REPORT

D.E. Karn Generating Facility
Bottom Ash Impoundment
2019 Annual Surface Impoundment Inspection Report

Essexville, Michigan
Pursuant to 40 CFR 257.83

Submitted to:

Consumers Energy Company
1945 W. Parnall Road
Jackson, Michigan, USA 49201

Submitted by:

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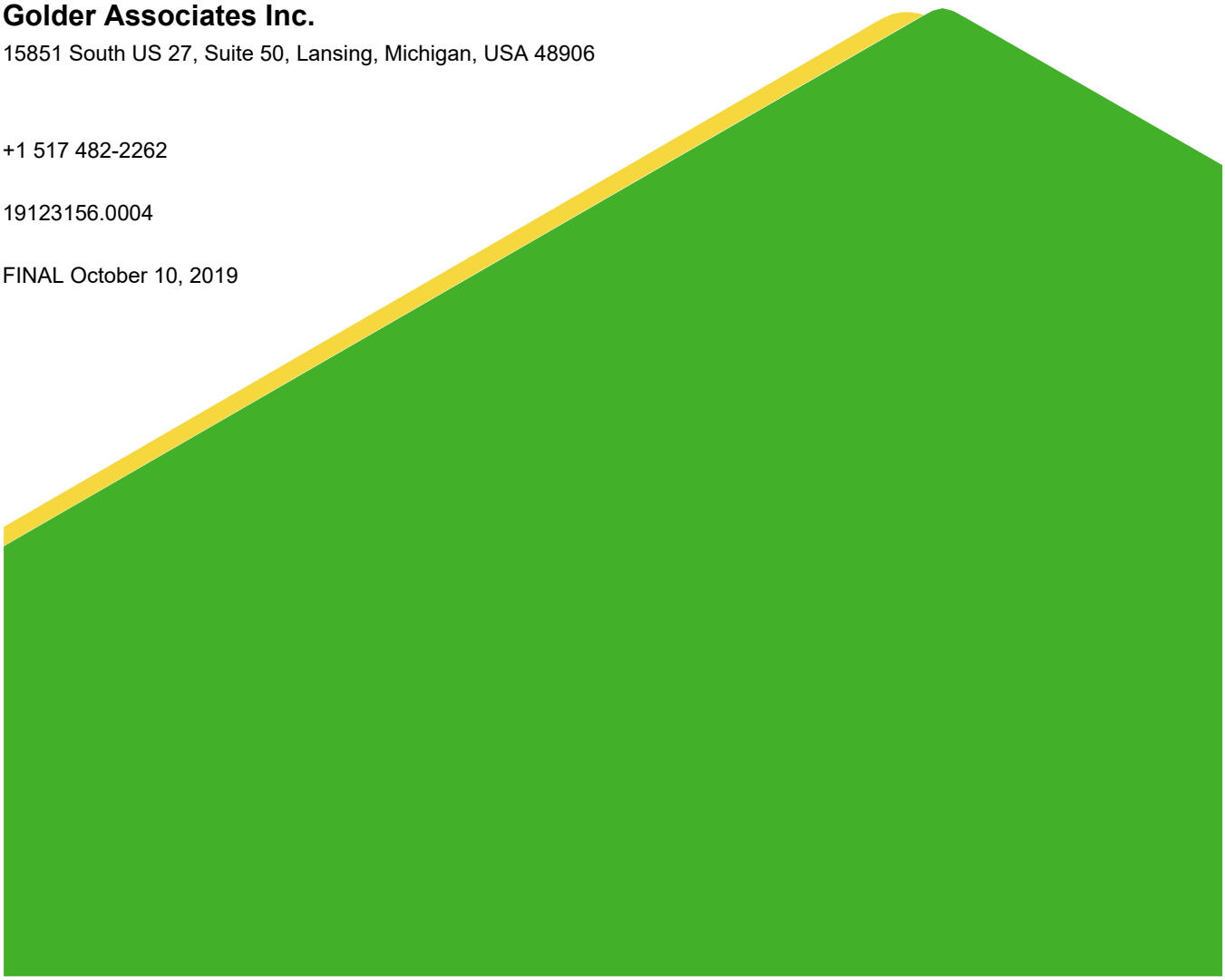


Certifications

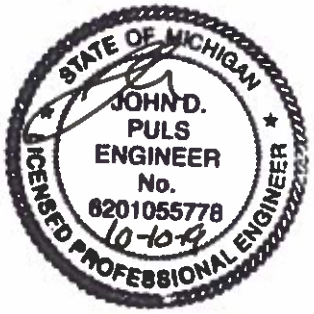
Professional Engineer Certification Statement [40 CFR 257.83]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.83 (40 CFR Part 257.83), I attest that this Annual Inspection Report is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.83.

Golder Associates Inc.

10/10/19

Date of Report Certification



John Puls, P.E.

Name

6201055778

Professional Engineer Certification Number

Table of Contents

1.0 INTRODUCTION **1**

2.0 BACKGROUND AND DOCUMENT REVIEW SUMMARY **1**

3.0 2019 VISUAL INSPECTION **2**

4.0 LIMITATIONS OF ASSESSMENT **4**

5.0 CLOSING **4**

6.0 REFERENCES **5**

CCR SURFACE IMPOUNDMENT VISUAL INSPECTION CHECKLIST **8**

List of Tables

Table 1 Summary of Background Document Review

List of Appendices

Appendix A Inspection Checklist Form

1.0 INTRODUCTION

On April 17, 2015, the United States Environmental Protection Agency (EPA) issued the Coal Combustion Residual (CCR) Resource Conservation and Recovery Act (RCRA) Rule (40 CFR 257 Subpart D) ("CCR RCRA Rule"). The CCR RCRA Rule requires owners or operators of existing CCR surface impoundments to have those units inspected on an annual basis by a qualified professional engineer (QPE) in accordance with 40 CFR 257.83(b). The annual qualified professional engineer inspections are required to be completed and the results documented in inspection reports (per 40 CFR 257.83(b)(2) for Existing CCR Surface Impoundments. These inspections are focused primarily on the structural stability of the unit and must ensure that the operation and maintenance of the unit is in accordance with recognized and generally accepted good engineering standards. Each inspection must be conducted and certified by a QPE.

Golder Associates Inc. (Golder) was retained by Consumers Energy Company (CEC) to perform the annual inspection of the Bottom Ash Impoundment at the D.E. Karn Generating Facility (D.E. Karn, Site) to document, to the extent reasonable based on the information provided by CEC and the limits of the visual inspection, that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. The new Bottom Ash Impoundment was constructed in 2018 and was operational at the time of the inspection.

The inspection included the following:

- Review of applicable information regarding the status and condition of the CCR unit
- A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures
- A visual inspection of hydraulic structures passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation

2.0 BACKGROUND AND DOCUMENT REVIEW SUMMARY

Bottom ash is sluiced from the D.E. Karn Unit 1 & 2 electrical generating units to the Bottom Ash Impoundment. Operators were removing bottom ash from the west end during the 2019 inspection. The Bottom Ash Pond is no longer operational and is in the process of being closed by removal of CCR. An elevated trestle and pipe system hydraulically conveys bottom ash to the impoundment system through two 10-inch diameter Nuvaloy pipes each connected to 15-feet of flexible rubber hose at the pond inlet. Stored bottom ash is removed via mechanical equipment from the pond as required to maintain storage capacity. Water is discharged from the settling basin section of the impoundment through an 18-inch diameter SDR 11 HDPE pipe located on the east side into the polishing basin section of the impoundment. The water is discharged from the polishing basing section through a 24-inch DR 17 HDPE pipe located near the southeast corner into an internal ditch that conveys the flow to the Site's permitted National Pollutant Discharge Elimination System (NPDES) outfall.

The applicable available information reviewed for this assessment is summarized in Table 1 below.

Table 1: Summary of Background Document Review

Document	Date	Author
Weekly inspections performed by Consumers Energy Company (CEC)	April 2019 – May 2019	Bottom Ash Pond Qualified Personnel
D.E. Karn Generating Facility Bottom Ash Impoundment 2019 Annual Inspection Surface Impoundment Report	October 2018	Golder Associates, Inc.
D.E. Karn Generating Plant Bottom Ash Surface Impoundment Approved For Construction Drawings Revision D	February 2018	Golder Associates, Inc.
D.E. Karn Generating Facility Karn Lined Impoundment Closure Plan	June 2018	Golder Associates, Inc.

3.0 2019 VISUAL INSPECTION

The 2019 onsite visual inspection of the Bottom Ash Impoundment was performed by Golder Associates Inc. (Golder) on May 20, 2019. Golder's inspectors, John Puls, P.E. and Halle Doering, EIT, were accompanied by two Consumers Energy Company (CEC) representatives, as follows:

- Mr. George McKenzie, P.E., CEC System Engineering Department
- Mr. Caleb Batts, P.E., CEC Site Environmental Department

The inspection checklist form (see Appendix A) provides both observations and recommendations as a result of the visual inspection and the following information as stipulated in 40 CFR 257.83(b):

- Any changes in geometry of the impounding structure since the previous annual inspection.
  - The Bottom Ash Impoundment was under construction for the 2018 inspection. The Bottom Ash Impoundment has since been completed and is receiving sluiced bottom ash.
- Approximate minimum, maximum, and present depth and elevation of the impounded water and Coal Combustion Residuals (CCR) since the previous annual inspection.
  - Average top of embankment elevation: 600 feet NAVD88
  - Average impoundment bottom elevation: 591 feet NAVD88
  - Minimum water surface elevation: 595 feet NAVD88, 4-ft depth (based on information provided by CEC)
  - Maximum water surface elevation: 598 feet NAVD88, 7-ft depth (based on information provided by CEC)

  - Present water surface elevation: 595 feet NAVD88, 4-ft depth (based on field observation at the time of inspection due to temporary pumping)
- Any instrumentation in place designed to monitor the structural stability of the Bottom Ash Pond.
  - There is currently no instrumentation in place designed to monitor for the structural stability of the Bottom Ash Impoundment at D.E. Karn.
- Storage capacity of the impounding structure at the time of inspection.
  - The Bottom Ash Impoundment is designed for a maximum storage capacity of approximately 9,660 cubic yards, which assumes an approximate 5-foot thick bottom ash deposit across the entire area of the impoundment.
  - Only the west half of the Settling Basin will be used for bottom ash collection. A bottom ash berm was constructed to separate the Settling Basin where it begins to widen. The western part of the Settling Basin is cleaned out routinely, so the maximum storage capacity of the impoundment is never reached.
- Approximate volume of the impounded water and CCR at the time of inspection.
  - Current volume of impounded water and CCR combined is approximately 4,000 cubic yards (based on water elevation of 595 ft).
- Appearances of actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.
  - None were observed during construction.
- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.
  - None were observed during construction.

The checklist categorizes observed conditions of the impoundment or appurtenant structures as either acceptable, monitor/maintain, investigate, or repair, which are defined as follows:

- Acceptable: The condition was visually documented to be acceptable, requiring no action beyond periodic inspection in accordance with the SMP and typical maintenance.
- Monitor/Maintain: The condition was visually identified to exhibit the potential for or show existing degeneration that should either be monitored or maintained as detailed in the checklist.
  - Items identified in this category are not considered a deficiency or release as classified under 40 CFR 257.83(b)(5) requiring immediate action by CEC.
- Investigate: The limitations of the visual inspection did not allow for an opinion to be made on the condition of the item observed, and Golder recommends additional investigation to categorize the item.
- Repair: Golder recommends that items identified with a repair designation exhibited conditions that should initiate measures be taken to rectify the area of concern.
- No items identified for repair were considered a deficiency or release as classified under 40 CFR 257.83(b)(5) requiring immediate action by CEC.

Based on a review of previous inspection reports listed in Table 1 compared to conditions noted during the inspection, the following changes were observed:

- The Bottom Ash Impoundment was constructed in 2018 and operational at the time of inspection, operators were cleaning bottom ash from the west end at the time of inspection; and
- The Bottom Ash Impoundment north toe ditch had steep banks and potential for sloughing.

4.0 LIMITATIONS OF ASSESSMENT

Golder has conducted the site inspection and prepared this report for the new Bottom Ash Impoundment at D.E. Karn. The factual data, assessment, interpretations, and recommendations provided herein are based on the results of field observations from site inspections performed by Golder and review of previous site inspection reports provided to Golder by CEC and pertain to the specific project as described in this report and are not applicable to any other project or site location.

Golder has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions and has characterized the site conditions within the limitations of the scope of services as defined by CEC and subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied, is made. Any change of site conditions, purpose, development plans, or operation may alter the validity of this report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

5.0 CLOSING

This report has been prepared in general accordance with normally accepted civil engineering practices to fulfill the Resource Conservation and Recovery Act (RCRA) reporting requirements in accordance with 40 CFR 257.83(b)(2). Golder has reviewed the available information on the Bottom Ash Impoundment at D.E. Karn and performed an onsite visual inspection. Golder's assessment is limited to the information provided by CEC and to the features that could be inspected visually in a safe manner. Golder cannot attest to the condition of subsurface or submerged structures.

6.0 REFERENCES

Document	Date	Author
Weekly inspections performed by Consumers Energy Company (CEC)	April 2019 – May 2019	Bottom Ash Pond Qualified Personnel
D.E. Karn Generating Facility Bottom Ash Impoundment 2019 Annual Inspection Surface Impoundment Report	October 2018	Golder Associates, Inc.
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Signature Page

Golder Associates Inc.

Halle Doering
Project Engineer

John Puls, P.E.
Senior Engineer

APPENDIX A - INSPECTION CHECKLIST FORM

CCR SURFACE IMPOUNDMENT VISUAL INSPECTION CHECKLIST

Facility Name: D.E. Karn Bottom Ash Impoundment

Owner: Consumers Energy Company (CEC)

Purpose of Facility: Detention and settlement of sluiced bottom ash.

County, State: Bay County, Michigan

Inspected By: John Puls and Halle Doering ***Inspection Date: May 20, 2019***

Weather: Overcast, 50 ºF

ITEM	Acceptable	Monitor/Maintain	Investigate	Repair	REMARKS The Bottom Ash Pond Impoundment was constructed in 2018 and is currently active. Operators were removing ash from the west end at the time of the inspection.
1. General Conditions					
a. Year Minimum Water Elevation					595.0
b. Year Average Water Elevation					597.5
c. Year Maximum Water Elevation					598.0
d. Current water level					595.0
e. Current storage capacity					9,660 CY
f. Current volume of impounded water and CCR					4,000 CY
g. Alterations					Constructed in 2018, now active.
h. Development of downstream plain	X				Good condition
i. Grass cover					N/A
j. Settlement/misalignment/cracks					N/A
k. Sudden drops in water level?					N/A
2. Inflow Structure					Good condition, newly constructed.
a. Settlement	X				
b. Cracking	X				
c. Corrosion	X				

ITEM	Acceptable	Monitor/Maintain	Investigate	Repair	REMARKS The Bottom Ash Pond Impoundment was constructed in 2018 and is currently active. Operators were removing ash from the west end at the time of the inspection.
d. Obstacles in inlet	X				
e. Riprap/erosion control	X				
3. Outflow Structure					Good condition, newly constructed.
a. Settlement	X				
b. Cracking	X				
c. Corrosion	X				
d. Obstacles in outlet	X				
e. Riprap/erosion control	X				
f. Seepage	X				
4. Upstream slope					Good condition, newly constructed. Bottom ash is built up on the west side of the impoundment for removal.
a. Erosion	X				
b. Rodent burrows	X				
c. Vegetation	X				
d. Cracks/settlement	X				
e. Riprap/other erosion protection	X				
f. Slide, Slough, Scarp	X				
5. Crest					Good condition, newly constructed.
a. Soil condition	X				
b. Comparable to width from previous inspection	X				
c. Vegetation	X				
d. Rodent burrows	X				
e. Exposed to heavy traffic	X				
f. Damage from vehicles/machinery	X				

ITEM	Acceptable	Monitor/Maintain	Investigate	Repair	REMARKS The Bottom Ash Pond Impoundment was constructed in 2018 and is currently active. Operators were removing ash from the west end at the time of the inspection.
6. Downstream slope					
a. Erosion	X				
b. Vegetation	X				
c. Rodent burrows		X			One burrow found on south exterior slope.
d. Slide, Slough, Scarp	X				
e. Drain conditions	X				
f. Seepage	X				
7. Toe					
a. Vegetation	X				
b. Rodent burrows	X				
c. Settlement	X				
d. Drainage conditions	X				
e. Slide, Slough, Scarp		X			Toe ditch on north side of the Bottom Ash Impoundment has steep banks and drops off into ditch. See note 1.
f. Seepage	X				

General Remarks:

1) Features observed and documented in this checklist were not considered a deficiency or release as classified under 40 CFR 257.84(b)(5) and required no immediate action beyond periodic inspection in accordance with the SMP and typical maintenance.

Name of Engineer: John Puls, P.E.

Date: October 10, 2019

Engineering Firm: Golder Associates Inc.

golder.com