



Written Closure Plan

Pawnee Station - North CCR Landfill
*Public Service Company of Colorado
Denver Colorado*

October 17, 2016

Revised: March 27, 2019



Table of Contents

1.0	General Information.....	3
2.0	Description of Closure Plan –257.102(b)(1)(i-iii).....	5
3.0	Inventory Estimate –257.102(b)(1)(iv).....	5
4.0	Area Requiring Final Cover – 257.102(b)1(v)	6
5.0	Schedule of Closure Activities –257.102(b)1(vi).....	6
6.0	Qualified Professional Engineer Certification – 257.102(b)(4) and 257.102(d)(3).....	7

List of Tables

Table 1.	Schedule of Closure Activities	6
----------	--------------------------------------	---

List of Figures

Figure 1.	Pawnee Power Station CCR Landfill Location Map	4
-----------	--	---



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
LLDPE	Linear Low-Density Polyethylene
PSCo	Public Service Company of Colorado

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) subject to the CCR rule located on the plant property approximately one-half mile south of the main power plant building. This Closure Plan is limited to the North CCR Landfill. A separate Closure Plan has been prepared for the East CCR Landfill.

The Morgan County Commissioners approved construction and operation of the landfill for ash and raw water treatment solids in 1976 as part of the Special Use Permit issued for construction of Pawnee Station. The landfill has been in continuous use since 1981, when the plant started operations, with ash disposal in the northern half (North CCR Landfill) and lime sludge disposal in the southern half (South/Lime Solids Landfill). The landfill is operated under an Engineering Design and Operations Plan developed pursuant to Colorado Department of Public Health and Environment Solid Waste Regulations. The area subject to the CCR Rule is limited to the North CCR Landfill which encompasses an area of approximately 22 acres.

A location map of the North CCR landfill is provided on **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).

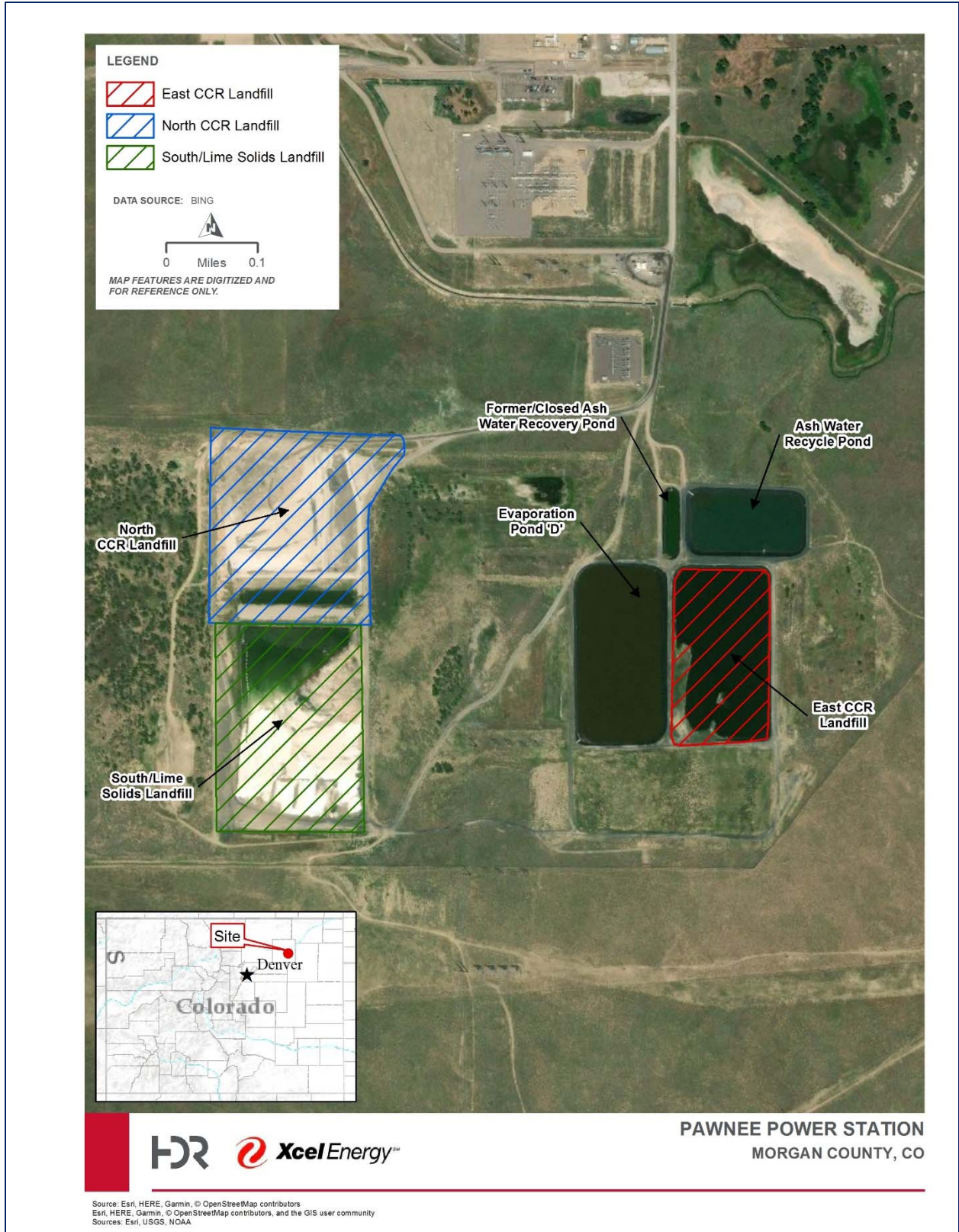


Figure 1. Pawnee Power Station CCR Landfill Location Map

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 landfill was constructed with the base cut into native Pierre Shale bedrock, which is approximately 5,000 feet thick in this area. The bedrock has a permeability of approximately 1×10^{-8} cm/sec, and acts as a natural barrier to potential seepage. Therefore, no engineered liner system was constructed.

The closure plan for the North CCR Landfill includes the installation of a synthetic turf final cover system with a maximum permeability of 1×10^{-8} cm/sec. 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, a 0.5-inch sand ballast infill, and a synthetic turf. The geomembrane includes drainage stubs on its upper side that provides a drainage pathway for infiltrated precipitation and spikes on the underside for superior interface friction strength. The synthetic turf final cover system will be installed directly on top of the intermediate cover soil installed during operations.

The final cover will have a grade that conveys precipitation runoff from the top of the landfill to downchute conveyance structures located at the perimeter of the landfill. Small swales along the tops and sidewalls of the landfill will direct precipitation runoff to the downchute conveyance structures. 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 33% (3 horizontal feet to 1 vertical foot).

For the purpose of permitting with CDPHE, an alternative cover equivalency demonstration was performed on the synthetic turf final cover system which showed 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.

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 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 through 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 air space 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 capacity of 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 the separate 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 North and East CCR Landfills 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 closed surface will require approximately 725,000 square feet of closure turf.

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

Table 1. Schedule of Closure Activities		
Task	Start Date	Finish Date (Initiation of Cell Closure)
Closure Plan	October 17, 2016	Revised March 15, 2019
Post-Closure Plan	October 17, 2016	Revised March 15, 2019
Last Receipt of CCR	On-going	Year 2022
Landfill Closure	Year 2022	Year 2022
Annual Inspections	Annually	Year 2022
Fugitive Dust Plan Updates	Annually	Year 2022
Post Closure 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 Closure Plan dated March 27, 2019, 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 0051341

DATE:

March 27, 2019