



NRG Texas Power LLC
Limestone Generating Station, Units 1 & 2

CCR Landfill Closure Plan

Prepared by



55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000
www.sargentlundy.com

S&L Project No. 12661-053

Rev. 0
Issue Date: October 7, 2016
Issue Purpose: Use

1 INTRODUCTION AND PURPOSE

Federal CCR Rule Reference: 40 CFR 257.102(b)

Pursuant to 40 CFR 257.102(b), this document serves as the written closure plan for the existing coal combustion residual (CCR) landfill, Unit 004 Landfill, at NRG Texas Power LLC's (NRG) Limestone Generating Station. NRG intends to close the landfill in compliance with the requirements of 40 CFR 257.102(d), by leaving the CCR in place and installing a final cover system.

2 CLOSURE PLAN NARRATIVE DESCRIPTION

Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(i) and 257.102(d)(1)

As disposal areas within the landfill reach capacity, the stored CCR is graded to designed contours, and a protective final cover system is incrementally installed to minimize infiltration and prevent storm water contact with the CCR. Materials for the final cover system are placed and compacted so as to limit erosion, settling, subsidence, and future maintenance, and to maintain positive drainage. As portions of the final cover system are installed, soil properties, compaction, permeability, and thickness testing are performed to confirm compliance with the closure plan and federal and state regulations in effect at the time. Eventually, the entire landfill will be encapsulated with a low permeability final cover system as described in Section 3 of this closure plan.

At the time this closure plan was prepared, NRG has installed the final cover system over areas that have reached their design capacities in the western portion of the landfill. Soil properties, compaction, and thickness testing of the cover material were performed during installation. Prior to final closure of the landfill, these previously installed portions of the final cover system will be tested for compliance with requirements in effect at the time of closure.

3 FINAL COVER SYSTEM DESCRIPTION

Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(iii) and 257.102(d)(1)

Pursuant to the closure performance standards prescribed in 40 CFR 257.102(d)(1), the final cover system for Unit 004 Landfill will:

1. Minimize the post-closure infiltration of liquid into the CCR,
2. Minimize the risk of release of CCR or contaminated run-off to the ground or surface waters, or to the atmosphere,
3. Preclude the probability of future impoundment of water, sediment, or slurry,
4. Provide major slope stability to prevent sloughing of the final cover system during the post-closure care period,
5. Minimize future maintenance, and
6. Allow closure activities to be completed as quickly as practical consistent with recognized and good engineering practices.

3.1 ESTABLISH GRADE AND SUPPORT FOR FINAL COVER SYSTEM

Federal CCR Rule Reference: 257.102(d)(1)(ii), 257.102(d)(1)(iii) & 257.102(d)(3)(i)(D)

To accomplish the closure goals promulgated by the Federal CCR Rule, the upper surface of the stored CCR, or possibly general fill if sufficient quantities of CCR are not available, will be graded to form a mounded profile. The top of the mound will be graded from a high point or ridge with 2 to 5 percent slope outward. At the crest of the side slopes, a perimeter drainage swale will be constructed to intercept storm water and minimize flow from the upper area to the side slopes. These drainage swales will be directed to armored downcomers. The side slopes of the mound are designed to have approximate slopes of 4H:1V. These established slopes have been designed to be stable from a global geotechnical basis. The slopes have also been designed to accommodate settling and subsidence while maintaining this positive drainage strategy.

3.2 INFILTRATION LAYER

Federal CCR Rule Reference: 257.102(d)(1)(i), 257.102(d)(3)(i)(A), & 257.102(d)(3)(i)(B)

Using the Federal CCR Rule nomenclature, an infiltration layer, consisting of compacted low permeability clay material, will be placed on top of the graded CCR to minimize infiltration of liquids through the closed CCR unit. Specifically, the infiltration layer for the side slopes of the landfill will consist of a minimum 3 feet of compacted clay material, while all other areas of the landfill will receive of a minimum 2 feet of compacted clay material. Each clay layer will have a permeability no greater than 1×10^{-7} cm/sec to match the permeability of the in-place bottom liner system.

3.3 EROSION LAYER

Federal CCR Rule Reference: 257.102(d)(3)(i)(C)

Continuing with the Federal CCR Rule nomenclature, an erosion layer, consisting of topsoil capable of sustaining native plant growth, will be provided above the infiltration layer to minimize erosion of the final cover system. Specifically, the erosion layer for the side slopes of the landfill will consist of a minimum 18 inches of topsoil, while all other areas of the landfill will receive a minimum 6 inches of topsoil. The entire surface of the final cover system for the closed landfill will be seeded with native vegetation, and regular maintenance of the seeding will take place until a vegetative cover is established and self-sustaining. The storm water run-off management strategy described in Section 3.1 further minimizes erosion of the final cover system.

4 ESTIMATED MAXIMUM INVENTORY OF CCR

Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(iv)

As of October 2016, approximately 29.5 million cubic yards of CCR had been disposed within the landfill. It is estimated that the landfill may store approximately 50 million cubic yards of CCR prior to the landfill reaching design capacity.



5 ESTIMATED COVER SURFACE AREA

Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(v)

The final cover system required to close Unit 004 Landfill is estimated to encapsulate an area of approximately 400 acres. Approximately 190 acres of the final cover system was installed as of October, 2016. NRG will continue to incrementally cover areas of the landfill as these areas reach capacity. It is estimated that the largest surface area that may require cover at any point in time in the remaining life of the landfill is approximately 100 acres.

6 CLOSURE SCHEDULE

Federal CCR Rule Reference: 40 CFR 257.102(b)(1)(vi)

Table 1 provides a listing of major milestones necessary to close the landfill with an estimated duration and an estimated year of completion for each milestone. NRG estimates that all closure activities for the CCR landfill will be complete by the year 2030.

Table 1: Planning Level Schedule for Closure of the Existing CCR Landfill

| Task Description | Estimated Duration | Estimated Completion Year |
|--|--------------------|---------------------------|
| Place Closure Plan into Station's Operating Record | 1 Day | 2016 |
| Send Notification of the Availability of the Closure Plan to the Texas Commission of Environmental Quality (TCEQ) & Post Closure Plan to NRG's CCR Website | 1 Month | 2016 |
| Deposit CCR Waste Material in Landfill Until Disposal Capacity is Reached | Ongoing | 2030 |
| Final Grading of CCR Material to Designed Slopes and Contours | Ongoing | 2030 |
| Place Final Cover System as Areas Reach Capacity | Ongoing | 2030 |
| Place Notification of Intent to Close into Station's Operating Record | 1 Month | 2030 |
| Certification of Completion of Closure by a Qualified Professional Engineer | 1 Month | 2030 |
| Place Notification of Landfill Closure Completion into Station's Operating Record | 1 Month | 2030 |
| Send Notification of Completion of Closure to the TCEQ & Post Notification of Completion of Closure to NRG's CCR Website | 1 Month | 2030 |
| Record a Notation of CCR Landfill Closure on the Deed of the Property | 1 Month | 2030 |
| Place Notification of the Deed Notation into Station's Operating Record | 1 Month | 2030 |
| Send Notification of the Deed Notation to the TCEQ & Post Notification Recording a Notation on the Deed to NRG's CCR Website | 1 Month | 2030 |

7 AMENDMENTS TO CLOSURE PLAN

Federal CCR Rule Reference: 40 CFR 257.102(b)(3)

NRG will amend this plan prior to a change in the operation of the CCR landfill that would substantially affect the written closure plan in effect or after an unanticipated event necessitates a revision to the written closure plan. If this written closure plan is revised, NRG will retain a qualified professional engineer licensed in the State of Texas to provide written certification that amendments to this plan meet the requirements of 40 CFR 257.102(b).

8 COMPLETION OF CLOSURE ACTIVITIES

Federal CCR Rule Reference: 40 CFR 257.102(f)(3)

Upon completion of closure, NRG will obtain a certification from a qualified professional engineer licensed in the State of Texas verifying that Unit 004 Landfill has been closed in accordance with the closure plan in effect at the time of closure.

9 CERTIFICATIONS

Federal CCR Rule Reference: 40 CFR 257.102(b)(4)

This document meets the requirements for a written closure plan pursuant to 40 CFR 257.102(b).

Federal CCR Rule Reference: 40 CFR 257.102(d)(3)(iii)

The proposed final cover system as described herein meets the design requirements pursuant to 40 CFR 257.102(d)(3).

I certify that this document was prepared by me or under my supervision and that I am a registered professional engineer under the laws of the State of Texas.

This document is released for use under the authority of James H. Staehlin, Texas PE # 87527 on October 7, 2016. Sargent & Lundy LLC Texas Registered Engineering Firm # F-2202.

Certified by:

JAMES H. STAEHLIN

Date:

10-7-2016

Seal:

