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# BULL RUN FOSSIL PLANT
# ASH IMPOUNDMENT CLOSURE PROJECT
# SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT
## Anderson County, Tennessee

**Prepared by:**
TENNESSEE VALLEY AUTHORITY
Chattanooga, TN

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For further information, contact:
Ashley R. Farless, PE, AICP
NEPA Compliance
Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402
Phone: 423-751-2361
E-mail: arfarless@tva.gov

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# Symbols, Acronyms, and Abbreviations

| | |
|---|---|
| **BRF** | Bull Run Fossil Plant |
| **CAA** | Clean Air Act |
| **CCR** | Coal Combustion Residuals |
| **CWA** | Clean Water Act |
| **EIP** | Environmental Investigation Plan |
| **EO** | Executive Order |
| **EPA** | U.S. Environmental Protection Agency |
| **ESA** | Endangered Species Act |
| **GWPS** | Ground Water Protection Standard |
| **MGD** | Million Gallons Per Day |
| **mg/L** | Milligrams Per Liter |
| **NEPA** | National Environmental Policy Act |
| **NPDES** | National Pollutant Discharge Elimination System |
| **PEIS** | Programmatic Environmental Impact Statement |
| **SEA** | Supplemental Environmental Assessment |
| **TDEC** | Tennessee Department of Environment & Conservation |
| **TVA** | Tennessee Valley Authority |

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# CHAPTER 1 – PURPOSE AND NEED FOR ACTION

## 1.1 Introduction and Background

The Bull Run Fossil Plant (BRF) is in Anderson County, Tennessee, about 5 miles east of downtown Oak Ridge, TN and 13 miles west of Knoxville, TN (Figure 1-1). BRF is operated by Tennessee Valley Authority (TVA) and is located on a 750-acre reservation on the east side of Melton Hill Reservoir at Clinch River Mile 48. Most nearby lands are United States Department of Energy reservation properties for the Oak Ridge National Laboratory facilities, but there are also residential and recreational land uses in the vicinity.

The BRF plant was built between 1962 and 1966. Commercial operation began in June 1967. Nameplate generating capacity for the single unit is 950 megawatts; BRF is the only single-generator coal-fired power plant in the TVA system. Winter net-dependable generating capacity is about 881 megawatts. BRF generates over 6 billion kilowatt-hours of electric power in a typical year, which is enough electrical energy to meet the needs of approximately 430,000 homes.

**View of Fly Ash Impoundment (Right) and Stilling Pond (Left) along Separator Berm**

The coal combustion residuals (CCR) generated by the plant include fly ash, bottom ash, and flue gas desulfurization gypsum. Disposal areas for CCR include a dry fly ash stack located east of the plant and a system of wet CCR disposal areas located south of the plant, ending at the convergence of Bullrun Creek and the Clinch River.

In accordance with the National Environmental Policy Act (NEPA), in June 2016, TVA issued a Final Programmatic Environmental Impact Statement (PEIS) that considered alternatives and related environmental impacts associated with closure of ash impoundments containing CCR at fossil fuel plants across the Valley (TVA 2016). A Record of Decision (ROD) was released in July 2016 that would allow future site-specific environmental reviews of CCR impoundment closures to tier from the PEIS. In Part II of the PEIS, TVA considered the closure of the BRF Sluice Channel and Fly Ash Impoundment which are part of the wet CCR disposal area (TVA 2016). TVA issued a Supplemental Environmental Assessment (SEA) in October 2017 that considered alternatives and related environmental impacts associated with the Closure-in-Place of the Fly Ash Impoundment, and the repurposing of a portion of the Fly Ash Impoundment and the entire Stilling Pond for use as a Process Water Basin (TVA 2017a).

The purpose of this document is to present a supplement to the June 2016 Ash Impoundment Closure PEIS, Part II Site-Specific NEPA Review: Bull Run Fossil Plant and the previous October 2017 Bull Run Fossil Plant Ash Impoundment Closure Project Supplemental Environmental Assessment (TVA 2016, TVA 2017a). This new SEA has been prepared to account for changes to the closure plan for the Fly Ash Impoundment and Stilling Pond identified in the NEPA Review and in the previous SEA.

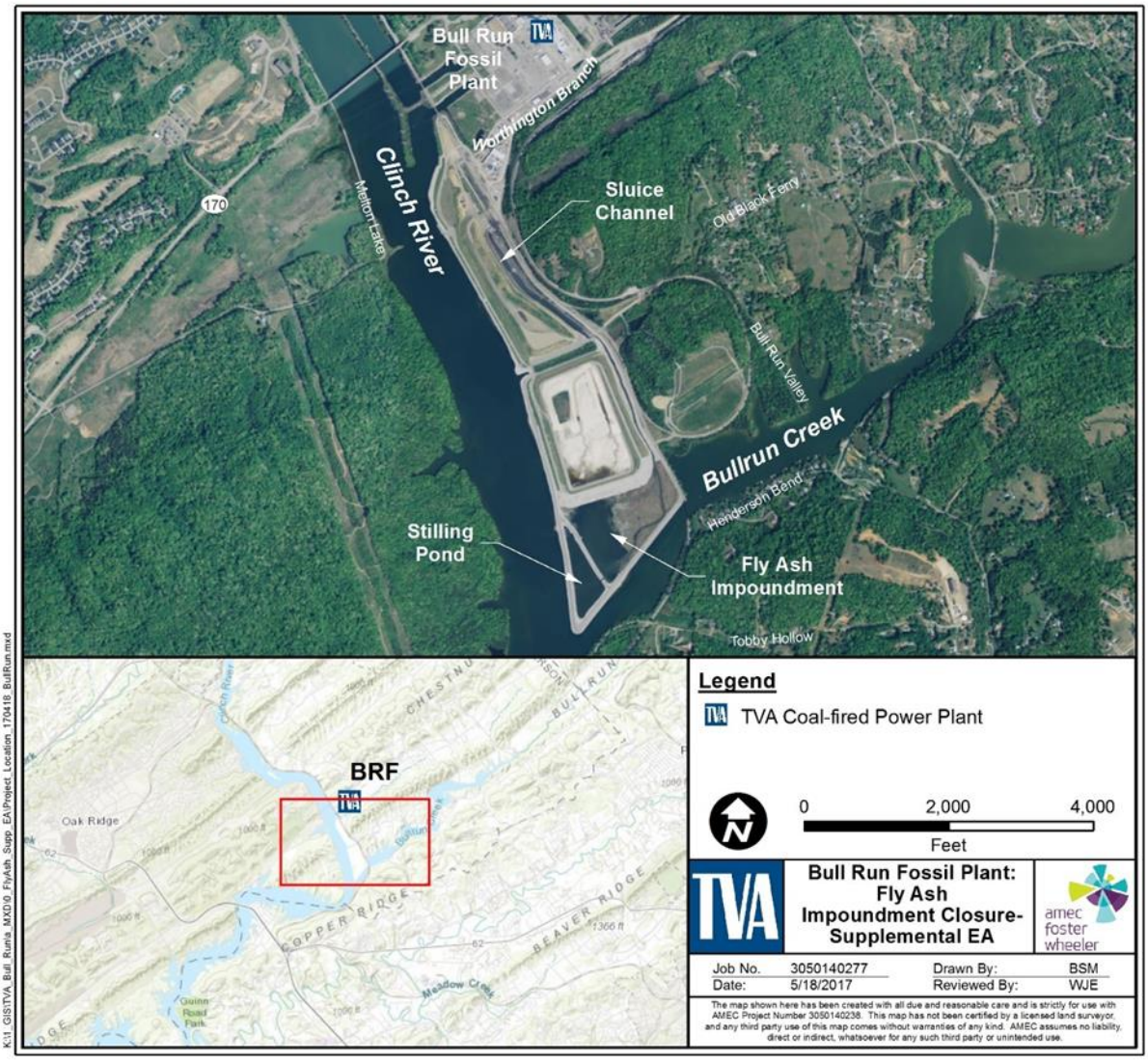


**Figure 1-1. BRF Project Location**

As originally proposed in the PEIS (TVA 2016), the approximately 33-acre Fly Ash Impoundment would be Closed-in-Place, which would entail dewatering, grading and covering with an approved cover system. BRF ceased sluicing CCR material in 2015. Non-CCR wastewater from the plant and storm water would continue to be discharged into the system, and ultimately into the Stilling Pond. However, under the originally proposed action, process wastewater flow would be conveyed to the Stilling Pond through a new lined ditch prior to release at Outfall 001. The prior SEA (TVA 2017a) revised the selected alternative to closure of the Fly Ash Impoundment and Stilling Pond in place using an approved cover system, and repurposing a portion of the closed area for use as a Process Water Basin. The capping system for the Closure-in-Place would serve as a bottom liner for the Process Water Basin. The proposed Process Water Basin would handle only storm water flow and non-CCR process water flow from the plant (TVA 2017a).

Subsequent to the completion of the PEIS, TVA determined that there is a long-term need for wastewater treatment at BRF and revised the closure plan to support the wastewater treatment system at BRF. This site-specific SEA therefore tiers off the programmatic level review provided in Part I, the prior site-specific review of proposed Fly Ash Impoundment closures under Part II of the PEIS (TVA 2016), and evaluates a proposed change to the action proposed in the previous site-specific SEA (TVA 2017a).

## 1.2 Decision to be Made

TVA must decide how to develop a Process Water Basin at BRF to support wastewater treatment at the plant. TVA's decision considers factors such as potential environmental impacts, economic issues, availability of resources and TVA's long-term goals.

## 1.3 Purpose and Need

The purpose of the proposed action is to support the implementation of TVA's stated goal of eliminating all wet CCR storage at its coal plants by closing the Fly Ash Impoundment and Stilling Pond at BRF, and to assist TVA in complying with state requirements and the U.S. Environmental Protection Agency's (EPA) CCR Rule. This project would support a long-term need for wastewater treatment at BRF by providing a facility for processing wastewater and storm water.

## 1.4 Other Environmental Reviews and Documentation

The following environmental reviews are relevant to the proposed action:

*Final Ash Impoundment Closure Environmental Impact Statement* (TVA 2016). The EIS was prepared to address the closure of CCR impoundments at all of TVA's coal-fired power plants. The report consists of two parts: Part I – Programmatic NEPA Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considered environmental effects of closure of ash impoundments using two primary closure methods: (1) Closure-in-Place and (2) Closure-by-Removal. A Record of Decision was released in July 2016 that would allow future environmental reviews of CCR impoundment closures to tier from the PEIS. In Part II, TVA considered site-specific ash impoundment closure activities at each of six fossil plants, including BRF. The preferred alternative at BRF was determined to be Closure-in-Place. This SEA is intended to tier from the 2016 PEIS (TVA 2016) and revise the October 2017 SEA (TVA 2017a) to evaluate the revised closure plan for the existing ash impoundments at BRF.

*Bull Run Fossil Plant Ash Impoundment Closure Project Supplemental Environmental Assessment (TVA 2017a).* This supplemental EA revised the selected alternative to the closure of the Fly Ash Impoundment and Stilling Pond in place using an approved cover system, and repurposing a portion of the closed area for use as a Process Water Basin. The capping system for the Closure-in-Place would serve as a bottom liner for the Process Water Basin. The proposed Process Water Basin would handle only storm water flow and non-CCR process water flow from the plant.

*Integrated Resource Plan, 2015 Final Report* (TVA 2015b). The plan provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. The document and the associated Supplemental Environmental Impact Statement evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future power demand economically while supporting TVA's equally important mandates for

environmental stewardship and economic development across the Tennessee Valley. The report indicated that a diverse portfolio is the best way to deliver low-cost, reliable electricity. TVA released the accompanying Final Supplemental EIS for TVA's Integrated Resource Plan in July 2015 (TVA 2015a) and identified BRF as one of the coal plants that TVA plans to continue operating in the future.

The findings in these documents related to this SEA are summarized in Chapter 3 as appropriate, for each relevant environmental resource, and analyses from Part II of the PEIS are incorporated by reference as appropriate.

## 1.5 Permits, Licenses and Approvals

TVA had previously identified some permits and approvals required to support the closure of the Sluice Trench and Fly Ash Impoundment at BRF. Authorizations required for the proposed action could include the following:

- National Pollutant Discharge Elimination Permit (NPDES) Construction Storm Water Permit for storm water runoff from construction activities.
- BRF's Storm Water Pollution Prevention Plan would be revised to include both the temporarily covered portions of the Fly Ash Impoundment, the closed Stilling Pond, and the new Process Water Basins.

## 1.6 Scope of the Supplemental Environmental Assessment

The geographic scope of this supplemental analysis includes the 41.6-acre area that contains the Fly Ash Impoundment and the Stilling Pond (see Figure 1-1). All activities associated with the proposed action will be limited to previously disturbed areas. The proposed action would entail regrading and consolidating existing CCR materials and will require less offsite borrow than was predicted in the PEIS Tier II analysis. This SEA addresses the potential impacts of the development and operation of the actions associated with the proposed alternatives.

TVA prepared this SEA to comply with NEPA and regulations promulgated by the Council on Environmental Quality and TVA's procedures for implementing NEPA. This assessment tiers off the impact analysis in the PEIS (TVA 2016) and the previous SEA (TVA 2017a), and evaluates existing conditions for the proposed alternative actions that are based upon the previous SEA (2017a).

Based on the specific activities proposed for this project, TVA focused its environmental review on specific resources and eliminated others from further evaluation. This SEA does not contain detailed discussions of resources not found in the project area or where site-specific conditions would not change the impact analysis presented in the PEIS and the site-specific analysis contained in Part II of the PEIS (TVA 2016) or previous SEA (2017a).

In consideration of the nature and scope of the proposed action, TVA determined that the potential impacts of the alternatives under consideration on the following environmental resources are bounded by the prior PEIS and SEA including the site-specific assessment of the closure and or repurposing of the Sluice Trench, Fly Ash Impoundment and Stilling Pond at BRF:

- air quality
- climate change
- land use
- prime farmland
- vegetation
- wildlife
- aquatic ecology
- threatened and endangered species
- geology
- wetlands
- floodplains
- natural areas
- parks
- public recreation
- cultural and historic resources
- visual resources
- hazardous materials and hazardous waste
- solid waste
- noise
- transportation
- socioeconomics
- environmental justice
- public health and safety

Because the proposed action is primarily associated with the closure, consolidation, and reconfiguration of the Fly Ash Impoundment and Stilling Pond, the only resources not bounded by the previous site-specific analyses and therefore retained for detailed analysis in this SEA are groundwater and surface water. Although a portion of the Fly Ash Impoundment and the Stilling Pond would be Closed-by-Removal, any potential impacts on noise, air quality, or climate change (i.e., greenhouse gas emissions) related to the transport and storage of CCR to an on-site BRF landfill are anticipated to be negligible as the transport of CCR is short-term and limited to on-site vehicle movements. In addition, the volume of offsite borrow is substantially reduced from that considered in the previous site-specific analysis in Part II of the PEIS (TVA 2016). Therefore, potential effects on air quality, noise, climate change and transportation are not assessed in this SEA.

TVA's action under this SEA would satisfy the requirements of Executive Order (EO) 11988 (Floodplains Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13112 as amended by EO 13751 (Invasive Species), and applicable laws including the National Historic Preservation Act, Endangered Species Act (ESA), Clean Water Act (CWA), and Clean Air Act (CAA).

## 1.7 Public and Agency Involvement

The draft SEA was posted on TVA's Web site for a 20-day public review period. The availability of the draft SEA was announced in local publications. TVA notified local, state, and federal agencies and federally recognized tribes of its availability through their required consultations.

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# CHAPTER 2 – ALTERNATIVES

## 2.1 Description of Alternatives

Alternatives evaluated in detail for this SEA are described below.

### 2.1.1 Alternative A – The No Action Alternative

Under the No Action Alternative TVA would close the Stilling Pond and Fly Ash Impoundment in place as previously described in the October 2017 SEA (TVA 2017a). The Stilling Pond and a portion of the Fly Ash Impoundment would be repurposed as Process Water Basins as previously described in the October 2017 SEA.

### 2.1.2 Alternative B – Temporarily Cover a Portion of the Fly Ash Impoundment, Closure-by-Removal of the Remaining Portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway

Under this alternative, TVA proposes to temporarily cover an approximately 20-acre portion of the Fly Ash Impoundment containing approximately 2,900,000 $yd^3$ of CCR materials. The remaining portion (approximately 13 acres) of the Fly Ash Impoundment would be Closed-by-Removal with up to an estimated 595,000 $yd^3$ of CCR materials being removed and transported to an on-site landfill. The portion of the Fly Ash Impoundment that is Closed-by-Removal would be repurposed into a Process Water Basin for BRF (Figure 2-1).

In addition, the Stilling Pond would be Closed-by-Removal, which would entail removal and transport of up to an estimated 71,000 $yd^3$ of CCR and residual materials to an existing on-site landfill. The Stilling Pond would be repurposed as a Process Water Basin.

Once constructed, the Process Water Basins would only manage storm water and non-CCR wastewater from BRF facilities.

Generalized construction steps for this project include dewatering the Stilling Pond and Fly Ash Impoundment and removal of CCR materials from the Stilling Pond and the Closed-by-Removal portion of the Fly Ash Impoundment. Handling of wet material would occur inside the footprint of the current Fly Ash Impoundment and Stilling Pond. The material would be handled and dried, and once dry, it would be disposed of in the on-site landfill.

For the temporarily covered portion of the Fly Ash Impoundment, if the CCR materials are suitable for regrading and consolidation, they would remain in the impoundment. If they are not suitable for regrading, the material would be removed, dried, and placed in an on-site landfill. In areas where CCR materials are removed and placed in the on-site landfill, suitable fill material may be imported to grade and support the temporary cover system. The temporary cover system in the fly ash pond would be constructed to the same standards as a permanent cover system, as described in Part II of the PEIS. However, the long-term disposition of the cover system would be determined through coordination with TDEC and analyzed in a future environmental review.

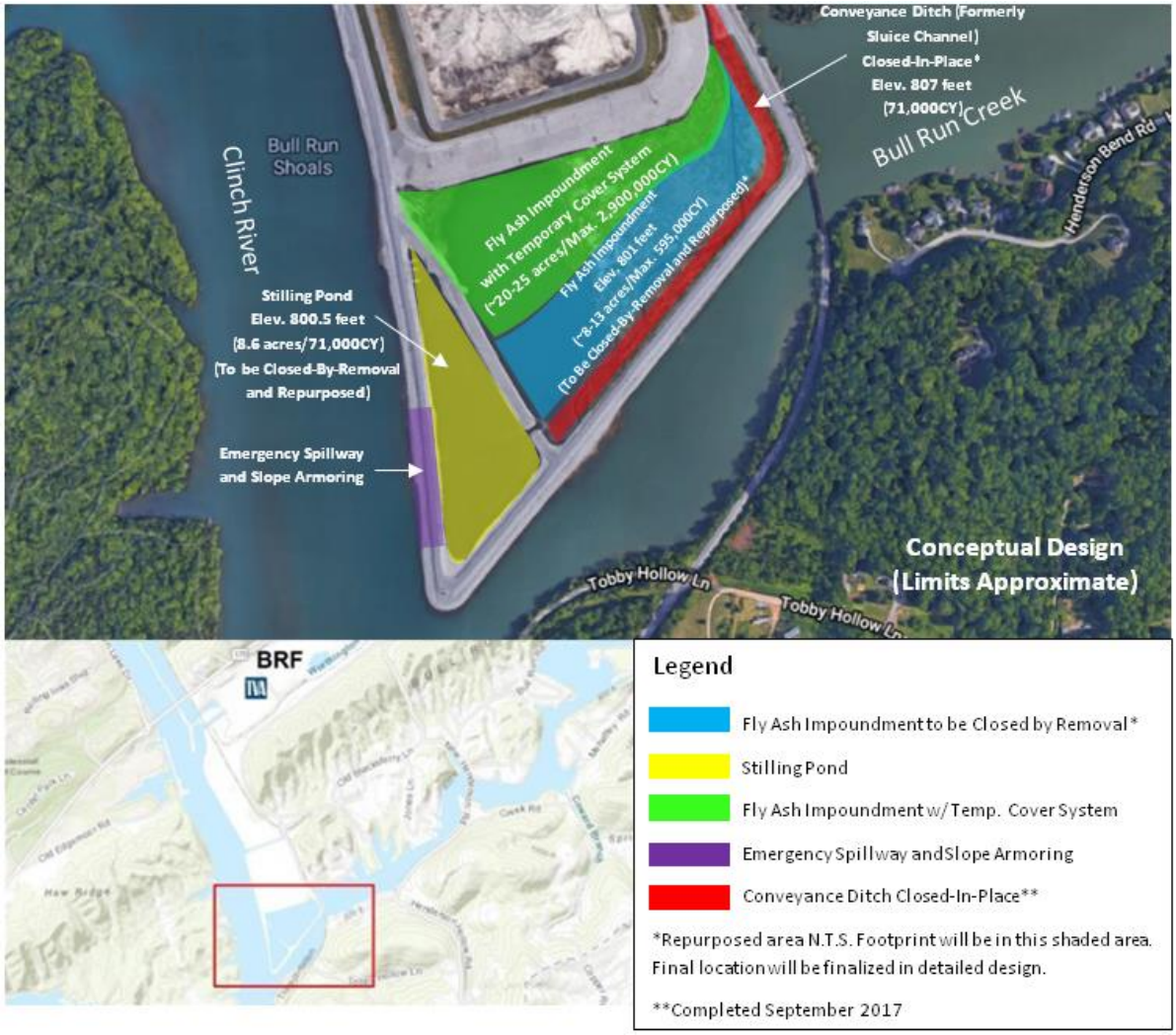


**Figure 2-1. Alternative B. Proposed Project Activity Areas.**

As part of the Process Water Basin infrastructure, an emergency spillway would be constructed along the western side of the perimeter dike that borders the Stilling Pond. (Figure 2-1). The emergency spillway would be created by modifying a section of the existing perimeter dike to have a lower elevation. The spillway would be armored with rip rap, concrete, or a combination of the two on the top and outside slope. Laydown areas would be the same as that described in Part II of the PEIS (TVA 2016) and the prior SEA (TVA 2017a).

Table 2-1 summarizes the general characteristics of the Fly Ash Impoundment and Stilling Pond under Alternative B in comparison to that under the previously considered action described in Part II of the PEIS and the October 2017 SEA.

**Table 2-1. Summary of Fly Ash Impoundment and Stilling Pond Attributes Under the Original Closure Plan, October 2017 SEA, and Newly Proposed SEA-Alternative B (2018)**

| Attribute | Original Closure-in-Place Alternative Evaluated in Tier II of PEIS | October 2017 Supplemental EA– Fly Ash Impoundment Closure-in-Place and Repurposing of the Stilling Pond and a Portion of the Fly Ash Impoundment | Alternative B – Temporarily Cover a portion of the Fly Ash Impoundment, Closure-by-Removal of the remaining portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway. |
|---|---|---|---|
| **Fly Ash Impoundment** | | | |
| Impoundment Status | Inactive | Inactive | Inactive |
| Size (ac) | 33 | Closed-in-Place Portion<br>per PEIS: 21.4<br>Repurposed: 11.6<br>Total: 33.0 | Temporarily Covered Portion: ~20<br>Closed-by-Removal &<br>Repurposed Portion: ~13<br>Total: 33 |
| CCR Material | Bottom Ash/Fly Ash | Bottom Ash/Fly Ash | Bottom Ash/Fly Ash |
| CCR Volume ($yd^3$) | 3,500,000 | Closed-in-Place: 3,500,000 | Temporarily Covered Portion: ~2,900,000<br>Closed-by-Removal Portion: ~595,000<br>Total: 3,500,000 |
| Borrow Material | 250,000 | No borrow soil required | 61,000 |
| Temporary Laydown Areas (ac) | 5 to 10 | 5 to 10 | 5 to 10 |
| **Stilling Pond** | | | |
| Impoundment Status | Not included in Original Closure Plan | Inactive | Inactive |
| Size (acres) | | Closed-in-Place: 8.6 acres<br>(Pond surface ~7 ac, berms: ~1.6 acres) | Closed-by-Removal: 8.6 acres<br>(Pond surface ~7 acres, berms: ~1.6 acres) |
| CCR Material | | Bottom Ash/Fly Ash | Bottom Ash/Fly Ash |

| Attribute | Original Closure-in-Place Alternative Evaluated in Tier II of PEIS | October 2017 Supplemental EA– Fly Ash Impoundment Closure-in-Place and Repurposing of the Stilling Pond and a Portion of the Fly Ash Impoundment | Alternative B – Temporarily Cover a portion of the Fly Ash Impoundment, Closure-by-Removal of the remaining portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway. |
|---|---|---|---|
| CCR Volume ($yd^3$) | | CCR: ~51,000 | CCR: ~51,000 + 20,000 (residual materials) = 71,000 |
| Borrow Material Volume ($yd^3$) | | No borrow soil required | Borrow required for re-purposed area less than and bounded by total volume included in Tier II of PEIS |
| Temporary Laydown Areas | | No additional laydown required | No additional laydown required |

## 2.2 Summary of Alternative Impacts

Table 2-2 summarizes a comparison of the PEIS - Part II (TVA 2016), the previous SEA (TVA 2017a) and Alternative B of this SEA for impacts associated with the proposed action associated with the Fly Ash Impoundment and the Stilling Pond. Although most of the impacts are similar between the prior SEA (TVA 2017a) and this SEA, under Alternative B an estimated total of up to 666,000 $yd^3$ of CCR would be removed from the Fly Ash Impoundment and the Stilling Pond with the Closed-by-Removal approach. This impact summary is limited to those resources reassessed in this SEA as being potentially affected by the proposed action.

## 2.3 Identification of Mitigation Measures

Mitigation measures identified in Parts I and II of the PEIS to avoid, minimize, or reduce adverse impacts to the environment are applicable to the proposed action and are summarized below. TVA's analysis of preferred alternatives includes mitigation, as required, to reduce or avoid adverse effects. In addition to the items listed below, best management practices would be used throughout the project to minimize erosion, prevent spills, reduce noise, and further reduce potential impacts on environmental resources.

- Fugitive dust emissions from site preparation and construction will be controlled by wet suppression and best management practices (CAA Title V operating permit incorporates fugitive dust management conditions).

- Consistent with EO 13112 as amended by EO 13751 (Invasive Species), disturbed areas will be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.

- TVA will implement supplemental groundwater mitigative measures that could include monitoring, assessment, or corrective action programs as mandated by state and federal requirements. The CCR Rule and state requirements provide an additional layer of groundwater protection to minimize risk.

## 2.4 The Preferred Alternative

TVA's preferred alternative is Alternative B. TVA would temporarily cover a portion of the Fly Ash Impoundment and the remaining portion would be Closed-by-Removal. The Stilling Pond also would be Closed-by-Removal. The portion of the Fly Ash Impoundment that is Closed-by-Removal and the Stilling Pond would be repurposed for use as a Process Water Basin. This alternative meets the purpose and need of the project and provides long-term benefits for BRF as this alternative would eliminate wet CRR storage and provide a facility (i.e., Process Water Basin) for storm water and non-CCR wastewater treatment with minimal environmental impacts. The proposed Process Water Basin under this alternative is of similar size to the Process Water Basin proposed in the previous October 2017 SEA (TVA 2017a) and would have similar water retention time and treatment capacity.

**Table 2-2. Summary and Comparison of the Original Closure Plan, October 2017 SEA, and Newly Proposed SEA Alternative B (2018) by Resource**

| Resource | Original Closure-in-Place Alternative Evaluated in Tier II of PEIS | October 2017 Supplemental EA – Fly Ash Impoundment Closure-in-Place and Repurposing of the Stilling Pond and a Portion of the Fly Ash Impoundment | Alternative B – Temporarily Cover a portion of the Fly Ash Impoundment, Closure-by-Removal of the remaining portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway. |
|---|---|---|---|
| Groundwater | Reduction of hydraulic input reduces risk of migration of constituents to groundwater. | Reduction of hydraulic input reduces risk of migration of constituents to groundwater.<br>Low permeability liner at base of repurposed Fly Ash Impoundment and Stilling Pond prevents contact of non-CCR wastewater and stormwater with groundwater. | Clean closing a portion of the Fly Ash Impoundment and the entire Still Pond in conjunction with the Process Water Basin and the capping system used for the remaining portion of the Fly Ash Impoundment is expected to enhance groundwater protection by removing 666,000 $yd^3$ of CCR, by reducing hydraulic inputs to the portion temporarily covered, thereby reducing risk of migration of constituents to groundwater.<br><br>Low permeability liner at base of repurposed Fly Ash Impoundment and Stilling Pond prevents contact of non-CCR waste water and storm water with groundwater. |
| Surface Water | Risk to surface water would be reduced. Construction-related impacts would be negligible. | Risk to surface water would be reduced. Construction-related impacts would be negligible. | Risk to surface water would be reduced. Construction-related impacts would be negligible. |

# CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## 3.1 Introduction

Chapter 3 describes existing resources that may be affected by the alternatives and the potential direct and indirect impacts on those resources. Chapter 3 focuses on the impacts resulting from the proposed activities associated with Alternative B. Impacts associated with Alternative A are the same as those summarized in the October 2017 SEA (TVA 2017a) and are not re-assessed in this document.

## 3.2 Groundwater

### 3.2.1 Affected Environment

#### 3.2.1.1 Physiographic Setting and Regional Aquifer

BRF is located in the Valley and Ridge Physiographic Province, a northeast-southwest trending series of parallel ridges and valleys composed of folded and faulted Paleozoic sedimentary rock. The primary surface features are mainly the result of differential weathering of various rock types, which include limestone, dolomite, shale, sandstone and siltstone. Residual soil typically ranges in thickness from about 10 to 150 feet.

Alluvial overburden with variable thickness mantles much of the site and has been derived by flood events of the Clinch River. Larger valleys may have a comparatively thin mantle of alluvial soils ranging in size from clay to coarse sand to boulders, and deeply weathered alluvium in the vicinity of streams and rivers may be found both in low-lying areas and on hills, reflecting the dynamic geologic nature of the province.

In areas underlain by limestone, solution weathering may result in karst development although karst has not been identified at BRF. Four different bedrock units underlie the site. These are the Rome Formation, the Conasauga and Knox groups, and the Chickamauga Limestone (URS 2011).

The plant site straddles Bull Run Ridge which is underlain by the Rome Formation. The valley south of Bull Run Ridge is underlain by rocks of the Conasauga Group while the valley north of the ridge is underlain by several sub-units of the Chickamauga Formation (Stantec 2009). Shallow fractures, enlarged by carbonate dissolution, are more common in this formation than any other at the site. Residuum produced from the Chickamauga is a silty clay containing variable amounts of chert. In the main plant area, the majority of this clayey soil has been removed, and the remaining residuum is expected to range in thickness from 0 to about 25 feet.

Groundwater underlying the BRF site is derived from infiltration of precipitation and from lateral inflow along the northwest boundary of the reservation.

All groundwater originating on, or flowing beneath the proposed site ultimately discharges to the Clinch River/Melton Hill Reservoir without traversing private property. The subsurface water flow occurs both in a shallow zone just beneath the land surface and in a deeper zone at the bedrock interface (TVA 2012).

The bedrock underlying the main plant area (Chickamauga Formation) may locally exhibit properties in which flow is dominated by fractures enlarged by carbonate dissolution. These fractures may alternately store and transmit relatively large volumes of water. At other areas of the site underlain by relatively impermeable strata (i.e., the Rome and Conasauga units), groundwater movement is controlled by fractures that may store fairly large volumes but transmit only limited amounts of water (TVA 2012).

TVA is currently conducting a hydrogeological characterization of BRF to address information requests from the Tennessee Department of Environment and Conservation (TDEC) about groundwater flow, including bedding planes, faults and joints. This characterization is conducted in accordance with the requirements of the TDEC Administrative Order issued to TVA on August 6, 2015 (OGC15-0177) to establish a transparent, comprehensive process for the investigation, assessment, and remediation of any risks resulting from the management and disposal of CCR at TVA coal-fired plants in Tennessee, and the groundwater monitoring requirements of the EPA Final CCR Rule (TVA 2017b). The upgraded monitoring system will be used to confirm that CCR management activities at BRF, including closure of CCR facilities, protect human health and the environment.

#### 3.2.1.2 Groundwater Use

As documented previously (TVA 2002), a 1999 survey of water wells in the BRF vicinity indicated there are 17 domestic wells within approximately 1 mile of the BRF dry ash stacking area. The 1999 survey was confirmed by review of a 2004 database update from TDEC (TVA 2005). In accordance with the Environmental Investigation Plan (EIP) developed in cooperation with TDEC, TVA will conduct an updated water-use survey. The purpose of the water-use survey is to determine the amount of surface water and groundwater (i.e., water wells or springs) for domestic usage by local residents and TVA (TVA 2017b). Well depths are unknown, but it is likely that most yield water at a relatively shallow depth in the Chickamauga Formation. Most residences located northeast and northwest of the BRF reservation rely on public water provided by the Clinton Utility Board. None of the residential wells are located downgradient of the proposed facility (TVA 2005). There is no potential for future development of groundwater supplies downgradient of the facility, as all property between the proposed facility and surface water boundaries lies within the BRF reservation (TVA 2012). However, in order to ensure that impacts are minimized, and in accordance with the EIP, TVA in cooperation with TDEC will implement the water use survey, conduct a verification plan to establish well characteristics and groundwater use, and conduct additional sampling and analysis, as appropriate (TVA 2017b).

#### 3.2.1.3 Groundwater Quality

Figure 3-1 identifies the network of existing groundwater monitoring wells in the vicinity of Sluice Channel and the Fly Ash Impoundment. Statistical analyses have been performed on monitoring wells in the immediate vicinity of the Fly Ash Impoundment (BRF-1, BRF-S, BRF-10-51, and BRF-10-52) using laboratory analytical results from 2000 through August 2014. Time series analyses have been developed for antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium, zinc, turbidity and total suspended solids. The time series for metals are developed using the total metals analysis results.

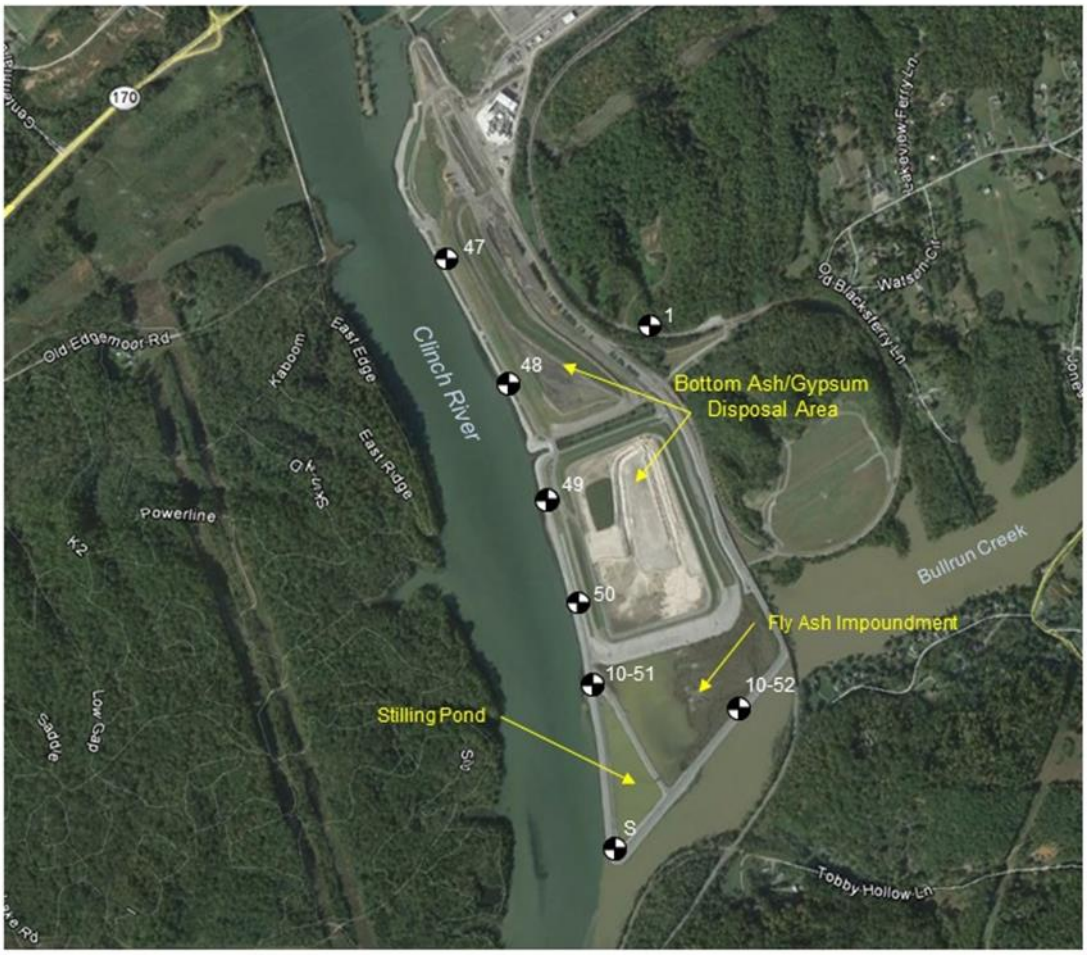


**Figure 3-1. Network of Groundwater Monitoring Wells Near Fly Ash Impoundment and Stilling Pond at BRF**

Subsequent to the completion of the PEIS, TVA continued voluntarily to sample and monitor groundwater near the Fly Ash Impoundment and submit the data to the state. Constituent concentrations from groundwater samples taken from the monitoring wells in the vicinity of the Fly Ash Impoundment exceeded the state Ground Water Protection Standard (GWPS) for arsenic (BRF-10-52); this is consistent with past results in which arsenic at BRF-10-52 has exceeded the state GWPS of 0.010 milligrams per liter (mg/L) since sampling began at this well in 2010. Concentrations have typically ranged from approximately 0.026 to 0.034 mg/L and appear stable. Barium concentrations at BRF-10-51 have consistently been reported as less than 0.100 mg/L; concentrations at BRF-10-52 have consistently been less than 0.650 mg/L. Exceedances of the state GWPS of 2 mg/L for barium have not been reported at either well since 2014. The remaining samples and parameters exhibit trends that appear stable or non-detectable and do not exceed their applicable state GWPS.

### 3.2.2 Environmental Consequences

#### 3.2.2.1 Alternative A – No Action

Under this alternative, the Stilling Pond and the southern portion of the Fly Ash Impoundment would be closed in place and repurposed for use as a Process Water Basin. Repurposing of the southern portion of the Fly Ash Impoundment and the Stilling Pond would entail installation of an approved low permeability liner that would isolate surface water above the liner and prevent groundwater contact.

Consequently, as previously described in the prior SEA (TVA 2017a), potential impacts to groundwater from in-place closure of a portion of the Fly Ash Impoundment and repurposing of a portion of the Fly Ash Impoundment and the Stilling Pond are expected to be minor and beneficial.

#### 3.2.2.2 Alternative B – Temporarily Cover a Portion of the Fly Ash Impoundment, Closure-by-Removal of the Remaining Portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway

Under this alternative, a portion of the Fly Ash Impoundment and the entire Stilling Pond would be Closed-by-Removal and would be repurposed for a Process Water Basin. The portion of the Fly Ash Impoundment that is not included as part of the repurposed area would be temporarily covered, with a cover system that adheres to the same standards as the closure plan described in the June 2016 Programmatic NEPA Review (TVA 2016).

As described in the PEIS (TVA 2016), the dewatering and subsequent lack of rainfall infiltration into the CCR materials in the temporarily covered portion of the Fly Ash Impoundment will provide an immediate reduction in the potential downward influx of leachate moving from these areas. Under Alternative B, reduction of the water level or water pressure in the Fly Ash Impoundment is expected to reduce mounding of the surficial aquifer, reduce vertical leaching of CCR constituents and reduce groundwater impacts in a manner similar to that previously described in Part II of the PEIS. The Stilling Pond and Closed-by-Removal portion of the Fly Ash Impoundment would be regraded, if necessary, and any residual CCR would be removed, dried and placed in a permitted solid waste facility.

Repurposing of the Closed-by-Removal portion of the Fly Ash Impoundment and the Stilling Pond would entail installation of an approved low permeability liner that would isolate surface water above the liner and prevent groundwater contact.

Consequently, as previously described in Part II of the PEIS, proposed impacts to groundwater from the temporarily covered portion of the Fly Ash Impoundment and the repurposed portion of the Fly Ash Impoundment and Stilling Pond following Closure-by-Removal are expected to be beneficial. Additionally, TVA will follow a closure plan approved by TDEC and implement any supplemental mitigation measures required pursuant to the 2015 TDEC Administrative Order. Supplemental mitigation could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the EIP (TVA 2017b). Therefore, impacts to groundwater relative

to the previous assessment of the proposed action documented in the prior SEA (TVA 2017a) are similar and minor.

## 3.3 Surface Water

### 3.3.1 Affected Environment

#### 3.3.1.1 Regional Surface Water Systems

The regional surface water features and water quality in the vicinity of the BRF plant is detailed in Part II of the PEIS for Surface Water (TVA 2016).

#### 3.3.1.2 Surface Water of BRF Ash Impoundments

As described in Part II of the PEIS, BRF has several existing wastewater streams that are permitted under NPDES Permit TN0005410. Because the Fly Ash Impoundment discharge (Outfall 001) is the primary wastewater stream potentially affected by the proposed project, it is the only existing BRF wastewater discharge stream discussed here. About 8.83 million gallons per day (MGD) of effluent is discharged from the Fly Ash Impoundment through NPDES Outfall 001 at river mile 48. Primary contributing sources (greater than 1 MGD) include the sump flows and low volume waste streams, boiler bilge sump, main station sump (equipment cooling water and leakage, service bay floor drainage, plant leakage – boilers, and roof drains) and the stack yard sump. The current NPDES permit contains limitations on the ash impoundment discharge with respect to pH, oil and grease, total suspended solids, and toxicity. This permit also requires reporting of total nitrogen, cyanide and 15 metals including total aluminum, antimony, arsenic, barium, beryllium, cadmium, copper, iron, lead, mercury, nickel, selenium, silver, thallium, and zinc. Recent data indicates that the pH of the Fly Ash Impoundment discharge ranged from 7.01 to 8.29; the oil and grease levels ranged between 4.27 and 5.88 mg/L; and total suspended solids levels ranged between 2.5 mg/L and 10 mg/L (TVA 2016). All discharges were within regulatory limits. Additionally, BRF has met aquatic whole effluent toxicity monitoring, which further indicates that this plant's discharge is not impacting aquatic organisms or water quality.

To evaluate and characterize discharges from Outfall 001, an analysis was conducted to summarize the average historical discharges and the instream mixing concentration from BRF (Table 3-1).

Results of the mixing analysis summarized in Table 3-1 demonstrates that all of the constituents, except thallium, met the TDEC strictest water quality criteria (i.e., limit equal to the minimum of the applicable stream designated criteria). The thallium exception is an artifact produced by high level calculations that do not account for data with values below detection limits, and the fact that the thallium laboratory analysis detection limit of 0.001 mg/L exceeds the TDEC criterion of 0.00024 mg/L.

**Table 3-1. BRF Mixing Analysis of Historical Operations**

| Element | Current Baseline | Current Operations | | Water Quality Criteria * Conc., (mg/L) |
|---|---|---|---|---|
| | Intake Conc. (mg/L) | Ash Stilling Pond*** Conc. (mg/L) | Total Discharge Conc. at Clinch River 1Q10 (mg/L) | |
| Aluminum | 0.120 | 0.282 | 0.13661 | |
| Antimony | <0.001 | 0.002 | 0.00062 | 0.0056 |
| Arsenic | <0.001 | 0.0089 | 0.00136 | 0.01 |
| Barium | 0.032 | 0.046 | 0.03338 | 2.0 |
| Beryllium | <0.001 | <0.002 | 0.00055 | 0.004 |
| Cadmium | <0.001 | 0.00697 | 0.00116 | 0.002 |
| Chromium | <0.001 | 0.00187 | 0.00064 | 0.1 |
| Copper | 0.0014 | 0.0032 | 0.00159 | 0.013 |
| Iron | 0.130 | 0.463 | 0.16414 | |
| Lead | <0.001 | 0.001 | 0.00060 | 0.005 |
| Manganese | 0.048 | 0.108 | 0.05415 | |
| Mercury | 0.00000089 | 0.00000228 | 0.0000010 | 0.00005 |
| Nickel | 0.0014 | 0.00484 | 0.00175 | 0.1 |
| Selenium | <0.001 | 0.006 | 0.00104 | 0.02 |
| Silver | 0.00051 | <0.002 | 0.00056 | 0.0032 |
| Thallium | <0.001 | <0.001 | 0.00050 | 0.00024 |
| Zinc | <0.01 | 0.0177 | 0.00226 | 0.13 |
| lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal. | | | | |
| CCW Flow | 129.3 | | | |
| | | | | |
| Stilling Pond Flow | 14.8 | | | |
| Flows taken from NPDES flow schematic 2013 for permit, except average flow data was taken for Outfall 001 maximum discharges. | | | | |
| Mass Discharge and Loadings were calculated using 0.5 the Minimum Detection Limit | | | | |
| *TDEC Criteria, Rule 0400-40-03 | | | | |

### 3.3.2 Environmental Consequences

#### 3.3.2.1 Alternative A – No Action

Under this alternative, construction and operational effects would be identical to that described in the prior SEA (TVA 2017a). The mixing analysis indicated that the proposed repurposed Process Water Basin is expected to maintain or improve the quality of water that would be discharged. Additionally, waste water would be managed and treated in lined basin(s), thus eliminating any potential seepage. Furthermore, mitigative measures would be introduced to ensure that discharge waters comply with NPDES permit limits and TDEC water quality criteria. These measures could include but would not be limited to implementing BMPs, waste water treatment technologies, and/or rerouting or recycling water. Therefore, with proper treatment implementation, these waste streams from the

proposed impoundment would not be expected to negatively impact surface water quality. Additionally, TVA would conduct a characterization to confirm no significant impacts to the Clinch River. The waters would be analyzed for metals and other parameters.

Because surface water flow and potential underseepage and groundwater releases to surface waters would be eliminated, and because all work would be done in compliance with applicable regulations, permits, and best management practices, potential direct and indirect impacts of this alternative to surface waters would be negligible.

#### 3.3.2.2 Alternative B – Temporarily Cover a Portion of the Fly Ash Impoundment, Closure-by-Removal of the Remaining Portion of the Fly Ash Impoundment and Repurposing into a Process Water Basin, Closure-by-Removal of the Stilling Pond and Repurposing into a Process Water Basin, and Development of a Process Water Basin Emergency Spillway.

BRF currently operates a Fly Ash Impoundment at the southern edge of the plant property, adjacent to the Clinch River to the west and Bullrun Creek to the south. A new lined trench has been constructed adjacent to the previous sluice trench and is now in service. The trench currently conveys process water streams to the Fly Ash Impoundment and Stilling Pond. Under this alternative, approximately 20 acres of the 33-acre Fly Ash Impoundment would be temporarily covered. The remaining portion of the Fly Ash Impoundment and the Stilling Pond would be Closed-by-Removal, lined and repurposed for the Process Water Basin.

By using engineering controls, the temporarily covered portion of the Fly Ash Impoundment would be dewatered of free water into the proposed Process Water Basin once completed and all remaining CCR material would be consolidated and compacted in place. A temporary cover system would be installed similar to that described in the PEIS (TVA 2016). Under the proposed action, all systems currently discharging wastewater to the impoundment and Stilling Pond would be rerouted to the proposed Process Water Basin. Surface water management under this alternative would be similar to that described in the prior SEA.

The proposed emergency spillway of the Process Water Basin would not impact any surface water under normal operating conditions. Water release at the spillway would be for emergency purposes only.

Wastewater generated during the proposed project may include construction stormwater runoff, dewatering of work areas, domestic sewage, non-detergent equipment washings, dust control, and hydrostatic test discharges. The scope and magnitude of wastewater generated under this alternative is expected to be similar to that evaluated in the selected alternative under the prior SEA (TVA 2017a). Therefore, impacts to surface water resources relative to the No Action alternative are similar and minor.

No substantive changes in operation of the proposed Process Water Basin are proposed relative to that considered for the selected alternative under the prior SEA (TVA 2017a). As stated in the prior SEA, the main operational change to occur with the closure of the Fly Ash Impoundment and the Stilling Pond is the onsite storm water and process wastewater operation that is currently treated and discharged from the Fly Ash Impoundment and Stilling Pond. Re-routing of these waste streams would use onsite non-CCR impoundments and the lined process trench to enable proper handling and treatment of the waste streams.

Mitigation measures, such as storm water BMPs and wastewater treatment would be employed, as needed, to mitigate any pollutant discharge.

Because surface water flow and potential underseepage and groundwater releases to surface waters would be eliminated, and because all work would be done in compliance with applicable regulations, permits, and best management practices, potential direct and indirect impacts of this alternative to surface waters would be negligible.

## 3.4 Relationship of Short-Term Uses and Long-Term Productivity

There would be no changes in short-term use or long-term productivity of the land designated for ash impoundment closure or repurposing as part of the BRF wastewater treatment system. These facilities would be located within the property already used by TVA for ash management or water treatment. Additionally, the proposed actions occur within a landscape subject to on-going human disturbance and maintenance; therefore, the short-term use of the land is not expected to significantly alter long-term productivity of wildlife or other natural resources.

## 3.5 Irreversible and Irretrievable Commitments of Resources

As described in Part I of the PEIS, there would be minor irreversible and irretrievable commitments due to the preferred action. No irreversible and irretrievable commitments associated with groundwater or surface water resources other than those discussed in the PEIS would result from Alternative B.

## 3.6 Cumulative Effects

The cumulative impacts of the proposed closure and repurposing of the Fly Ash Impoundment and the Stilling Pond was assessed in this SEA and in combination with the previous assessments described in the PEIS (TVA 2016) and the October 2017 SEA (TVA 2017a), and it has been determined that relevant past, present, and reasonably foreseeable future actions that had the potential to, in conjunction with the proposed action, have a cumulatively greater effect on the environment included the following:

- Mechanical Dewatering Facility
- House Demolition
- New CCR Dry Storage Landfill

No other foreseeable future actions are known within the project vicinity. Because the proposed action would result in environmental effects that are equal to or less than those identified in Part II of the PEIS, no additional cumulative effects are expected with the proposed action.

# CHAPTER 4 – LIST OF PREPARERS

## 4.1 NEPA Project Management

| | |
|---|---|
| Name: | **Ashley Farless, PE, AICP (TVA)** |
| Education: | B.S., Civil Engineering |
| Project Role: | TVA Project Manager |
| Experience: | Professional Engineer and Certified Planner, 15 years in NEPA Compliance |

| | |
|---|---|
| Name: | **Bill Elzinga (Amec Foster Wheeler)** |
| Education: | M.S. and B.S., Biology |
| Project Role: | Project Manager, NEPA Coordinator |
| Experience: | 34 years experience managing and performing NEPA analyses for electric utility industry, and state/federal agencies; ESA compliance; CWA evaluations |

## 4.2 Other Contributors

| | |
|---|---|
| Name: | **James Feild, PhD (Amec Foster Wheeler)** |
| Education: | M.S., Hydrogeology and B.S., Marine Geology |
| Project Role: | Groundwater |
| Experience: | 18 years experience in Remediation, Investigation, Compliance, Drilling and Well Installation, Subsurface Hydrogeology, Fractured Rock Hydrogeology, Quality Assurance, Health & Safety, Waste Management and Restoration) |

| | |
|---|---|
| Name: | **A. Chevales Williams (TVA)** |
| Education: | B.S. Environmental Engineering |
| Project Role: | Surface Water |
| Experience: | 12 years of experience in water quality monitoring and compliance; 10 years in NEPA planning and environmental services. |

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