



Unstable Areas Determination

Lewis & Clark Station

Prepared for
Montana-Dakota Utilities Co.

October 2018

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Certifications

I hereby certify that this Unstable Areas Determination report for the Lewis & Clark Station meets the requirements of the Coal Combustion Residuals Rule 40 CFR 257 Subpart D, and the requirements of 40 CFR §257.64.



A handwritten signature in cursive script that reads "Paul T. Swenson".

Paul T. Swenson
Barr Engineering Co.
MT Registration Number 12805PE

Dated this 15th day of October 2018

1.0 Introduction

Montana-Dakota Utilities Co. (MDU) operates the Lewis & Clark Station (Lewis & Clark), a coal-fired steam-electric generating plant, near Sidney, Montana, to produce electrical energy. Coal combustion residuals (CCR) is a by-product of plant operation. Management of CCR produced by electric utilities is subject to the requirements of 40 CFR 257 Subpart D, Disposal of Coal Combustion Residuals From Electric Utilities (CCR Rule).

A Temporary Storage Pad at Lewis & Clark temporarily stores flue-gas desulfurization sludge and fly ash material until it is removed and placed in an off-site landfill. The Temporary Storage Pad (TSP) is required to comply with the applicable existing CCR landfill (40 CFR §257.53) provisions since the CCR is not beneficially used offsite, not containerized, and accumulation of CCR occurs on land. This CCR unstable areas determination report has been developed to satisfy the requirements of 40 CFR §257.64 as they apply to the TSP.

2.0 Demonstration

As required by 40 CFR §257.64, existing CCR landfills must not be located in an unstable area unless the owner or operator demonstrates 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.

The owner or operator must consider the following three factors, at a minimum, when determining whether an area is unstable:

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

2.1 Response to Criteria

This section provides a response to each of the criteria established in the CCR Rule.

1. On-site or local soil conditions that may result in significant differential settling

As shown on Figure 1, surficial geological materials identified by the Montana Bureau of Mines and Geology (MBMG) in the vicinity of the TSP include Quaternary (most recent geological period) deposited alluvium and gravel. Figure 1 also shows the Yellowstone River is bounded locally by the Fort Union Formation in the northwest and southeast.

The *Lewis & Clark Station Groundwater Characterization and Monitoring* (Barr, 2015) memorandum provides a comprehensive review of the geology in the vicinity of the TSP. Soil samples collected at depth from a pilot boring drilled within about 50 feet of the TSP identified alluvium and coarse deposits overlying the Fort Union Formation (Barr, 2015). The local surficial geology shown on Figure 1 is consistent with the on-site geological units encountered.

The local soil conditions at the TSP exhibit characteristics of stable soils with little risk of significant differential settling.

2. On-site or local geologic or geomorphologic features

As mentioned above, a pilot boring drilled within about 50 feet of the TSP identified alluvium and coarse deposits overlying the Fort Union Formation (Barr, 2015), which exhibit stable, firm soil characteristics. No known features that would contribute to the area being geologically unstable is associated with the geological media. A review of Landslide Overview Map of the Conterminous United States (USGS, 1920) identified that areas of moderate and high incidence of landslides in Eastern Montana are confined mostly to the valley walls of rivers and tributaries and when slopes are steepened by man or nature. The TSP is more than 325 feet from the Yellowstone River. Steepened topographic features were not identified along the riverbank.

A USGS map of known karst in the United States (Weary and Doctor, 2014) was reviewed and this indicated that no known karst features are located at the TSP.

Based on a review of the geologic formations in the vicinity of the TSP as well as available public documents, the local geologic and geomorphologic features exhibit stable characteristics that would not result in instability at the TSP.

3. On-site or local human-made features or events (both surface and subsurface)

Berms and other features around the TSP were designed to provide stable conditions. Erosion control rock is present on the outer slopes of the TSP berms.

Surface water runoff around the facility is well controlled. Natural and human-made swales and ditches, grassed areas, and natural wooded areas effectively temper and control surface water runoff. Uncontrolled runoff and erosion that could result are therefore absent at this facility. A buffer of more than 300 feet exists between the TSP and other plant operations, so plant operations will not affect stability of the TSP.

No other on-site or local human-made features or events are known to exist in the area.

In summary, the three factors listed above that may contribute to unstable areas were not identified at the TSP. Based on this review, the location of the TSP conforms to the location restriction of §257.64.

3.0 References

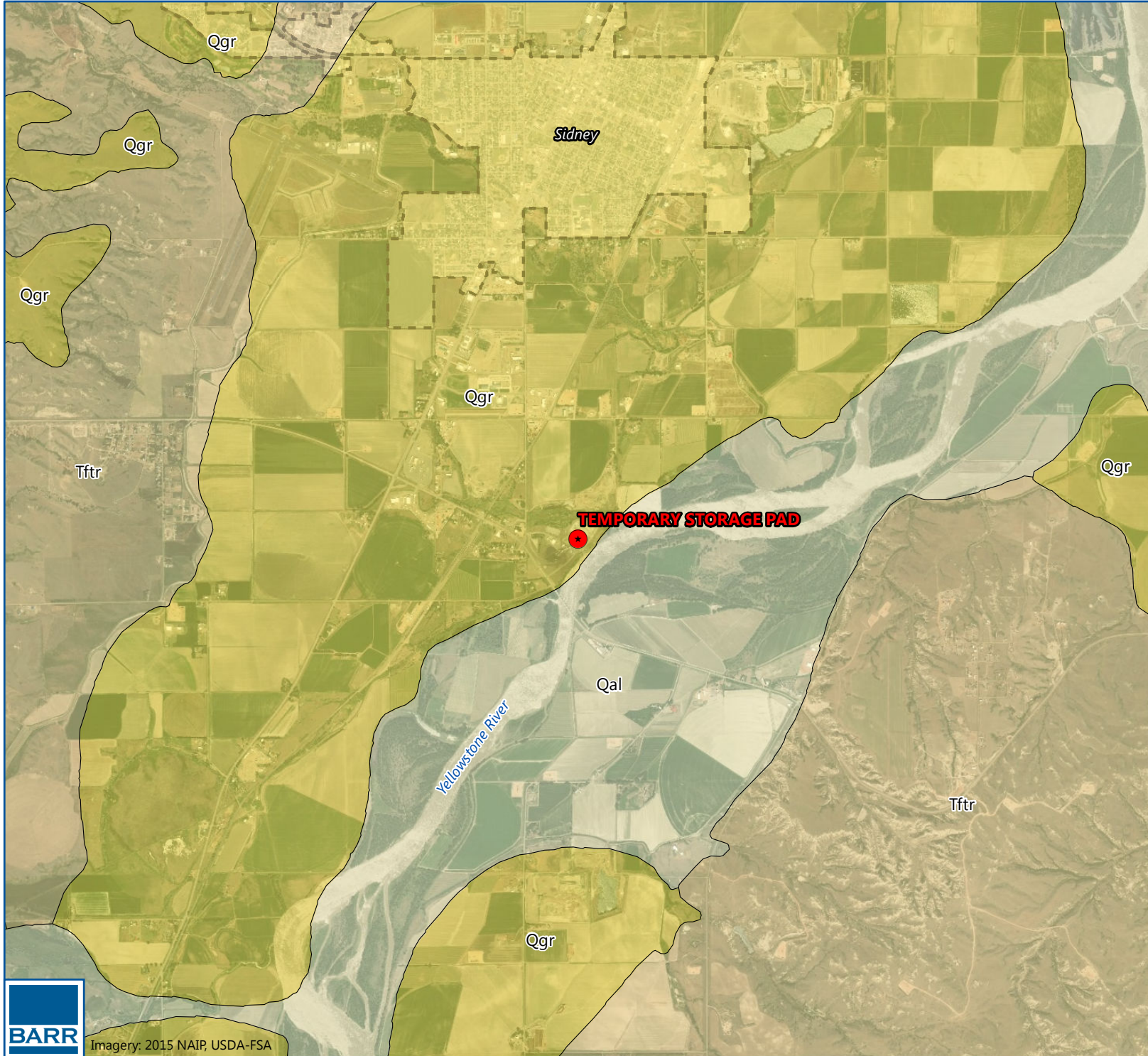
Barr, 2015. Lewis & Clark Station Groundwater Characterization and Monitoring: Task 2. Sidney, Montana. Prepared by Barr Engineering Co. for Montana Dakota Utilities Co., February 4, 2015.

USGS, 1920. Landslide Overview Map of the Conterminous United States.

<https://pubs.usgs.gov/pp/p1183/pp1183.html#upperm>

Vuke, S.M., Porter, K.W., Lonn, J.D., and Lopez, D.A., 2007. Geologic Map of Montana (matte paper): Montana Bureau of Mines and Geology Geologic Map 62-B, 73 p., 2 sheets, scale 1:500,000.

Weary and Doctor, 2014. Karst in the United States: A digital map compilation and database: U.S. Geological Survey Open-File Report 2014–1156, 23 p., <http://dx.doi.org/10.3133/ofr20141156>.



★ Temporary Storage Pad

Geology Unit

Qal - Alluvium

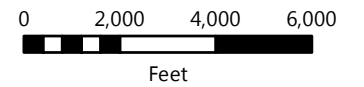
Qgr - Gravel

Tftr - Tongue River

Member of Fort Union Formation

Geology data received from Montana Bureau of Mines and Geology

Vuke, S.M., Porter, K.W., Lonn, J.D., and Lopez, D.A., 2007, *Geologic Map of Montana (digital data)*: Montana Bureau of Mines and Geology, scale 1:500,000



Imagery: 2015 NAIP, USDA-FSA

SURFICIAL GEOLOGY
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FIGURE 1