



Closure Plan Tecumseh Energy Center Industrial Landfill #322

Prepared for:

Evergy Kansas Central, Inc.

Tecumseh Energy Center

Tecumseh, Kansas

Prepared by:

APTIM Environmental & Infrastructure, LLC

Revision 0 - October 14, 2016

Revision 1 - March 4, 2021



TABLE OF CONTENTS

| | |
|---|-----------|
| 1.0 INTRODUCTION..... | 1 |
| 2.0 REGULATORY OVERVIEW OF CCR CLOSURE PLAN REQUIREMENTS..... | 2 |
| 3.0 TEC LANDFILL OVERVIEW | 4 |
| 3.1 LOCATION, TOPOGRAPHY, AND DESCRIPTION | 4 |
| 3.2 EXISTING SOLID WASTE REGULATORY PERMITS AND CONSENTS | 4 |
| 3.3 CCR MATERIAL GENERATION, RECYCLING, AND DISPOSAL..... | 4 |
| 3.4 MAXIMUM VOLUME ESTIMATE (§257.102(B)(1)(IV)) | 4 |
| 3.5 LARGEST AREA REQUIRING FINAL COVER (§257.102(B)(1)(V))..... | 5 |
| 4.0 CLOSURE PLAN (§257.102(B)(1)) | 6 |
| 4.1 NARRATIVE DESCRIPTION (§257.102(B)(1)(I))..... | 6 |
| 4.2 FINAL COVER AND SUBGRADE OVERVIEW (§257.102(B)(1)(III) AND §257.102(D)(3)(I)) | 6 |
| 4.2.1 Uppermost Final Cover Subgrade (Top of CCR) Surface | 6 |
| 4.2.2 Infiltration Layer | 7 |
| 4.2.3 Erosion Control Layer..... | 7 |
| 4.3 CONSTRUCTION METHODS AND PROCEDURES (§257.102(B)(1)(III) AND §257.102(D)(3)(I)) | 7 |
| 4.3.1 Stormwater Run-On and Run-Off Controls..... | 7 |
| 4.3.2 Stability | 7 |
| 5.0 CLOSURE PERFORMANCE STANDARDS (§257.102(D)(1)) | 8 |
| 5.1 MINIMIZATION OF LIQUID INFILTRATION INTO CCR MATERIAL MASS (§257.102(D)(1)(I)) | 8 |
| 5.2 PRECLUSION OF FUTURE IMPOUNDMENT OF WATER, SEDIMENT, OR SLURRY (§257.102(D)(1)(II)) | 8 |
| 5.3 MEASURES TO MAINTAIN SLOPE STABILITY (§257.102(D)(1)(III)) | 8 |
| 5.4 DESIGN TO MINIMIZE ONGOING MAINTENANCE (§257.102(D)(1)(IV))..... | 8 |
| 5.5 TIMELY COMPLETION - ENGINEERING GOOD PRACTICES (§257.102(D)(1)(V)) | 8 |
| 6.0 CLOSURE ACTIVITY SCHEDULE (§257.102(B)(1)(VI)) | 9 |
| 6.1 COMMENCEMENT OF CLOSURE | 9 |
| 6.2 CLOSURE SCHEDULE..... | 9 |
| 7.0 AMENDMENT OF CCR CLOSURE PLAN (§257.102(B)(1)) | 10 |
| 8.0 PROFESSIONAL ENGINEER CERTIFICATION (§257.102(B)(4))..... | 11 |

LIST OF TABLES

Table 1 – Estimated Closure Schedule



Plan Review/Amendment Log §257.102(b)(3)

| Date of Review | Reviewer Name | Amendment Required (YES/NO) | Sections Amended and Reason |
|--|---|-----------------------------|---|
| October 14, 2016 (original version) | APTIM Environmental & Infrastructure, LLC | N/A | Original |
| March 4, 2021 (Revision 1) | APTIM Environmental & Infrastructure, LLC | YES | <p>Revised company name, removed regulatory requirements cross-reference table, updated regulatory references, clarified closure acreages, in-place volume, removed geomembrane cover option; added CCR types, updated closure schedule; and various revisions for better alignment with other Evergy closure plans.</p> <p>Note that no triggering event has necessitated this revision.</p> |
| | | | |
| | | | |



1.0 INTRODUCTION

APTIM Environmental and Infrastructure, LLC (APTIM) has revised the following Closure Plan (Plan) at the request of Evergy Kansas Central, Inc. (Evergy) for the Industrial Landfill No. 322 (Landfill) located at the Tecumseh Energy Center (TEC) in Tecumseh, Kansas. TEC is a closed coal-fired generating station that consisted of two operational coal-fired electric generating units owned and operated by Evergy.

The Landfill has been deemed to be a regulated coal combustion residuals (CCR) unit under the United States Environmental Protection Agency (USEPA) Disposal of Coal Combustion Residuals from Electric utilities Final Rule (CCR Rule) 40 CFR §257 and §261. Evergy is in the process of completing in-place closure of the Landfill in accordance with §257.102(d).

This Plan details the closure requirements outlined in §257.102(b) for CCR units closed in place. The criteria for conducting the closure or retrofit of CCR units for the Landfill are detailed in Section 2.0. Additionally, this Plan details the necessary steps to close the Landfill based on recognized and good engineering practices.



2.0 REGULATORY OVERVIEW OF CCR CLOSURE PLAN REQUIREMENTS

On April 17, 2015, USEPA published the CCR Rule under Subtitle D of the Resource Conservation and Recovery Act (RCRA) as 40 CFR Part §257 and §261. The purpose of the CCR Rule is to regulate the management of CCR in regulated CCR units for landfill and surface impoundments. The Landfill has been deemed to be a regulated CCR unit at TEC.

Section 257.102(b) of the CCR Rule requires owners or operators of CCR landfills and surface impoundments to prepare a Plan describing the closure of the unit and schedule for implementation of the Plan. The following citations from the CCR Rule are applicable for the Landfill as discussed in this Plan:

§257.102(b)(1) stipulates:

(b) Written closure plan – (1) Content of the plan. The owner or operator of a CCR unit must prepare 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. The written closure plan must include, at a minimum, the information specified in paragraphs (b)(1)(i) through (vi) of this section

- (i) A narrative description that discusses how the CCR unit will be closed in accordance with this section. (See Section 4.1)*
- (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 paragraph (c) of this section. (N/A)*
- (iii) If closure of the CCR unit will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with paragraph (d) of this section, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in paragraph (d) of this section. (Sections 4.2, 4.3, and 5.0)*
- (iv) An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit. (See Section 3.4)*
- (v) An estimate of the largest area of the CCR unit ever requiring a final cover as required by paragraph (d) of this section at any time during the CCR unit's active life. (Section 3.5)*
- (vi) A 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 identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR unit closure. When preparing the written closure plan, if the owner or operator of a CCR unit estimates that the time required to complete closure will exceed the timeframes specified in paragraph (f)(1) of this section, the written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under paragraph (f)(2) of this section. (See Section 6.0)*



Moreover, the final cover system has been planned in accordance with the following requirements of §257.102(d)(3), which stipulates:

“If a CCR unit is closed by leaving CCR in place the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraphs (d)(3)(i) of this section, or the requirements of the alternative final cover system specified in paragraph (d)(3)(ii) of this section.

- (i) *The final cover system must be designed and constructed to meet the criteria in paragraphs (d)(3)(i)(A) through (D) of this section. The design of the final cover system must include the written closure plan required by paragraph (b) of this section.*
 - (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 permeability no greater than 1×10^{-5} cm/sec, whichever is less. (Section 4.2)*
 - (B) *The infiltration of liquids through the CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material. (Section 4.2)*
 - (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 4.2.3)*
 - (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)*

An outline of the closure performance standards for closure of units where CCR material will be left in place is described in §257.102(d)(1), which stipulates:

“The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner than will:

- (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 5.1)*
- (ii) *Precludes the probability of future impoundment of water, sediment, or slurry; (Section 5.2)*
- (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 5.3)*
- (iv) *Minimize the need for further maintenance of the CCR unit; and (Section 5.4)*
- (v) *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.” (Section 5.5)*

A written certification is provided in Section 8.0 from a qualified professional engineer in the State of Kansas, to certify that this Plan meets the requirements of the CCR Rule.



3.0 TEC LANDFILL OVERVIEW

3.1 Location, Topography, and Description

Bottom ash, economizer ash and fly ash (CCR material) were disposed within TEC's Landfill. The closure of the Landfill will be accomplished by leaving the CCR material in place. The following Plan was developed to satisfy the CCR Rule requirements for in-place closure per §257.102(b)(1)(iii).

The permitted Landfill footprint is approximately 32.3 acres, most of which was used for CCR material disposal and management. The Landfill has been filled in three separate phases: Phase 1 through Phase 3. Final cover was constructed over approximately 7.5 acres of Phase 2 prior to promulgation of the CCR Rule. Some areas permitted for CCR waste disposal did not receive waste (approximately 1.4 acres). The remaining area, approximately 23.4 acres, will receive a CCR Rule-compliant final cover.

Topography varies across the Landfill in approximate elevations ranging from approximately 927 feet mean sea level (ft. MSL) to 961 ft MSL. Once final cover is complete the Landfill will be graded to have positive drainage from the plateau to perimeter berms. Side slopes will be no more than approximately 3H:1V and drain into drainage channels along the toe of the Landfill. The drainage channels direct the flow to an outfall pipe located along the northern boundary of the Landfill.

3.2 Existing Solid Waste Regulatory Permits and Consents

Evergy was previously granted an Industrial Landfill Permit (Permit No. 0322) at TEC by the Kansas Department of Health and Environment – Bureau of Waste Management (KDHE-BWM), in accordance with Kansas Statutes Annotated (KSA) 65-3407. KDHE modified the solid waste permit, per K.A.R. 28-29-6a, in response to the CCR Rule to include all on-site CCR waste materials management units as disposal areas under the existing solid waste permit for TEC. The current Industrial Landfill Permit modification was approved on October 15, 2015.

3.3 CCR Material Generation, Recycling, and Disposal

CCR materials generated at TEC were transported from both the Bottom Ash Settling Area and energy center and hauled to the on-site Landfill for disposal. CCR material recycling rates have varied annually.

3.4 Maximum Volume Estimate (§257.102(b)(1)(iv))

The Landfill is intended to be closed in 2021, therefore the maximum volume of CCR material ever in the unit is the current waste in place. Black & Veatch, Inc. completed volume calculations in November 2020 which estimated the CCR in place to be approximately 800,000 cubic yards. No additional CCR is intended to be placed in the Landfill.



3.5 Largest Area Requiring Final Cover (§257.102(b)(1)(v))

The total area of the Landfill requiring final cover is approximately 30.9 acres. A pre-CCR Rule final cover is in place over approximately 7.5 acres of Phase 2. The largest area of the unit requiring final cover at any time during the CCR unit's operating period is the remaining acreage, which is estimated to be approximately 23.4 acres.



4.0 CLOSURE PLAN (§257.102(b)(1))

This Plan has been prepared in accordance with requirements of the CCR Rule and includes a written certification in Section 8.0 from a qualified Professional Engineer for the State of Kansas.

4.1 Narrative Description (§257.102(b)(1)(i))

Closure of the Landfill will be accomplished by leaving the CCR material in place, and as required in accordance with Permit No. 0322 by KDHE. This method of closure has been designed and approved to minimize maintenance, leachate generation, and control run-on and run-off to ensure the protection of human health and the environment.

4.2 Final Cover and Subgrade Overview (§257.102(b)(1)(iii) and §257.102(d)(3)(i))

The final cover will be installed on top of a subgrade layer of compacted and graded soil or CCR material. The top slope of the final cover will be a minimum of approximately one-half percent or more, with a peak elevation of approximately 962 ft MSL. The exterior side slopes are constructed of clay at an approximate 3H:1V slope or less. The positive drainage will serve to minimize the potential for the infiltration of liquids into the waste material. The final cover will include the following, from bottom to top:

- 1) A minimum 18-inch infiltration layer consisting of compacted earthen material; and
- 2) A minimum 6-inch vegetated, erosion control layer consisting of earthen material capable of sustaining native plant growth.

The final cover system will meet the requirements of §257.102(d)(3)(i) and have a maximum permeability of 1×10^{-5} cm/sec. An alternate final cover may be used in lieu of the final cover system described above, and if used and will be in accordance with §257.102(d)(3)(ii). In the event that an alternate cover system is considered, the KDHE will be notified and appropriate permitting will be secured.

4.2.1 Uppermost Final Cover Subgrade (Top of CCR) Surface

CCR material and/or earthen material will be added and/or graded to achieve final design subgrade slopes and grades using appropriate earthmoving equipment. The final cover will be installed over a subgrade of CCR or soil material. The subgrade will be compacted, then graded with appropriate earthmoving equipment, and smoothed to ensure a uniform subgrade surface. After the grading and compaction of the subgrade, the area will be inspected to ensure the working surface is consistent with the design plans and allows for drainage.



4.2.2 Infiltration Layer

An 18-inch compacted soil infiltration will be installed to minimize infiltration of moisture through the final cover into the CCR material. The 18-inch soil infiltration layer will be compacted with a maximum permeability of 1×10^{-5} cm/sec. The soil infiltration layer will be constructed from soil obtained from either local or on-site borrow sources and will be free of large particles or debris, which is consistent with the design plans.

4.2.3 Erosion Control Layer

A 6-inch erosion control layer will be located above the infiltration layer and will be comprised of soils capable of sustaining native vegetation. After placement, the soil will be seeded to promote the establishment of a healthy stand of vegetation. The vegetation will assist in limiting the infiltration of surface waters and effects of erosion on the final cover.

4.3 Construction Methods and Procedures (§257.102(b)(1)(iii) and §257.102(d)(3)(i))

4.3.1 Stormwater Run-On and Run-Off Controls

Stormwater at the Landfill will be managed, where needed, by gentle side slopes, perimeter drainage channels, top-slope channels or swales, and berms, which will prevent off-site migration of contact water. The final grades and relatively gentle slopes will be constructed to properly convey stormwater away from the Landfill. Non-contact stormwater run-off will flow into the perimeter drainage channels. The perimeter drainage channels convey stormwater along the east and west borders and away from the Landfill.

4.3.2 Stability

Minimal CCR material consolidation is anticipated due to the physical characteristics of the fly ash, economizer ash, and bottom ash material deposited, the CCR material compaction during placement and because most settlement will have occurred shortly after placement. Stability issues are not expected for this unit.



5.0 CLOSURE PERFORMANCE STANDARDS (§257.102(d)(1))

5.1 Minimization of Liquid Infiltration into CCR Material Mass (§257.102(d)(1)(i))

As detailed above, the final cover system for the Landfill will include an infiltration layer consisting of compacted soils with a maximum permeability of 1×10^{-5} cm/sec and an erosion control layer. The compacted soils will help to minimize the potential infiltration of water into the CCR material.

The final cover system will assist in enhancing run-off and evapotranspiration and will minimize the contact between the surface water and the CCR material. This will minimize the infiltration of water as required by the performance standards.

5.2 Preclusion of Future Impoundment of Water, Sediment, or Slurry (§257.102(d)(1)(ii))

The closure design of the Pond includes graded slopes and designed surface water features to control run-off and run-on, which precludes the future impoundment of water or sediment or slurry. Therefore, the closure design is in compliance with the required performance standard.

5.3 Measures to Maintain Slope Stability (§257.102(d)(1)(iii))

Run-off is collected and controlled in erodible areas, such as the side slopes and top slope, in order to maintain slope stability of the final cover. The run-off controls and designed slopes will prevent erosion, movement, and sloughing of the final cover system. Final cover stability will also be maintained by limiting unit access to the public. The primary material disposed in this unit is fly ash, economizer ash and bottom ash, so little to no settlement is expected. Therefore, the closure design is in compliance with the required performance standard.

5.4 Design to Minimize Ongoing Maintenance (§257.102(d)(1)(iv))

The incorporation of slope stability and erosion control measures will minimize the need for on-going maintenance on the Landfill final cover. The design will minimize the requirement for larger maintenance of the Landfill cover. Therefore, the closure design is in compliance with the required performance standard.

5.5 Timely Completion - Engineering Good Practices (§257.102(d)(1)(v))

Although this is a large project, the design as reviewed by APTIM should allow completion of the final cover construction within six months of commencing final closure activities. Therefore, the design is in compliance with the required performance standard. Closure extensions are allowed if necessary, per 40 CFR 257.102(f)(2).



6.0 CLOSURE ACTIVITY SCHEDULE (§257.102(b)(1)(vi))

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.

6.1 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 257.102(e)(3)):

- (i) Steps necessary to implement this 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.

6.2 Closure Schedule

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

Table 1: Estimated Closure Schedule

| | |
|--|-------------------------------|
| Written Closure Plan | October 14, 2016 |
| Notification of Intent to Close Placed in Operating Record | October 30, 2020 ¹ |
| Initiation of Closure / Coordinating with and obtaining necessary approvals and permits from other agencies | October 30, 2020 |
| Mobilization | Month 1 - 3 |
| Installation of Final Cover System | Month 1 - 6 |
| Year all closure activities for the CCR unit will be completed | April 30, 2021 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)). | |



7.0 AMENDMENT OF CCR CLOSURE PLAN (§257.102(b)(1))

The owner or operator may amend the initial or any subsequent written Plan developed pursuant to §257.102(b)(1) at any time.

The written 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 Plan. If a written Plan is revised after closure activities have commenced for a CCR unit, the current written 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 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.



8.0 PROFESSIONAL ENGINEER CERTIFICATION (§257.102(b)(4))

The undersigned registered professional engineer is familiar with the requirements of CCR Rule requirements of §257.102 of the CCR Rule and has visited and examined TEC or has supervised examination of TEC by appropriately qualified personnel. The undersigned registered professional engineer attests that this Closure Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and meets the requirements of §257.102, and that this Plan is adequate for TEC's facility. This certification was prepared as required by §257.102(b)(4).

Name of Professional Engineer: Richard Southorn

Company: APTIM

Professional Engineer Seal:

