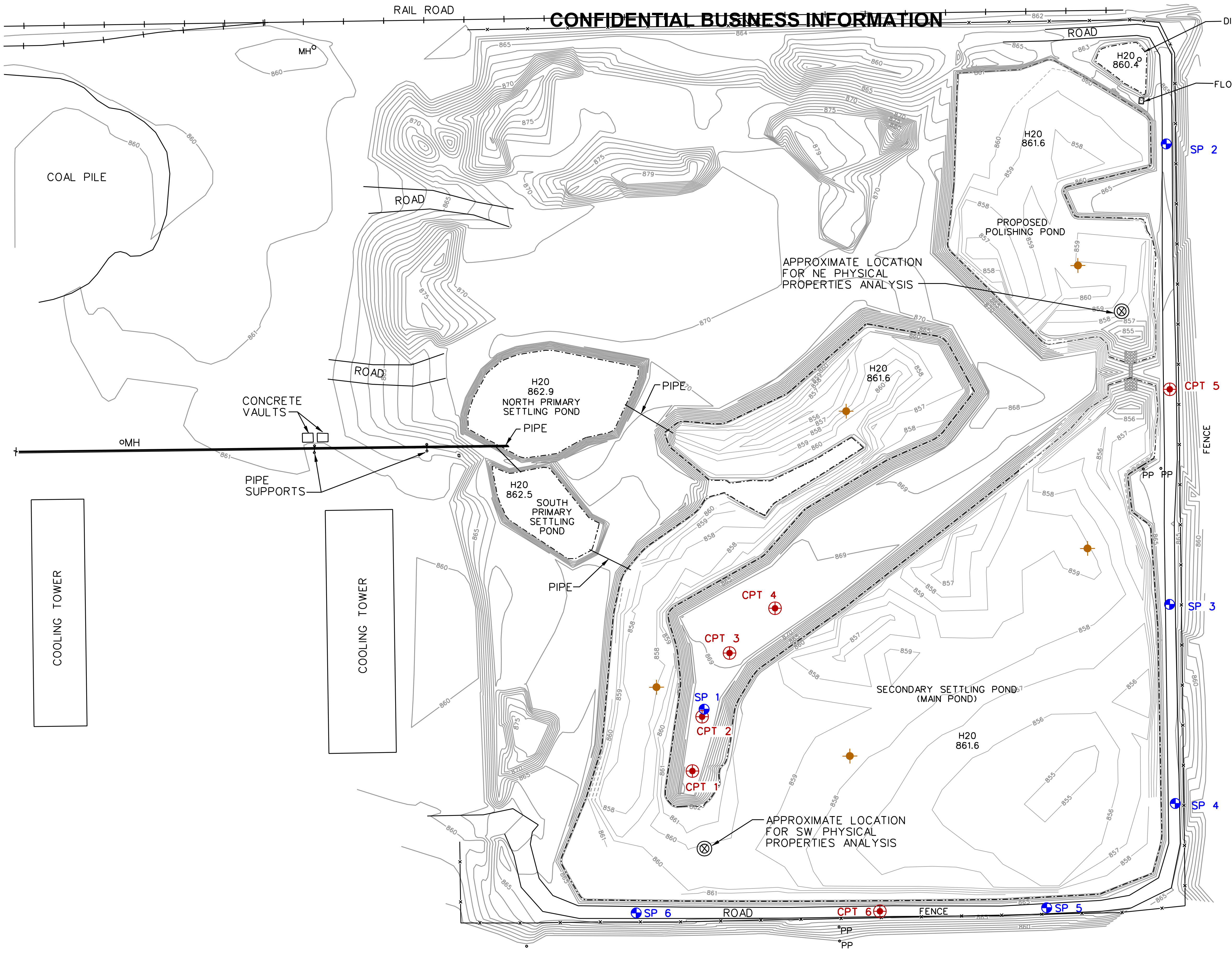
CLIENT:
INTERSTATE POWER & LIGHT
SUTHERLAND GENERATING STATION

TITLE:
PHASE 2
SETTLING POND RECONFIGURATION

SHEET
3

...\reconfiguration.dgn
4/19/2006

CONFIDENTIAL BUSINESS INFORMATION



LEGEND:

⊕	SOIL PROBE LOCATION
⊕	CONE PENETRATION TEST LOCATION
✦	COMPOSITE SAMPLE LOCATION
MH∘	MANHOLE
PP∘	POWER POLE
— 860 —	CONTOUR FROM GROUND SURVEY (NOV, 2005)
-·-·-·-	WATER LINE

NOTES:

1. CONE PREPARATION TESTS WERE CONDUCTED TO A DEPTH OF 15' OR UNTIL REFUSAL.
2. SOIL PROBES WERE COMPLETED WITH A SPLIT SPOON SAMPLER TO A DEPTH OF 15' OR UNTIL REFUSAL.
3. SAMPLING ACTIVITIES WERE CONDUCTED ON 3-14-06.
4. ALL FIVE COMPOSITE SAMPLE LOCATIONS WERE PLACED IN A FIVE GALLON BUCKET. IT WAS MIXED FOR 15 MINUTES, SAMPLED, AND SENT TO THE LABORATORY FOR TOTAL METALS AND SFLP ANALYSIS.

DRAWING NUMBER:

$FILEABBREVS

$DATES

REV	DATE	BY	DESCRIPTION

SCALE:
0 50 100
SCALE IN FEET

DESIGNED: M. Loerop
DRAWN: HHSI
CHECKED: T. Blair

HARD HAT SERVICES™
Engineering, Construction and Management Solutions

940 E. Diehl Rd, Suite 150
Naperville, IL 60563
(630) 637-9470

CLIENT: INTERSTATE POWER & LIGHT
SUTHERLAND GENERATING STATION

TITLE: GEOTECHNICAL AND SEDIMENT SAMPLE TEST LOCATIONS

FIGURE
1

CONFIDENTIAL BUSINESS INFORMATION

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Hard Hat

PROJECT: Alliant Energy

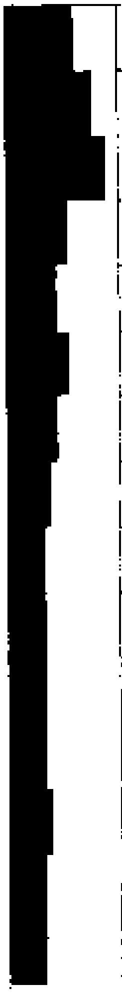
COORDINATES: N NOT SURVEYED
E NOT SURVEYED

BORING NO.: SP2

page 1 of 2

LOGGED BY: John Noves
EDITED BY: John Noves
CHECKED BY: Mack Lorep
DATE BEGAN: 3-14-06
DATE FINISHED: 3-14-06
GROUND SURFACE ELEVATION: NOT MEASURED

DEPTH TO WATER WHILE DRILLING	SAMPLE NO AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER READINGS	POCKET PENETROMETER HISTOGRAM	DEPTH IN FEET	PROFILE	DESCRIPTION
				0		0		CLAY; brown; low to high plasticity; moist; trace sand and gravel.
				2.75				
				3.5				
	GP 1	5'/5'		4.0				
				2.5				
				2.0		5		
				1.5				
	GP 2	2'/5'						
				1.5				
				1.5		10		
				1.75				
	GP 3	5'/5'		1.5				
				1.5		15		Bottom of boring @ 15.0'
								Boring advanced w/ Geoprobe Model 6610 using 60" Macro-core sampling system.
						20		



CONFIDENTIAL BUSINESS INFORMATION

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Hard Hat

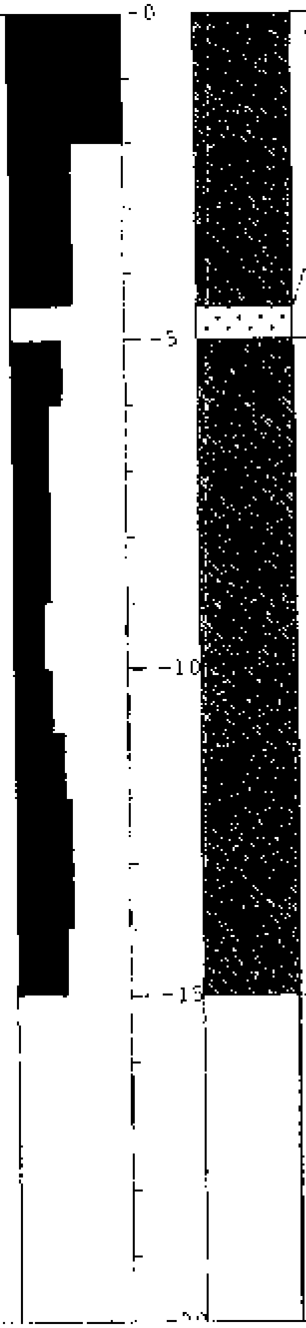
PROJECT: Alliant Energy

COORDINATES: N NOT SURVEYED
E NOT SURVEYED

BORING NO.: SP3

page 1 of 2

LOGGED BY: John Noyes
EDITED BY: John Noyes
CHECKED BY: Mark Loerop
DATE BEGAN: 3-14-06
DATE FINISHED: 3-14-06
GROUND SURFACE ELEVATION: NOT MEASURED



DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFORMATION	POCKET PENETROMETER READINGS	POCKET PENETROMETER HISTOGRAM	DEPTH IN FEET	PROFILE	DESCRIPTION
				0		0		CLAY; yellowish brown to olive; med. plastic to low plasticity; moist; trace [illegible], sand and gravel
				4.5				
				4.5				
	GP 1	5/5'						
				2.5				
								SAND; [illegible] gray poorly graded; medium grained; moist
						5		CLAY; ol gray low plasticity; moist, some sand.
				2.0				
				1.5				
	GP 2	2/5'						8.4' grades [illegible] organic matter
				1.5				
				1.25		10		
				1.5				[illegible]
				2.0				
	GP 3	5/5'		2.25				[illegible]
				2.25				
				2.0		15		Bottom of boring @ 15.0'. Boring advanced w/ Geoprobe Model 6610 using 60" Macrocore sampling system.
						20		

CONFIDENTIAL BUSINESS INFORMATION

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Hard Hat

PROJECT: Alliant Energy

COORDINATES: *N NOT SURVEYED*
E NOT SURVEYED

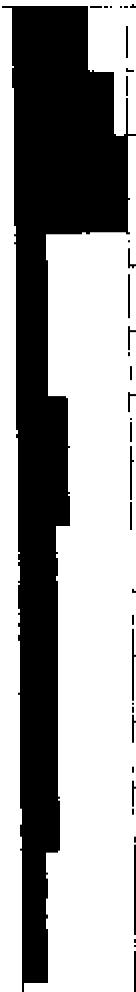
BORING NO.: *SP4*

page 1 of 2

LOGGED BY: *John Noyes*
EDITED BY: *John Noyes*
CHECKED BY: *Mark Loreg*
DATE BEGAN: *5-14-06*
DATE FINISHED: *5-14-06*
GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFORMATION	POCKET PENETROMETER READINGS	DEPTH IN FEET	DESCRIPTION
					0	[illegible] wet [illegible] brown to black, nonplastic to low plastic silty [illegible] [illegible] and gravel.
				3.0		
				4.0		
	GP 1	5/5'				
				4.5		
				1.25	5	CLAY: olive; low plasticity; moist; some sand
				1.25		
				2.0		
	GP 2	2/5'				[illegible] grades [illegible]
				2.0		
				1.5	10	
						With organic matter [illegible]
				1.5		
	GP 3	5/5'				@ 13' grades olive
				1.5		
				1.0		
				1.0	15	Bottom of boring @ 15.0'. Boring advanced by Geoprobe Model 6610 using 60" Macrocore sampling system.
					20	

POCKET PENETROMETER HISTOGRAM



PROFILE

CABENO

Environmental Field Services, LLC

BORING LOG

CLIENT: Hard Hat

PROJECT: Alliant Energy

COORDINATES: *N NOT SURVEYED*
E NOT SURVEYED

BORING NO.: *SP5*

page 1 of 2

LOGGED BY: *John Noyes*

EDITED BY: *John Noyes*

CHECKED BY: *Mark Lorep*

DATE BEGAN: *3-14-06*

DATE FINISHED: *3-14-06*

GROUND SURFACE ELEVATION: *NOT MEASURED*

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFORMATION	POCKET PENETROMETER READINGS	DEPTH IN FEET	DESCRIPTION
				0	0	CLAY; brown; low plasticity; moist; trace sand and gravel.
				>4.5		
	GP 1	5'/5'		>4.5		
				>4.5		
				1.5	5	CLAY & ASH; black; non-plastic to low plasticity; moist.
				1.75		CLAY; olive; low plasticity; moist; trace sand and gravel
				1.25		
	GP 2	2'/5'		1.25		@ 9' grades gray
				2.0	10	@11' grades olive
				1.25		
	GP 3	5'/5'		1.5		
				1.5		
				1.5	15	Bottom of boring @ 15 feet.
						Boring advanced w/ Geoprobe Model 6610 using 5" Macrocore sampling system.

CONFIDENTIAL BUSINESS INFORMATION

CABENO
Environmental Field Services, LLC

BORING LOG

CLIENT: Hard Hat

PROJECT: Alliant Energy

COORDINATES: N NOT SURVEYED
E NOT SURVEYED

BORING NO.: SP6

page 1 of 2

LOGGED BY: John Noves
EDITED BY: John Noves
CHECKED BY: Mark Larep
DATE BEGAN: 3-14-06
DATE FINISHED: 3-14-06
GROUND SURFACE ELEVATION: NOT MEASURED

DEPTH TO WATER WHILE DRILLING	SAMPLE NO. AND TYPE	SAMPLE RECOVERY	SAMPLE INFROMATION	POCKET PENETROMETER READINGS	DEPTH IN FEET	DESCRIPTION
				0	0	CLAY, brown, low plast, silty, moist, trace sand and gravel.
				>4.5		
				>4.5		
	GP 1	5/5'				
				>4.5		
				2.5	5	
				2.5		
				1.75		
	GP 2	2/5'				
				2.5		
						@ 9' grades some organic material
				2.25	10	
						@11' organic matter ... grades out
				1.75		
	GP 3	5/5'				
				2.5		
				2.25		
					15	
				2.0		
						Bottom of boring @ 15.0'.
						Boring advanced w/ Geoprobe Model 66.D using 60" Macrocore sampling system.
					20	

PROFILE

CONFIDENTIAL BUSINESS INFORMATION

Attachment B

Hydrological and Hydraulics Study

Aether dbs, December 31, 2010

Hydrograph Summary Report

CONFIDENTIAL BUSINESS INFORMATION

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	92.95	10	790	24.867	----	------	------	Sutherland Station
2	Reservoir	65.48	10	840	24.862	1	864.39	9.532	Through Secondary Pond
3	Reservoir	64.12	10	860	24.858	2	864.39	3.343	Polishing Pond
4	Reservoir	64.14	10	850	24.858	3	862.51	0.061	Discharge Pond

Proj. file: Marshalltown2.gpw	Return Period: 100 yr	Run date: 12-31-2010

Hyd. No. 1

Sutherland Station

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 57.00 ac
Basin Slope = 0.1 %
Tc method = LAG
Total precip. = 6.60 in
Storm duration = 24 hrs

Peak discharge = 92.95 cfs
Time interval = 10 min
Curve number = 89
Hydraulic length = 1920 ft
Time of conc. (Tc) = 130.6 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 24.867 acft

Hydrograph Discharge Table

Time -- Outflow		Time -- Outflow		Time -- Outflow		Time -- Outflow	
(hrs	cfs)	(hrs	cfs)	(hrs	cfs)	(hrs	cfs)
6.00	0.95	11.67	14.06	17.33	9.12	23.00	4.45
6.17	1.08	11.83	19.20	17.50	8.83	23.17	4.42
6.33	1.21	12.00	28.89	17.67	8.56	23.33	4.39
6.50	1.35	12.17	39.07	17.83	8.31	23.50	4.36
6.67	1.50	12.33	49.53	18.00	8.08	23.67	4.33
6.83	1.64	12.50	60.09	18.17	7.87	23.83	4.30
7.00	1.79	12.67	70.50	18.33	7.67	24.00	4.27
7.17	1.94	12.83	80.64	18.50	7.49	24.17	4.20
7.33	2.10	13.00	89.18	18.67	7.32	24.33	4.07
7.50	2.25	13.17	92.95 <<	18.83	7.15	24.50	3.90
7.67	2.41	13.33	89.25	19.00	6.99	24.67	3.68
7.83	2.57	13.50	84.60	19.17	6.84	24.83	3.42
8.00	2.73	13.67	79.23	19.33	6.69	25.00	3.11
8.17	2.89	13.83	73.40	19.50	6.54	25.17	2.76
8.33	3.06	14.00	67.27	19.67	6.39	25.33	2.36
8.50	3.24	14.17	60.89	19.83	6.24	25.50	1.99
8.67	3.44	14.33	54.35	20.00	6.09	25.67	1.65
8.83	3.65	14.50	47.68	20.17	5.94	25.83	1.35
9.00	3.88	14.67	40.94	20.33	5.79	26.00	1.08
9.17	4.14	14.83	34.21	20.50	5.65		
9.33	4.42	15.00	27.53	20.67	5.51		
9.50	4.71	15.17	21.43	20.83	5.38		
9.67	5.03	15.33	17.12	21.00	5.26		
9.83	5.37	15.50	15.63	21.17	5.14		
10.00	5.73	15.67	14.48	21.33	5.04		
10.17	6.11	15.83	13.58	21.50	4.94		
10.33	6.53	16.00	12.82	21.67	4.86		
10.50	6.99	16.17	12.16	21.83	4.79		
10.67	7.51	16.33	11.58	22.00	4.72		
10.83	8.11	16.50	11.06	22.17	4.66		
11.00	8.82	16.67	10.60	22.33	4.61		
11.17	9.63	16.83	10.17	22.50	4.57		
11.33	10.63	17.00	9.79	22.67	4.52		
11.50	11.85	17.17	9.44	22.83	4.49		

...End

Reservoir No. 1 - Secondary

Pond Data

Pond storage is based on known values

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	862.40	00	0.000	0.000
1.00	863.40	00	4.800	4.800
2.00	864.40	00	4.800	9.600
3.00	865.40	00	4.800	14.400

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 2.00	20.00	0.00	0.00
Crest El. ft	= 862.40	863.40	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0.000	862.40	---	---	---	---	0.00	0.00	---	---	---	0.00
0.10	0.480	862.50	---	---	---	---	0.16	0.00	---	---	---	0.16
0.20	0.960	862.60	---	---	---	---	0.46	0.00	---	---	---	0.46
0.30	1.440	862.70	---	---	---	---	0.85	0.00	---	---	---	0.85
0.40	1.920	862.80	---	---	---	---	1.32	0.00	---	---	---	1.32
0.50	2.400	862.90	---	---	---	---	1.84	0.00	---	---	---	1.84
0.60	2.880	863.00	---	---	---	---	2.42	0.00	---	---	---	2.42
0.70	3.360	863.10	---	---	---	---	3.04	0.00	---	---	---	3.04
0.80	3.840	863.20	---	---	---	---	3.72	0.00	---	---	---	3.72
0.90	4.320	863.30	---	---	---	---	4.44	0.00	---	---	---	4.44
1.00	4.800	863.40	---	---	---	---	5.20	0.00	---	---	---	5.20
1.10	5.280	863.50	---	---	---	---	6.00	1.64	---	---	---	7.64
1.20	5.760	863.60	---	---	---	---	6.84	4.65	---	---	---	11.48
1.30	6.240	863.70	---	---	---	---	7.71	8.54	---	---	---	16.25
1.40	6.720	863.80	---	---	---	---	8.61	13.15	---	---	---	21.76
1.50	7.200	863.90	---	---	---	---	9.55	18.38	---	---	---	27.93
1.60	7.680	864.00	---	---	---	---	10.52	24.16	---	---	---	34.68
1.70	8.160	864.10	---	---	---	---	11.52	30.44	---	---	---	41.97
1.80	8.640	864.20	---	---	---	---	12.56	37.19	---	---	---	49.75
1.90	9.120	864.30	---	---	---	---	13.62	44.38	---	---	---	58.00
2.00	9.600	864.40	---	---	---	---	14.71	52.00	---	---	---	66.71
2.10	10.080	864.50	---	---	---	---	15.82	59.99	---	---	---	75.81
2.20	10.560	864.60	---	---	---	---	16.97	68.35	---	---	---	85.32
2.30	11.040	864.70	---	---	---	---	18.14	77.07	---	---	---	95.21
2.40	11.520	864.80	---	---	---	---	19.33	86.13	---	---	---	105.46
2.50	12.000	864.90	---	---	---	---	20.55	95.52	---	---	---	116.07
2.60	12.480	865.00	---	---	---	---	21.80	105.23	---	---	---	127.02
2.70	12.960	865.10	---	---	---	---	23.07	115.24	---	---	---	138.31
2.80	13.440	865.20	---	---	---	---	24.36	125.56	---	---	---	149.92
2.90	13.920	865.30	---	---	---	---	25.68	136.16	---	---	---	161.84
3.00	14.400	865.40	---	---	---	---	27.02	147.08	---	---	---	174.10

Reservoir No. 2 - Polishing

Pond Data

Pond storage is based on known values

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	861.60	00	0.000	0.000
1.00	862.60	00	1.200	1.200
2.00	863.60	00	1.200	2.400
3.00	864.60	00	1.200	3.600

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 1.00	24.00	0.00	0.00
Crest El. ft	= 861.60	863.50	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0.000	861.60	---	---	---	---	0.00	0.00	---	---	---	0.00
0.10	0.120	861.70	---	---	---	---	0.08	0.00	---	---	---	0.08
0.20	0.240	861.80	---	---	---	---	0.23	0.00	---	---	---	0.23
0.30	0.360	861.90	---	---	---	---	0.43	0.00	---	---	---	0.43
0.40	0.480	862.00	---	---	---	---	0.66	0.00	---	---	---	0.66
0.50	0.600	862.10	---	---	---	---	0.92	0.00	---	---	---	0.92
0.60	0.720	862.20	---	---	---	---	1.21	0.00	---	---	---	1.21
0.70	0.840	862.30	---	---	---	---	1.52	0.00	---	---	---	1.52
0.80	0.960	862.40	---	---	---	---	1.86	0.00	---	---	---	1.86
0.90	1.080	862.50	---	---	---	---	2.22	0.00	---	---	---	2.22
1.00	1.200	862.60	---	---	---	---	2.60	0.00	---	---	---	2.60
1.10	1.320	862.70	---	---	---	---	3.00	0.00	---	---	---	3.00
1.20	1.440	862.80	---	---	---	---	3.42	0.00	---	---	---	3.42
1.30	1.560	862.90	---	---	---	---	3.85	0.00	---	---	---	3.85
1.40	1.680	863.00	---	---	---	---	4.31	0.00	---	---	---	4.31
1.50	1.800	863.10	---	---	---	---	4.78	0.00	---	---	---	4.78
1.60	1.920	863.20	---	---	---	---	5.26	0.00	---	---	---	5.26
1.70	2.040	863.30	---	---	---	---	5.76	0.00	---	---	---	5.76
1.80	2.160	863.40	---	---	---	---	6.28	0.00	---	---	---	6.28
1.90	2.280	863.50	---	---	---	---	6.81	0.00	---	---	---	6.81
2.00	2.400	863.60	---	---	---	---	7.35	1.97	---	---	---	9.33
2.10	2.520	863.70	---	---	---	---	7.91	5.58	---	---	---	13.49
2.20	2.640	863.80	---	---	---	---	8.48	10.25	---	---	---	18.73
2.30	2.760	863.90	---	---	---	---	9.07	15.78	---	---	---	24.85
2.40	2.880	864.00	---	---	---	---	9.67	22.05	---	---	---	31.72
2.50	3.000	864.10	---	---	---	---	10.28	28.99	---	---	---	39.27
2.60	3.120	864.20	---	---	---	---	10.90	36.53	---	---	---	47.43
2.70	3.240	864.30	---	---	---	---	11.53	44.63	---	---	---	56.17
2.80	3.360	864.40	---	---	---	---	12.18	53.26	---	---	---	65.44
2.90	3.480	864.50	---	---	---	---	12.84	62.38	---	---	---	75.22
3.00	3.600	864.60	---	---	---	---	13.51	71.99	---	---	---	85.50

Reservoir No. 3 - Discharge Pond

Pond Data

Pond storage is based on known values

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	860.40	00	0.000	0.000
1.00	861.40	00	0.029	0.029
2.00	862.40	00	0.029	0.058
3.00	863.40	00	0.029	0.087
4.00	864.40	00	0.029	0.116

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 6.30	0.00	0.00	0.00
Crest El. ft	= 860.40	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

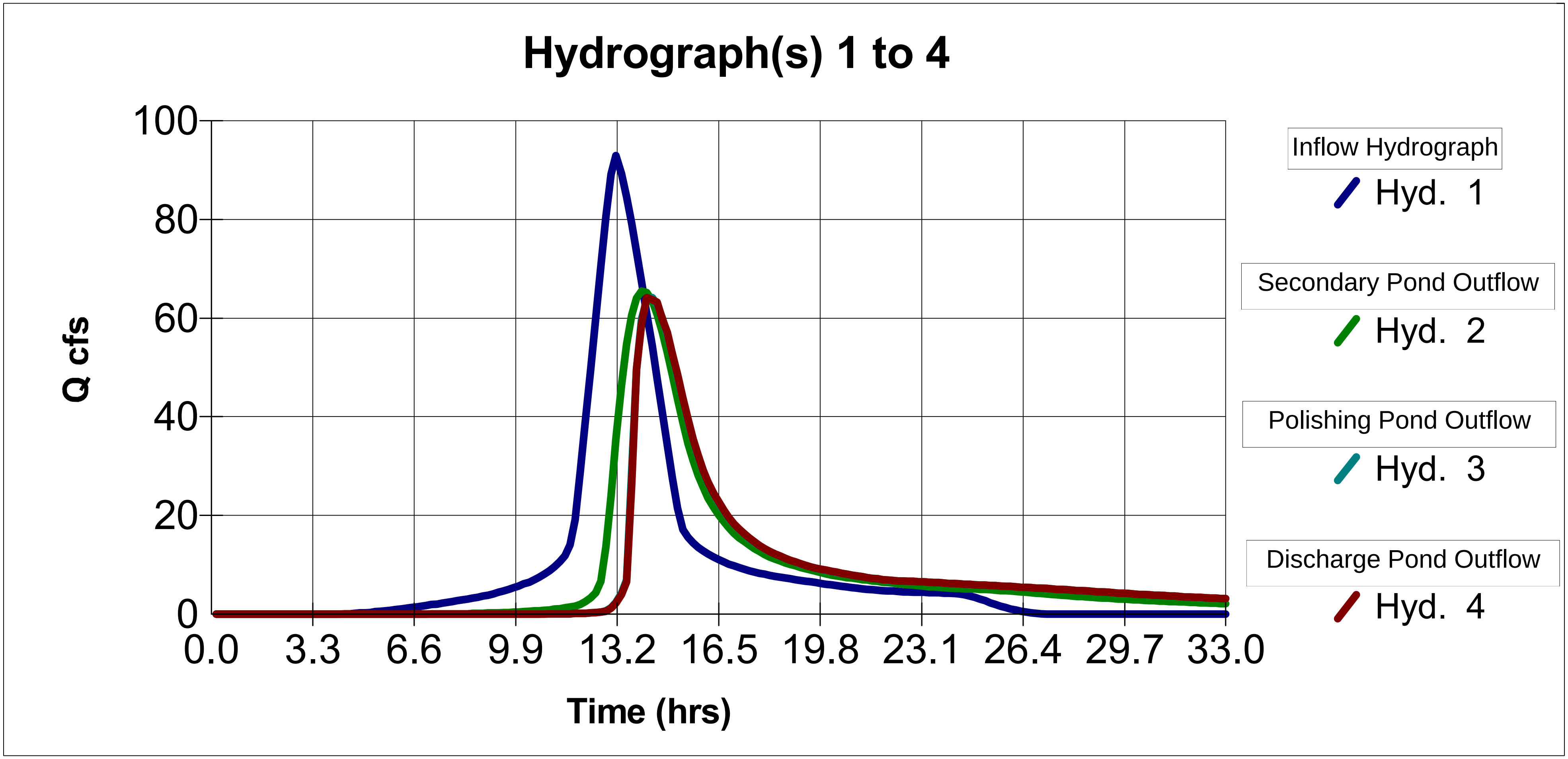
Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0.000	860.40	---	---	---	---	0.00	---	---	---	---	0.00
0.10	0.003	860.50	---	---	---	---	0.66	---	---	---	---	0.66
0.20	0.006	860.60	---	---	---	---	1.88	---	---	---	---	1.88
0.30	0.009	860.70	---	---	---	---	3.45	---	---	---	---	3.45
0.40	0.012	860.80	---	---	---	---	5.31	---	---	---	---	5.31
0.50	0.015	860.90	---	---	---	---	7.41	---	---	---	---	7.41
0.60	0.017	861.00	---	---	---	---	9.75	---	---	---	---	9.75
0.70	0.020	861.10	---	---	---	---	12.28	---	---	---	---	12.28
0.80	0.023	861.20	---	---	---	---	15.01	---	---	---	---	15.01
0.90	0.026	861.30	---	---	---	---	17.91	---	---	---	---	17.91
1.00	0.029	861.40	---	---	---	---	20.98	---	---	---	---	20.98
1.10	0.032	861.50	---	---	---	---	24.20	---	---	---	---	24.20
1.20	0.035	861.60	---	---	---	---	27.58	---	---	---	---	27.58
1.30	0.038	861.70	---	---	---	---	31.09	---	---	---	---	31.09
1.40	0.041	861.80	---	---	---	---	34.75	---	---	---	---	34.75
1.50	0.044	861.90	---	---	---	---	38.54	---	---	---	---	38.54
1.60	0.046	862.00	---	---	---	---	42.45	---	---	---	---	42.45
1.70	0.049	862.10	---	---	---	---	46.49	---	---	---	---	46.49
1.80	0.052	862.20	---	---	---	---	50.66	---	---	---	---	50.66
1.90	0.055	862.30	---	---	---	---	54.93	---	---	---	---	54.93
2.00	0.058	862.40	---	---	---	---	59.34	---	---	---	---	59.34
2.10	0.061	862.50	---	---	---	---	63.84	---	---	---	---	63.84
2.20	0.064	862.60	---	---	---	---	68.45	---	---	---	---	68.45
2.30	0.067	862.70	---	---	---	---	73.17	---	---	---	---	73.17
2.40	0.070	862.80	---	---	---	---	78.00	---	---	---	---	78.00
2.50	0.073	862.90	---	---	---	---	82.92	---	---	---	---	82.92
2.60	0.075	863.00	---	---	---	---	87.94	---	---	---	---	87.94
2.70	0.078	863.10	---	---	---	---	93.07	---	---	---	---	93.07
2.80	0.081	863.20	---	---	---	---	98.28	---	---	---	---	98.28
2.90	0.084	863.30	---	---	---	---	103.59	---	---	---	---	103.59
3.00	0.087	863.40	---	---	---	---	109.01	---	---	---	---	109.01
3.10	0.090	863.50	---	---	---	---	114.50	---	---	---	---	114.50
3.20	0.093	863.60	---	---	---	---	120.09	---	---	---	---	120.09

Continues on next page...

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
3.30	0.096	863.70	---	---	---	---	125.76	---	---	---	---	125.76
3.40	0.099	863.80	---	---	---	---	131.52	---	---	---	---	131.52
3.50	0.102	863.90	---	---	---	---	137.36	---	---	---	---	137.36
3.60	0.104	864.00	---	---	---	---	143.29	---	---	---	---	143.29
3.70	0.107	864.10	---	---	---	---	149.30	---	---	---	---	149.30
3.80	0.110	864.20	---	---	---	---	155.39	---	---	---	---	155.39
3.90	0.113	864.30	---	---	---	---	161.56	---	---	---	---	161.56
4.00	0.116	864.40	---	---	---	---	167.83	---	---	---	---	167.83

...End



Note: Hydrographs 3 & 4 are almost identical.

Alliant Energy near Marshalltown - Sutherland Station
Ash Pond Analysis 154.006.005

Curve Number (CN) Calculation
Group D soils assumed (clay soils)
Plant Drainage Area => approximates a rectangle (see working drawing)
Total Drainage Area = 10.8" * 240'/" * 4" * 240'/" * acres / 43,560 SF = 57 acres (Conservative)

	X	Y	SF	Acres	CN
Total	10.8	4	2488320	57.1	89

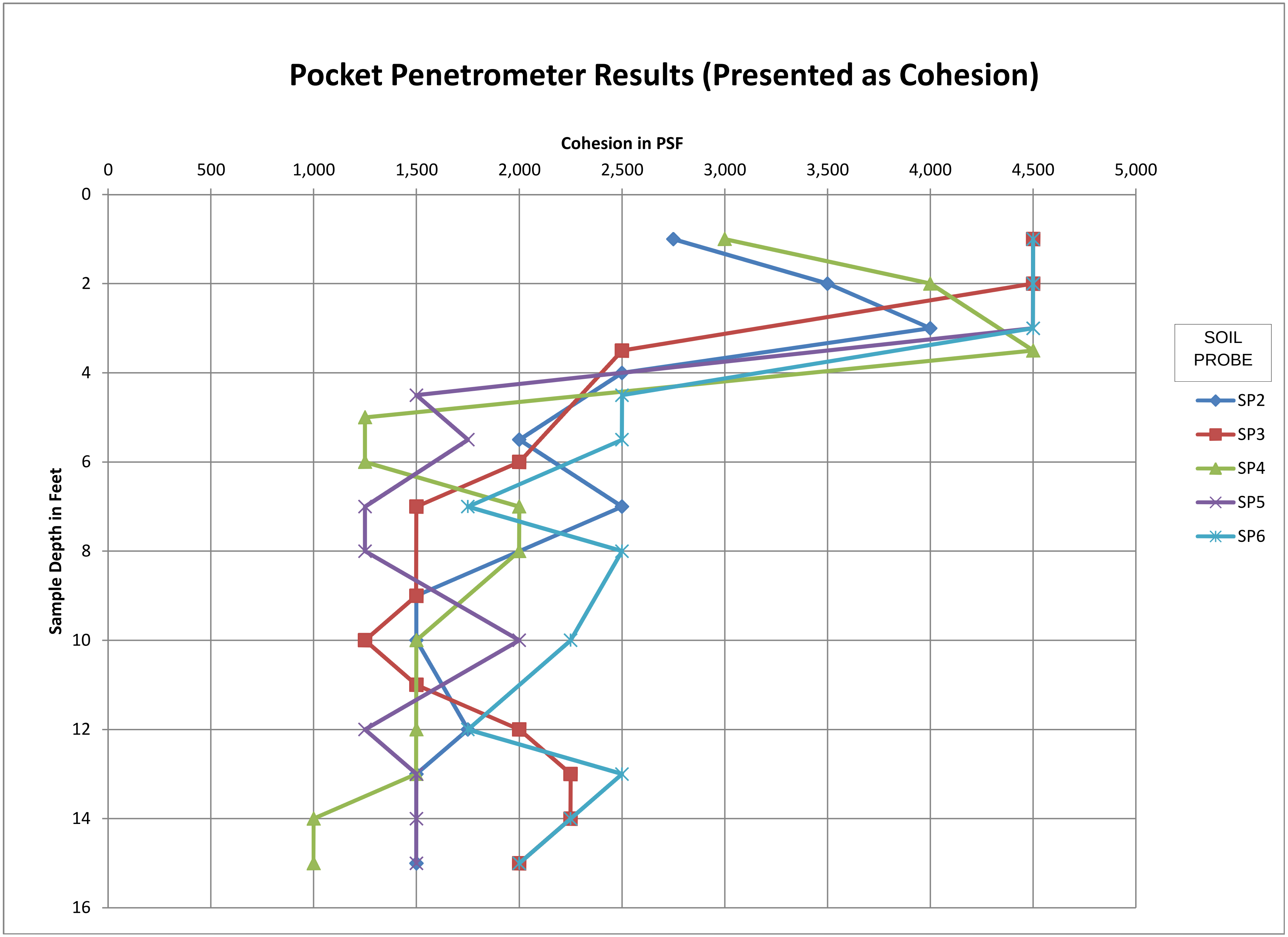
Different Areas have different Curve Numbers => areas approximated as rectangles

Ash	3	4	691200	15.9	91	Gravel Road
Coal	3.1	1.6	285696	6.6	91	Gravel Road
Grass	2.4	1.9	262656	6.0	80	grass cover > 75%
Grass	1.6	1.5	138240	3.2	80	grass cover > 75%
Difference (Rock, concrete, asphalt, plant, etc				25.5	91	Industrial CN

Attachment C

CABENO Environmental Field Services, LLC
2006 Pocket Penetrometer Results

Strength data presented in Appendix A charted by Aether dbs, December 30th, 2010


Pocket Penetrometer Results (Presented as Cohesion)
Cohesion in PSF
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
Sample Depth in Feet
0
2
4
6
8
10
12
14
16
SOIL PROBE
SP2
SP3
SP4
SP5
SP6

Attachment D

Area Plan
Marshalltown Steam Power Station

Source:
Iowa Light & Power Company 1957 Drawing


R-1189A
CHICAGO GREAT WESTERN R.R. EL. 98.0
COAL STORAGE
ASH STORAGE
N
CRUSHER HOUSE
BOILER ROOM
TURBINE ROOM
NO. 1
NO. 3
WAREHOUSE
COOLING TOWERS
DIESEL PLANT
33 KV SUBSTATION
115 KV SUBSTATION
PARKING AREA
LINE TO BOONE
LINE TO CORN. BELT
LINE TO CEDAR RAPIDS
FOR ACCESS ROAD, SEE 1-2060-0-D-C2800
GUARD RAIL
8'x6' CMP CALVERT
PUMP STATION
SEPTIC TANK
ABANDONED DISPOSAL FIELD
DISPOSAL FIELD
EXISTING WELL
WATER LINE FROM CITY
ROAD
FENCE
WELL #5
NOTES:
C.I.P.M.J. - CAST IRON PIPE MECHANICAL JOINT
R.C.P. - REINFORCED CONCRETE PIPE
V.S.P. - VITRIFIED SOIL PIPE
SEE DRAWING 1-2060-0-V- FOR LOCATION & ELEVATION OF 4" SANITARY LINE FROM WAREHOUSE.
THIS DRWG. BASED ON ORIGINAL DRWG. NO. R1189 WITH CORRECTIONS AND ADDITIONS TO FEB 1957
16 COOLING TOWER REVISION 7-24-95 MAH
15 UP-DATED PER MARK-UPS 8-3-93-REB
14 ADDED SEPTIC TANK #2 & DISPOSAL FIELD 9-1-52 REB
13 ADDED WAREHOUSE 11-20-91 MAH
12 10-31-61 ACID TANK ADDED BOILER CONV. HEATING ADDED
11 10-9-61 TRACK HOPPER LOCATION MOVED TO NEW HOPPER DG
10 4-19-61 WELL WATER LINE TO COOLING TOWER UNIT 3 ADDED DG
9 1-12-61 ADDED LOCATIONS OF WELLS DG
8 6-30-60 FM ADDED ELEVATIONS OF DUCT BETWEEN MANHOLE & CHLORINATOR HOUSE
7 JUNE 20, 60 12" C.I.P.M.J. TO WELLS 5, 6 ADDED DIM. OF TRACKS ADDED D.G.
6 3-21-60 REV. DG
5 12-21-59 REVISED 1½" GAS LINE, ADDED 12" GAS LINE DEG
4 8-7-59 REVISED DEG
3 5-15-59 CONDUIT LINES ADDED D.E.G.
2 3-27-59 WELLS 5 AND 6 ADDED DEG.
1 2-26-59 8 CELL COOLING TOWER ADDED DG
IOWA ELECTRIC LIGHT & POWER CO.
ENGINEERING DEPT.
CEDAR RAPIDS IOWA
MARSHALLTOWN STEAM POWER STATION
AREA PLAN
DATE 3-19-57
SCALE 1" = 50'
DWG. BY DEG
APPROVED
IMPR. REQD NO.
DRWG NO R-1189A

Attachment E

Selected Deep Soil Borings
Sutherland Generating Station

Source:
Preliminary Subsurface Investigation
Black & Veatch, May 14, 2007

BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION

BORING LOG

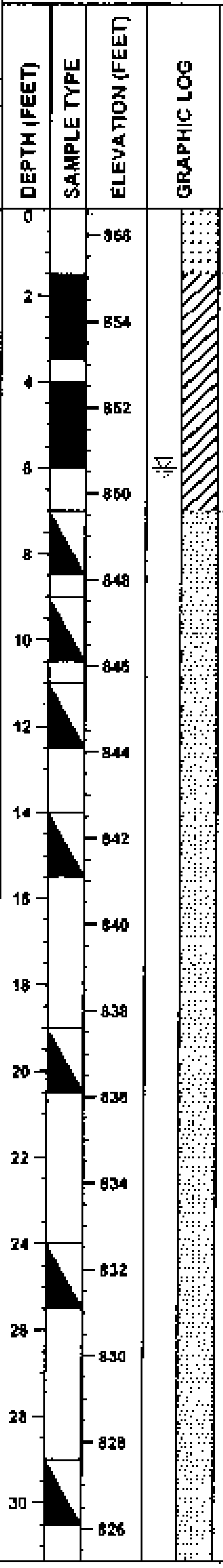
BORING NO. BV-6

SHEET 1 OF 3

CLIENT Interstate Power & Light	**PROJECT** Sutherland Station	**PROJECT NO.** 145491

PROJECT LOCATION Marshalltown, Iowa	**COORDINATES** N 3479395.0' E 5095039.0'	**GROUND ELEVATION (DATUM)** 856.6 ft (MSL)	**TOTAL DEPTH** 80.5 (feet)
SURFACE CONDITIONS Flat, grassy marsh, standing water, offset 28' south	**COORDINATE SYSTEM** State Plane	**DATE START** 04/13/07	**DATE FINISHED** 04/14/07

LOGGED BY R. S. Edwards	**CHECKED BY** V. Bhadriraju	**APPROVED BY** E. Meyer



SOIL SAMPLING								
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY		
ROCK CORING								
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD	**CLASSIFICATION OF MATERIALS**	**REMARKS**
							Silty CLAY; dark gray; moist; low plasticity; (TOPSOIL) 1.5	Boring advanced w/4-1/4" ID hollow stem auger. SPT performed w/ automatic hammer.
TW	1	-	-	-	-	1.6	CLAY; yellow-brown; moist, high plasticity	
TW	2	-	-	-	-	1.5	grading gray w/some brown mottling 7.0	
SPT	3	3	3	5	8	1.5	SAND; brownish-yellow; loose; wet; medium to coarse grained; well graded; rounded	Water encountered @ 6' during drilling.
SPT	4	3	5	7	12	0.7	grading medium dense	
SPT	5	5	7	8	15	0		Below 11.5' continued w/ 2-15/16" tricone roller bit using bentonite mud as drilling fluid
SPT	6	6	4	4	8	0	grading loose	
SPT	7	9	7	7	14	0	grading medium dense	
SPT	8	5	4	3	7	0.7	grading loose	
SPT	9	9	10	15	25	0.8	grading medium dense; medium to fine grained; rounded to subrounded; w/rounded cobbles	Driller reports cobbles.

BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION
BORING LOG

BORING NO. BV-6
SHEET 2 OF 3

CLIENT	PROJECT	PROJECT NO.
Interslate Power & Light	Sutherland Station	145491

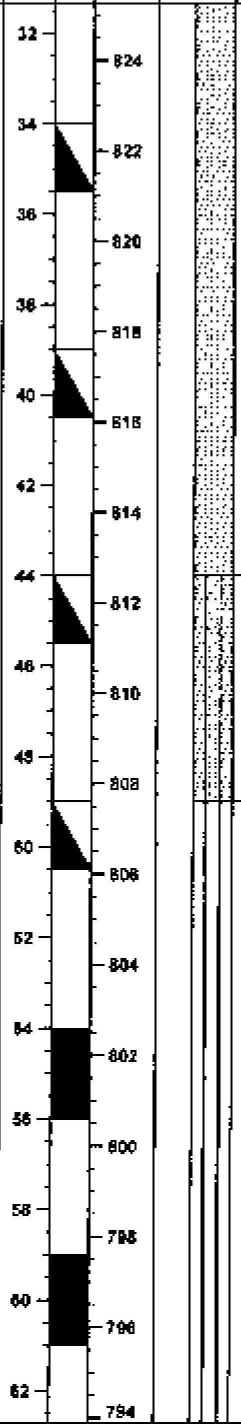
PROJECT LOCATION	COORDINATES		GROUND ELEVATION (DATUM)	TOTAL DEPTH
Marshalltown, Iowa	N 3479395.0'	E 5095039.0'	856.6 ft (MSL)	80.5 (feet)

SURFACE CONDITIONS	COORDINATE SYSTEM	DATE START	DATE FINISHED
Flat, grassy marsh, standing water, offset 28' south	State Plane	04/13/07	04/14/07

LOGGED BY	CHECKED BY	APPROVED BY
R. S. Edwards vsr sv	V. Bhadriraju vs	E. Meyer

SOIL SAMPLING						
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY
ROCK CORING						
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD
SPT	10	8	11	11	22	0.5
SPT	11	6	6	5	11	0.8
SPT	12	3	6	7	13	0.8
SPT	13	6	13	12	25	1.4
TW	14	-	-	-	-	0
TW	16	-	.	.	.	0

DEPTH (FEET) | SAMPLE TYPE | ELEVATION (FEET) | GRAPHIC LOG



CLASSIFICATION OF MATERIALS

grading fine to coarse grained; fine to coarse, angular gravel

36.7' to 37.3' gravel lense

44.0

Silty SAND; dark gray; medium dense; wet; fine grained; poorly graded

49.0

SILT; dark gray; very stiff; moist; low plasticity; w/trace sand (Glacial Till)

REMARKS

Graval lense based on drilling resistance.

TW 14 recovered w/split spoon.
PP = 1.5 tsf

BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION

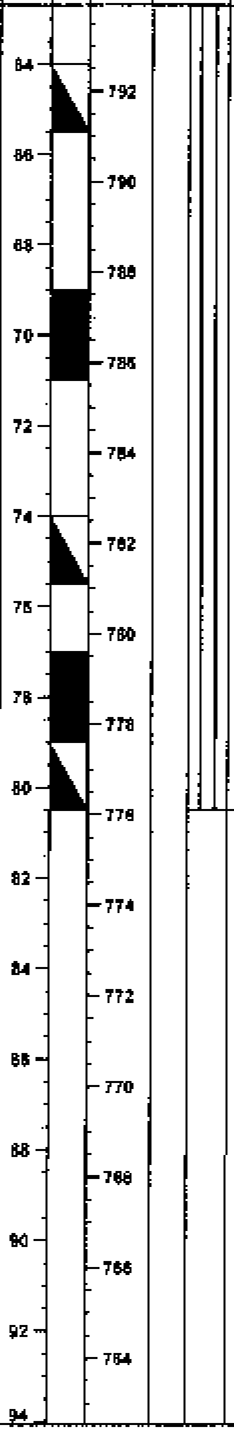
BORING LOG

BORING NO. BV-6
SHEET 3 OF 3

CLIENT Interstate Power & Light	**PROJECT** Sutherland Station	**PROJECT NO.** 145491

PROJECT LOCATION Marshalltown, Iowa	**COORDINATES** N 3479395.0' E 5095039.0'	**GROUND ELEVATION (DATUM)** 856.6 ft (MSL)	**TOTAL DEPTH** 80.5 (feet)
SURFACE CONDITIONS Flat, grassy marsh, standing water, offset 28' south	**COORDINATE SYSTEM** State Plane	**DATE START** 04/13/07	**DATE FINISHED** 04/14/07
LOGGED BY R. S. Edwards	**CHECKED BY** V. Bhadriraju	**APPROVED BY** E. Meyer	

SOIL SAMPLING: SAMPLE TYPE ROCK CORING: CORE SIZE	SAMPLE NUMBER RUN NUMBER	1ST 6 INCHES RUN LENGTH	2ND 6 INCHES RUN RECOVERY	3RD 6 INCHES RQD RECOVERY	N VALUE PERCENT RECOVERY	SAMPLE RECOVERY RQD	DEPTH (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
SPT	18	6	8	8	16	1.4	64		PP = 1.5 to 2.0 tsf
TW	18A	-	-	-	-	0	69	grading stiff	TW 18A recovered w/split spoon. PP = 1.75 tsf
SPT	19	7	9	10	19	1.4	74	grading very stiff	PP = 2.25 tsf
TW	20	-	-	-	-	1.0	77		PP = 3.0 tsf
SPT	21	8	9	9	18	1.0	79		PP = 2.5 tsf
							80.5		Bottom of boring @ 80.5'. Water level not recorded. Boring backfilled w/ cement bentonite grout on 04/14/07.



5/11/2007 1:04 PM IP&L - Sutherland Station

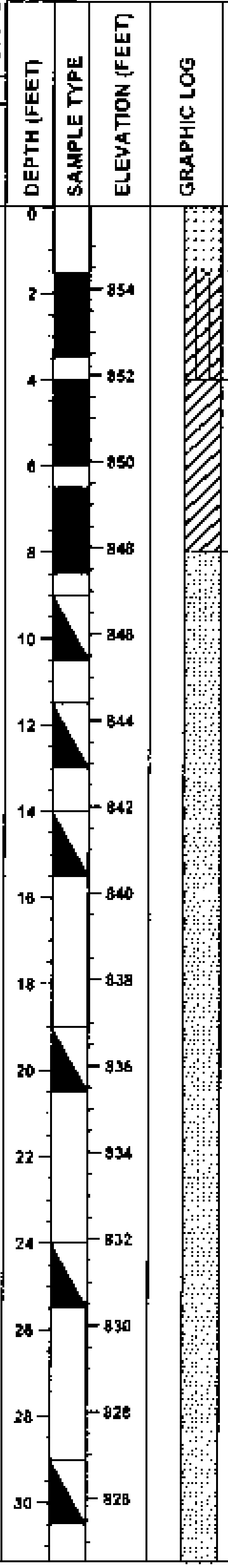
BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION
BORING LOG

BORING NO. BV-7
SHEET 1 OF 3

CLIENT Interstate Power & Light	**PROJECT** Sutherland Station		**PROJECT NO.** 145491
PROJECT LOCATION Marshalltown, Iowa	**COORDINATES** N 3479095.0' E 5097105.0'	**GROUND ELEVATION (DATUM)** 855.9 ft (MSL)	**TOTAL DEPTH** 80.5 (feet)
SURFACE CONDITIONS Agricultural field off access road	**COORDINATE SYSTEM** State Plane	**DATE START** 04/11/07	**DATE FINISHED** 04/12/07
LOGGED BY R. S. Edwards VB	**CHECKED BY** V. Bhadriraju VB	**APPROVED BY** E. Meyer	

SOIL SAMPLING: SAMPLE TYPE ROCK CORING: CORE SIZE	SAMPLE NUMBER RUN NUMBER	SET 6 INCHES RUN LENGTH	2ND 6 INCHES RUN RECOVERY	3RD 6 INCHES RQD RECOVERY	N VALUE PERCENT RECOVERY	SAMPLE RECOVERY RQD	CLASSIFICATION OF MATERIALS	REMARKS
							Silty CLAY; dark gray; moist; low plasticity (TOPSOIL) 1.5	Boring advanced w/4-1/2" ID hollow stem auger SPT performed w/ automatic hammer.
TW	1	-	-	-	-	1.5	Silty CLAY; dark gray; moist; low plasticity 4.0	
TW	2	-	-	-	-	1.5	CLAY; gray-brown; mottled; moist; high plasticity	Below 4' continued w/ 2-15/16" tricone roller bit using bentonite mud as drilling fluid.
TW	3	-	-	-	-	1.5	8.0	
							SAND; yellow-brown; loose; wet; fine to medium grained; well graded; w/rounded to subrounded gravel	
SPT	4	2	3	3	6	1.0		
SPT	5	5	4	5	9	0.8		
SPT	6	6	7	7	14	0.6	grading medium dense	
SPT	7	5	4	2	6	0.8	grading loose	
SPT	8	3	4	4	8	1.4	grading w/cobbles	Driller reports cobbles @ 23.4'.
SPT	9	8	10	10	20	1.3	grading medium dense; cobbles grade out	



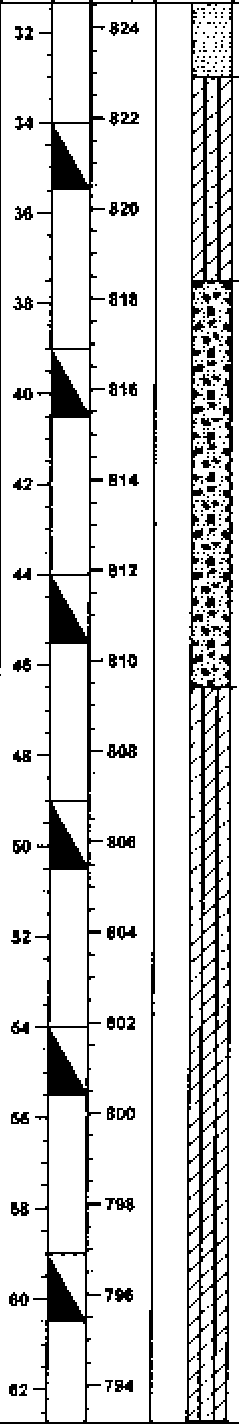
BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION
BORING LOG

BORING NO. BV-7
SHEET 2 OF 3

CLIENT Interstate Power & Light	**PROJECT** Sutherland Station		**PROJECT NO.** 145491
PROJECT LOCATION Marshalltown, Iowa	**COORDINATES** N 3479095.0' E 5097105.0'	**GROUND ELEVATION (DATUM)** 855.9 ft (MSL)	**TOTAL DEPTH** 80.5 (feet)
SURFACE CONDITIONS Agricultural field off access road	**COORDINATE SYSTEM** State Plane	**DATE START** 04/11/07	**DATE FINISHED** 04/12/07
LOGGED BY R. S. Edwards ss	**CHECKED BY** V. Bhadriraju vg	**APPROVED BY** E. Meyer	

SOIL SAMPLING: SAMPLE TYPE / ROCK CORING: CORE SIZE	SAMPLE NUMBER / RUN NUMBER	SET 6 INCHES / RUN LENGTH	2ND 6 INCHES / RUN RECOVERY	3RD 6 INCHES / RQD RECOVERY	N VALUE / PERCENT RECOVERY	SAMPLE RECOVERY / RQD	DEPTH (FEET)	CLASSIFICATION OF MATERIALS	REMARKS
							33.0	Clayey SILT; dark gray; stiff; moist; low plasticity	
SPT	10	4	4	5	9	2.0			PP = 1.0 tsf
							37.5	Gravelly SAND; gray; medium dense; wet; medium to coarse grained; poorly graded; angular	
SPT	11	17	4	7	11	0			
								grading dense	
SPT	12	37	31	16	47	1.8			
							46.5	Clayey SILT; dark gray; very stiff; moist; low plasticity; w/trace angular sand; (Glacial Till)	
SPT	13	9	12	13	25	1.7			PP = 4.5 tsf
								grading hard	
SPT	14	8	16	17	33	1.4			PP = 4.5 tsf
								grading very stiff	
SPT	15	13	14	13	27	1.0			PP = 2.5 tsf
									Below 60' continued w/ 4-1/4" ID hollow stem auger.



BLACK & VEATCH

CONFIDENTIAL BUSINESS INFORMATION

BORING LOG

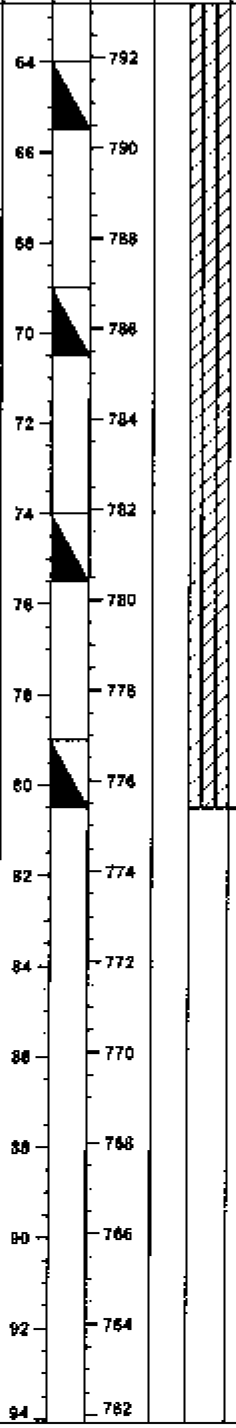
BORING NO. BV-7

SHEET 3 OF 3

CLIENT Interstate Power & Light	**PROJECT** Sutherland Station	**PROJECT NO.** 145491

PROJECT LOCATION Marshalltown, Iowa	**COORDINATES** N 3479095.0' E 5097105.0'	**GROUND ELEVATION (DATUM)** 855.9 ft (MSL)	**TOTAL DEPTH** 80.5 (feet)
SURFACE CONDITIONS Agricultural field off access road	**COORDINATE SYSTEM** State Plane	**DATE START** 04/11/07	**DATE FINISHED** 04/12/07
LOGGED BY R. S. Edwards vg for SE	**CHECKED BY** V. Bhadriraju vg	**APPROVED BY** E. Meyer	

SOIL SAMPLING									
SAMPLE TYPE	SAMPLE NUMBER	SET 6 INCHES	2ND 6 INCHES	3RD 6 INCHES	N VALUE	SAMPLE RECOVERY			
ROCK CORING									
CORE SIZE	RUN NUMBER	RUN LENGTH	RUN RECOVERY	RQD RECOVERY	PERCENT RECOVERY	RQD	DEPTH (FEET) / SAMPLE TYPE / ELEVATION (FEET) / GRAPHIC LOG	CLASSIFICATION OF MATERIALS	REMARKS
SPT	16	8	13	14	27	1.2			PP = 3.75 tsf
SPT	17	8	12	13	25	1.2			PP = 4.0 tsf
SPT	18	9	13	12	25	2.0			PP = 3.0 tsf
SPT	19	9	11	12	23	2.0			PP = 3.0 tsf
									Bottom of boring @ 80.5'. Water level not recorded. Boring backfilled w/ cement bentonite grout on 04/12/07



Attachment F

Deep Soil Borings
Sutherland Generating Station

Source:
Subsurface Exploration, Sutherland Air Heater Building
TEAM Services, December 3, 2007

LOG OF BORING NO. 1

Page 1 of 2

OWNER	ARCHITECT/ENGINEER
SITE Marshalltown, Iowa	PROJECT Sutherland Air Heater Building

DESCRIPTION

Approx. Surface Elev.: 859.3 ft.

Depth	Description	Elev.
2.0	Fill -- SAND, with gravel and coal debris, very dark gray	857.3
3.0	Fine SAND	856.3
8.0	Lean CLAY, trace sand and ferrous staining, dark grayish brown and yellowish brown, medium stiff	▽ 851.3
12.0	Silty fine to medium SAND, yellowish brown, very loose	847.3
27.0	Silty fine to coarse SAND, trace gravel, dark grayish brown, very loose	832.3
	Fine to coarse SAND, trace gravel and silt, light brownish gray, medium dense	

DEPTH (ft.)	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY	SPT - N BLOWS / FT.	TESTS MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
	SP	1	AS			8.4		
			HS					
	CL	2	SS	12"	3	28.2		1500*
5			HS					
	SP	3	SS	10"	1	17.2		
10			HS					
	SP	4	SS	1"	1	13.2		
15			HS					
	SP	5	SS	1"	1			
20			HS					
	SP	6	SS	0"	1			
25			HS					
	SP	7	SS	14"	12	11.2		
30			HS					
	SP	8	SS	11"	16	13.5		
35								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS				
WL	▽ 8'	WD ▼	BORING STARTED	11-13-07
WL			BORING COMPLETED	11-13-07
WL			RIG Rig 112	FOREMAN MG
			APPROVED RED	JOB # 1-2125

TEAM Services, Inc.

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 1

Page 2 of 2

OWNER

ARCHITECT/ENGINEER

SITE Marshalltown, Iowa

PROJECT Sutherland Air Heater Building

GRAPHIC LOG	DESCRIPTION	DEPTH (ft.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH PSF
⁙	Fine to coarse SAND, trace gravel and silt, light brownish gray, medium dense 38.0 821.3				HS					
⁙	Silty fine to coarse SAND, trace gravel and ferrous staining, olive gray, medium dense		SP	9	SS	17"	14	15.0		
		40			HS					
			SP	10	SS	18"	19	14.1		
	46.0 813.3	45			HS					
▨	Sandy lean CLAY, trace gravel, very dark gray, very stiff 48.0 811.3		CL	11	SS	18"	19	10.7		7500*
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	∇ 8'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	Rig 112	FOREMAN	MG
APPROVED	RED	JOB #	1-2125

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 2

Page 1 of 3

OWNER	ARCHITECT/ENGINEER
SITE Marshalltown, Iowa	PROJECT Sutherland Air Heater Building

Approx. Surface Elev.: 859.7 ft.

Depth	DESCRIPTION	Elev.
2.0	Fill -- Lean CLAY, trace sand, gravel, and organic matter, very dark brown	857.7
8.0	Lean CLAY, trace sand and ferrous staining, dark gray, stiff	851.7
12.0	Silty fine to medium SAND, yellowish brown, loose ∇	847.7
17.0	Silty fine to coarse SAND, trace gravel, light yellowish brown, loose	842.7
	Silty fine to coarse SAND, trace gravel and ferrous staining, light olive brown, medium dense -- color change to gray @ 22' -- becomes loose @ 28' -- color change to grayish brown, becomes medium dense @ 32'	

Depth (ft.) scale: 5, 10, 15, 20, 25, 30, 35

USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY	SPT-N BLOWS / FT.	TESTS MOISTURE %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
CL	1	AS			19.1		
		HS					
CL	2	SS	12"	5	22.4		2500*
		HS					
SP	3	SS	16"	5	17.7		
		HS					
SP	4	SS	13"	4	14.5		
		HS					
SP	5	SS	12"	13	6.4		
		HS					
SP	6	SS	14"	10	12.6		
		HS					
SP	7	SS	10"	7	11.8		
		HS					
SP	8	SS	8"	20	10.1		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS

WL	∇ 9'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	Rig 112	FOREMAN	MG
APPROVED	RED	JOB #	1-2125

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 2

Page 2 of 3

OWNER

ARCHITECT/ENGINEER

SITE
Marshalltown, Iowa

PROJECT
Sutherland Air Heater Building

GRAPHIC LOG	DESCRIPTION
	Silty fine to coarse SAND, trace gravel and ferrous staining, grayish brown, medium dense
	43.0 816.7
	Sandy lean CLAY, trace gravel, very dark gray, very stiff

DEPTH (ft.)	USCS SYMBOL	SAMPLES				TESTS		
		NUMBER	TYPE	RECOVERY	SPT - N BLOWS / FT.	MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
			HS					
	SP	9	SS	10"	15	10.7		
40			HS					
	CL	10	SS	16"	13	12.4		
45			HS					
	CL	11	SS	8"	20	12.7		
50			HS					
	CL	12	SS	18"	20	10.9		
55			HS					
	CL	13	SS	18"	16	11.8		
60			HS					
	CL	14	SS	18"	19	12.5		
65			HS					
	CL	15	SS	18"	21	12.4		
70								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES IN-SITU, THE TRANSITION MAY BE GRADUAL

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	▽ 9'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	Rig 112	FOREMAN	MG
APPROVED	RED	JOB #	1-2125

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 2

Page 3 of 3

OWNER	ARCHITECT/ENGINEER
SITE Marshalltown, Iowa	PROJECT Sutherland Air Heater Building

GRAPHIC LOG	DESCRIPTION	DEPTH (ft.)	USCS SYMBOL	SAMPLES				TESTS		
				NUMBER	TYPE	RECOVERY	SPT - N BLOWS / FT.	MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
▨					HS					
▨			CL	16	SS	18"	21	12.3		
▨		75			HS					
▨	-- becomes hard @ 77'									
▨			CL	17	SS	18"	29	12.3		
▨	80.0 779.7	80								
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	∇ 9'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	Rig 112	FOREMAN	MG
APPROVED	RED	JOB #	1-2125

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 3

Page 1 of 2

OWNER	ARCHITECT/ENGINEER
SITE Marshalltown, Iowa	PROJECT Sutherland Air Heater Building

GRAPHIC LOG	DESCRIPTION Approx. Surface Elev.: 859.9 ft.		DEPTH (ft.)	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY	SPT - N BLOWS / FT.	TESTS MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
3.0	Fill – Lean CLAY, with sand, trace gravel, organic matter, and coal debris, very dark brown	856.9		CL	1	AS			5.6		
						HS					
8.5	Lean CLAY, trace sand and ferrous staining, dark gray and olive brown, medium stiff	851.4	5	CL	2	SS	13"	6	24.4		1500*
						HS					
12.0	Silty fine to medium SAND, dark yellowish brown, very loose ▽	847.9	10	SP	3	SS	10"	3	18.1		
						HS					
	Silty fine to coarse SAND, trace gravel, light yellowish brown, medium dense		15	SP	4	SS	11"	11	16.4		
						HS					
			20	SP	5	SS	9"	16	18.2		
						HS					
	– color change to gray @ 23'		25	SP	6	SS	8"	19	13.7		
						HS					
	-- color change to grayish brown @ 28'		30	SP	7	SS	12"	16	9.9		
						HS					
	-- becomes dense @ 33'		35	SP	8	SS	10"	35	16.0		

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES. IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	▽ 10'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	ATV	FOREMAN	DC
APPROVED	RED	JOB #	1-2125

CONFIDENTIAL BUSINESS INFORMATION

LOG OF BORING NO. 3

Page 2 of 2

OWNER	ARCHITECT/ENGINEER
SITE Marshalltown, Iowa	PROJECT Sutherland Air Heater Building

GRAPHIC LOG	DESCRIPTION	DEPTH (ft.)	USCS SYMBOL	SAMPLES				TESTS		
				NUMBER	TYPE	RECOVERY	SPT -N BLOWS / FT.	MOISTURE, %	DRY DENSITY PCF	UNCONFINED STRENGTH PSF
	Silty fine to coarse SAND, trace gravel, grayish brown, dense				HS					
	40.0 819.9	40	SP	9	SS	9"	37	15.6		
	40.5 Sandy lean CLAY, trace gravel, very dark gray, very stiff 819.4									
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*

WATER LEVEL OBSERVATIONS		
WL	∇ 10'	WD ▼
WL		
WL		

TEAM Services, Inc.

BORING STARTED	11-13-07		
BORING COMPLETED	11-13-07		
RIG	ATV	FOREMAN	DC
APPROVED	RED	JOB #	1-2125

Attachment G

Well Record
Well Number 6A, Permit No. 3090

Source:
Iowa Department of Natural Resources, Geological Survey Bureau

Iowa Department of Natural Resources Geological Survey Bureau
109 Trowbridge Hall Iowa City, Ia. 52242-1319 PH (319) 335-1575

WELL RECORD

Permit No. 3090

CONFIDENTIAL BUSINESS INFORMATION

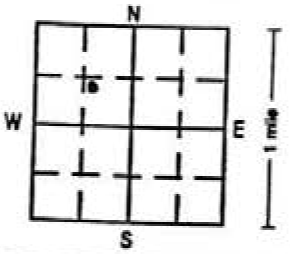
Site Identification

Property Owner IES [illegible] Well Number [illegible]
Address E. MAIN ST ROAD; MARSHALLTOWN
Tenant
Well Depth 252 ft Date Completed 5 / 18 / 94

Location

County MARSHALL
___ mi. N/S and ___ mi. E/W of intersection of ______ and ______
NW 1/4 of the SE 1/4 of the NW 1/4 of Sec 32 TWP 84N RNG 17 E/W

Show exact location of well in section grid with a dot (●).



Sketch map of well location on property
N
200 ft

☐ upland ☐ hillside ☒ valley Elevation (if known) ______

Formation log

From	To	Color	Hardness	Formation description
0	8	BLACK		FILL MATL
8	11	BLACK		TOP SOIL
11	18	GRAY		CLAY
18	22	GRAY		SAND / GRAVEL
22	44	BROWN		SAND/GRAVEL/COBBLE
44	46	GRAY		SANDY CLAY
46	58	BROWN		SAND/GRAVEL/COBBLES
58	127	GRAY		CLAY W/COBBLES
127	132	GRAY		SANDY CLAY
132	140	GRAY		SAND, GRAVEL
140	152	GRAY		CLAY WITH SAND
152	168	GRAY		SAND GRAVEL
168	173	GRAY		CLAY, COBBLES
173	185	GRAY		SAND
185	192	GRAY		FINE SAND
192	241	GRAY		SANDY CLAY
241	252	GRAY		SAND, GRAVEL
252		GRAY		LIMESTONE

use additional sheets as needed

Remarks (including depth of lost drilling fluids, materials, or tools)

Well use

☐ Domestic
☐ Livestock
☐ Test Well
☐ Municipal
☐ Public Supply
☐ Irrigation
☒ Industrial
☐ Monitoring
☐ Other ______ (explain)

Drill method

☒ rotary ☐ auger ☐ cable other ______

Hole size

60 inch from 0 ft to 63 ft
54 inch from 63 ft to 252 ft

hole size continued
___ inch from ___ ft to ___ ft
___ inch from ___ ft to ___ ft

Record all depth measurements from ground level (GL). Use (+) for above GL measurements.

Casing

Drive shoe (~~yes~~ / no) Pitless adaptor (yes / no)

Size (ID/OD)	Type / Wt	Depth top	Depth bottom	Amount (length)
54" ID	STEEL	0	63	63
30" ID	STEEL/119	+2	152	154
"	" "	167	172	5
"	" "	182	240	58

Perforated or slotted casing? (~~yes~~ / no)

Perforated / slotted from ______ ft to ______ ft
Perforated / slotted from ______ ft to ______ ft

Casing grouted? (yes / ~~no~~)

Type	Depth Top	Depth Bottom	Amount
CEMENT	0	63	11 YD³ OUTSIDE
CEMENT	0	20	12 YD³

Well screen? (yes / ~~no~~)

Diameter	Slot size	Depth Top	Depth Bottom	Length	Material
~~30"~~	.075	152	167	15	~~SST~~
~~30"~~	~~.075~~	~~172~~	~~182~~	10	~~SST~~
30"	.075	240	250	10	SST

Bottom capped (yes / ~~no~~) with STAINLESS PLATE
Seals / Packers (~~yes~~ / no) kind ______ depth ______ ft
Gravel packed (yes / ~~no~~) from 120 ft to 252 ft
type NORTH. 3 amount 106 TONS

Well developed? (yes / ~~no~~)

Explain AIR DEVELOPED, SURGED, BAILED, PUMPED

Pump Installed? (yes / ~~no~~)

Date 06 / 01 / 94
Installer's name PAUL RENTSCHLER
Type of pump VERTICAL TURB. Depth to intake 150 ft
Pump diameter 12" BOWL Rated capacity 1,000 GPM

Water Information

Aquifer: ☒ sand/gravel ☐ limestone ☐ sandstone
Main water-supply zone from 120 ft to 252 ft
Final water level (static water level) 37 ft (below / above) GL
Pumping water level 73.9 ft below GL; ☐ tape airline ☒ E-line
At yield of 1313 GPM; ☒ orifice ☐ volumetric ☐ estimate Date 5-18-94

Water quality test? (yes / ~~no~~)

Date tested 5 / 18 / 94
Tested by UNIV. OF IOWA LAB
Test results

Contractor LAYNE-WESTERN
Address 25450 HWY 275; VALLEY, NE 68064
Driller D. DEAVER Certification no. 40259

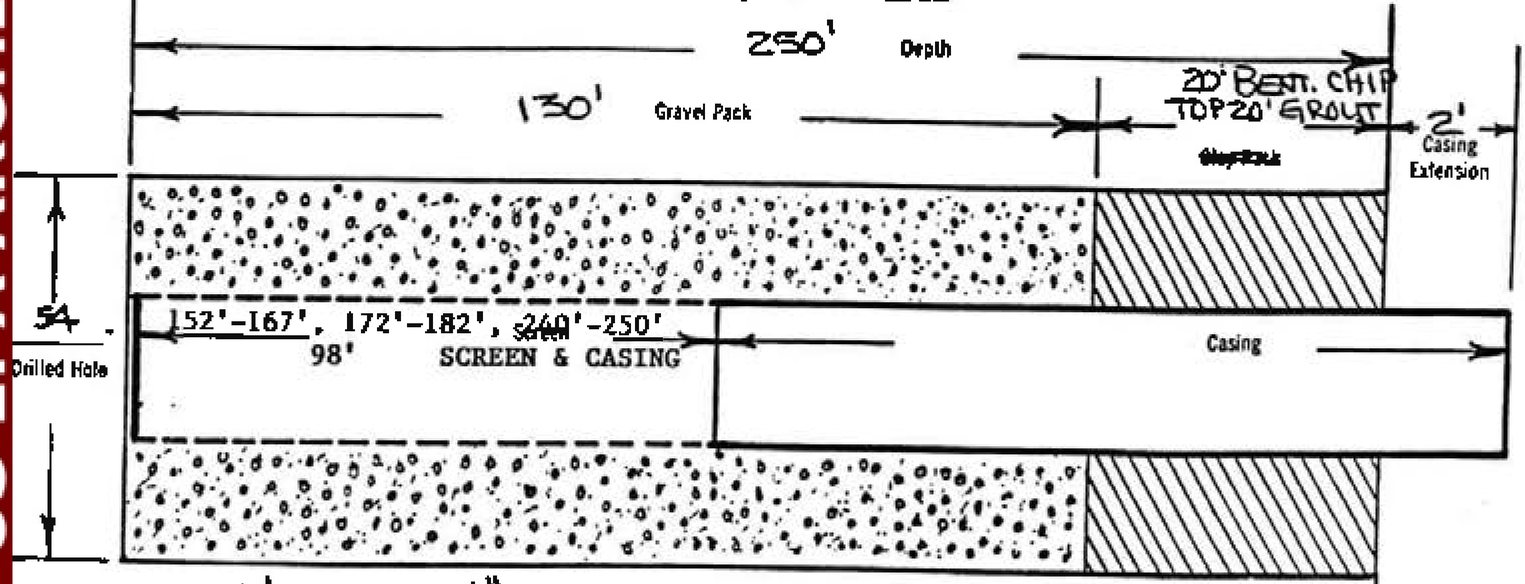
white copy - Iowa DNR, Geological Survey Bureau blue copy - Well Contractor pink copy - Customer yellow copy - County Health Officer

CONTRACT IES UTILITIES, INC. Well No. 6

CONFIDENTIAL BUSINESS INFORMATION

Log of well from ground level:

Feet		Feet	Formation
0	to	8	FILL MATERIAL
8	to	11	TOP SOIL
11	to	18	GRAY CLAY
18	to	22	GRAY SAND AND GRAVEL
22	to	44	BROWN SAND AND GRAVEL WITH COBBLES
44	to	46	SANDY GRAY CLAY
46	to	58	BROWN SAND AND GRAVEL WITH COBBLES
58	to	127	GRAY CLAY WITH COBBLES
127	to	132	SANDY GRAY CLAY - SMALL GRAVEL
132	to	140	SAND WITH SMALL GRAVEL
140	to	152	SANDY GRAY CLAY
152	to	168	GRAY SAND AND GRAVEL
168	to	173	GRAY CLAY WITH COBBLES
173	to	185	GRAY SAND
185	to	192	FINE GRAY SAND
192	to	241	SANDY GRAY CLAY WITH COBBLES
241		252.5	SAND AND GRAVEL
252.5			LIMESTONE, TOTAL DEPTH



NOTE: 54" OUTER CASING GROUTED 0'-63'
20' BENT. CHIP ABOVE GRAVEL PACK
80' SAND, TOP 20' CEMENT GROUTED

Attachment H

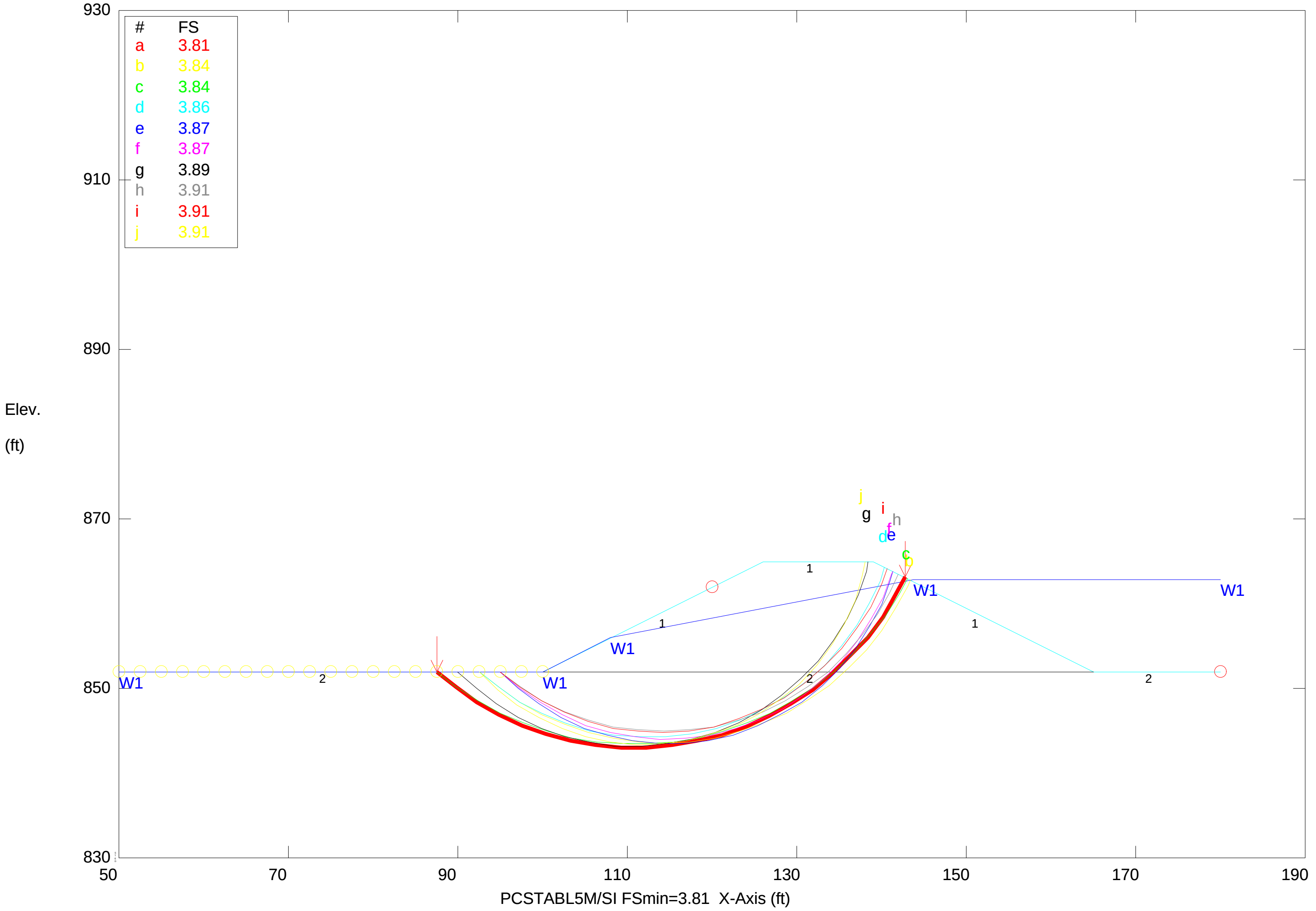
Slope Stability Analyses Results
Ten Most Critical Surfaces Per Analysis
Sutherland Generating Station

Source:
Program pcSTABLE5m/si output by Aether dbs, June, 2011

CONFIDENTIAL BUSINESS INFORMATION

Alliant Energy - Marshalltown, Iowa Static Case

Ten Most Critical. C:MARSH01.PLT By: TCW 06-15-11 4:09pm

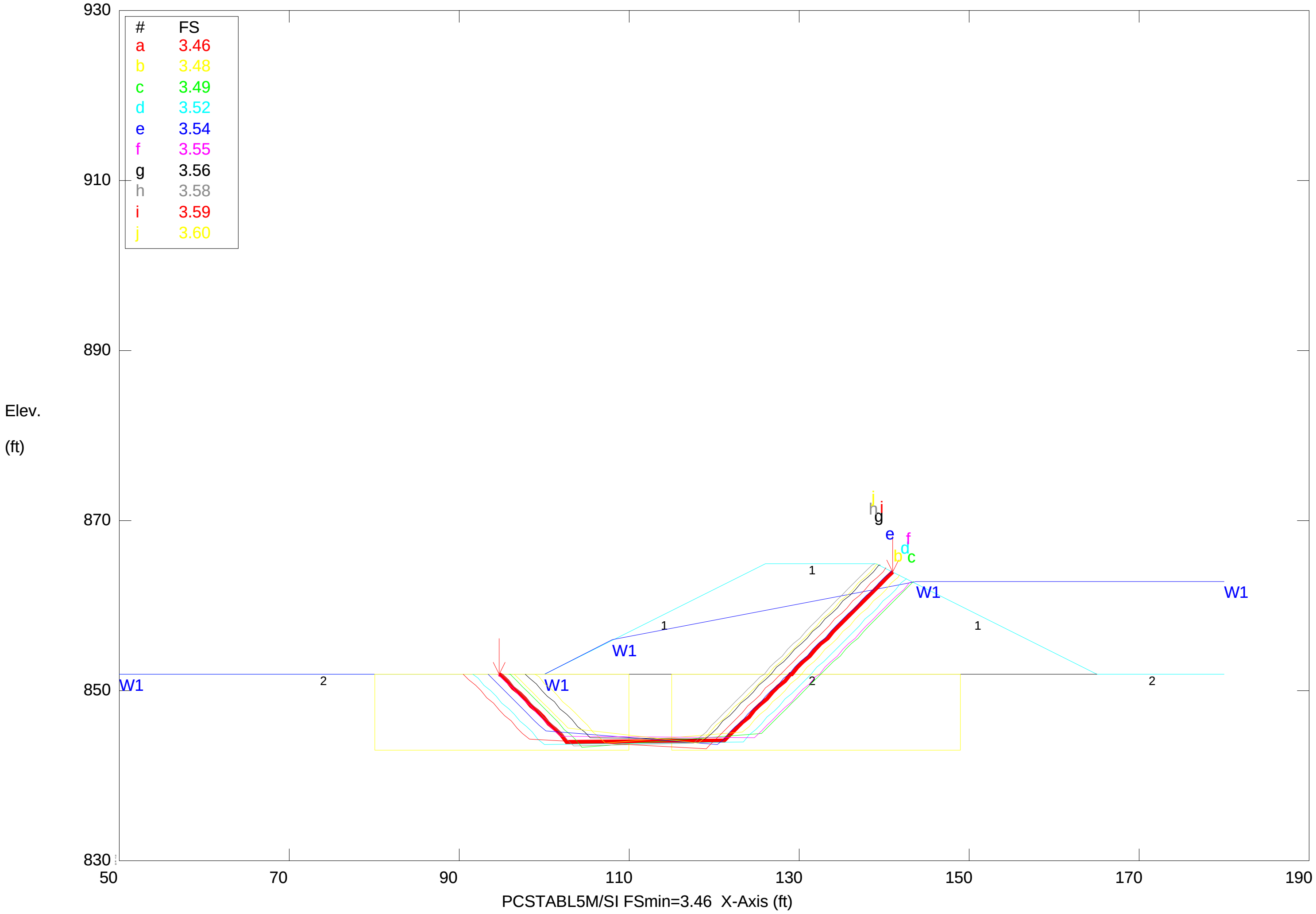


Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	130	130	1250	0	0	0	W1
2 Clay	126	126	1000	0	0	0	W1

CONFIDENTIAL BUSINESS INFORMATION

Alliant Energy - Marshalltown, Iowa Static Case

Ten Most Critical. C:MARSH02.PLT By: TCW 06-15-11 4:18pm

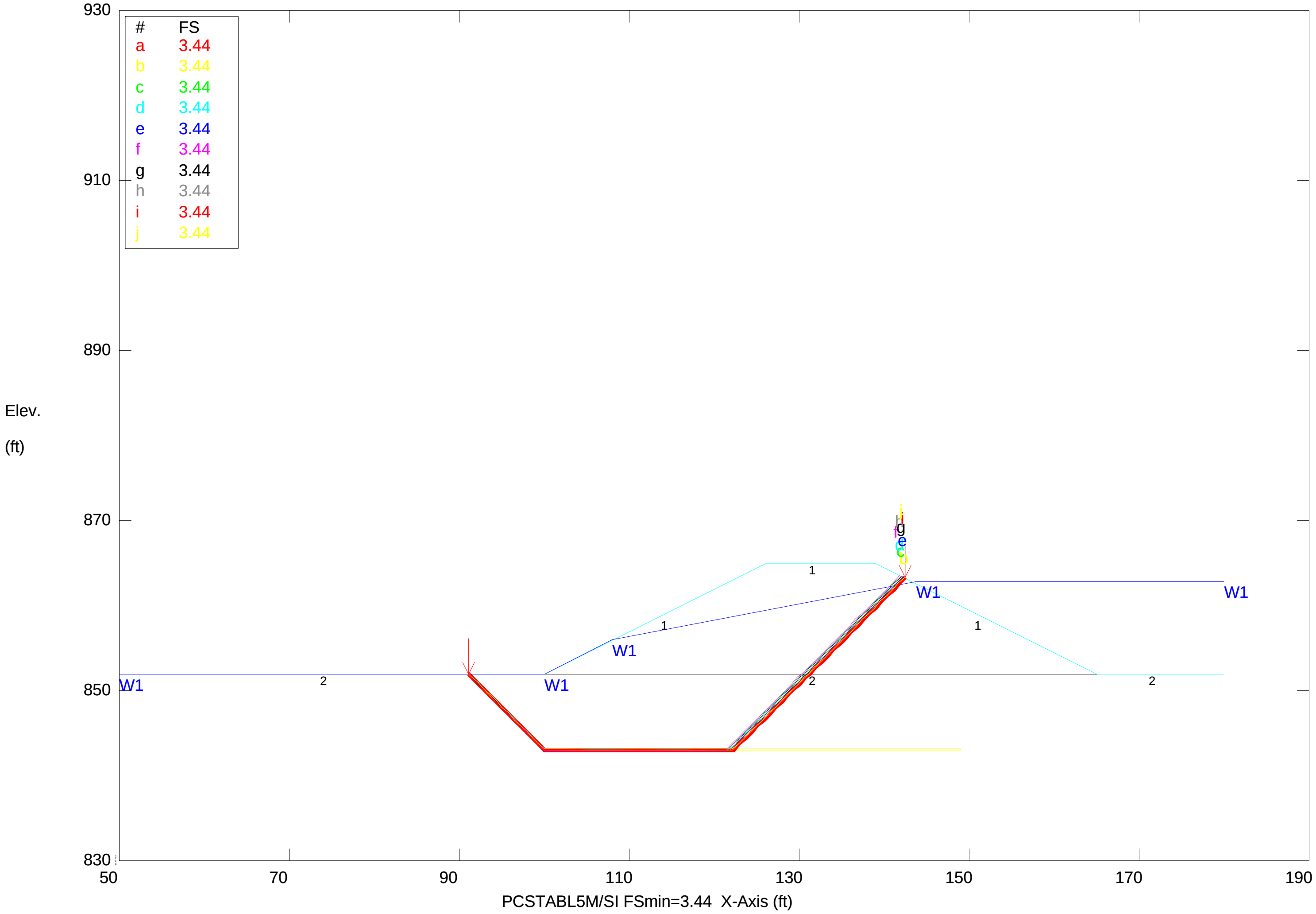


Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	130	130	1250	0	0	0	W1
2 Clay	126	126	1000	0	0	0	W1

CONFIDENTIAL BUSINESS INFORMATION

Alliant Energy - Marshalltown, Iowa Static Case

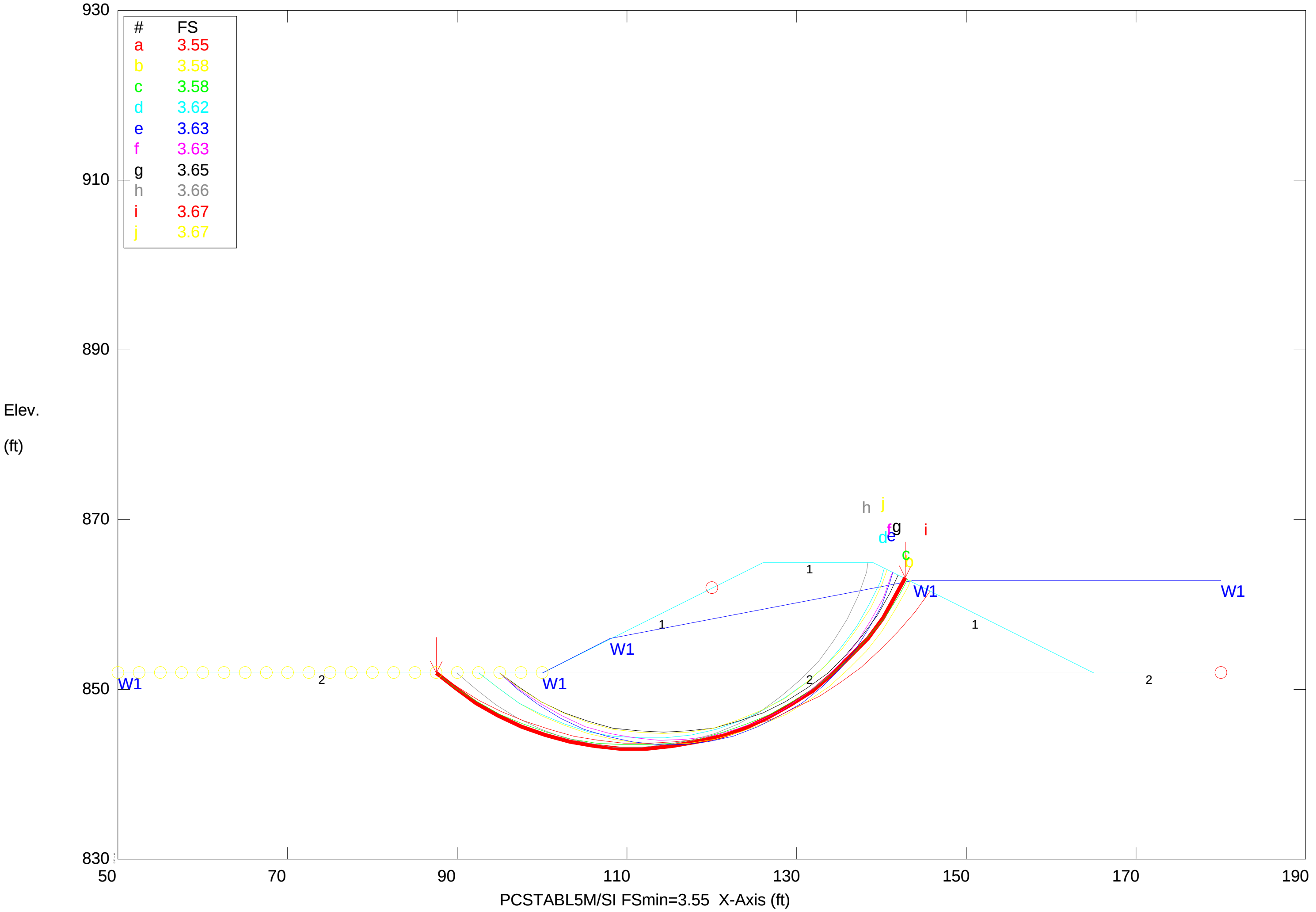
Ten Most Critical. C:MARSH03.PLT By: TCW 06-15-11 4:20pm



Soil Type No.	Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	Dike	130	130	1250	0	0	0	W1
2	Clay	126	126	1000	0	0	0	W1

Alliant Energy - Marshalltown, Iowa Earthquake Case (0.019 & -0.013)

Ten Most Critical. C:MARSH11.PLT By: TCW 06-15-11 4:27pm

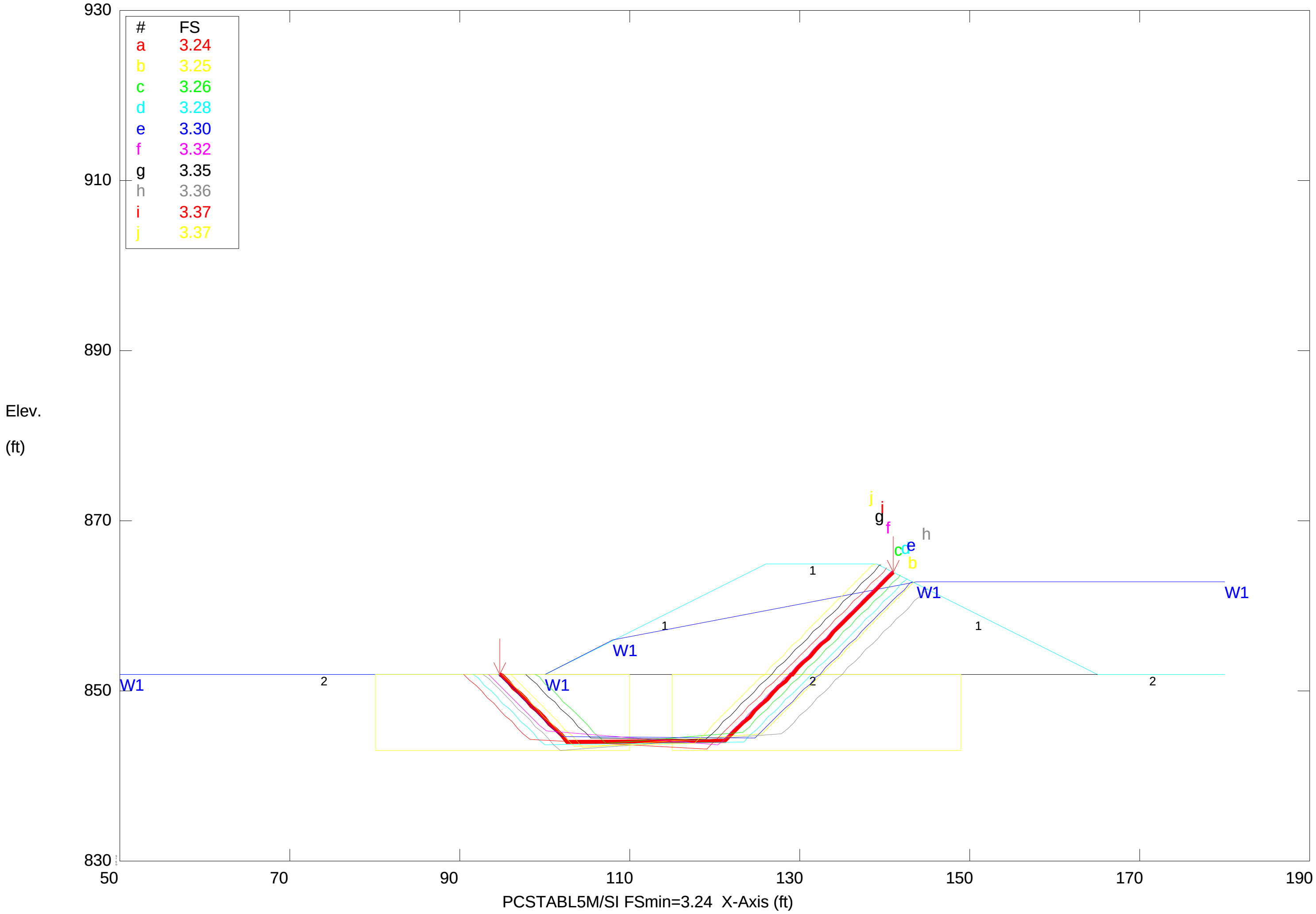


Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	130	130	1250	0	0	0	W1
2 Clay	126	126	1000	0	0	0	W1

CONFIDENTIAL BUSINESS INFORMATION

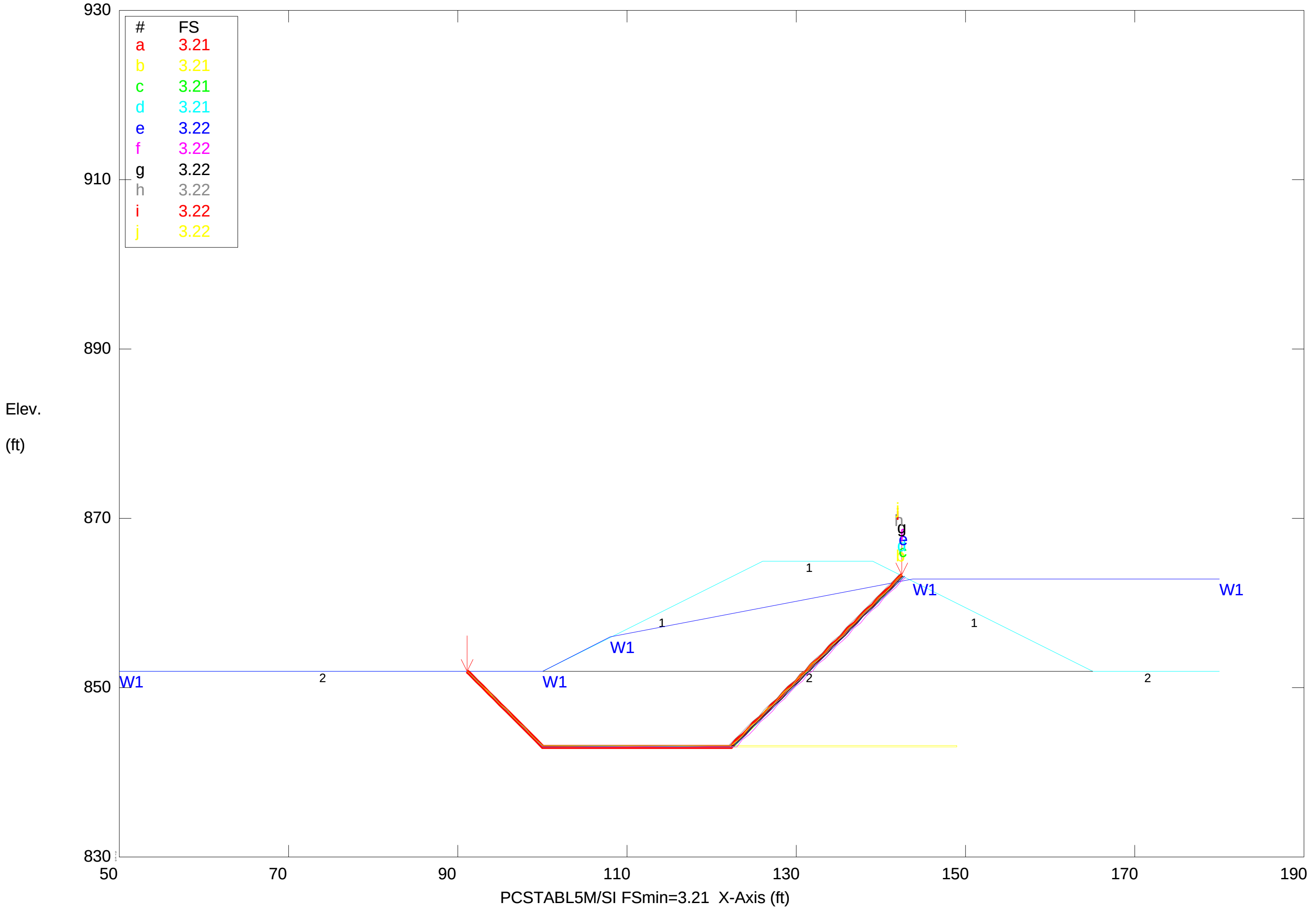
Alliant Energy - Marshalltown, Iowa Earthquake Case (0.019 & -0.013)

Ten Most Critical. C:MARSH12.PLT By: TCW 06-15-11 4:28pm



Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	130	130	1250	0	0	0	W1
2 Clay	126	126	1000	0	0	0	W1

CONFIDENTIAL BUSINESS INFORMATION


Alliant Energy - Marshalltown, Iowa Earthquake Case (0.019 & -0.013)

Ten Most Critical. C:MARSH13.PLT By: TCW 06-15-11 4:29pm

Soil Type No. Label	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 Dike	130	130	1250	0	0	0	W1
2 Clay	126	126	1000	0	0	0	W1