REPORT

2023 Annual Inspection Report

Sheldon Station Ash Landfill No. 4

Submitted to:

Nebraska Public Power District
Sheldon Station
4500 West Pella Road, Hallam, Nebraska 68368

Submitted by:

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1.0 INTRODUCTION AND BACKGROUND

Sheldon Station is a coal-fired electrical generation facility owned and operated by Nebraska Public Power District (NPPD) and is located in the southwest quarter of Section 19, Township 7N, Range 6E, near Hallam, Nebraska, in Lancaster County. The facility, which is capable of generating 225 MW of power, uses a Type C low sulfur coal from Wyoming's Powder River Basin. Fly ash and bottom ash are the two products of coal combustion at Sheldon Station. Both products are marketed for beneficial re-use and the un-utilized amounts are placed into Ash Landfill No. 4 (see Figure 1). Ash Landfill No. 4 was constructed in 2002 and is operated in accordance with Nebraska Department of Environment and Energy Permit No. NE0204285.

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final Coal Combustion Residuals (CCR) Rule in the Code of Federal Regulations (CFR). The CCR Rule was published under 40 CFR Part 257 of the Subtitle D solid waste provisions under the Resource Conservation and Recovery Act. This report has been prepared by WSP USA Inc. (WSP) to satisfy the annual inspection requirements for CCR landfills under Part 257.84. The following sections present the findings from the annual inspection of Ash Landfill No. 4 performed on October 24, 2023.

2.0 REVIEW OF EXISTING INFORMATION

2.1 Inspection Reports

This is the eighth annual inspection of Ash Landfill No. 4 performed by a professional engineer (PE) licensed in the State of Nebraska as required by the CCR Rule. The previous annual PE inspections did not find signs of structural weakness or changes in geometry. The 2022 inspection report (WSP 2022) noted only minor areas for monitoring or maintenance:

- tracking and removal of burrowing animals
- removal of woody vegetation growth on exterior slopes
- continued monitoring of cracks on the embankment crest perimeter road

NPPD also performs weekly inspections of the ash disposal facility. Observations from the weekly inspections are recorded on inspection forms, which are maintained in the site operating record. The 2023 weekly inspection forms reported the following notable maintenance activities:

- Maintenance was performed on the sump and underdrain pumps.
- Pollinator seed mix was applied to the partial final cover on November 12, 2022.
- Erosion control maintenance was performed between March 6 and 8, 2023, including silt fence and erosion control mat maintenance and hydroseed application.
- Shredded rye mulch was applied to the partial final cover on May 26, 2023 to help growth of the pollinator seed mix.
- Additional seed was applied to the partial final cover area on August 23, 2023.
- Removal of undesirable vegetation (including small cedar saplings) was ongoing throughout 2023.

- Cracking was observed in the perimeter road around the crest of the facility embankment. The cracking was attributed to warm and dry conditions desiccating the surface soils. Cracking was observed to improve after rains but return with periods of warm, dry weather.

2.2 Liner and Contact Water Collection System

The configuration of the liner and contact water collection system (CWCS) at Ash Landfill No. 4 is as follows, from top to bottom:

- at least 3 feet of select fill or fly ash, serving as a protective layer to prevent trafficking damage to the liner
- geotextile (8 ounces per square yard) (Trevira 011/280)
- 1 foot of contact water collection material and four-inch perforated piping to reduce drainage lengths (ADS N-12 LF)
- 3 feet of low-permeability soil (LPS) liner
- underdrain system consisting of gravel and four-inch perforated piping in trenches (ADS N-12 LF)

The configuration of the liner system on the side slopes is, from top to bottom:

- protective layer of 0.67 feet (8 inches) of revegetated soil, covered by fly ash
- 3 feet of LPS liner

The CWCS is designed to prevent the buildup of hydrostatic head of more than 1 foot on the liner system outside the sump area. In conjunction with the Evaporation Pond, the CWCS is designed to remove contact water from the landfill. This is accomplished by grading the ash to the south to promote drainage toward the sump.

A composite-lined evaporation pond is located immediately south of Ash Landfill No. 4. This pond stores contact water pumped from the CWCS and enhances evaporative loss. The Evaporation Pond liner consists of two feet of LPS, overlain by textured 60-mil high-density polyethylene geomembrane.

2.3 Final Cover

Final cover has been placed on approximately one-third of Ash Landfill No. 4 at the northern end. The current operational plan for Ash Landfill No. 4 includes a phased closure plan; interim cover will not be used. NPPD began construction of partial final cover on the northern portion of Ash Landfill No. 4 in the third quarter of 2021 and completed this phase of closure in the third quarter of 2022.

2.4 Water Management

Stormwater, contact water, and groundwater are managed at Ash Landfill No. 4. Stormwater is water that does not come into contact with ash, and water that comes into contact with ash is classified as contact water. Water management methods are described in the following sections. Descriptions of CWCS maintenance, contact water uses, and the National Pollutant Discharge Elimination System (NPDES) permit are also included.

2.4.1 Stormwater

Precipitation that falls outside the landfill footprint (and therefore does not come into contact with ash) drains to natural surface water draws located east and west of the landfill. The landfill perimeter berm provides a surface water divide so that stormwater is diverted away from the landfill.

2.4.2 Contact Water

Contact water includes precipitation falling within the landfill and leachate as defined in Title 132 of the Nebraska Administrative Code. Contact water is managed with the CWCS and ash grading. The active ash deposition area is graded to maintain an approximately 3% slope to direct contact water towards the collection sump. Contact water is pumped from the collection sump into the Evaporation Pond. The collection sump pump has sufficient capacity and head capabilities to pump the contact water into the Evaporation Pond.

Ash is placed to promote contact water flow on the surface of the ash from the landfill perimeter towards the middle and southern areas of the landfill. Contact water that does not infiltrate into the CWCS is temporarily stored on the ash surface. A portable pump capable of pumping contact water to the Evaporation Pond is used as needed.

Once ash levels become higher than the perimeter berm, ash will be placed so that contact water sheds towards the cell runoff drainage control channel around the perimeter of the landfill and to the collection sump. Ash adjacent to the perimeter berm will not be placed higher than the perimeter berm to maintain the cell runoff drainage control channel. The cell runoff drainage control channel is designed to divert water to the southern portion of the landfill and to accommodate the current operational plan. A portable pump capable of pumping contact water to the Evaporation Pond will be used as needed.

2.5 Evaporation Pond

The Evaporation Pond has the capacity to store water from more than the 25-year, 24-hour storm from the landfill and handle the runoff from the landfill for the period in which ash levels are below the height of the perimeter berm. In the unlikely event that successive storms cause water levels to rise to near the top of the Evaporation Pond berms, the water will drain back into the landfill through an overflow pipe, until the point at which ash placement rises above the top of the landfill perimeter berm. Once ash placement is above the perimeter berm, the overflow pipe will be abandoned. The current phased operational plan will minimize the volume of contact water so that water from the 25-year, 24-hour storm can either be contained in the Evaporation Pond or temporarily stored within the landfill, or both.

In March 2012, an aerator was installed in the Evaporation Pond to increase evaporation of contact water. A bubbler was installed during the fall of 2012. The bubbler helps prevent water in the Evaporation Pond from freezing so that the contact water can be used year-round for dust suppression within the lined landfill footprint.

2.6 CWCS Maintenance

Performance of the CWCS is evaluated periodically. The evaluation includes the sump, pumps, other related appurtenances, and overall system performance. Repairs determined to be necessary based on these evaluations are completed by NPPD, and records of the repairs are maintained as part of the weekly inspection reports.

2.7 Contact Water Uses

Contact water is periodically pumped from the Evaporation Pond into the site's water truck for operational functions such as fugitive dust suppression over the lined landfill footprint. Contact water is not sprayed outside of the lined landfill footprint and will not be sprayed over the final cover.

2.8 Underdrain System

Beneath the LPS liner of the landfill is an underdrain system, which consists of a series of trenches and drains that surround the base of the landfill to collect groundwater. Groundwater within the underdrain system flows to the southern end of the Evaporation Pond into a sump within an interceptor trench. The underdrain consists of perforated pipe within a gravel trench. The intent of the underdrain system is to keep groundwater at least 5 feet below the base of the LPS liner. Water from the sump is pumped to the Evaporation Pond or, under the facility's NPDES permit (NE0111490), can be discharged to a tributary of Olive Branch (Outfall 003).

3.0 2023 ANNUAL INSPECTION

On the morning of October 24, 2023, Jacob Sauer, Nebraska PE (E-15119), of WSP performed an inspection of Ash Landfill No. 4 as per 40 CFR Part 257.84(b) requirements. The inspection consisted of a site reconnaissance by walking around the crest of the perimeter berm combined with traversing up and down the embankment slopes. Photographs were taken and are presented in Appendix A. The following presents a summary of the observations made during the 2023 annual inspection.

3.1 Changes in Geometry

The geometry of the ash disposal facility was found to be in general conformance with the design. Ash disposal grades, outer embankment slopes, and contact water channels were observed to be consistent with the permitted design. Unexpected changes in geometry such as sloughing or differential settlement were not found during the site inspection.

3.2 Volume of CCR

The sources and materials deposited in Ash Landfill No. 4 consist of fossil fuel combustion ash, defined pursuant to Title 132 of the Nebraska Administrative Code. Ash quantities vary from year to year due to plant generation levels, market conditions, weather, and other factors. NPPD produced approximately 7,600 tons of fly ash and 11,600 tons of bottom ash at Sheldon Station in 2023 (through October). Of the ash produced, approximately 5,500 tons of ash were placed in Ash Landfill No. 4. Approximately 270,000 cubic yards of fly ash and bottom ash have been placed in Ash Landfill No. 4 since operations began at the facility in 2002 through October 2023. The remaining lifespan of the facility is estimated to be approximately 25 years.

3.3 Signs of Structural Weakness

No signs of structural weakness of Ash Landfill No. 4 were observed during the site inspection on October 24, 2023.

3.4 Other Observations that Could Affect Stability

3.4.1 Burrowing Animals

No significant animal burrowing was observed during the October 24, 2023 site inspection. Any increase in the level of small animal activity, or any sign of large animal burrowing, will be remedied by trapping and removal to an off-site location.

3.4.2 Erosion

No signs of erosion that could affect stability at Ash Landfill No. 4 were observed during the site inspection on October 24, 2023.

3.4.3 Embankment Crest Cracks

Surficial cracks have been observed in the perimeter road around the crest of the facility embankment during previous annual inspections. The cracking was observed to be significantly more widespread during the site inspection on October 24, 2023. Cracks were observed along significant stretches of the embankment crest, both along the interior and exterior, especially on the south, east, and west sides of the facility. The cracks were as large as approximately two inches wide and were over a foot deep (and as much as 3+ feet deep) in several locations. The cracking was not continuous, but there were areas with cracks as long as approximately 15 feet. The cracks were generally parallel with the crest, but in several locations, cracking perpendicular to the crest was also observed. No signs of bulking or slope movement were observed along the surface or toe of interior or exterior slopes. The cracking may have initially appeared due to drought conditions desiccating the surface soils, but it appears to have worsened due to freeze/thaw cycles and/or water infiltration. WSP recommends that NPPD develop a plan to repair the cracks. NPPD should continue to closely monitor the cracking and report to WSP immediately if the cracks change in size, or if additional cracks appear or displacement is observed.

4.0 CLOSING

The 2023 annual inspection for Ash Landfill No. 4 at Sheldon Station was performed on October 24, 2023. The inspection met the requirements for CCR landfills under 40 CFR Part 257.84. The inspection found no indication of major structural deficiencies. NPPD should continue to monitor the cracking in the perimeter and notify WSP of any changes.

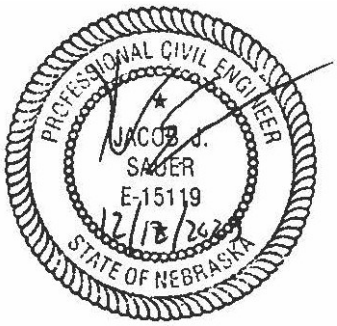
We appreciate the opportunity to provide NPPD with assistance related to Ash Landfill No. 4 at Sheldon Station. Please let us know if you have any questions or need additional support.

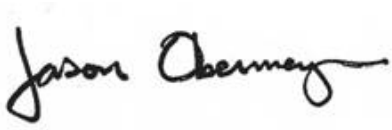
5.0 REFERENCES

WSP USA Inc. 2022. 2022 Annual Inspection Report – Sheldon Station Ash Landfill No. 4. December 15.

Signature Page

.WSP USA Inc.





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Figures

LEGEND

PHOTO LOG LOCATION

0 112.5 225 450 Feet

REFERENCE(S)

1. AERIAL IMAGERY: ESRI PROVIDED BASEMAP SERVICE. LANCASTER CO 2022. IMAGERY CAPTURED 3/19/2022.

CLIENT
NEBRASKA PUBLIC POWER DISTRICT

PROJECT
SHELDON STATION

TITLE
PHOTO LOG LOCATIONS

CONSULTANT

YYYY-MM-DD	2023-12-06
DESIGNED	RHG
PREPARED	RHG
REVIEWED	---
APPROVED	---

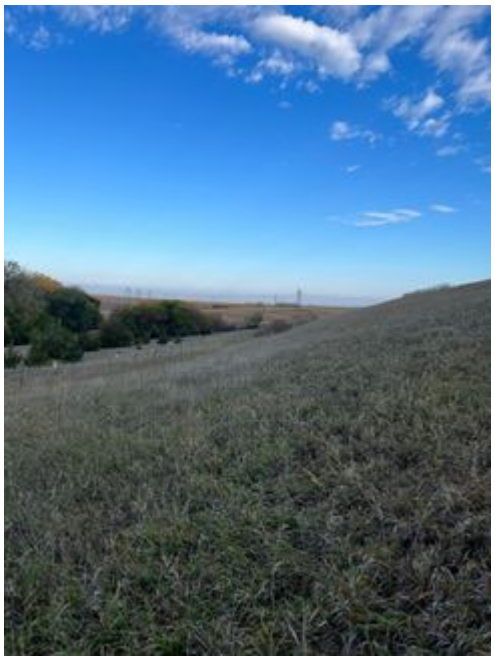
PROJECT NO.
31405886.002

FIGURE
1

APPENDIX A

Inspection Photographs

Photo Location 1



IMG_2984.JPG

West exterior slope vegetation

Photo Location 2

IMG_3008.JPG

Northern interior slope

Photo Location 3

IMG_2987.JPG

Vegetation on partial final cover

Photo Location 4

IMG_2969.JPG

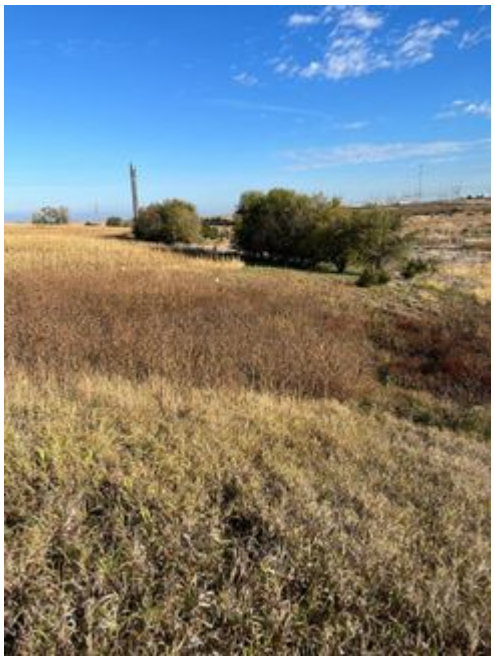
Bottom ash stockpile area

Photo Location 5

IMG_2963.JPG

Cracking in perimeter road on south side of facility

Photo Location 6



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Eastern exterior slope

Photo Location 7

IMG_3010.JPG

Eastern exterior slope

Photo Location 8

IMG_2999.JPG

Downchute channel

Photo Location 9

IMG_3012.JPG

Entrance to ash disposal facility

Photo Location 10

IMG_3013.JPG

Perimeter road

Photo Location 11

IMG_2975.JPG

Southern interior slope

Photo Location 12

IMG_2983.JPG

Cracking in perimeter road on south side of facility

Photo Location 13

IMG_2976.JPG

Southern interior slope

Photo Location 14

IMG_3018.JPG

Dust management activities in disposal area

Photo Location 15	
	**IMG_3016.JPG** Leachate evaporation pond

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