AECOM

Periodic Structural Stability Assessment Report

Fly Ash Impoundment
Sibley Generating Station

Evergy Missouri West, Inc.

October 2021

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Tables

Appendices

1. Introduction

1.1 Purpose

The purpose of this Periodic Structural Stability Assessment Report is to document whether the Fly Ash Impoundment at the Evergy Metro, Inc. (Evergy) Sibley Generating Station continues to meet the requirements of 40 CFR §257.73(d) of the Coal Combustion Residuals (CCR) Rule[1]. The Fly Ash Impoundment is an existing CCR surface impoundment as defined by 40 CFR §257.53.

1.2 Regulatory Requirements

In accordance with the CCR Rule, this assessment documents whether the design, construction, operation, and maintenance of the Fly Ash Impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the Fly Ash Impoundment has been designed, constructed, operated, and maintained in accordance with 40 CFR §257.73(d) referenced below. The periodic assessment must also identify any structural stability deficiencies associated with the Fly Ash Impoundment in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

This Periodic Structural Stability Assessment Report has been completed by October 11, 2021, five years after the Initial Structural Stability Assessment Report. Periodic structural stability assessments shall be prepared every five years. The date of completing the initial assessment is the basis for establishing the deadline to complete the first periodic assessment.

Regulatory Citation: 40 CFR §257.73(d) Periodic structural stability assessments. (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The assessment must, at a minimum, document whether the CCR unit has been designed, constructed, operated, and maintained with:

(i) Stable foundations and abutments;

(ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;

(iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;

(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;

(v) A single spillway or a combination of spillways configured as specified in paragraph (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.

(A) All spillways must be either:

(1) Of non-erodible construction and designed to carry sustained flows; or

(2) Earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected.

(B) 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.

(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; and

(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.

(2) The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

1.3 Brief Description of Impoundment

The Sibley Generating Station is a former coal-fired power plant located near Sibley in Jackson County, Missouri. The Station is located east of Sibley and is bordered to the north by the Missouri River. The Fly Ash Impoundment is located approximately 0.5 miles east of the station. A site Location Map showing the area surrounding the station is in **Figure 1** of **Appendix A**. The unit has ceased operations and has initiated closure.

1.3.1 Design Operation and Construction

The original construction of the impoundment was substantially completed in 1977. Earthen embankments were constructed to create the impoundment. When constructed the embankment was approximately 2,800 feet long, a maximum of 15 feet high, and with 3 to 1 (horizontal to vertical) side slopes covered with grassy vegetation[2]. The embankment crest elevation was approximately 725.0 feet (unless otherwise noted, all elevations in this plan are in the NGVD29 datum), and the crest width was approximately 20 feet. The impoundment is currently undergoing closure activities which have reconfigured the embankment. Per Burns & McDonnell construction plans[3], the embankment is now approximately 2,400 feet long, a maximum of 14 feet high, and with 3 to 1 (horizontal to vertical) side slopes. The embankment crest elevation is approximately 719 feet and the crest width is approximately 20 feet. The surface area of the impoundment as measured from the center line of the perimeter roadway is approximately 17.0 acres. Due to ongoing construction activities associated with closure, the ash has been removed from the impoundment and there is currently no water stored in the impoundment.

1.3.2 Outlet Structures

The outlet structure for the impoundment has been removed from service and is being demolished as part of ongoing closure construction per the Burns & McDonnell construction plans[3]. The most recent construction schedule includes construction of a breach in the east embankment during November 2021. Once breached, accumulated non-industrialized water will discharge from the impoundment through the embankment breach on the east side. This land disturbance activity is covered under Section (E) of the Sibley Generation Station NPDES permit (Permit No. 0004871) as the discharge is associated with Outfall 007. The breach is currently planned to be approximately 112 feet wide at an elevation 704 feet but could change depending on construction needs. Due to the elimination of the sedimentation basin, alternative stormwater best management practices will be implemented. A rock check dam is planned for

the width of the breach, 18 inch in height, 2H:1V side slopes, and width of 20 feet. After flowing through the breach, runoff will discharge to a tributary that that ultimately leads to the Missouri River. Current Outfall 007 will be closed out as a wastewater outfall as the water is no longer wastewater and the discharge is stormwater only from construction activities. After the site reaches the final state, a NPDES permit modification will be submitted to eliminate all outfalls that no longer discharge wastewater or industrialized stormwater.

1.4 Assessment Approach

This periodic structural stability assessment was performed to document the design, construction, operation, and maintenance of the impoundment is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein. The analyses used: the Initial Structural Stability Assessment, subsurface information collected from historic subsurface investigations and laboratory testing data; reviews of historical construction[2] and current construction[3] engineering drawings; site inspections by AECOM and Evergy personnel; and geotechnical evaluations conducted by AECOM in 2016 as part of the initial structural stability assessment[4]. The following sections summarize the evaluations performed and the results from the analyses.

Table 1 cross references 40 CFR §257.73(d) with the assessment section.

Table 1. CCR Rule Cross Reference Table

Report Section	Title	CCR Rule Reference
2.1	Foundations and Abutments	§257.73 (d)(1)(i)
2.2	Slope Protection	§257.73 (d)(1)(ii)
2.3	Dike Compaction	§257.73 (d)(1)(iii)
2.4	Spillways	§257.73 (d)(1)(v)(A) and (B)
2.5	Stability and Structural Integrity of Hydraulic Structures	§257.73 (d)(1)(vi)
2.6	Downstream Slope Inundation/Stability	§257.73 (d)(1)(vii)
2.7	Structural Stability Deficiencies	§257.73 (d)(2)

2. Structural Stability Assessment

Regulatory Citation: 40 CFR §257.73(d)(1); Conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein.

A periodic structural stability assessment has been performed to document that the design, construction, and final closure procedures of the Fly Ash Impoundment is consistent with good engineering practices. The results of the structural stability assessment are discussed in the following sections.

2.1 Foundations and Abutments

CCR unit has been designed, constructed, operated, and maintained with stable foundations and abutments.

The stability of the foundations and abutments was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM and Evergy personnel. Additionally, slope stability analyses[4] were performed by AECOM to evaluate slip surfaces passing through the foundations and abutments. No changes to the foundation soils of this unit have been made over the past five years.

Based on this evaluation, stable foundations and abutments were designed and constructed at the Fly Ash Impoundment, and operational and maintenance procedures are appropriate to maintain the stable conditions. Therefore, the Fly Ash Impoundment meets the requirements presented in §257.73(d)(1)(i).

2.2 Slope Protection

CCR unit has been designed, constructed, operated, and maintained with adequate slope protection to protect against surface erosion, wave action and adverse effects of sudden drawdown.

The adequacy of slope protection was evaluated by reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM and Evergy personal. In addition, since the impoundment is located adjacent to the Missouri River, slope stability analyses were conducted to evaluate the effects of sudden drawdown[4]. The sudden drawdown analyses are discussed in Section 2.6.

The ongoing construction per the Burns & McDonnell construction plans[3] has made modifications to the slope protection for this unit. However, the modifications will result in equivalent or improved slope protection compared to the analyses conducted in 2016 as part of the initial structural stability assessment[4]. Based on this evaluation, adequate slope protection is present at the Fly Ash Impoundment, and operational and maintenance procedures are appropriate to protect against surface erosion and wave action. Therefore, the Fly Ash Impoundment meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction

CCR unit has been designed, constructed, operated, and maintained with dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit.

The density of the dike materials was evaluated using soil data from field investigations and reviewing design drawings, operational and maintenance procedures, and conditions observed in the field by AECOM and Evergy personal. Additionally, slope stability analyses[4] were performed by AECOM to evaluate slip surfaces passing through the dikes over the range of expected loading conditions as defined within the section §257.73.

The ongoing construction per the Burns & McDonnell construction plans[3] has made modifications to the dikes for this unit. However, the modifications will result in equivalent or improved dike compaction, design, construction, operation, or maintenance of this unit and will not detrimentally change the structural stability of this unit compared to the analyses conducted in 2016 as part of the part of the initial structural stability assessment[4]. Based on this evaluation, the design and construction of the Fly Ash Impoundment included sufficient dike compaction. The operational and maintenance procedures at the Fly Ash Impoundment are appropriate for maintaining compaction of the dikes. Therefore, the Fly Ash Impoundment meets the requirements in §257.73(d)(1)(iii).

2.4 Spillways

CCR unit has been designed, constructed, operated, and maintained with a single spillway or a combination of spillways configured as specified in paragraph (A) and (B):

> *(A) all spillways must be either: (1) of non-erodible construction and designed to carry sustained flows; or (2) earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected;*
>
> *(B) 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*
> > *(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/outfall structure for the impoundment has been removed from service and is being demolished as part of ongoing closure construction per the Burns & McDonnell construction plans[3]. There is no discharge from the Fly Ash Impoundment during the current construction conditions. All stormwater runoff is stored within the impoundment. Following the completion of construction when the unit no longer meets the definition of "Surface Impoundment" under the CCR Rule, the discharge will enter a tributary that leads to the Missouri River. Therefore, the Fly Ash Impoundment requirements in §257.73(d)(1)(v)(A) and (B) are no longer applicable.

2.5 Stability and Structural Integrity of Hydraulic Structures

CCR unit has been designed, constructed, operated, and maintained with 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.

All hydraulic structures have been removed from service and are being demolished as part of ongoing closure construction per the Burns & McDonnell construction plans[3]. Currently all the water has been drained and all ash has been removed from the impoundment, and the impoundment is no longer receiving water or ash from CCR operations.

Therefore, the requirements in §257.73(d)(1)(vi) are no longer applicable to the Fly Ash Impoundment.

2.6 Downstream Slope Inundation/Stability

CCR unit designed, constructed, operated and maintained with, 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.

The downstream slope of the Fly Ash Impoundment is susceptible to inundation by the Missouri River during periods of flooding. Slope stability analyses were conducted to evaluate the impacts of sudden drawdown of the river on the downstream slope of the impoundment. The analyses showed that the computed safety factor value of 1.32 is above the minimum required value of 1.30, and therefore is appropriate for the conditions analyzed[4].

The ongoing construction per the Burns & McDonnell construction plans[3] has made modifications to the downstream slopes of this unit. However, the modifications will result in equivalent or improved slope stability compared to the analyses conducted in 2016 as part of the part of the initial structural stability assessment[4]. Based on this evaluation, the Fly Ash Impoundment was designed, constructed, and is operated with downstream slopes that can maintain structural stability during low pool of the adjacent Missouri River and during sudden drawdown of the river. Therefore, the Fly Ash Impoundment meets the requirement of §257.73(d)(1)(vii).

2.7 Structural Stability Deficiencies

Identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

No structural stability deficiencies were identified. Consequently, the Fly Ash Impoundment meets the requirements of §257.73(d)(2), so no corrective actions are required.

3. Limitations

Background information, design basis, and other data have been furnished to AECOM by Evergy, which AECOM has used in preparing this report. AECOM has relied on this information as furnished and is not responsible for the accuracy of this information. Our recommendations are based on available information from previous and current investigations. These recommendations may be updated as future investigations are performed.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as observed by AECOM or provided by Evergy. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the findings and revise the report if necessary.

This development of the Periodic Structural Stability Assessment Report was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

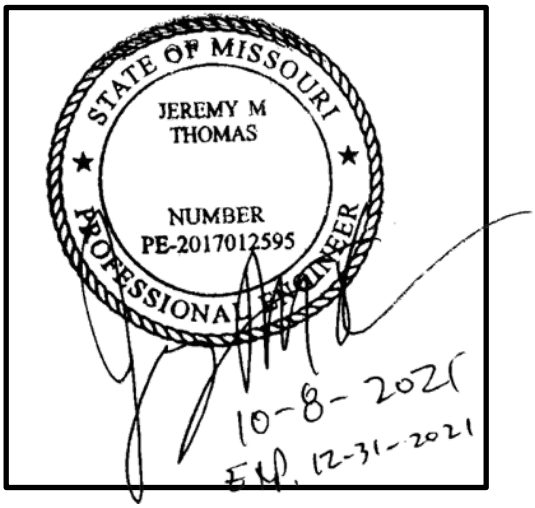
4. Certification Statement

CCR Unit: Evergy Sibley Generating Station, Fly Ash Impoundment

I, Jeremy Thomas, being a Registered Professional Engineer in good standing in the State of Missouri, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the Periodic Structural Stability Assessment Report dated October 8, 2021, which includes all pages in Sections 1 and 2, was conducted in accordance with the requirements of 40 CFR § 257.73(d).

Jeremy Thomas
Printed Name

October 8, 2021
Date



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5. References

1. U.S. Environmental Protection Agency, Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, 40 CFR §257. Federal Register 80, Subpart D, April 17, 2015.

2. AECOM, History of Construction Report, Fly Ash Impoundment, Sibley Generating Station, KCP&L Greater Missouri Operations Company, dated October 2016.

3. Burns and McDonnell, Impoundment Closure and Site Restoration Issued for Construction Drawings, Sibley Generating Station, KCP&L, dated 2019.

4. AECOM, Geotechnical Report, Fly Ash Impoundment, Sibley Generating Station, KCP&L Greater Missouri Operations Company, dated October 2016.

Appendix A Figures

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600 0 600

SCALE IN FEET

SOURCE: 2014 BUCKNER, MISSOURI USGS 7.5 MINUTE QUADRANGLE

PROJECT NUMBER AND TASK: 60661844		REV. NO.	BY	DATE	REVISIONS DESCRIPTION
DRAWN BY: TMS	DESIGNED BY: -				
CHECKED BY: JAT	APPROVED BY: JAT				
DATE: SEPTEMBER 20, 2021					

AECOM

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Kansas City, Missouri 64108

EVERGY METRO, INC.
SIBLEY GENERATING STATION
SIBLEY, MISSOURI

LOCATION MAP

FIGURE 1

September 20, 2021 9:23:01 pm (mik)
J:\Evergy Sibley IDF 2021\Location Map.dwg