Inflow Design Flood Control System Plan, Revision 1

Upstream Raise 92 CCR Surface Impoundment, Coal Creek Station

Submitted to:

Great River Energy

Coal Creek Station, 2875 Third Street SW, Underwood, North Dakota 58576

Submitted by:

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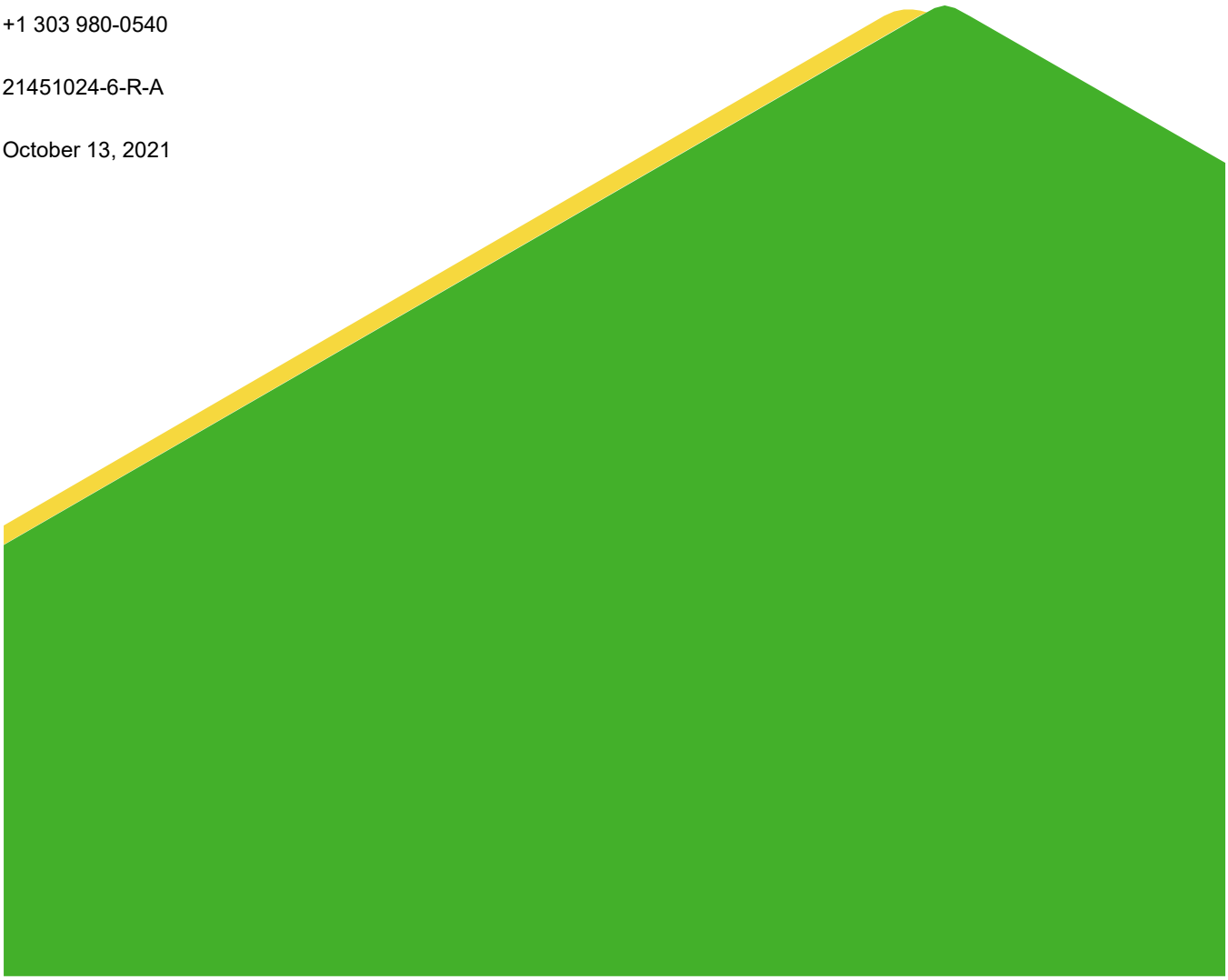

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this inflow design flood control system plan for the Upstream Raise 92 CCR Surface Impoundment (Upstream Raise 92) at Great River Energy's (GRE's) Coal Creek Station (CCS). The United States Environmental Protection Agency's (USEPA's) Coal Combustion Residuals (CCR) Rule, 40 Code of Federal Regulations (CFR) Part 257 (USEPA 2015) requires an inflow design flood control system plan be completed as specified in 40 CFR 257.82(c)(3)(i). Per 40 CFR 257.82(c)(4), inflow design flood control system plans must be revisited every five years. This document serves as the current version of the inflow design flood control system plan.

Upstream Raise 92 is also regulated by the North Dakota Department of Environmental Quality (NDDEQ) under Permit 0033. The NDDEQ requires an inflow design flood control system plan as part of the application for a permit, as described in Section 33.1-20-08-05.3.c.3.a. of the North Dakota Administrative Code (NDAC 2020). This inflow design flood control system plan satisfies the state-specific requirement.

2.0 REQUIREMENTS FOR HYDROLOGIC AND HYDRAULIC CAPACITY SYSTEMS

In accordance with 40 CFR 257.82(a)(1) and NDAC Section 33.1-20-08-05.3.a.1., "the inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge from the inflow design flood." Further, per 40 CFR 257.82(a)(2) and NDAC Section 33.1-20-08-05.3.a.2., "the inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood." The requirements for appropriate inflow design floods are as follows:

- For a high hazard potential CCR surface impoundment, the probable maximum flood.
- For a significant hazard potential CCR surface impoundment, the 1,000-year flood.
- For a low hazard potential CCR surface impoundment, the 100-year flood.
- For an incised CCR surface impoundment, the 25-year flood.

Upstream Raise 92 is classified as a low hazard potential CCR surface impoundment, and the inflow design flood control system plan is based on the 24-hour, 100-year storm event (4.82 inches, NOAA 2016). The inflow design flood control system designed for and operated at Upstream Raise 92 is described below.

3.0 INFLOW DESIGN FLOOD CONTROL SYSTEM

Upstream Raise 92 is designed to be a vertically expanding CCR surface impoundment with the ability to be closed with CCR materials remaining in place. The design crest of the soil embankments surrounding Upstream Raise 92 are approximately 10 to 25 feet above surrounding topography, preventing stormwater run-on into Upstream Raise 92. As dry CCR materials (fly ash and bottom ash) are deposited around the perimeter of Upstream Raise 92, the crest of the CCR surface impoundment will rise as well as the pool within Upstream Raise 92. The maximum crest elevation is anticipated to be at an approximate elevation of 1998 feet.

As indicated in the Notice of Intent to Close Upstream Raise 92 (submitted in June 2021), closure of Upstream Raise 92 has commenced (Golder 2021). Closure activities include drainage and stabilization of CCRs, placement of beneficial use CCR (or other non-waste material) to achieve required crown slopes, regrading of final waste slopes, and placement of the final cover system. Therefore, a minimal pool is anticipated to be present in the center of Upstream Raise 92 during the closure period, and dry CCR materials graded to drain toward perimeter

contact water channels and sump areas are expected to cover a larger portion of the active footprint that has not received final cover.

The only inflow to the facility comes via precipitation since hydraulically conveyed flue-gas desulfurization material is no longer directed to Upstream Raise 92. Outflows from Upstream Raise 92 consist of perimeter drainage ditches and culverts that passively transfer run-off from precipitation to the adjacent Upstream Raise 91 CCR Surface Impoundment or the Drains Pond System CCR Surface Impoundment.

3.1 Flood Control Calculation

At the maximum anticipated impoundment loading condition (current condition as of September 2021), the maximum crest and crown elevation of Upstream Raise 92 is at an elevation between 1998 feet and 2002 feet and the impoundment capture area is approximately 4.8 acres. Approximately 1.9 acre-feet of run-off is estimated to be collected in the Upstream Raise 92 operating pool during the 24-year, 100-year storm (assuming 100% of the 4.82 inches of precipitation falling on the crest and pool is captured). Assuming the impoundment contains a di minimis amount of water at the time of this storm event (based on observations through 2021 as closure of the facility commenced, this pool area of the impoundment has been maintained dry), the facility's operating pool capacity is roughly 17 acre-feet. The estimated 1.9-acre feet of run-off will raise the water level in the operating pool by approximately 3.8 feet to an approximate elevation of 1996 feet, leaving approximately 5 feet of remaining freeboard to the top of the material surrounding the pool (elevation 2001 feet).

Should the operating pool water levels within Upstream Raise 92 be elevated above desired operating levels prior to closure of the surface impoundment pool, GRE has operating procedures to actively transfer water to the adjacent Upstream Raise 91 CCR Surface Impoundment or the Drains Pond System CCR Surface Impoundment.

4.0 REVISION HISTORY

A history of revisions to this document:

Revision 0 – Published October 13, 2016.

Revision 1 – 5-Year Update: Published October 13, 2021

1) New CCR unit naming convention (Upstream Raise to Upstream Raise 92)

2) Reflect that closure has commenced at Upstream Raise 92 and changes to inflows, capture area, and maximum anticipated operating pool geometry have been considered

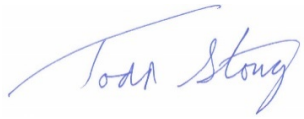
5.0 CERTIFICATION

The undersigned attest to the completeness and accuracy of this inflow design flood control system plan, and certify that the plan meets the requirements of 40 CFR 257.82(c) and Section 33.1-20-08-05.3.c. of the North Dakota Administrative Code.

Signature Page

Golder Associates Inc.

Craig Schuettpelz, PE



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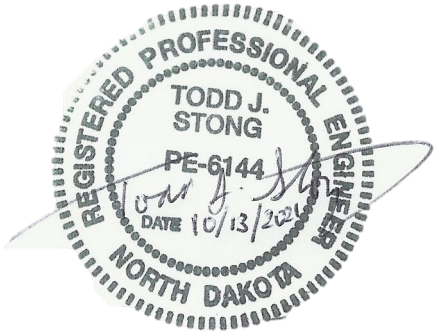

https://golderassociates.sharepoint.com/sites/140044/project files/6 deliverables/21451024/reports/6-r-ur92_inflow_01oct21/6-r-0/21451024-6-r-0-ur92_inflow_rev1_13oct21.docx

6.0 REFERENCES

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NOAA (National Oceanic and Atmospheric Administration). 2016. Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS). Retrieved April 30, 2021, from https://hdsc.nws.noaa.gov/hdsc/pfds/.

NDAC (North Dakota Administrative Code). 2020. Chapter 33.1-20-08 – Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

USEPA (United States Environmental Protection Agency). 2015. Code of Federal Regulations Title 40 Part 257: Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities. April 17.

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