



# Karn Lined Impoundment Closure Plan

## D.E. KARN GENERATING FACILITY

## KARN LINED IMPOUNDMENT CLOSURE PLAN

Essexville, Michigan

Pursuant to 40 CFR 257.102

**Submitted To:** Consumers Energy Company  
1945 W. Parnall Road  
Jackson, Michigan 49201

**Submitted By:** Golder Associates Inc.  
15851 South US 27, Suite 50  
Lansing, Michigan 48906

June 2018

1781451

A world of  
capabilities  
delivered locally





### CERTIFICATION

#### Professional Engineer Certification Statement [40 CFR 257.102(b)(4)]

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 257.102 (40 CFR Part 257.102), I attest that this Closure Plan 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 257.102.

Golder Associates Inc.

  
Signature

June 4, 2018  
Date of Report Certification

Jeffrey R. Piaskowski, PE  
Name

6201061033  
Professional Engineer Certification Number





## Table of Contents

	CERTIFICATION.....	C-1
1.0	INTRODUCTION.....	1
2.0	NARRATIVE DESCRIPTION [40 CFR 257.102(B)(1)(I)].....	3
2.1	Karn Lined Impoundment CCR Quantity [40 CFR 257.102(b)(1)(iv-v)].....	3
2.2	Closure Construction Sequence [40 CFR 257.102(b)(1)(ii)].....	4
3.0	SCHEDULE [40 CFR 257.102(B)(1)(VI)].....	5
3.1	Introduction.....	5
3.2	Closure Construction.....	5
3.3	Closure Deadline Extension [40 CFR 257.102(f)(2)].....	6
4.0	REFERENCES.....	7

### List of Tables

Table 2.0.1	Groundwater Assessment Monitoring Constituents
Table 3.2.1	Conceptual CCR Removal Schedule Milestones

### List of Figures

Figure 1	Site Location Map
Figure 2	General Site Plan
Figure 3	Conceptual Closure Plan
Figure 4	Closure Plan Sections A & B



## 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”) to regulate the beneficial use and disposal of CCR materials generated at coal-fired electrical power generating complexes. In accordance with the CCR RCRA Rule, any CCR surface impoundment or CCR landfill that first receives CCR or commences construction after the effective date of the CCR RCRA Rule (October 19, 2015) is deemed to be a “New CCR Unit” and subject to self-implementing compliance standards and schedules. Consumers Energy Company (CEC) is currently constructing a new CCR surface impoundment at the D.E. Karn Generating Facility (DE Karn). The new CCR surface impoundment, identified as the Karn Lined Impoundment, is scheduled to be complete by June 1, 2018 and will begin accepting CCR soon after construction is complete. DE Karn is located in Essexville, Michigan, as presented on Figure 1 – Site Location Map. The location of the Karn Lined Impoundment is highlighted on Figure 2 – General Site Plan.

Consumers Energy established a groundwater monitoring system as required by 40 CFR 257.91 and developed a groundwater sampling and analysis plan inclusive of statistical procedures as required by 40 CFR 257.93 prior to the initial receipt of CCR in the impoundment. The groundwater sampling and analysis procedure plan was developed for the groundwater monitoring program and includes direction on how to perform or acquire the following:

- Groundwater elevations
- Sample collection and handling procedures
- Equipment decontamination procedures
- Chain of custody control
- Sample preservation and shipment
- Quality assurance/quality control (QA/QC)
- Investigation derived waste (IDW) handling
- Field documentation
- Analytical suite and procedures
- Optional additional analyses
- Data evaluation

The Detection Monitoring program detailed in 40 CFR 257.94(b) will commence upon the initial receipt of CCR in the unit anticipated in June 2018. If a statistically significant increase over background levels for one or more of the constituents listed in 40 CFR 257 Appendix III is observed, CEC will follow requirements in 40 CFR 257.94(e) including evaluation of an Alternate Source Demonstration as described in 40 CFR 257.94(e)(2). Statistically significant increase(s) over background or unsuccessful Alternate Source Demonstration(s) will trigger Assessment Monitoring requirements detailed in 40 CFR 257.95.

The collection and presentation of data will be certified in an annual groundwater monitoring and corrective action report no later than January 31 of the following calendar year per 40 CFR 257.90(e) and annually



thereafter, until groundwater monitoring concentrations do not exceed the groundwater protection standards established pursuant to 40 CFR 257.95(h) for constituents listed in 40 CFR 257 Appendix III.

This written closure plan is being generated pursuant to 40 CFR 257.102(a) and describes the steps necessary to close the Karn Lined Impoundment CCR unit consistent with recognized and generally accepted good engineering practices.



## 2.0 NARRATIVE DESCRIPTION [40 CFR 257.102(b)(1)(i)]

The Karn Lined Impoundment at DE Karn will be closed by removing and decontaminating all areas affected by releases from the CCR unit. CCR removal and decontamination of the CCR unit will be complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to 40 CFR 257.95(h) for constituents listed in Table 2.0.1 – Groundwater Assessment Monitoring Constituents.

Prior to removal of CCR, the Karn Lined Impoundment influent pipes will be properly abandoned and the CCR unit will be dewatered by actively pumping decant downstream in a manner that maintains National Pollutant Discharge Elimination System (NPDES) permitted effluent limits. Once the Karn Lined Impoundment is dewatered and hydraulic structures are abandoned, the remaining CCR and all areas affected by releases from the CCR unit will be removed. It is anticipated that the excavation will include ponded CCR and the primary geosynthetic liner. Sand beneath the primary geosynthetic liner will be examined for releases from the CCR unit, and; if releases are present, they will be excavated and documented. The proposed removal grades are provided on Figure 3 – Conceptual Closure Plan and on Figure 4 – Closure Plan Sections A & B.

Decontamination of any areas affected by releases from the CCR unit will be confirmed when at least two consecutive quarterly groundwater monitoring events completed after the removal of the CCR demonstrate that groundwater monitoring concentrations do not exceed the groundwater protection standards established pursuant to 40 CFR 257.95(h) for constituents listed in Table 2.0.1.

**Table 2.0.1 – Groundwater Assessment Monitoring Constituents**

Common Name		
Antimony	Chromium	Mercury
Arsenic	Cobalt	Molybdenum
Barium	Fluoride	Selenium
Beryllium	Lead	Thallium
Cadmium	Lithium	Radium 226 and 228 combined

## 2.1 Karn Lined Impoundment CCR Quantity [40 CFR 257.102(b)(1)(iv-v)]

The Karn Lined Impoundment was constructed in May 2018 and does not currently contain CCR. The surface impoundment has a maximum capacity of approximately 9,660 cubic yards (cy) of CCR and is



expected to begin receiving waste by June 2018. Final cover will not be required for the Karn Lined Impoundment, since the CCR unit will be closed by removal of CCR.

## **2.2 Closure Construction Sequence [40 CFR 257.102(b)(1)(ii)]**

Per 40 CFR 257.102(b)(1)(ii), if closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with this section must be provided in the closure plan. Per 40 CFR 257.102(c), CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standards established pursuant to 40 CFR 257.95(h) for constituents listed in Table 2.0.1. The following description includes the procedures to remove and decontaminate the Karn Lined Impoundment.

The Karn Lined Impoundment will be dewatered, its hydraulic structures will be abandoned, and CCR and the primary geosynthetic liner will be removed. The sand beneath the primary geosynthetic liner will be examined for releases from the CCR unit, and; if releases are present, they will be excavated and documented. Conceptual excavation limits with approximate elevations are provided in Figures 3 and 4.

Groundwater monitoring will be conducted to document that constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit do not exceed the groundwater protection standards per 40 CFR 257.95(h) for constituents listed in Table 2.0.1. Closure will be complete when two consecutive quarterly groundwater monitoring events demonstrate no exceedances.



### 3.0 SCHEDULE [40 CFR 257.102(b)(1)(vi)]

#### 3.1 Introduction

CEC intends to cease coal-fired electrical generation at DE Karn by 2029 and will initiate closure by providing notification pursuant to 40 CFR 257.102(e) when CCR placement is expected to cease and at least one of the following actions or activities will have been completed:

- Taken any steps to implement the written closure plan
- Submitted a completed application for any required state or other agency permit or permit modification
- Taken any steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure of a CCR unit

In accordance with 40 CFR 257.102(f)(1)(ii), closure activities are anticipated to commence by May 1, 2030, and are expected to be completed within five years of the notification of intent to initiate closure (by May 1, 2035).

#### 3.2 Closure Construction

Closure construction is anticipated to begin on or before May 1, 2030, in order to comply with the closure schedule. Removal of the CCR and areas affected by releases from the CCR unit is anticipated to be completed by September 1, 2030. Once the removal of CCR has been completed, at least two consecutive quarterly groundwater monitoring events will be necessary to complete the clean closure certification. Table 3.2.1 – Conceptual CCR Removal Schedule Milestones contains a list of milestone dates that were developed as part of the closure construction schedule to demonstrate that closure will be completed within the self-implementing closure schedule per 40 CFR 257.102(f)(1)(ii).

**Table 3.2.1 – Conceptual CCR Removal Schedule Milestones**

Closure Component	Start Date	End Date
Notification of closure	NA	May 1, 2030
Dewatering	May 1, 2030	June 1, 2030
Removal of CCR and areas affected by releases of the CCR unit	June 1, 2030	September 1, 2030
Document constituent concentrations do not exceed groundwater protection standards	October 1, 2030	October 1, 2032
Certified closure report	NA	December 1, 2032



### **3.3 Closure Deadline Extension [40 CFR 257.102(f)(2)]**

As previously indicated in Section 3.1, closure of existing CCR surface impoundments must be completed within five years of initiating closure in accordance with 40 CFR 257.102(f)(1)(ii). A deadline extension can be obtained as outlined in 40 CFR 257.102(f)(2) if completion of closure is not feasible within five years (e.g., shortened construction season, significant weather delays during construction, time required for dewatering CCR, delays due to state or local permitting or approval, etc.). An extension must include a narrative description demonstrating that closure is not feasible in the required timeframe in accordance with 40 CFR 257.102(f)(2)(i, iii). The closure deadline for the Karn Lined Impoundment may be extended up to two years per 40 CFR 257.102(f)(2)(ii)(A).

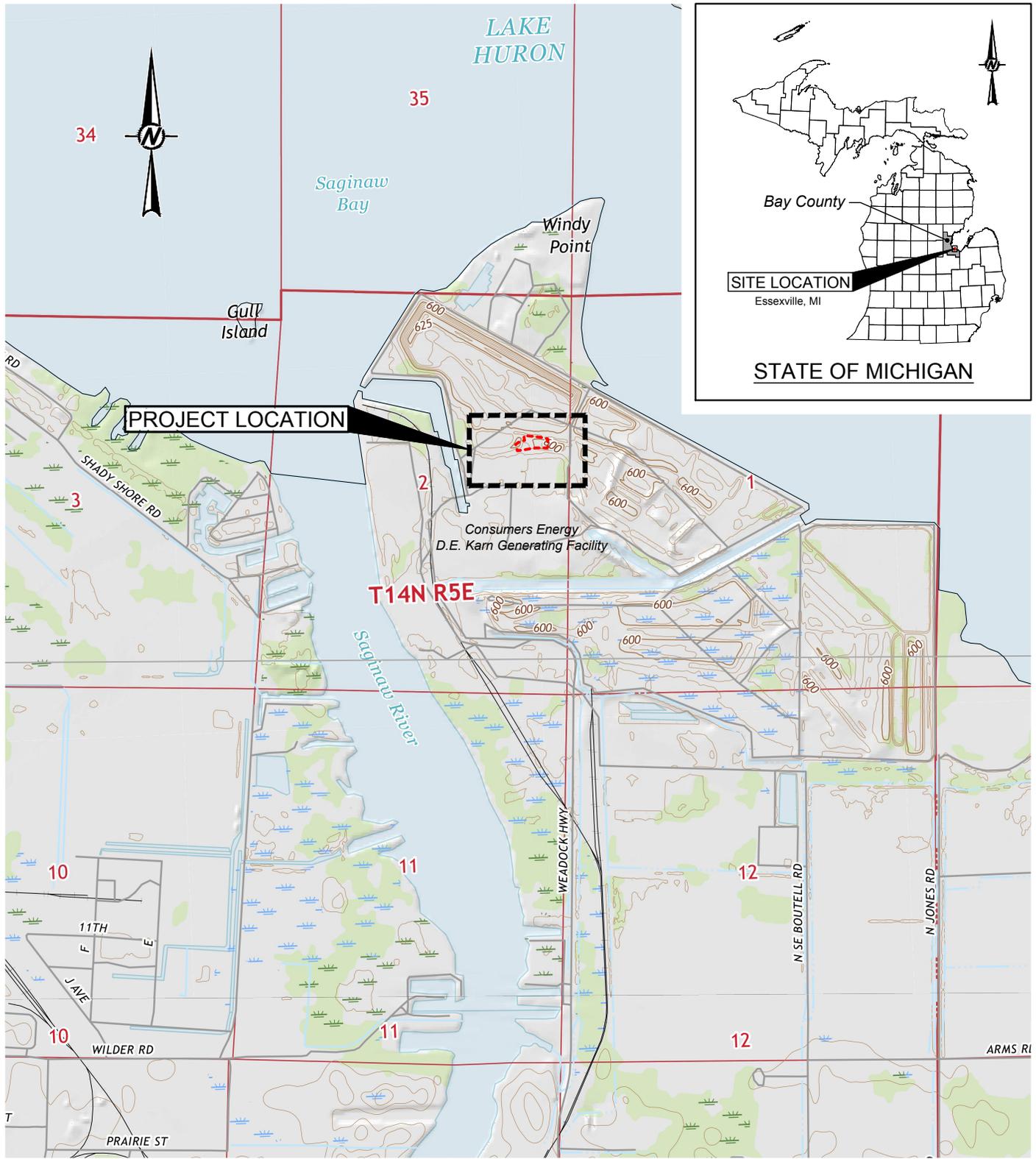


## 4.0 REFERENCES

- “DE Karn Lined Surface Impoundment Sample and Analysis Plan,” – TRC Environmental Corporation, June 2018.
- “Groundwater Monitoring System Certification, §257.91(f) DE Karn Power Plant, Karn Lined Impoundment,” – Consumers Energy, June 2018.
- “Groundwater Statistical Evaluation Plan, DE Karn Power Plant Lined Impoundment,” – TRC Environmental Corporation, June 2018.
- “Selection of Statistical Procedures Professional Engineer Certification, §257.93(f)(6) DE Karn Power Plant, Karn Lined Impoundment,” – Consumers Energy, June 2018.
- “Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments,” Title 40 – Protection of the Environment Part 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices Subpart D – Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments – U.S. Environmental Protection Agency, April 2015.

## FIGURES

P:\0\_projects\Consumers Energy\1781451\_DE Karn New BALI RCRA Compliance\960\_CAD\02\_FIGURES\A - Bottom Ash Lined Impoundment RCRA Closure Plan\1781451\_BALI\_RCRA\_OP\_USGS-Site-Location-Map.dwg Jun 04, 2018 - 10:51am By: STAnderson



**REFERENCE**  
 BASE MAP IMAGERY DERIVED FROM U.S. DEPARTMENT OF INTERIOR, UNITED STATES GEOLOGICAL SURVEY (USGS), MICHIGAN-BAY COUNTY, 7.5-MINUTE SERIES QUADRANGLE MAPS "BAY CITY NE" AND "ESSEXVILLE", BOTH DATED 2017.



CLIENT  
**CONSUMERS ENERGY COMPANY**  
 2742 NORTH WEADOCK HIGHWAY  
 ESSEXVILLE, MICHIGAN 48732

PROJECT  
**D.E. KARN GENERATING FACILITY**  
**KARN LINED IMPOUNDMENT RCRA CLOSURE PLAN**

CONSULTANT	YYYY-MM-DD	2018-06-04
	DESIGNED	MMJ
	PREPARED	SDA
	REVIEWED	JRP
	APPROVED	MAB



TITLE  
**SITE LOCATION MAP**

PROJECT NO.  
**1781451.0003**

REV.  
**1**

FIGURE  
**1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

A

B

C

D



0 150 300  
1" = 150'  
FEET

Saginaw Bay

KARN LANDFILL

INTAKE CHANNEL

BOTTOM ASH POND

LIMIT OF  
KARN LINED  
IMPOUNDMENT

Consumers Energy  
D.E. Karn Generating Facility

Saginaw River

- REFERENCES**
1. AERIAL BASE MAP IMAGE FROM © CNES 2016, DISTRIBUTION AIRBUS DS GEO SA / AIRBUS DS GEO INC., PHOTO DATE: MAY 6, 2016.
  2. HORIZONTAL DATUM AND COORDINATES SHOWN BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD83), SOUTH ZONE, INTERNATIONAL FOOT.

REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DR	BY	CHK	APP	CO	REV	DATE	DESCRIPTION	DR	BY	CK	APP	CO
									1	2018-06-04	SUBMITTED TO POST ON OWNER'S WEBSITE	MMJ	SDA	JRP	MAB	
									0	2018-05-24	SUBMITTED FOR OWNER'S REVIEW	MMJ	SDA	JRP	MAB	

SIGNATURE  
NAME  
MICHIGAN P.E. No.



**D.E. KARN GENERATING FACILITY**  
ESSEXVILLE, MI

**GENERAL SITE PLAN**

**KARN LINED IMPOUNDMENT RCRA CLOSURE PLAN**

SCALE: AS SHOWN	DRAWING NO.	FIGURE	REV.
JOB: 1781451.0003		<b>2</b>	<b>1</b>

A

B

C

D

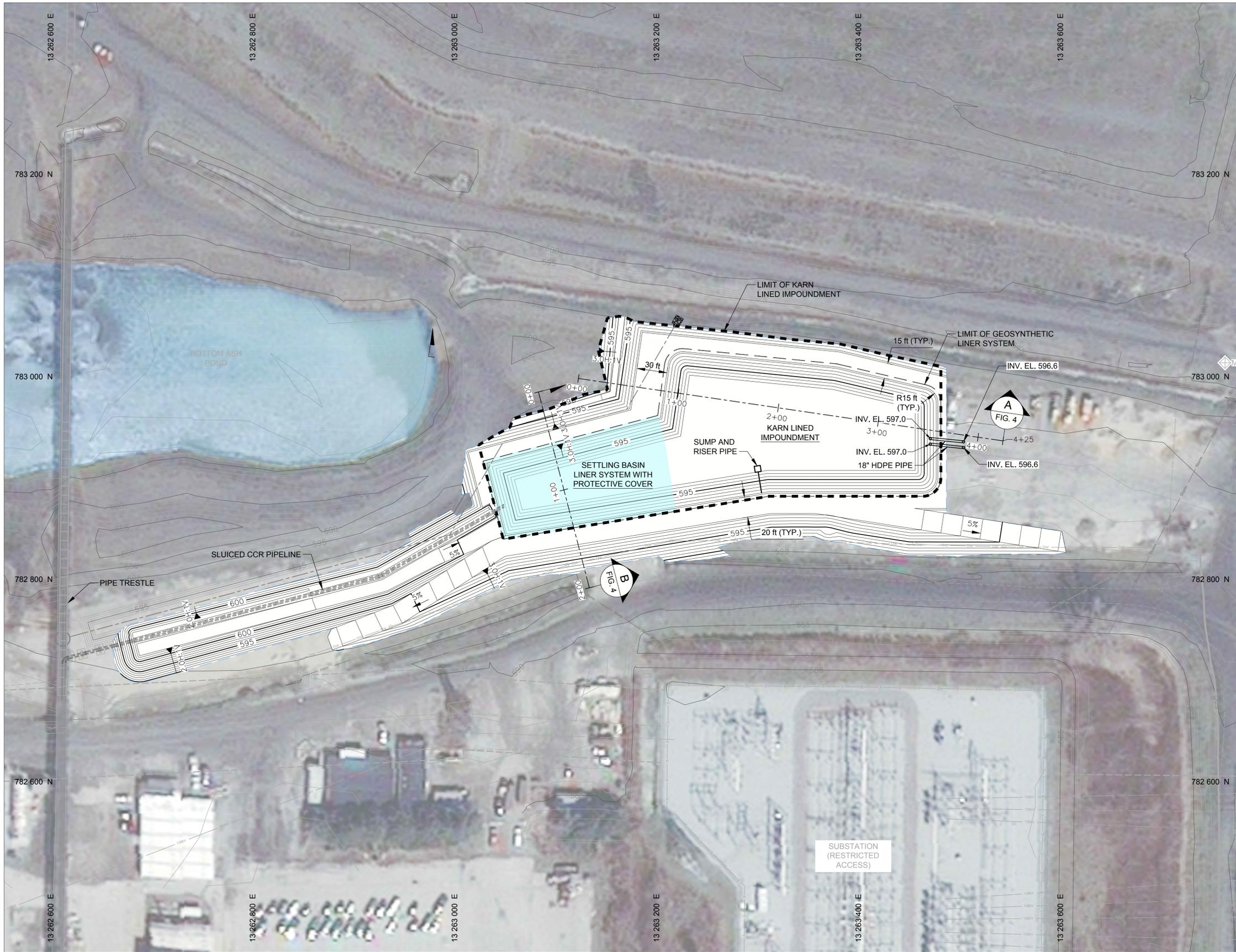
P:\0\_projects\Consumers Energy\1781451\_DE Karn New BAU RCRA Closure Plan\1781451\_BAU\_RCRA\_Closure\_Site-Plan\_DWG Jun 04, 2018 - 10:47am By: STAnderson

A

B

C

D

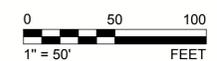


**LEGEND**

	EXISTING GROUND TOPOGRAPHY
	PROPOSED GRADE (TOP OF EMBANKMENT FILL)
	EXISTING PROCESS WATER PIPE
	EXISTING CULVERT
	LIMIT OF GEOSYNTHETICS
	EXISTING ASH TRESTLE
	PROTECTIVE COVER

- NOTES**
- EXISTING FEATURES OUTSIDE OF THE PROJECT AREA MAY NOT BE SHOWN FOR CLARITY.
  - EXISTING CONDITIONS IN THE BOTTOM ASH POND AND ASH LANDFILL MAY VARY FROM THOSE SHOWN DUE TO ONGOING ASH DISPOSAL OPERATIONS.

- REFERENCES**
- AERIAL IMAGE: © CNES 2016, DISTRIBUTION AIRBUS DS GEO SA/AIRBUS DS GEO INC.
  - HORIZONTAL COORDINATE SYSTEM: MICHIGAN STATE PLANE, SOUTH ZONE, NORTH AMERICAN DATUM 1983 (1994 ADJUSTMENT), INTERNATIONAL SURVEY FOOT.
  - VERTICAL BASIS OF ELEVATION: NORTH AMERICAN VERTICAL DATUM 1988.
  - EXISTING SITE TOPOGRAPHY PROVIDED IN APRIL 2016 BY ENGINEERING & ENVIRONMENTAL SOLUTIONS, L.L.C. AUGMENTED WITH DESIGN GRADES FOR PROCESS WATER MODIFICATIONS IMPLEMENTED IN FALL 2017.



REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DR	BY	CHK	APP	CO	REV	DATE	DESCRIPTION	DR	BY	CK	APP	CO
									1	2018-06-04	SUBMITTED TO POST ON OWNER'S WEBSITE	MMJ	SDA	JRP	MAB	
									0	2018-05-24	SUBMITTED FOR OWNER'S REVIEW	MMJ	SDA	JRP	MAB	

SIGNATURE

NAME

MICHIGAN P.E. No.

**D.E. KARN GENERATING FACILITY**  
ESSEXVILLE, MI

**CCR REMOVAL GRADES**

**KARN LINED IMPOUNDMENT RCRA CLOSURE PLAN**

SCALE: AS SHOWN	DRAWING NO.	FIGURE	REV.
JOB: 1781451.0003		<b>3</b>	<b>1</b>

A

B

C

D

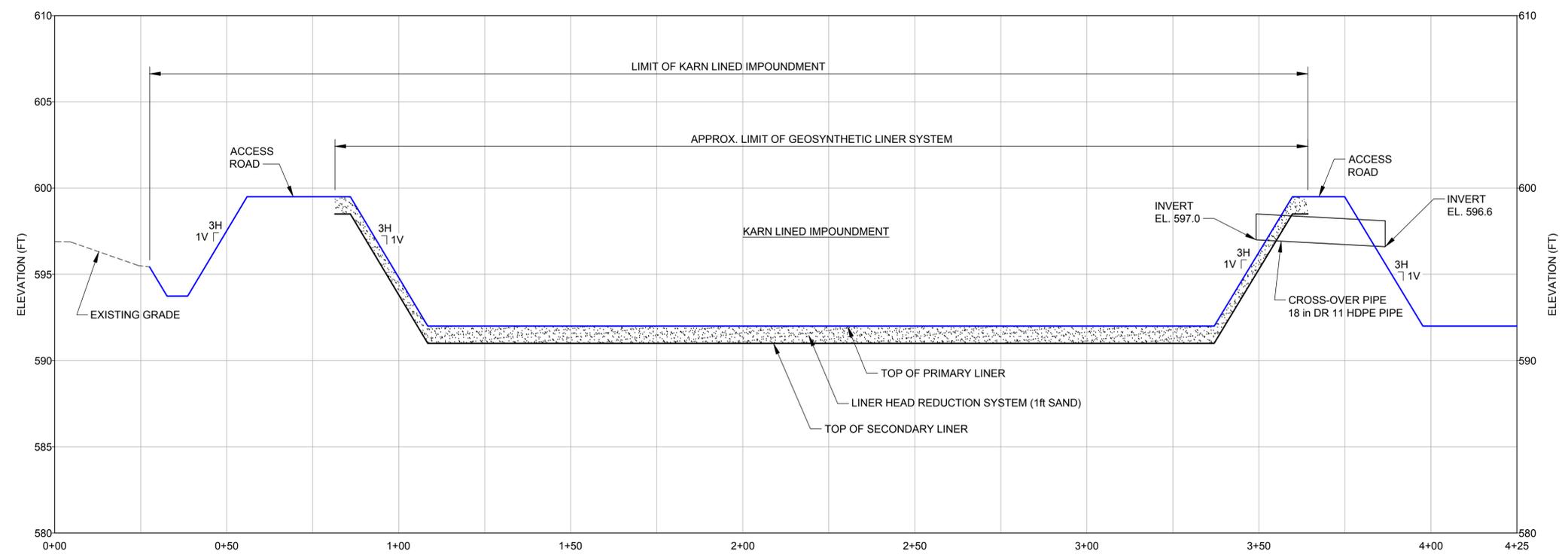
P:\0 projects\Consumers Energy\1781451 DE Karn New Baku RCRA Compliance\940 CAD\02\_FIGURES\A - Bottom Ash Lined Impoundment RCRA Closure Plan\1781451\_Baku\_RCRA\_Closure\_Grades-Final.dwg Jun 04, 2018 - 12:03pm By: S.Henderson

A

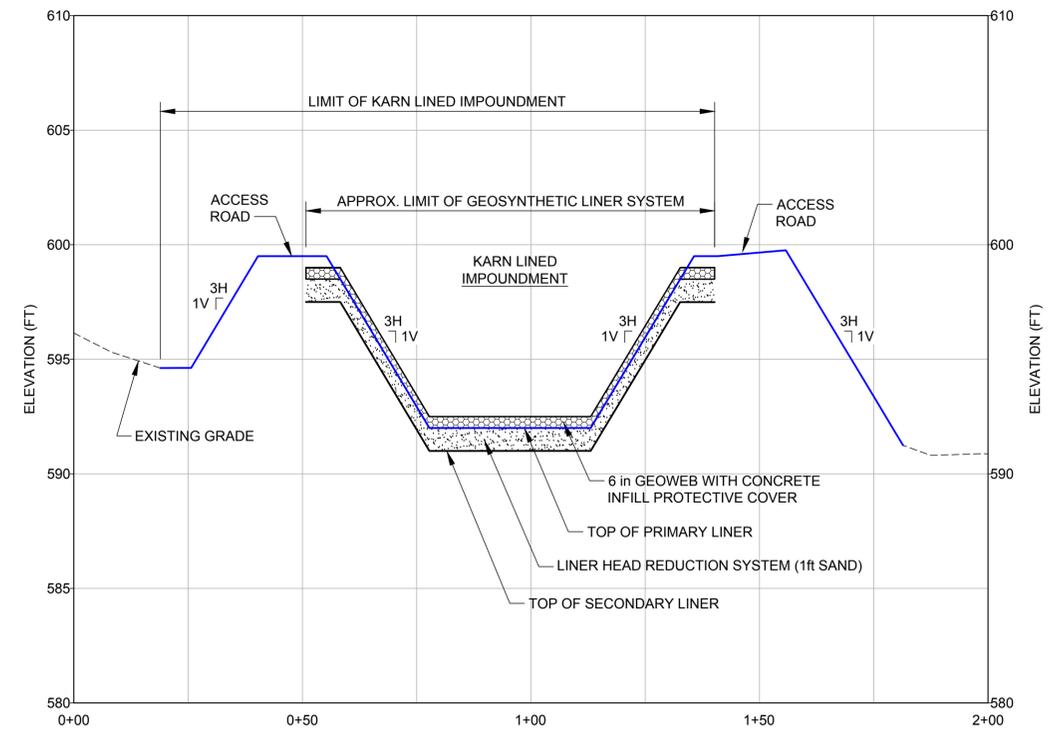
B

C

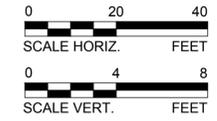
D



SCALE 1" = 20'  
5X VERT. **A** SECTION A  
FIG. 3



SCALE 1" = 20'  
5X VERT. **B** SECTION B  
FIG. 3



REFERENCE DRAWINGS	REV	DATE	DESCRIPTION	DR	BY	CHK	APP	CO	REV	DATE	DESCRIPTION	DR	BY	CK	APP	CO
									1	2018-06-04	SUBMITTED TO POST ON OWNER'S WEBSITE	MMJ	SDA	JRP	MAB	
									0	2018-05-24	SUBMITTED FOR OWNER'S REVIEW	MMJ	SDA	JRP	MAB	

SIGNATURE  
NAME  
MICHIGAN P.E. No.  
**Consumers Energy**  
**D.E. KARN GENERATING FACILITY**  
ESSEXVILLE, MI

**CROSS SECTIONS A & B**  
**KARN LINED IMPOUNDMENT RCRA CLOSURE PLAN**  
SCALE: AS SHOWN DRAWING NO. FIGURE REV.  
JOB: 1781451.0003 4 1

A

B

C

D

P:\0\_projects\Consumers Energy\1781451 DE Karn New Baku RCRA Closure Plan\1781451\_Baku\_RCRA\_Closure-Grades-Sections-Sections.dwg Jun 04, 2018 - 11:50am By: STAnderson

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates Inc.**  
**15851 South U.S. 27, Suite 50**  
**Lansing, MI 48906 USA**  
**Tel: (517) 482-2262**  
**Fax: (517) 482-2460**



**Engineering Earth's Development, Preserving Earth's Integrity**

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation