

FINAL

2023 ANNUAL INSPECTION REPORT

**GRAND RIVER ENERGY CENTER - CCR LANDFILL
SOLID WASTE PERMIT NO. 3549012**

Chouteau, Oklahoma

**B&V PROJECT NO. 405290
B&V FILE NO. 41.0403**

PREPARED FOR



7 DECEMBER 2023



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1.0 Executive Summary

This report presents a summary of the annual inspection for the Grand River Dam Authority (GRDA) Coal Combustion Residual (CCR) landfill at the Grand River Energy Center (GREC) in Chouteau, Oklahoma. The annual inspection was completed by Black & Veatch on November 7, 2023. The annual inspection was completed in compliance with Oklahoma Administrative Code (OAC) 252:517-13-5 *Inspection Requirements for CCR Landfills*.

Requirements in 252:517-13-5 include review of available information regarding the landfill as well as a visual inspection of the landfill and appurtenant structures.

1.1 SUMMARY OF FINDINGS

No signs of structural weakness or conditions that would disrupt or affect the safety of the landfill were identified. There were no concerns with existing conditions or the current maintenance activities.

1.2 RECOMMENDATIONS

Black & Veatch has no recommendations for improvements, no concerns for stability, and no recommended changes to the maintenance program.

2.0 Inspection Team and Date of Inspection

2.1 INSPECTION TEAM

The inspection team consisted of two GRDA employees and one Black & Veatch geotechnical engineer. The inspection team members included:

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2.2 DATE OF INSPECTION

The inspection team began their work at 10:30 a.m. on Tuesday, November 7, 2023, and completed their work at 12:50 p.m.

2.3 WEATHER DURING INSPECTION

The weather on the day of the inspection was clear, no wind, with an ambient temperature about 70° Fahrenheit. There had been no significant precipitation within the previous week and the conditions were dry on the day of the investigation.

3.0 Description of Landfill

3.1 GENERAL DESIGN INFORMATION

The GREC power plant is located east of Chouteau, Oklahoma within Mayes County. It was designed with a coal-fired, 490 MW Unit that was commissioned in 1981. The facility expanded operations in 1985 with a second unit rated at 520 MW. Unit 2 has a dry Flue Gas Desulfurization(FGD) scrubber for control of sulfur emissions.

The GREC landfill was permitted in 1979 as a Non-Hazardous Industrial Waste Landfill that is allowed to accept fly ash, bottom ash and spent powdered activated carbon used to control flue gas emissions, generated at the GREC facility. The original permitted landfill consisted of 116 acres, of which only 47 acres have been utilized for placement of CCR materials.

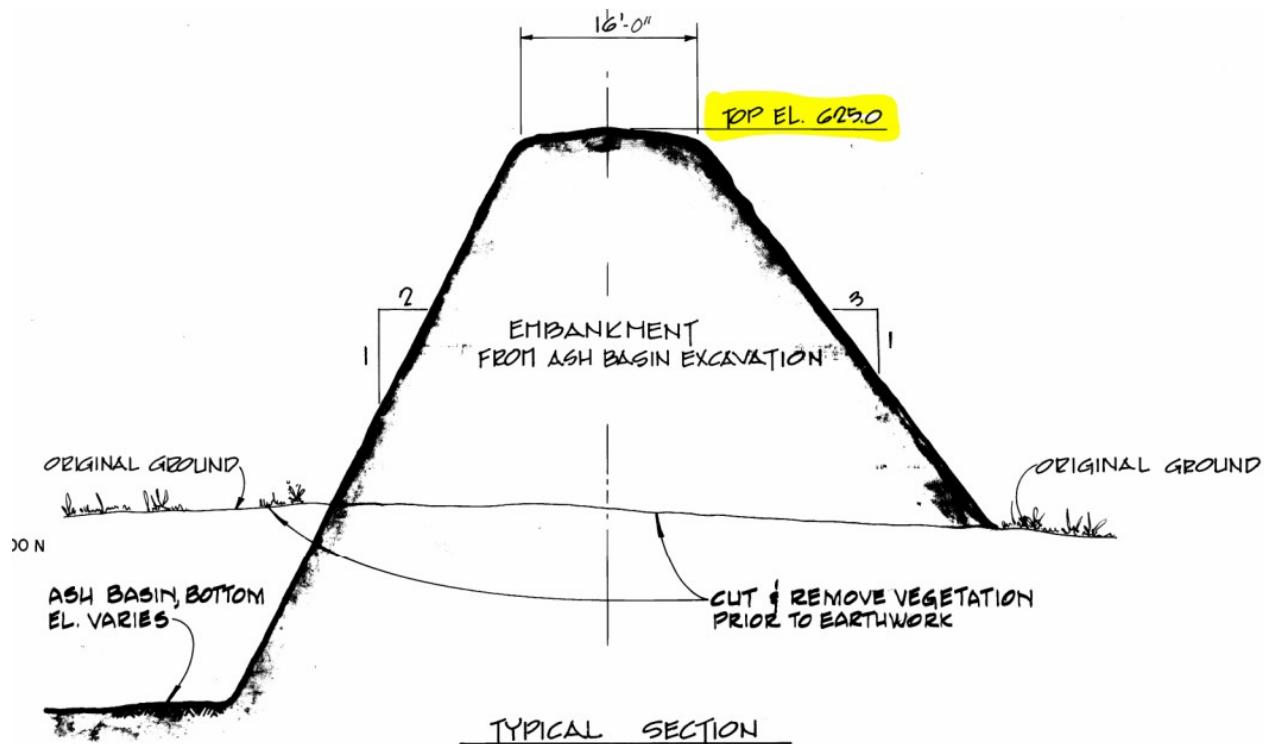
In October 2017, a request to modify the existing landfill permit was submitted to DEQ. The modification requested a reduction in landfill permit area from 116 acres to 67 acres. The request for permit modification has been approved by DEQ. The original drawings for the landfill were completed in 1979 by Holway-United. The drawings show the embankments surrounding the landfill were constructed to Elevation 625 with a 16-foot wide top and 2 Horizontal to 1 Vertical side slopes, see Figure 3-1. The native soil materials from inside the landfill footprint were used to construct the embankments.

The landfill was designed so that all surface water drainage is routed around the landfill area and into a series of permitted Class III industrial wastewater treatment impoundments regulated under an Oklahoma Pollutant Discharge Elimination System (OPDES) permit OK0035149. The industrial wastewater system consists of 11 process water and storm water retention/treatment basins around the western and southern perimeter of the landfill. These surface impoundments provide a total holding capacity of 1,371,521,000 gallons as stated in the facility OPDES permit and receive process water, cooling tower water, and storm water run-off from the landfill, coal pile, and the operational areas of the plant. The discharge is to the Neosho River.

Grand River Dam Authority (GRDA) is proposing to construct and operate a new simple cycle combustion turbine (SCCT) unit (along with ancillary equipment) at the existing facility. The SCCT unit will consist of one combustion turbine generator (CTG) which will combust commercial grade natural gas; The SCCT will have a nominal rating of 453 megawatts (MW), gross, at ISO (International Organization for Standardization) conditions (ambient temperature of 59 degrees Fahrenheit (°F) and a relative humidity of 60 percent). As part of this project, GRDA will permanently shut down the existing coal-fired boiler Unit 2. Additionally, GRDA will also permanently shut down the existing fly ash handling processes and the cooling tower associated

with the operation of the existing coal-fired boiler. GRDA has committed to closing out unit 2 by April of 2026 if unit 4 comes online by then.

Figure 3-1 Original Design Drawing Cross-Section of Landfill Embankment



3.2 OPERATIONS

Disposal operations within the power plant require dump trucks to haul the fly ash and bottom ash from the plant to the landfill. The haul trucks are loaded from storage silos using dry disposal methods. The haul trucks unload the ash in the landfill area and dozers are used to grade the material into even lifts. A water truck is used to condition the dry ash to aid in grading and prevent fugitive dust. Currently the existing face of the disposed ash is on the north and the drainage of the exposed ash is toward the north. In general, bottom ash is deposited at the northeast corner of the current working face of the landfill area. The bottom ash has occasionally been sold as a beneficial use product; therefore, bottom ash is deposited separately from the fly ash. Bottom ash has a granular/gravel texture and is also dampened with water for fugitive dust control purposes prior to loading. Once loaded, the transport vehicles then convey CCRs to the landfill for final disposal. At the landfill, water trucks are used to minimize fugitive dust, as necessary. Ash material that has been placed at the planned final grade has been capped with the planned cover soil, topsoil and seeded with grass.

During the past few years, the bottom ash has been deposited toward the north end to provide better conditions for placement of fly ash. The bottom ash has been end-dumped toward the north and east corner of the active open area.

The construction and modification of the east perimeter and new east embankment are partially complete. The regrading of the east side of the landfill has been part of the east embankment construction. The original south landfill embankment that is east of the new embankment has been cleared of trees and regraded to near the original planned slope.

The completed portions of the landfill still maintain a good stand of native grass and has been maintained by mowing. There was no indication of new growth within older vegetation indicating that the vegetation has been properly maintained with no signs of bare patches or unwanted groundwater seeps. No ruts or erosion rills were observed on the side slopes.

Grading and CCR deposition are constant on the north portion of the landfill area. Fly ash and bottom ash are deposited separately but within the same general landfill area. Haul roads are still properly sloped and maintained.

3.3 LANDFILL VOLUME AND CAPACITY

Based on the original construction drawings, the landfill's exterior embankment was constructed to elevation 625 feet. CCR materials have been placed in the west 47 acres of the original permitted landfill boundary. Side slopes of the landfilled ash (ash deposited inside the embankments) have been graded at 4 horizontal to 1 vertical in compliance with the Closure Plan, dated April 21, 2021.

The most recent survey evaluation of ash placement has estimated the current ash volume to be 3,778,500 cubic yards within the 47-acre footprint. This is an increase of approximately 16,000 tons of fly ash and bottom ash from last year.

Construction of the new embankment is on the east side of the active 47-acre landfilled area. This reduced the permit area to the current footprint of stored ash materials. Using the planned closure grades and elevations for the 47 acres, the planned capacity of the landfill area will be 4,350,000 cubic yards.

3.4 LANDFILL INSPECTION PROCEDURES

In accordance with OAC 252:517-13-5(a)(1) the facility is inspected on a weekly basis by plant personnel. The inspections include observations of structural integrity, fugitive dust, and proper operations. The inspection findings and any required actions are recorded and presented at <https://www.grda.com/ccr-weekly-ccr-landfill-inspection-for-2023/>

The weekly inspections were initiated on October 11, 2015. The weekly inspection reports have been completed during the past year and were reviewed for this inspection.

4.0 Inspection Findings

Black & Veatch completed the annual inspection based on the requirements of OAC 252:517-13-5(b) *Annual Inspection by a Qualified Professional Engineer*. The inspection was completed as an on-site, walking, visual inspection with the main goals of identifying signs of distress or malfunction of the embankments and cover soils. As part of this inspection, Black & Veatch also performed a review of the available information which included the following documents;

- a. Coal Combustion Residual (CCR) Landfill – Stability Analysis Report, prepared by Black & Veatch, 9 July 2020.
- b. Grand River Dam Authority (GRDA) 490-MW Coal Fired Generating Station Ash Disposal Permit Application, Chouteau, Oklahoma; 22 August 1979.
- c. Oklahoma Administrative Code (OAC). Chapter 517. Disposal of Coal Combustion Residuals from Electric Utilities, Effective 15 September 2018
- d. Bottom Ash Surface Impoundment Hazard Potential Classification Assessment, prepared by Black & Veatch, October 2016.
- e. Closure Plan for GRDA Landfill – Grand River Energy Center, by Black and Veatch April 2021.
- f. Quality Assurance and Quality Control Plan for GRDA Landfill – Grand River Energy Center, by A & M Environmental Services, 13 September 2019.
- g. CCR Weekly Landfill Inspection Reports for 2023. grda.com/CCR-Weekly-CCR-Landfill-inspection-for-2023/

Field inspection of the landfill included a site walk to observe the embankment crest, embankment slope, embankment toe, and cover soils.

4.1 RESULTS OF INSPECTION

4.1.1 Crest

The crest of the landfill embankments on the south, west, and north sides are grass covered. The crest of the embankments had good grass cover, no signs of cracking, settlement, movement, erosion, or deterioration. (See Figure 4-1). The grass height is maintained to ensure there is no unwanted vegetation (bushes or trees). No ruts or bare areas were observed on the crest. No depressions or slumps were observed that would indicate the beginnings of slope failure. There were no erosion areas that could not be traversed by the mowing equipment and there were no apparent wet areas on the slopes.



Figure 4-1 –Top of West Landfill, Center Looking South.

The crest of the embankment on the south side of the landfill had been covered with ash and the crest was not distinguishable along the side slope. The original permitted landfill embankments to the northeast, east, and southeast have been stripped of vegetation and used as cover soil on the final grades of the CCR material.

The east half of the landfill south embankment has been cleared of the vegetation overgrowth and then regraded to bare soil. The south embankment, located east of the new east perimeter berm, has never retained CCR material. The northeast, east, and southeast permitted embankments will be removed from the permitted landfill area when a new east embankment is constructed adjacent to the existing ash material.

4.1.2 Exterior Slopes - Embankment

The exterior slopes of stockpiled CCR were capped with the cover soil, topsoil, and vegetation. There were no signs of unwanted vegetative growth, new encroachments, or settlement. There were no active erosion channels along the slopes. There were no erosion channels too deep for

access by the mowing equipment. No wet or damp areas were observed that would indicate seepage. The grass has prevented active erosion.



Figure 4-2 – South CCR Slope and Embankment with Vegetation Cover. Looking South.

There was no indication that some sod cover had more growth due to higher moisture contents. There were no signs of slope stability problems and no signs of depression caused by slumping ground. There was no indication of animal burrows or animal tracks leading to burrows.

4.1.3 Exterior Slopes – CCR Material

The areas of the CCR material that have reached final grade have been capped with the planned cover soil, topsoil, and grass seed. In general, the cover soil observed on the closed portion of the landfill was the same condition as the exterior slopes of the embankment. Areas of the south CCR landfill have grass cover on areas that are not yet fully closed. The grass cover provides runoff and erosion protect. This is observed on the east side of the CCR material adjacent to the new embankment that under construction (Figure 4-3)



Figure 4-3 East CCR material with new embankment construction, South Looking North



Figure 4-3 Final Cover on top of CCR Material – Top of Landfill from Center looking Northwest

The top surface of the landfill area has been graded to slope toward the north and the area has been covered with the planned cover soils, topsoil, and vegetation. The areas that had been vegetated within the past year were not discernable from older areas indicated good growth and appropriate mowing that limits brush and trees.

5.0 Conclusions and Recommendations

The landfill is sufficient to function as intended based on the original and new landfill embankments, grading of the final placement of CCR toward the south three-fourths of the landfill, and the grading of the CCR material on the north one-fourth of the landfill. This inspection was performed on November 7, 2023 and no signs of distress or instability were observed.

There are no recommendations for the future placement of the landfilled CCR materials or the related containment structures.