



**Stantec Consulting Services Inc.**  
1409 North Forbes Road, Lexington KY 40511-2024

October 12, 2016  
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Revision 0

Tennessee Valley Authority  
1101 Market Street  
Chattanooga, Tennessee 37402

**RE: Closure and Post-Closure Plan  
Peninsula Disposal Area  
EPA Final Coal Combustion Residuals (CCR) Rule  
TVA Kingston Fossil Plant  
Roane County, Tennessee**

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## **1.0 PURPOSE**

This letter documents Stantec's certification of the EPA Final CCR Rule closure and post-closure plan for the TVA Kingston Fossil Plant's Peninsula Disposal Area.

## **2.0 CLOSURE AND POST-CLOSURE PLAN**

The closure plan describes the steps necessary to close the CCR unit at any time during the life of the unit, and is subject to the requirements described in 40 CFR 257.102(b). The post-closure plan describes the monitoring and maintenance activities to be performed during the post-closure period of the unit, and is subject to the requirements of 40 CFR 257.104(d).

The EPA Final CCR Rule closure and post-closure plan is conceptual and subject to change at any time. The attached closure and post-closure plan demonstrates compliance with the requirements set forth in 40 CFR 257.102(b) and 257.104(d).

## **3.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION**

I, Don W. Fuller II, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below;



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TVA Kingston Fossil Plant  
Roane County, Tennessee**

3. that the closure plan for the TVA Kingston Fossil Plant's Peninsula Disposal Area meets the requirements described in 40 CFR 257.102(b); and
4. that the post-closure plan for the TVA Kingston Fossil Plant's Peninsula Disposal Area meets the requirements of 40 CFR 257.104(d).

SIGNATURE

DATE

*10/12/2016*

ADDRESS:

Stantec Consulting Services Inc.  
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Lexington, Kentucky 40511-2024

TELEPHONE:

(859) 422-3000

ATTACHMENT: Closure and Post-Closure Plan



## **Closure and Post-Closure Plan**

Kingston Fossil Plant  
Peninsula Disposal Area  
Harriman, Tennessee



Prepared for:  
Tennessee Valley Authority  
Chattanooga, Tennessee

Prepared by:  
Stantec Consulting Services Inc.  
Lexington, Kentucky

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## CLOSURE AND POST-CLOSURE PLAN

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### 1.0 INTRODUCTION

This Coal Combustion Residuals (CCR) Rule closure and post-closure plan is conceptual and is subject to revision. It describes the CCR closure and post-closure activities at the TVA Kingston Fossil Plant to ensure that the Peninsula Disposal Area will be closed and maintained in accordance with the CCR closure and post-closure requirements of 40 CFR §§257.102 and 104, respectively. TVA has determined that the Peninsula Disposal Area is an existing CCR landfill and therefore subject to the EPA Final CCR Rule. The landfill has been operating under Tennessee Department of Environment and Conservation (TDEC) Permit No. IDL 73-0211. The information contained herein is consistent with the Closure and Post-Closure Plan for the Peninsula Disposal Area prepared by Geosyntec Consultants (February, 2014) that has been approved by TDEC under that permit. Necessary State approvals will be obtained prior to initiating closure of the landfill.

### 2.0 WRITTEN CLOSURE PLAN

**40 CFR 257.102(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 of how the CCR unit will be closed in accordance with this section.*
- (ii) *If closure of the CCR unit will be accomplished through the 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.*
- (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.*
- (iv) *An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR unit.*
- (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.*

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- (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 CRR 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 and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phase 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 extensions sought under paragraph (f)(2) of this section.*

### 2.1 CLOSURE ACTIVITIES

Based on conceptual plans and existing TDEC permit drawings, the Peninsula Disposal Area will be closed in place. Upon achieving the appropriate final grades for the waste, the final cover system will be installed in the following sequence:

Closure will initially begin by constructing the cap liner subgrade on the final grade of CCR placement as an intermediate cover using materials from the designated borrow source. For this installation, an on-site or off-site borrow source will be identified, and both field and laboratory tests will be performed to ensure that the properties of the soil material from the proposed borrow area satisfy material acceptance criteria.

A 40-mil thick-textured HDPE geomembrane barrier layer and double-sided geocomposite drainage layer will be installed on top of the compacted soil subgrade and tested as required by the manufacturer and/or specifications.

The protective cover soil layer will be installed on top of the double-sided geocomposite layer. To prevent damage to the underlying geosynthetic layers, the protective cover soil will be tracked in place using the tracks of a low ground pressure (LGP) bulldozer.

The vegetative soil cover will be installed on top of the protective cover soil layer. To aid in root development, this layer will be tracked in place. The surface of the cover will be seeded and/or vegetated, and fertilizer will be added as necessary to promote germination and growth.

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### 2.2 CLOSURE TYPE

#### 2.2.1 Closure in place

The current plan is for the CCR in the Peninsula Disposal Area to be left in place and to receive a final cap cover. The design of a final cover system and related closure elements will meet the CCR closure in-place performance standards described in Section 3.0.

#### 2.2.2 Closure by removal

**40 CFR 257.102(c).** *Closure by removal of CCR. An owner or operator may elect to close a CCR unit by removing and decontaminating all areas affected by releases from the CCR unit. CCR removal and decontamination of the CCR unit are complete when constituent concentrations throughout the CCR unit and any areas affected by releases from the CCR unit have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to §257.95(h) for constituents listed in appendix IV to this part.*

The conceptual process of closure allows for the possibility of closure by removal at the Peninsula Disposal Area in line with the aforementioned CCR closure by removal standards.

### 2.3 MAXIMUM CCR INVENTORY

The estimated maximum inventory of CCR ever on-site over the active life of the Peninsula Disposal Area is 10,828,000 cubic yards, based on data provided in the Closure and Post-Closure Plan for the Peninsula Site (Geosyntec Consultants, February 2014).

### 2.4 LARGEST AREA REQUIRING FINAL COVER

Based on the current closure and post-closure plan developed by Geosyntec Consultants, the estimated largest area of the Peninsula Disposal Area requiring a final cover during the active life of the CCR unit is approximately 95.7 acres.

### 2.5 SCHEDULE OF CLOSURE ACTIVITIES

The following closure schedule for completing the activities stipulated by 40 CFR 257.102 and the related completion timeframes are subject to change based on plant operations, regulatory permitting approvals, EPA Final CCR Rule standards, marketing, and any other factors. Table 1 provides the estimated schedule of closure activities.

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**Table 1. Estimated Schedule of Closure Activities**

	<b>Closure Activity</b>	<b>Start Date (day)</b>
1.	Coordinating with and obtaining necessary approvals and permits from regulatory agencies; provide notice of intent to close.	1
2.	Close landfill, and achieve final grade	61
3.	Installation of final cover	151
4.	Establish vegetative cover	241
5.	Completion of post-closure care period	30 years after final cover installed

### **2.6 ESTIMATED YEAR OF CLOSURE COMPLETION**

Based on information provided in the Closure and Post-Closure Plan for the Peninsula Site (Geosyntec Consultants, February 2014), the estimated year for completion of closure activities is between 2032 and 2039. The estimated year(s) of closure is subject to change based on plant operations, regulatory permitting approvals, EPA Final CCR Rule standards, marketing, and other factors.



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### 2.7 REQUEST FOR TIME EXTENSION

The EPA Final CCR Rule allows six months to complete the closure of a landfill or lateral expansion of a landfill upon commencing closure activities. However, if it is estimated that the time required to complete closure will exceed the regulatory timeframes, site-specific information, factors and considerations will be provided to support any time extensions.

### 3.0 CCR CLOSURE IN-PLACE PERFORMANCE STANDARDS

**40 CFR 257.102(d).** Closure performance standard when leaving CCR in place —

- (1) *The owner or operator of a CCR unit must ensure that, at a minimum, the CCR unit is closed in a manner that 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;*
  - (ii) *Preclude the probability of future impoundment of water, sediment, or slurry;*
  - (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;*
  - (iv) *Minimize the need for further maintenance of the CCR unit; and*
  - (v) *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.*

#### 3.1.1 Control of Infiltration and Releases

TVA will control post-closure infiltration into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere, through the design of a site grading plan, construction of an engineered cap system, and the establishment of a stormwater management system in accordance with accepted engineering practices. The cap system will be designed to limit the infiltration of precipitation into the unit according to acceptable, permeability compliance limits. The cap system will also act to cover, control, and prevent the release of CCR material from the unit, into surface waters and the atmosphere. The designed grading plan and stormwater management system promotes positive drainage and limits infiltration into the CCR materials. The cap cover will limit the exposure of CCR material to the atmosphere.

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The alternate cap system contains a 40-mil textured HDPE geomembrane with typical permeability values ranging from  $10^{-13}$  to  $10^{-14}$  cm/s, 12 inches of protective cover soil, and 12 inches of vegetative cover soil, the alternate cap is in compliance with the requirements of the EPA Final CCR Rule. The proposed final cover system on top of CCR material will consist of the following materials and thicknesses, as listed in order of construction (bottom to top):

- 12-inches compacted soil for liner subgrade
- 40-mil textured HDPE geomembrane
- Double-sided geocomposite drainage layer
- 12-inches protective cover soil
- 12-inches vegetative cover soil

Details for the geomembrane cap system are discussed in the following paragraphs. CCR materials will be placed and compacted in a manner to minimize settling and subsidence that could disrupt the integrity of the final cover system.

### **Compacted Soil and Geosynthetic Materials**

Twelve inches of compacted soil will underlie the 40-mil textured HDPE geomembrane, which in turn covers the Peninsula Disposal Area. The geocomposite drainage layer will be placed above the HDPE geomembrane, in order to drain surface water infiltrating through the initial soil layer.

### **Protective Cover Soil**

A 12-inch layer of protective cover soil will be placed over the geocomposite drainage layer. Soil balance estimates indicate that sufficient borrow materials will be available from on-site sources. Soils for the construction of the low-permeability soil component of the final cover system will be obtained from the designated on-site borrow area sources to the extent practical. Where on-site soil is insufficient in terms of quantity or quality, TVA may supplement on-site soil with off-site borrow materials.

### **Vegetative Cover**

A 12-inch vegetative cover layer will be established over the protective cover soil layer. The vegetative soil layer will be constructed using locally available soils from the KIF reservation, or from off-reservation sources provided the soil meets the requirements contained on the drawings and in the specifications. Following placement of the vegetative soil layer, the soil will be prepared and seeded using an appropriate mix outlined in the specifications. No nuisance or invasive species will be used as vegetative cover.

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### 3.1.2 Prevention of Future Impoundment of Water, Sediment, or Slurry

TVA will control the future impoundment of water or sediment at the Peninsula Disposal Area through the design and construction of a site grading plan and an engineered cap system, and the establishment of a stormwater management system in accordance with accepted engineering practices. The designed grading plan and stormwater management system will promote positive surface drainage on the site.

The final cover system promotes positive drainage and precipitation run-off by including a minimum 3 percent surface gradient. Benches will intercept surface water runoff from the cover slopes and convey the runoff to down drain pipes, which will convey the runoff to the perimeter drainage ditch located at the toe of the final cover system. The perimeter drainage ditch is sloped towards the south-west corner of the disposal area and will discharge to the existing three drop-inlets and three 48-in. diameter culverts under the perimeter access road conveying runoff to the stormwater pond. Drainage features have been designed to accommodate at least a 25-year, 24-hour storm event with greater than one foot of freeboard.

### 3.1.3 Slope Stability Measures

TVA will include measures that provide for acceptable veneer slope stability factors of safety against the sloughing or movement of the final cover system during the closure and post-closure period in accordance with accepted engineering practices. Erosion of soil material on the final cover system will be minimized through slope stabilization techniques. The final cover out slopes will not exceed 33 percent (i.e., 3 horizontal: 1 vertical) in inclination. Maintenance of vegetative cover during the construction and post-construction periods will further aid in the prevention of erosion and sloughing.

### 3.1.4 CCR Unit Maintenance

TVA will mitigate against the need for further maintenance of the CCR unit through compliance with post-closure care activities. Regularly scheduled inspections to evaluate post-closure conditions and to verify preventive maintenance activities of the unit will reduce the need for additional maintenance. Post-closure monitoring and maintenance activities are addressed in Section 4.0.

### 3.1.5 Completion of Closure

Closure will be completed in a timeframe consistent with recognized and generally accepted good engineering practices. A qualified professional engineer will verify that the final cover system is constructed in accordance with the EPA Final CCR Rule.

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## 3.2 DRAINAGE AND STABILIZATION OF SURFACE IMPOUNDMENTS

**40 CFR 257.102(d)(2).** *Drainage and stabilization of CCR surface impoundments.*

*The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of paragraphs (d)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (d)(3) of this section.*

- (i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.*
- (ii) Remaining wastes must be stabilized sufficient to support the final cover system.*

Since the unit is not a surface impoundment, it is not subject to the requirements of 40 CFR 257.102(d)(2). Therefore, this section is not applicable.

## 3.3 FINAL COVER SYSTEM DESIGN (OR ALTERNATIVE)

**40 CFR 257.102(d)(3).** *Final cover system. 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 paragraph (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 be included in 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 a permeability no greater than  $1 \times 10^{-5}$  cm/sec, whichever is less.*
  - (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.*
  - (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.*
  - (D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

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- (ii) *The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (f)(3)(ii)(A) through (D) of this section. The design of the final cover system must be included in the written closure plan required by paragraph (b) of this section.*
  - (A) *The design of the final cover system must include an infiltration layer that provides an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.*
  - (B) *The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (d)(3)(i)(C) of this section.*
  - (C) *The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.*

### 3.3.1 Final Cover System Design Standards

TVA will install an alternative final cover system as described in Section 3.3.2.

### 3.3.2 Alternative Final Cover System Design

The current closure plans include the design of an alternative final cover system design (described above in Section 3.1.1) that meets the standard criteria described in Section 40 CFR 257.102(d)(3) of the CCR Rule as follows:

- An infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in Section 3.3.
- An erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in Section 3.3.
- The minimization of disruptions of the integrity of the final cover system through a design that accommodates settling and subsidence.

The current proposed final cover (described in Section 3.1.1) involves the installation of a geocomposite infiltration layer that meets the definition of an alternative final cover system under the EPA Final CCR Rule. This proposed layer achieves an equivalent reduction in infiltration as the infiltration layer specified in Section 3.3, by having a permeability value ranging from  $10^{-13}$  to  $10^{-14}$  cm/sec.

The protective soil and vegetative covers will be designed to stabilize and protect the closed unit from erosive forces. The cover will be designed such that risk of settling and subsidence is within approved performance standards.

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### 3.3.3 Methods and Procedures for Installation of Final Cover

40 CFR 257.102(b)(1)(iii) requires a description of the methods and procedures used in the installation of the final cover. Section 3.1.1 describes the details regarding the construction procedures for cover installation.

### 3.3.4 Professional Engineer Certification

**40 CFR 257.102(d)(3)(iii).** *The owner or operator of the CCR unit must obtain a written certification from a qualified professional engineer that the design of the final cover system meets the requirements of this section.*

A professional engineer will provide a written certification stating that the design of the final cover system meets the requirements of 40 CFR 257.102. The certification will be included in the facility's notification of intent to close the Peninsula Disposal Area, as per 40 CFR 257.102(g).

## 4.0 WRITTEN POST-CLOSURE PLAN

**40 CFR 257.104(d).** *Written Post-Closure Plan – (1) Content of the Plan. The owner or operator of a CCR unit must prepare a written post-closure plan that includes, at a minimum, the information specified in paragraphs (d)(1)(i) through (iii) of this section.*

- (i) *A description of the monitoring and maintenance activities required in paragraph (b) of this section for the CCR unit, and the frequency at which these activities will be performed;*
- (ii) *The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period; and*
- (iii) *A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in this subpart. Any other disturbance is allowed if the owner or operator of the CCR unit demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a qualified professional engineer, and notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owner's or operator's publicly accessible internet site.*

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### 4.1 MONITORING AND MAINTENANCE ACTIVITIES

**40 CFR 257.104(b).** *Post-closure care maintenance requirements. Following closure of the CCR unit, the owner or operator must conduct post-closure care for the CCR unit, which must consist of at least the following:*

- (1) *Maintaining the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;*
- (2) *If the CCR unit is subject to the design criteria under §257.70, maintaining the integrity and effectiveness of the leachate collection and removal system and operating the leachate collection and removal system in accordance with the requirements of §257.70; and*
- (3) *Maintaining the groundwater monitoring system and monitoring the groundwater in accordance with the requirements of §§257.90 through 257.98.*

In accordance with 40 CFR 257.104(d)(1)(i), post-closure care for the Peninsula Disposal Area will address the following systems as required under 40 CFR 257.104(b), along with the frequencies for the identified monitoring and maintenance activities:

- Final cover system;
- Groundwater monitoring system.

#### 4.1.1 Final Cover System

TVA will maintain the integrity and effectiveness of the final cover system, and make repairs as necessary to correct the effects of settlement, subsidence, erosion, and other events, and control run-on and run-off from eroding or otherwise damaging the final cover, in accordance with accepted engineering practices. Regularly scheduled inspections, developed specifically for the conditions at the Kingston Fossil Plant, will be conducted on the final cover system, and will include visual observations of the dike slopes, crest, and toe. Inspections will monitor for erosion, pooling, sloughing, burrows, excessive plant growth, wet areas, seeps, bare areas, and other visual structural issues.

Repairs will be conducted as deemed necessary to correct the effects of settlement, subsidence, erosion, and other surface defects encountered during visual inspections, and to prevent run-on and run-off from eroding or otherwise damaging the final cover. Repairs may consist of grading activities to correct erosion and poor surface runoff conditions, and pest management to control burrowing into dikes.

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Regular maintenance events will include preserving the health of the vegetative cover, and mowing activities to be conducted as needed.

During the post-closure care period, the following activities will be performed on the closed portions of the facilities:

- Maintain the approved final contours and drainage systems of the site such that erosion of the cover system is minimized, precipitation on the closed areas is controlled and directed off the closure area, and poor surface runoff is eliminated.
- Maintain a healthy vegetative cover on the site for sediment and erosion control. The vegetative cover will be inspected on a monthly basis so as to maintain a healthy stand of vegetation. Areas containing distressed vegetation will be reseeded. The vegetative cover over the site will be maintained by mowing on a regular schedule.
- Eradicate nesting non-migratory pests as needed.
- Maintain and monitor the surface water drainage features until such time as permanent cover has been established. Maintenance of the surface water drainage system will continue throughout the post-closure period to prevent erosion and remove sediment accumulation to promote positive drainage and acceptable performance of the drainage system.

If issues or problems are observed, corrective measures will be implemented to correct the problem as needed, and inspection records will be maintained at the site.

### 4.1.2 Leachate Collection and Removal System

Since the unit is not a new CCR landfill or lateral expansion of a CCR landfill, it is not subject to the requirements of 40 CFR 257.70. Therefore, this section is not applicable.

### 4.1.3 Groundwater Monitoring System

The groundwater monitoring system will be designed and maintained in accordance with the EPA Final CCR Rule, 40 CFR §257.90 through 98. Regularly scheduled inspections and preventive maintenance activities will be conducted on the groundwater monitoring system, subject to specific groundwater monitoring compliance conditions and frequencies stipulated by the EPA Final CCR Rule.



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The groundwater monitoring system will be maintained and monitored in accordance with the CCR Rule Groundwater Monitoring Plan. The monitoring system, sampling and analysis program will be continued during the post-closure period, unless the closure plan is modified to establish a different system or program.

### **4.2 CONTACT INFORMATION**

The following contact information is provided for the post-closure period:

Owner: Tennessee Valley Authority (TVA)

Contact: Civil Projects & CCP Management, Strategy and Engineering  
Tennessee Valley Authority  
1101 Market Street  
Chattanooga, Tennessee 37402

Phone: 844-342-0012

Email: tvainfo@tva.com

### **4.3 PLANNED USES**

TVA currently has no plans for commercial, recreational, or industrial use of the property during the post-closure care period.