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REPORT ON
PERIODIC STRUCTURAL STABILITY ASSESSMENT
POND 001 – CELL 001
THOMAS HILL ENERGY CENTER
CLIFTON HILL, MISSOURI

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Associated Electric Cooperative, Inc.
Clifton Hill, Missouri

File No. 128064-022
October 2021





HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

15 October 2021
File No. 128064-022

Associated Electric Cooperative, Inc.
Thomas Hill Energy Center
5693 Highway F
Clifton Hill, Missouri 65244

Attention: Mr. Curtis Stundebek
Principal Engineer

Subject: Periodic Structural Stability Assessment
Pond 001 - Cell 001
Thomas Hill Energy Center
Clifton Hill, Missouri

Mr. Stundebek:

Enclosed please find our report on the Periodic Structural Stability Assessment (Assessment) for the Associated Electric Cooperative, Inc. (AECI) Pond 001 - Cell 001 (Cell 001) coal combustion residuals (CCR) Surface Impoundment located at the Thomas Hill Energy Center (THEC) in Clifton Hill, Missouri.

We completed an inspection on behalf of AECI on 21 July 2021 and have completed this assessment as a follow up activity. This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of AECI in accordance with the US Environmental Protection Agency's (EPA's) CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR) §257.73(d).

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Cell 001 surface impoundment and appurtenant structures; 2) visit the site to observe Cell 001; 3) evaluate whether the design, construction, operation, and maintenance of Cell 001 are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our assessment including recommendations and remedial actions.

Associated Electric Cooperative, Inc.

15 October 2021

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Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

A handwritten signature in black ink, appearing to read 'Steven F. Putrich', written over a horizontal line.

Steven F. Putrich, P.E.
Project Principal

Enclosures

**HALEY
ALDRICH**

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1. General

1.1 AUTHORITY

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Associated Electric Cooperative, Inc. (AECI) to perform the Periodic Structural Stability Assessment (Assessment) for the AECI Pond 001 – Cell 001 (Cell 001) coal combustion residuals (CCR) surface impoundment located at Thomas Hill Energy Center (THEC) in Clifton Hill, Missouri. This work was completed in accordance with the US Environmental Protection Agency's (EPA's) CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR) §257.73(d).

This report summarizes the results of our Periodic Structural Stability Assessment for Cell 001, including our 21 July 2021 visual inspection of the unit.

1.2 PURPOSE OF STRUCTURAL STABILITY ASSESSMENT

The purpose of this Structural Stability Assessment was to document whether the design, construction, operation, and maintenance of Cell 001 are consistent with recognized and generally accepted good engineering practices.

The scope of our work consisted of the following: 1) obtain and review readily available reports, investigations, plans and data pertaining to the Cell 001 surface impoundment and appurtenant structures; 2) visit the site to observe Cell 001; 3) evaluate whether the design, construction, operation, and maintenance of Cell 001 are consistent with recognized and generally accepted good engineering practices; and 4) prepare and submit this report presenting the results of our evaluation, including recommendations and remedial actions.

2. Description and Operation of Cell 001

2.1 DESCRIPTION OF CELL 001

Cell 001 is a CCR surface impoundment used for settling and temporary wet storage of bottom ash and boiler slag sluiced from Thomas Hill Units 1 and 2. CCR slurry is pumped from the power plant to the Concrete Dewatering Tank (CDT). Currently, the CDT serves as a pass-through, as it is not fully operational. Once fully operational, the CDT will provide additional settling capacity for influent waters. After initial settling, water and remaining suspended CCR are pumped from the CDT into the northeast corner of Cell 001 through one approximate 15-in. diameter pipe. This flow is then conveyed through Cell 001 until it enters the rectangular concrete decant structure equipped with 60-inch wide wood stop logs, and flow via a 30-in. diameter concrete outlet pipe to a drainage channel which discharges into Cell 003.

It is understood that Cell 001 was originally designed by Burns & McDonnell in 1978-1979 and constructed shortly thereafter. The embankments were constructed from clayey fill obtained from an on-site borrow source. Underlying the embankment fill is naturally deposited stiff clay, which in turn is underlain by stiff shaley clay.

Historically, CCR that settled in Cell 001 were excavated from the impoundment and placed in the high and dry northern portion of Cell 002. The ash was then loaded onto trucks by a contractor who sold it for beneficial re-use. Excess CCR has been placed as mine reclamation.

In 2015, AECl constructed a CCR Processing and Containment Pad to allow continued removal and dewatering of CCR from Cell 001 in compliance with Federal CCR Regulation 40 CFR Part 257 Subpart D. The processing and containment pad was designed to allow removal and dewatering of CCR from Cell 001, with free liquids from the dredged CCR draining back into Cell 001. The construction included a 5-ft high containment berm to prevent CCR and free liquids from migrating outside the pad. Fill for the processing pad and containment berm consisted of clayey fill obtained from on-site borrow sources. The clay fill was keyed into the underlying natural clays, and a 2-ft thick compacted clay liner was placed below the processing and containment pad.

In 2016, Haley & Aldrich, Inc. on behalf of AECl developed an Initial Post-Closure Plan for Cell 001. As part of AECl's plan to close the unit, at the time of inspection, the southern portion of Cell 001 was not receiving any water, and CCR material removal had begun. Upon closure of Cell 001, the CDT unit will serve as the initial settling area for the CCR slurry pumped from the power plant. After initial settling occurs, this water is then pumped into the northeastern corner of Cell 001. This water is then transported through Cell 001, which will allow additional settling time, into the outlet control structure. As a result of this routing, Cell 001 is anticipated to continue receiving the same flow quantities from the power plant.

The Cell 001 impoundment has an area of approximately 1.8 acres based on a normal operating water level of 740.13. Based on a comparison of the most recent survey performed in 2019 to the design bottom of Cell 001, the approximate volume of water and CCR within the unit is 17 acre-ft. Note that Cell 001 was being dewatered during the inspection and water was only present in the northern portion of the unit. Cell 001 has a capacity of approximately 20 acre-ft based on a comparison of elevation 744 (dam low crest elevation) in the 2019 survey to the design bottom of the unit. The Cell 001 embankments are generally 10 ft or less in height, with a crest width generally ranging from 15 to 20 ft.

The containment berm defines the southern edge of the processing and containment pad. Beyond the containment berm, ground surface slopes downward to Cell 002 with a slope height of up to 30 ft.

2.2 OPERATION, MAINTENANCE, AND INSPECTION

Cell 001 and the other cells within Pond 001 system are operated and managed by AECI personnel in accordance with AECI's "Operating and Management Plan" dated December 14, 2012 (Reference 1).

AECI personnel are conducting 7-day and annual inspections of the Cell 001 impoundment in accordance with EPA's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257.83. In addition, the impoundment is inspected following heavy rain events. No instrumentation exists in the dike for the 30-day inspection.

Maintenance of the impoundment includes regular mowing of grass, seeding of thinly vegetated areas, control of woody growth, repair of erosion as needed, and inspection of the drain mechanisms.

Operation includes regular removal and processing of accumulated bottom ash and boiler slag from the impoundment, regulating and monitoring wastewater discharge from the plant to Cell 001, regulating water levels in the cell, and monitoring flow in the drainage channel from Cell 001 to Cell 003.

3. Structural Stability Assessment

3.1 REVIEW OF EXISTING INFORMATION

For this assessment, Haley & Aldrich reviewed multiple sources of information including:

- Report on the Initial Structural Stability Assessment performed by Haley & Aldrich in accordance with 40 CFR §257.73(d), dated October 2016
- Previous Annual Inspections performed by Gredell Engineering Resources in accordance with 40 CFR §257.83
- Weekly inspections performed by AECl
- Operating and Management Plan
- Topographic plans and aerial photos
- Construction drawings
- Subsurface information
- Geotechnical laboratory test results
- Slope stability evaluations
- Correspondence
- Variety of other information in addition to verbal information provided by AECl during our assessment.

Our review included, but was not limited to the references listed in Appendix C.

3.2 SITE VISIT AND FIELD OBSERVATIONS

On 21 July 2021, Haley & Aldrich visited Thomas Hill Energy Center to observe conditions at Cell 001, and to meet with AECl personnel to discuss operations and maintenance of the impoundment. Prior to the site visit, we reviewed previous inspection reports including the above-referenced Initial Structural Stability Assessment, Annual Inspection Report, and previous inspection reports referenced above and listed in Appendix C. At the time of our site visit, Cell 001 was receiving process flows for the Concrete Dewatering Unit (CDT). Water was flowing, in a naturally formed channel, from the inlet pipe in the northeast corner of Cell 001 to the outlet structure in the northwest corner. The south side of Cell 001 was not receiving any water at the time of our inspection.

3.3 STRUCTURAL STABILITY ASSESSMENT

In accordance with 40 CFR §257.73(d), the owner or operator of a CCR surface impoundment must conduct initial and periodic structural stability assessments to determine whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

Haley & Aldrich reviewed the information provided to us and visited the site to observe Cell 001. Based on our review of available information and observations during our 21 July 2021 site visit, we have concluded the following in accordance with 40 CFR §257.73(d):

1. §257.73(d)(1)(i): Stable foundations and abutments.

Based on our review of available subsurface information, design/construction records, investigation reports, impoundment inspection reports, geotechnical laboratory test results, slope stability analyses, and observations during our 21 July 2021 site visit, Cell 001 was judged to have stable foundations. The Cell 001 embankments have not exhibited signs of excessive settlement, instability, or other signs of inadequate foundation support.

2. §257.73(d)(1)(ii): Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown.

The Cell 001 interior slopes are covered with vegetation for the full height of the slopes. Based on observations during our 21 July 2021 site visit, the slope protection on the interior slopes was in good condition and was judged to provide adequate slope protection against surface erosion, wave action and adverse effects from sudden drawdown.

The exterior slopes are well vegetated with grass and were judged to have adequate slope protection.

3. §257.73(d)(1)(iii): Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

Records of the original construction of Cell 001 are not available. However, in 2001, Geotechnology, Inc. drilled three test borings through the Cell 001 embankments and into the underlying natural soils. The test borings indicate that the embankments consist of medium stiff clay fill with varying amounts of sand, gravel, and slag.

During our 21 July 2021 site visit, we observed no evidence of slope instability or other signs of inadequate compaction of the embankment fill. In addition, based on the information reviewed for this Structural Stability Assessment, there has been no historic evidence of slope instability or other signs of inadequate embankment compaction.

Based on our review of the test boring logs and other available information on the Cell 001 embankments, as well as our observations during the 21 July 2021 site visit, we have concluded the fill soils used to construct the Cell 001 embankments were likely mechanically compacted during construction.

4. §257.73(d)(1)(iv): Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike, except for slopes which have an alternate form or forms of slope protection.

At the time of our 21 July 2021 site visit, the grass on the Cell 001 exterior, interior, and downstream slopes were typically 12 to 48 inches in height.

5. §257.73(d)(1)(v)(A): Spillway Erosion Protection – All spillways must be either: (1) Of non-erodible construction and designed to carry sustained flows; or (2) Earth- of grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

The spillway in Cell 001 consists of the concrete decant structure located in the northwest corner of the impoundment. The concrete construction is non-erodible and designed to carry sustained flows.

6. §257.73(d)(1)(v)(B): Spillway Capacity – *The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a: (1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or (2) 1000-year flood for a significant hazard potential CCR surface impoundment; or (3) 100-year flood for a low hazard potential CCR surface impoundment.*

The spillway capacity for the impoundment is required to be modeled and analyzed in accordance with §257.82 Hydrologic and Hydraulic Capacity Requirements for CCR Surface Impoundments. AECl has completed the Initial Inflow Design Flood Control System Plan and it is available on AECl's CCR compliance website. AECl will complete the Periodic Inflow Design Flood Control System Plan requirement under separate cover, consistent with the CCR Rule Preamble reference to the same section.

7. §257.73(d)(1)(vi): Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure.

Cell 001 hydraulic structures include the decant structure and outlet pipe. The rectangular concrete decant structure is located in the northwest corner of the impoundment. Flow entering the decant structure is conveyed through the Cell 001 west embankment via a 30-in. diameter reinforced concrete pipe which discharges to a drainage ditch that flows to Cell 003.

The walkway leading to the structure was overgrown with tall grasses and shrubs. The decant structure has some surface pitting on the concrete and surface rust on some of the metal components but was judged to be in good condition overall.

The 30-inch discharge pipe is buried and is only visible for a few feet at each end of the pipe. There are no signs of ground settlement above or around the pipe. No sediment or debris were observed at either end of the outlet pipe.

8. §257.73(d)(1)(vii): For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.

There are no natural water bodies in the vicinity of Cell 001. Cell 002 exists immediately to the south of Cell 001 with normal operating levels below the elevation of the Cell 001 slope. The drainage channel west and southwest of Cell 001 that conveys flow from Cell 001 to Cell 003 also conveys other plant process water and coal pile runoff. Flow to this channel is controlled by the power plant, and their elevations and flow capacities prevent them from inundating the downstream slopes of Cell 001. As a result, inundation of the Cell 001 downstream slopes is not likely, and no rapid drawdown potential exists.

9. §257.73(d)(2): *Identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures.*

See Section 4 of this report for a discussion of deficiencies and recommendations.

4. Impoundment Inspection Assessment and Recommendations

4.1 ASSESSMENT

The following deficiencies were observed at the Cell 001 Impoundment:

1. Tall vegetation up to 4 feet high on upstream slopes.
2. Grass and shrubs several feet high growing in front of entrance to the outlet control structure walkway.
3. Ruts and puddles observed in aggregate surface on east crest of cell.
4. Tall vegetation up to 4 feet high on north and west downstream slopes.
5. Woody vegetation observed in southeast corner of Cell 001 along the downstream slope.
6. Vegetation observed to be up to greater than 1 foot along south embankment.
7. Previous inspections noted a seep on the downstream slope of Cell 001; however, this seep was not present during the 21 July 2021 site inspection.
8. A staff gage is not present for ACEI to regularly document the water level in the unit.

4.2 RECOMMENDATIONS

Haley & Aldrich recommends the following remedial measures:


1. Tall vegetation – Cut vegetation and maintain at the required maximum height per the regulations. Maintain in a manner to reduce and control woody vegetation.
2. Tall vegetation – Cut vegetation and maintain at the required maximum height per the regulations. Maintain in a manner to reduce and control woody vegetation.
3. Ruts and Puddles – Monitor the area and fill eroded areas with additional aggregate material to prevent further degradation of the surface if necessary.
4. Tall vegetation – Cut vegetation and maintain at the required maximum height per the regulations. Maintain in a manner to reduce and control woody vegetation.
5. Woody Vegetation – Remove woody vegetation encroaching on embankments to prevent degradation of the embankment.
6. Tall vegetation – Cut vegetation and maintain at the required maximum height per the regulations. Maintain in a manner to reduce and control woody vegetation.
7. Downstream slope seep – Continue to monitor the area for any changes.

8. Staff gage – Install staff gage to document water level in unit.

5. Conclusions/Certification

Based on our review of the information provided to us and observations during our 21 July 2021 site visit, it is our opinion that the design, construction, operation, and maintenance of Pond 001 – Cell 001 at Thomas Hill Energy Center is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded in Cell 001.

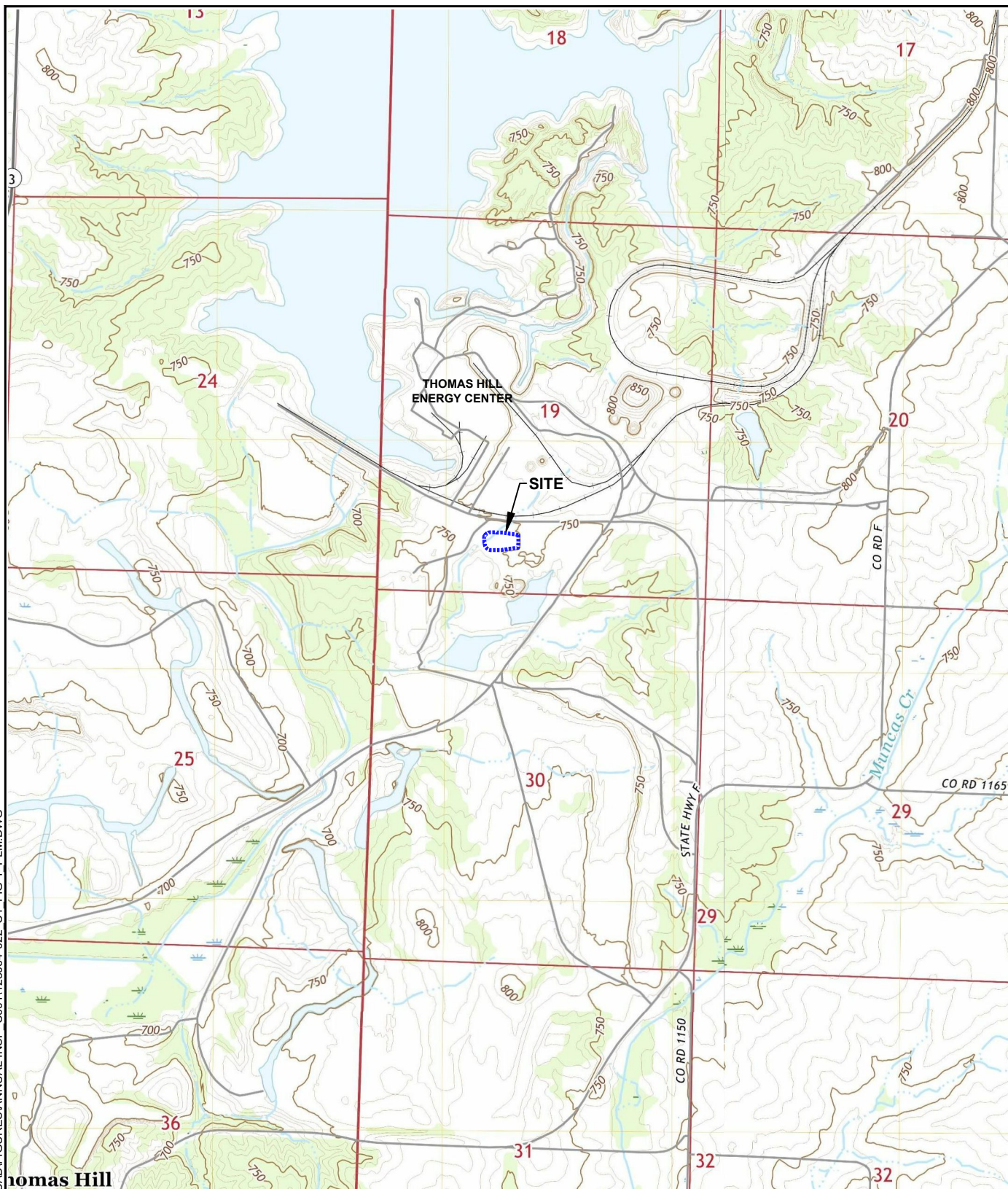
I certify that the Periodic Structural Stability Assessment for AECI's Pond 001 – Cell 001 at the Thomas Hill Energy Center was conducted in accordance with the requirements of §257.73(d) of the USEPA's CCR Rule.

Signed: 
Certifying Engineer

Print Name: Steven F. Putrich
Missouri License No.: 2014035813
Title: Project Principal
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal:





MAP SOURCE:
PRAIRIE HILL AND COLLEGE MOUND QUADRANGLES
MISSOURI, 7.5-MINUTE SERIES, 2021



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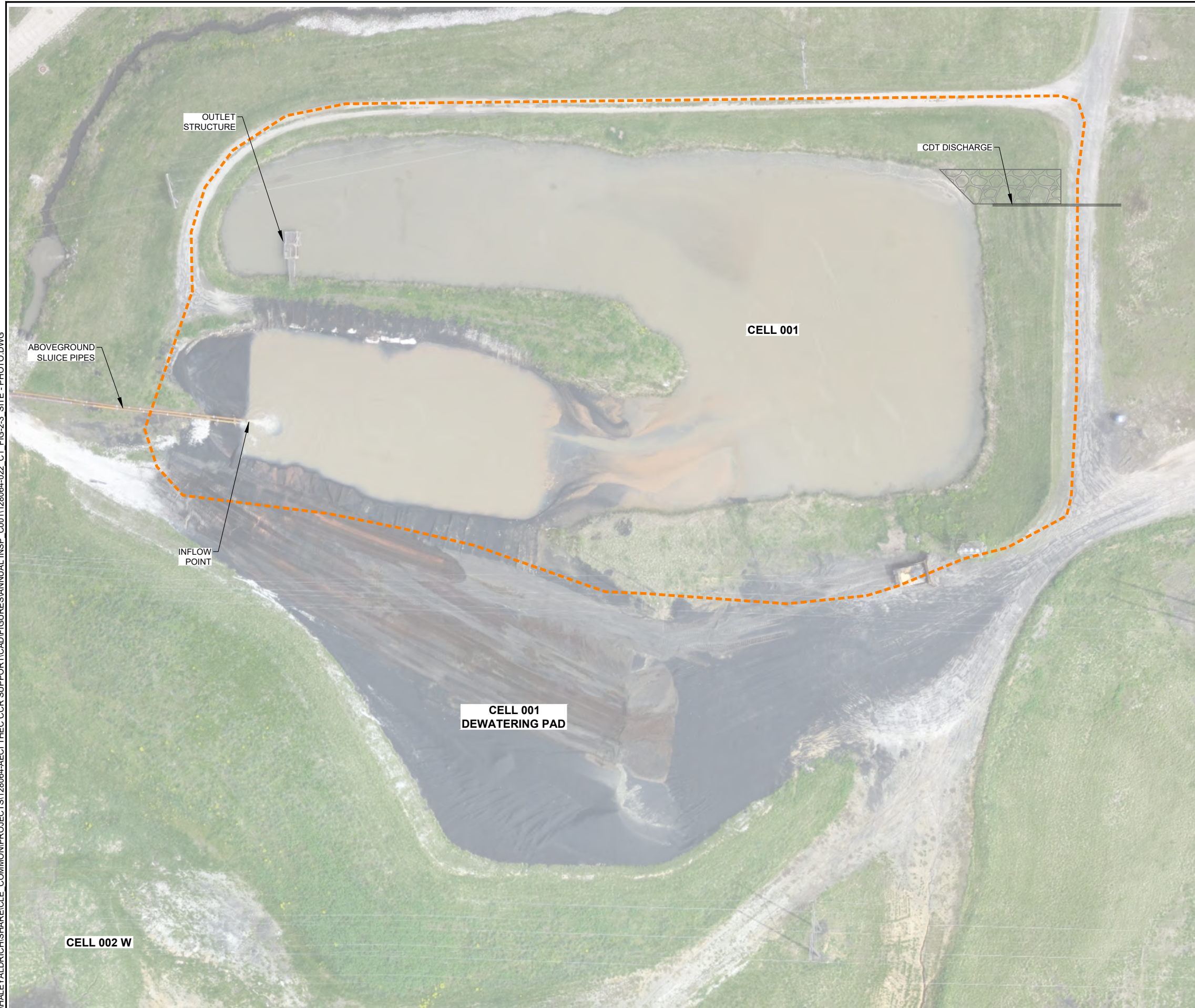
ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER - CELL 001
CLIFTON HILL, MISSOURI

PROJECT LOCATION MAP

APPROXIMATE SCALE: 1IN = 2000 FT
AUGUST 2021

FIGURE 1

VARI, KATALIN
\\HALEYALDRICH\SHARE\EGLE_COMMON\PROJECTS\128064-AECI\THEC CCR SUPPORT\CAD\FIGURES\ANNUAL INSP_C001128064-022_C1_FIG-2-3_SITE - PHOTO.DWG
Printed: 8/20/2021 5:11 PM Layout: FIGURE 2

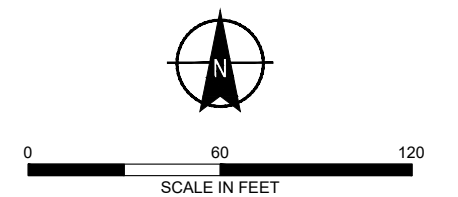


LEGEND

--- APPROXIMATE LIMITS OF CELL

NOTES

1. AERIAL IMAGE FROM HAMPTON, LENZINI, AND RENWICK, INC. (HLR), DATED MAY 08, 2019.
2. LIMITS OF THE PONDS BASED ON EXISTING TOPOGRAPHY FROM ASSOCIATED ELECTRIC COOPERATIVE, INC. DATED AUGUST 2016. HORIZONTAL CONTROL IS BASED ON NAD83 ZONE 15N. VERTICAL CONTROL IS BASED ON NAVD88.



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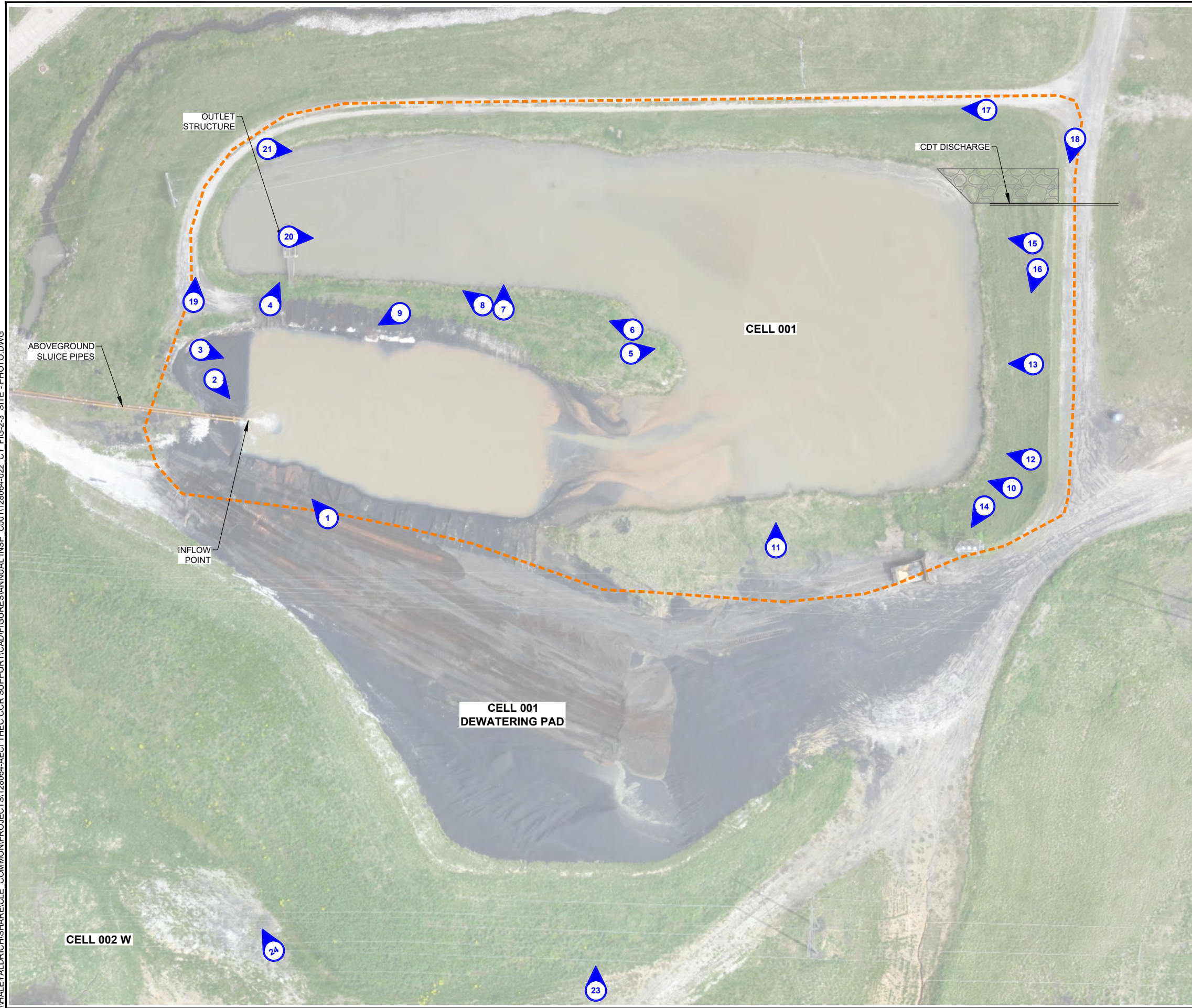
ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER - CELL 001
CLIFTON HILL, MISSOURI

SITE PLAN

SCALE: AS SHOWN
AUGUST 2021

FIGURE 2

VARI, KATALIN
\\HALEYALDRICH\SHARE\CCLE_COMMON\PROJECTS\128064-AECI\THEC CCR SUPPORT\CAD\FIGURES\ANNUAL INSP_C001128064-022_C1_FIG-2-3_SITE - PHOTO.DWG
Printed: 8/20/2021 5:11 PM Layout: FIGURE 3

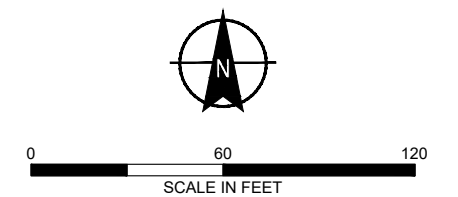


LEGEND

- APPROXIMATE LIMITS OF CELL
- 1 PHOTO LOCATION/DIRECTION

NOTES

1. AERIAL IMAGE FROM HAMPTON, LENZINI, AND RENWICK, INC. (HLR), DATED MAY 08, 2019.
2. LIMITS OF THE PONDS BASED ON EXISTING TOPOGRAPHY FROM ASSOCIATED ELECTRIC COOPERATIVE, INC. DATED AUGUST 2016. HORIZONTAL CONTROL IS BASED ON NAD83 ZONE 15N. VERTICAL CONTROL IS BASED ON NAVD88.



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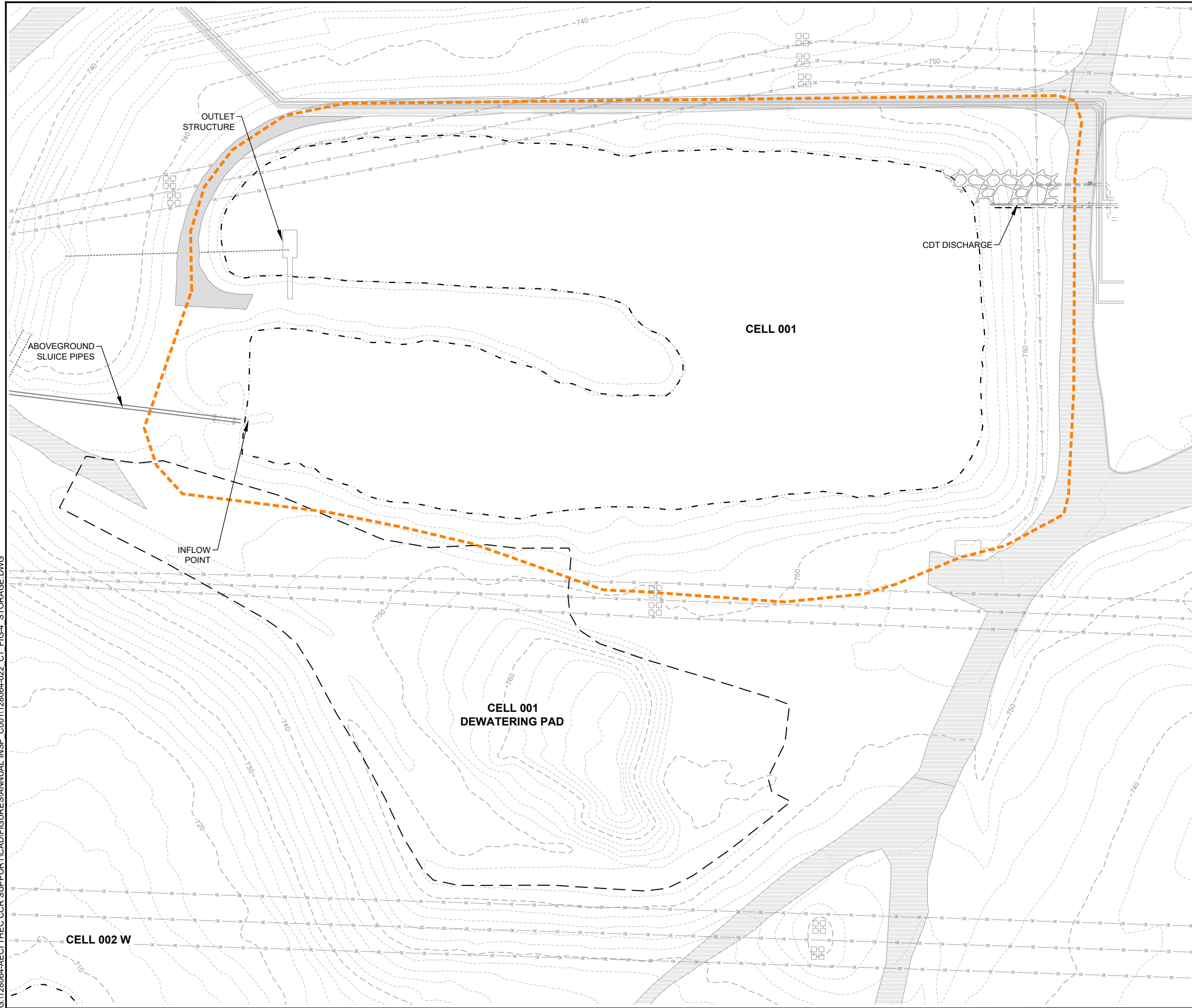
ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER - CELL 001
CLIFTON HILL, MISSOURI

PHOTO LOCATION PLAN

SCALE: AS SHOWN
AUGUST 2021

FIGURE 3

LUCAS, ANDY
G:\128064-AECI\THEC CCR SUPPORT\CAD\FIGURES\ANNUAL INSP_C001\128064-022_C1 FIG-4 STORAGE.DWG
Printed: 9/15/2021 8:09 AM Layout: FIGURE 4



LEGEND

----- APPROXIMATE LIMITS OF CELL

NOTES

1. SURVEY BY HAMPTON, LENZINI, AND RENWICK, INC., (HLR) DATED 8 MAY 2019.
2. LIMITS OF THE PONDS BASED ON EXISTING TOPOGRAPHY FROM ASSOCIATED ELECTRIC COOPERATIVE, INC. DATED AUGUST 2016. HORIZONTAL CONTROL IS BASED ON NAD83 ZONE 15N. VERTICAL CONTROL IS BASED ON NAVD88.

TOTAL STORAGE CAPACITY: 20 AC-FT

VOLUME BETWEEN THE 1984 DESIGN BOTTOM OF THE UNIT AND ELEVATION 744' (MINIMUM CREST ELEVATION OF DAM).

IMPOUNDED WATER AND CCR VOLUME: 17 AC-FT

VOLUME BETWEEN THE 1984 DESIGN BOTTOM OF THE UNIT AND ELEVATION 740.13' (NORMAL WATER LEVEL). NOTE AECI IS IN THE PROCESS OF DEWATERING THE UNIT FOR FUTURE CLOSURE. AT THE TIME OF THE INSPECTION, WATER WAS PRESENT WITHIN THE NORTHERN PORTION OF THE UNIT.



0 60 120
SCALE IN FEET

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ANNUAL CCR SURFACE IMPOUNDMENT PE INSPECTION
ASSOCIATED ELECTRIC COOPERATIVE, INC.
THOMAS HILL ENERGY CENTER - CELL 001
CLIFTON HILL, MISSOURI

**STORAGE CAPACITY AND
IMPOUNDED CCR AND WATER
VOLUMES**

SCALE: AS SHOWN
AUGUST 2021

FIGURE 4

APPENDIX A

Photographs



Photo No. 1
Overview historic inlet pipe southwest corner of pond



Photo No. 2
Historic inlet pipe southwest corner of pond facing south



Photo No. 3

Overview of south side of pond from southwest corner of finger dike



Photo No. 4

Tall vegetation around outlet control structure



Photo No. 5

Tall vegetation in foreground at northeast corner of finger dike
Inlet pipe from CDT in background



Photo No. 6

Tall vegetation along finger dike north embankment



Photo No. 7
Tall vegetation on north upstream slope of pond



Photograph No. 8
Overview of north side of pond from northeast corner of finger dike



Photo No. 9
Overview of CCR removal from southwest corner of pond



Photo No. 10
Tall vegetation along southeast upstream embankment



Photo No. 11
Overview of east side of pond and end of finger dike from south embankment



Photo No. 12
Sign labeling Pond 001 – Cell 001



Photo No. 13
Overview of pond from east embankment



Photo No. 14
Tall woody vegetation in southeast embankment



Photo No. 15
Discharge pipes from CDT at northeast corner of Cell 001



Photo No. 16
Vegetation exceeding 1 ft along east upstream embankment



Photo No. 17
Above ground utility lines along top of north embankment



Photo No. 18
Aggregate top of east embankment



Photo No. 19

Vegetation greater than 1 ft along west embankment downstream slope



Photo No. 20

Tall vegetation along north slope of finger dike
View from outlet control structure facing east



Photo No. 21
Tall vegetation along north upstream embankment



Photo No. 22
Aggregate road rutting and potholes



Photo No. 23
Typical vegetation on embankment downstream slope



Photo No. 24
Embankment downstream area
Cell 002 at left

\\haleyaldrich.com\share\cle_common\Projects\128064-AECI THEC CCR Support\022 Cells 001 003 004 Compliance Update\Structural Stability Assessment\Cell 001\Appendices\App-A\2021-0806-Cell 001 Appendix A-Photos-D1.docx
G:\129778 - Westar_CCR Support\047 - JEC BASA CCR Compliance Update\2021-0730 Appendix A-Photos-D2.docx

APPENDIX B

Inspection Checklist

DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Pond 1 - Cell 001</u>	STATE ID #: <u>MO-0097675</u>
REGISTERED: (YES/NO) <u>No</u>	NID ID #: <u>N/A</u>
STATE SIZE CLASSIFICATION: <u>N/A</u>	STATE HAZARD CLASSIFICATION: <u>Low</u>
	CHANGE IN HAZARD CLASSIFICATION REQUESTED?: (YES/NO) _____
<u><i>DAM LOCATION INFORMATION</i></u>	
CITY/TOWN: <u>Clifton Hill</u>	COUNTY/STATE: <u>Randolph / Missouri</u>
DAM LOCATION: <u>5693 Highway F, Clifton Hill, Missouri</u> (street address if known)	ALTERNATE DAM NAME: <u>N/A</u>
USGS QUAD.: <u>College Mound, MO & Prairie Hill, MO</u>	LAT.: <u>39°32.8' N</u> LONG.: <u>92°38.2' W</u>
DRAINAGE BASIN: <u>N/A</u>	RIVER: _____
IMPOUNDMENT NAME(S): <u>Cell 001</u>	
<u><i>GENERAL DAM INFORMATION</i></u>	
TYPE OF DAM: <u>Earthen Incised and Bermed</u>	OVERALL LENGTH (FT): <u>1500</u>
PURPOSE OF DAM: <u>Sedimentation and Storage Basin</u>	NORMAL POOL STORAGE (ACRE-FT): <u>17</u>
YEAR BUILT: <u>1980's</u>	MAXIMUM POOL STORAGE (ACRE-FT): <u>20</u>
STRUCTURAL HEIGHT (FT): <u>10</u>	EL. NORMAL POOL (FT): <u>740.1</u>
HYDRAULIC HEIGHT (FT): <u>8</u>	EL. MAXIMUM POOL (FT): <u>744.0</u>
RESERVOIR SURFACE AREA (ACRES): <u>3</u>	WINTER DRAWDOWN (FT BELOW NORMAL POOL) <u>0.0</u>
PUBLIC ROAD ON CREST: <u>No</u>	DRAWDOWN VOL. (AC-FT) <u>0.0</u>
PUBLIC BRIDGE OVER SPILLWAY: <u>No</u>	

NAME OF DAM: <u>Pond 1 - Cell 001</u>	STATE ID #: <u>MO-0097675</u>	
INSPECTION DATE: <u>July 21, 2021</u>	NID ID #: <u>N/A</u>	
<u><i>INSPECTION SUMMARY</i></u>		
DATE OF INSPECTION: <u>July 21, 2021</u>	DATE OF PREVIOUS INSPECTION: <u>August 28, 2020</u>	
TEMPERATURE/WEATHER: <u>Sunny, 78</u>	ARMY CORPS PHASE I: No (YES/NO) If YES, date _____	
CONSULTANT: <u>Haley & Aldrich, Inc.</u>	PREVIOUS ALT. PHASE I: No (YES/NO) If YES, date _____	
BENCHMARK/DATUM: <u>NAVD88</u>		
OVERALL PHYSICAL CONDITION OF DAM: <u>Satisfactory</u>	DATE OF LAST REHABILITATION: <u>N/A</u>	
SPILLWAY CAPACITY: <u>N/A</u>		
EL. POOL DURING INSP.: <u>734.9</u>	EL. TAILWATER DURING INSP.: _____	
<u><i>PERSONS PRESENT AT INSPECTION</i></u>		
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>
Andy Lucas	Senior Engineer	Haley & Aldrich, Inc.
Matthew Krakora	Staff Engineer	Haley & Aldrich, Inc.
Curtis Stundebeck	Principal Engineer	AECI - Thomas Hill Energy Center

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>	
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>	
OWNER:	ORGANIZATION	CARETAKER:	ORGANIZATION
	<u>AECI - Thomas Hill Energy Center, Inc.</u>		<u>AECI - Thomas Hill Energy Center, Inc.</u>
	NAME/TITLE		NAME/TITLE
	<u>Jenny Jones</u>		<u>Curtis Stundebek</u>
	STREET		STREET
	<u>5693 Highway F</u>		<u>5693 Highway F</u>
	TOWN, STATE, ZIP		TOWN, STATE, ZIP
	<u>Clifton Hill, Missouri 65244</u>		<u>Clifton Hill, Missouri 65244</u>
	PHONE		PHONE
	_____		_____
	EMERGENCY PH. #		EMERGENCY PH. #
	_____		_____
	FAX		FAX
	_____		_____
	EMAIL		EMAIL
	<u>jjones@aeci.org</u>		<u>cstundebek@aeci.org</u>
	OWNER TYPE		
	<u>Private</u>		
PRIMARY SPILLWAY TYPE		<u>Decant Structure</u>	
SPILLWAY LENGTH (FT)		<u>N/A</u>	
AUXILIARY SPILLWAY TYPE		<u>N/A</u>	
NUMBER OF OUTLETS		<u>One</u>	
TYPE OF OUTLETS		<u>One decant</u>	
DRAINAGE AREA (SQ MI)		<u>0.01</u>	
HAS DAM BEEN BREACHED OR OVERTOPPED? (YES/NO):		<u>No</u>	
FISH LADDER (LIST TYPE IF PRESENT)		<u>No</u>	
DOES CREST SUPPORT PUBLIC ROAD? (YES/NO)		<u>No</u>	
PUBLIC BRIDGE WITHIN 50' OF DAM? (YES/NO):		<u>No</u>	
		IF YES, PROVIDE DATE(S) _____	
		IF YES, ROAD NAME: _____	
		IF YES, ROAD/BRIDGE NAME: _____	
		MHD BRIDGE NO. (IF APPLICABLE) _____	

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
EMBANKMENT (CREST)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Aggregate, bottom ash, and grassy vegetation	X		
	2. SURFACE CRACKING	None observed	X		
	3. SINKHOLES, ANIMAL BURROWS	None observed	X		
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	None observed	X		
	5. HORIZONTAL ALIGNMENT	None observed	X		
	6. RUTS AND/OR PUDDLES	Evidence of rutting on aggregate surface		X	
	7. VEGETATION (PRESENCE/CONDITION)	Mowed grass	X		
	8. ABUTMENT CONTACT	N/A	X		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>Juy 21, 201</u>		NID ID #: <u>N/A</u>			
EMBANKMENT (D/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	None observed	X		
	2. SEEPAGE	None observed		X	
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. SINKHOLE/ANIMAL BURROWS	None observed	X		
	6. EROSION	None observed	X		
	7. UNUSUAL MOVEMENT	None observed	X		
	8. VEGETATION (PRESENCE/CONDITION)	Vegetation consist of grass and brush up to 4 ft tall			X
		Tall woody vegetation along southeast embankment			X
ADDITIONAL COMMENTS: <u>Seepage was not present during inspection, but has been noted on downstream slope during previous inspections.</u> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; height: 15px; margin-top: 5px;"></div>					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
EMBANKMENT (U/S SLOPE)					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	None observed	X		
	2. SLOPE PROTECTION TYPE AND COND.	None, exposed ash	X		
	3. SINKHOLE/ANIMAL BURROWS	None observed	X		
	4. EMB.-ABUTMENT CONTACT	N/A	X		
	5. EROSION	None observed	X		
	6. UNUSUAL MOVEMENT	None observed	X		
	7. VEGETATION (PRESENCE/CONDITION)	Vegetation consist of grass and brush up to 4 ft tall			X
ADDITIONAL COMMENTS: <u>Slope steeper than 3:1 in portions of upstream embankments</u> <div style="border: 1px solid black; height: 100px; width: 100%; margin-top: 5px;"></div>					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
INSTRUMENTATION					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	Piezometers observed along downstream area	X		
	2. OBSERVATION WELLS	Wells observed along downstream area	X		
	3. STAFF GAGE AND RECORDER	None observed	X		
	4. WEIRS	None observed	X		
	5. INCLINOMETERS	None observed	X		
	6. SURVEY MONUMENTS	None observed	X		
	7. DRAINS	None observed	X		
	8. FREQUENCY OF READINGS	Quarterly	X		
	9. LOCATION OF READINGS	AECT's operating record	X		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
DOWNSTREAM AREA					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	N/A			
	2. FOUNDATION SEEPAGE	None observed	X		
	3. SLIDE, SLOUGH, SCARP	None observed	X		
	4. WEIRS	N/A	X		
	5. DRAINAGE SYSTEM	N/A	X		
	6. INSTRUMENTATION	N/A	X		
	7. VEGETATION	Vegetation exceeding 6-in. Ground surface not visible in areas.			X
	8. ACCESSIBILITY	Gravel access road along crest and to Cell 002/toe of Cell 001 downstram slope	X		
ADDITIONAL COMMENTS: _____ _____ _____ _____					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
PRIMARY SPILLWAY					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
SPILLWAY	SPILLWAY TYPE	Decant structure	X		
	WEIR TYPE	Wood stoplogs in decant structure	X		
	SPILLWAY CONDITION	Fair	X		
	TRAINING WALLS	None observed	X		
	SPILLWAY CONTROLS AND CONDITION	None observed	X		
	UNUSUAL MOVEMENT	None observed	X		
	APPROACH AREA	Fair. Heavy grass and shrub coverage.			X
	DISCHARGE AREA	Fair	X		
	DEBRIS	None observed	X		
	WATER LEVEL AT TIME OF INSPECTION	734.9	X		
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Pond 1 - Cell 001</u>		STATE ID #: <u>MO-0097675</u>			
INSPECTION DATE: <u>July 21, 2021</u>		NID ID #: <u>N/A</u>			
OUTLET WORKS					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
OUTLET WORKS	TYPE	Outlet pipe inspected at downstream end	X		
	INTAKE STRUCTURE	Decant structure with stoplogs	X		
	TRASHRACK	N/A	X		
	PRIMARY CLOSURE	N/A	X		
	SECONDARY CLOSURE	N/A	X		
	CONDUIT	N/A	X		
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG TOE OF DAM	None observed	X		
	SEEPAGE/LEAKAGE	None observed	X		
	DEBRIS/BLOCKAGE	None observed	X		
	UNUSUAL MOVEMENT	None observed	X		
	DOWNSTREAM AREA	Vegetation exceeding 6-in. Ground surface not visible in areas.			
	MISCELLANEOUS				
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: Pond 1 - Cell 001STATE ID #: MO-0097675INSPECTION DATE: July 21, 2021NID ID #: N/A**UNDERLYING HYDRAULIC STRUCTURES/PIPES**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
UNDERLYING HYDRAULIC STRUCTURES /PIPES	TYPE	Not observed	X		
	INLET				
	CONDUIT				
	OUTLET STRUCTURE/HEADWALL	Fair	X		
	EROSION ALONG STRUCTURE	None present	X		
	SEEPAGE/LEAKAGE	None present	X		
	DEBRIS/BLOCKAGE	None present	X		
	UNUSUAL MOVEMENT				
	DOWNSTREAM AREA				
	MISCELLANEOUS				

ADDITIONAL COMMENTS: Outlet pipe was inspected on downstream end in ditch.

APPENDIX C

References

References

1. Haley & Aldrich, Inc., "Initial Periodic Structural Stability Assessment, Pond 001 – Cell 001," dated October 17, 2016.
2. Gredell Engineering Resources, Inc., "Report: Pond 001, Cell 1 Professional Engineering Annual Inspection of CCR Impoundment," dated 2017, 2018, 2019, and 2020.
3. Burns & McDonnell, Various Construction Drawings, dated 1979 and 1984.
4. GEI Consultants, "Specific Site Assessment for Coal Combustion Waste Impoundments at Thomas Hill Energy Center," dated June 2011.
5. Gredell Engineering Resources, Inc., "Project #3 – CCR Processing Pad & Containerization, Pond 001 Cell 1 – 2015, Project Description and Specifications," dated September 9, 2015.
6. Gredell Engineering Resources, Inc., "Pond 001 Cell 1 CCR Processing Pad" Design and Construction Summary Report, dated December 2015.
7. Geotechnology, Inc., "Slope Stability and Seepage Analysis, Slag Dewatering Basin, Thomas Hill Energy Center," dated February 3, 2012.