

TECHNICAL MEMORANDUM

DATE October 10, 2018

Project No. 18107517

TO Jeff Jones
Luminant Generation Company LLC

FROM Patrick J. Behling, P.E.

**LUMINANT GENERATION COMPANY LLC
CCR RULE LOCATION RESTRICTION DEMONSTRATION
OAK GROVE STEAM ELECTRIC STATION – ROBERTSON COUNTY, TEXAS
FGD PONDS**

Luminant Generation Company LLC (Luminant) operates the Oak Grove Steam Electric Station (OGSES) located approximately 12 miles north of Franklin, Robertson County, Texas. The OGSES consists of two coal/lignite-fired units with a combined operating capacity of approximately 800 megawatts. Coal Combustion Residuals (CCR) including fly ash, bottom ash, boiler slag, and flue gas desulfurization sludge (gypsum) are generated as part of OGSES unit operation.

The U.S. Environmental Protection Agency's (EPA's) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities* (CCR Rule) has established technical requirements for CCR landfills and surface impoundments (See 80 Fed. Reg. 21,302 (Apr. 17, 2015); 83 Fed. Reg. 36,435 (July 30, 2018)). The following surface impoundments at the OGSES have been identified as Existing CCR Surface Impoundments regulated under the CCR Rule:

- FGD-A Pond;
- FGD-B Pond; and
- FGD-C Pond.

The FGD-A, FGD-B, and FGD-C ponds (collectively referred to as the "FGD Ponds") are located approximately 1,500 feet northwest of the OGSES power plant (Figure 1). FGD-A and FGD-B are located immediately adjacent to each other and share an interior earthen embankment. FGD-C is located approximately 750 feet southwest of the other ponds. Due to their proximity to each other, the FGD-A, FGD-B, and FGD-C ponds are considered one CCR surface impoundment (identified as the "FGD Ponds") under the CCR Rule.

Golder Associates Inc. (Golder) was retained by Luminant to evaluate the FGD Ponds against the five (5) applicable location restriction criteria for existing CCR surface impoundments described in Sections 257.60 through 257.64 of the CCR Rule. This memorandum sets forth Luminant's location restriction demonstrations and corresponding certifications required by the CCR Rule.

LOCATION RESTRICTION DEMONSTRATION – SUMMARY OF FINDINGS/CONCLUSIONS

This location restriction demonstration concludes that the FGD Ponds satisfy each of the five (5) CCR Rule location restriction criteria for existing CCR surface impoundments (placement above the uppermost aquifer, wetlands, fault areas, seismic impact zone and unstable areas):

- The base elevations of the FGD Ponds satisfy the separation criteria defined in §257.60.
- The FGD Ponds were determined to not be located in wetlands as per §257.61.
- Based on the available published geologic data and information reviewed, the nearest known faults to the FGD Ponds are located approximately 9.3 miles northwest and southwest of the OGSES. Therefore, the FGD Ponds satisfy the location restriction criterion presented in §257.62.
- The FGD Ponds were determined to not be located in a Seismic Impact Zone as per §257.63.
- The FGD Ponds were determined to not be located in an Unstable Area as per §257.64.

A professional engineering certification that covers all five location restriction evaluations is included on page 10 of this memorandum.

MEMORANDUM ORGANIZATION

The memorandum is organized as follows:

SECTION 1.0 - Location Restriction Criteria & CCR Unit Description

SECTION 2.0 - Placement Above Uppermost Aquifer

SECTION 3.0 - Wetlands

SECTION 4.0 - Fault Areas

SECTION 5.0 - Seismic Impact Zone

SECTION 6.0 - Unstable Areas

SECTION 7.0 - Limitations

SECTION 8.0 - Professional Certification

FIGURE 1 – Site Plan – FGD Ponds

SECTION 1.0 Location Restriction Criteria & CCR Unit Description

LOCATION RESTRICTION CRITERIA

Existing CCR Surface Impoundments must comply with the following five location restrictions described in Sections 257.60 through 257.64 of the CCR Rule:

- §257.60 – Placement above the Uppermost Aquifer
- §257.61 – Wetlands
- §257.62 – Fault Areas
- §257.63 – Seismic Impact Zone
- §257.64 – Unstable Areas

The CCR Rule requires that the CCR Surface Impoundment owner or operator certify that the CCR Unit meets the specified location restriction requirements by October 17, 2018 for continued operation of the CCR Unit.

CCR UNIT DESCRIPTION

The FGD Ponds receive gypsum/scrubber sludge and other OGSES process waters and are considered an existing CCR Surface Impoundment under the CCR Rule. FGD-A was constructed in 2008, FGD-B was constructed in 2011, and FGD-C was constructed in 2015. FGD-A and FGD-B are approximately 875 feet long by 500 feet wide and 640 feet long by 700 feet wide respectively. FGD-C is approximately 1200 feet long by 550 feet wide. The FGD Ponds are constructed partially above and partially below grade and are surrounded by engineered earthen embankments that extend approximately 10 to 25 feet above grade.

Section 2.0 Placement Above Uppermost Aquifer

Section 257.60(a) of the CCR Rule states:

- a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.*

Section 257.53 of the CCR Rule defines uppermost aquifer as follows:

- Aquifer: a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.
- Uppermost aquifer: the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

Golder evaluated the distance between the bases of the FGD Ponds and the uppermost aquifer by comparing the documented elevation of the bases of the pond liner systems and historical maximum groundwater elevations as measured from monitoring wells in the vicinity of the ponds. The upper limit of the uppermost aquifer in the vicinity of the FGD Ponds was calculated to be approximately 412.6 feet MSL. As-built surveys for the clay components of the liner systems in the FGD Ponds indicate that the base of the clay liner systems in the ponds is at approximately Elev. 419, 413, and 439 feet MSL in FGD-A, FGD-B, and FGD-C respectively.

The minimum distances between the bases of FGD-A and FGD-C and the upper limit of the uppermost ground-water bearing unit is greater than the required minimum of 5 feet and satisfy the minimum separation location restriction criterion of §257.60(a).

The distance between the base of FGD-B and the uppermost ground-water bearing unit is not greater than the required minimum of 5 feet; however, the highest measured groundwater elevations in the monitoring wells nearest to FGD-B are less than the base of the clay liner system in FGD-B, which demonstrates that there has not been an intermittent, recurring, or sustained hydraulic connection between the base of FGD-B and the uppermost aquifer. As a result, FGD-B satisfies the minimum separation location restriction criterion requirements of §257.60(a).

Section 3.0 Wetlands

Section 257.61(a) of the CCR Rule states:

- a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.*

40 CFR 232.2 defines wetlands as follows:

- Wetlands: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The FGD Ponds were constructed between 2008 and 2015 and are located in a developed industrial area that is part of the OGSES power plant. To determine if the FGD Ponds are located in wetlands, the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) website was reviewed by Golder. Although the FGD Ponds themselves are represented on the NWI maps as “permanently flooded freshwater basins that were excavated by humans”, wastewater discharges from the OGSES are regulated under Texas Pollution Discharge Elimination System (TPDES) permit WQ0001986000 and the FGD Ponds are part of the OGSES wastewater management system. As a result, the FGD Ponds were designed and constructed to meet Clean Water Act requirements and are therefore not considered federally jurisdictional wetlands in accordance with 33 CFR § 328.3(b)(1).

Based on the NWI maps and the construction characteristics of the FGD Ponds, the FGD Ponds are not “located in wetlands” as per §257.61(a), and the FGD Ponds satisfy the wetlands location restriction criterion.

Section 4.0 Fault Areas

Section 257.62(a) of the CCR Rule states:

- a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.*

Section 257.53 of the CCR Rule defines Holocene as the most recent epoch of the Quaternary period, extending from the end of the Pleistocene Epoch (11,700 years before present) to present.

Golder evaluated the potential for existence of CCR Rule-defined faults in proximity to the FGD Ponds based on geologic maps and documents published by the United States Geological Survey (USGS). The nearest known mapped faults to the FGD Ponds are located approximately 9.3 miles northwest and southwest of the OGSES, which greatly exceeds the 200-foot distance prescribed in the CCR Rule. As a result, the FGD Ponds comply with the requirements of §257.62(a).

Section 5.0 Seismic Impact Zone

Section 257.63(a) of the CCR Rule states:

- a) *New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.*

Section 257.53 of the CCR Rule defines these terms as follows:

- Seismic impact zone: an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10g in 50 years.
- Lithified earth material: all rock, including all naturally occurring and naturally formed aggregates or masses of minerals or small particles of older rock that formed by crystallization of magma or by induration of loose sediments. This term does not include man-made materials, such as fill, concrete, and asphalt, or unconsolidated earth materials, soil, or regolith lying at or near the earth surface.
- Maximum horizontal acceleration in lithified earth material: the maximum expected horizontal acceleration at the ground surface as depicted on a seismic hazard map, with a 98% or greater probability that the acceleration will not be exceeded in 50 years, or the maximum expected horizontal acceleration based on a site-specific seismic risk assessment.
- Structural components: liners, leachate collection and removal systems, final covers, run-on and run-off systems, inflow design flood control systems, and any other component used in the construction and operation of the CCR unit that is necessary to ensure the integrity of the unit and that the contents of the unit are not released into the environment.

Golder evaluated the location of the FGD Ponds relative to seismic impact zones using maps and documents published by the United States Geological Survey (USGS). The FGD Ponds are located in an area with peak ground accelerations between 0.02g and 0.04g, which is well below the maximum acceleration of 0.10g specified in the CCR Rule to be considered a Seismic Impact Zone. As a result, the FGD Ponds are not located in a Seismic Impact Zone as defined in the CCR Rule and therefore comply with § 257.63(a).

Section 6.0 Unstable Areas

Section 257.64(a) of the CCR Rule states:

- a) *An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.*

Section 257.53 of the CCR Rule defines unstable area as follows:

- Unstable area: 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.
- Poor Foundation Conditions: those areas where features exist which indicate that a natural or human-induced event may result in inadequate foundation support for the structural components of an existing or new CCR unit.
- Areas Susceptible to Mass Movement: those areas of influence (i.e., areas characterized as having an active or substantial possibility of mass movement) where, because of natural or human-induced events, the movement of earthen material at, beneath, or adjacent to the CCR unit results in the downslope transport of soil and rock material by means of gravitational influence. Areas of mass movement include, but are not limited to, landslides, avalanches, debris slides and flows, soil fluctuation, block sliding, and rock fall.
- Karst terrain: an area where karst topography, with its characteristic erosional surface and subterranean features, is developed as a result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrain include, but are not limited to, dolines, collapse shafts (sinkholes), sinking streams, caves, seeps, large springs, and blind valleys.

Under § 257.64(b), the following factors must be considered when determining whether an area is unstable:

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

Golder completed a CCR Rule Structural Stability Assessment Report for the FGD Ponds in 2016. The Structural Stability Assessment Report concluded that the soils underlying the FGD Ponds were stable. As a result, the FGD Ponds are not located in an unstable area as defined in the CCR Rule.

Section 7.0 Limitations

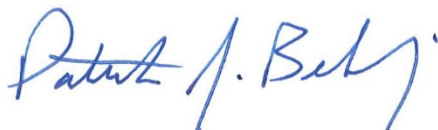
In preparing this evaluation, Golder has reviewed historic, design and investigative information and other data furnished by Luminant. Golder has relied on this information in completing the location restriction evaluations for the FGD Ponds.

The conclusions presented in this memorandum assume that subsurface site conditions in the vicinity of the FGD Ponds reasonably match those conditions associated with site borings, laboratory testing results, etc. The reported conclusions are also based on our understanding of current site operations, maintenance and CCR management practices at the OGSES at the current time as provided by Luminant.

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Section 8.0 Professional Certification

I, Patrick J. Behling, being a Registered Professional Engineer in good standing in the State of Texas, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this CCR Rule Location Restrictions Demonstration has been prepared in accordance with the accepted practice of engineering. I certify that the CCR Unit described in this report and as explained further in the CCR Rule Location Restriction Evaluation – Oak Grove Steam Electric Station FGD Ponds, Golder Associates Inc. October 10, 2018, meets the requirements of 40 CFR Sections 257.60 through 257.64.



Patrick J. Behling, P.E.
Principal Engineer
Texas PE No. 79872
Golder Associates Inc.
Texas Engineering Firm No. 2578



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Figures



LEGEND



CCR MONITORING WELL LOCATION

CLIENT

LUMINANT GENERATION COMPANY LLC

PROJECT

OAK GROVE STEAM ELECTRIC STATION

FGD PONDS

CCR RULE LOCATION RESTRICTION DEMONSTRATION

TITLE

SITE PLAN

CONSULTANT



GOLDER

YYYY-MM-DD 2018-10-05

DESIGNED BZH

PREPARED BZH

REVIEWED PJB

APPROVED PJB

REFERENCE(S)

IMAGERY FROM WWW.TNRIS.GOV, ROBERTSON CO., AERIAL PHOTOGRAPHS, 2012.

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FIGURE
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