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December 19, 2017
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Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

**RE: Closure and Post-Closure Plan
Bottom Ash Pond
EPA Final Coal Combustion Residuals (CCR) Rule
TVA John Sevier Fossil Plant
Rogersville, Tennessee**

1.0 PURPOSE

This letter documents Stantec's certification of the EPA Final CCR Rule closure and post-closure plan for the TVA John Sevier Fossil Plant's Bottom Ash Pond.

2.0 CLOSURE AND POST-CLOSURE PLAN

The closure plan describes the steps necessary to close the CCR 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 attached closure and post-closure plan demonstrates compliance with the requirements set forth in 40 CFR 257.102(b) and 257.104(d), and is subject to amendment at any time under 40 CFR 257.102(b)(3). TVA has previously completed a Notice of Intent for closure of the Bottom Ash Pond to comply with 40 CFR 257.100, which qualifies the unit for a deadline extension on CCR Rule requirements. The written closure and post-closure care plans for the John Sevier Bottom Ash Pond are required to be placed in the operating record by April 17, 2019.

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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EPA Final Coal Combustion Residuals (CCR) Rule
TVA John Sevier Fossil Plant
Rogersville, Tennessee**

3. that the closure plan for the TVA John Sevier Fossil Plant's Bottom Ash Pond meets the requirements described in 40 CFR 257.102(b); and
4. that the post-closure plan for the TVA John Sevier Fossil Plant's Bottom Ash Pond meets the requirements of 40 CFR 257.104(d).

SIGNATURE


Don W. Fuller II, PE

DATE

12/19/2017

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ATTACHMENT: Closure and Post-Closure Plan



Closure and Post-Closure Plan

John Sevier Fossil Plant
Bottom Ash Pond
Rogersville, Tennessee



Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:
Stantec Consulting Services Inc.
Lexington, Kentucky

December 19, 2017

Revision 0

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CLOSURE AND POST-CLOSURE PLAN

Introduction
December 19, 2017

1.0 INTRODUCTION

This Coal Combustion Residuals (CCR) Rule closure and post-closure plan describes the CCR closure and post-closure activities at the TVA John Sevier Fossil (JSF) Plant and certifies that the Bottom Ash Pond (BAP) will be closed and maintained in accordance with the CCR closure and post-closure requirements of 40 CFR §257.102 and 104, respectively. Formerly managed as a partially-exempt inactive surface impoundment under §257.100, the Bottom Ash Pond is now subject to the closure and post-closure plan requirements of the Direct Final Rule that was published in response to a partial vacatur that became effective on October 4, 2016. This revision eliminated the exemption for inactive surface impoundments to meet the same requirements as active surface impoundments. An extended timeline was given to inactive surface impoundments for which the owner/operator had completed a Notice of Intent (NOI) that complied with the previous section §257.100. The Bottom Ash Pond at JSF is an Inactive CCR Surface Impoundment as defined by the Environmental Protection Agency (EPA) Final CCR Rule that meets the requirements for an extended timeline under the Direct Final Rule and has completed closure activities.

In compliance with 40 CFR §257.100(c)(1), a notification of intent to initiate closure of an inactive surface impoundment, dated December 15, 2015, was placed in the plant's operating record. The notification stated that the Bottom Ash Pond is an inactive CCR surface impoundment closing under the requirements of 40 CFR §257.100(b), and included a narrative description of how the Bottom Ash Pond would be closed, a schedule for completing closure activities, and the required Professional Engineer (PE) certifications pursuant to 40 CFR §§257.100(b)(4) and (6). The PE certifications stated the design of the final cover system met the CCR requirements, and that closure was technically feasible within the timeframe of the inactive surface impoundment requirements per 40 CFR §257.100(b).

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Written Closure Plan
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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.*
- (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 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

TVA has completed closure in place of the Bottom Ash Pond. The unit has undergone dewatering and waste stabilization and has been graded and capped with a final vegetative cover.



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The design approach for the Bottom Ash Pond closure includes installing an engineered cap system and vegetative cover over an approximately 20-acre area on the east side of the BAP where CCR material has been consolidated. The remaining area on the west side (approximately 22 acres) has been graded to gravity drain and has been vegetated. An earthen berm has been constructed on the west boundary of the capped area to contain the consolidated CCR material. The original dike forming the western perimeter of the BAP has been regraded to supply material for the construction of the earthen berm, cover soil for the cap system, and fill material for grading.

The details of the pond drawdown, construction sequencing, and management of stormwater during construction was determined during development of the closure design.

The top surfaces of the Bottom Ash Pond have been graded to promote positive drainage and a permanent vegetative cover has been established.

2.2 CLOSURE TYPE

2.2.1 Closure in Place

The CCR in the Bottom Ash Pond has been dewatered, consolidated, stabilized, and left in place with a final cover system that mitigates rain infiltration. In consolidating the unit, TVA excavated the CCR and some of the underlying soil from one portion of the unit and placed those materials with CCR into another portion of the unit, thus reducing the overall footprint. The design of the final cover system and related closure elements meets the closure in-place performance standards in the CCR Rule, described in Section 3.0 of this document, because the unit has been dewatered and stabilized sufficient to support a final cover system that meets the criteria in 40 C.F.R. 257.102(d)(3)(i)(A)-(D).

2.3 MAXIMUM CCR INVENTORY

It is estimated that the maximum inventory of CCR material on-site is approximately 660,000 cubic yards, based on comparison of the native surface established by geotechnical boring data and subgrade surface established by the as-built survey of the unit.

2.4 AREA REQUIRING FINAL COVER

The area of the Bottom Ash Pond requiring a final cover during the active life of the CCR unit is approximately 20 acres due to consolidation of the CCR and a reduced footprint.

2.5 SCHEDULE OF CLOSURE ACTIVITIES

Table 1 provides the estimated schedule of closure activities.



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Table 1 Estimated Schedule of Closure Activities

	Closure Activity	Timeframe for Completion
1.	Coordinating with and obtaining necessary approvals and permits from regulatory agencies	2016
2.	Dewatering, stabilization, and regrading of surface impoundments	2016
3.	Installation of final cover	2017
4.	Completion of closure	2017
5.	Completion of post-closure care period	2047

2.6 ESTIMATED YEAR OF CLOSURE COMPLETION

The year for completion of closure activities is 2017.

2.7 REQUEST FOR TIME EXTENSION

The EPA Final CCR Rule allows five years to complete the closure of a surface impoundment upon commencing closure activities. Time extensions are not necessary for the closure of the Bottom Ash Pond.

CLOSURE AND POST-CLOSURE PLAN

CCR Closure In-Place Performance Standards
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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 has been designed to limit the infiltration of precipitation into the unit according to acceptable permeability compliance limits. The cap system also acts to cover, control, and prevent the release of CCR material from the unit to the ground and into surface waters and the atmosphere. The designed grading plan and stormwater management system promote positive drainage and limit infiltration into the CCR materials. The cap cover is designed to limit the exposure of CCR material to the atmosphere.

The top surfaces have been graded and drainage channels have been constructed to promote positive drainage. Dike and berm slopes have been constructed as required to achieve appropriate slope stability safety factors.

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An alternative cap system with a synthetic geomembrane was used for the final cover. Details of this alternative cap system are addressed in Section 3.3.2.

The CCR has been graded and compacted in a manner to mitigate settling and subsidence that could disrupt the integrity of the final cover system.

Geosynthetic Materials

A synthetic geomembrane was included in the final cap design. The geotextile cushion and 40-mil LLDPE liner covers the Bottom Ash Pond CCR material footprint, and the geocomposite drainage layer has been placed above it. The drainage layer drains surface water that infiltrates through the overlying soil materials. The geosynthetic materials have been installed and tested as required by the manufacturer.

Protective Cover Soil

An 18-inch infiltration layer of protective soil cover has been placed over the geocomposite drainage layer within the final cover system.

Vegetative Cover

A 6-inch vegetative cover has been established over the 18-inch soil cover layer. The conditioning, fertilizing, and seeding or sodding began immediately upon placement of the final cover. No nuisance or invasive species have been used as vegetative cover.

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

TVA controls future impoundment of water or sediment in the closed Bottom Ash Pond 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 promotes positive surface drainage on the site.

As an essential aspect of the stormwater management system, the drainage system also keeps water from impounding in the unit. Prior to closure of the BAP, remaining inflows were eliminated or re-directed.

The proposed cap has been graded to encourage positive drainage of surface water and seeded to establish a vegetative cover for erosion control. In addition to the implementation of a cap system that meets infiltration requirements, a stormwater management system has been incorporated.

Erosion prevention and sediment control measures were put in place at each outfall until vegetation was established upstream.



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3.1.3 Slope Stability Measures

TVA has included 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. Maintenance of vegetative cover during the construction and post-construction periods 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 has been completed in a timeframe consistent with recognized and generally accepted good engineering practices. A qualified professional engineer has verified that the final cover system is constructed in accordance with the EPA Final CCR Rule.

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.*

Operational drawdown of the Bottom Ash Pond has been designed prior to commencing closure activities. It provided for the dewatering of the surface impoundment, and the stabilization of the remaining CCR material to the extent necessary to support the final cover system.

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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 1×10^{-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.*
- (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

The closure incorporates a geosynthetic cover due to the limited amount of acceptable borrow material located near the project site. Therefore, TVA has installed an alternative final cover system as described in Section 3.3.2.



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3.3.2 Alternative Final Cover System Design

The EPA Final CCR Rule allows for an alternative final cover system design, which may be selected provided it achieves an equivalent standard to Section 3.3 for the following:

- 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.
- Reduce the potential for disruptions of the integrity of the final cover system through a design that accommodates settling and subsidence.

A synthetic geomembrane final cap design was selected for the Bottom Ash Pond closure. This alternative cap system consists of the following materials, listed in order of construction (bottom to top):

- 40-mil geomembrane
- Geocomposite drainage layer
- 24 inches of cover soil (i.e., 18 inches of infiltration layer, 6 inches of erosion layer)

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

3.3.3 Methods and Procedures for Installation of Final Cover

The CCR Rule, 40 CFR 257.102(b)(1)(iii), requires that closure plans include a description of the methods and procedures used in the installation of the final cover. Section 3.1.1 of this document 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.*

In compliance with 40 CFR §257.100(c)(1), a notification of intent to initiate closure of an inactive surface impoundment, dated December 15, 2015, was placed in the plant's operating record. The notification stated that the Bottom Ash Pond is an inactive CCR surface impoundment closing under the requirements of 40 CFR §257.100(b), and included the required Professional Engineer's certification pursuant to 40 CFR §257.100(b)(4). The PE certification stated that the design of the final cover system meets the CCR requirements of 40 CFR §257.100(b)(3).



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Since the PE certification requirement for an inactive surface impoundment under 40 CFR §257.100(b)(4) is identical to the PE certification requirement for active units under 40 CFR §257.102(d)(3)(iii), the PE certification previously submitted for the inactive surface impoundment meets the requirements of this section. This document serves as a re-certification that the design of the final cover system meets the requirements under 40 CFR §257.102(d)(3)(iii).



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Written Post-Closure Plan
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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.*

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 Bottom Ash Pond 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; and
- Groundwater monitoring system.



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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 JSF, 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 and unwanted vegetation, 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 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, and the mitigation and repair of wet areas and pooling.

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 mitigated, precipitation on the closed areas is controlled and directed off the closure area, and poor surface runoff is avoided.
- Maintain a healthy vegetative cover on the site for sediment and erosion control.
- Eradicate nesting non-migratory pests as needed.
- Maintain and monitor the surface water drainage features until 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.



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4.1.3 Groundwater Monitoring System

The groundwater monitoring system has been designed and will be 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.

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 plans to retain ownership of the closed Bottom Ash Pond, and will control access to this site following closure. The closed facility shall remain undeveloped.

