CCR Rule Report:

Initial Structural Stability Assessment

GMF Recycle Pond
Coffeen Power Station
Montgomery County, Illinois

Submitted to Illinois Power Generating Company
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HANSON
Engineering | Planning | Allied Services

1. Introduction

The GMF Recycle Pond at the Coffeen Power Station is located in the NW 1/4 of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian in Montgomery County, Illinois, approximately 1.5 miles south of Coffeen, Illinois.

The GMF Recycle Pond is lined with a 60-mil, high-density polyethylene (HDPE) geomembrane, has a maximum embankment height of 16 feet and has a maximum impounding capacity of 243 acre-feet (measured at the top elevation 629.0 feet). There is an additional 99 acre-feet of incised storage.

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).

2. Initial Structural Stability Assessment

40 CFR 257.73(d)(1) 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: 40 CFR 257.73(d)(1)(i)-(vii)

An initial structural stability assessment has been performed in accordance with 40 CFR 257.73(d)(1)(i)-(vii), documenting that the design, construction, operation, and maintenance of the GMF Recycle Pond is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater, which can be impounded therein.

2.1 Stable Foundations and Abutments

40 CFR 257.73(d)(1)(i) - CCR unit designed, constructed, operated, and maintained with stable foundations and abutments.

The GMF Recycle Pond foundation soils are grayish brown to brown, firm, silty clay, having Standard Penetration Test (SPT) blow counts ranging from 4-7 blows/foot and unconfined compressive strengths of approximately 1.3 tons per square foot. The GMF Recycle Pond has no abutments. The structural stability of the foundation soils and embankment was assessed and found to meet the structural stability requirements of 40 CFR 257.73(e). Information related to this assessment is found in the CCR Rule Report: Initial Safety Factor Assessment for the GMF Recycle Pond, dated October 2016. Procedures are in place to maintain and operate the foundations in a stable manner. Therefore, the GMF Recycle Pond meets the requirements of 40 CFR 257.73(d)(1)(i).

2.2 Adequate Slope Protection

40 CFR 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 interior slopes of the GMF Recycle Pond are designed and constructed using a high-density polyethylene (HDPE) geomembrane, which is not susceptible to surface erosion or wave action. The exterior slopes were designed and constructed with a 4H:1V slope and vegetation to protect against

surface erosion. The operational condition of the interior and exterior slopes were visually evaluated during the annual inspection performed per 40 CFR 257.83 on September 27, 2016, and found to be intact. Procedures are in place to maintain and operate the slope protection features.

Even though it is highly unlikely that the GMF Recycle Pond interior slopes will be subjected to a rapid drawdown condition because they are lined with an HDPE geomembrane, slope stability analyses of the critical cross section of the slope indicate that sudden drawdown will have no adverse effects.

Therefore, the GMF Recycle Pond meets the requirements in 40 CFR 257.73(d)(1)(ii).

2.3 Dike Compaction

40 CFR 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.

Construction records for the GMF Recycle Pond indicate that the dike was constructed of sandy silty clay fill materials, having a maximum compacted lift thickness of 8 inches. Fill materials were compacted to a dry density equal to or greater than 95 percent of the maximum dry density obtained from the Standard Proctor Test, ASTM D698. Fill was compacted at a moisture content that is no more than 2 percent below and no more than 2 percent above optimum moisture content. In-place compacted densities range from 105.1 to 112.7 pounds per cubic foot.

These in-place parameters meet the criteria of the original slope stability analyses found in the design record. Procedures are in place to maintain and operate the dikes to withstand the range of loading conditions. Therefore, the GMF Recycle Pond meets the requirements in 40 CFR 257.73(d)(1)(iii).

2.4 Vegetated Slopes

40 CFR 257.73(d)(1)(iv) - 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 GMF Recycle Pond exterior slopes were designed and constructed with vegetated slopes capable of providing protection against surface erosion. The interior slopes of the GMF Recycle Pond were designed and constructed using a HDPE geomembrane liner for slope protection. Operational and maintenance procedures are in place to operate and maintain the vegetation on the slopes. The operational condition of the exterior slopes was evaluated and found to be intact. Procedures are in place to maintain and operate the vegetated slopes and alternate slope protection. Therefore, the GMF Recycle Pond meets the requirements in 40 CFR 257.73(d)(1)(iv).

2.5 Spillways

40 CFR 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 emergency spillway for the GMF Recycle Pond consists of three 6-foot-by-6-foot precast reinforced concrete risers (drop inlets) each with a top elevation of 624 feet (5 feet below the top of the dam). The GMF Recycle Pond HDPE liner is attached to the exterior sides of each riser. A 4-foot-diameter HDPE outlet conduit that returns water to the power station was constructed at each riser, with an upstream invert of 615.0 feet and a downstream invert of 613.0 feet. Assuming a maximum normal pool elevation of 624.0 feet (control elevation of the risers), the emergency spillway has been designed to pass the 24-hour PMF storm event of 34 inches of precipitation, based on NOAA Hydrometeorolgical Report No. 51, with adequate freeboard to prevent overtopping of the GMF Recycle Pond crest by wind-generated waves. By contrast, the regulatory 1,000-year flood event was estimated to be 9.13 inches in 24 hours, based on NOAA Atlas 14, which is much less than the PMF. The downstream end of the emergency spillway is protected from scour by a riprap stilling basin. The emergency spillway is regularly inspected and maintained in accordance with the gypsum management facility operation and maintenance manual found in the Coffeen Power Station GMF Recycle Pond Documentation Report.

Therefore, the GMF Recycle Pond spillway meets the requirements in 40 CFR 257.73(d)(1)(v).

2.6 Stability and Structural Integrity of Hydraulic Structures

40 CFR 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 emergency spillway drop inlet structures were constructed on structural soil fill materials. Discharge piping is composed of non-erodible butt-fusion HDPE piping, and a flowable backfill plug was installed at the location where the pipes exit the drop inlet structures to prevent seepage. Compacted structural soil backfill was installed around the discharge pipes as they pass through the GMF Recycle Pond dike. A riprap stilling basin was installed on the downstream end of the discharge pipes to prohibit scour.

The process water decant pipes that feed water to the GMF Recycle Pond pumphouse are composed of non-erodible butt-fusion HDPE piping. Compacted structural soil backfill was installed around the decant pipes as they pass through the GMF Recycle Pond dike. The pipes are booted through the HDPE geomembrane to prevent leakage.

A pond riser pipe that hydraulically connects the GMF Recycle Pond to the ultrasonic transducer manhole for the purpose of water level monitoring is composed of non-erodible butt-fusion HDPE piping. Compacted structural soil backfill was installed around the pipes beneath the GMF Recycle Pond dike. The pipe is booted through the HDPE geomembrane to prevent leakage.

A decant pipe that transfers water from the GMF Pond to the GMF Recycle Pond is composed of non-erodible butt-fusion HDPE piping. Flowable backfill was installed around the decant pipe as it passes beneath the process water transfer channel. The pipe is booted through the HDPE geomembrane to prevent leakage.

A slurry pipe that can transfer FGD slurry from the plant scrubber system to the GMF Recycle Pond is composed of non-erodible butt-fusion HDPE piping. This pipe passes through the west dike of the GMF Recycle Pond and is not in operation. Compacted structural soil backfill was installed around the decant pipe as it passes through the dike. The pipe is booted through the HDPE geomembrane to prevent leakage.

The emergency spillway was visually inspected during the annual inspection on September 27, 2016, and no deficiencies were observed. Therefore, the stability and structural integrity of the emergency spillway was designed, constructed, operated and maintained to meet the requirements of 40 CFR 257.73(d)(1)(vi).

The September 27, 2016, inspection did not identify any observable deficiencies with the process water decant pipes, the pond riser pipe, the transfer channel decant pipe or the slurry pipe that may negatively affect operation of those hydraulic structures. However, thorough inspections of those pipes have not yet been performed to confirm the current condition of the pipes as free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris per 40 CFR 257.73(d)(1)(vi). Thus, while the design and construction of the process water decant pipes, the pond riser pipe, the transfer channel decant pipe and the slurry pipe meets the requirements of 40 CFR 257.73(d)(1)(vi), in accordance with 40 CFR 257.73(d)(2), Hanson recommends that a nondestructive inspection of these pipes be performed as soon as feasible and that this report be updated with inspection documentation at that time.

2.7 Downstream Slope Inundation/Stability

40 CFR 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.

A review of Federal Emergency Management Agency flood hazard maps indicates that adjacent water bodies, more specifically the intermittent stream east of the GMF Recycle Pond, are not prone to flooding. Therefore, the GMF Recycle Pond downstream slopes would not be inundated by the pool of an adjacent water body.

3. Certification Statement

COFFEEN POWER STATION - GMF RECYCLE POND
ILLINOIS POWER GENERATING COMPANY
INITIAL STRUCTURAL STABILITY ASSESSMENT CERTIFICATION

As a Qualified Professional Engineer as defined by 40 CFR 257 Subpart D, I certify that I have personally examined and am familiar with the design information referenced below, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete.

The **Coffeen Power Station GMF Recycle Pond** Initial Structural Stability Assessment, as supported by the Coffeen Power Station GMF Recycle Pond Documentation Report in the operating record was conducted in accordance with the requirements set forth by 40 CFR 257.73 as published on April 17, 2015.

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Seal:

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