

# Coal Combustion Residuals Landfill Closure and Post-Closure Plans

GenOn Northeast Management Company  
Keystone Station Disposal Site (#300837)  
Shelocta, Pennsylvania

GAI Project Number: C151611.01, Task 002  
October 2016



Prepared by: GAI Consultants, Inc.  
Murrysville Office  
4200 Triangle Lane  
Export, Pennsylvania 15632-1358

Prepared for: GenOn Northeast Management Company  
121 Champion Way, Suite 300  
Canonsburg, Pennsylvania 15317

# Coal Combustion Residuals Landfill Closure and Post-Closure Plans

GenOn Northeast Management Company  
Keystone Station Disposal Site (#300837)  
Shelocta, Pennsylvania

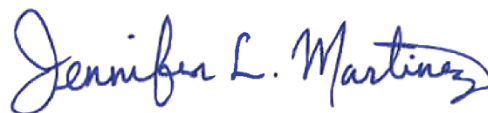
GAI Project Number: C151611.01, Task 002

October 2016

Prepared for:  
GenOn Northeast Management Company  
121 Champion Way, Suite 300  
Canonsburg, Pennsylvania, 15317

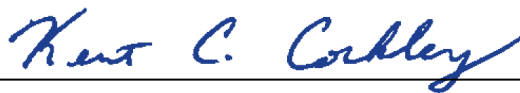
Prepared by:  
GAI Consultants, Inc.  
Murrysville Office  
4200 Triangle Lane  
Export, Pennsylvania 15632-1358

Report Authors:



---

Jennifer L. Martinez, EIT  
Senior Engineer-in-Training



---

Kent C. Cockley, PE  
Director, Engineering


# Table of Contents

Professional Engineer's Certification .....	ii
1.0 Introduction .....	1
2.0 Closure Plan .....	1
2.1 Closure Plan Overview .....	1
2.2 Closure Plan Narrative .....	2
2.3 Final Cover System .....	3
2.3.1 Cover Components .....	3
2.3.2 Site Preparation .....	3
2.3.3 Infiltration Layer Installation .....	3
2.3.4 Stormwater Run-on/Run-off Controls Installation .....	3
2.3.5 Erosion Layer Installation .....	3
2.3.6 Final Seeding .....	3
2.4 Information Elements .....	4
2.4.1 CCR Material Estimates .....	4
2.4.2 Drainage Description .....	4
2.5 Closure Schedule .....	4
3.0 Post-Closure Plan .....	5
3.1 CCR Post-Closure Plan Overview .....	5
3.2 Post-Closure Plan Narrative .....	5
3.3 Monitoring and Maintenance Activities .....	6
3.3.1 Final Cover Surface .....	6
3.3.2 Stormwater Drainage Features .....	6
3.3.3 Fencing and Gates .....	6
3.3.4 Groundwater Monitoring System .....	6
3.3.5 Additional Site Specific Features .....	7
3.4 Site Contact Information .....	7
3.5 Proposed Post-Closure Property Use .....	7
3.6 Plan Amendment .....	7
4.0 References .....	8

## Professional Engineer's Certification

The Closure and Post-Closure Plans for the Keystone Station Disposal Site were prepared by GAI Consultants, Inc. (GAI). The Plans were based on certain information that, other than for information GAI originally prepared, GAI has relied on but not independently verified. Therefore, this Professional Engineer's Certification is limited to the information available to GAI at the time the Plans were written. On the basis of and subject to the foregoing, it is my professional opinion as a Professional Engineer licensed in the Commonwealth of Pennsylvania, that the Plans have been prepared in accordance with good and accepted engineering practices as exercised by other engineers practicing in the same discipline(s), under similar circumstances and at the time and in the same locale. It is my professional opinion that the Plans were prepared consistent with the requirements of Sections 257.102 and 257.104 of the United States Environmental Protection Agency's "Disposal of Coal Combustion Residuals from Electric Utilities," published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015.

The use of the words "certification" and/or "certify" in this document shall be interpreted and construed as a Statement of Professional Opinion and is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion.

  
Kent C. Cockley, P.E.  
Engineering Director / Senior Associate



## 1.0 Introduction

The Keystone Generating Station is a steam electric generating station located along Crooked Creek in Plumcreek Township, Shelocta, Pennsylvania (PA). The station is jointly owned by the utilities in the Keystone Owners Group, and operated by GenOn Northeast Management Company, a subsidiary of NRG Energy, Inc. The station consists of two 900-megawatt coal-fired units.

The current Keystone Station Disposal Site (disposal site) is permitted under PA Department of Environmental Protection (DEP) Solid Waste Permit No. 300837 and has been used for the disposal of Keystone Generating Station's Coal Combustion Residuals (CCR) and coal refuse since 1984. The CCR placed at the disposal site contains mostly bottom ash, fly ash, pyrites, and flue gas desulfurization by-products. The currently permitted site (233 acres) is a lined existing CCR landfill and is divided into four stages of the East Valley and West Valley of the site.

The facility's four contiguous stages are:

- ▶ Stage I of the East Valley (northern side) was constructed first and became operational in 1984 (approximately 48 acres soil covered);
- ▶ Stage II of the East Valley (southern side) is currently active and is being covered with soil. This completes the existing permitted development in the East Valley (approximately 77 acres);
- ▶ Stage III of the West Valley (northern side) is currently active (approximately 52 acres); and
- ▶ Stage IV of the West Valley (southern side) is permitted and under construction (approximately 56 acres).

## 2.0 Closure Plan

This CCR Closure Plan (CP) [§257.102(b)] sets forth the techniques that will be utilized to complete closure activities of the disposal site by placement of a final cover system (FCS) in accordance with §257.102(b)(1)(iii) and §257.102(d). This CP will be placed in the facility's operating record in accordance with §257.102(b)(2)(iii) by October 17, 2016.

This document was prepared in accordance with the United States Environmental Protection Agency's "Disposal of Coal Combustion Residuals from Electric Utilities" (CCR Rule).

### 2.1 Closure Plan Overview

The CP includes the following information:

- Narrative describing how the CCR unit will be closed in accordance with §257.102;
- Description of the FCS including a general description of the methods and procedures to install the FCS, and a description stating how the FCS will achieve the performance standards set forth by §257.102(d);
- Estimate of the maximum inventory of CCR ever on-site over the active life of the disposal site;
- Estimate of the largest area of the CCR unit ever requiring final cover at any time over the disposal site's active life;
- Schedule for completing all activities necessary to satisfy the closure criteria, including an estimate of the year in which all closure activities for the disposal site will be completed; and
- Written certification from a qualified professional engineer that the written CP meets the requirements of §257.102.

## 2.2 Closure Plan Narrative

During the active life of Stages I, II, III, and the permitted Stage IV area under construction, cover soil will be placed on an intermittent schedule. As each bench within a stage is completed, it will be covered with soil, seeded, fertilized, and mulched. Where the benches and slopes become part of the final disposal landfill configuration, they will be covered with two feet of cover soil. Where the benches and slopes will be buried by the succeeding stage development, these areas will be covered with one-foot of cover soil. The one-foot of cover soil will be removed and reused prior to burial by the succeeding stage. Cover soil removed will be used later for final cover and the underlying CCR regraded, if necessary, to promote positive drainage.

At final closure, all disposal site surfaces will have received two feet of soil cover and will be vegetated in accordance with the approved permit. Existing stormwater controls will be utilized to manage stormwater and for erosion and sediment control. Once the disposal site has been properly revegetated, the stormwater will be diverted as clean water to the existing diversion channels where it will be conveyed to the unnamed tributaries of Plum Creek and Crooked Creek.

At final closure, leachate flows from the West Valley will continue to flow by gravity to the existing station's industrial wastewater treatment (IWT) plant where the water will be treated prior to discharge to Crooked Creek. Leachate flows from the East Valley will continue to flow by gravity to the East Valley pumping station where the leachate will be pumped to the station IWT plant. The treated water will then discharge to Crooked Creek.

At station closure, the IWT will remain only for leachate management of the CCR units. If the station is still operational, the treated discharge water will continue to be recycled, used at the station as makeup water, or discharged to a National Pollutant Discharge Elimination System (NPDES) outfall. If the station is closed, the treated discharge water will be conveyed to an NPDES outfall.

The closure performance standards stated in §257.102(d) will be achieved in the following manner:

1. CCR material at the disposal site will be graded to promote positive drainage.
2. Closure will be accomplished by placing the FCS, consisting of erosion, soil layers, and textured geomembrane over the CCR surface to meet §257.102(d)(1)(i). The textured geomembrane will meet the infiltration layer requirement of the CCR Rule.
3. The soil layer will be graded to promote positive drainage and to preclude the probability of future impoundment of water, sediment, or slurry as required by §257.102(d)(1)(ii).
4. Stability of FCS will be promoted by the selection of the appropriate textured geomembrane and geosynthetic drainage layer on the final slope configuration for the landfill. The stability of the proposed geosynthetic products is expected to prevent sloughing or movement of the FCS during closure and post-closure care periods as required by §257.102(d)(1)(iii).
5. To the extent practical for a FCS, the proposed design of the FCS will minimize the need for further maintenance of the CCR unit as required by §257.102(d)(1)(iv).
6. Periodic inspection and maintenance of the FCS and stormwater management system will occur through the closure and post-closure care periods.

## 2.3 Final Cover System

This section provides a description of the proposed FCS components, site preparation, and installation.

### 2.3.1 Cover Components

The proposed FCS consists of the following (from the bottom layer to the top layer):

- ▶ An infiltration layer composed of a textured geomembrane with a geosynthetic drainage layer above;
- ▶ Two feet of cover soil (which includes 18 inches of soil and a six-inch erosion layer as stated in the CCR Rule and defined later in this plan); and
- ▶ Vegetation (mulch, fertilizer, and seed).

The proposed FCS is an alternate FCS as set forth in §257.102(d)(3)(ii).

### 2.3.2 Site Preparation

Site preparation will comply with applicable regulations. The cover soil and temporary vegetation covering the Stages I, II, III and future Stage IV areas (final landfill configuration) will be stripped. The topmost portion of the final landfill configuration will be regraded, if necessary, to provide positive drainage toward the drainage facilities. An infiltration layer composed of geosynthetic materials will be placed on top of the regraded surface. A textured geomembrane will first be placed as the low permeability layer. Next, a geosynthetic drainage layer will be placed above the textured geomembrane. Finally, two feet of cover soil (i.e. 18 inches of soil and a six-inch erosion layer) will be placed, then seeded, fertilized, and mulched.

### 2.3.3 Infiltration Layer Installation

An infiltration layer consisting of geosynthetic materials will be placed on the landfill. The geosynthetic layers to be used are identified in sub-section 2.3.1. They will be placed according to the manufacturer specifications. Prior to textured geomembrane placement, the CCR will be fine-graded and compacted.

### 2.3.4 Stormwater Run-on/Run-off Controls Installation

Erosion and Sedimentation Controls will be incorporated into the construction of the closure facilities. Once the disposal site has been properly revegetated, the stormwater will be diverted as clean water to the existing diversion channels where it will be conveyed to the unnamed tributaries of Plum Creek and Crooked Creek. The channels and erosion and sedimentation control facilities will be maintained and inspected on an annual basis and, if needed, repaired through the closure and post-closure periods.

### 2.3.5 Erosion Layer Installation

The erosion layer will be six inches of earthen material over 18 inches of cover soil. In steep slope areas, the erosion layer soil will be placed from the bottom of the slope and pushed upward. The erosion layer will support vegetation to stabilize the soil to reduce erosion during the post-closure period.

### 2.3.6 Final Seeding

A grass mix, suited for the PA climate, will be seeded onto the erosion layer.



## 2.4 Information Elements

This section provides a description of the maximum quantity of CCR material expected to be contained during landfill closure, an estimate of the largest area ever requiring a FCS, and a description of the drainage facilities.

### 2.4.1 CCR Material Estimates

The East Valley and West Valley of the Keystone Station Disposal Site will be developed in steps which represent convenient construction breaks. The maximum final cover area will occur when Stage IV reaches full capacity. At that time, the amount of cover material, geosynthetic drainage material, and textured geomembrane required will be at a maximum.

The maximum area to be capped will include the flat areas, outside slopes, and benches of Stages I, II, III, and IV. The flat area of the final configuration (slope less than 15 percent) will be approximately 59 acres. The outside slopes and benches will be approximately 174 acres. The total area to be capped and covered will be approximately 233 acres. The total permitted capacity of the disposal site is 49,926,000 cubic yards and the total remaining capacity is 22,256,458 cubic yards, as per the 2015 Residual Waste Landfill Annual Operation Report.

### 2.4.2 Drainage Description

The Stages I and II landfill embankments consist of 20-foot wide benches constructed every 15 vertical feet with 2H:1V side slopes. The Stages III and IV landfill embankments consist of 15-foot wide benches constructed every 25 vertical feet with 2.5H:1V side slopes. The limit of the 15-foot or 25-foot high face slopes between benches will constrain the drainage path lengths, thus minimizing erosion gulley development. The benches are sloped back into the landfill and are sloped longitudinally to drain towards slope drains and channels. The proposed geosynthetic drainage materials in the FCS will prevent saturation of the overlying vegetated cover soil.

The topmost portion of the landfill will be fine-graded to provide positive drainage towards drainage facilities. The overall top grade will be no less than three percent. The current and future run-on, run-off controls for the disposal site are detailed in a separate report, the CCR Run-on and Run-off Control System Plan.

## 2.5 Closure Schedule

The total area to be capped and covered will be approximately 233 acres. According to the 2015 Annual Operation Report for the Keystone Station Disposal Site (June 2016), final waste placement should occur at the end of 2031. The actual year of final waste placement in the landfill is dependent on the amount of power production and beneficial use of CCRs and may extend beyond 2031.

Under the CCR Rule, closure of the disposal site must be initiated within 30 days after the disposal site receives the final known volume of CCR [§257.102(e)(1)(i)]. The closure process is initiated by the state closure permit process and posting of a notification of intent to close the CCR facility. The notification must include a certification by a qualified professional engineer that the design of the FCS meets the requirements of §257.102(d) [§257.102(g)]. Closure is to be completed within six months [§257.102(f)(1)(i)].

The CCR Rule also allows owners of CCR units to request time extensions beyond the time specified in the CP. CCR landfills may extend the timeframe to complete closure of the CCR unit two times in one-year increments [§257.102(f)(2)(i) and §257.102(f)(2)(ii)(C)].



Assuming that the disposal site reaches near full capacity in December 2031 and it will take approximately eight years to place synthetic cap on 233 acres of Stages I, II, III, and IV areas, below is a suggested closure timeline to place the synthetic cap on 233 acres of Stage I, Stage II, Stage III, and Stage IV:

- December 2022 – Submit a major permit modification to the PADEP for the CP. This application must be submitted a minimum of 180 days prior to initiating closure activities.
- June 2023 – Begin placing FCS on Stages I, II, III, and IV areas that have reached final configuration.
- December 2031 – Final waste to be placed on disposal area. Initiate final closure. Commence final closure [§257.102(e)(1)] no later than 30 days after final placement of either CCR or any non-CCR waste stream.
- June 2032 – Finalize closure of disposal site. Closure should be finished within six months of initiating final closure. Modify CP if closure extensions are needed.

Once closure is complete, a professional engineer will verify and certify that closure has been completed in accordance with the CP [§257.102(f)(3)]. Within 30 days of completing closure, a notification of closure will be prepared including the professional engineer's certification of completion [§257.102(h)]. A notation must also be recorded on the deed to the property, or some other instrument that is normally examined during title search [§257.102(i)], to notify potential buyers that the land has been used as a CCR unit and its use is restricted under the post-closure care requirements as provided by §257.104(d)(1)(iii).

### 3.0 Post-Closure Plan

This CCR Post-Closure Plan (PCP) [§257.104(b) and (d)] sets forth the techniques that will be utilized to perform post-closure care activities at the Keystone Station Disposal Site. The purpose of this PCP document is to detail the post-closure care maintenance activities, which will be performed for a period of 30 years. This PCP will be placed in the facility's operating record by October 17, 2016.

#### 3.1 CCR Post-Closure Plan Overview

The PCP includes the following information according to §257.104(d)(1)(i through iii):

- Narrative of how the CCR unit will be maintained after closure;
- Description of the monitoring and maintenance activities including the frequency the activities would be performed;
- Name, address, and telephone number of the office to contact about the facility during the post-closure care period; and
- Description of the planned use of the property during the post-closure care period.

#### 3.2 Post-Closure Plan Narrative

The proposed maintenance and monitoring activities associated with post-closure include the following:

- Groundwater quality monitoring;
- Maintenance of the leachate collection system;
- Maintenance of FCS and vegetation;
- Maintenance of clean water diversion channels and culverts;
- Maintenance of access controls (fencing, gates, etc.); and
- Leachate treatment.

These activities are discussed in detail in the next section.

Repairs to the proposed FCS will be made, as necessary, to mitigate erosion or settlement of the erosion and infiltration soil layers. The FCS will be inspected at least annually for the 30 year post-closure period. Stormwater drainage features will be cleared of debris to maintain capacity, as needed. The groundwater monitoring system will be monitored for the full 30 years of post-closure.

### **3.3 Monitoring and Maintenance Activities**

Following closure of the CCR unit, the owner or operator will conduct post-closure care, which consists of at least the following:

- Maintaining the integrity and effectiveness of the FCS, including making repairs to the final cover as necessary to correct the effects of settlement, erosion, or other events, and preventing stormwater from eroding or otherwise damaging the final cover;
- Maintaining the integrity, effectiveness, and operation of the leachate collection and removal system; and
- Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of §257.90 through §257.98.

The owner or operator of the CCR unit must conduct post-closure care for 30 years.

As provided by paragraph (c)(2) of §257.104, if at the end of the post-closure care period the owner or operator of the CCR unit is operating under assessment monitoring in accordance with §257.95, the owner or operator must continue to conduct post-closure care until the owner or operator returns to detection monitoring in accordance with §257.95.

#### **3.3.1 Final Cover Surface**

The FCS will be inspected annually by a qualified person during the 30-year post-closure period. The surface of the landfill will be inspected for stressed vegetation, animal burrows, woody vegetation, and cracking in the soil cover which could indicate surface movement. Woody vegetation will be removed. The FCS will be repaired if any of the aforementioned conditions are observed.

#### **3.3.2 Stormwater Drainage Features**

Stormwater drainage channels and basins will be inspected as part of the annual inspections. The channels will be inspected for sign of siltation and vegetative growth which are inhibiting the functionality of the channel. Basins will be inspected for sign of siltation, which may be causing operational issues. The drainage features will be cleaned and repaired, if necessary, if any of the aforementioned conditions are observed.

#### **3.3.3 Fencing and Gates**

Perimeter fencing and gates will be inspected at least annually for signs of unauthorized entry, damage caused by tree growth or falling limbs/trees, broken or bent posts, and to verify functionality of any gates. Gates will remain locked at all times when the site is unattended to prevent unauthorized access to the site. Any damage to the access control features observed will be repaired.

#### **3.3.4 Groundwater Monitoring System**

Groundwater monitoring will be performed in accordance with the requirements of §257.90 through §257.98 for the duration of the post-closure period.

### **3.3.5 Additional Site Specific Features**

The station IWT plant will be maintained for as long as the site produces discharges that do not meet the NPDES discharge limits unless alternative treatment methods such as wetlands or other passive systems are approved and implemented.

Site roads will be inspected on an annual basis and, if needed, repaired to maintain access to site facilities.

## **3.4 Site Contact Information**

The name, address, and telephone number at which the operator can be reached during the post-closure period is provided below:

Environmental Specialist  
GenOn Northeast Management Company  
313 Keystone Drive  
Shelocta, Pennsylvania 15774  
724-354-5533

## **3.5 Proposed Post-Closure Property Use**

The closed site will be revegetated and will have the character of open land suitable as habitat for resident wildlife species. No specific post-closure land use is planned other than grassed open land. No adjacent land uses will be impacted by the project. The deed notation required under §257.102(i) will protect future uses of the property.

## **3.6 Plan Amendment**

The initial CP and PCP can be amended [§257.102(b)(3) and §257.104(d)(3), respectively] at any time, and must be amended whenever a change in operations substantially affects the written plan in effect. The CP must be amended at least 60 days prior to a planned change in operation, or no later than 60 days after an unanticipated event. In addition, if closure activities have commenced for the Keystone Station Disposal Site, then the initial written CP must be revised within 30 days of the event.

## 4.0 References

- Form 1R Attachments 1R-1 and 1R-2, Facility Plan, Keystone Station Ash Disposal Site; September 22, 2009.
- Form 12R Narrative, Operation Plan, Keystone Station Ash Disposal Site; July 30, 1999.
- Form 16R Attachments 16R-11 and 16R-18, Liner System – Phase II, Keystone Station Ash Disposal Site; August 1, 2002.
- Form 18R Narrative, Closure/Post-Closure Land Use Plan, Keystone Station Ash Disposal Site; June 15, 1998.
- Form H Narrative and Appendix 1, Revegetation, Keystone Station Ash Disposal Site; December 8, 1997.
- July 1996 Major Permit Modification Application, Residual Waste Permit 300876, Stage III – Keystone Station Ash Disposal Site. Revision 1: December 8, 1997, Revision 2: June 15, 1998, Revision 3: July 30, 1999, Revision 4: August 1, 2002, Revision 5: September 22, 2009.
- June 2016, 2015 Annual Operation Report, Keystone Generating Station.
- United States Environmental Protection Agency (USEPA) 40 CFR Parts 257 and 261 Hazardous and Solid Waste Management Disposal System; Disposal of Coal Combustion Residual from Electric Utilities, Final Rule April 2015.