REPORT

CCR Location Restriction Report

Sheldon Station - Nebraska Public Power District

Submitted to:

Nebraska Public Power District

Sheldon Station
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Submitted by:

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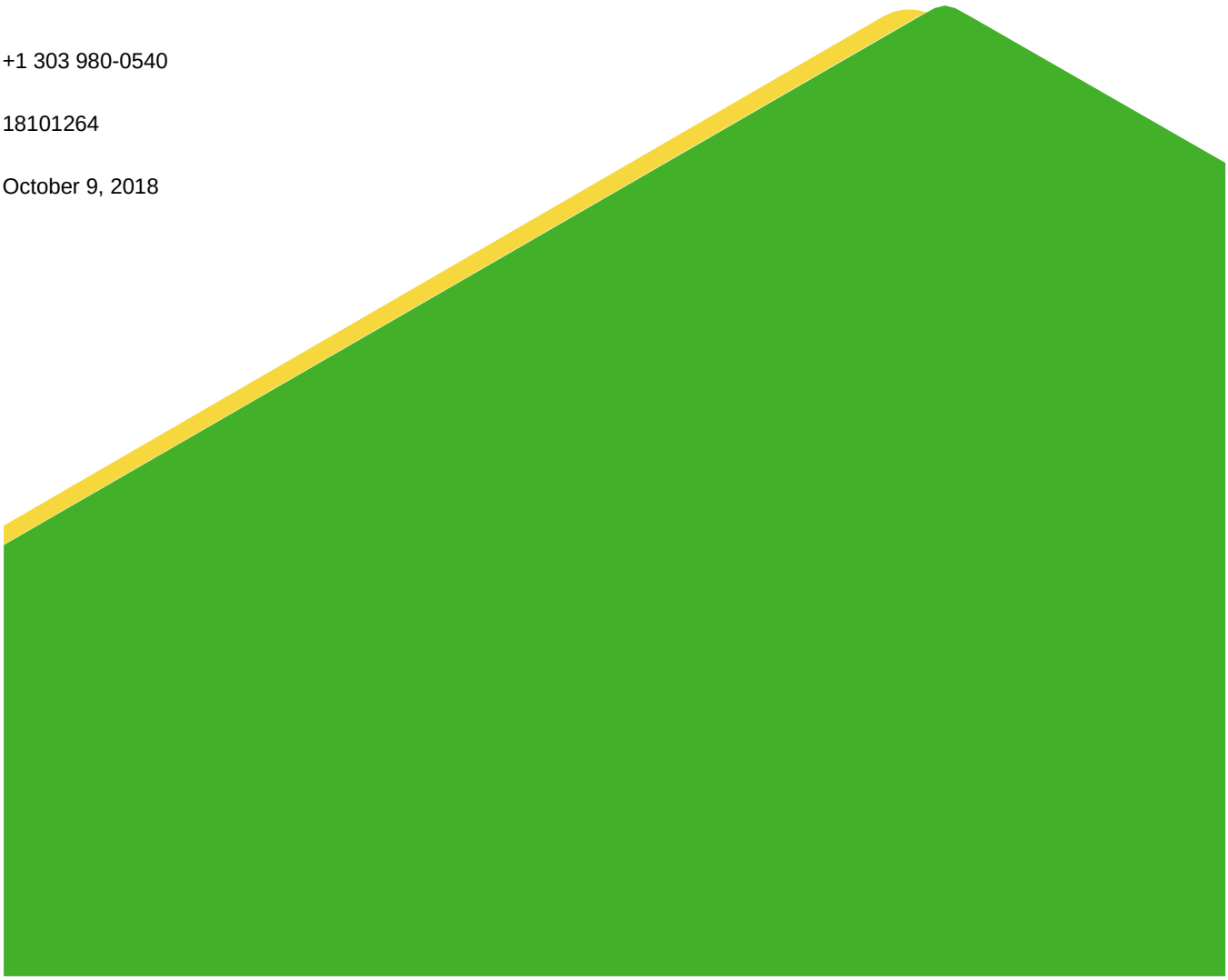

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this Location Restrictions Report on behalf of Nebraska Public Power District's (NPPD's) Sheldon Station (SS). This report has been developed in accordance with recognized and generally accepted best management practices and is required under Environmental Protection Agency's (EPA's) Coal Combustion Residual (CCR) rule (40 CFR 257.64). The location restrictions for existing CCR landfills as defined in the CCR rule are summarized in the following sections regarding unstable areas.

The CCRs generated at SS include fly ash and bottom ash. These CCRs are managed in a dry ash landfill that is owned and operated by NPPD and regulated by Nebraska Department of Environmental Quality (NDEQ). The dry ash landfill was permitted by the NDEQ in 2001, and many of the location requirements of the CCR rule were addressed in the Hydrogeologic Characterization Report and Alternative Liner Demonstration document included in the facility permit application (Golder, 2001).

2.0 REGULATORY REQUIREMENTS

The ash disposal facility is considered an existing landfill under the CCR rule definitions. The landfill has been fully developed, with no plans for lateral expansion. As such, the location restrictions for the placement above the uppermost aquifer, wetlands, fault areas, and seismic impact zones are not required to be addressed under this report. Nevertheless, several of these items were previously evaluated during the initial permitting of the landfill. The evaluation of the uppermost aquifer is described in Section 3 of the Hydrogeologic Characterization (Golder, 2001). Seismic impact zones are discussed in Section 2.5 of the Hydrogeologic Characterization.

The section of the location restrictions under the CCR rules that does apply to existing landfills is the demonstration that the landfill is not located in an unstable area. The unstable area consideration is presented in the following section.

3.0 UNSTABLE AREAS EVALUATION

Per §257.64, this report considers the following factors in determining whether the landfill has been located within unstable areas:

- On-site or local soil conditions that may result in significant differential settlement;
- On-site or local geologic or geomorphologic features; and
- On-site or local human-made features or events (both surface and subsurface).

The CCR rule defines an unstable area as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains.

Potential indications of unstable areas are evaluated during the annual visual inspections required to satisfy 40 CFR Part 257.84. These inspections are specifically meant to assess hydraulic structures, upstream and downstream slopes, berm crests, and the toe of the facility to look for signs of structural weakness, differential settlement, or other conditions that could affect stability. No evidence of differential settlement or other unstable areas have been observed at the facility during annual inspections performed in 2015, 2016, and 2017.

3.1 Soil Conditions

Section 4.1 of the site Hydrogeologic Characterization Report (Golder, 2001) summarizes the site-specific soils. The summary is based on a soil survey of Lancaster County (where SS is located) from 1980. This summary shows that the soils in the area of the landfill consist of loams and clayey loams that formed on glacial till and on uplands. Soil characterization and observations performed in conjunction with the monitoring well installation and low permeability soil liner construction indicated that the soils in the area are generally clays, with some interspersed sands.

Site soil conditions do not indicate that the facility is located in an unstable area susceptible to significant differential settlement. The facility will continue to be inspected per the state and federal regulatory requirements, and signs of significant differential settlement will be documented and corrected as necessary.

3.2 Geologic and Geomorphologic Features

The regional geology at SS and the site-specific geology for SS is described in Section 2.4 and 4.2 of the Hydrogeologic Characterization Report (Golder, 2001). As part of that report, a literature review was conducted and the information was used to develop a stratigraphic section of the area. The specific geological characterization of the SS area is summarized as follows.

Sheldon Station lies within the well-drained glacial-drift hills at the upper end of the Salt Creek drainage basin near the intersection of the divides separating the drainage basins of Salt Creek, the Big Nemaha River, and the Big Blue River. The area lies within a U-shaped reentrant in the eastern border of the Dakota Sandstone. The overlying Pleistocene Age sediments lie unconformably on the lower portion of the Dakota Sandstone or the Permian, where the Dakota has been completed eroded.

Sheldon Station is located in an area dominated by glacial drift in southeastern Nebraska. The base of the primary groundwater system in this area is the top of the relatively impermeable Pennsylvanian and Permian age bedrock, consisting of limestone and shale which, in places, reaches maximum thickness of over 400 feet. Pleistocene sediment deposits composed of debris from glacial ice sheets, outwash streams, and wind depositions overlie these bedrock unites. Erosion of the limestone and shale deposits created numerous paleovalleys that were generally filled with relatively coarse Pleistocene sand and gravel. Areas with no valleys were filled with finer-grained materials, primarily glacial tills over which wind-blown silts (or loess) were deposited. A mantle of till more than 200 feet thick was left when the Kansas glacier melded. The Kansan till remains the principal surficial material in the area surrounding the site, although it is mantled in many places by the loess alluvium. Illinoian and Wisconsin glaciofluvial and eolian deposits are found locally overlying Kansan deposits.

Geologic borings, Shelby tube cores, electric and geophysical logging, and trenches indicate that the till section is mostly clay to silty clay with sand lenses rare and when encountered laterally discontinuous. At the facility location, the thickness of the till ranges from 180 to 200 feet, thinning toward the north. The base of the till is at approximately 1,250 feet above mean sea level (amsl). The lower till directly above the principal groundwater reservoir becomes coarser grained grading from a till to a silt with a thickness of as much as 40 feet directly north and east of the site. The thickness of this silt ranges from 0 to 20 feet. Another coarse grained thin lens with in the till at 1350 feet amsl was noted, but was not mapable.

Review of the United States Geological Survey's (USGS's) report "Karst in the United States: A Digital Map Compilation and Database" (USGS 2014) indicates that Sheldon Station is not located in an area likely to contain Karst features.

Several trenches were excavated to the total depth of the facility (approximately 30 feet from previous grades). Soils observed in these trenches were composed of clay to silty clay that was gray to yellow in color. Individual sand bodies were not observed, instead there was a gradual transition of texture from clay to silty clay with no discernable pattern.

Review of the site geologic and geomorphologic conditions indicate that the site is located in a stable area.

3.3 Human-Made Features

The primary human-made feature in the immediate area of the facility is the 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 Leachate Evaporation Pond to a sump within an interceptor trench (see NDEQ permit Design Drawing 9, Golder 2001). The underdrain consists of perforated pipe within a gravel trench. The intent of this underdrain system is to keep groundwater five feet below the base of the landfill liner. Water from the sump is pumped to the Leachate Evaporation Pond or, under the facility's NPDES permit (NE0111490), can be discharged to a tributary of Olive Branch according to Outfall 003.

The underdrain system will not have an impact on the stability of the landfill. The primary function of the underdrain system is environmental, not structural. Other human-made features on site (surface water controls, access roads, etc.) have been constructed according to generally accepted good engineering practices and have been incorporated into the design of the CCR facility. The human-made features do not represent significant risk of disrupting the integrity of structural components of the landfill.

4.0 CERTIFICATION

The undersigned attest to the completeness and accuracy of the above written Location Restrictions Demonstration and certify that the location of ash disposal facility at GGS is not in an unstable area and meets the requirements detailed in 40 CFR 257.64.

If further information is required, please contact the undersigned at (303) 980-0540.

Golder Associates Inc.

Jacob Sauer, PE
Senior Engineer

Todd Stong, PE
Associate and Senior Consultant

REFERENCES

EPA 2015. Environmental Protection Agency, Code of Federal Regulations Title 40 Part 257: Hazardous and Solid Waste Management System; *Disposal of Coal Combustion Residuals from Electric Utilities*. April 17, 2015.

Golder 2001. Permit Application/Operational Plan to Operate NPPD Sheldon Station Fly/Bottom Ash Landfill No. 4; *Hydrogeologic Characterization Report and Alternative Liner Demonstration*. January 2001.

Golder 2015. *Golder Associates Inc., 2015 Annual Inspection Report, Sheldon Station Ash Landfill No. 4*.

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USGS 2014. Karst in the United State: A Digital Map Compilation and Database. Reston, VA. 2014.

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