

**PLATTE RIVER POWER AUTHORITY – RAWHIDE ENERGY STATION
BOTTOM ASH TRANSFER (BAT) IMPOUNDMENTS
LARIMER COUNTY, CO**

**ENGINEER'S CERTIFICATION OF FAULT AREA
DEMONSTRATION
(40 CFR §257.62)
FOR COAL COMBUSTION RESIDUALS (CCR)
EXISTING SURFACE IMPOUNDMENT**

Prepared for

Platte River Power Authority



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October 16, 2018

Prepared by



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1.0 INTRODUCTION

1.1 OBJECTIVE

The purpose of this demonstration is to document compliance with 40 CFR §257.62 of the Environmental Protection Agency Final Coal Combustion Residual Rule (EPA Final CCR Rule). This Fault Area Demonstration is based on existing documentation such as construction drawings, record drawings, geotechnical information, and other pertinent data and/or investigations that support historical conditions and operations at the Bottom Ash Transfer (BAT) Impoundments at Rawhide Energy Station.

1.2 RULE REQUIREMENTS

According to 40 CFR §257.62(a) of the EPA Final CCR Rule, any 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 Period unless the owner or operator demonstrate by October 17, 2018 that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

1.3 BACKGROUND

During active fault movement, earth displacement where the ground may be bent or warped typically occurs within a zone spanning 200 feet from the fault line. In accordance with 40 CFR §257.62(a), all new and existing CCR impoundments, landfills, and vertical expansions must not be located within 60 meters (200 feet) of the outermost danger zone created by faults active during the Holocene Period. The Holocene Period is defined by any geologic event occurring within the past 11,700 years; the time span indicating that a fault is active.

Providing an adequate setback distance as required by 40 CFR §257.62(a), is an attempt to reduce the risk of CCR unit failures. Potential failures include surface breakage, cracks, and fissures between fill and confining slopes, slope failure via landslides, liquefaction induced lateral spacing and settlement, and disruption of surface water and drainage control systems. In the case that an existing CCR facility is within 200 feet of an active fault, the operator or owner of the facility must provide a demonstration recognizing that acceptable engineering practices have been incorporated into the design of the CCR unit so that the structural integrity of the CCR unit will not be disrupted.

1.4 SITE BACKGROUND

Rawhide Energy Station (Rawhide) is a 4,560 acre facility located at 2700 East County Road 82 in Wellington, CO. Construction of Rawhide began in 1979 and it has operated as a coal-fired power plant since. The primary land use on the Rawhide property is related to utility service electric generation. Power generation at Rawhide produces coal combustion residuals (CCR). Rawhide places these residuals in the Solid Waste Management Facility (the Monofill), located in the northwest corner of the Rawhide site.

The BAT Impoundments are located northwest of the main plant and north of the Cooling Pond. A site location plan of the Rawhide Energy Station is depicted on **Figure 1**. An overview of the impoundments is presented in **Figure 2**.

Bottom ash is produced during the coal combustion process and is hydraulically sluiced from the boiler to one of the two incised BAT impoundments. These impoundments also receive resin filter backwash water from the demineralizer at the wastewater treatment plant. The impoundments were constructed in the early 1980s by excavating below grade into the underlying Pierre Shale and then lining the bottom with 18 inches of compacted clay. Each of the two impoundments measure approximately 725 feet by 225 feet at the surface (approximately 7.5 acres total) with a bottom elevation of 5,660 feet above mean sea level (amsl), a normal water elevation of 5,674 feet amsl, and a dike crest elevation ranging between 5,678 and 5,679 feet amsl. It takes approximately one to two years to fill one of the ponds. Once the ponds are filled, the solids are excavated by an outside contractor and disposed of in the on-site monofill. The bottom clay liner has been surveyed during the cleanout. The ponds are cleaned out in an alternating manner, approximately every three years, and the material is then transported to the Monofill.

A plant shutdown event at the Rawhide facility is planned to occur during Fall 2018. The existing BAT impoundments will be permanently taken out of service following this shutdown event.

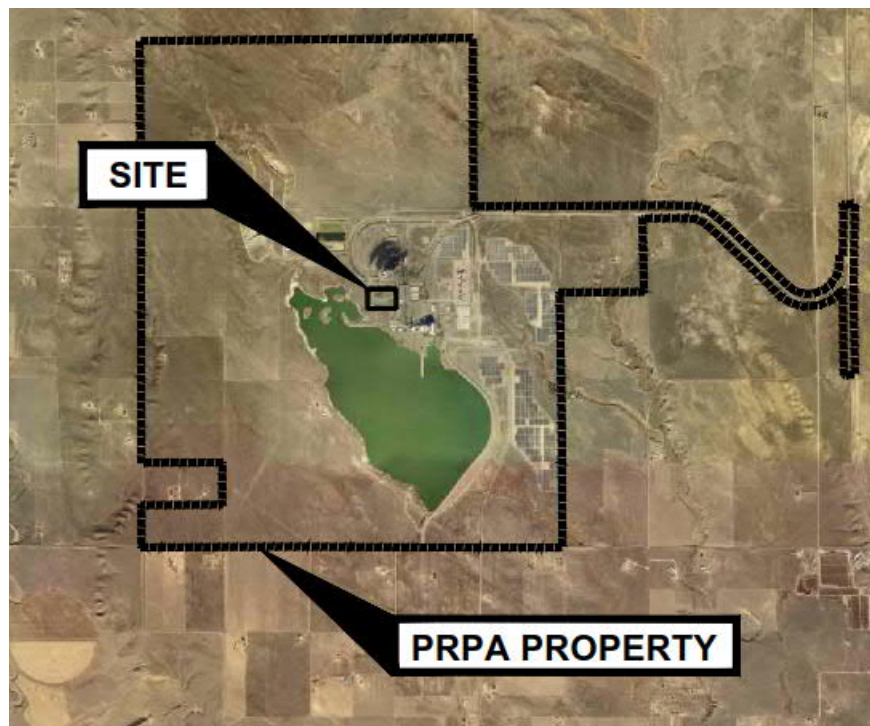


Figure 1: Site Location Map



Figure 2: CCR Unit Site Location

2.0 REGIONAL/SITE GEOLOGY

The geologic setting at Rawhide lies on the high plains located immediately east of the Colorado Front Range, where soil and bedrock units are incised by drainage from nearby mountains to the west, forming small, relatively minor valley and ridge topographic expressions, as discussed in the Annual Ash Monofill Inspection Report (AECOM, 2016). The most distinctive topographic feature at Rawhide is a broad basin that occupies the center of the site and extends from northwest to southeast. Smooth ridges and rounded bluffs surround this basin and mark the transition to uplands that are 50 to 70 feet (ft) higher.

According to the United States Geological Survey (USGS) geologic map, bedrock at Rawhide consists of Cretaceous units including the Upper Pierre Shale Formation. Specifically, the majority of the Rawhide site lies on the Upper Pierre Shale Formation transition zone, the eastern extent of which transitions to the Lower Fox Hills Sandstone downslope and east of the Rawhide site. The Pierre Shale transition zone is described as shale with interbedded sandstones.

The bedrock surface at the site is mapped as dipping east-southeast toward the Cooling Pond. The geologic map indicates bedrock bedding structure in the area striking roughly north-south with shallow dips 5 to 10 degrees to the east. The Rawhide site is considered to be in an area of overall minor seismicity.

3.0 SITE GEOLOGY/FAULTING

Geotechnical information for the Rawhide Energy Station was gathered for the Geotechnical Analysis Report by Black & Veatch Consulting Engineers dated July 1979. At that time, one hundred fourteen (114) soil borings were performed at the plant in various locations, including 2

soil borings (B-41 and B-104) located within the footprint of the BAT impoundments. The BAT impoundments were excavated down through the overburden silty-clay material to the weathered shale (5660 feet asml).

3.1 SITE FAULTING

According to the U.S. Quaternary Faults and Folds Database (USGS), Rawhide Energy Station is located north of several fault lines: the Rock Creek fault, located about 65 miles south of the plant site, the Walnut Creek fault, situated approximately 66 miles south of the site, and various unnamed faults in the Williams Fork Valley (See **Figure 3**). Based on a review of the USGS website which contains information on faults and associated folds in the United States, there are no known faults of Holocene age located within the vicinity of Rawhide Energy Station. The closest fault of the Quaternary age (<15,000 yrs) is the Williams Fork Mountains fault located 90 miles southwest from the site.

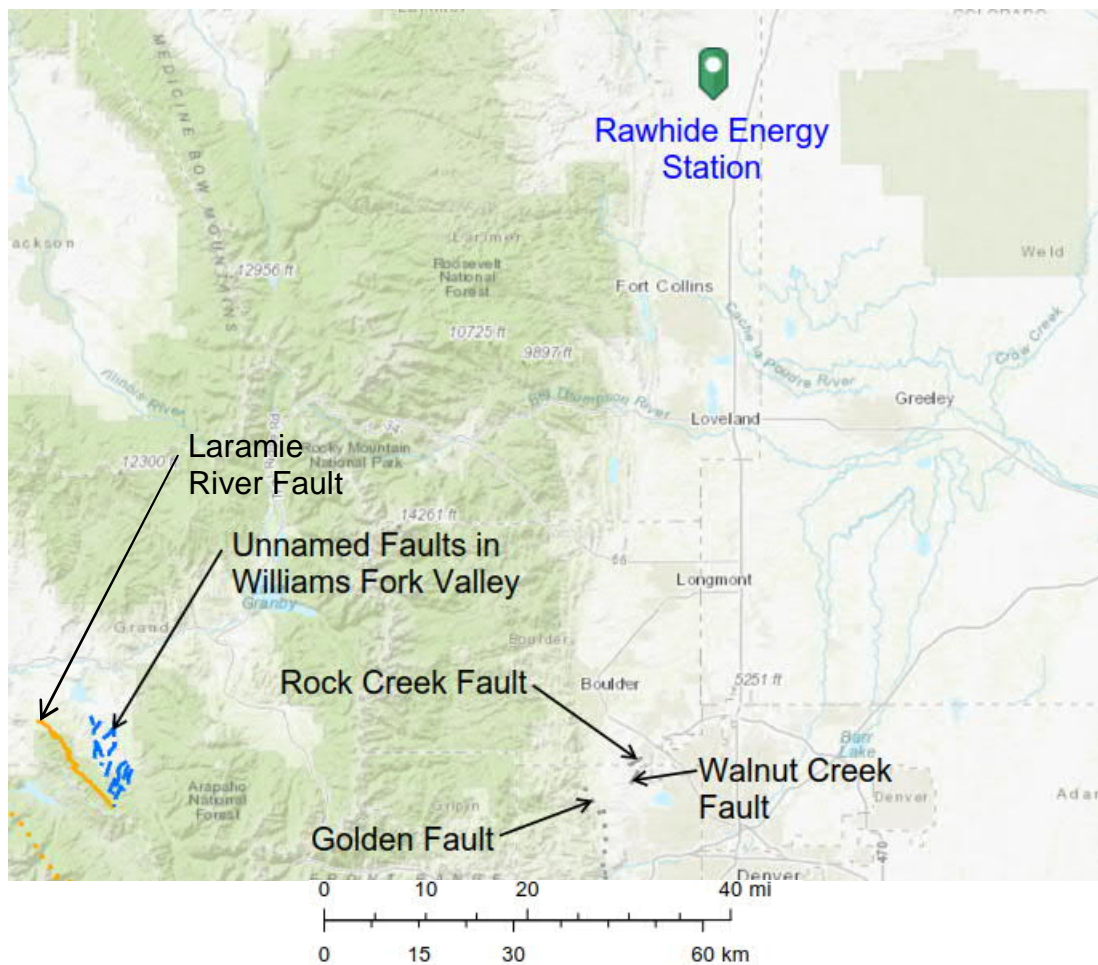


Figure 3. U.S. Quaternary Fault and Folds Database Map, USGS

In the Geotechnical Analysis Report by Black & Veatch Consulting Engineers (1979), the nearest faults mentioned include the Rawhide fault (5 miles north), the Round Butte fault (4 miles northwest), the Greenacre fault (5 miles west) and an unnamed north-south trending fault about 1 mile northeast of the site. None of these faults have been active during the Holocene period. The closest fault suspected or known to show Quaternary movement is the Valmont fault located 55 miles from the site (Black & Veatch, 1979). The Valmont fault is not included in the USGS information.

According to the Colorado Earthquake and Late Cenozoic Fault Map Server (Colorado Geological Survey), which contains all of the fault line locations determined to have ruptured with the last 23 million years, the closest fault to the site is the Laramie River fault, located approximately 37 miles to the east (See **Figure 4**).

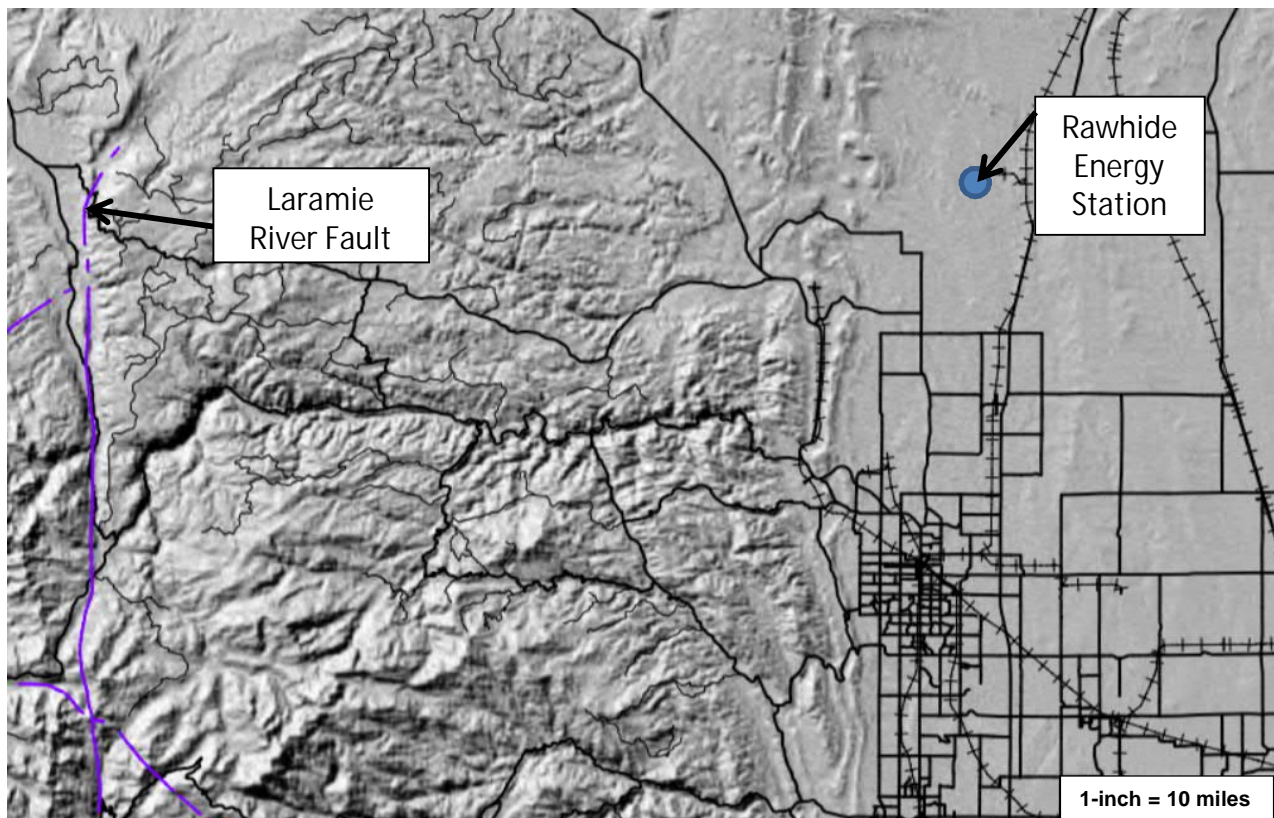


Figure 4. Earthquake and Late Cenozoic Fault and Fold Map Server (Morgan 2017)

All of the fault zones discussed exceed the prescribed 200 foot minimum offset from the BAT Impoundments.

4.0 CONCLUSIONS

Based upon a review of the documented sources and comparison with CCR Rule 40 CFR §257.62(a) as presented above, the CCR units comprising the BAT Impoundments are much further than 60 meters (200 feet) from the outermost damage zone of a fault that has seen

displacement during the Holocene Period. Through the references listed below and the attached figures, AECOM has determined that the BAT Impoundments at the Rawhide Energy Station meet the fault area requirements of the EPA Final CCR Rule § 257.62. AECOM has determined that there are no reasonable expectations that faults will disrupt the integrity of the BAT Impoundments due to fault movement.

Pursuant to 40 C.F.R. § 257.62 (c)(1), for an existing surface impoundment, the owner or operator must complete the demonstration no later than October 17, 2018. Certification by a qualified professional engineer is included in **Appendix A**.

5.0 REFERENCES

- Black & Veatch Consulting Engineers, Geotechnical Analysis Report, Platte River Power Authority Rawhide Project: July 23, 1979.
- Morgan, M. L., 2017, Colorado Earthquake Map Server:
<http://dnrwebmapgdev.state.co.us/CGSONline/>
- Online Fault Map, U.S. Quaternary Faults and Folds Database, United States Geological Survey, accessed September 27, 2018.
<https://usgs.maps.arcgis.com/apps/webappviewer/index.html?id=db287853794f4555b8e93e42290e9716>

APPENDIX A

ENGINEER'S CERTIFICATION

**ENGINEER'S CERTIFICATION OF FAULT AREAS DEMONSTRATION
CCR SURFACE IMPOUNDMENT: RAWHIDE ENERGY STATION
CCR UNIT: BOTTOM ASH TRANSFER IMPOUNDMENTS**

AECOM ("Consultant") has been retained by Platte River Power Authority to prepare a demonstration of whether the above-referenced existing coal combustion residuals ("CCR") surface impoundment meets the location restriction for fault areas requirements set out in 40 C.F.R. § 257.62(a). Presented below are the project background, summary of findings, limitations, and certification.

1.0 BACKGROUND

Pursuant to 40 C.F.R. § 257.62(a), new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of a CCR unit 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 that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

Pursuant to 40 C.F.R. § 257.62(b) and (c)(1), for an existing CCR surface impoundment, the owner or operator must obtain a certification from a qualified professional engineer stating that the owner or operator has demonstrated that the CCR unit meets the requirements for fault areas no later than October 17, 2018.

In support of Consultant's assessment, Consultant completed a desktop evaluation of the location of the CCR unit and determined that sufficient information is available to document the required fault areas demonstration.

2.0 SUMMARY OF FINDINGS

Based upon a review of U.S. Geological Survey (USGS) mapping of faults zones and their proximity to CCR unit location, Consultant concludes as follows:

CCR Unit	Fault Areas
BAT Impoundments	<i>Meets the requirements of 40 C.F.R. § 257.62(a)</i>

3.0 LIMITATIONS

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

4.0 CERTIFICATION

I, Sherry Bugg, being a Registered Professional Engineer, in accordance with the Colorado Professional Engineer's Registration, do hereby certify to the best of my knowledge, information, and belief, that the CCR unit that is the subject of this report dated October 16, 2018 meets the location restriction for fault areas requirements pursuant to 40 C.F.R. § 257.62(a), and that this report is true and correct and has been prepared in accordance with generally accepted good engineering practices.

SIGNATURE




DATE 10/16/2018

