

Closure Plan

Pawnee Station - East CCR Landfill

*Public Service Company of Colorado
Denver Colorado*

December 28, 2018

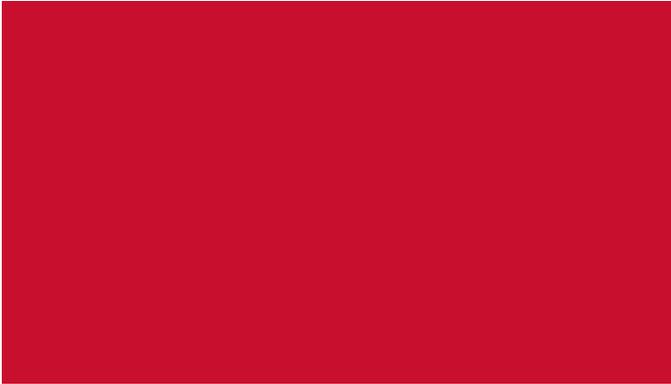




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Table of Abbreviations and Acronyms

Abbreviation	Definition
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
CDPHE	Colorado Department of Public Health and Environment
cm/sec	Centimeters per Second
cy	Cubic Yards
LLDPE	Linear low-density polyethylene
PSCo	Public Service Company of Colorado
sf	Square Feet

1.0 General Information

On April 17, 2015 the U.S. Environmental Protection Agency (EPA) published the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities; Final Rule (40 CFR 257 and 261) (Federal CCR Rule). The rule defines a set of requirements for the disposal and handling of CCR within CCR units. The requirements include preparation of a Closure Plan for all existing and new CCR landfills.

The Pawnee Station Power Plant, operated by the Public Service Company of Colorado (PSCo), an Xcel Energy company, is located at 14940 Morgan County Road 24, Brush, Colorado, approximately four miles southwest of Brush, Colorado. Pawnee Station operates two CCR landfills (North and East CCR Landfills) located on the plant property approximately one-half mile south of the main power plant building. This Closure Plan is limited to the East CCR Landfill which is subject to the CCR rule. A separate Closure Plan was previously prepared for the North CCR Landfill.

The Morgan County Commissioners approved construction and operation of the east landfill in September 2017 as part of a Special Use Permit. The landfill will start ash disposal early 2019. The landfill is operated under an Engineering Design and Operations Plan approved by the Colorado Department of Public Health and Environment (CDPHE).

The East CCR Landfill, located at the southeastern portion of the site, encompasses an area of approximately 13 acres. This landfill will provide disposal capacity for CCR and lime solids from plant operations and relocating of lime solids from the South Landfill. The East CCR Landfill was constructed in the footprint of the former Bottom Ash Storage Pond. The Bottom Ash Storage Pond was constructed in 1980 with a composite liner system, was taken out of service in 2005 and was closed in 2017. The pond was closed by removal of all CCR, the liner system, and soil confirmatory sampling; closure was overseen and certified by a Professional Engineer. Construction of the East CCR Landfill occurred in 2018.

A location map of the East CCR Landfill is provided in **Figure 1**.

In accordance with 40 CFR 257 Disposal of Coal Combustion Residuals From Electrical Utilities §257.102(b), owners of CCR disposal units are required to publish a written closure plan that, *“...describes the steps necessary to close the CCR unit at any point during the active life of the CCR unit consistent with recognized and generally accepted good engineering practices.”*

This closure plan fulfills the requirements of 40 CFR §257.102(b).

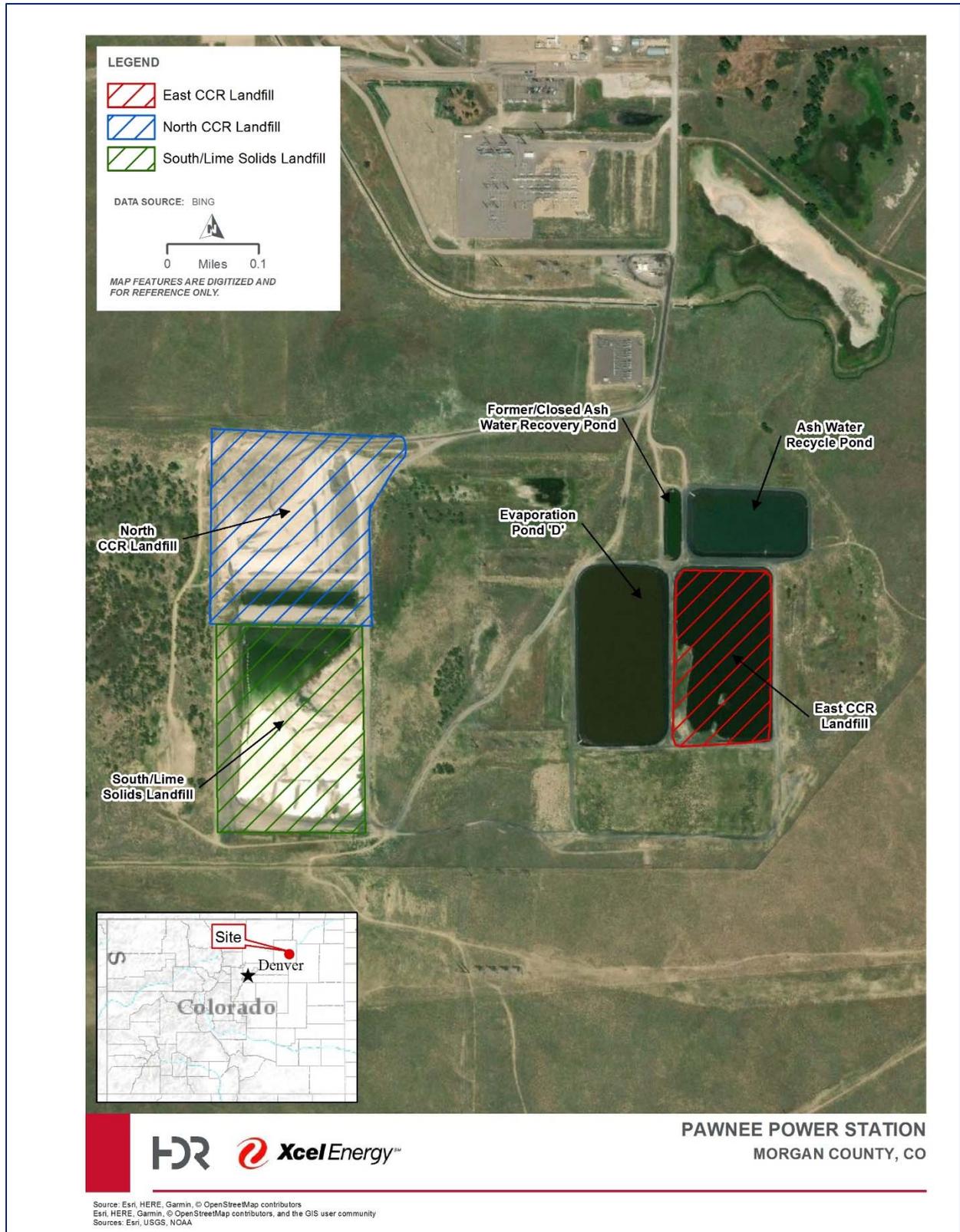


Figure 1. Pawnee Power Station CCR Landfill Location Map

2.0 Description of Closure Plan –257.102(b)(1)(i-iii)

According to 40 CFR 257.102(d) - Closure performance standard when leaving CCR in place – the final cover system shall be designed to have a 6-inch erosion control layer and an 18-inch infiltration layer with a permeability less than or equal to any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less.

The closure plan for the East CCR Landfill includes installation of a synthetic turf final cover system designed to meet or exceed the final cover requirements of 257.102(d). The synthetic turf final cover system is a three component system comprised of a structured geomembrane, an engineered synthetic turf, and a specialized infill. The materials of construction will include a 50-mil LLDPE geomembrane, 0.5-inch sand ballast infill, and synthetic turf. The geomembrane includes drainage stubs on the upper side that provide a drainage pathway for infiltrated precipitation and spikes the on under side for superior interface friction strength. The synthetic turf final cover system will be installed on top of the intermediate cover soil installed during operations.

For the purpose of permitting with CDPHE, an alternative cover equivalency demonstration has been performed on the synthetic turf final cover system showing that the alternative cover met or exceeded the performance of the regulatory cover system described in 40 CFR 257(d)(3)(i).

The synthetic turf final cover system will not require a soil drainage layer or vegetative support layer above the geomembrane, as the synthetic turf materials replace the vegetation and provide an aesthetic appearance and protect the underlying geomembrane from UV degradation. The integrated drainage layer above the geomembrane and below the ballasted synthetic turf provides a drainage pathway for precipitation to the drainage benches or swales. The proposed system also prevents common erosion and siltation problems that are often issues for maintenance of traditional capping systems, especially in areas where vegetation is difficult to establish and maintain.

The final cover will have a grade that promotes surface water run-off and minimizes erosion. The slope of the final cover on the top of the landfill will be no less than 5% and the final cover side slopes will be no greater than 33% (3 horizontal feet to 1 vertical foot). The top deck slope will be pitched to direct run-off to either the north or south end of the landfill.

During filling operations, Xcel Energy will construct drainage benches and drop chutes to manage run-off from the intermediate cover soils. The benches and drop chutes will be stabilized during operations with erosion control matting and reno-mattresses as needed to minimize erosion. For final closure, the synthetic turf final cover system will incorporate the drainage benches and drop chutes for managing the post-closure run-off, and utilize a cementitious infill in lieu of a sand infill ballast in areas with high shear stress and velocities. The drop chutes and roadway drainage swale discharge into the perimeter toe drainage swales and then into one of two non-contact storm water ponds or a low lying drainage area to the east.

PSCo will initiate closure activities within 30 days of the landfill reaching final grades.

3.0 Inventory Estimate –257.102(b)(1)(iv)

In accordance with 257.102(b)(1)(iv), an estimate of the maximum inventory of CCR ever on site over the active life of the East CCR Landfill must be provided.



Pawnee Station began operations in 1981 and generated approximately 65,000 cubic yards of CCR per year through 2013, resulting in approximately 2.1 million cubic yards of CCR generated over this time period. However, from about 1996 to 2013, the majority of CCR was sold for beneficial use. Therefore, the estimated inventory of CCR in the North CCR Landfill at the end of 2013 was approximately 975,000 cubic yards. Sale of CCR for beneficial use ceased in 2014, and all CCR since 2014 has been disposed in the landfill. The estimated remaining airspace in the North CCR landfill at the end of 2013 was approximately 600,000 cubic yards. An expansion of the capacity at the North CCR Landfill was permitted in 2017 adding an additional 291,000 cubic yards. Therefore, the final inventory of CCR in the North CCR Landfill at closure is estimated to be 1,866,000 cubic yards.

It is estimated that approximately 325,000 cubic yards of lime solids are contained in the South Landfill. In addition to fly ash and bottom ash, the lime solids area is planned to be excavated and deposited into the East CCR Landfill after mixing with fly ash for stabilization. Under the permitted design, the East CCR Landfill has a total disposal capacity of 904,400 cubic yards. Assuming a 2:1 fly ash to lime solid mix ratio, and a monthly bottom ash disposal of 2,000 cubic yards, it is estimated that the East CCR Landfill will have 579,400 cubic yards of CCR in its final inventory.

Combining the CCR inventories from the East and North CCR Landfills, it is estimated that the maximum inventory of CCR on site over the active life of the East CCR Landfill will be 2,445,400 cubic yards.

4.0 Area Requiring Final Cover – 257.102(b)1(v)

In accordance with 40 CFR §257.102(b)(1)(v), an estimate of the largest area of the CCR unit ever requiring a final cover must be provided.

The footprint of the East CCR Landfill covers approximately 13 acres, and the closed surface will require approximately 589,606 sf of closure turf, including the closure area as well as the perimeter drainage channel.

5.0 Schedule of Closure Activities –257.102(b)1(vi)

Task	Start Date	Finish Date
Closure Plan	October 17, 2018	December 28, 2018
Post-Closure Plan	October 17, 2018	December 28, 2018
East CCR Landfill Operation	Year 2019	Year 2022 (Initiation of Cell Closure)
Annual Inspections	Annually	Annually until 2022
Fugitive Dust Plan Updates	Annually	Annually until 2022
Post Closure Inspections and Maintenance	Year 2022	Year 2052 (minimum)

6.0 Qualified Professional Engineer Certification – 257.102(b)(4) and 257.102(d)(3)

In accordance with 40 CFR §257.102(b)(4), the owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the initial and any amendment of the written closure plan meets the requirements of this section.

In accordance with 40 CFR §257.102(d)(3), the owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design of the final cover system meets the requirements of this section.

I, Matthew M. Rohr, being a registered Professional Engineer, in accordance with the Colorado State Board of Licensure for Architects, Professional Engineers, and Professional Land Surveyors, do hereby certify to the best of my knowledge, information, and belief, that the information contained in this written Closure Plan dated December 28, 2018, was conducted in accordance with the requirements of 40 CFR §257.102(b) and (d), is true and correct, and was prepared in accordance with recognized and generally accepted good engineering practices.

SIGNATURE:



Colorado PE 0053467

DATE:

December 28, 2018