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FINAL
ASH IMPOUNDMENT CLOSURE PROGRAMMATIC EIS

PART II – SITE-SPECIFIC NEPA REVIEW: BULL RUN FOSSIL PLANT

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, TN

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Ashley R. Farless, PE, AICP
NEPA Compliance
Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402
Phone: 423-751-2361
Fax: 423.751.7011

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Table of Contents

List of Appendices

List of Tables

List of Figures

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Symbols, Acronyms, and Abbreviations

≥	Greater Than or Equal To
ug/L	Micrograms per Liter
AADT	Annual Average Daily Traffic
BRF	Bull Run Fossil Plant
BMP	Best Management Practices
BRCRP	Bullrun Creek Restoration Partnership
CCR	Coal Combustion Residuals
CRM	Clinch River Mile
CWA	Clean Water Act
dBA	A-Weighted Decibel
DO	Dissolved Oxygen
EJ	Environmental Justice
ELG	Effluent Limitation Guidelines
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
gpm	Gallons Per Minute
GWPS	Ground Water Protection Standard
HUD	U.S. Department of Housing and Urban Development
MCL	Maximum Contaminant Level
MGD	Million Gallons Per Day
m^3/s	Meters Per Second
mi^2	Square Miles
L&N	Louisville and Nashville
Ldn	Day-Night Sound Level
LULC	Land Use/Land Cover
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PM	Particulate Matter
RIF	Relative Impact Framework
SR	State Route
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
USFWS	U.S. Fish and Wildlife Service
yd^3	Cubic Yards

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

The Bull Run Fossil Plant (BRF) is located in Anderson County, Tennessee, about 5 miles (mi) east of downtown Oak Ridge and 13 mi west of Knoxville (Figure 1-1). BRF is operated by Tennessee Valley Authority (TVA) and is located on a 750-acre (ac) reservation on the east side of Melton Hill Reservoir at Clinch River Mile (CRM) 48. The plant adjoins State Route (SR) 170 (Edgemoor Road) between U.S. Highway 25 (Clinton Highway) and SR 162 (Pellissippi Parkway). Most nearby lands are United States Department of Energy reservation properties for the Oak Ridge 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, and it 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) along Stilling Basin Separator Berm

The coal combustion residuals (CCR) generated by the plant include fly ash, bottom ash, and flue gas desulfurization gypsum. Disposal areas for CCRs include a dry fly ash stack located east of the BRF Plant and a system of wet CCR disposal areas located south of the BRF Plant, ending at the convergence of Bullrun Creek and the Clinch River. The BRF Sluice Channel and Fly Ash Impoundment are part of the wet CCR disposal area (Figure 1-2) (URS 2011). Table 1-1 summarizes the general characteristics of the CCR impoundments subject to closure at BRF.

This site-specific National Environmental Protection Policy (NEPA) review tiers off the programmatic level review provided in Part I.

1.2 Decision to be Made

TVA must decide how to close two wet management CCR facilities at BRF. TVA's decision will consider 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 this site-specific action is to support the implementation of TVA's stated goal of eliminating all wet CCR storage at its coal plants by closing the Sluice Channel and Fly Ash Impoundment at BRF, and to assist TVA in complying with the U.S. Environmental Protection Agency (EPA)'s CCR Rule.

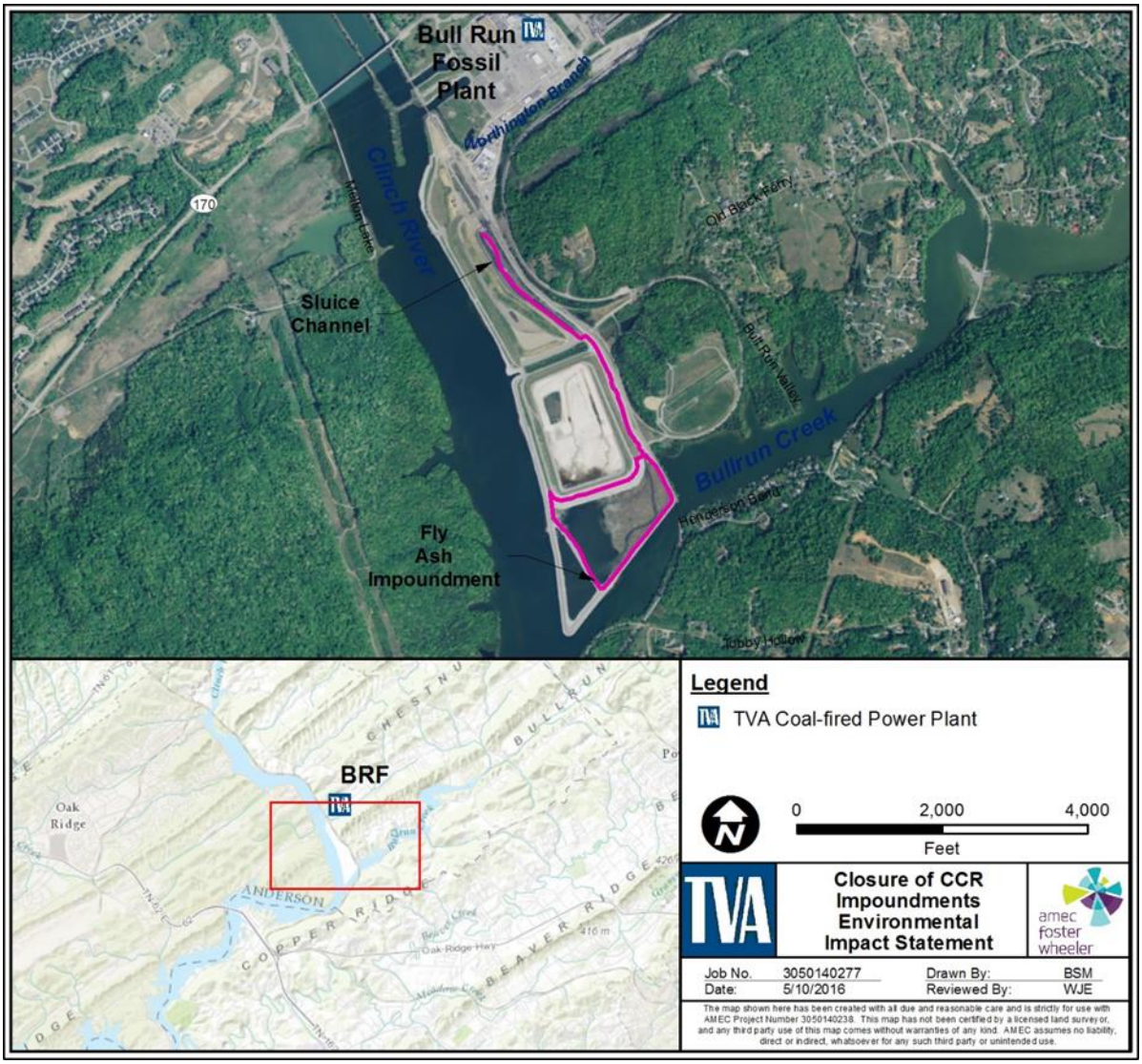

Figure 1-1. BRF Project Location

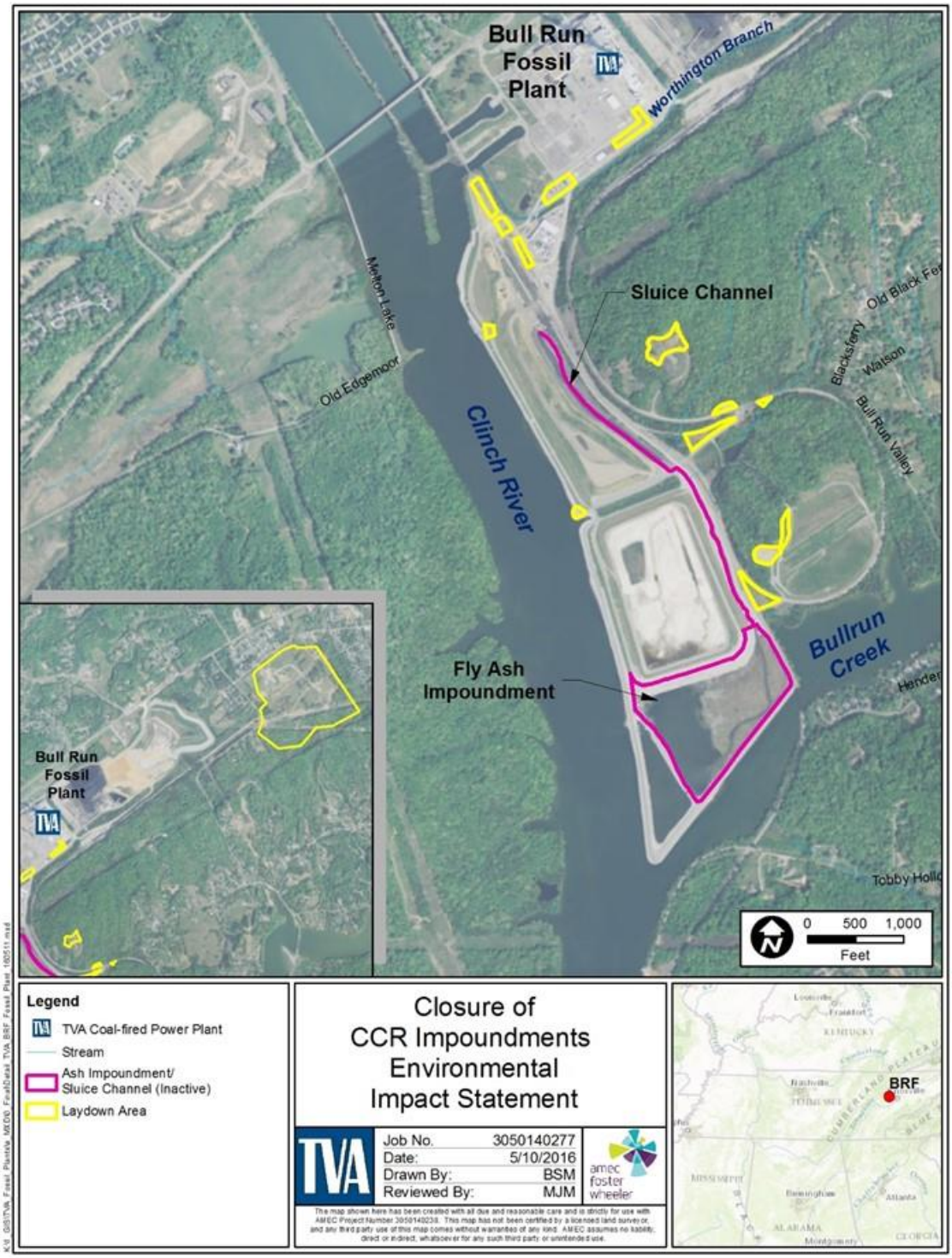

Figure 1-2. Ash Impoundment Closure Utilization Areas at BRF

Table 1-1. Summary of Sluice Channel and Fly Ash Impoundment Characteristics

Attribute	Description
Location	Anderson County, Tennessee
Impoundment Name	Sluice Channel and Fly Ash Impoundment
Impoundment Status	Inactive
Size	5.5 ac for Sluice Channel; 33 ac for Fly Ash Impoundment
CCR Material	Bottom Ash/Fly Ash
CCR Volume	3,500,000 cubic yards (yd^3)
Borrow Material Volume	250,000 yd^3
Temporary Laydown Areas	5 to 10 ac
Proposed Closure Completion Date	Within 5 years

1.4 Summary of Proposed Action

TVA proposes to close the inactive Sluice Channel and Fly Ash Impoundment at BRF by using an approved closure methodology. The proposed action is described in detail in Chapter 2

CHAPTER 2 - ALTERNATIVES

This section tiers off the programmatic level alternatives narrative in Part I.

2.1 Existing Impoundment Operations

The Fly Ash Impoundment has not received CCR since November 2010, but continues to receive non-CCR wastewater flow. Because the site has previously received CCRs and contains both CCR material and water, it is considered an inactive impoundment for the purposes of the CCR Rule.

The Bottom Ash and Gypsum Disposal areas at BRF were developed in 2007 and have not received CCRs since September 2015. These sites do not impound water and are maintained in accordance with the existing BRF solid waste permit. These sites are considered inactive landfills and are not governed by the CCR Rule. Both the bottom ash and gypsum material streams are dewatered and new material is disposed of on-site at the current Dry Fly Ash Stack located east of the plant. On-site CCR management capacity is limited, and TVA is currently evaluating options for management of CCRs generated at BRF including possibly building a new landfill.

There are several existing wastewater streams that are permitted under National Pollutant Discharge Elimination System (NPDES) Permit No. TN0005410. Because the Fly Ash Impoundment discharge (Outfall 001) is the primary stream potentially affected by the proposed project, it is the only existing BRF wastewater stream discussed here. About 8.83 million gallons per day (MGD) of effluent is discharged from the CCR 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.

2.2 Project Alternatives

TVA evaluated the three alternatives for closing BRF's Sluice Channel and Fly Ash Impoundment: Alternative A – No Action, Alternative B – Closure-in-Place, and Alternative C – Closure-by-Removal. Screening analysis to determine the reasonability of the "action" alternatives was undertaken by evaluating a range of key issues and factors related to the Sluice Channel and Fly Ash Impoundment at BRF and the feasibility of undertaking closure activities (Figure 2-1).

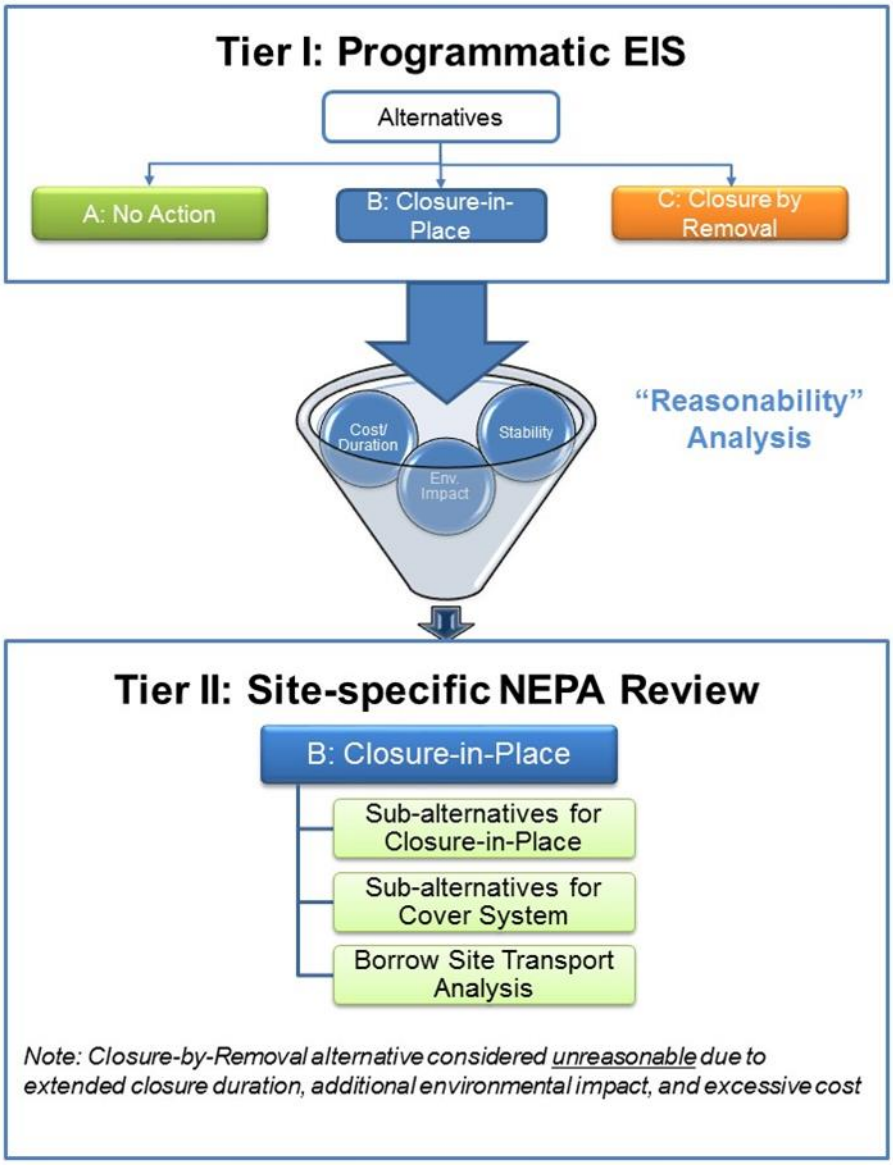

Figure 2-1. Reasonable Alternatives Analysis for BRF Sluice Channel and Fly Ash Impoundment

Key factors that TVA considered included the following:

Volume of CCR Materials. The size of an impoundment and volume of CCR may affect closure activities and appropriateness of an alternative. The Sluice Channel and Fly Ash Impoundment are estimated to contain 3,500,000 yd^3 of CCR materials.

Schedule/Duration of Closure Activities. Time necessary to complete closure activities at a CCR impoundment will affect the reasonability of closure alternatives. EPA initially structured its CCR Rule to encourage regulated entities to cease disposing of CCRs in impoundments by October 19, 2015, and complete closure activities by April 2018 (EPA 2015). As promulgated, EPA excluded impoundments closed by April 2018 from the rule's other substantive requirements. In spring 2016, however, EPA agreed to remove this exemption from the rule because the agency failed to provide an opportunity for notice and comment on the exclusion. This change does not affect EPA's technical determination that removing the hydraulic head by dewatering and closing impoundments substantially reduces the risks of structural failures and groundwater contamination. Because of this pending regulatory change, TVA decided not to use the April 2018 incentive closure date as a significant factor in its consideration of the reasonableness of Closure-in-Place or Closure-by-Removal. Instead, TVA takes into account the 5-year timeframe that EPA set for completing impoundment closures, 40 CFR §257.102(f). Closing earlier rather than later is preferable from an environmental standpoint, and this still remains an important consideration in TVA's analyses.

Stability. Stability of TVA's CCR facilities were evaluated by Dewberry Consultants (2012). Safety ratings under static conditions were determined to be adequate for the Sluice Channel and Fly Ash Impoundment. TVA is currently evaluating the seismic stability of all CCR facilities (including the Sluice Channel and Fly Ash Impoundment) and will make appropriate modifications to ensure that the berm stability is at a level that meets or exceeds industry acceptable factors of safety using conservative assumptions. The proposed closure grades of the facilities will be evaluated prior to construction and any needed improvements to the berms will be made as part of the closure system construction. The Sluice Channel and Fly Ash Impoundment have ceased receipt of CCR materials and water levels are being reduced consistent with the plant's NPDES permit. Consequently, hydraulic loading due to wet transport to the impoundment has been reduced to *de minimis* levels. Closure of the CCR units will also include a rerouting of all process waters around the CCR units, further reducing hydraulic inputs and enhancing stability.

Risk to Human Health and Safety Relating to Closure Activities. Closure activities entail a range of construction activities that represent a potential risk to the health and safety of the workforce and the public. Worker safety is a particular concern as heavy equipment and difficult working conditions would occur for any closure activities. However, deep excavations into the CCR impoundment required under the Closure-by-Removal Alternative are particularly dangerous as noted by reports of accidents leading to injury or death in the industry. As discussed in *Challenges of Closing Large Fly Ash Ponds*, accidents, near misses and fatalities have been reported at impoundments during operations and closure activities (Seymour, et. al. 2013 and Johnson 2014). Equipment, such as bulldozers and trucks, can become bogged down, disabled and engulfed. For example, while removing fly ash from an impoundment in Kentucky, an excavator was operating approximately 200 ft from the side of the impoundment when the exposed surface of the fly ash slid over an underlying soft, apparently saturated area carrying the excavator and killing its operator.

Closure-by-Removal also would require a substantially greater number of truck movements into and out of the site which would increase the risk of injuries and

fatalities associated with truck crashes (see Part I, Chapter 2). As the number of truck movement miles increase, both for Alternatives B and C, the risk of traffic crashes, including personal injuries and fatalities, increases.

Mode and Duration of Transport Activities. As described in Part I, Section 2.2, the activities related to transport of borrow (Alternative B) and CCR removal and transport (Alternative C) by truck or rail require the use of large numbers of vehicles and operators. The Sluice Channel and Fly Ash Impoundment contain approximately 3,500,000 yd^3 of CCR. For sites like BRF with CCR volumes exceeding 600,000 yd^3, TVA determined that insufficient time is available within the construction schedule to effectively remove the CCR materials by truck or rail and achieve closure of inactive impoundments within the 5-year period for closure. It is estimated that it would take 24.7 years to transport BRF's CCR by truck and 24.3 years by train to a permitted landfill.

For those impoundments containing greater than 600,000 yd^3 of CCR the duration of removal activities by truck would extend closure activities for prolonged periods and would likely result in greater environmental impacts associated with noise and emissions, degradation of roadway infrastructure, increased risk of injuries and death, and increased potential for accidental release.

Transport of CCR by rail must consider the volume of CCR materials to be removed (cost-effectiveness and duration of removal operations), logistics related to supporting infrastructure (constructing and permitting loading and unloading facilities), the availability of rail service at receiving landfills and transport of suitable borrow material to the closure site. The duration of CCR removal by rail is generally expected to be similar to that of truck transport because rail loading operations are highly dependent on the rate at which CCR can safely be excavated, dried and moved to rail loading facilities.

Potential Effects to Water Resources. Potential human health risk was also considered by reviewing the results of groundwater monitoring and the incidence of surface water releases from the Sluice Channel and Fly Ash Impoundment to receiving waterbodies. No records of releases or issues of concern are known that represent a risk to human health from CCR constituents associated with the existing impoundments.

Potential Effects to Wetlands. Under the Clean Water Act, wetlands are considered "special aquatic sites" deserving of special protection because of their ecologic significance. Wetlands are important, fragile ecosystems that must be protected, and EPA has long identified wetlands protection as a high priority. Initial screening analysis by TVA determined that for both Alternatives B and C, proposed actions would not cause or contribute to significant degradation of wetlands; and that appropriate measures could be taken to avoid and minimize impacts to wetlands and ensure no net loss of wetlands.

Risk to Adjacent Environmental Resources. Risk of potential release and degradation of sensitive environmental resources (air, groundwater, surface water, ecological receptors, and natural resources, and factors related to the human environment) with a defined nexus to the CCR impoundment is an important consideration for alternative development.

Initial screening analysis by TVA determined that for both Alternatives B and C, proposed actions would not cause or contribute to violations of any applicable state water quality standard, violate any applicable toxic effluent standard or prohibition, or jeopardize the continued existence of endangered or threatened species or critical habitats.

Excessive Cost. Excessive closure costs may affect the reasonableness of an alternative.

Other factors affecting cost-effectiveness of transport of CCR, and not related to engineering and infrastructure, include availability of materials for construction, availability of labor, availability of permitted landfills, fuel costs, and other economic factors.

2.2.1 Alternatives Eliminated from Further Consideration

2.2.1.1 Alternative A – No Action Alternative

The No Action Alternative was fully evaluated in Part I and was determined to not meet the purpose and need of achieving the TVA goal of closing CCR impoundments. Therefore, Alternative A – No Action Alternative is not included in the site-specific analysis.

2.2.1.2 Alternative C – Closure-by-Removal

As described above, two action alternatives were evaluated by TVA for potential consideration in a site-specific review of reasonable alternatives at BRF. Alternative C – Closure-by-Removal was eliminated from detailed consideration as it was determined to be unreasonable. Key factors contributing to the elimination of this alternative from further consideration included:

Excessive volume of CCR materials (3,500,000 yd^3).

On-site landfill capacity is limited and therefore CCR materials would need to be transported off-site to an existing permitted Subtitle D landfill.

Extended duration of normal removal operations (estimated to be 24.7 years of trucking at 100 trucks per day).

While the CCR Rule specifies a 5-year closure window, it is anticipated that up-front permitting and planning will take 6 months and post-closure site restoration and permit close-out will take 6 months. Thus, a 4-year window is used for the timeframe for hauling of CCR from the site. So the number of trucks to accomplish removal within a 4-year closure period would result in 350,000 total truck loads (583 truckloads per day, Figure 2-2) to the nearest Subtitle D landfill. It is estimated that this would equate to approximately 65 loaded trucks passing by a given location each hour (a little over one truck per minute) or 130 truck trips each hour (two trucks per minute) (factoring in the return trip).

- Potential safety concerns associated with increased motor vehicle crashes as described above and in Part I, Chapter 2.

- Potential impacts related to increased air and noise emissions associated with transport of CCRs to the nearest permitted Subtitle D Landfill.

- Potential impacts to environmental justice populations located adjacent to SR 170 (Edgemoor Road), which likely would be used by trucks to access BRF as they travel to and from the nearest permitted Subtitle D Landfill.

- Significant transportation related impacts related to degradation of local roadways, traffic congestion and safety issues (especially along Edgemoor Road) and localized air and noise emissions to receptors along haul routes.

- Deep excavations into the ash impoundment required under the Closure-by-Removal alternative are particularly dangerous as noted by reports of accidents leading to injury or death in the industry as discussed above in Section 2.2.

- Removal of CCR by rail was also considered by TVA for Closure-by-Removal of the Sluice Channel and Fly Ash Impoundments at BRF. In Part I, Chapter 2.0, TVA identified factors to determine whether transport of CCR by rail would be reasonable. Those factors include volume of material; distance from the impoundment to a permitted landfill; availability of the infrastructure to manage the transfer of material; cost effectiveness; and schedule. Applying these factors to the removal of CCR from the Sluice Channel and Fly Ash Impoundment at BRF, transport by rail is unreasonable due to the cost and closure schedule (see Table 2-1). Rail transport would require the installation of loading infrastructure, and a rail transportation service in the form of a rail carrier. Additional rail infrastructure may need to be constructed at or very near a Subtitle D landfill. The components of a rail unloading infrastructure may include: clamshell buckets to move the CCR off the train to a stockpile area prior to being placed on trucks and conveyors or loaders to load the CCR onto trucks; and infrastructure to support trucking to the landfill site. The necessary environmental and construction permits to construct these facilities could easily take 18 to 24 months to acquire. Rail cars may need to be lined to prevent spills or releases as was the case for the removal of CCR at KIF. Given the closure schedule for this impoundment, the costs and environmental impacts associated with development and permitting of the required loading and unloading infrastructure, use of rail to transport CCR from this site would not be feasible.

- Excessive removal cost in comparison to Closure-in-Place includes CCR excavation and transport, borrow transport and placement. ($274 million for truck transport and $287 million for rail transport) (see Table 2-1).

- In addition, under Alternative C, CCR would be removed and placed in an appropriate receiving landfill. This may include a Subtitle D Landfill or a former mine. This activity introduces uncertainty into the schedule due to the possibility of environmental justice or permit challenges concerning the destination landfill. For example, when TVA removed CCR to the Arrowhead Landfill after the Kingston coal ash spill, some nearby residents opposed the placement of CCR in that landfill even though Alabama's and Tennessee's environmental agencies (ADEM and TDEC, respectively), EPA, and the Perry County Commission approved it. Local residents subsequently filed a complaint at EPA's Office of Civil Rights, alleging that the landfill disproportionately harmed the surrounding minority property owners. Similarly, despite receiving state approval to move ash from its impoundments to former clay mines and agreeing to line the mines, Duke Energy has encountered local resistance and legal challenges from residents living near the mines.

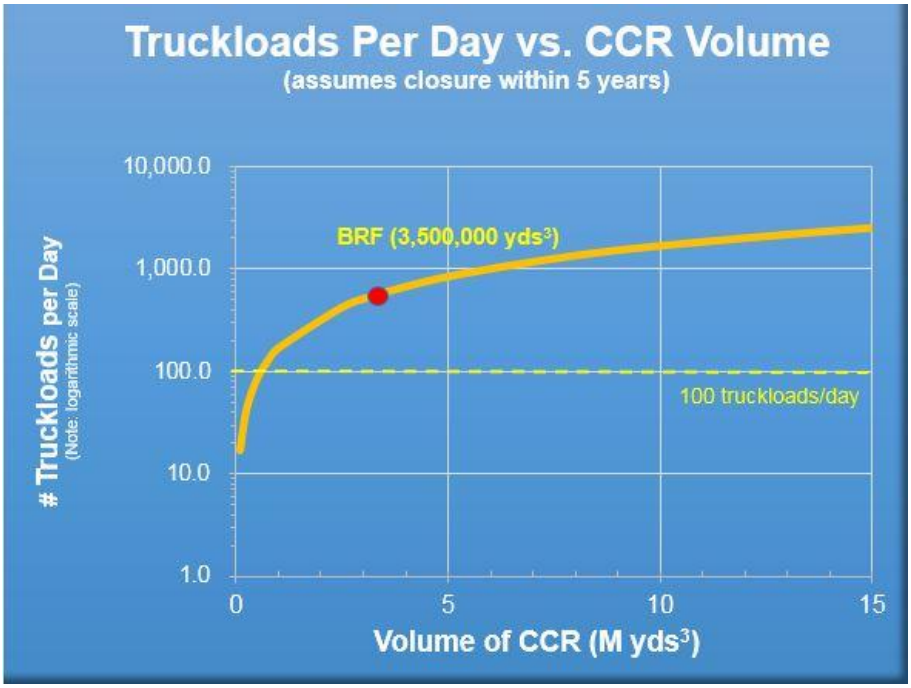

Figure 2-2. Number of Truckloads vs. CCR Removal Volume

2.2.2 Reasonable Alternatives Retained for Further Analysis

As illustrated in Figure 2-1, two action alternatives were evaluated by TVA for potential consideration in a site-specific review of reasonable alternatives at KIF. Alternative B was determined to be the only reasonable alternative for consideration of closure of the Stilling Impoundment and Sluice Trench.

Alternative B – Closure-in-Place

Construction activities associated with the closure of the Sluice Channel and Fly Ash Impoundment will entail direct disturbance of the CCR impoundment and disturbance of supporting laydown areas (see Figure 1-2). TVA anticipates temporarily using approximately 5 to 10 ac within the laydown areas for vehicle and equipment parking, materials storage, and construction administration. Conceptual designs for the in-place closure of the Sluice Channel and Fly Ash Impoundment are provided in Appendix A. Under this alternative approximately 250,000 yd^3 of borrow material would be hauled from one or more previously developed sites within 30 mi of BRF. The BRF Stilling Impoundment would continue to be used for low volume plant flows.

TVA would consider the opportunities for beneficial use of CCR as part of any closure method. TVA has completed its beneficial use analysis for the bottom ash at BRF under the CCR Rule and has concluded that it meets the beneficial use criteria. Accordingly, it could be used as fill to close the fly ash pond and avoid the impacts associated with moving fill material to the site. The extent to which bottom ash may be used will be addressed as TVA planning moves from conceptual design and engineering to final design. That depends in the first instance on whether TVA decides to close in place.

Activities associated with this action would include the following:

1. Dewater surface water from the impoundment.
2. Reroute conveyances sending storm water and wastewater to the Stilling Impoundment for final treatment.
3. Determine the extent to which bottom ash will be used to close the fly ash pond as part of final design and engineering.
4. Grade and reconfigure CCR (Category C) to consolidate CCR, reduce footprint, and promote site drainage.
5. Acquire and transport additional borrow material as needed to help grade and cover site, depending on the extent to which bottom use is used in the final closure design.
6. Install approved cover system (Geosynthetic-Protective Soil Cover System or Engineered Synthetic Turf Cover System).
7. Install protective soil cover and establish vegetation.
8. Install and operate groundwater monitoring system.
9. Complete and submit closure documentation.

TVA has identified a closure cover system for BRF that is designed to have a permeability performance standard of 1 x 10^{-7} or better – 100 times lower (better) than that prescribed by EPA in the Final Rule.

Because the Sluice Channel and Fly Ash Impoundment were not considered to have a stability risk, no measures to improve stability are anticipated during the closure process (Dewberry 2012).

Alternative B is estimated to cost $13 million.

This closure alternative is evaluated in further detail in the Environmental Consequences section as it is an alternative that could meet the purpose and need of the project. It could be accomplished within 5 years.

Table 2-1. Cost and Duration for Closure of the Sluice Channel and Fly Ash Pond at BRF

Closure-in-Place		Closure-by-Removal (Truck)			Closure-by-Removal (Rail)		
Cost (millions)	**Duration (years)**	**Cost (millions)**	**Increase in Cost from Closure-in-Place (percent)**	**Duration (years)**	**Cost (millions)**	**Increase in Cost from Closure-in-Place (percent)**	**Duration (years)**
$13	1.7	$274	2008%	24.7.1	$287	2108%	24.3

2.3 EPRI Relative Impact Framework

As was described in Part I, Section 2.3, the Electric Power Research Institute (EPRI) has developed a comprehensive analytical tool, the "Relative Impact Framework" (RIF) to assess and compare the potential health and environmental impacts of the two CCR impoundment closure alternatives, Closure-in-Place and Closure-by-Removal (EPRI, 2016c). The RIF provides a systematic approach to quantify potential relative impacts to environmental media associated with each closure scenario, including constituents in groundwater, surface water, and ambient air. In addition to environmental media, the RIF also provides an approach to quantify potential relative impacts to safety of workers and nearby residents from construction activities, including the transportation of materials to and from the site, in addition to the potential relative impacts to the sustainability of natural resources (e.g., energy, water and materials) associated with each closure alternative.

Part I provides an independent assessment of the health and environmental impacts for each impoundment closure alternative, which the EPRI analysis substantiates. At the programmatic level (Part I), TVA concluded that in most situations, Closure-in-Place likely will be more environmentally beneficial and less costly than Closure-by-Removal, especially when the amount of borrow and CCR material that must be moved to and from a site is substantial.

EPRI qualitatively applied its RIF to specific CCR facilities that TVA is proposing to close. Those analyses are discussed here in Part II for each of the sites for groundwater and surface water. In every instance, potential impacts on air quality, green and sustainable remediation, and safety were the same across all sites and not discussed in further detail. TVA's conclusions drawn from these more site-specific analyses confirm TVA's programmatic conclusions.

2.4 Summary of Alternative Impacts

The environmental impacts of Alternative B are summarized in Table 2-2. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Part I and Chapter 3 of this document.

Table 2-2. Summary and Comparison of Alternatives by Resource Area

Issue Area	Alternative B – Closure-in-Place
Closure Cost	$13 million
Air Quality	Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles
Climate Change	Construction and trucking operations of borrow material contributes to emissions of GHG.
Land Use	No impact as no change in industrial land use
Prime Farmland	No impact
Geology and Seismology	Stable under static conditions. Stability increased by removal of hydraulic head. Seismic stability under evaluation and mitigable.
Groundwater	Reduction of hydraulic input reduces risk of migration of constituents to groundwater.
Surface Water	Risk to surface water would be reduced. Construction-related impacts would be negligible.
Floodplains	Reduces risk and extent of CCR migration into surface water during potential flooding event.
Vegetation	Minor and adverse impact in the short term to largely industrialized environmental settings that lack notable plant communities, but minor and positive in the long term
Wildlife	Minor impact to predominantly previously disturbed low quality habitats. Potential beneficial impacts in the long term.
Aquatic Ecology	No impact
Threatened and Endangered Species	No effect on threatened or endangered species
Wetlands	No impact
Socioeconomic Resources	Short-term beneficial increases in employment, payroll, and tax payments during construction
Environmental Justice	No disproportionate adverse impacts to low-income or minority communities
Natural Areas, Parks and Recreation	No impacts
Transportation	Temporary minor impacts such as traffic turning movements during peak traffic hours on SR 170 (Edgemoor Road) due to construction related traffic
Visual Resources	Minor impacts during construction. Beneficial in the long term.
Cultural Resources	No impacts due to use of previously disturbed lands.
Noise	Temporary minor to moderate impact from transport of borrow material
Solid and Hazardous Waste	Minimal amounts generated during construction activities and managed in permitted facilities
Public Health and Safety	Temporary minor potential for impacts during construction activities and transportation of borrow material
Cumulative Effects	Minor cumulative effects

2.5 Identification of Mitigation Measures

Mitigation measures identified in Part I and Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. TVA's analysis of preferred alternatives includes mitigation, as required, to reduce or avoid adverse effects. Project-specific best management practices (BMPs) are also identified.

- Fugitive dust emissions from site preparation and construction will be controlled by wet suppression and BMPs (Clean Air Act Title V operating permit incorporates fugitive dust management conditions).

- Erosion and sedimentation control BMPs (e.g., silt fences and a truck wash) will ensure that surface waters are protected from construction impacts.

- Consistent with Executive Order (EO) 13112, disturbed areas will be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.

- BMPs will be used during construction activities to minimize and restore areas disturbed during construction.

- TVA will evaluate use of temporary traffic signal as means to minimize traffic impacts from transporting borrow material.

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

2.6 The Preferred Alternative

TVA has identified Alternative B – Closure-in-Place as the preferred alternative. Alternative B would achieve the purpose and need of the project and close the Sluice Channel and Fly Ash Impoundment within the five-year closure period. Alternative B can be completed in a shorter time frame than Alternative C, requires substantially less cost and avoids negative environmental impacts of off-site transfer of CCR.

2.7 Necessary Permits or Licenses

TVA holds the permits necessary for the operation of BRF. Depending on the decisions made respecting the proposed actions, however, TVA may have to obtain or seek amendments to the following permits:

- NPDES Construction Storm Water Permit for storm water runoff from construction activities.

- Modification to the Tennessee Multi-Sector Permit for Industrial Storm Water discharges would be made for the addition of new storm water outfalls.

- BRF's Storm Water Pollution Prevention Plan would be revised to include the closed Fly Ash Impoundment.

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the baseline environmental conditions potentially affected by the proposed closure of the existing Sluice Channel and Fly Ash Impoundment at BRF and an assessment of impacts of the project on the environmental resources identified. This assessment tiers off the impact analysis presented in Part I, Chapter 3.0 and, based on the specific activities proposed for closure of the impoundment, TVA was able to focus its environmental review on specific resources and eliminate others from further evaluation.

At the site-specific level, only a few of the resource areas addressed in the Part I programmatic review have the potential to be meaningfully different and these are the focus of the detailed analyses in this part. Resource area impacts that are not meaningfully different are:

- Air Quality and Climate Change. Potential impacts to air quality or climate are expected to be minor. See Part I, Section 3.1. As discussed in Part I, Anderson County is nonattainment for fine particulate matter ($PM_{2.5}$) and closure activities could contribute to PM levels in the area. However, these activities would be short term and would not impact regional air quality.
- Land Use
- Prime Farmland
- Geology and Seismology
- Socioeconomics (excluding Environmental Justice)
- Visual Resources
- Solid and Hazardous Waste
- Public Health and Safety

A discussion of resources retained for detailed analysis is provided in the following sections.

3.1 Groundwater

3.1.1 Affected Environment

3.1.1.1 Pysiographic 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 geomorphological 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 (ft).

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. Four different bedrock units underlie the site. These are the Rome Formation, the Conasauga and Knox Groups, and the Chickamauga Limestone (URS 2011).

The Chickamauga Formation underlies the main plant area. Commonly, the bedrock of this formation consists of a heterogeneous assemblage of limestone, shaly limestone, calcareous shales, and calcareous siltstones. 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 ft.

Groundwater underlying the BRF site is derived from infiltration of precipitation and from lateral inflow along the northwest boundary of the reservation. Data from past investigations and sampling at the site indicates Worthington Branch and Clinch River/Melton Hill Reservoir are the principal receptors of shallow groundwater flow from the plant area (TV 2012a).

All groundwater originating on, or flowing beneath, the proposed site ultimately discharges to the 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 below the water table (TVA 2012a).

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 2012b).

Although the Sluice Channel and Fly Ash Impoundment are inactive impoundments under the current version of the CCR Rule and thereby exempt from most CCR Rule requirements, EPA has agreed to remove this exemption from the rule. TVA is in the process of further studying groundwater characteristics near BRF to upgrade the groundwater monitoring system at the plant in accordance with CCR Rule requirements. The upgraded monitoring system will be used to confirm that CCR activities at BRF, including closure of CCR facilities, protect human health and the environment.

3.1.1.2 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 mi of the BRF dry ash stacking area. The 1999 survey was confirmed by review of a 2004 database update from TDEC (TVA 2005). 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 2012b).

3.1.1.3 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 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 metals series' are developed using the total metals analysis results.

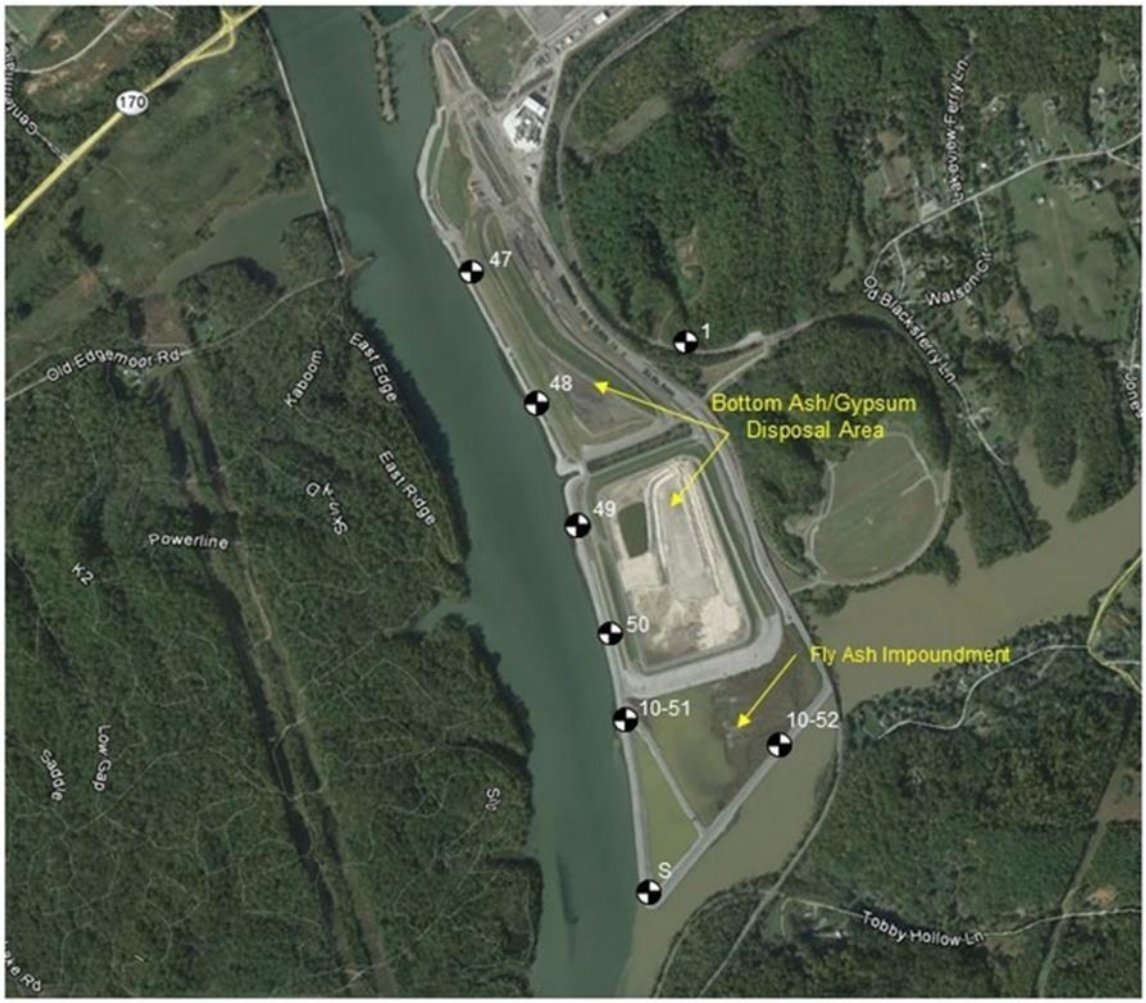

Figure 3-1. Array of Groundwater Monitoring Wells at BRF

Groundwater concentrations from the samples taken from the monitoring wells in the vicinity of the Fly Ash Impoundment exceeded the Ground Water Protection Standard

(GWPS) for arsenic (BRF-10-52) and barium (BRF-1). Arsenic at BRF-10-52 exceeded the GWPS of 10 ug/L (micrograms per liter) since sampling began at this well in 2010. Concentrations have ranged from approximately 22 to 32 ug/L and appear stable. Barium at BRF-1 exceeded the GWPS of 2,000 ug/L during the last sampling event in August 2014. The remaining samples and parameters exhibit trends that appear stable or non-detectable and do not exceed their applicable GWPS.

Analyses have also been performed on monitoring wells associated with the bottom ash/gypsum disposal area (wells BRF-1, BRF-47, BRF-48, BRF-49 and BRF-50) using laboratory analytical results from 2006 through February 2015. Time series 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 metals series' are developed using the total metals analysis results. These time series are included in regulatory reporting to the agency.

Groundwater concentrations from the monitoring wells associated with the bottom ash and gypsum disposal areas have generally not exceeded the GWPS for any parameter analyzed. Overall the trends appear stable or non-detectable, with the exception of arsenic (BRF-F45R, BRF-47). Arsenic appears to fluctuate but has mostly remained below the GWPS. In a recent sample, from BRF-47, arsenic was 11.1 ug/L (1.1 ug/L above the GWPS of 10.0 ug/L). However, the filtered sample was below the GWPS at 5.0 ug/L. Arsenic is naturally present at high levels in regional soils, (USGS 2001), and suspended solids in unfiltered samples can result in higher arsenic readings.

3.1.2 Environmental Consequences

3.1.2.1 Alternative B – Closure-in-Place

As part of this alternative, the dewatering and subsequent lack of rainfall infiltration into the CCR materials in the impoundment, will provide an immediate reduction in the potential downward influx of leachate moving from the impoundment. Under Alternative B, reduction of the hydraulic head in the Fly Ash Impoundment is expected to reduce mounding of the surficial aquifer, reduce vertical leaching of CCR constituents and reduce groundwater contamination. This conclusion is supported by TVA's on-going monitoring of its dry ash management facilities at BRF. The State of Tennessee's groundwater protection standards for solid waste facilities are set forth in TDEC Rule 0400-11-01-.04. The standards are likewise defined in Section IV(1)(d) of TDEC's Ground Water Monitoring Guidance for Solid Waste Landfill Units Policy. Per that Policy, GWPS are the constituent Maximum Contaminant Level (MCL) listed in Appendix III of Rule 0400-11-01-.04. The GWPS were established in May 2012. Groundwater analytical data from TVA's most recent sampling event are available on TVA's project Website https://www.tva.com/Environment/Environmental-Stewardship/Environmental-Reviews/Closure-of-Coal-Combustion-Residual-Impoundments. This data shows no evidence of groundwater contamination above groundwater protection standards for TDEC-required constituents from the Dry Fly Ash Landfill at BRF. Concentrations of the sampled constituents were below applicable GWPS and promulgated Maximum Contaminant Levels or were non-detectable.

In addition to any federal requirements that may apply to the Fly Ash Impoundment and Sluice Channel after closure is completed, TVA will implement any supplemental mitigation measures required pursuant to a unilateral administrative order that TDEC issued in August

2015 as well as an approved closure plan, which could include additional monitoring, assessment, or corrective action programs.

TVA reviewed EPRI's qualitative application of the Relative Impact Framework to the BRF impoundments for groundwater (EPRI 2016). With respect to groundwater, EPRI's analysis indicated that the Closure-in-Place Alternative for BRF will result in impacts similar to the EPRI hypothetical site. In particular, the Closure-in-Place Alternative resulted in a greater beneficial impact than the Closure-by-Removal Alternative with respect to both low and high mobility constituents under the non-intersecting groundwater and CCR condition (high mobility and low mobility constituents are defined in Part I, Section 2.3). This means that where the CCR is not in contact with groundwater, Closure-in-Place is predicted to reduce groundwater constituent concentrations more than Closure-by-Removal. Under the intersecting groundwater and CCR condition, however, the Closure-in-Place Alternative resulted in a less beneficial impact for high mobility constituents. This means that where the CCR is in contact with groundwater, Closure-by-Removal is predicted to reduce high mobility groundwater constituent concentrations more than Closure-in-Place.

For the reasons discussed above, the impacts of this alternative on groundwater are beneficial compared to the No Action alternative.

3.2 Surface Water

3.2.1 Affected Environment

3.2.1.1 Regional Surface Water Systems

The main BRF plant area is drained by Worthington Branch, while the region southeast of Bull Run Ridge is drained by Bullrun Creek. Worthington Branch, a meandering creek draining Raccoon Valley, was relocated to the south side of the valley during plant construction. The length of relocation of Bullrun Creek on the BRF site was approximately 1.6 mi. Bullrun Creek essentially follows its original watercourse, except for straightening from the Louisville and Nashville Railroad bridge to its confluence with the Clinch River (Figure 3-2). An unnamed stream is also located on the plant site that bisects the bottom ash disposal area and gypsum stack (TVA 2005).

3.2.1.1.1 Clinch River

The Clinch River originates in southwestern Virginia and enters the Tennessee River near Kingston, Tennessee. Two reservoirs, Norris and Melton Hill, are located on the Clinch River. BRF is located 31.8 river miles downstream from Norris Dam and 24.9 river miles upstream of Melton Hill Dam. Flow in the Clinch River in the vicinity of BRF is dependent upon releases through the hydroelectric plant at Norris Dam and releases from Melton Hill Dam. At the plant site, the main river channel is about 26 ft deep and 696 ft wide.

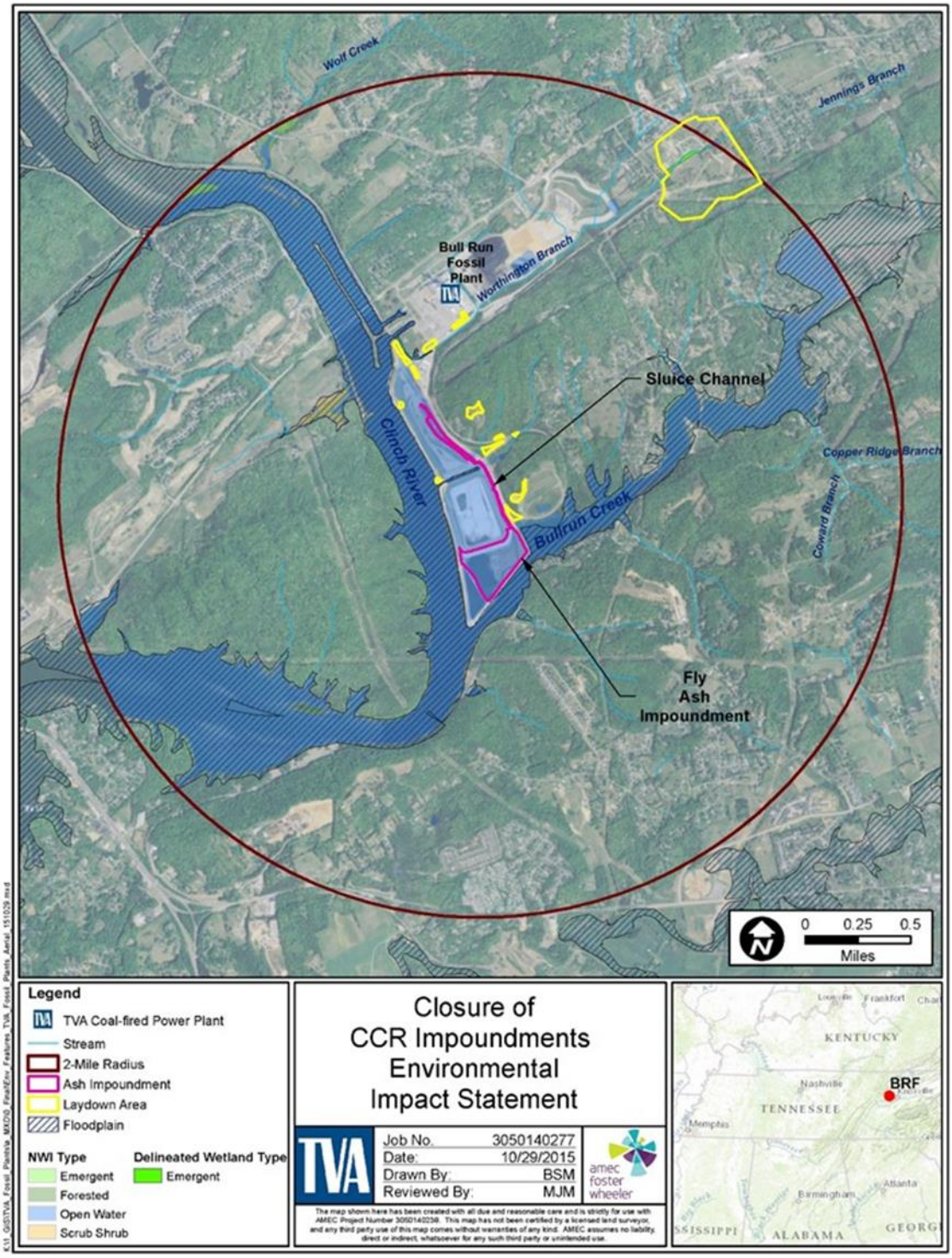

Figure 3-2. Environmental Features in the Vicinity of BRF

The health of these reservoirs is monitored as part of the Reservoir Vital Signs Monitoring Program which was initiated by TVA in 1990. Reservoirs throughout the Tennessee Valley have been monitored for physical and chemical characteristics of waters, sediment contaminants, benthic macroinvertebrates (bottom-dwelling animals such as worms, mollusks, insects, and snails living in or on the sediments), and fish community assemblage. Five key indicators (i.e., dissolved oxygen (DO), chlorophyll, fish, bottom life, and sediment contaminants) are monitored and contribute to a final rating that describes the "health" and integrity of an aquatic ecosystem.

3.2.1.1.2 Norris Reservoir

Norris Dam is the only large TVA multi-purpose storage project on the Clinch River. Norris Dam is operated for flood control, augmentation of flows for navigation, hydropower production, water supply, recreation, and aquatic ecology. Norris Reservoir has an annual pool level variation of about 42 ft during normal years. This fluctuation is necessary to provide flood storage and for flow augmentation during the drier seasons of the year. Additionally, the deep Norris Reservoir supplies a source of cold water to help maintain a prime trout fishery in the tailwater and provide cooling water for efficient operation of BRF.

3.2.1.1.3 Melton Hill Reservoir

Melton Hill Reservoir is operated for many purposes, including navigation, hydroelectric power generation, water supply, water quality, recreation, and aquatic ecology. Unlike most of the other TVA multipurpose tributary projects, Melton Hill does not provide any significant flood damage reduction benefits and, because it has very little useful storage volume, it does not provide any significant seasonal flow regulation. It has a narrow operating range, and the reservoir level fluctuates a maximum of 6 ft during the course of a year, with a normal daily fluctuation of about 2 ft. Melton Hill is fed by releases from TVA's Norris Dam upstream, as well as unregulated inflows from its 431 square mile (mi^2) drainage area.

TVA monitors three locations on Melton Hill Reservoir. These are the forebay, the middle part of the reservoir, and the river-like area at the upper end of the reservoir, which is called the inflow. Monitoring is usually done on a 2-year cycle. The overall ecological condition of Melton Hill was rated "fair" in 2012, down from its "good" rating in 2010. The higher ecological health scores were primarily due to two indicators, chlorophyll and bottom life, which had ratings near the upper ends of their historic ranges.

DO rated "poor" at the forebay and "good" at the mid-reservoir location. A large section along the reservoir bottom at the forebay had low DO concentrations in June, resulting in a "poor" rating. DO has rated "good" at the mid-reservoir location for all years monitored and typically has rated "good" in the forebay unless there was an extended period with low flow. Low-flow conditions can allow water to sit long enough that oxygen in the lower water column becomes depleted as it is used in the natural process of decomposition of decaying plants and other materials. Chlorophyll rated "fair" at the forebay and "good" at the mid-reservoir monitoring locations. Average annual chlorophyll concentrations have shown an overall trend of increasing at the forebay location since monitoring began in 1991. Reservoir flows have played a part in the year-to-year fluctuations because low-flow conditions tend to allow more time for algal populations to become established.

The Clinch River watershed drains approximately 4,400 mi^2 of area located above BRF. The watershed supports both small farms and light industry, with heavy industry occurring in urban areas. Boating, fishing, and water sports are popular on the Clinch River. BRF is located in the Lower Clinch River Watershed. In 2009, the Natural Resources Conservation

Service (NRCS), a branch of the United States Department of Agriculture, completed a watershed assessment of the Lower Clinch River Watershed and found that almost 30 percent of the Lower Clinch River Watershed's stream miles were listed as impaired by the State of Tennessee due to excessive nutrients, pathogens, siltation, alteration of streamside vegetation, low DO, thermal modifications, and contaminants such as PCBs, mercury, and chlordane (NRCS 2009).

The latest TDEC 303(d) report (TDEC 2014a) states that chlordane, PCBs, mercury, *Escherichia coli (E coli)*, loss of biological integrity due to siltation, physical substrate habitat alterations, habitat loss due to alteration in stream-side or littoral vegetative cover, arsenic, strontium, cesium, biological loss due to undetermined cause, and oil and grease contamination have all been found as factors that impact the integrity of the Clinch River. This contamination results from the presence of a CERCLA site (part of the DOE Oak Ridge reservation), pasture grazing atmospheric deposition, industrial point source, channelization, industrial permitted runoff, discharges from municipal separate storm sewer areas, and municipal urbanized areas. The Clinch River in Anderson County, upstream of the BRF Plant, is also listed for temperature and flow alterations due to upstream impoundment (Norris Dam). TVA has taken action to improve water quality and flows downstream of the dam, which is located over 20 mi upstream of BRF.

The West Knox Utility District operates two surface water treatment plants both located on the Clinch River on Melton Hill Reservoir. The nearest drinking water intake is approximately 1,800 ft downstream from the Fly Ash Impoundment. This intake is operated by the West Knoxville Utility District. The West Knox Utility District provides water and wastewater service to over 25,000 customers (West Knox Utility District 2016).

BRF has three active NPDES permitted process wastewater discharges to the Clinch River. These are the Fly Ash Impoundment (Outfall 001), condenser cooling water (Outfall 002), and intake screen backwash (Outfall 004). The permit also specifies an internal monitoring point 005 via Outfall 001 for the metal cleaning pond, boiler chemical cleaning, and air-preheater washes. BRF also has several outfalls for storm water permitted under the Tennessee Multi-sector General Permit for storm water runoff associated with industrial activity. The plant intake channel is located upstream from Outfalls 001 and 002.

3.2.1.1.4 Bullrun Creek

Bullrun Creek drains a 104-mi^2 area that includes portions of Anderson, Knox, Union, and Grainger counties, and it empties into the Clinch River at river mile 46.7, just south of the southwest corner of the plant boundary. The Bullrun Creek watershed is long and narrow, draining the area between Chestnut/Hinds Ridge and Copper Ridge. The BRF CCR impoundment and the east and west dredge impoundments (now closed) are adjacent to Bullrun Creek. The average flow for Bullrun Creek at mile 0.9 is estimated to be 4.25 cubic meters per second (m^3/s) [approximately 67,380 gallons per minute (gpm)] based on monthly measurements from 1957 to 1986 (Lowery et al. 1986). In 2006, the Bullrun Creek Restoration Partnership (BRCRP) drafted a watershed restoration plan of the Bull Run Watershed and found that 45.8 mi of Bullrun Creek and its tributaries were classified as impaired (BRCRP 2006). According to the TDEC's 2014 303(d) list, 23.2 mi of Bullrun Creek are classified as impaired (TDEC 2014a). The 11.8-mi segment of Bullrun Creek, from its confluence with Melton Hill near BRF to US 441, is impaired due to the presence of *E. coli* bacteria. Pollution sources include collection system failure, discharges from municipal storm sewers, and pasture grazing. BRF does not have any discharges to Bullrun Creek permitted under NPDES Permit TN0005410.

3.2.1.1.5 Worthington Branch

The fly ash dry stacking area, dry stacking area runoff impoundment, coal storage yard impoundment, coal storage area, and main plant site are adjacent to Worthington Branch. Additionally, the new bottom ash and gypsum dewatering facility is located adjacent to Worthington Branch. Worthington Branch empties into the condenser cooling water discharge channel to the Clinch River. The minimum 7-day low flow that occurs once in 10 years (i.e., the "7Q10") stream flow data for Worthington Branch were obtained from nearby continuous gauging stations and had a mean value of 0.268 cubic feet per second. Worthington Branch has had significant rerouting and channelization from its original course through BRF in the past by previous plant activities.

3.2.1.1.6 Unnamed Stream

A small unnamed stream borders the dry bottom ash and gypsum dry bottom ash storage area and drains into the Clinch River at river mile 47.1. Stream flow data were not available for this unnamed stream. This unnamed stream has experienced significant rerouting and channelization from its original course through BRF by previous plant activities (TVA 2005).

3.2.1.2 Surface Water Relating to BRF Ash Impoundments

As described in Chapter 2.0, BRF has several existing wastewater streams that are permitted under NPDES Permit TN0005410. Because the Fly Ash Impoundment discharge (Outfall 001) is the primary stream potentially affected by the proposed project, it is the only existing BRF wastewater stream discussed here. About 8.83 MGD of effluent is discharged from the CCR 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 pH of the CCR impoundment discharge generally ranges from 6.6 to 8.2. The current NPDES Permit contains limitations on the CCR impoundment discharge with respect to pH, oil and grease, total suspended solids, and toxicity. This permit also requires reporting of total ammonia-nitrogen and 17 metals.

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

Results of the mixing analysis summarized in Table 3-1 demonstrates that all of the constituents except thallium met the TDEC lowest criteria (i.e., limit equal to minimum of the drinking water and aquatic toxicity limits). The thallium exception is an artifact produced by the method of treating censored data in mass balance calculations (i.e., values below detection limits set equal to one-half detection limit), and the fact that the thallium detection limit of 0.001 mg/L exceeds the TDEC criterion of 0.00024 mg/L.

Table 3-1. Surface Water Mixing Analysis of Current Operations at BRF

	Current Baseline	Current Operations		
Element	Intake[1] (mg/L)	Ash Stilling Pond[2] (mg/L)	Total Discharge Concentration at Clinch River 1Q10 (mg/L)	Water Quality Criteria [3] (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**[4]	0.00024
Zinc	<0.01	0.0177	0.00226	0.13

Note: lb/day = conc. in mg/L X flow in MGD X 8.34 lb/gal.
[1]CCW Flow: 129.3 MGD
[2]Stilling Pond Flow: 14.8 MGD
[3]TDEC Criteria, Rule 1200-4-3-03
[4]**bold**-xceeds WQC (but likely an artifact of the analytical method as described below)

3.2.2 Environmental Consequences

3.2.2.1 Alternative B – Closure-in-Place

3.2.2.1.1 Impoundment Closure

Under this alternative no alteration or modification of surface water resources would occur within the immediate project site or associated laydown areas.

Surface water within the BRF Fly Ash Impoundment and Sluice Channel Fly Ash Impoundment would be dewatered and all remaining CCR material would be consolidated and compacted. The Sluice Channel would no long accept process water flows and would be closed. An approved cover system consisting of either a geosynthetic liner coupled with cover soil or an engineered synthetic turf would be installed as described in Part I, Section 2.2. In conjunction with impoundment closure activities, TVA would reroute conveyances sending storm water and wastewater to the Stilling Pond for final treatment.

Wastewater generated during the proposed project may include construction storm water runoff, dewatering of work areas, non-detergent equipment washings, dust control and hydrostatic test discharges. Potential impacts and BMPs to minimize effects of these wastewater streams are provided in Part I, Section 3.7.

Storm water from the closed Fly Ash Impoundment and Sluice Channel would continue to be routed through the Stilling Impoundment. Some storm water would be conveyed directly to the stilling impoundment from the approved closure system and the remaining areas would be re-routed to a new lined ditch that would discharge into the stilling impoundment.

3.2.2.1.2 Surface Water Withdrawal and Discharge

Withdrawal rates would not change with the closure of these impoundments and all waste streams would still be discharged from the current Outfall 001 location. Discharges from the site would include station sumps, leachate, outage washes, flue gas desulfurization discharge water, minimal low volume wastewater flows, and some process and non-process storm water driven flows. The majority of the storm water flows in the areas around the impoundments would still be managed through the implementation of BMPs and cleaning and maintenance plans and discharged through the stilling impoundment from Outfall 001 to the receiving stream. The process waste water flows would be routed for co-treatment and waste water treatment as process wastewater into a new lined ditch line and would discharge to the stilling impoundment prior to release at Outfall 001.

Although the in-flows would be the same for this project, the waste water treatment system would be altered and therefore changes in discharge flows would be likely depending on the retention time of ditch line and stilling impoundment.

3.2.2.1.3 Operational Impacts

The main operational change that would take place with the closure of the impoundments is the change in management of the on-site storm water and process waste water that is currently treated and discharged from the Fly Ash and Stilling Impoundments. This re-routing would conceptually utilize on-site non-CCR impoundments and a new lined ditch to enable the proper handling and treatment of the waste streams. BMPs and waste water treatment would be employed, as needed, to mitigate any pollutant discharge.

As described above, the mixing analysis indicates that the current operations do not have obvious overall negative impacts to surface water quality. Under future operating conditions, waste water treatment would be introduced as appropriate, to ensure compliance of discharge waters with NPDES permit limits and TDEC water quality criteria. TVA would also comply with potentially applicable requirements under EPA's new Effluent Limitation Guideline (ELG) for coal-fired power plants (80 Fed. Reg. 67838-67903 (Nov. 3 2015). TVA is reviewing the final ELG to determine what actions may be required to comply with it.

TVA reviewed EPRI's qualitative application of the RIF to the BRF impoundments for surface water (EPRI 2016). The EPRI modeling predicted only a negligible difference in surface water impacts between the Closure-in-Place and Closure-by-Removal alternatives with respect to both low and high mobility constituents under both the non-intersecting groundwater condition and the intersecting groundwater condition. It is expected that both closure alternatives will have similar benefits for surface water.

Lateral movement of water (seepage) from berms at the Fly Ash Impoundment is not known to occur. Nonetheless, this alternative would reduce or eliminate the potential for any future lateral movement of water from berms and subsurface flow of groundwater and their subsequent release to surface waters. Consequently, any pathways for transport of constituents of concern as a result of the lateral movement of water from the berm or groundwater subsurface flow to adjacent surface waters would be minimized.

Because surface water flow and potential lateral movement and groundwater releases to surface waters would be minimized, enhanced stability of the berm due to reduction of hydraulic inputs and because all work would be done in compliance with applicable regulations, permits, and BMPs, potential direct and indirect impacts of this alternative to surface waters and regional users of surface water would be negligible.

3.3 Floodplains

3.3.1 Affected Environment

The Fly Ash Impoundment and Sluice Channel at BRF are located on Melton Hill Reservoir between CRM 46.3 and 47.9. Bullrun Creek enters Melton Hill Reservoir at the downstream end of the impoundments at CRM 46.3. Flood elevations on Bullrun Creek in this area are influenced by water surface elevations on the Clinch River. The 100-year flood elevations on Melton Hill Reservoir range from 797.2 ft at CRM 46.7 (Sluice Channel) to 797.3 ft at CRM 47.9 (Fly Ash Impoundment). The 500-year flood elevations on Melton Hill Reservoir range from 797.9 ft at CRM 46.7 (Sluice Channel) to 798.1 ft at CRM 47.9 (Fly Ash Impoundment).

The Sluice Channel and the Fly Ash Impoundment are depicted on Anderson County, Tennessee, Flood Insurance Rate Maps as being located outside the limits of the Clinch River and Bullrun Creek 100-year floodplains (Figure 3-3), which would be consistent with EO 11988. The lowest crest of the Fly Ash Impoundment is elevation 809.1, and the lowest crest of the Sluice Channel is elevation 809.6. The low crests of each facility are located outside the 100-year floodplain and well above the 500-year flood elevations of the Clinch River and Bullrun Creek.

3.3.2 Environmental Consequences

3.3.2.1 Alternative B – Closure-in-Place

Under this alternative, TVA would relocate CCR within the existing footprints of the Sluice Channel and Fly Ash Impoundment. These facilities are located outside the 100-year floodplain of the Clinch River and Bullrun Creek, which would be consistent with EO 11988. There would be no impacts to floodplains or floodplain resources due to construction of the final closure systems of the Sluice Channel and Fly Ash Impoundment.

Proposed laydown areas would also be outside 100-year floodplains, which would be consistent with EO 11988. There would be no permanent impacts to floodplains or floodplain resources due to construction of the final closure systems of the Sluice Channel and Fly Ash Impoundment.

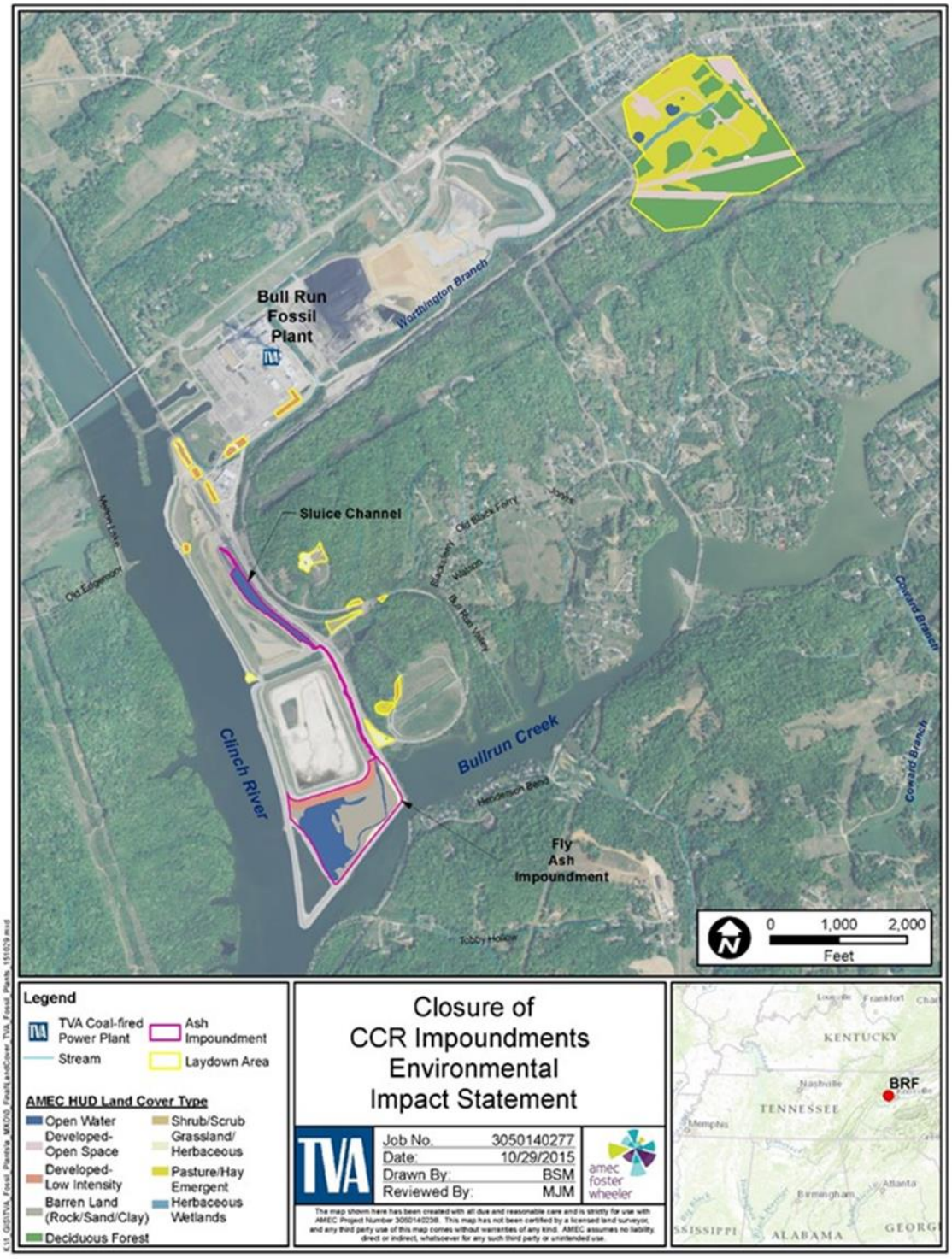

Figure 3-3. Land Cover Types Associated with Ash Impoundment Closure at BRF

3.4 Vegetation

3.4.1 Affected Environment

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion of Tennessee. Dominated by cherty clay, lands within this ecotype historically supported mixed deciduous/evergreen forest but many lands on gentler slopes have been converted to agricultural uses such as cropland and pasture.

Plant communities in the vicinity of BRF include areas of herbaceous vegetation and mixed evergreen-deciduous forests (Griffith et al. 2001). Common herbaceous species include those typical of old field communities such as Bermuda grass, blackberries, butterfly weed, chicory, daisy fleabane, Johnson grass, narrow-leaf plantain, perennial ryegrass, orchard grass, Queen Anne's lace, smooth brome grass, tall fescue, yellow sweet clover, white sweet clover, crown vetch, Japanese honeysuckle, Japanese stilt grass, and sericea lespedeza.

Wooded areas within BRF consist of a mosaic of mixed evergreen-deciduous forests. Common woody species include American elm, autumn olive, black gum, black locust, box-elder, chestnut oak, eastern red cedar, mockernut hickory, northern red oak, southern red oak, sweetgum, sugar maple, tulip poplar, Virginia pine, white ash, and white oak. Vines such as greenbriers, Japanese honeysuckle, passion flower, poison ivy, summer grape, trumpet creeper, Virginia creeper, and rose are common (TVA 2012a).

Within a 2-mi radius of BRF, land cover is primarily deciduous forest (2,834.7 ac), hay/pasture (1,143.0 ac) and open water (1,061.3 ac) (Table 3-2). The predominant land cover types mapped within the Fly Ash Impoundment and proposed laydown areas include hay/pasture (43.0 acres), open water (19.2 ac), "developed" land cover (11.0 ac) and early successional herbaceous land cover types (4.8 ac) within, exposed ash in upper portion of impoundment. The Sluice Channel is essentially unvegetated. Notably, the hay/pasture cover types and several forested areas are present within the larger supplemental laydown area located east of BRF. Actual use of these areas would be managed to avoid impacts to forested areas. No unique plant communities are present within the proposed project footprint at BRF.

Table 3-2. Land Use/Land Cover within the Vicinity of B

Land Cover Type	Impact Area[1] (ac)	2-Mi Radius (ac)
Barren Land	16.1	35.1
Cultivated Crops	0	14.2
Deciduous Forest	9.6	2834.7
Developed, High Intensity	0	64.9
Developed, Low Intensity	11.0	712.9
Developed, Medium Intensity	0	372.5
Developed, Open Space	0	876.8
Emergent Herbaceous Wetlands	0	6.2
Evergreen Forest	0	214.8
Hay/Pasture	43.0	1143.0
Herbaceous	4.8	341.2
Mixed Forest	0[2]	211.0
Open Water	19.2	1061.3
Shrub/Scrub	0.4	58.7
Woody Wetlands	0[2]	94.7
Total	**104.1**	**8042.0**

Source: USGS 2011.

[1] Permanent Use Area: existing CCR Impoundment; Temporary Use Area: Laydown Areas
[2] Mixed forest and woody wetlands included based on inaccuracies of Land Use/Land Cover mapping. They are not actually present in impoundment or laydown area

3.4.2 Environmental Consequences

As discussed in Part I, Section 3.9, impacts to vegetation would result from earthmoving activities related to shaping and filling the ash within the impoundments, inward reconfiguration of berms, and grubbing of laydown areas. Because plant communities within the impoundments and most laydown areas are poorly represented at BRF (limited to early successional herbaceous land cover types within older, exposed ash in upper portion of the impoundment), and potential impacts are very small relative to the abundance of similar cover types within the vicinity, direct impacts from site construction activities would be negligible. While several forested areas are present within one of the larger supplemental laydown areas identified at BRF, actual use of these areas would be managed to avoid impacts to forested areas. No tree removal would be required under this alternative.

Under Alternative B, impoundments will be filled with borrow material from a previously permitted borrow site unless TVA can beneficially reuse CCR material onsite that meets the beneficial use criteria in the CCR Rule. TVA's initial evaluation of bottom ash available onsite indicates that the bottom ash could be beneficially reused for this purpose, which would eliminate the need for offsite borrow material. This evaluation is being refined and TVA plans to discuss it with TDEC. If offsite borrow material is used, potential indirect impacts of the transport of borrow material are associated with the deposition of fugitive dust on adjacent vegetation. However, this potential impact would be minimized by use of BMPs that include covering loads during transport. If beneficial reuse of onsite material is allowed, these potential fugitive dust impacts would be largely avoided, because the

proximity of the onsite material to the impoundments would significantly decrease the extent of transport.

Lands within the CCR impoundments will also be restored with a cover system that may include the establishment of an herbaceous cover. Temporary use areas will be revegetated to their current land cover type or replanted with herbaceous vegetation. Although transportation of borrow material has the potential to introduce invasive plants, BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate that risk. Therefore, impacts to vegetation under the Closure-in-Place Alternative would be minor and adverse in the short term, but would have a long term minor beneficial impact.

3.5 Wildlife

3.5.1 Affected Environment

The area evaluated for wildlife impacts includes the existing Sluice Channel and Fly Ash Impoundment, their immediate surroundings, and associated laydown areas. Habitat within these areas include roads, maintained grassed berms, scattered trees along the maintained berms and riparian zones, early successional lands used as rights-of-way, riverine/shoreline habitats, and small embayments.

The CCR impoundments intermittently support variable numbers of waterfowl, gulls, and other wildlife, primarily during the winter.

The maintained impoundment areas and grassed berms offer little suitable habitat for wildlife species, and may be expected to support a range of common species as described in Part I, Section 3.10. Species observed in 2014 during biological monitoring of the Clinch River approximately 28 river miles downstream of BRF generally reflect typical species found in riparian areas and floodplain habitats in the BRF area. Identified species included eastern gray squirrel, American coot, American crow, belted kingfisher, blue jay, Canada goose, cliff swallow, double-crested cormorant, great blue heron, green heron, mallard duck, mockingbird, mourning dove, pied-billed grebe, and wood duck (TVA 2015).

Areas with standing water within the CCR impoundment and along the Sluice Channel could provide habitat for a variety of amphibians, reptiles and mammals that may include water snakes, tree frogs, rodents, eastern chipmunk, eastern gray squirrel, raccoons, opossum, coyotes, and white-tailed deer.

Notable wildlife records in the vicinity include a heron rookery (1.4 mi), two caves (3 mi), and an active osprey nest on a transmission line tower (0.5 mi) (TVA 2012b). However, based on review of aerial photography, suitable habitat for heron colonies is not available within the project footprint.

3.5.2 Environmental Consequences

The Fly Ash Impoundment and associated Sluice Channel occur within a highly disturbed and fragmented industrial landscape that offers minimal habitat for wildlife (see Table 3-2 and Figure 3-3). Under this alternative, resident wildlife found in the project area would continue to opportunistically use available habitats within the project area. No tree clearing would occur in conjunction with closure activities within the CCR impoundment area or associated laydown areas. As a result, no impacts would occur to tree roosting/nesting bird

or mammal species. Additionally, in consideration of the large distance to documented heron rookery or established osprey nesting sites, no impacts to these species are expected. During construction, most wildlife present within the project site would likely disperse to adjacent and/or similar habitat.

Following the construction period, wildlife use of the closed impoundments may be limited, depending on the cover system selected for use at this site. TVA is considering use of the engineered synthetic turf cover system at BRF. As such, no long-term habitat is expected within the closed impoundments for grassland dependent wildlife species. A geosynthetic and protective soil cover system is also being considered for use at this site. This cover system may be expected to provide limited foraging and nesting habitat for grassland species. The resulting habitat would be of marginal quality and is not anticipated to support large populations of these species.

In consideration of the highly disturbed habitats present within the project area and associated temporary laydown areas, and the availability of higher quality wildlife in proximity, potential direct and indirect impacts to associated wildlife are expected to be minor and potentially slightly beneficial relative to existing conditions.

3.6 Aquatic Ecology

3.6.1 Affected Environment

BRF is located in the impounded portions of the Clinch River, on Melton Hill Lake, near CRM 47 (Figure 3-2). The Melton Hill Dam impounds the 5,470-ac Melton Hill Lake, and is the only TVA tributary dam serviced by a navigation lock.

The main area considered for CCR impoundment closure activities at BRF is located on a peninsula between the Clinch River and Bullrun Creek in Melton Hill Lake. A larger supplemental laydown area has been identified east of the facility; Worthington Branch is located to the south, in the immediate vicinity of this area. TVA has systematically monitored the ecological conditions of its reservoirs since 1990 as part of its Vital Signs Monitoring Program. It is expected that aquatic resources within Worthington Branch are similar to Melton Hill Lake, given adjacency and backwater influence of the lake on the lower portions of Worthington Branch near the facility.

Shoreline and substrate sections were evaluated for aquatic habitat upstream and downstream of BRF in 2014. The shoreline sections had average scores of “fair,” while no aquatic macrophytes were noted along the banks during the shoreline evaluation. The substrate was dominated by silt (33.4 percent), bedrock (19.4 percent), and detritus (18.3 percent) downstream of BRF and by clay (34.9 percent), silt (26.5 percent) and algae (11.2 percent) upstream of BRF (TVA 2015).

TVA has evaluated the health of the fish community using the Reservoir Fish Assemblage Index at CRM 45, downstream of BRF, and at CRM 66, upstream of BRF. The fish community rated “Fair” at both of these locations in 2014. Historically, the fish community has rated “Good” or “Fair” at these locations.

During the 2014 study, 37 species were collected at the downstream site and 28 at the upstream site; this includes 17 commercially valuable and 20 recreationally valuable species:

- Common centrarchid species present at BRF included black crappie, white crappie, bluegill, green sunfish, redear sunfish and warmouth.

- Benthic invertivore species present included black redhorse, freshwater drum, golden redhorse, logperch, northern hog sucker, silver redhorse and spotted sucker.

- Top carnivore species present included black crappie, flathead catfish, largemouth bass, rock bass, skipjack herring, smallmouth bass, spotted bass, walleye, white crappie, white bass and yellow bass.

- Intolerant species present included black redhorse, brook silverside, northern hog sucker, rock bass, skipjack herring, smallmouth bass and spotted sucker. In addition, three thermally sensitive species, white sucker, spotted sucker and logperch were present (TVA 2015).

Benthic community data was collected from three sites, upstream and downstream of BRF, in 2014. Monitoring results for 2014 support the conclusion that balanced indigenous populations of benthic macroinvertebrates is maintained downstream of BRF. Sites had taxa averages of 16.3, 14.5 and 14.9 at CRM 45.6, 47.0 and 52.0 respectively. However, the Ephemeroptera, Plecoptera and Trichoptera taxa present were 1.4, 0.7 and 0.2 at CRM 45.6, 47.0 and 52.0 respectively, mid- and low-range numbers. In addition, the proportions of oligochaetes were 38.4 percent, 48.7 percent and 58.2 percent, receiving the lowest score (TVA 2015).

The mussel fauna in the Clinch River near BRF has been altered substantially by the impoundment of Melton Hill Reservoir. TVA conducted a mussel and habitat survey in 2010 to characterize mussel resources in the Clinch River and Bullrun Creek adjacent to BRF. Only four mussels, consisting of three common species, the mapleleaf, fragile papershell and three-horn wartyback, were found along the BRF waterfront (Third Rock Consultants 2010).

3.6.2 Environmental Consequences

Under Alternative B, no direct impacts to aquatic ecosystems are expected from the closure-in-place of either the Sluice Channel or the Fly Ash Impoundment at BRF. Temporary laydown areas supporting closure activities are located within previously disturbed upland areas. One larger supplemental laydown area has been identified east of the plant site, approximately 2 mi from the Fly Ash Impoundment. While a stream is located within this area, any laydown activities will be planned so as to avoid any impacts to the stream. Consequently, no direct impacts to aquatic ecosystems would occur in conjunction with planned closure activities.

The wastewater discharges during dewatering will meet existing permit limits, and compliance sampling will continue to be performed at the approved outfall structure in accordance with the NPDES permit to demonstrate compliance. Additionally, any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources in the Clinch River. Therefore, no adverse

effects to aquatic resources from the closure-in-place of CCR impoundments at BRF are expected.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

A review of the TVA Regional Natural Heritage Project database in September 2015 indicated that seven federally listed species are currently known, or have been known to occur within a 2-mi radius of the project area (Table 3-3). Additionally, eight state listed species have occurrence records within a 2-mi radius of BRF. The Indiana bat and northern long-eared bat are also evaluated herein because these federally listed bat species are known to occur throughout the region.

Six freshwater mussel species and one aquatic snail are recorded within a 2-mi radius of BRF. All of these aquatic species require freshwater riverine systems with flowing water (Biggens 1991; Ahlstedt 1983; Ahlstedt 1984a; Ahlstedt 1984b; Neves 1983; Dillon et al. 2013). A recent mussel survey of the riverfront at BRF (Third Rock Consultants LLC 2010) did not reveal the presence of any state-listed or federally listed threatened or endangered mussel species.

One heron rookery was historically known to occur along the Clinch River approximately 1.2 mi upstream of BRF. This small rookery consisted of five pairs of great blue heron and was observed in 1996. No recent occurrences of this rookery have been recorded. In addition, five caves are known to occur off-site within a 2-mi radius of BRF.

The barn owl is state-listed NMGT (in need of management) with a rank of S3 (vulnerable). A nesting pair was observed in Knox County (Tennessee) within 2-mi of BRF in 1987 but more recent occurrences of this species in the vicinity of the plant are unknown. Open habitats such as grasslands, deserts, marshes, and agricultural fields are preferred but the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites. Hollow trees, cavities in cliffs and riverbanks, nest boxes, and many human structures (barns) are readily used for nesting and roosting (Marti et al. 2005).

The hellbender is state-listed NMGT (in need of management) with a rank of S3 (vulnerable). A single hellbender was caught in a gill net in Melton Hill Reservoir in 1976 but more recent occurrences of this species in the vicinity of the plant are unknown. Hellbenders are completely aquatic salamanders and prefer fast-flowing, clear, well-oxygenated streams and rivers with substrate consisting of large flat boulders and logs. In Virginia, hellbenders have been observed in streams as small as 5 meters and rivers over 100 meters wide (Virginia Department of Game and Inland Fisheries 2015).

The Indiana bat is listed as federally endangered by the U.S. Fish and Wildlife Service (Pruitt and TeWinkel 2007). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). Indiana bats disperse from wintering caves to areas throughout the eastern U.S. This species range extends from New York and New Hampshire in the north to Alabama, Georgia, and Mississippi in the south and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees with suitable roost characteristics in close proximity to suitable snags has also been documented. Multiple roost sites are generally selected. The availability of trees of a

sufficient bark condition, size, and sun exposure is another important limiting factor in how large a population an area can sustain (Tuttle and Kennedy 2002, Harvey 2002, Kurta et al. 2002). Five cave sites are known to occur off-site with 2-mi of the plant. Suitable summer roosting habitat may be present on-site or in the vicinity of BRF but such habitat does not occur within the CCR impoundment or temporary laydown areas.

Table 3-3. Species of Conservation Concern within the Vicinity of BRF

Common Name	Scientific Name	Status	
		Federal[1]	State[2] (Rank[3])
Mollusks			
Cracking Pearlymussel	*Hemistena lata*	LE	END(S1)
Dromedary Pearlymussel	*Dromus dromas*	LE	END(S1)
Orange-foot pimpleback	*Plethobasus cooperianus*	LE	END(S1)
Shiny pigtoe pearlymussel	*Fusconaia cor*	LE	END(S1)
Spectaclecase	*Cumberlandia monodonta*	LE	TRKD(S2S3)
Spiny riversnail	*Io fluvialis*	--	TRKD(S2)
White wartyback	*Plethobasus cicatricosus*	LE	END(S1)
Amphibians			
Hellbender	*Cryptobranchus alleganiensis*	PS	NMGT(S3)
Birds			
Barn Owl	*Tyto alba*	--	NMGT(S3)
Mammals			
Indiana bat[4]	*Myotis sodalis*	LE	END(S1)
Northern long-eared bat[4]	*Myotis septentrionalis*	LT	(S1S2)
Plants			
American ginseng	*Panax quinquefolius*	--	S-CE(S3S4)
Northern bush honeysuckle	*Diervilla lonicera*	--	THR(S2)
Northern white cedar	*Thuja occidentalis*	--	SPCO(S3)
Spreading false-foxglove	*Aureolaria patula*	--	SPCO(S3)
Tall larkspur	*Delphinium exaltatum*	--	END(S2)

Source: TVA Natural Heritage Database, accessed 09/18/2015; Species documented within 2 mi of BRF.
[1] Federal Status Codes: DM = Delisted, Recovered, and Being Monitored; LE = Listed Endangered; LT = Listed Threatened; PE = Proposed Endangered; CAND = candidate for federal listing; PS = partial status (subspecies listed in Midwest).
[2] State Status Codes: END = listed endangered; NMGT = Listed in Need of Management; S-CE = special concern, commercially exploited; SPCO = species of special concern; THR = listed threatened; TRKD = tracked as sensitive but has no legal status
[3] State Rank: S1 = Extremely rare and critically imperiled; S2 = Very rare and imperiled; S3 = Vulnerable; S4 = Apparently secure, but with cause for long-term concern; SH = Historic in Tennessee; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).
[4] Known throughout the region but no occurrence records within 2-mi of the project site.

The northern long-eared bat is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and with high humidity and minimal air

currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter ≥3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, tree-lined corridors, and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2014). Suitable summer roosting habitat may be present on-site or in the vicinity of BRF but such habitat does not occur within the CCR impoundment or temporary laydown areas.

A 2015 review of the TVA Regional Natural Heritage database indicated that no federally-listed plant species are known to occur within two mi of the proposed project site. Five state-listed plant species, however, are known to occur in the vicinity of BRF as listed in Table 3-3. American ginseng requires humus-rich woodland soil and prefers shaded, north-facing hillsides (North American Native Plant Society 2015). Northern bush honeysuckle is a deciduous shrub inhabiting mountain woodlands, bluffs, and streambanks (Center for Plant Conservation, 2015). Northern white cedar is found on cool, moist, nutrient-rich sites where it is often associated with wetlands (NRCS 2015). Spreading false foxglove requires canopy openings in mixed hardwood forests on limestone slopes associated with large streams and rivers (Kentucky State Nature Preserves Commission 2015). Finally, the tall larkspur grows in dry, exposed cedar barrens and prairie/forest edge in eastern Tennessee at the Oak Ridge Reservation (Salk and Parr 2006). None of these listed plants are known to exist in the highly disturbed ash impoundment or temporary laydown areas at BRF.

3.7.2 Environmental Consequences

The area of permanent and temporary impact subject to project activities under this alternative is primarily comprised of developed or disturbed land that is generally unsuitable for the listed species in Table 3-3. The CCR impoundments at BRF do not provide suitable habitat for listed aquatic species and aquatic habitat outside the CCR impoundments is not being impacted by this closure project, therefore the listed mollusks and hellbender are unlikely to suffer adverse effects. Terrestrial habitat on-site has been severely degraded, is populated with weedy and adventive species, and is generally unsuitable for the listed plant species in Table 3-3. Five cave sites are known from within 2-mi of BRF but suitable roosting habitat for the Indiana bat and northern long-eared bat is not present within the project area and tree clearing is not anticipated with the proposed action. Although the open water areas of the CCR impoundment may provide foraging opportunities for the listed bat species, foraging habitat would be low-quality.

Because suitable habitat for the species in Table 3-3 is either absent or degraded within the CCR impoundments and temporary laydown areas at BRF, and because no tree removal would occur, no impacts to threatened and endangered species are expected with this alternative.

3.8 Wetlands

3.8.1 Affected Environmental

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion where the land use and land cover includes mostly mixed forest with some prairie and cropland on less sloping land (Griffith et al. 2001). Natural vegetation includes Appalachian oak forest and some mixed mesophytic forest consisting of upland species.

The proposed construction footprint includes a Fly Ash Impoundment, a Sluice Channel, and several small temporary laydown areas as depicted in Figure 3-2. National Wetland Inventory (NWI) mapping includes 32.3 ac of open water within the CCR impoundment, 4.9 ac of open water within the Sluice Channel, and another 0.5 ac of open water within the temporary laydown areas. The NPDES outfall from the Fly Ash Impoundment discharges through a pipe to the Clinch River.

Although the USFWS mapped NWI features within the Fly Ash Impoundment and Sluice Channel, wetland features are not present. The impoundment appears to consist mostly of open water, riprap banks and some opportunistic wetland vegetation. Most of the temporary laydown areas are located in disturbed open areas on the BRF site as depicted in Figure 3-2. One larger supplemental laydown area has been identified east of the plant site, approximately 2 mi from the Fly Ash Impoundment. A small 1.8-acre emergent wetland has been identified along the floodplain of the stream that is located in this area (TVA 2013). Any laydown activities would be planned so as to avoid impacts to this site.

3.8.2 Environmental Consequences

Closure of the Fly Ash Impoundment and Sluice Channel would include filling with earthen material or bottom ash if this is allowed and installation of a cover system. The temporary laydown areas would be used to store equipment and materials during the construction phase and would be restored to existing contours and planted with herbaceous cover upon completion. Any use of the supplemental laydown area identified east of the plant would be limited to previously disturbed areas and would avoid any impact to streams.

No wetlands were identified within the footprint of the Fly Ash Impoundment and Sluice Channel and there should be no wetland impacts.

Indirect impacts to off-site or nearby jurisdictional or non-jurisdictional wetlands could potentially result from the alteration of hydrologic inputs to these wetland systems resulting from closure of the impoundments. Jurisdictional wetlands near the CCR impoundments have a hydrology that is dominated by water levels within the adjacent Clinch River. Therefore, any modification of hydrologic inputs from the CCR impoundments are expected to have a negligible effect on these wetlands. Adjacent non-jurisdictional wetlands that may be perpetuated by lateral movement of water from the impoundment berms (seepage) (typically small, linear wetlands) may be reduced in size or eliminated by reductions in hydrology associated with impoundment closure. This cannot be avoided if these facilities are closed under either closure method. In terms of EO 11990, there is no practicable alternative that would avoid impacting such wetlands.

Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into off-site or nearby jurisdictional and non-jurisdictional wetlands. BMPs in accordance with site-specific erosion control plans would be implemented to minimize this potential. Indirect impacts to wetland areas due to construction activities would be short-term and minor.

3.9 Environmental Justice

3.9.1 Affected Environment

EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” requires some federal agencies to consider when identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations. While TVA is not subject to this EO, TVA applies it as a matter of policy.

Here, closure activities would occur on previously developed industrial sites and borrow material would be obtained from a previously permitted site. These activities would temporarily result in construction related noise, exposure to fugitive dust and exhaust emissions to those persons near the construction site and borrow material haul routes. Although the exact location of the borrow material site is not known, as identified in Part I, Section 3.16, it is assumed that transport of borrow material would use existing arterial or interstate roadways. Given the location of BRF, SR 170 (Edgemoor Road) would have to be used to access the site. Therefore for this analysis, potentially affected communities were defined as any census block group that included the CCR impoundment to be closed and any block group along the anticipated route between SR 170 (Edgemoor Road) and the nearest interstate or arterial road to the east and west [US 25 W (Clinton Highway) and SR 62, respectively].

The geographic distribution of the block groups studied are shown on Figure 3-4. Total minority populations comprise between 0 to 8.7 percent of the population of the block groups studied. The minority populations within the block groups studied did not exceed 50 percent of the total population and did not significantly exceed rates for Anderson County (10 percent minority). Therefore, none of the block groups studied met the criteria as EJ minority populations.

The percentages of persons within each block group living below the poverty threshold range from 6.8 to 36.0 percent. No block groups had low-income populations that exceeded 50 percent of the total population in the given block group and did not significantly exceed corresponding rates for Anderson County (18.2 percent). However, because specific income information is not available at the block level, smaller populations, such as the trailer park located east of BRF on the south side of SR 170 (Edgemoor Road), identified as an EJ population in this analysis. It is probable that persons in this area should also be considered as a sensitive low-income population subject to EJ considerations.

3.9.2 Environmental Consequences

As identified on Figure 3-4, none of the block groups in the immediate vicinity of the impoundments to be closed meet the criteria for EJ consideration. The CCR impoundments at BRF are located in an area reserved for heavy industry and given the distance between the impoundments and the nearest residences, no direct impacts to the surrounding population are anticipated.

An estimated total of approximately 111 loaded trucks per day would be required to haul borrow material to BRF during the closure period. (These trips would be reduced or eliminated if bottom ash replaces some or all of this fill material.) This results in a traffic volume of 222 dump trucks passing by a given location each day (25 trucks per hour) during a portion of the overall construction period (approximately 12 months as noted in Section 3.11). A potential EJ community is located adjacent to SR 170 (Edgemoor Road),

which would be used to access BRF. This community could experience mild to moderate impacts associated with noise and fugitive dust related to the transport of borrow material due to the frequency of these trips during the construction period.

Dust control measures would be implemented to minimize emissions of fugitive dust and the haul of borrow material would generally occur during normal working hours, and only during intermittent times throughout the site closure period which would reduce the severity of these impacts.

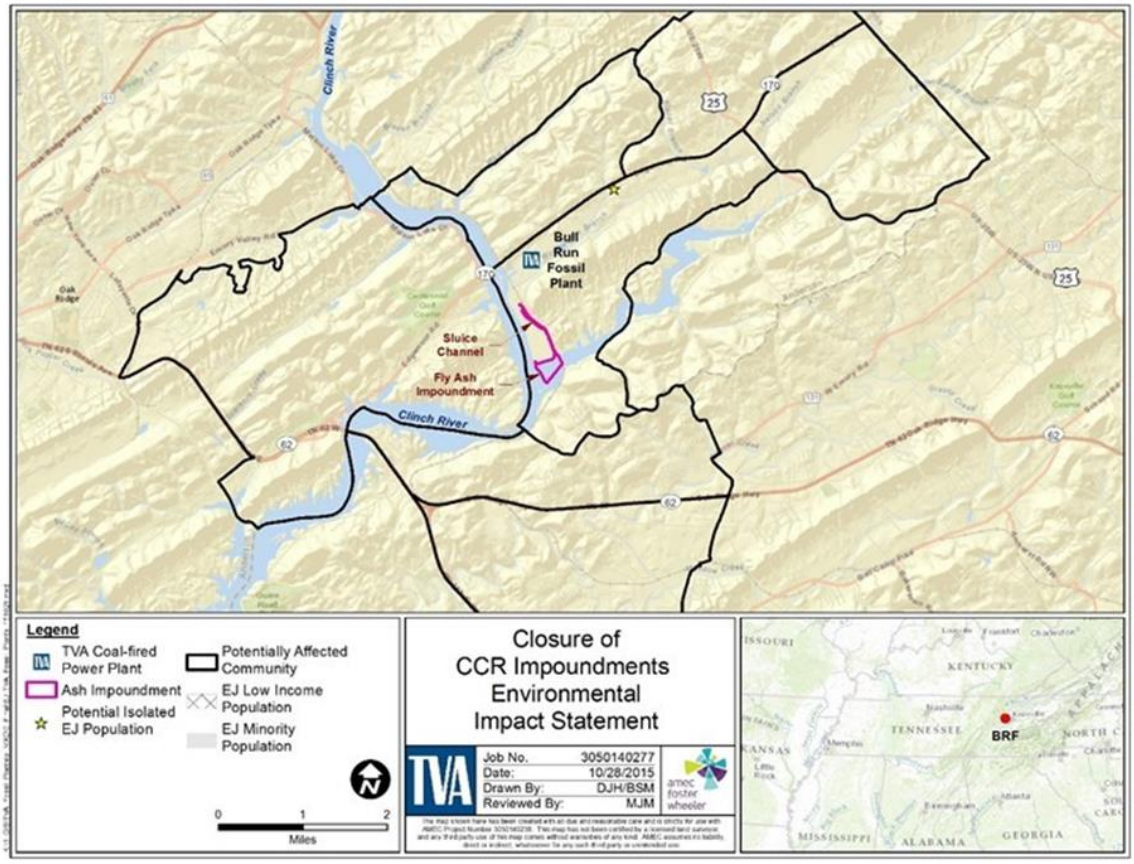

Figure 3-4. Environmental Justice Populations Near BRF

In addition, as shown on Figure 1-2, a temporary laydown area which would be used to temporarily store supplies and equipment has been identified just south of the trailer park on the south side of Old Edgemoor Road. The use of this area would indirectly impact this community as a result of construction-related noise and traffic, and would create a visual impact as this area is within the viewshed of the potential EJ community.

Impacts associated with the transport of borrow material and the proposed laydown area are short term and minor to moderate in nature and would be consistent across all communities (EJ and non-EJ) and would not be disproportionate to the area identified as a potential EJ population. Therefore, there is no potential for any high and adverse impacts to be disproportionately borne by low-income and minority populations.

It should also be noted that opportunities would be provided to residents with some construction phase employment, thereby providing potential positive impacts to area low-income and minority populations.

3.10 Natural Areas, Parks and Recreation

3.10.1 Affected Environment

As illustrated on Figure 3-5, ten managed areas (i.e. natural areas, parks, wildlife management areas, habitat protection areas, recreational areas) occur within 2 mi of the CCR impoundments proposed for closure at BRF. This section addresses managed areas that are on or near the CCR impoundments as impacts from closure activities would generally occur within areas in the vicinity of the impoundments.

Haw Ridge Park and two TVA habitat protection areas are located within 0.5 mi of the project area. Haw Ridge Park is located southwest of the project area on the shore of Melton Hill Lake. The 780-ac park has over 28 mi of dirt trails and is used by hikers, trail runners, mountain bikers and horseback riders (Outdoor Knoxville 2015). This park contains a playground area and three ball fields. The habitat protection areas are natural areas managed by TVA to protect significant natural features. In addition, there is a small parking area on the south side of Edgemoor Road just east of the Clinch River Bridge. This parking lot is utilized by fisherman to access the Clinch River.

In Anderson County, the Clinch River is a designated Nationwide Rivers Inventory listed by the National Park Service from CRM 47, upstream to River Mile 73, below Norris Dam. This section is recognized by the U.S. National Park Service for its scenic, recreational, geological, fisheries, wildlife, historical and cultural values (TVA 2012). The State of Tennessee recognizes the section of the Clinch River from Melton Hill Dam upstream to the Pellissippi Parkway (SR 62) as a Class III Partially Developed River. A partially developed river is defined by TDEC as rivers or sections of rivers that are free flowing, unpolluted and with shorelines and vistas essentially more developed (TDEC 2015).

3.10.2 Environmental Consequences

Under Alternative B, TVA would close the inactive CCR impoundments in place and borrow material needed for closure would be obtained from a currently permitted site within a 30-mi radius of BRF unless TVA can beneficially reuse CCR onsite for fill material that meets the beneficial use criteria in the CCR Rule. As discussed in Part I, Section 3.15 there would be no direct impact to natural areas, parks or recreation areas as the CCR impoundments are located on an industrial area and borrow material would be obtained from a previously permitted site.

Although the exact location of the borrow material site is not known, as identified in Part I, Section 3.16, impacts associated with the transport of borrow material are anticipated to be minor given the temporary nature of the action and the preferred use of existing arterial or interstate roadways. However, given the location of BRF, SR 170 (Edgemoor Road) would have to be used to access the site and recreational users of facilities along this road (the parking lot south side of SR 170 (Edgemoor Road) just east of the Clinch River Bridge, Haw Ridge Park, the Centennial Golf Course, Soloway Park, and Claxton Community Park) would potentially be impacted by increased traffic, fugitive dust and noise during the construction period. This impact would be minor given implementation of BMPs designed to minimize fugitive dust, the temporary nature of the action, and the intermittent use of these sites.

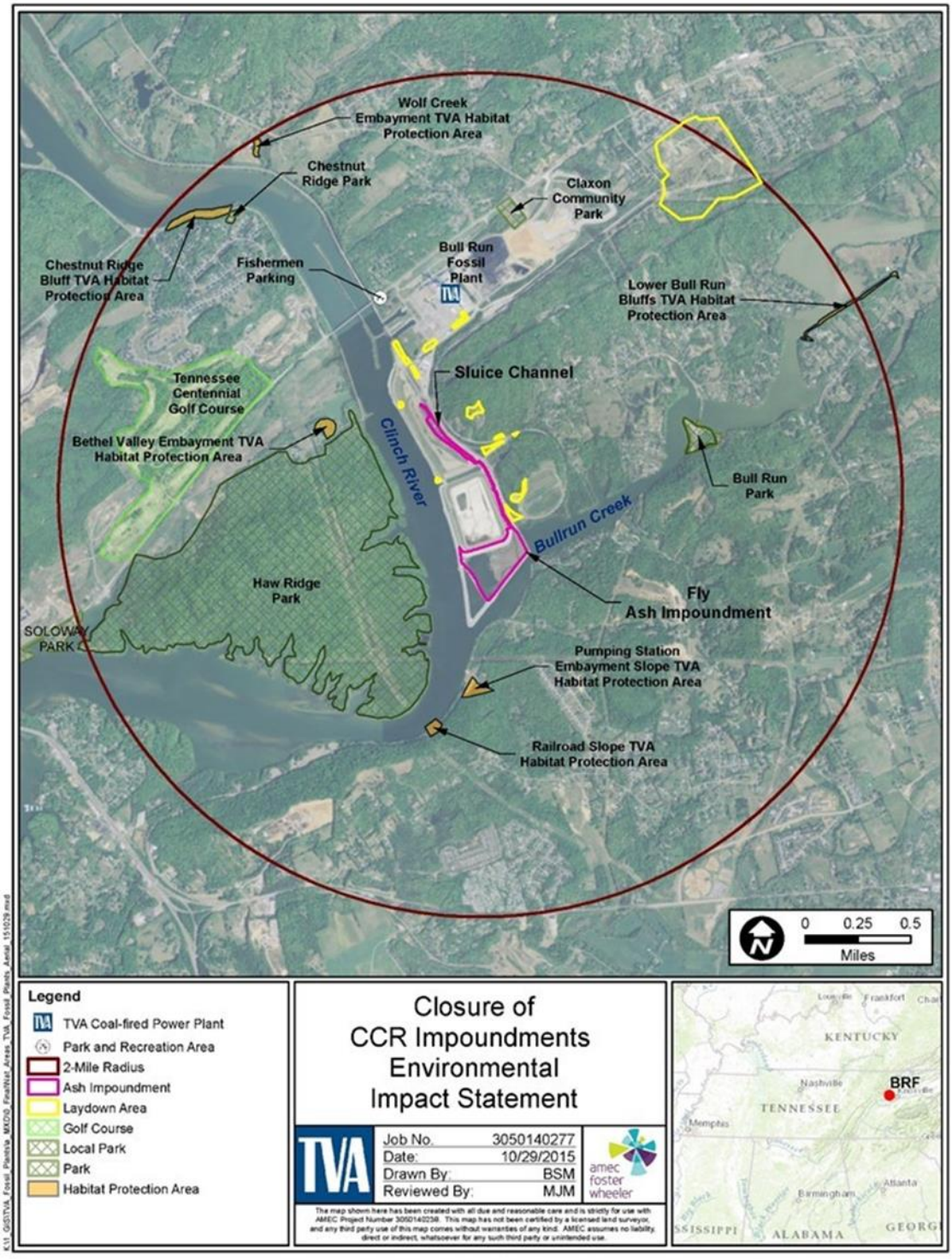

Figure 3-5. Natural Areas, Parks and Recreational Facilities Near BRF

3.11 Transportation

3.11.1 Affected Environment

BRF is served by highway, railway and waterway modes of transportation. Traffic generated by BRF is expected to be composed of a mix of cars and light duty trucks, as well as medium duty to heavy duty trucks.

State highways provide ample access in the immediate vicinity of BRF. Principal access at BRF is via SR 170 (Edgemoor Road), which is two lanes wide. US 25W, a four-lane roadway, is approximately 3.2 mi east of BRF. The intersection of SR 170 (Edgemoor Road) and Melton Lake Road is approximately 0.4 mi west of BRF on the opposite side of the Clinch River from the plant. Approximately 3.0 mi west of BRF is the interchange of SR 170 (Edgemoor Road) and SR 62, a four-lane highway.

The proposed borrow material haul route has not been identified. Therefore, a 30-mi radius was used to define the affected environment for BRF. Within a 30-mi radius of BRF, the transportation network is extensive, and contains hundreds of miles of roads and bridges, rail lines and navigable waterways. Major interstates include I-75 and I-40, which also serve the Oak Ridge and the Knoxville metropolitan areas. The proposed haul route is assumed to incorporate a mix of local, state and interstate roadways. The 2013 Annual Average Daily Traffic (AADT) on the roadways in the immediate vicinity of BRF for SR 170 (Edgemoor Road), US 25W, Melton Lake Road, and SR 62 are indicated in Table 3-4.

Table 3-4. Average Daily Traffic Volume (2013) on Roadways in Proximity to BRF

Roadway	Average Daily Vehicle Use (AADT)
SR 170 (Edgemoor Rd.) between BRF and US 25W	14,909
US 25W (Clinton Hwy.) north of SR 170	14,537
US 25W (Clinton Hwy.) south of SR 170	14,819
SR 170 (Edgemoor Rd.) between US 62 and BRF	18,362*
US 62 (Oak Ridge Hwy.) north of SR 170	33,440*
US 62 (Oak Ridge Hwy.) south of SR 170	54,582*

Source: TDOT 2013.

* Indicates AADT is from 2012.

3.11.2 Environmental Consequences

Traffic generated by the closure of the Fly Ash Impoundment or the Sluice Channel would consist of the construction workforce, shipments of goods and equipment, and the hauling of borrow material to the site to be used in the closure-in-place activities. However, if beneficial reuse of onsite material is allowed, TVA would avoid the potential impacts discussed in this section associated with the hauling of offsite borrow material.

Traffic generated by the transport of borrow material along a dedicated haul route to the site is the controlling factor in assessing impacts to the local roadway network. This traffic, along with the construction workforce traffic, would occur in addition to the existing traffic generated by the operation of BRF and is considered to reflect the maximum potential impact on transportation. The estimated number of daily truckloads (of borrow material) using 15-yard tandem dump trucks would be 111 over a period of not more than 12 months. This would result in a traffic count of 222 truck trips per day. The construction workforce traveling to and from BRF would contribute to the traffic on the local transportation network.

A construction workforce of 75 to 100 is expected to support closure activities under this alternative. This workforce volume would occur at the beginning and ending of the work day. Additional construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered to the Fly Ash Impoundment or the Sluice Channel on flatbed trailers under both the mobilization and demobilization stages of the project. Overall, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and it is assumed that these motorists would disperse throughout the transportation network and use interstate highways or major arterial roadways as much as possible.

Once construction is completed, maintenance phase traffic associated with maintaining the closed impoundment would be negligible.

The exact haul route and travel patterns of the construction workforce are not known as a particular borrow site has not yet been identified. However, for this analysis it has been assumed that the transport of borrow material, the construction workforce and the shipment of equipment would use SR 170 (Edgemoor Road) to access BRF. As a conservative analysis, it was also assumed that all construction vehicles would follow the exact same path either from the east or west of BRF. Table 3-5 summarizes the worst case traffic increase along each of the potential routes to/from BRF.

The percentage increases in traffic on the surrounding road network resulting from the closure-in-place of the BRF CCR impoundments are negligible. As mentioned previously, the assignment of all of the construction traffic in the same direction is conservative. In actuality, traffic associated with this alternative will be distributed throughout the road network and their effect on the roadway network will decrease as it spreads out with greater distances from BRF. With the exception of SR 170 (Edgemoor Road), the existing roadway network is expected to have sufficient capacity to absorb the expected temporary construction traffic increase.

However, on SR 170 (Edgemoor Road), which is a two-lane roadway, potential localized minor to moderate impacts of construction on roadway transportation may occur. For example, peak hour delays are known to occur along SR 170 (Edgemoor Road). In fact, it has been reported that westbound traffic on SR 170 (Edgemoor Road) in front of the BRF entrance backs up east of Melton Lake Drive onto the Clinch River Bridge. The existing (2013) traffic volume on SR 170 (Edgemoor Road) in this area is over 18,000 vehicles per day. This volume would affect the trucking of borrow material that is along a route to and from the west of BRF. Delays are also known to occur on the approach to SR 62 and on the merge from SR 162 to I-40 and vice versa, although these roadways are four lanes wide and able to handle additional volume. Additionally, the trucking of borrow material to and from the east of BRF is likely to experience congestion on SR 170 (Edgemoor Road) during peak hours of the day. East of BRF, SR 170 (Edgemoor Road) carries almost 15,000 vehicles per day. The addition of construction-related traffic from BRF would have a minor to moderate impact on traffic east of BRF during peak hours of the day. Ingress/egress turning movements of construction traffic at BRF may at times be difficult and lead to unsafe conditions during peak hours. Therefore, while the impacts of the additional project related traffic on the surrounding transportation network may be absorbed and short term, localized effects on traffic flow and safety may be evident on SR 170 (Edgemoor Road). TVA will coordinate with Tennessee Department of Transportation and Anderson County transportation officials as needed to develop appropriate mitigation measures to reduce localized temporary transportation effects on SR 170 (Edgemoor

Road) such as the installation of traffic lights. Otherwise on the remainder of the road network, the percentage increases in traffic resulting from the closure-in-place of the Fly Ash Impoundment and the Sluice Channel are negligible. Because the existing roadway network is expected to have sufficient capacity to absorb the expected temporary construction traffic increase, potential impacts of construction on roadway transportation are expected to be minor and temporary.

Table 3-5. Traffic Impacts Associated with the Closure-in-Place of the Sluice Channel and Fly Ash Impoundment

Roadway	2013 Traffic (AADT)	Construction Phase Traffic (AADT)	Traffic Increase (Percent)
Route To/From the East			
SR 170 (Edgemoor Rd.) between BRF and US 25W, **then**	14,909	15,131	1.5
US 25W (Clinton Hwy.) north of SR 170 **or**	14,537	14,759	1.5
US 25W (Clinton Hwy.) south of SR 170	14,819	15,041	1.5
Route To/From the West			
SR 170 (Edgemoor Rd.) between US 62 and BRF, **then**	18,362*	18,584	1.2
US 62 (Oak Ridge Hwy.) north of SR 170 **or**	33,440*	33,662	0.6
US 62 (Oak Ridge Hwy.) south of SR 170	54,582*	54,804	0.4

* Indicates AADT is from 2012.

3.12 Cultural and Historic Resources

3.12.1 Affected Environment

Parts of BRF have been previously surveyed for cultural resources. These surveys were conducted to satisfy the requirements of Section 106 of the National Historic Preservation Act (see Part I, Section 3.18).

No known archaeological sites or architectural properties listed or eligible for listing on the National Register of Historic Places have been previously identified within the footprint of the CCR impoundment or laydown area. A Phase I cultural resource survey for the 115-ac ash management expansion project was undertaken in 2011; however, no archaeological sites were identified on this portion of the plant property (TVA 2012b).

3.12.2 Environmental Consequences

Under Alternative B, TVA would close the inactive CCR impoundments in place and borrow material needed for closure would be obtained from a currently permitted site within a 30-mi radius of BRF unless beneficial reuse of onsite material is allowed. For the laydown area, TVA anticipates using 5 to 10 ac temporarily during construction for parking, and equipment and material storage. The proposed laydown areas have been determined to have no effect on cultural resources because the areas has been previously surveyed for cultural resources, disturbed from previous construction and/or covered by asphalt/gravel. As discussed in Part I, Section 3.18, there would be no direct impact to cultural resources as the CCR impoundments are located on a previously disturbed industrial area and borrow

material would be obtained from a previously permitted site or onsite. The Tennessee Historical Commission concurred that the project will have no effect on any cultural resources listed on or eligible for the National Register of Historic Place (Tennessee Historical Commission 2016) (see Part I Appendix C).

Although the exact location of the borrow material site is not known, impacts associated with the transport of borrow material are anticipated to be minimal given the temporary nature of the action and the preferred use of existing arterial or interstate roadways. However, given the location of BRF, SR 170 (Edgemoor Road) would have to be used to access the site and any historic properties located along this route would potentially be impacted by increased traffic and associated noise and vibration during the construction period. This impact would be minor and temporary and will be avoided altogether if beneficial reuse of onsite material is allowed.

3.13 Noise

3.13.1 Affected Environment

BRF is bordered by wooded ridges on the north and south, a partially wooded valley to the east, and the Clinch River on the west. There are noise sensitive land uses (residential areas) located north, south and east of the plant site. The partially wooded hills across the river are used for residential and recreational purposes. The residences closest to the plant and therefore most affected by plant noise are located north of the plant. The residences closest to the Fly Ash Impoundment and Sluice Channel are located across Bullrun Creek on the ridge south of the plant site at a distance of approximately 412 ft.

There are numerous existing sources of noise at BRF. Operations at the existing coal plant generate varying amounts of environmental noise. Noise generating activities associated with the existing plant include coal unloading activities, periodic dozer operations associated with coal pile management and truck operations. Existing noise emission levels associated with these activities typically ranges from 79 to 88 A-weighted decibel (dBA). Average ambient noise levels surrounding BRF measured in 2005 ranged from 42 dBA to 69 dBA. Off-site sources of noise were primarily derived from highway traffic (TVA 2005).

Anderson County, Tennessee has established quantitative noise-level regulations specifying environmental noise level limits based on the land use of the property receiving the noise. Per the Anderson County Ordinance, allowable noise levels from industrial properties cannot exceed 80 dBA. In addition, EPA (1974) guidelines recommend that the day-night sound level (Ldn) not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985).

3.13.2 Environmental Consequences

As discussed in Part I, Section 3.19, noise impacts under this alternative would be associated with on-site closure activities, the transport of borrow material, and construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the closure site.

Typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 ft from the construction site. Based on straight line noise attenuation, it is estimated that noise levels from these sources would attenuate to 66.7 dBA at the residences located southeast of the Fly Ash Impoundment on the left descending bank of

Bullrun Creek. However, the actual noise would probably be lower in the field, where objects and topography would cause further noise attenuation. Although within the guidelines established by Anderson County, this level exceeds the EPA noise guideline for Ldn of 55 dBA, as well as the HUD guideline for Ldn of 65 dBA. Given the temporary and intermittent nature of construction noise, the impact of noise generated from on-site closure activities is expected to be minor.

There is a potential for indirect noise impacts associated with the increase in construction-related traffic and the transport of borrow material to the closure site. However, as stated in Part I, Section 3.19, noise impacts from construction related traffic are expected to be minor as construction-related traffic would utilize interstate highways or major arterial roadways as much as possible and likely would not have a noticeable increase on traffic volume and consequently traffic noise in the vicinity of those major roadways.

Primary noise impacts are associated with the concentrated truck movements along the dedicated route used to transport borrow material to BRF. As identified in Section 3.11, the percentage increases in traffic on the surrounding road network resulting from the closure-in-place of the BRF CCR impoundment are negligible. Therefore, the increase in current noise levels is estimated to be less than 3 dBA, and as such, traffic noise is not anticipated to increase perceptibly. However, given the primarily residential nature of the land uses along SR 170 (Edgemoor Road), the projected increase of 111 loaded trucks (traffic count of 222 trucks per day) during the construction closure period noise-sensitive receptors (primarily residents and parks) adjacent to SR 170 (Edgemooor Road) would experience increased noise emissions corresponding to the frequency of these trips. Given the temporary and intermittent nature of closure activities, and negligible increase in noise levels, these indirect impacts would be minor to moderate and would be avoided altogether if beneficial reuse of onsite material is allowed.

3.14 Cumulative Effects

3.14.1 Identification of "Other Actions"

Past, present, and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-6. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger, and potentially significant adverse impacts to the resources of concern.

Actions that are listed as having a timing that is "past" or "present" inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis. There are other CCR facilities at BRF that will be closed in the future. When this is proposed, additional reviews will be conducted under NEPA that tier from this EIS. Impacts from those future actions that cumulate with the impacts resulting from closure of the Fly Ash Impoundment and Sluice Channel will be considered in the reviews of those actions when the details of such actions can be better determined.

3.14.1.1 Mechanical Dewatering Facility

TVA recently installed equipment to remove water from gypsum and bottom ash generated at BRF. The equipment was located in a pre-engineered building located southwest of the

powerhouse. Installation of the mechanical dewatering facility has allowed TVA to close wet CCR handling and disposal operations at BRF. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

Table 3-6. Summary of Other Past, Present or Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Project

Actions Description	Description	Timing and Reasonable Foreseeability
Mechanical Dewatering Facility	Installation of mechanical dewatering facility for dry storage of ash and gypsum at BRF	Past
House Demolition	166 ac purchase adjacent to BRF to expand plant boundary	Past
New CCR Dry Storage Landfill	Construction of new CCR disposal site for dry storage	Reasonably Foreseeable Future

3.14.1.2 House Demolition

TVA recently purchased approximately 166 acres adjacent to BRF to expand the plant boundary. Several of the homes and structures were removed by previous owners of the property before TVA took ownership, however some vacant structures remained, including dwellings, garages, or out-buildings. To minimize the risk to human health and safety, TVA decided to demolish and remove the remaining structures. This site is currently under consideration by TVA as a potential site for a new CCR dry storage landfill. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

3.14.1.3 New CCR Dry Storage Landfill

To meet its need for 20 years of dry, CCR storage capacity, TVA is evaluating alternatives to expand its current capacity for managing newly generated CCRs at BRF. Construction of a dry landfill would provide additional CCR management capacity that will enable TVA to continue operations at BRF and would be consistent with TVA's commitment to convert wet CCR management systems to dry systems. This also would support TVA's compliance with the EPA's recently issued CCR Rule. TVA is currently evaluating alternatives to construction of the landfill.

3.14.2 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the Sluice Channel and Fly Ash Impoundment was considered in conjunction with the environmental impacts presented in Chapter 3 and as described programmatically in Part I, Section 3.25. These combined impacts are defined by the Council on Environmental Quality as "cumulative" in 40 Code of Federal Regulations 1508.7 and may include individually minor but collectively significant actions taking place over a period of time. The potential for cumulative effects to the identified environmental resources of concern are analyzed below for the preferred alternative.

Air Quality: Other identified actions within the geographic area that have the potential to contribute to additional air quality impacts include the installation of the mechanical dewatering facility and the construction of a new CCR dry storage landfill. Emissions from the operation of the mechanical dewatering facility are subject to specific State of

Tennessee process and fugitive dust regulations. While the emissions for this process are a minor increase over the previous conditions, they do not exceed significance levels. Construction of a new landfill could result in some minor emissions during the construction phase, which would be temporary. During operation of the landfill, fugitive dust from the pile and transport of CCR to the landfill may impact residences or parkland areas near the site, but fugitive dust limitations should appropriately mitigate such impacts.

As discussed in the programmatic evaluation for Closure-in-Place, Alternative B would involve several activities that would potentially result in temporary air emissions and fugitive dust. These activities include equipment removal, grading and compaction of CCR, transport of borrow material, and installation of approved closure systems. If the new CCR landfill is constructed near BRF such that the dust emissions from the site are concurrent with the closure activities, there would be potential for minor and short-term impacts. However, exceedances of applicable ambient air quality standards are not expected. Therefore, no cumulative effects to air quality are anticipated as a result of this alternative.

Environmental Justice: Other identified actions that would have an impact on EJ communities within the geographic area include the demolition of houses on the adjacent properties and construction of the new landfill. Any impacts to EJ communities as a result of the demolition of the houses would have been minor and limited to the demolition phase, which is now complete. Any EJ impacts associated with constructing a new on-site landfill will be addressed in the EIS that TVA is preparing for that proposal. This will include any cumulative impacts.

For this alternative, impacts associated with the transport of borrow material and the proposed laydown area are short term and minor in nature and would be consistent across all communities (EJ and non-EJ) and would not be disproportionate to the area identified as a potential EJ population. Therefore, there is no potential for any high and adverse impacts to be disproportionately borne by low-income and minority populations. Additionally, employment opportunities would be provided to local residents to support the construction phase which would result in positive impacts to area low-income and minority populations. Therefore, adverse cumulative impacts from this alternative to EJ communities are not anticipated.

Transportation: The potential for cumulative effects to transportation from other identified actions includes the construction of the new CCR landfill site. During the construction phase of the landfill a small increase in traffic could be anticipated, however, this increase would be localized near the landfill site. Once construction is completed, operational phase traffic of the new landfill would be much lower than the traffic generated during construction.

It is anticipated that the percentage increases in traffic on the surrounding road network resulting from the closure-in-place of the Fly Ash Impoundment and Sluice Channel are negligible for most roadways that could be impacted. However, while the existing roadway network is expected to have sufficient capacity to absorb the expected temporary construction traffic increase, potential localized impacts of construction on roadway transportation may occur. TVA will coordinate with TDOT and County transportation officials as needed to develop appropriate mitigative measures to reduce localized transportation effects on SR 170 (Edgemoor Road). Any increases in traffic from the other identified actions are expected to also be minor and temporary. Therefore, cumulative effects to transportation resources are not anticipated as a result of this alternative.

Noise: Among the other identified actions within the geographic area the mechanical dewatering facility and construction of the new CCR landfill have the potential to contribute to additional noise impacts. Since the dewatering facility is currently in operation at BRF, it is considered part of the overall noise levels for the industrial setting. The noise generated during the construction of the landfill would be temporary. Impacts to any sensitive noise receptors would be limited to the construction phase and are therefore not anticipated to be significant.

As discussed in Part I, Section 3.25 the potential for cumulative noise impacts would be associated with the transportation of borrow material from off-site locations. While impacts due to this alternative may have a minor impact on residences and parkland proximate to the haul routes used, cumulative effects from the other identified actions are not anticipated. Such impacts may be avoided altogether if beneficial reuse of onsite material is allowed.

CHAPTER 4 – LITERATURE CITED

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Appendix A – Conceptual Closure Plans, Preferred Alternative

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PROCESS WATER CONVEYANCE DITCH (N.I.C.)

PROPOSED PROCESS WATER CONVEYANCE DITCH

RAILROAD

BULL RUN CREEK

FLOW

APPROXIMATE LOCATION OF RELOCATED CHANNEL – SEPTEMBER 2015

PROPOSED MANHOLE

FLY ASH POND TO BE DEWATERED

POOL ELEVATION = 801.0'

PROPOSED DEWATERING DAM

STANDPIPES & CULVERTS

PROPOSED CLEANOUT

PROPOSED GYPSUM STACK UNDERDRAIN CONVEYANCE PIPE

PROPOSED TURBIDITY CURTAIN

GYPSUM DISPOSAL AREA

STILLING POND

POOL ELEVATION = 800.0'

RAILROAD

PROCESS WATER CONVEYANCE DITCH

BOTTOM ASH DISPOSAL AREA

CLINCH RIVER

FLOW

EXISTING DISCHARGE PIPES

CLOSED CCR EM. POND

LEGEND

- ROAD
- RAILROAD
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- 500 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- TURBIDITY CURTAIN
- EXISTING WATER LINE
- EXISTING ACCESS ROAD
- AREA TO BE DEWATERED
- PROPOSED DEWATERING DAM

0 150 300

SCALE IN FEET

FOR SUPPORTING DESIGN CALCULATIONS SEE

R #

R #

REV NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST

DISCIPLINE INTERFACE

REV CD 1 2 3 4

SCALE: 1" = 150' EXCEPT AS NOTED

PROPOSED SITE PLAN

BULL RUN FLY ASH POND CLOSURE PLAN

BULL RUN FOSSIL PLANT

DRAFT SUBMITTAL

DRAFT

ISSUED FOR APPROVAL NOT FOR CONSTRUCTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
YRC	AN	SCW	NSG	XXX	XXX	XXX

AECOM

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2013 | DATE 12/16/15 | C | 10WXXX-04 | R A

AECOM	A
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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