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.
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June 2018
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
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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

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Antimony</th>
<th>Chromium</th>
<th>Mercury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>Cobalt</td>
<td>Molybdenum</td>
<td></td>
</tr>
<tr>
<td>Barium</td>
<td>Fluoride</td>
<td>Selenium</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>Lead</td>
<td>Thallium</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>Lithium</td>
<td>Radium 226 and 228 combined</td>
<td></td>
</tr>
</tbody>
</table>

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 geosynthetics 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

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


FIGURES
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.