DOMINION ENERGY

PERIODIC STRUCTURAL STABILITY ASSESSMENT

CHESAPEAKE ENERGY CENTER INACTIVE CCR SURFACE IMPOUNDMENT: BOTTOM ASH POND

APRIL 2023

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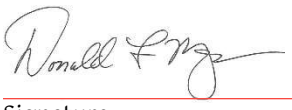
1 CERTIFICATION

This periodic Structural Stability Assessment for the Chesapeake Energy Center's Bottom Ash Pond was prepared by WSP USA Inc. (WSP; formerly d/b/a Golder Associates USA Inc.). The document and Certification/Statement of Professional Opinion are based on and limited to information that WSP has relied on from Dominion Energy and others, but not independently verified, as well as work products produced by Golder.

On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Virginia that this document has been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances, at the same time, and in the same locale. It is my professional opinion that the document was prepared consistent with the requirements in 40 CFR §257.73(d) of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015, with an effective date of October 19, 2015 [40 CFR §257.73(d)], as well as with the requirements in 40 CFR §257.100 resulting from the EPA's "Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals from Electric Utilities: Extension of Compliance Deadlines for Certain Inactive Surface Impoundments; Response to Partial Vacatur" published in the Federal Register on August 5, 2016, with an effective date of October 4, 2016 (40 CFR §257.100).

The use of the word "Certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty, or legal opinion.

Donald Mayer, PE	Vice President
Print Name	Title
	4/12/2023
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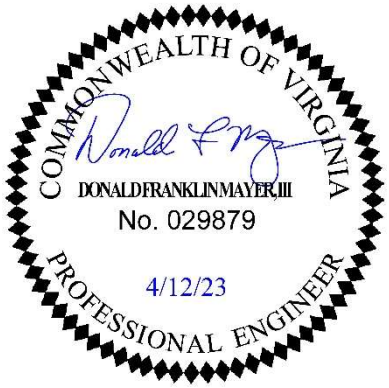

2 INTRODUCTION

This periodic Structural Stability Assessment (Assessment) was prepared for the Chesapeake Energy Center's (CEC) Coal Combustion Residuals (CCR) inactive surface impoundment known as the Bottom Ash Pond (BAP). This periodic Structural Stability Assessment was prepared in accordance with 40 CFR Part §257, Subpart D and is consistent with the requirements of 40 CFR §257.73(d).

CEC, owned and operated by Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion Energy), is located in the City of Chesapeake, Virginia, at 2701 Vepco Street. CEC includes an inactive CCR surface impoundment, the BAP, as defined by the Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule and Direct Final Rule (40 CFR §257; the CCR rule). The BAP is also regulated as a dam by the Virginia Department of Conservation and Recreation (DCR) with Inventory Number 550002 (DCR Dam Permit).

3 PURPOSE

This periodic Assessment is prepared pursuant to the requirements in the CCR Rule, 40 CFR §257.73(d)(1). The initial Structural Stability Assessment was completed in April 2018 and is required to be updated every five (5) years pursuant to 40 CFR §257.73(f)(3).

4 STRUCTURAL STABILITY ASSESSMENT REQUIREMENTS

In accordance with 40 CFR §257.73(d)(1), the owner or operator of a CCR surface impoundment must conduct periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR surface 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 CCR unit has been designed, constructed, operated, and maintained with:

- Stable foundations and abutments;
- Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;
- Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;
- 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;
- A single spillway or a combination of spillways that is designed, constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the 1,000-year flood;
- All spillways must be either of non-erodible construction and designed to carry sustained flows or earth- or grass-lined and designed to carry short-term, infrequent flows at non-erosive velocities where sustained flows are not expected;
- 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
- 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.

5 STRUCTURAL STABILITY ASSESSMENT

5.1 FOUNDATION AND ABUTMENTS

The BAP lies in a geologically stable area with no active (Holocene) faults, karst (limestone, dolomite, or marble) potential, or other geologic conditions of concern. The BAP embankments were originally constructed as part of a larger sluiced ash impoundment in the early 1950's. Prior to site improvements, the site was low-lying tidal back swamp or marsh area subject to regular tidal influences. Subsurface site investigations conducted by Golder and others show the site underlain by recent coarse-grained and fine-grained alluvium deposits of silty sand ranging from approximately 8 to 16 feet thick [to approximate elevation -7 feet above mean sea level (ft amsl)]. Under the alluvium layers is generally considered the Norfolk formation of coarse-grained and fine-grained clayey sands, which extend to depths greater than elevation -30 ft amsl. WSP's assessment of embankment stability in the Periodic Safety Factor Assessment (WSP, 2023) show that the BAP meets the minimum factor of safety requirements in the CCR Rule §257.73(e)(1). Additionally, the BAP has been routinely inspected and monitored by CEC and Dominion Energy personnel in accordance with the requirements in the DCR Dam Permit. Areas of concern are evaluated by professional engineers with corrective actions implemented and documented.

Material properties of the embankment soils and underlying strata are presented in Table 1 below.

Table 1 Summary of Geotechnical Strength Properties

MATERIAL	TOTAL UNIT WEIGHT (POUND PER CUBIC FOOT, PCF)	STRENGTH PROPERTIES		
		PEAK Φ' (°)	COHESION (POUND PER SQUARE FOOT, PSF)	SU (PSF)
Dike Fill Soils – BAP	125	26	100	1,500
Ponded Fill	100	28	0	700
Fine-grained Alluvium	115	N/A	N/A	500
Upper Sand	120	32	0	N/A
Layered Clayey Sand	120	28	100	0
Silty Sand	120	30	0	N/A
Lower Sand	120	34	0	N/A

MATERIAL	TOTAL UNIT WEIGHT (POUND PER CUBIC FOOT, PCF)	STRENGTH PROPERTIES		
		PEAK Φ' (°)	COHESION (POUND PER SQUARE FOOT, PSF)	SU (PSF)
Lower Silty Sand	120	34	0	N/A

5.2 SLOPE PROTECTION

The BAP dike was built with interior slopes of 2 horizontal to 1 vertical (2H:1V) and 6H:1V, and the exterior slopes vary from 2H:1V to 2.5H:1V. The interior and exterior slopes are maintained and protected against surface erosion by regular inspections and maintenance, as required, to prevent small erosion areas from developing into larger problem areas. The exterior slope has a good stand of existing vegetation that is mowed at least once per year to preclude the development of woody vegetation.

Protection from interior wave action is not required, as the pond normally does not contain a permanent pool of water. On the exterior, the embankment is bordered on the east by the Southern Branch of the Elizabeth River and on the south by wetland areas. The primary source of wave action in the river is from passing ship traffic, as the fetch length for wind-driven waves is relatively sort. The river-facing embankment is adequately protected from wave action by a combination of stone riprap, sheet pile walls, and well-established vegetation.

Dominion Energy performs annual inspections in accordance with the requirements of the DCR Dam Permit with the most recent inspections on June 9, 2021 (Virginia Electric and Power Company, 2021) and April 5, 2022 (Virginia Electric and Power Company, 2022). Dominion Energy evaluates the vegetation on the slopes of the impoundment embankment as part of the annual inspections. Current operations at the BAP call for grass to be mowed 2-3 times per year to control vegetation height. Additionally, in accordance with 40 CFR Section §257.83, annual inspections are performed by a qualified professional engineer with the most recent inspection on June 15, 2022 (WSP, 2022).

5.3 COMPACTION OF DIKES

In addition to a review of previous exploration work by others, Golder completed two rounds of cone penetrometer testing (CPT) during 2016 and 2017 geotechnical exploration programs. A total of 14 soundings were made through and near the BAP dikes to assess the material strength of the dike and materials below the dike. Soundings were made to depths up to 100 feet below ground surface (bgs). The dike fill soil contains variations of fine-grained and coarse-grained soils and exhibit sufficient compaction and density to withstand the anticipated range of loading conditions. Additional information and CPT sounding logs are included in the Initial Structural Stability Assessment for the BAP (Golder, 2018).

No visible indications of weakened embankment (e.g., tension cracks, elevated groundwater, groundwater seeps, sinkholes, etc.) have been observed at the BAP over the past five years during routine and annual inspections. Slope stability analyses presented in the Safety Factor Assessment (WSP, 2023) present the embankment to be stable.

5.4 VEGETATED SLOPES

As required by §257.73(d)(1)(iv), vegetation on slopes and surrounding areas are not to exceed a height of six inches above the slope of the dike. Current operations at the BAP call for grass to be mowed 2-3 times per year to control vegetation height. The vegetated slopes are operated and maintained to be stable and to provide for visual observation of any instability. The 2021 and 2022 annual inspections (Virginia Electric and Power Company, 2021; Virginia Electric and Power Company, 2022) noted that the upstream and downstream slopes of the embankment have been mowed.

5.5 SPILLWAYS

The BAP receives stormwater runoff from the adjacent landfill, where the runoff enters the northeast corner of the pond. The principal spillway is a 30-inch diameter corrugated high density polyethylene (CHPDE) culver pipe located in the wester embankment. The CHDPE pipe has an invert elevation of 15.15 feet and an outlet elevation of 14.15 feet. There are no flow or inlet control devices on this pipe. As shown in the Initial Inflow Design Flood Control System Plan for the BAP, the culvert has adequate capacity to pass the flow from the 1,000-year storm event as required for a "Significant" hazard classification rating (Golder, 2018).

5.6 HYDRAULIC STRUCTURES

The BAP's principal spillway passes through the western dike into the adjacent sediment basin. There are no other known structures passing through or underlying the base of the BAP. In accordance with 40 CFR §257.83, the pipe is monitored and inspected periodically for clogging, leaks, erosion around the pipe, movements, and other issues.

5.7 ADJACENT WATER BODIES

The impacts of rapid drawdown of slopes facing the Southern Branch of the Elizabeth River as described in 40 CFR §257.73(d)(1)(vii) of the CCR rule were considered. The mapped (FIRM Zone AE) 100-year flood level in the Southern Branch of the Elizabeth River is elevation 8 ft-msl, indicating a maximum rise of 1.6 meters (5.4 feet) above mean water levels. Thus, the dikes of the BAP are not expected to undergo rapid drawdown in excess of 5.4 feet. Impacts of such a drawdown event have been mitigated by armoring the toe of the dike slopes along the Southern Branch of the Elizabeth River. Therefore, additional rapid drawdown analyses are not necessary.

6 CORRECTIVE MEASURES

No structural stability deficiencies were identified, so no corrective measures are required.

7 CONCLUSIONS

Based on known site conditions, review of available information, and the analyses performed for the BAP embankment, the BAP surface impoundment design, construction, operations, and maintenance procedures are consistent with good engineering practices for the volume of CCR and CCR wastewater that is impounded and meets the requirements of 40 CFR 257.73(d).

REFERENCES

- Golder Associates. Structural Stability Assessment, Chesapeake Energy Center Inactive CCR Surface Impoundment: Bottom Ash Pond. April 2018.
- Virginia DCR Dam Permit, Inventory No. 550002.
- Virginia Electric and Power Company. Annual Inspection Report for Virginia Regulated Impounding Structures, Chesapeake Energy Center Bottom Ash and Sediment Pond Dam. June 2021.
- Virginia Electric and Power Company. Annual Inspection Report for Virginia Regulated Impounding Structures, Chesapeake Energy Center Bottom Ash and Sediment Pond Dam. April 2022.
- WSP USA Inc. Annual Inspection Report for Existing CCR Surface Impoundment, Chesapeake Energy Center (CEC) Bottom Ash Pond. July 2022.
- WSP USA Inc. Periodic Inflow Design Flood Control System Plan, Chesapeake Energy Center CCR Surface Impoundment: Bottom Ash Pond. March 2023.
- WSP USA Inc. (WSP). 2023. Periodic Hazard Potential Classification Assessment, Chesapeake Energy Center Inactive Surface Impoundment: Bottom Ash Pond. March 2023.