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Zimmer Power Station
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CCR Rule Report: Initial Structural Stability Assessment

For

Coal Pile Runoff Pond

At Zimmer Power Station

1 Introduction

This Coal Combustion Residual (CCR) Rule Report documents that the Coal Pile Runoff Pond at the Zimmer Power Station meets the structural stability assessment requirements specified in 40 Code of Federal Regulations (CFR) §257.73(d). The Coal Pile Runoff Pond is located near Moscow, Ohio in Clermont County, approximately 0.6 miles north of the Zimmer Power Station. The Coal Pile Runoff Pond receives leachate from the Zimmer Power Station's on-site landfill, discharge from the Chemical Metal Cleaning waste treatment tank, and pumped flows from the D Basin CCR surface impoundment and other non-CCR ponds at Zimmer Power Station.

The Coal Pile Runoff Pond is an existing CCR surface impoundment as defined by 40 CFR §257.53. The CCR Rule requires that an initial structural stability assessment for an existing CCR surface impoundment be completed by October 17, 2016. In general, the initial structural stability assessment must document that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices.

The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial structural stability assessment was conducted in accordance with the requirements of 40 CFR § 257.73(d). The owner or operator must prepare a periodic structural stability assessment every five years.

2 Initial Structural Stability Assessment

40 CFR §257.73(d)(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 [the standards in (d)(1)(i)-(vii)].

An initial structural stability assessment has been performed to document that the design, construction, operation and maintenance of the Coal Pile Runoff Pond is consistent with recognized and generally accepted good engineering practices and meets the standards in 257.73(d)(1)(i)-(vii). The results of the structural stability assessment are discussed in the following sections. Based on the assessment and its results, the design, construction, operation, and maintenance of the Coal Pile Runoff Pond were found to be consistent with recognized and generally accepted good engineering practices.

2.1 Foundations and Abutments (§257.73(d)(1)(i))

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

The stability of the foundations was evaluated using soil data from field investigations and reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the foundations. The Coal Pile Runoff Pond is a ring dike structure and does not have abutments.

The foundation consists of medium stiff to hard clay soil, underlain by loose to very dense sand, which indicates stable foundations. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the foundation. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). A review of information about operations and maintenance as well as current and past performance of the dikes has determined appropriate processes are in place for continued operational performance.

Based on the conditions observed by AECOM, the Coal Pile Runoff Pond was designed and constructed with stable foundations. Any issues related to the stability of the foundation is addressed during operations and maintenance; therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(i).

2.2 Slope Protection (§257.73(d)(1)(ii))

CCR unit 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, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, adequate slope protection was designed and constructed at the Coal Pile Runoff Pond. No evidence of significant areas of erosion or wave action were observed and slopes were covered in vegetation. The Zimmer Power Station regularly maintains the slopes, including repairing observed surface erosion and addressing areas of poor vegetation growth, as required. Due to the characteristics of the outfall structure for the

Coal Pile Runoff Pond, sudden drawdown conditions are not expected to occur on the interior slopes. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(ii).

2.3 Dike Compaction (§257.73(d)(1)(iii))

CCR unit 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, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, slope stability analyses were performed to evaluate slip surfaces passing through the dike over the range of expected loading conditions as defined within §257.73(e)(1).

Based on this evaluation, the dike consists of very stiff to hard clay material, which is indicative of mechanically compacted dikes. Slope stability analyses exceed the criteria listed in §257.73(e)(1) for slip surfaces passing through the dike. The slope stability analyses are discussed in the *CCR Rule Report: Initial Safety Factor Assessment for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016); therefore, the original design and construction of the Coal Pile Runoff Pond included sufficient dike compaction. Deficiencies related to compaction of the dikes are identified and mitigated as part of operations and maintenance, in order to maintain sufficient compaction and density of the dikes to withstand the range of loading conditions. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(iii).

2.4 Vegetated Slopes (§257.73(d)(1)(iv))¹

CCR unit designed, constructed, operated, and maintained with vegetated slopes of dikes and surrounding areas, except for slopes which have an alternate form or forms of slope protection.

The adequacy of slope vegetation was evaluated by reviewing design drawings, information about operations and maintenance, and conditions observed in the field by AECOM.

Based on this evaluation, the vegetation on the interior and exterior slopes is adequate as no substantial bare or overgrown areas were observed. Therefore, the original design and construction of the Coal Pile Runoff Pond included adequate vegetation of the dikes and surrounding areas. Adequate operational and maintenance practices are in place to regularly manage vegetation growth, including mowing and seeding any bare areas, as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(iv).

¹ As modified by court order issued June 14, 2016, *Utility Solid Waste Activities Group v. EPA*, D.C. Cir. No. 15-1219 (order granting remand and vacatur of specific regulatory provisions).

2.5 Spillways (§257.73(d)(1)(v))

CCR unit 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; 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 was evaluated using design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. Additionally, hydrologic and hydraulic analyses were completed to evaluate the capacity of the spillway relative to inflow estimated for the 1,000-year flood event for the significant hazard potential Coal Pile Runoff Pond. The hazard potential classification assessment was performed by Stantec in 2016 in accordance with §257.73(a)(2).

The spillway consists of two, high-density polyethylene (HDPE) pipes, which is a non-erodible material that is designed to carry sustained flows. The capacity of the spillway was evaluated using hydrologic and hydraulic analysis performed per §257.82(a). The analysis found that the spillway can adequately manage flow during peak discharge resulting from the 1,000-year storm event without overtopping of the embankments. The hydrologic and hydraulic analyses are discussed in the *CCR Rule Report: Initial Inflow Design Flood Control System Plan for Coal Pile Runoff Pond at Zimmer Power Station* (October 2016). Any issues with the spillway are repaired and debris or other obstructions are removed from the spillway during operations and maintenance, as appropriate and as evidenced by the conditions observed by AECOM. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures (§257.73(d)(1)(vi))

CCR unit 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.

The stability and structural integrity of the hydraulic structure penetrating the dike of the Coal Pile Runoff Pond, which includes two HDPE pipe conduits, was evaluated using design drawings, information about operations and maintenance, and conditions observed in the field by AECOM. No other hydraulic structures are known to pass through the dike of or underlie the base of the Coal Pile Runoff Pond.

AECOM's field observations found the HDPE pipes to be free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris that may negatively affect the operation of the hydraulic structure. Operations and maintenance practices are in place to remove debris or other obstructions from the hydraulic structures, and address any deficiencies, as evidenced by conditions observed by AECOM. As a result, these procedures are appropriate for maintaining the hydraulic structures. Therefore, the Coal Pile Runoff Pond meets the requirements in §257.73(d)(1)(vi).

2.7 Downstream Slope Inundation/Stability (§257.73(d)(1)(vii))

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 structural stability of the downstream slopes of the Coal Pile Runoff Pond was evaluated by comparing the location of the Coal Pile Runoff Pond relative to adjacent water bodies using published Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), aerial imagery, conditions observed in the field by AECOM, and sudden drawdown slope stability analyses.

Based on this evaluation, the Ohio River is adjacent to the western downstream slope of the Coal Pile Runoff Pond. No other downstream water bodies such as rivers, streams, or lakes are adjacent to the Coal Pile Runoff Pond. Several adjacent non-CCR surface impoundments are present, but they are not a river, stream, or lake.

A sudden drawdown slope stability analysis was performed for a cross section adjacent to the Ohio River considered critical for sudden drawdown slope stability analysis. The analysis considered drawdown of the pool in the Ohio River from a 100-year flood condition, as found from the FEMA FIRM map, to an empty pool condition, thereby evaluating both sudden drawdown and low pool conditions. The resulting factor of safety was found to satisfy the criteria listed in United States Army Corps of Engineers Engineer Manual 1110-2-1902 for drawdown from normal to empty pool, as factor of safety criteria for sudden drawdown slope stability analysis is not expressly stated as a requirement of §257.73(d)(1)(vii). Therefore, the Coal Pile Runoff Pond meets the requirements listed in §257.73(d)(1)(vii).

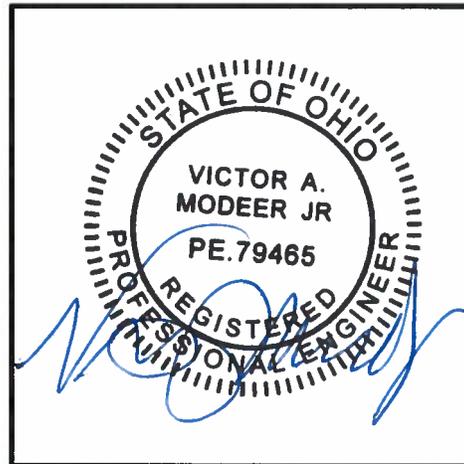
3 Certification Statement

CCR Unit: Zimmer Power Station; Coal Pile Runoff Pond

I, Victor A. Modeer, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this CCR Rule Report, and the underlying data in the operating record, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the initial structural stability assessment dated October 13, 2016 was conducted in accordance with the requirements of 40 CFR § 257.73(d).

VICTOR A MODEER JR.
Printed Name

10/13/16
Date



About AECOM

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