
CLOSURE AND POST-CLOSURE CARE PLAN

**JOHN TWITTY ENERGY CENTER
UTILITY WASTE LANDFILL**

CITY UTILITIES OF SPRINGFIELD, MISSOURI

INITIAL PREPARATION DATE: October 14, 2016

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1. CERTIFICATION PAGE

In accordance with 40 CFR 257.102(b)(4) and 257.104(d)(4), the undersigned certifies that the Closure and Post-Closure Care Plans contained in this document meet the applicable requirements of 40 CFR Part 257. This certification is based on information, drawings, data, reports, calculations, visual observations, and other documents reviewed by me personally, or individuals under my direct supervision, and includes documents prepared personally by me, or individuals under my direct supervision.

Seal

Name:

Ted C. Salveter

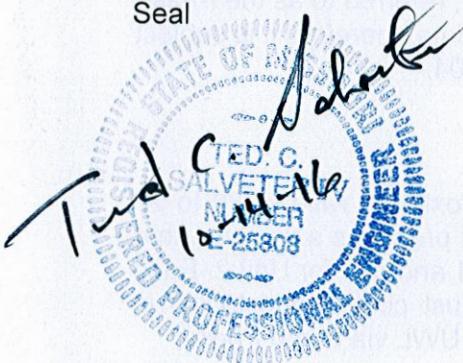
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Registration Number:

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Date:

10/14/16



2. INTRODUCTION

2.1 Plan Objective

This Closure and Post-Closure Care plan has been prepared in accordance with the closure and post-closure requirements found at 40 CFR 257.102(b) and 257.104(d). It is not the intent of this document to address those closure and post-closure requirements under Missouri Department of Natural Resource (MDNR) regulations that are also applicable to the UWL.

2.2 Facility Description

City Utilities of Springfield (CU) owns and operates a Utility Waste Landfill (UWL) at the John Twitty Energy Center (JTEC) located at the southwest boundary of the City of Springfield in Greene County, Missouri. The JTEC operates two coal-fired steam electric generating units that produce coal combustion residuals (CCR). Unit 1, original to the plant, began operation in 1976. Unit 2 became commercially operational in 2011.

The UWL is permitted (Permit No. 707702) through the Missouri Department of Natural Resources (MDNR) to receive CCR from the combustion of coal at the JTEC. The UWL fill footprint totals approximately 40 acres. Pursuant to Permit 707702, the filling of UWL has progressed in two separate phases. The northern section, defined as Phase I Area, has been filled to capacity, and has received final cover (approximately 12.5 acres) in accordance with the MDNR permit. Closure of the Phase I area was completed about 1990, well ahead of the October 19, 2015 date in the “existing CCR landfill” definition found at 257.53. Therefore, for the purpose of this plan, it is assumed that the closed Phase I Area is not regulated under 40 CFR 257 as an “existing CCR landfill.” The remainder of the landfill footprint, referred to as the Phase II Area, has received CCR both before and after the October 19, 2015 date, therefore it is subject to the closure/post-closure care standards found at 257.102 and 257.104.

Current Waste Generation

The combustion of coal produces fly ash and bottom ash at an approximate ratio of 80 to 20 percent, respectively. Since 1995, low-sulfur coal has been utilized that produces a fly ash with a high calcium content. Fly ash is collected dry in two silos, one for Unit 1 and one for Unit 2. Each silo uses equipment that mixes and slightly moistens the ash for dust control and to aid in compaction at the landfill. The conditioned fly ash is transported to the UWL via dump trucks.

In early 2015, the plant began sluicing bottom ash from Unit 1 to a new closed-loop concrete basin south of the plant. This replaced the previous practice of sluicing Unit 1 bottom ash to the temporary ash holding ponds south of the plant. The new closed-cycle sluice system returns water to the Unit 1 wet-bottom for sluicing reuse. Unit 2 bottom ash is handled via a submerged flight conveyor enclosed tank system which transfers the bottom ash directly to dump trucks destined for the UWL.

Clean closure of the two on-site inactive surface impoundments began in August 2016 and is essentially complete. Approximately 68,000 cubic yards of CCR resulting from pond closure has been placed in the UWL.

Historic Waste Generation

From about 1976 through 1995 high sulfur coal was burned in Unit 1. During this period a wet scrubber was operated to remove sulfur dioxide and other acid gases and fine particulates from the flue gases. This process generated scrubber sludge (primarily calcium sulfate) which was partially dried via a vacuum filtration system. Using a pug mill, the resulting scrubber sludge, still very wet, was mixed with dry fly ash. This material, still relatively high in moisture and having the consistency of a thick sludge, was transported to the landfill in dump trucks.

During this same period, Unit 1 bottom ash was sluiced to the two ash holding ponds south of the plant. Periodically, every five to seven years, a pond was dewatered and the ash moved to the landfill. The overall resulting waste placed in the UWL yielded a fly ash to scrubber sludge to bottom ash ratio of approximately 50:35:15 percent. This material is present in the north end of the landfill and is referred to as the Phase I fill area. The footprint of the Phase I fill area closely aligns with the 12.5 acre footprint that has received final cover.

3. CLOSURE PLAN

In accordance with 40 CFR 257.102(b)(1)(i) through (vi), this UWL closure plan provides the following:

- Description of closure;
- Description of final cover system;
- Maximum CCR inventory;
- Maximum area of final cover;
- Closure schedule, notifications, certifications, and deed notations;
- Closure plan amendment.

3.1 Description of Closure

In accordance with 40 CFR 257.102(b)(1)(i), this section provides a narrative description of how the UWL will be permanently closed. The JTEC UWL is a monolithic fill. In 1982 filling began at the north end of the landfill footprint and has proceeded south into the Phase II area. Final cover is periodically placed on the sides and top of the fill when lateral and vertical permitted fill limits are reached. As of this writing approximately 12.5 acres of the total 40 acres have received final cover. This practice of incremental application of final cover will continue until the landfill has been filled to capacity. The leachate collection system will be constructed prior to placing fill within the limits of the storm water detention pond. This will entail dewatering and cleaning of the storm water pond to ready the pond bottom for leachate collection system installation. As filling over the leachate collection system progresses, the outer embankments will be raised to ensure that adequate storage capacity exists for a 25-year, 24-hour storm event.

3.2 Description of Final Cover System

In accordance with 40 CFR 257.102(b)(1)(iii) a description of the final cover system must be included, along with the methods and procedures to be used to install the final cover. This section also discusses how the final cover system will achieve the performance standards given in 257.102(d).

Phase I Fill Area Cover System

This section provides a description of the Phase I Area final cover system, even though, as discussed in Section 2.2, the closed Phase I fill area is not subject to 257.102 requirements. The original UWL permit received from MDNR in 1980 specified that the thickness of the final cover must be a minimum of 18-inches. This was comprised of the silty clay soils existing within the upper two to three feet of the landfill footprint. Soils from the Phase I Area (the northern section of landfill (approximately 12.5 acres) that has received final cover) were stripped and used to construct perimeter berms and the Phase I storm water collection pond at the south end of the Phase I fill area. As filling progressed from north to south, these soils were used to construct the final cover over the compacted fly ash/scrubber and bottom ash fill. Because the stripped soils used to construct the final cover are essentially equivalent in classification to the natural subsoils of the landfill, the criteria specified in 257.102(d)(3)(i)(A) is achieved.

Although the final cover system installed over the Phase I fill area does not meet the specific criteria listed in 40 CFR 257.102(d)(3)(i)(B) and (C), it does adequately function to minimize the infiltration of liquids into the compacted ash fill. When compacted, fly ash/bottom ash exhibits a permeability in the range of 10^{-5} cm/sec or less, therefore infiltration is minimized if the ash surface is adequately sloped to shed precipitation. The scrubber sludge component of the fill serves to further reduce the effective hydraulic conductivity. The width, side slopes and landfill crown (top) slope aid in minimizing infiltration. The Phase I fill area width is narrow with side slopes approaching 3:1. The crown (top) is also relatively narrow with a slope of near two percent.

In 2010, geotechnical borings were completed in the Phase I fill area with samples being obtained through the entire 55-foot fill thickness. All samples were described as “moist” with the overall average moisture content approaching 40 percent. These moisture levels are indicative of the initial moisture present in the fill (primarily the thick scrubber sludge/fly ash mix) at the time of placement. There were no indications that there was any infiltration of liquids capable of generating leachate or causing potential slope stability concerns. No free moisture or phreatic zones were detected in the borings.

The Phase I final cover has functioned as an effective erosion control layer, more than capable of sustaining a perennial grass cover as evidenced by the near 30 years that the cover has been present. The UWL will be monitored for erosion pursuant to state and federal regulations, therefore the risk detrimental erosion is further reduced.

Phase II Fill Area Cover System

In 2012, MDNR Permit 707702 was modified. The final cover system design was changed to more closely align with current MDNR regulations. Permit 707702 now requires that the final cover system for the UWL consists of a minimum six-inch vegetative soil layer capable of sustaining vegetative growth overlaying a minimum 12-inch soil layer consisting of cohesive soils (classified as CH, CL, ML, SC, or MH under the Unified Soil Classification System) compacted to achieve a permeability less than or equal to 1×10^{-5} cm/sec. All clay used to construct the cover shall be free from brush, stumps, logs, roots, and other organic matter subject to decay, deleterious material, and rocks larger than four (4) inches in diameter. The sides of the landfill final cover system will have a slope of three horizontal to one vertical, and the top of the landfill final cover system will be sloped a minimum of one (1) percent. The vegetative layer will be fertilized, seeded and mulched to achieve a healthy stand of grass.

Since Permit 707702 was modified, no final cover has been applied to the Phase II area. To align with CCR requirements of 257.102(d)(3)(i)(B), the minimum thickness of compacted clay infiltration layer will be increased from 12-inches to 18-inches for the remaining 27.5 acres yet to receive final cover.

3.3 Maximum CCR Inventory

As required by 257.102(b)(1)(iv), an estimate of the future maximum inventory of CCR ever on-site over the active life of the UWL is provided herein. With clean closure of the inactive surface impoundments essentially complete, the maximum future on-site CCR inventory consists of:

Unit 1 bottom ash concrete storage basin:	700 cubic yards
Unit 1 fly ash silo:	850 cubic yards
Unit 2 fly ash silo:	2600 cubic yards
Unit 2 bottom ash submerged flight conveyor system:	20 cubic yards

3.4 Maximum Area of Final Cover

As required by 257.102(b)(1)(v), an estimate of the largest area of the UWL ever requiring final cover during the UWL's active life is provided herein. The current footprint of the open UWL, currently approximately 27.5 acres, represents the largest area requiring final cover. Approximately 12.5 acres of the entire landfill footprint has already received final cover.

3.5 Closure Schedule, Notifications, Certifications, and Deed Notations

There is no defined schedule for permanent closure of the UWL. The UWL has available valuable permitted capacity to receive additional CCR. Commencement of the closure activities described herein is contingent upon future CCR generation by the plant. Future utilization of these materials for beneficial uses will also impact the landfill closure schedule.

As of the most recent topographic survey (November 2015), the JTEC utility waste landfill had 1,459,000 cubic yards of material in place and 1,391,000 cubic yards of landfill capacity remaining. Since the 2015 survey, it is estimated that an additional 70,000 to 90,000 cubic yards of CCR have been placed in the UWL.

In accordance with 257.102(e), closure activities will commence within 30 days following the known final receipt of CCR, or the known final removal of CCR for beneficial uses. In accordance with 257.102(f), closure will be completed within six months of commencing closure activities.

In accordance with 257.102(g), no later than the date closure is initiated, CU will prepare a notification of the intent to close the UWL. The notification will include a certification by a qualified professional engineer for the design of final cover system as required by 257.102(d)(3)(iii). The notification will be placed in the facility's operating record in accordance with 257.105.

Upon completion of closure, a qualified professional engineer will certify that closure has been completed in accordance with the requirements of this closure plan. This will be made part of the facility's operating record.

257.102(i)(1) requires that the property deed contain a notation that the land has been used as a UWL and that post-closure use is restricted. In accordance with MDNR regulations, a deed

notification for the JTEC UWL has already been executed and recorded with Greene County. This meets the requirements of 257.102(i)(1)-(2).

3.6 Closure Plan Amendment

In accordance with 257.102(b)(3), City Utilities will amend the Closure Plan whenever:

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

The plan will be amended at least 60 days prior to a planned change in the operation of the UWL, or no later than 60 days after an unanticipated event requires the need for a revision. City Utilities will obtain a written certification from a qualified professional engineer that the initial and any amendment of the plan meets the applicable requirements of 257.102.

4. POST-CLOSURE CARE PLAN

This Post-Closure Care Plan addresses the post-closure care requirements stipulated in 257.104(d)(1)(i) through (iii). The following are addressed in turn:

- Monitoring and maintenance activities
- Facility contact information
- Post-closure period property uses
- Plan amendment

4.1 Monitoring and Maintenance Activities

City Utilities will conduct post-closure care for the UWL for a minimum of 30 years. These activities will consist of maintaining integrity of final cover system and maintaining/monitoring the groundwater monitoring system. The JTEC UWL is equipped with a leachate collection and removal system that must also be maintained and operated in accordance with Permit 707702.

Final Cover System

The final cover system will be monitored and maintained through-out the post-closure care period. Repairs will be made as necessary to correct the effects of settlement, subsidence, erosion (from run-on or run-off), or other events. Regular monthly visual inspections of the final cover system, coupled with additional inspections following severe rainfall events will be made. To facilitate visual inspections, the UWL will be mowed as needed. Deficiencies will be noted and promptly corrected. Inspection activities will be documented and maintained with the facility operating record in accordance with 257.105. At a minimum, inspections will focus on:

- Storm water conveyance structures (ditches, swales) for signs of erosion or obstructions
- Removal of deep-rooted trees and shrubs
- Damage from burrowing animals
- Erosion of, or slumps in the final cover system
- Bare areas in vegetation on slopes and crown
- Excessive settlement of landfill crown that precludes drainage (no ponding of water)
- Access control fencing, gates and locks

Groundwater Monitoring System

A groundwater monitoring system is being developed in accordance with the requirements of 257.90 through 257.98, and applicable MDNR regulations. Groundwater monitoring will be conducted in accordance with the JTEC UWL Groundwater Sampling and Analysis Plan, which will be certified by a qualified professional engineer. As part of the regularly scheduled UWL inspections, the monitoring wells (caps, locks, bollards, etc.) will be inspected for damage.

Leachate Collection and Removal System

During post-closure, the leachate collection and removal system will be operated and maintained in accordance with MDNR Permit 707702. Following closure of the UWL, leachate generation should quickly dissipate. Leachate will continue to be managed in accordance with applicable NPDES and Solid Waste permits until DNR is satisfied that the landfill has ceased to generate leachate. The leachate collection system will be maintained and operated in accordance with the requirements of 10 CSR 80-11.010(9)(C). Records will be maintained that show the quantity of leachate removed and the method(s) of leachate treatment and disposal. Regular and episodic (following extended rainfall events) inspections of the system will include monitoring of the leachate level in the collection tanks and inspecting the leachate tanks for leaks.

4.2 Facility Contact Information

The position listed below is responsible for ensuring that the activities of the Post-Closure Care Plan are conducted:

Position:	Director – Power Generation
Address:	301 E. Central Springfield MO 65802
Telephone No.:	417-863-9000
Email:	info@cityutilities.net

4.3 Post-closure Period Property Uses

There are no planned post-closure uses of the UWL property. No activities will be allowed that may jeopardize the integrity of the cover system. Access to the area will be restricted to plant personnel only. Unauthorized personnel are restricted from entry to the area.

4.4 Post-Closure Care Plan Amendment

In accordance with 257.104(d)(3), City Utilities will amend the Post-Closure Care Plan whenever:

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

The plan will be amended at least 60 days prior to a planned change in the operation of the UWL, or no later than 60 days after an unanticipated event requires the need for a revision. City Utilities will obtain a written certification from a qualified professional engineer that the initial and any amendment of the plan meets the applicable requirements of 257.104.