Cardinal Power Plant

Structural Stability Assessment for

Retrofitted Bottom Ash Pond of the Bottom Ash Pond Complex

Issue Purpose: For Use, Rev. 0

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1 PURPOSE

Pursuant to 40 CFR 257.74(d), this report provides the initial structural stability assessment for the retrofitted Bottom Ash Pond at the Cardinal Power Plant. Beginning in 2021, the South Pond of the Bottom Ash Pond Complex (BAPC) was retrofitted with a CCR-compliant liner system and will receive bottom ash in accordance with 40 CFR 257.102(k). Upon completion of the retrofit, the South Pond's name is changed from the former "Recirculation Pond" to the retrofitted "Bottom Ash Pond."

2 APPLICABLE CCR REGULATION

To develop the structural stability assessment for the retrofitted Bottom Ash Pond, the following excerpts from 40 CFR Part 257 Subpart D (Federal CCR Rule) are applicable:

- **§257.74(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.

(3) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the initial assessment and each subsequent periodic assessment was conducted in accordance with the requirements of this section."

3 STRUCTURAL STABILITY ASSESSMENT RESULTS

To develop the assessment presented herein, a review of the available construction documents, soil borings through the dikes, the annual inspections conducted to date by a third-party, qualified professional engineer in accordance with 40 CFR 257.83(b)(1), Cardinal's observations of the dikes, and visual observations from a 2021 walkdown done by a qualified professional engineer from Sargent & Lundy has been completed. Pursuant to 40 CFR 257.74(d)(1), the standard for this evaluation is consistent with recognized and generally accepted good engineering practices.

It is noted that the retrofit of this impoundment did not include significant modifications to the dams. Instead it was to install a CCR compliant lining system. Thus, the existing dikes, which have been previously certified, are improved by the lowering of the phreatic surface within them.

3.1 Stable Foundations and Abutments - 40 CFR 257.74(d)(1)(i)

Calculations supporting the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.74(e)) indicate the soils supporting the exterior dikes of the retrofitted Bottom Ash Pond meet or exceed the minimum required safety factors to be considered stable for the maximum volume of CCR and CCR wastewater which can be impounded therein. The soils were screened for liquefaction potential and the soils were found to be non-liquefiable.

3.2 Adequate Slope Protection - 40 CFR 257.74(d)(1)(ii)

The slopes of the dikes are adequately protected against surface erosion, wave action, and adverse effects of sudden drawdown.

3.3 Compacted Dikes - 40 CFR 257.74(d)(1)(iii)

As documented by the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.74(e)), the dikes are adequately compacted to provide the required engineering properties to meet or exceed the minimum required stability safety factors for the required loading conditions.

3.4 Vegetated Slopes - 40 CFR 257.74(d)(1)(iv)

The slopes of the retrofitted Bottom Ash Pond are regularly maintained and no woody vegetation was observed.

3.5 Spillway - 40 CFR 257.74(d)(1)(v)

This perched impoundment does not receive inflow from areas beyond the top of dike. There is not a spillway. Instead a blow down line to the flue gas desulfurization (FGD) system is used to dispose of excess water and to maintain an appropriate water quality. During normal operation, the majority of flow is recirculated into the plant via the pump station located on the west side of the retrofitted Bottom Ash Pond.

3.6 Hydraulic Structures - 40 CFR 257.74(d)(1)(vi)

The only active pipes that penetrate the dike are discharge lines that exit the pump house and penetrate the dike above the normal operating water level. These active pipes exhibit no visual evidence of risk to the dikes. All other pipes have been removed or abandoned in place and exhibit no visual evidence of risk to the dikes.

3.7 Adjacent Water Bodies - 40 CFR 257.74(d)(1)(vii)

As documented by the Station's Safety Factor Assessment (completed in accordance with 40 CFR 257.74(e)), the downstream slopes of the exterior dikes are appropriate for the flooding risks of the adjacent Ohio River.

4 RESULTS & CONCLUSIONS

This structural stability assessment confirms that the retrofitted Bottom Ash Pond, at Cardinal Power Plant has been designed, constructed, operated, and maintained consistent with recognized and generally accepted good engineering practices to provide structural stability for the maximum volume of CCR and CCR wastewater which can be impounded therein.

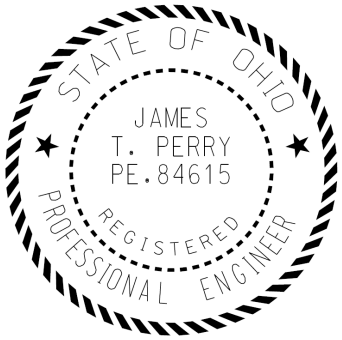
5 CERTIFICATION

I certify that

- This initial structural stability assessment for the retrofitted Bottom Ash Pond was prepared by me or under my supervision,
- This initial structural stability assessment meets the requirements of 40 CFR 257.74(d) and 40 CFR 257.74(f), and
- I am a registered professional engineer under the laws of the State of Ohio.

Certified By: _____James T. Perry_____ Date: _01/05/2022___

Seal:



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