

**LANDFILL CLOSURE PLAN**

**PLUM POINT ENERGY STATION**  
**CLASS 3N CCR LANDFILL**

**PERMIT NO. 0303-S3N**  
**AFIN: 47-00461**

**OCTOBER 14, 2016**

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PERMIT NO. 0303-S3N  
AFIN: 47-00461

Prepared for

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October 14, 2016

## PROFESSIONAL ENGINEER'S CERTIFICATION

In accordance with §257.102 , I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

This Closure Plan for the Plum Point Energy Station Class 3N CCR Landfill was prepared und the direction and supervision of a qualified, State of Arkansas-registered Professional Engineer. Mr. Paul Crawford, PE, PG of FTN Associates, Ltd., was responsible for the overall preparation of the plan.



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Paul Crawford, PE #8943

October 14, 2016  
Date



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## 1.0 INTRODUCTION

### 1.1 Purpose of Plan

In accordance with 40 CFR §257, *Subpart D - Disposal of Coal Combustion Residuals From Electric Utilities* (the CCR Rule), the purpose of this plan is to provide information on the procedures required for closure of a CCR unit at any point during its active life at the Plum Point Services Company, LLC (PPSC) Plum Point Energy Station (the Plant, PPES) Class 3N CCR Landfill (the Landfill). This Closure Plan (the Plan) includes:

1. A description of the steps that will be taken to close each CCR unit that has not been closed;
2. A description of the final cover system and the methods used to install the cover;
3. An estimate of the maximum inventory of CCR ever onsite over the active life of the CCR unit;
4. An estimate of the largest area of the CCR unit ever requiring a final cover; and
5. A general schedule for closure.

Appendix A includes definitions for terms included in this Plan.

### 1.2 Plum Point Energy Station Information

The PPSC Plant Class 3N CCR Landfill is located in Mississippi County, approximately 2 miles southeast of Osceola, Arkansas. The 245-acre solid waste management facility is located within the Plant boundaries. The location of the facility is shown on Figure 1.1. The site is characterized by flat terrain and is situated within the Mississippi River floodplain. The Plant is located in an agricultural and industrial area.

PPSC is the owner of the landfill facility but uses a contractor to operate the Landfill for disposal of CCR materials generated at the Plant and general maintenance of the landfill facility.

The Plant generates electricity through the combustion of coal, which produces CCR

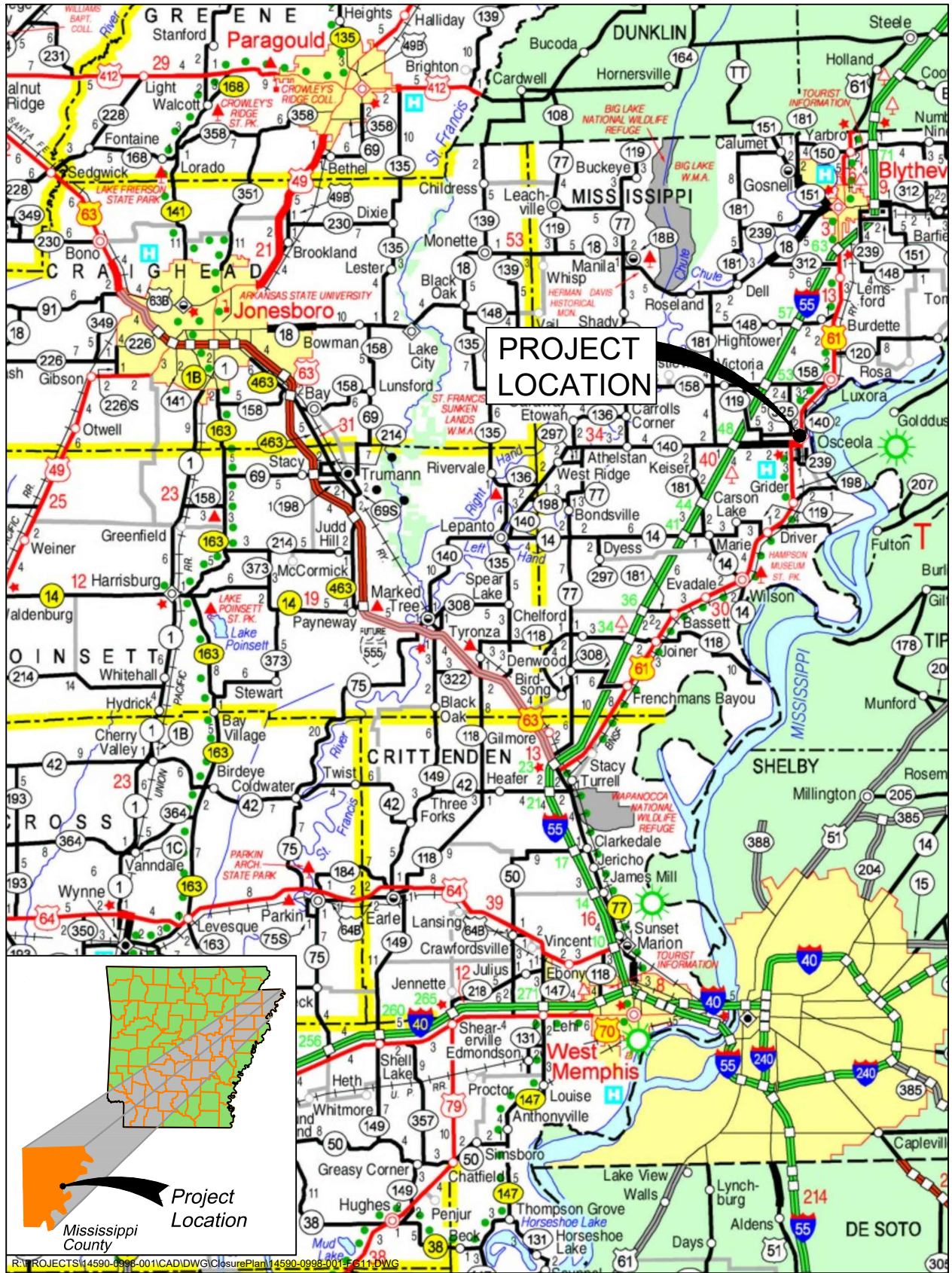


Figure 1.1. Site location map.

materials that are captured through the facility air emission control systems and placed in the onsite landfill. The CCRs consist of bottom ash, economizer ash, fly ash, and coal pulverizer rejects.

The bottom ash is the coarsest fraction of the coal ash and is collected in a water-filled trough beneath the steam generation furnace. Bottom ash is composed of angular, glassy particles with a porous surface texture and has the consistency of coarse sand. Coal pulverizer rejects are periodically sluiced to the collection trough beneath the boiler furnaces along with the bottom ash. The economizer ash is the heavier fraction of fly ash and is collected in hoppers and is periodically transferred via dry flight conveyors to a submerged flight conveyor that carries the bottom ash, economizer ash, and coal pulverizer rejects to a concrete basin called the “Bottom Ash Stockout Area.” The collected materials are periodically loaded into haul trucks and taken to the Landfill.

The largest fraction of the CCR material generated from the coal combustion process is fly ash. The fly ash is composed of very fine particles similar to glass and has the consistency of a powder. The plant has a fly ash collection system that captures dry air heater ash and dry scrubber ash in a series of fabric filter and air heater hoppers. The collected material is conveyed to a large silo, which is periodically unloaded into haul trucks and transferred to the Landfill.

The Plant air emission controls include a dry Flue Gas Desulfurization (FGD) system and an activated carbon injection system. The FGD system is designed to cool down the flue gas and remove sulfur dioxide and particulate matter from the gases emitted from the coal-fired boiler. This is accomplished by a chemical reaction using a slurry of calcium hydroxide with the flue gases, while simultaneously allowing the hot flue gases to dry the reaction products (calcium sulfite, calcium sulfate, calcium chloride, and calcium fluoride). The dry reaction products are collected with the fly ash materials in a fabric filter hopper system. The activated carbon injection system removes mercury from the gases emitted from the coal-fired boiler. The mercury combines chemically with powdered activated carbon and is removed in the same filter system as the fly ash and dry scrubber ash.

The used FGD lime slurry is collected and reused within the FGD system. The retained solids are containerized and periodically transported to the Ash Containment Area, and then to the onsite landfill.

Water is pumped from the Mississippi River and clarified to become either cooling tower makeup water or service water for plant use. The sludge generated from this process is conveyed to a filter press where the solids are containerized and periodically transported to the onsite landfill. The filtrate from this process is pumped back to the clarifiers for treatment.

Although it varies greatly, the Plant generates approximately 500,000 tons of fly ash, bottom ash, and filter cake per year, of which approximately 85% is fly ash, 10% is bottom ash, and 5% is filter cake. The amount placed in the Landfill also varies from year to year, but the average for the past 5 years is approximately 150,000 cubic yards (cy), in-place volume.

The permitted landfill area is located west of the plant site as shown on Figure 1.2. The landfill is permitted to have 12 disposal areas, varying in size from 15 to 9 acres.

### **1.3 Permit History**

In July 2001, Genesis Environmental Consulting, Inc. (GEC) submitted an application on behalf of Plum Point Energy Associates, LLC, to the Arkansas Department of Environmental Quality (ADEQ) for a solid waste disposal facility at the PPES. In October 2002, ADEQ issued a solid waste permit (0303-S3N) to construct and operate the proposed Class 3N CCR landfill facility.

Prior to construction of the landfill, GEC submitted a minor permit modification application in November 2005 to revise the final landfill grading plan, stormwater control plan, bottom grading plan, earthwork balance calculations, and Construction Quality Assurance (CQA) Plan. The application also included the request for an alternative bottom liner design. ADEQ requested the inclusion of a leachate collection system and Terracon Consultants, Inc. (which had purchased GEC) submitted revised permit documents in July 2006. ADEQ approved the minor permit modification in September 2006. Cell 1 of the landfill and the western stormwater pond were constructed in 2008. The Plant and the Landfill began operation in March 2010.



Since beginning operation, the landfill constructed an adjacent cell, Cell 3, in 2014 and began placing waste in the new cell in 2015.

#### **1.4 Existing Conditions of Landfill**

The current ADEQ-permitted PPES Class 3N Landfill is approximately 173 acres in size and has been designed to have 12 waste disposal cells (Figure 1.3). Cells 1 through 10 are about 15 acres in size with approximate dimensions of 1,000 ft by 660 ft. Cells 11 and 12 are narrower and smaller than the remaining cells to accommodate a potential archeological concern area located east of the Landfill. Cell 11 is about 9.6 acres (450 ft by 1,000 ft) and Cell 12 is about 10.8 acres (500 ft by 1,000 ft). The permitted disposal capacity (air space) for all 12 cells is 22,400,000 cubic yards.

The Landfill has been designed to meet Arkansas Pollution Control and Ecology Commission Regulation No. 22 standards. The bottom of the Landfill is divided to slope north or south to leachate collection sumps. The elevation of the bottom varies from 245 ft National Geodetic Vertical Datum (NGVD) in the center of the Landfill to 230 ft NGVD at the collection sump. The final surface of the Landfill has 4:1 (horizontal to vertical) slopes up to elevation 335 ft NGVD and then slopes at 5% to elevation 365 ft NGVD (Figure 1.3).

The bottom liner system for Waste Cells 1 and 3 were prepared in accordance with the 2006 permit for the facility (i.e., 12-inch minimum thickness compacted clay liner with a maximum hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec, a 60-mil HDPE liner and a leachate collection system). Waste Cells 1 and 3 comprise the active disposal area of the CCR landfill that received CCR materials after October 19, 2015.

No final cover system has been installed on Waste Cells 1 and 3. However, as shown on Figure 1.3, the west, north, and south slopes of Cell 1 have received interim soil cover.

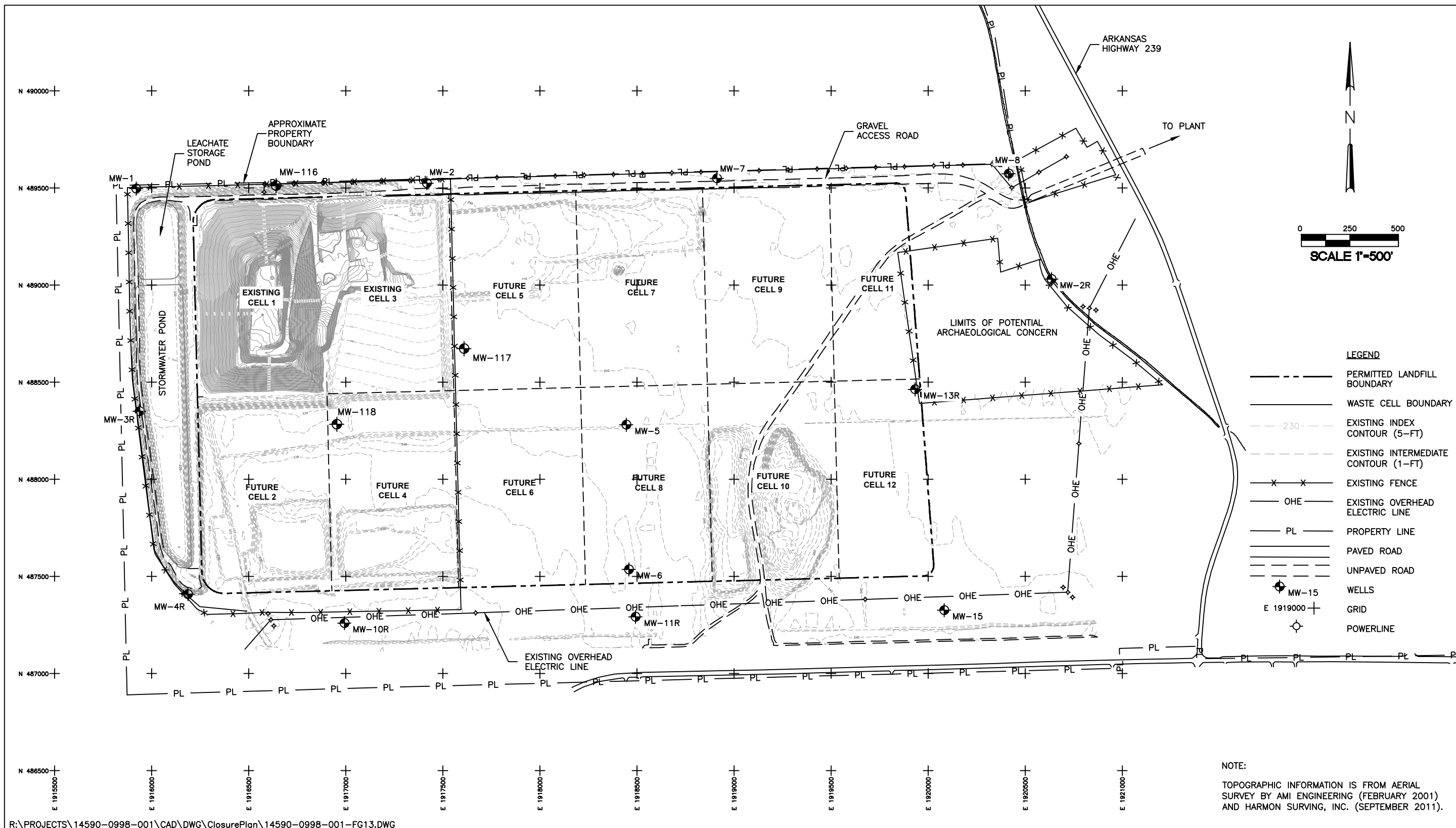


Figure 1.3. Layout of PPES class 3N CCR Landfill.

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## 2.0 CLOSURE PLAN

### 2.1 Closure Requirements

According to §257.102(b), the closure plan for a CCR unit must include information on how the CCR unit will be closed, the design of the final cover system, the methods for installation of the final cover system, an estimate of the maximum inventory of CCR ever onsite over the active life of the CCR unit, an estimate of the largest area of the CCR unit ever requiring a final cover, and a schedule for completing all the closure activities.

### 2.2 Closure Activities

The PPES CCR Landfill cover system will be installed in phases. Closure activities will include preparation of the area to be closed, installation of the barrier and erosion layers, establishment of vegetative cover, and preparation of a certification that the closure activities were conducted in accordance with §257.102 and the facility Construction Quality Assurance (CQA) Plan.

As each CCR unit reaches its design disposal capacity, the waste will be graded to the permitted waste grades. The 24-inch thick compacted clay layer (infiltration layer) will be constructed in four 9-inch thick loose lifts by placing excavated or stockpiled soils across the waste material and then compacting to achieve the required permeability of  $1 \times 10^{-7}$  cm/sec and a compacted thickness of 6 inches per lift. After the compacted clay layer is completed, the 12-inch thick protective cover layer and 6-inch thick erosion layer will be installed. The erosion layer will be seeded with native grasses.

Upon completion of installation of the cover system, erosion control devices such as rock check dams, silt fences, or erosion control matting will be installed in areas where excessive erosion may occur such as on side slopes, discharge locations of stormwater structures and drainage channels.

### **2.3 Design of Final Cover System**

In accordance with §257.102(d)(3)(i) and the current ADEQ-issued solid waste permit, the final cover system for the CCR Landfill consists of the following configuration from bottom to top (Figure 2.1):

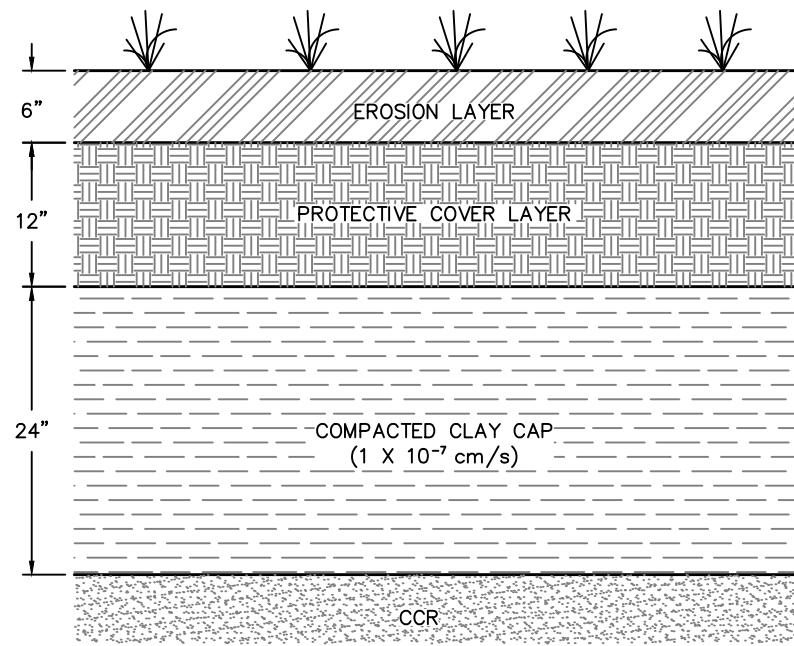
- Twenty-four inches of compacted clay (infiltration layer) having a hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec or less;
- Twelve inches of protective cover layer;
- Six inches of topsoil (erosion layer); and
- A vegetative layer of native perennial grasses.

As allowed by §257.102(d)(3)(ii), an alternative cover consisting of a geosynthetic clay liner (GCL) in place of the compacted clay layer may also be constructed (Figure 2.1). If the GCL used in place of the compacted clay layer, a protective cover layer (intermediate cover) consisting of compacted onsite soils will be installed between the CCR and the GCL. The protective cover layer provides a foundation and damage protection for the overlying synthetic materials. The soil shall be free of rocks, roots, and debris that could damage the synthetics and will be installed in accordance with the CQA Plan.

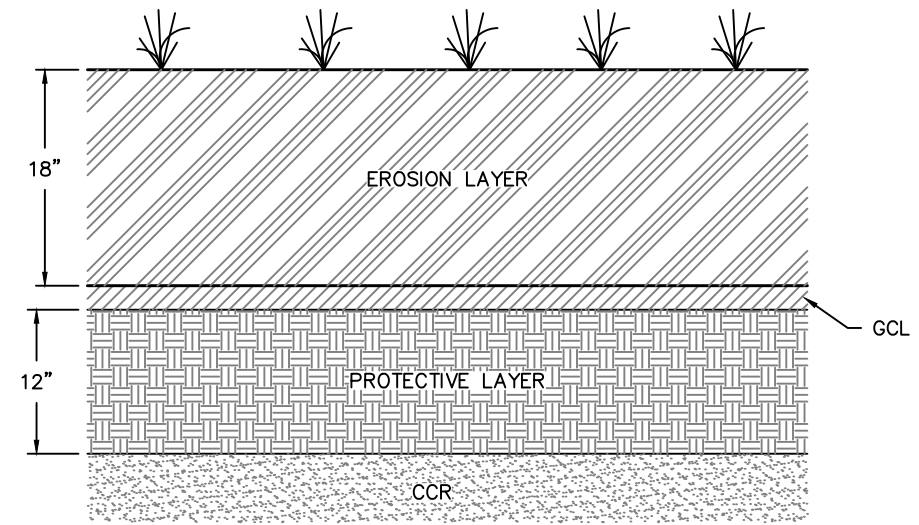
### **2.4 Construction of Final Cover System**

The landfill cover system will be installed during the spring, summer, or fall months to minimize wet weather problems for the construction activities. Prior to installing the cover system, the landfill management company or earthwork contractor will grade the side slopes of the waste area to meet the design requirements.

The cover materials will come from excavated soils from previous waste cell construction projects or from onsite borrow sources. The cover materials will be placed on the area requiring cover, graded, and compacted to meet the requirements of the construction documents and the facility CQA Plan. After installation of the cover soils, the vegetative cover will be established.



STANDARD FINAL COVER DESIGN



ALTERNATE FINAL COVER DESIGN

NOTE:  
MATERIALS SHALL BE  
INSTALLED IN ACCORDANCE  
WITH FACILITY CQA PLAN.

SCALE: 3/4"=1'-0"

Figure 2.1. Final cover options.

Cover system installation activities will include:

- The installation and testing of the infiltration layer of the cover system in accordance with the facility CQA Plan;
- The installation of the protective cover layer and erosion layer;
- The establishment of vegetation over completed areas; and,
- The development of a certification report by a registered professional engineer which will include a summary of all construction activities, a description of installed items and materials used, an “as-built” plan, and a summary statement signed and sealed by the certifying professional.

Soil borrow areas will be managed with best management practices (BMPs) during its active operation. The area will be closed with maximum slopes of 33.3% (three horizontal to one vertical) and re-vegetated with a good stand of grass.

#### **2.4.1 Construction Quality Assurance**

Construction of the final cover system is outlined in the facility CQA Plan. It describes the steps necessary for closure construction activities of the CCR Landfill at any point during its active life in accordance with the final cover design requirements.

In accordance with the CQA Plan, all cover system construction activities will be monitored and documented to assure that the system complies with the permit requirements. The certification document of the construction activities will be placed in the facility operating record and website when completed.

#### **2.4.2 Erosion Control Measures**

Upon conclusion of the final cover system construction activities, erosion control measures such as check dams, straw wattles, silt fences, or erosion control matting will be installed in areas where excessive erosion may occur such as side slopes, discharge locations of stormwater structures and drainage channels. These devices will be periodically monitored and maintained until a good stand of vegetation has been established in the construction area.

## **2.5 Maximum Inventory of CCR in Landfill Facility**

The estimated maximum inventory of CCR in the Landfill facility is 1,425,100 cy when the active CCR units (Cells 1 and 3) have been filled to the maximum disposal capacity as shown on Figure 2.2. This volume includes CCR placed in the landfill prior to October 19, 2015.

## **2.6 Largest Area Requiring Closure**

The largest area of the CCR Landfill requiring a final cover at any time during the active life is under current conditions when Cells 1 and 3 must be closed, which is approximately 29.1 acres in area. Figure 2.2 presents the proposed plan for closure, including stormwater control facilities, for Cells 1 and 3.

## **2.7 Closure Schedule**

Closure of the CCR Landfill will generally begin within 30 days following the final receipt of waste; or, if the landfill has remaining capacity and there is a reasonable likelihood that it will receive additional wastes or the CCR may be removed for beneficial use, no later than two years after the most recent receipt of waste as allowed by §257.102(f)(2). An estimated schedule for completing all activities necessary for closure of the largest estimated area (29.1 acres) is presented in Table 2.1. Closure of the landfill will be completed no later than six months following the beginning of closure activities. In accordance with §257.102(f)(2)(ii)(C), PPSC may extend the closure timeframe multiple times, in one-year extensions. No more than a total of two one-year extensions may be allowed.

For each extension, PPSC must substantiate the circumstances for the need of the extension(s) in accordance with §257.102(f)(2)(i) and place a the demonstration and a statement in the facility operating record and website.

In accordance with §257.102(g), whenever closure activities are initiated at the Landfill, PPSC will place a notification in the facility operating record and website that closure activities will be performed. The notification must include the certification by an Arkansas-registered professional engineer for the design of the cover system.



Table 2.1. Estimated closure schedule for largest landfill area open (Cells 1 and 3).

Closure Activity/Tasks	Number of Days to Complete
Perform grading of waste	30
Install final cover system	90
Grade soil borrow areas and prepare for seeding	10
Seed and mulch	10
Installation of erosion and sediment control structures	20
<b>Estimated Total Time to Complete Closure</b>	<b>160</b>

## 2.8 Closure Certification

In accordance with §257.102(h), within 30 days of completion of the closure activities, PPSC will place a notification in the facility operating record and website that the closure activities have been completed. The notification must include the certification by an Arkansas-registered professional engineer, verifying that closure has been completed in accordance with closure construction documents.

## 2.9 Deed Restriction

In accordance with §257.102(i), following placement of final cover over the entire landfill, PPSC will record a notation on the deed to the property. The notation on the deed must inform any potential purchaser of the property of the following:

- The past use of the land was used as a CCR unit, and
- Its use is restricted under the post-closure care requirements as provided by §257.104(d)(1)(iii).

Within 30 days of completing the deed restriction, PPSC will record a notification in the facility operating record and website that the deed restriction has been recorded.

## **2.10 Amendment of the Closure Plan**

In accordance with §257.102(b)(3), PPSC may amend this closure plan at any time.

Specifically, PPSC must amend the written closure plan whenever:

1. There is a change in the operation of the CCR unit that would substantially affect the written closure plan in effect; or
2. After closure activities have commenced, unanticipated events necessitate a revision of the written closure plan.

The closure plan must be amended at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise the plan. If the plan is revised after closure activities have commenced for a CCR unit, the owner or operator must amend the written closure plan no later than 30 days following the triggering event.

PPSC will obtain a written certification from a qualified professional engineer that the initial and any amendment of the written closure plan meets the requirements of §257.102(b)(3). The amended plan and certification will be placed in the facility operating record and website. Any amendments will be logged in the Plan Amendment page at the front of this document.

# **APPENDIX A**

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## **Definitions**

## DEFINITIONS

The following definitions are from §257.53 of the CCR Rule and used in this Plan:

***Active Life or In Operation:*** the period of operation beginning with the initial placement of CCR in the CCR unit and ending at completion of closure activities in accordance with §257.102.

***Active portion:*** that part of the CCR unit that has received or is receiving CCR or non-CCR waste and that has not completed closure in accordance with §257.102.

***Coal Combustion Residuals (CCR):*** fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers.

***CCR Landfill:*** an area of land or land excavation that receives CCR and which is not a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground or surface coal mine, or a cave. It also includes sand and gravel pits and quarries that receive CCR, CCR piles, and any practice that does not meet the definition of a beneficial use of CCR.

***CCR Unit:*** any CCR landfill, CCR surface impoundment, or lateral expansion of a CCR unit, or a combination of more than one of these units based on the context of the paragraph(s) in which it is used. This term includes both new and existing units, unless otherwise specified.

***Closed Unit or Landfill:*** placement of CCR in a CCR unit has ceased, and the owner or operator has completed closure of the CCR unit in accordance with § 257.102 and has initiated post-closure care in accordance with § 257.104.

***Existing CCR Landfill:*** a CCR Landfill that receives CCR both before and after October 15, 2015, or for which construction commenced prior to October 14, 2015 and receives CCR on or after October 14, 2015. A CCR landfill has commenced construction if the owner or operator has obtained the federal, state, and local approvals or permits necessary to begin physical construction and a continuous onsite physical construction program had begun prior to October 14, 2015.

***Hydraulic Conductivity:*** the rate at which water can move through a permeable medium (i.e., the coefficient of permeability).

***Lateral Expansion:*** a horizontal expansion of the waste boundaries of an existing CCR landfill or existing CCR surface impoundment made after October 14, 2015.

***New CCR Landfill:*** a CCR landfill or lateral expansion of a CCR landfill that first receives CCR or commences construction after October 14, 2015. A CCR landfill has commenced construction if the owner or operator has obtained the federal, state, and local approvals or

permits necessary to begin physical construction and a continuous onsite physical construction program had begun after to October 14, 2015.

***Operator:*** the person(s) responsible for the overall operation of a CCR unit.

***Qualified Professional Engineer:*** an individual who is licensed by a state as a Professional Engineer to practice one or more disciplines of engineering and who is qualified by education, technical knowledge and experience to make the specific technical certifications required under this subpart. Professional engineers making these certifications must be currently licensed in the state where the CCR unit(s) is located.

***Recognized and Generally Accepted Good Engineering Practices:*** engineering maintenance or operation activities based on established codes, widely accepted standards, published technical reports, or a practice widely recommended throughout the industry. Such practices generally detail approved ways to perform specific engineering, inspection, or mechanical integrity activities.

***Run-Off:*** any rainwater, leachate, or other liquid that drains over land from any part of a CCR landfill or lateral expansion of a CCR landfill.

***Run-On:*** any rainwater, leachate, or other liquid that drains over land onto any part of a CCR landfill or lateral expansion of a CCR landfill.

***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.