



**CCR CLOSURE PLAN
Sibley CCR Landfill
Sibley Generating Station**

**33200 East Johnson Rd.
Sibley, MO 64088**

KCP&L Greater Missouri Operations Company

October 14, 2016

TABLE OF CONTENTS

SECTION 1 BACKGROUND	1
1.1 Facility Information	1
1.2 Regulatory Requirements	1
SECTION 2 CLOSURE DESCRIPTION	5
2.1 Closure Description	5
2.1.1 Description	5
2.1.2 Construction Methods and Procedures	5
2.2 Area and Volume Estimates	6
2.3 Closure Schedule	6
2.3.1 Commencement of Closure	6
2.3.2 Closure Schedule	8
SECTION 3 Closure performance standards	9
3.1 Liquid Infiltration Control	9
3.2 Liquid Impoundment Control	9
3.3 Slope Stability	9
3.4 Minimization of Maintenance	9
3.5 Minimization of the Closure Period	9
SECTION 4 Cover Design	10
4.1 Permeability and Infiltration	10
4.2 Erosion Layer	11
4.3 Accommodation of Settling and Subsidence	11
SECTION 5 AMENDMENT OF CCR CLOSURE PLAN	12
SECTION 6 ENGINEERING CERTIFICATION	13

**SIBLEY GENERATING STATION
 CCR LANDFILL
 CCR CLOSURE PLAN
 REVISION HISTORY**

Revision Number	Revision Date	Section Revised	Summary of Revisions

Revisions are accomplished in accordance with Section 5.

SECTION 1

BACKGROUND

The purpose of this CCR Closure Plan (Plan) is to identify and describe the measures needed to close the Sibley Generating Station (Sibley) CCR landfill consistent with recognized and generally accepted good engineering practices and in accordance with the Coal Combustion Residuals Rule (CCR Rule). The following sections provide background information on the facility and related regulatory requirements.

1.1 Facility Information

Name of Facility: Sibley Generating Station

Name of CCR Unit: CCR Landfill

Name of Operator Kansas City Power & Light Company (KCP&L)

Facility Mailing Address: 33200 East Johnson Rd., Sibley, MO 64088

Location: East of and adjacent to Sibley, Missouri.

Facility Description: The Sibley Generating Station consists of three coal-fired units. CCR produced at the facility include fly ash, bottom ash as slag, and economizer ash. CCR is either shipped off-site for beneficial use or transported to the landfill from the Fly Ash Impoundment, the Fly Ash Silo, or Slag Settling Impoundment for disposal. Related landfill facilities include a groundwater monitoring system, storm water and leachate management systems, and haul/access roads.

1.2 Regulatory Requirements

This plan has been developed for the Sibley Generating Station CCR Landfill in accordance with 40 CFR 257.102 (b). The CCR Rule requires preparation of a Closure Plan for all existing CCR landfills and surface impoundments in operation as of October 19, 2015, the effective date of the CCR Rule.

The owner or operator of a CCR unit must prepare a written closure plan that includes, at a minimum, the information specified in 40 CFR 257.102 (b) (1) (i) through (vi). These items and the section of this plan responsive to each follows:

40 CFR 257.102 (b) Written Closure Plan

(1) Content of the Plan

- (i) Narrative description of how the CCR unit will be closed in accordance with 40 CFR 257.102 (Section 2.1).
- (ii) If closure of the CCR unit will be accomplished through removal of CCR from the CCR unit, a description of the procedures to remove the CCR and decontaminate the CCR unit in accordance with 40 CFR 257.102 (c). This section is not applicable since the unit will be closed in place (N/A).
- (iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system and methods and procedures used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in 40 CFR 102 (d) (Section 2.1).
- (iv) Estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit (Section 2.2).
- (v) Estimate of the largest area of the CCR unit ever requiring a final cover (Section 2.2).
- (vi) Schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR unit will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR unit, including major milestones and the estimated timeframes to complete each step or phase of CCR unit closure (Section 2.3).

40 CFR 257.102 (b) (1) (iii) requires, when a CCR unit closure is accomplished in place, that the plan describe how the performance standards specified in 40 CFR 102 (d) will be achieved:

40 CFR 257.102 (d) (1)

- (i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere (Section 3.1).
- (ii) Preclude the probability of future impoundment of water, sediment, or slurry (Section 3.2).

- (iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period (Section 3.3).
- (iv) Minimize the need for further maintenance of the CCR unit (Section 3.4).
- (v) Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices. (Section 3.5)

40 CFR 257.102 (d) (2) – Drainage and Stabilization of CCR Surface Impoundments (not applicable for landfill units)

- (i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residue (N/A).
- (ii) Remaining wastes must be stabilized sufficiently to support the final cover system (N/A).

40 CFR 257.102 (d) (3) A final cover system must be installed to minimize infiltration and erosion, and at minimum, meets the requirements of (d) (3) (i) (A) through (D) below, or the requirements of an alternative final cover system (Section 4).

- (A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less. (Section 4.1)
- (B) The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material. (Section 4.1)
- (C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth. (Section 4.2)
- (D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence. (Section 4.3)

Selected definitions from the CCR Rule are provided below.

Closed means 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.

CCR (coal combustion residuals) means 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 means an area of land or an 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. For purposes of this subpart, a CCR landfill 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 means 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.

Qualified Professional Engineer means 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.

SECTION 2

CLOSURE DESCRIPTION

This Plan describes the steps needed to close the Sibley CCR Landfill at any point during the active life of the unit in accordance with the CCR Rule and recognized and generally accepted good engineering practices. This Plan does not apply to areas in where final cover has been constructed prior to October 19, 2015. Plan items required under the CCR Rule described in this section fall into the general categories of Closure Description, Area and Volume Estimates, and Closure Schedule. This initial or any subsequent Plan may be amended pursuant to 40 CFR 257.102 (b) (3) at any time as discussed in Section 5. The current plan is to close the unit in place.

2.1 Closure Description

2.1.1 Description

The final cover system design and basis is described in Section 4, but in general includes two types of final cover. Over areas where the baseliner is constructed with a composite liner system containing a flexible membrane liner (FML), the cover will include: 1) a minimum 40-mil linear low-density polyethylene (LLDPE) FML; 2) a geocomposite drainage layer (optional); 3) an infiltration layer consisting of a minimum of 18" of earthen material; and 4) an erosion layer consisting of a minimum of 6" of earthen material capable of sustaining native plant growth. Over areas with a compacted earthen base liner system, the cover design includes: 1) an infiltration layer consisting of a minimum of 18" of earthen material; and 2) an erosion layer consisting of a minimum of 6" of earthen material capable of sustaining native plant growth.

The final cover slopes are designed with a maximum slope of 33%, a minimum slope of 10%, and will be graded to convey stormwater runoff to benches to convey the surface water to six drainage letdowns for removal from the landfill cover system.

2.1.2 Construction Methods and Procedures

CCR material and/or earthen material will be added and graded to achieve final design subgrade slopes and grades using appropriate earthmoving equipment. In the event closure is required before the landfill is filled to capacity, the unit will be brought to grade using CCR material and/or earthen material to achieve revised design grades. The FML (over areas with a composite base liner) and overlying geocomposite drainage

layer (optional) will be installed in direct contact with a subgrade of earthen and/or CCR material. For all areas, the infiltration layer will be placed and graded in approximate 6” compacted layers using earthmoving equipment. Soil will be tested during construction to meet moisture, density, and permeability requirements. Elevations will be surveyed on a 100-ft grid before after construction of the 18” infiltration and 6” erosion layers. The surface of preceding compacted layers will be scarified before the next layer is constructed. Earthen material will then be placed over the infiltration layer to create a minimum 6” erosion layer that will be capable of sustaining native plant growth. The final cover surface will be fertilized, mulched, and seeded to achieve a healthy stand of grass. A discussion of how this system meets the performance standards of 40 CFR 257.102 (d) is provided in Section 3.

2.2 Area and Volume Estimates

The maximum inventory of CCR ever planned on-site over the active life of the CCR existing unit is approximately 2.3 million cubic yards. The largest area of the unit that may ever require final cover at any time during the unit’s active life is estimated to be approximately 15 acres.

2.3 Closure Schedule

The size of area and time of year closure construction takes place will vary, therefore closure construction schedules will vary. The schedule provided in this section is therefore a general estimation.

2.3.1 Commencement of Closure

Commencement of final closure has occurred if placement of waste in the landfill has ceased and any of the following actions or activities has been completed (40 CFR 102 (e) (3)):

- (i) Steps necessary to implement this closure plan;
- (ii) Submittal of a completed application for any required state or agency permit or permit modification; or
- (iii) Steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure.

There are three regulatory timeframes within which a unit may be required to close:

- (i) In accordance with 40 CFR 257.102 (e) (1), a landfill has 30 days after the date the unit receives the *known* final receipt of waste, either CCR or non-CCR waste stream; or removes the *known* final volume of CCR from the CCR unit for the purpose of beneficial use of CCR.
- (ii) In accordance with 40 CFR 257.102 (e) (2), for idled units with additional capacity that expect to resume CCR or non-CCR waste disposal operations, or CCR removal operations for beneficial use, closure must be initiated within two years unless a written demonstration prepared in accordance with 40 CFR 257.102 (e) (2) (ii) is placed in the unit's operating record, which would provide an additional two year extension(s).
- (iii) If a landfill is required to close due to technical siting criteria (i.e. location in an unstable area), closure must be initiated within six months.

Extensions to complete the closure activity may be allowed under 40 CFR 257.102 (f) (2).

2.3.2 Closure Schedule

The milestones and the associated timeframes in this section are initial estimates. Some of the activities associated with the milestones will overlap.

Estimated Closure Schedule

Written Closure Plan	October 17, 2016
Notification of Intent to Close Placed in Operating Record	No later than the date closure of the CCR unit is initiated. Closure will commence per applicable timeframes in 40 CFR 257.102 (e). ¹
Initiation of Closure / Coordinating with and obtaining necessary approvals and permits from other agencies	Month 0 - 1
Mobilization	Month 1 - 3
Installation of the final cover system	Month 1 – 6
Month all closure activities for the CCR unit will be completed	Month 3 – 6 ²

Notes

1. Initiation of Closure may be extended for multiple two year periods in accordance with 40 CFR 257.102 (e) (2) (ii) and (iii).
2. Final closure of CCR landfills must be completed within six months of commencing closure unless a demonstration is placed in the operating record document (40 CFR 257.102 (f) (2)).

SECTION 3

CLOSURE PERFORMANCE STANDARDS

3.1 Liquid Infiltration Control

Post-closure infiltration of liquids is minimized by use of sideslopes coupled with a surface water management system and a constructed infiltration barrier. The top surface of the landfill is designed with a minimum slope of 10% and sideslopes of 33% to enhance runoff. The infiltration layer includes a 40-mil LLDPE FML and an optional geocomposite drainage layer over areas constructed with a composite base liner; and 18-inches of earthen material. The earthen material will be installed with a design maximum permeability of: 1×10^{-5} cm/sec over areas constructed with a composite base liner; and 2.8×10^{-6} cm/sec over areas constructed with a compacted earthen base liner.

3.2 Liquid Impoundment Control

The probability of future impoundment of liquids on the landfill is minimized by use of 10% top slopes and 33% sideslopes coupled with an engineered surface water removal system consisting of benches, ditches, and letdown channels designed with typical slopes of between 1% and 33%. Layered compaction of the underlying CCR material and infiltration layer will also minimize the likelihood of settlement resulting in ponding on the landfill surface. These design features preclude the probability of future impoundment of liquids on the landfill.

3.3 Slope Stability

The final cover is designed with a minimum 10% slope, and a maximum of 33% slope. Drainage channels are designed with a minimum of 1% slope. Drainage channels are designed with grass, riprap, and geotextile where required to reduce the potential for erosion. Geotechnical analyses determined the designed slopes and cover will meet the stability requirements to prevent sloughing or movement of the final cover system.

3.4 Minimization of Maintenance

The final cover will be graded, vegetated, and mowed to minimize erosion and maintenance.

3.5 Minimization of the Closure Period

Final closure is estimated to be completed no later than six months after commencing final closure activities.

SECTION 4

COVER DESIGN

The Sibley CCR Landfill will utilize two cover designs developed in accordance with 40 CFR 257.102 (d) (3) (i). This design meets the criteria of 40 CFR 257.102 (d) (3) (i) (A) through (D).

4.1 Permeability and Infiltration

The final cover system for the Sibley CCR Landfill over areas constructed with a composite base liner is designed with:

1. A minimum 40-mil FML;
2. Geocomposite drainage layer (optional);
3. Minimum 18” of compacted earthen material with a maximum permeability of 1×10^{-5} cm/sec; and
4. Minimum 6” erosion layer capable of sustaining native plant growth.

The final cover system for the Sibley CCR Landfill over areas constructed with an earthen base liner is designed with:

1. Minimum 18” of compacted earthen material with a maximum permeability of 2.8×10^{-6} cm/sec; and
2. Minimum 6” erosion layer capable of sustaining native plant growth.

The composite base liner system of the Sibley CCR Landfill is designed, from the bottom up, with:

1. 24” compacted earthen material with a maximum permeability of 1×10^{-5} cm/sec;
2. 60-mil high density polyethylene (HDPE) FML;
3. Six-ounce non-woven geotextile (optional)
4. A 12-inch granular drainage layer; and
5. Six-ounce non-woven geotextile

The earthen base liner system of the Sibley CCR Landfill is designed, from the bottom up, with:

1. 24" compacted earthen material with a maximum permeability of 2.8×10^{-6} cm/sec;
2. Six inches of uncompacted filter rock; and
3. Geotextile.

The permeability of the final cover systems described above will be equal to or less than the permeability of the existing bottom liner systems.

4.2 Erosion Layer

The final cover will include a minimum 6" of an earthen erosion layer that is capable of sustaining native plant growth. Soil used in the erosion layer will be tested to determine if additional nutrients are required for establishing and sustaining vegetation. The erosion layer will be seeded and vegetated.

4.3 Accommodation of Settling and Subsidence

The final cover is designed with minimum slopes of 10%. Review of past topographic mapping indicates no measureable settlement to date at the landfill. Geotechnical calculations indicate maximum calculated settlement resulting from consolidation of the underlying soils for a completed landfill to result in a reduction in the effective slope of approximately 1.17%, which would not impact the performance of the landfill final cover and surface water management systems.

SECTION 5

AMENDMENT OF CCR CLOSURE PLAN

The initial or any subsequent written closure plan developed pursuant to 40 CFR 257.102 (b) (1) may be amended at any time.

The Plan must be amended whenever:

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

The written 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 an existing written closure plan. If a written closure plan is revised after closure activities have commenced for a CCR unit, the current closure plan must be amended no later than 30 days following the triggering event.

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) must be obtained.

Plan changes will be documented using the Revision History which prefaces this Plan. Substantial changes to this plan will be certified by a Qualified Professional Engineer.

SECTION 6

ENGINEERING CERTIFICATION

Pursuant to 40 CFR 257.102 (b) (4) and by means of this certification, I attest that:

- (i) I am a Qualified Professional Engineer licensed in the State of Missouri;
- (ii) I am familiar with the requirements of the CCR Rule (40 CFR 257);
- (iii) I, or my agent, have visited and examined the Sibley Generating Station landfill;
- (iv) I do hereby certify to the best of my knowledge, information, and belief that this Closure Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of the CCR Rule;
- (v) this CCR Closure Plan meets the requirements of 40 CFR 257.102 (b); and
- (vi) the pages certified herein include Pages i, ii, 1 through 12, altogether a total of 14 pages in a protected Adobe™ document.

Walter J. Martin, P.E.

Printed Name of Qualified Professional Engineer
1200 Main St, Kansas City, MO 64105, 816-556-2200

P.E. SEAL, STATE OF MISSOURI

