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FINAL
ASH IMPOUNDMENT CLOSURE PROGRAMMATIC EIS

PART II – SITE-SPECIFIC NEPA REVIEW: KINGSTON FOSSIL PLANT

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Symbols, Acronyms and Abbreviations

µg/L	Micrograms Per Liter
µm	Micrometer
AADT	Annual Average Daily Traffic
BMP	Best Management Practice
CCR	Coal Combustion Residual
CRM	Clinch River Mile
dBA	Decibels A-Weighted
COC	Constituent of Concern
EJ	Environmental Justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ERM	Emory River Mile
GWPS	Groundwater Protection Standard
HPA	Habitat Protection Area
HUD	U.S. Department of Housing and Development
KIF	Kingston Fossil Plant
Ldn	Day Night Average Sound Level
MCL	Maximum Contaminant Level
MGD	Million Gallons Per Day
mg/L	Milligrams Per Liter
NEPA	National Environmental Policy Act
NHPA	National Preservation Act
NLEB	northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyls
PM	Particulate Matter
RIF	Relative Impact Framework
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWQC	Tennessee Water Quality Criteria
USFWS	U.S. Fish and Wildlife Service
VSMP	Vital Signs Monitoring Program
yd^3	Cubic Yard

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

The Kingston Fossil Plant (KIF) is located on the west side of Watts Bar Lake at the confluence of the Emory and Clinch rivers, north of Kingston, Tennessee (Figure 1-1) Construction of the 1,723 megawatt plant began in 1951 and the plant went into commercial production in 1954. KIF is a coal-burning power plant with nine generating units. Kingston's nine units generate approximately 10 billion kilowatt-hours a year, which is enough electricity to power approximately 700,000 homes. As part of this action, the Tennessee Valley Authority (TVA) plans to close the inactive Stilling Impoundment and Sluice Trench at KIF. Table 1-1 summarizes the general characteristics of the ash impoundments subject to closure at KIF.

Bottom ash that collects in the bottom of the boiler was wet-sluiced to the Sluice Trench until October 2015 (Figure 1-2). The Sluice Trench is approximately 1,870 feet (ft) long with an average width of 80 ft. The Sluice Trench was used for dewatering of bottom ash sluice water. Much of the coal combustion residuals (CCR) would settle out in the Sluice Trench before the remaining CCR and water would travel to the Stilling Impoundment. This trench is also used for conveyance of other non-CCR waters to the Stilling Impoundment.

View of Stilling Impoundment

The Stilling Impoundment is surrounded by a dike on three sides (see inset photograph). The dike is approximately 30 ft high and 2,800 ft long. In 2009 after a dredge cell dike failed at KIF, a dike buttress was constructed along the edge of the Stilling Impoundment for seepage control with some additional stability for the dike. The buttress was installed as a precaution and not as remediation for the dredge cell dike that is located approximately 2,000 ft to the north of the Stilling Impoundment.

Prior to October 19, 2015, the Stilling Impoundment received bottom ash wastewater, outage wash water, station sump discharges, coal yard run-off impoundment discharges and other ancillary plant discharges. The Stilling Impoundment also receives storm water runoff from part of the closed Dredge Cell and Ash Disposal Area (specifically, the South Dredge Cell, Lateral Expansion and Ash Pond areas) and the so-called "Ball Field," a dry storage area. Some runoff from the Ball Field area enters the Sluice Trench. Water from the Stilling Impoundment is discharged through a National Pollutant Discharge Elimination System (NPDES) permitted Outfall 001. The CCR was dredged periodically from the Sluice Trench by track hoe and placed on the Ball Field.

TVA is in the process of converting to a dry-stacking operation at KIF. Once the dry-stacking operation is in place, it is anticipated that bottom ash will first be dewatered in a dewatering facility and then moved to the new permitted landfill in the peninsula area for stacking. This is anticipated to occur in 2017 (TVA 2015). TVA has constructed a new lined ditch parallel to the existing Sluice Trench and has installed free standing tanks to manage the bottom ash flow until the dewatering system is operational.

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

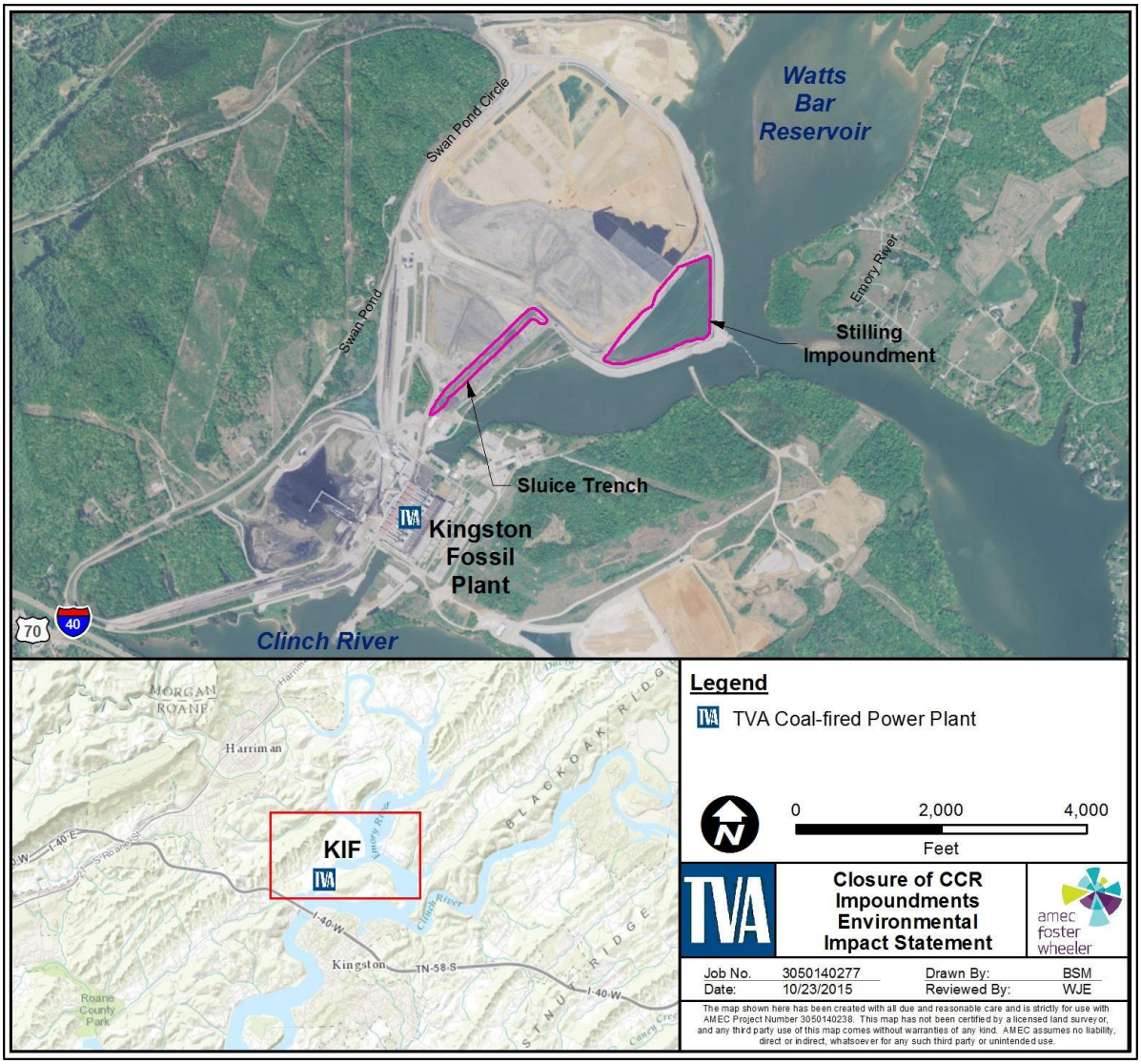

Figure 1-1. KIF Project Location

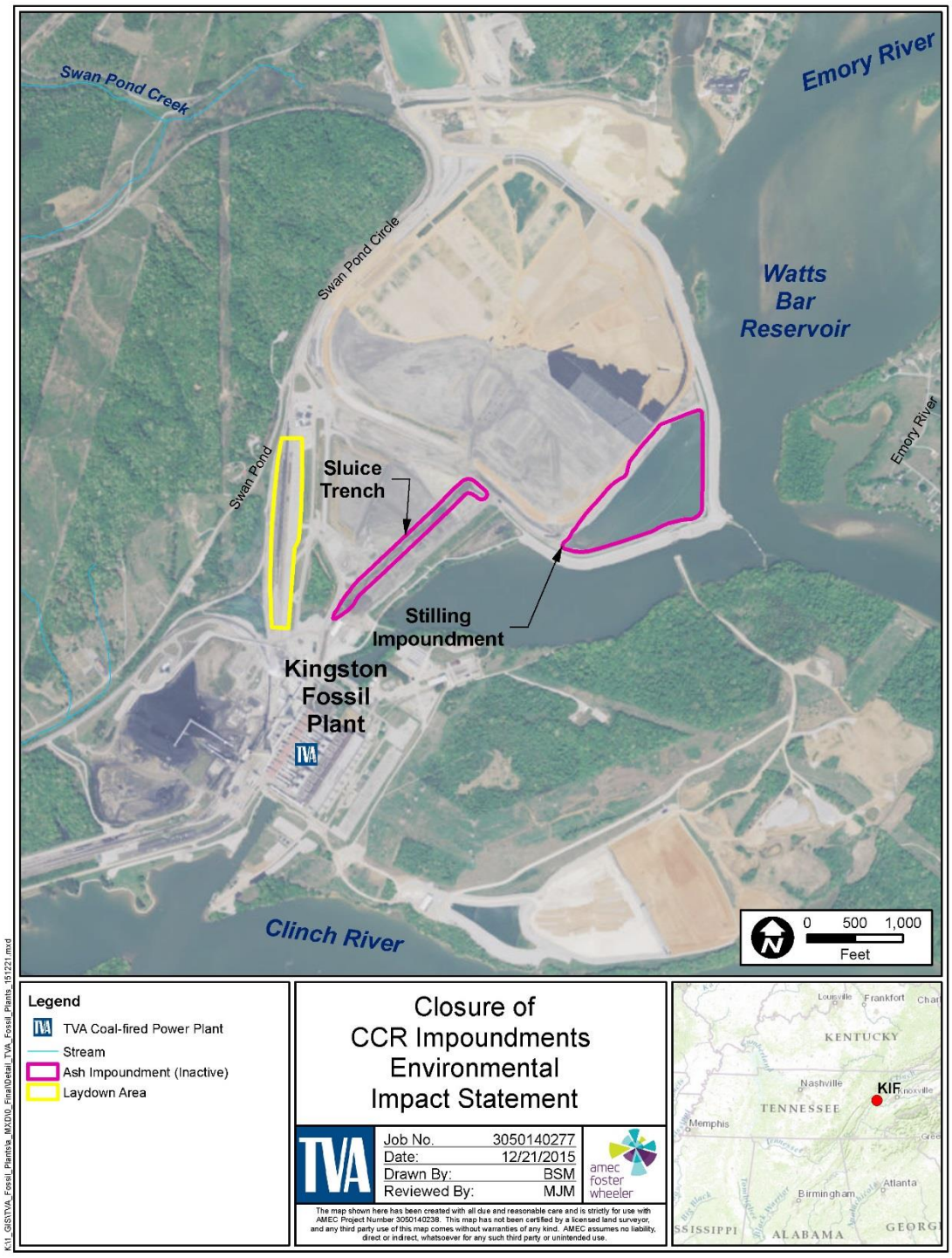

Figure 1-2. Ash Impoundment Closure Utilization Areas at KIF

Table 1-1. Summary of Stilling Impoundment and Sluice Trench Characteristics

Attribute	Description
Location	Roane County, Tennessee
Impoundment Name	Stilling Impoundment and Sluice Trench
Impoundment Status	Inactive
Size	31 ac
CCR Material	Bottom Ash/Fly Ash
CCR Volume	700,000 cubic yards (yd^3)
Borrow Material Volume (Closure-in-Place)	262,000 yd^3
Borrow Material Volume (Closure-By-Removal)	912,000 yd^3
Temporary Laydown Areas	5 to 10 ac
Proposed Closure Completion Date	Within 5 years

1.2 Decisions to be Made

TVA must decide how to close two wet management CCR facilities at KIF. 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 Stilling Impoundment and Sluice Trench at KIF, and to assist TVA in complying with the U.S. Environmental Protection Agency (EPA)'s CCR Rule.

1.4 Summary of Proposed Action

TVA proposes to close the inactive Stilling Impoundment and Sluice Trench at KIF by converting the wet CCR storage to dry storage on-site using an approved closure methodology. The proposed action is described in detail in Chapter 2.

CHAPTER 2 – ALTERNATIVES

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

2.1 Existing Stilling Impoundment and Sluice Trench Operations

Water from the Stilling Impoundment discharges into the waters of the state of Tennessee (Emory River in Watts Bar Lake) via the current NPDES permitted Outfall 001. On average, 15.3 million gallon per day (MGD) flows are discharged from the Stilling Impoundment via Outfall 001. The largest source is the station sump discharge (7.7 MGD). The station sump primarily receives equipment cooling water, unit leakage, etc. Currently, the Bottom Ash Sluice waste stream (6.8 MGD) is undergoing a separate NEPA review to evaluate dewatering alternatives (TVA 2015). Runoff from the coal yard (0.145 MGD) is also directed into the Stilling Impoundment. Other minor effluent streams that are also contained in the discharge from Outfall 001 include air pre-heater washes.

2.2 Project Alternatives

TVA evaluated three alternatives for closing KIF's Stilling Impoundment and Sluice Trench: 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 Stilling Impoundment and Sluice Trench at KIF and the feasibility of undertaking closure activities (Figure 2-1).

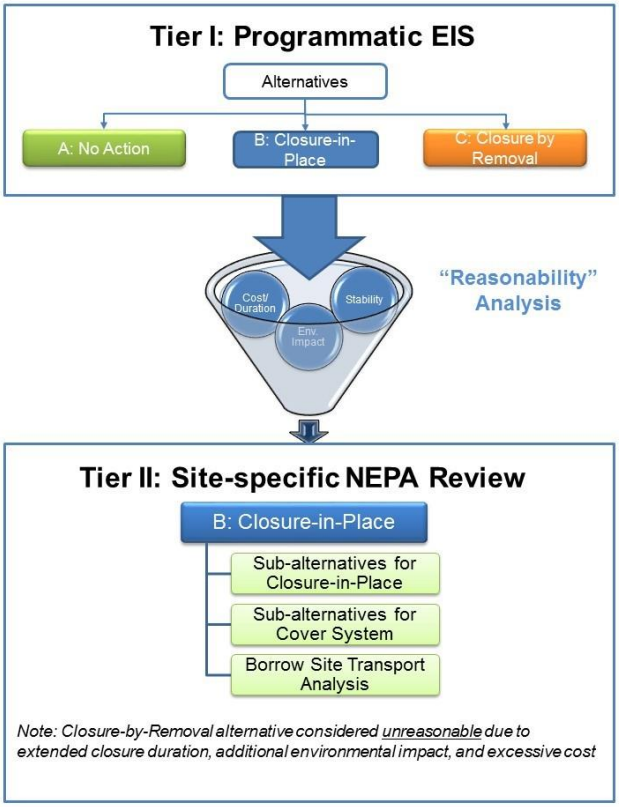

Figure 2-1. Reasonable Alternatives Analysis for KIF Ash Impoundments

Key factors that TVA considered included the following:

- *Volume of CCR materials.* The size of an ash impoundment and volume of CCR will affect closure activities and appropriateness of an alternative. The Ash Impoundment Complex at KIF is estimated to contain 700,000 yd^3 of CCR materials.
- *Schedule/Duration of Closure Activities.* Time necessary to complete closure activities at an ash 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 five-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 the CCR facilities was evaluated by Dewberry Consultants (2013). Safety ratings under static conditions were determined to be adequate for the Stilling Impoundment and Sluice Trench. TVA is currently evaluating the seismic stability of all CCR facilities (including the Stilling Impoundment and Sluice Trench) 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. TVA ceased sending CCRs to the Stilling Impoundment and Sluice Trench before October 19, 2015, consistent with EPA's CCR Rule and is currently reducing water levels in accordance with existing NPDES permit allowances. Consequently, hydraulic loading due to wet transport to the impoundment has been reduced to de minimis levels. Closure of the CCR units would also include a rerouting of all process waters around the CCR units, further reducing hydraulic inputs and enhancing stability.

  The Stilling Impoundment abuts the southeastern boundary of a closed Ash Landfill (this is sometimes referred to as the CERCLA landfill). Along this perimeter, a series of parallel subsurface walls (or "shear" walls) were constructed to stabilize the landfill facility. In designing the walls, the Stilling Pond was assumed to be closed, with earth fill placed on top of the existing ash deposits. This configuration would provide lateral support to the landfill facility, which is required to maintain stability during an earthquake. Therefore, ash excavated from the Stilling Impoundment must be completed in a controlled manner (i.e., immediately replace excavated material with borrow.
- *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, Johnson 2014, Mitchell 2006). 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 edge of the impoundment when the exposed surface of the fly ash slid over an underlying soft, apparently saturated area. As a result, the fly ash and water engulfed the excavator resulting in the death of the 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.

- *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) require the use of large numbers of vehicles and operators. At KIF, the Stilling Impoundment and Sluice Trench contain approximately 700,000 yd^3 of CCR. For those sites like KIF that have 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 and achieve closure of inactive impoundments within the 5-year period for closure.

  In addition, duration of transport of materials at KIF is extended due to the need to maintain the stability of the adjacent landfill perimeter berm as excavated CCR must be replaced with borrow in a controlled manner. Given, the existing volume of CCR and the requirement for controlled removal, it is estimated that it would take 10.5 years to transport CCR from KIF by truck to a permitted landfill.

  Transport of CCR by rail must consider the volume of CCR materials to be removed, 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 be safely excavated, dried and moved to rail loading facilities.

  After the KIF spill in 2008, rail was used to transport CCR to the Arrowhead Landfill in Perry County, Alabama. Permits were not required because the spill was being managed under CERCLA. Since then, the infrastructure used to load the CCR has been removed, so new infrastructure would need to be constructed and possibly permitted. Also, the effort involved in transporting coal ash recovered after the KIF spill by rail turned out to be labor intensive, required dedicated rail cars and was slower than anticipated. Given the costs and environmental impacts associated with development and permitting of the required loading and unloading infrastructure and the rate that CCR could safely be removed from the Stilling Impoundment and Sluice Trench, it would take 9.4 years to transport CCR from this site by rail to a permitted landfill.

- *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 Stilling Impoundment and Sluice Trench 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 protected because of their ecologic significance. 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 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 (groundwater, surface water, ecological receptors 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 showed 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 not to meet the purpose and need of complying with the CCR Rule and closing ash impoundments. This alternative, therefore, 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 KIF. Alternative C – Closure-by-Removal was eliminated from further consideration as it was determined to be unreasonable for logistical, environmental and economic reasons. Key factors contributing to this determination included:

- Excessive volume of CCR materials.
- KIF no longer has rail facilities with infrastructure for loading CCR. As described in Part I, Chapter 2, rail transport of CCR would require initial steps similar to transport by truck including CCR excavation, drying and loading onto trucks to transport to a rail loading facility. TVA would need to install CCR loading infrastructure (e.g., concrete removal pad, push walls, loading equipment, stormwater controls) near an existing or new rail siding. Rail transport would require the installation of loading and unloading infrastructure, and a rail transportation service in the form of a rail carrier. A rail intermodal terminal would need to be constructed at or very near a Subtitle D landfill. The components of a rail terminal would 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. Additionally, there is substantial time and uncertainty related to environmental permitting of rail loading and unloading facilities as well as for the temporary area used to dry CCR before movement. The necessary environmental and construction permits could easily take 18 to 24 months to acquire. Given the expected duration of the closure of 9.4 years, 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.

- Extended duration of normal removal operations. CCR excavated from the Stilling Impoundment must be completed in a controlled manner (i.e., immediately replace excavated material with borrow as compared to excavate, grade and cover with borrow that can be used at other sites), which extends the duration of removal. This extended duration 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 as compared to Closure-in-Place.
- Alternatively, increasing the trucking rate would be highly impactful. While the CCR ruling 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. The number of trucks required to accomplish removal within the 4-year construction schedule would result in 70,000 truckloads of CCR. Over the 4-year hauling window, a count of 117 truckloads per day would be required to haul the CCR off site (Figure 2-2) to a Subtitle D landfill. It is estimated that this would equate to approximately 13 loaded trucks passing by a given location each hour (0.2 loaded trucks per minute). However, due to stability issues at the Stilling Impoundment, CCR removal operations are limited to no more than 54 truckloads per day at KIF; therefore, the 4-year hauling window would be exceeded. In addition, the number of daily truckloads of borrow material would be 405 and would be done by 15-yard tandem dump trucks. This activity would result in a traffic count of 810 trucks per day along the haul route.
- Potential impacts related to increased air and noise emissions associated with transport of CCRs to the nearest permitted Subtitle D Landfill.
- Potential safety concerns associated with increased motor vehicle crashes as described above and in Part I, Chapter 2.
- Potential concerns associated with worker safety as described above and in Part I, Chapter 2.
- Potential impacts to environmental justice populations located adjacent to Interstate Highway 40, which would likely be used by trucks to access KIF as they travel to and from the nearest permitted Subtitle D Landfill.
- Excessive removal cost in comparison to Closure-in-Place ($107 million for truck transport and $73 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 strongly 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 former mines.

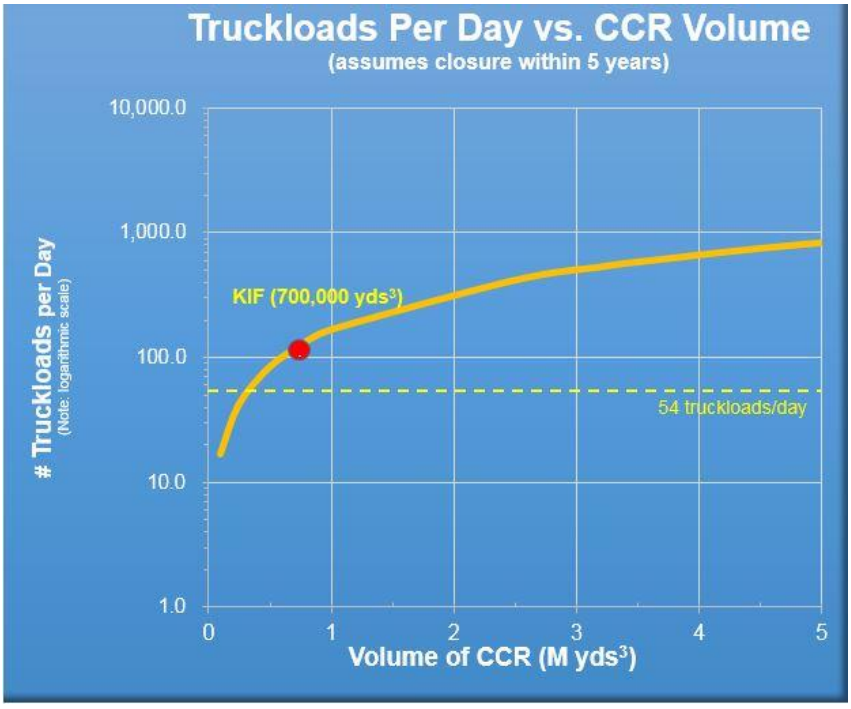

Figure 2-2. Number of Truckloads vs. CCR Removal Volume
Note: 54 trucks per day are used in this analysis due to the reduced rate of removal due to consideration of stability issue at the Stilling Impoundment.

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 detailed consideration of closure of the Stilling Impoundment and Sluice Trench.

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

Alternative B – Closure-in-Place

Construction activities associated with the closure of the Stilling Impoundment and Sluice Trench would entail direct disturbance of the ash impoundment and disturbance of supporting laydown areas (see Figure 1-2). Within the identified laydown areas, TVA anticipates temporarily using

approximately 5 to 10 acres (ac) for vehicle and equipment parking, materials storage and construction administration. Conceptual designs for the in-place closure of the Stilling Impoundment and Sluice Trench are provided in Appendix A. Under this alternative, approximately 262,000 yd^3 of borrow material would be hauled from one or more previously developed sites within 30 mi of KIF. Activities associated with this action would include the following:

1. Dewatering surface water from impoundments
2. Reroute conveyances sending storm water to Stilling Impoundment and Sluice Trench.
3. Grade and reconfigure CCR (Category A) to consolidate CCR, reduce footprint and promote site drainage.
4. Acquire and transport borrow material to help grade and cover site.
5. Install a geosynthetic liner cover system (Geosynthetic-Protective Soil Cover System).
6. Install a protective soil cover and establish non-invasive vegetation.
7. Install and operate groundwater monitoring system per federal and any additional state requirements.
8. Complete and submit closure documentation.

TVA can complete Closure-in-Place of the Stilling Impoundment and Sluice Trench within a reasonable time frame (i.e. within 5 years). However, considering the expected scope and sequencing of the project, closure may be completed within approximately 1.7 years. Alternative B is estimated to cost $40 million. Cost and duration information is summarized in Table 2-1.

This closure alternative is evaluated in the Environmental Consequences section because it is an alternative that could meet the purpose and need of the project.

Table 2-1 Cost and Duration for Closure of the Stilling Impoundment and Sluice Trench at KIF

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)
$40	1.7	$107	168%	10.5	$73	83%	9.4

2.3 EPRI Relative Impact Framework

As was described in Part I, Section 2.3, Electrical 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 TVA's 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. The conclusions that TVA draws from these more site-specific analyses confirm TVA's programmatic conclusions about the merits of and relative differences between the two closure methods.

2.4 Summary of Alternative Impacts

The environmental impacts of Alternative B are analyzed in detail in this section and 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 Chapter 3.

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

Issue Area	Alternative B – Closure-in-Place
Closure Cost	$40 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. 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 of largely industrialized environmental settings that lack notable plant communities but minor and positive in the long term.
Wildlife	Minor impact to previously disturbed low quality habitats. Potentially minor beneficial impacts in the long term.
Aquatic Ecology	No impact.

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

Issue Area	Alternative B – Closure-in-Place
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 impact.
Transportation	Temporary minor impacts from transport of borrow material.
Visual Resources	Minor impacts during construction. Beneficial in long term.
Cultural Resources	No impacts due to use of previously disturbed lands.
Noise	Temporary minor construction noise impacts from equipment and vehicles.
Solid and Hazardous Waste	Minimal amounts generated during construction activities and managed in permitted facilities.
Public Health and Safety	Temporary minor impacts associated with on-site construction activities and transportation of borrow material.
Cumulative Effects	Minor cumulative effects.

2.5 Identification of Mitigation Measures

Mitigation measures identified in 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 truck wash) will ensure that surface waters are protected from construction impacts (Bowen et al. 2012).
- 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.
- Under the CCR Rule, TVA will be required to install or upgrade groundwater monitoring systems for KIF CCR facilities. Data from these systems will be used to assess groundwater contamination and, could trigger or corrective action. State requirements provide an additional layer of groundwater protection to minimize risk.

2.6 Preferred Closure 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 Stilling Impoundment and Sluice Trench within the 5-year closure period. Alternative B can be completed in a shorter time frame than Alternative C, requires substantially less cost and avoids adverse impacts associated with the off-site transfer of CCR.

2.7 Necessary Permits or Licenses

TVA holds the permits necessary for the operation of KIF. 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 of KIF's existing NPDES permit to reflect the closing of the Stilling Impoundment. Outfall 001: Stilling Impoundment will still discharge some storm water and plant process flows.
- Modification to the Tennessee Multi-Sector Permit for Industrial Storm Water discharges would be made for the addition of new storm water outfalls.
- KIF's Storm Water Pollution Prevention Plan would be revised to include the closed Stilling Impoundment.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the baseline environmental conditions potentially affected by the proposed closure of the Stilling Impoundment and Sluice Trench at KIF 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 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.

The analysis presented here does not contain detailed discussions on resources not found in the planning area, or where site-specific conditions would not change the impact analysis presented in Part I, Chapter 3. These include:

- Air Quality and Climate Change. No impacts to air quality and climate change were identified in Part I, Section 3.1. Roane County has been designated as nonattainment for particulate matter less than 2.5 micrometers (µm) ($PM_{2.5}$). TVA has significantly reduced its primary and secondary emissions of $PM_{2.5}$. Any emissions of PM would be temporary and confined to the immediate site 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 Physiographic Setting and Regional Aquifer

KIF is located in the Valley and Ridge Physiographic Province and is underlain by Cambrian-aged rocks of the Conasauga Group and Ordovician-aged rocks of the Knox group. The Valley and Ridge aquifer consists of folded and faulted carbonate, sandstone and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province and more erosion-resistant siltstone, sandstone and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, Knox and Conasauga groups are repeated throughout the Valley and Ridge Physiographic Province (Lloyd and Lyke 1995).

Groundwater is derived from infiltration of precipitation and from lateral inflow along the western boundary of the reservation. Groundwater movement generally follows topography with flow in an easterly direction from Pine Ridge toward the Emory River and Watts Bar Reservoir. An exception to this trend occurs on the northern margin of the ash disposal area where groundwater movement is northerly toward Swan Pond Creek. Groundwater originating on, or flowing beneath, the site ultimately discharges to the reservoir without traversing off-site property (TVA 2015).

The chemical quality of water in the freshwater parts of the Valley and Ridge aquifers is similar for shallow wells and springs. The water is hard, is a calcium-magnesium-bicarbonate type and typically has a dissolved-solids concentration of 170 milligrams per liter (mg/L) or less. In places where the residuum that overlies the carbonate rocks is thin, the Valley and Ridge aquifers are susceptible to contamination by human activities. Public drinking water for Roane County is supplied by surface water sources. Public groundwater sources in Roane County were closed prior to December 2008, except for one and it is located approximately 10 mi east of the project area (TVA 2015).

As described in Part I, Section 3.6, the CCR Rule allows for the differentiation of the uppermost aquifer and the point at which groundwater is first encountered. Currently, the groundwater monitored at KIF has not been confirmed to be from the uppermost aquifer. In 40 CFR § 257.60(a), the term uppermost aquifer is defined as including a shallow, deep, perched, confined or unconfined aquifer, provided it yields usable water, which may include considerations of water quality and yield (EPA 2015). TVA is in the process of studying groundwater characteristics near KIF for the purposes of better identifying the uppermost aquifer.

3.1.1.2 Groundwater Quality

The existing monitoring well network is illustrated in Figure 3-1. Groundwater flow direction reflects the topography and local geology and generally flows toward the adjacent Emory River system.

Historically, prior to the KIF dike failure, unfiltered groundwater samples were collected semiannually from at least four monitoring wells associated with the Dredge Cell and analyzed for 17 inorganic constituents. Following the December 2008 KIF dike failure, EPA, Tennessee Department of Environment and Conservation (TDEC) and TVA crews sampled water to assess the quality of public drinking water supplies, private wells, in-stream river water (both near the slide and at multiple downstream locations) and local springs. Currently, plant-wide groundwater monitoring plans require monitoring of wells associated with the CCR infrastructure (TVA 2015).

3.1.1.2.1 Ash Disposal Area (included the Stilling Impoundment)

Time series analysis has been performed on monitoring wells in the vicinity of the Ash Disposal Area using laboratory analytical results from 2009 through March 2015. Time series have been developed for antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, fluoride, lead, mercury, nickel, radium 226, selenium, silver, thallium, 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.

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

Groundwater concentrations exceeded the Groundwater Protection Standard (GWPS) for arsenic (10 micrograms per liter [µg/L]) in KIF-22 during the December 2014 sampling event. GWPS are as defined in Section IV(1)(d) of TDEC Ground Water Monitoring Guidance for Solid Waste Landfill Units Policy. Per Policy, GWPS are the constituent maximum contaminant levels (MCL) listed in Appendix III of Rule 0400-11-01-.04. The GWPS were established in May 2012. GWPS include MCLs as well as additional state standards for metals that do not have MCLs. This was the only sample that has exceeded the GWPS. This well was resampled for arsenic in February 2015 and the concentration was below the GWPS. Overall, the trends appear stable, with the exception of arsenic (KIF-22 in 2014) and cobalt (KIF-AD3). Arsenic levels fluctuate but remain significantly lower than what appeared to be an anomaly in 2014.

3.1.1.2.2 Ball Field (included Sluice Trench)

Analysis has been performed on monitoring wells AD1, AD2 and AD3 using laboratory analytical results from 2009 through March 2015. Time series have been developed for antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, fluoride, lead, mercury, nickel, selenium, silver, thallium, 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 do not exceed the GWPS for any parameter analyzed. Overall the trends appear stable, with the exception of cobalt (AD-2 and AD3). Cobalt appears to fluctuate but does not have a GWPS.

3.1.1.2.3 Gypsum Disposal Area

Groundwater concentrations at the gypsum disposal area currently do not exceed the GWPS for any parameter analyzed. Overall, the trends appear stable or non-detectable. Selenium has historically exceeded its GWPS of 50 ug/L in G5A, G5B and G6B. Concentrations peaked at approximately 420 ug/L in late 2010 and have steadily declined since that time. Concentrations have been at or below the GWPS over the last 5 years.

3.1.2 Environmental Consequences

As part of this alternative, the dewatering and subsequent stabilization of the CCR materials in the Stilling Impoundment and Sluice Trench would provide an immediate reduction in the potential subsurface flow from the impoundment. Under Alternative B, surface water and all contributing surface inputs would be minimized, resulting in a reduction of any groundwater below the Stilling Impoundment and Sluice Trench and general improvement in groundwater. Additionally, the installation of an approved closure cover system (see Chapter 2.0) would further reduce subsurface flow to the groundwater.

This conclusion is supported by TVA's on-going monitoring of similar ash management facilities at KIF. GWPS for facility constituents falling under Appendix II of Rule 0400-11-01-.04. Groundwater analytical data from the most recent sampling event are available on TVA's project website (https://www.tva.gov/Environment/Environmental-Stewardship/Environmental-Reviews/Closure-of-Coal-Combustion-Residual-Impoundments) and show no evidence of groundwater contamination from the Stilling Impoundment and Sluice Trench at KIF. Concentrations of the sampled constituents were below the applicable MCL or were non-detectable with the exception of a recent, slight exceedance of the arsenic MCL in a single well. Levels are expected to decrease even further with removal of the hydraulic head.

As discussed in Part I, Chapter 2, TVA will implement any supplemental mitigation measures required pursuant to a unilateral administrative order that TDEC issued in August 2015, which could include additional monitoring, assessment, or corrective action programs. These measures would further minimize risk from the closed Stilling Impoundment and Sluice Trench.

Consistent with EPA's determination in the CCR Rule and the results of the EPRI model described in Part I, Chapter 2.0, groundwater impacts would be reduced under the Closure-in-Place Alternative when the hydraulic head is removed and the facilities are capped. Removal of potential additional hydraulic inputs from precipitation, surface water run off or other water additions to the impoundment through the capping process would effectively reduce potential subsurface flows to groundwater. The activities associated with Alternative B would therefore, reduce groundwater risk related to this impoundment.

With respect to groundwater, EPRI's qualitative analysis of KIF indicated that this alternative was similar to the analysis of its hypothetical site and that it had a greater beneficial impact than the Closure-by-Removal Alternative with respect to both low and high mobility constituents under the non-intersecting groundwater condition (high mobility and low mobility constituents are defined in Part I, Section 2.3). By comparison, for high-

mobility constituents EPRI found that this alternative had a less beneficial impact for only high mobility constituents under the intersecting groundwater condition.

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

3.2 Surface Water

3.2.1 Affected Environment

KIF is located in eastern Tennessee and is situated on a peninsula formed by the confluence of the Clinch and Emory rivers at Clinch River Mile (CRM) 2.6 (Figure 3-2). River flow rates past the site are regulated by upstream dams on the Clinch River (Melton Hill and Norris dams) and downstream on the Tennessee River by Watts Bar Dam. The flow rates are also influenced by upstream dam operations on the Tennessee River (Tellico and Fort Loudoun dams). Flow patterns can be complex in the embayments of the Emory and Clinch rivers. The Emory River flow fluctuates between flowing upstream from the Clinch River through the Emory River embayment to also flowing backwards upstream of KIF. Water is pushed up the Emory River because of inflows that raise the pool elevation in Watts Bar Reservoir. Such inflow typically occurs when the reservoir is filling in the spring or during a spring flood event. Different rates and timing of releases from Watts Bar, Fort Loudoun and Melton Hill reservoirs can also cause reverse flows in the Clinch River arm of Watts Bar Reservoir. There is also the potential for water from the Clinch River to flow upstream into the Tennessee River during the filling of Watts Bar Reservoir.

These flow patterns are further complicated by temperature and density differences in the water. Warmer water is less dense and therefore stays on the surface of a reservoir. In the summer, the sun and ambient air temperatures warm the surface water and introduce thermal layering which becomes stable and prevents this warmer surface water from mixing with deeper, cooler and denser water. This stable thermal layering of water is known as stratification. The Emory River water also warms during summer. Discharges from Norris Dam and Melton Hill Dam tend to keep the Clinch River relatively cool despite increased air temperatures in the summer. When Clinch River water flows upstream into the Emory River embayment to the KIF water intakes in the summer, this cooler water flows along the bottom of the embayment and the warmer Emory River water flows downstream over the top of the cooler Clinch River water.

3.2.1.1 Water Quality (Pre-December 2008)

The Emergency Dredging for the KIF Ash Dike Failure Final Environmental Assessment (TVA 2009) describes the water quality prior to the December 2008 dike failure. The Emory River arm of Watts Bar Reservoir is on the state 303(d) list of impaired waters (TDEC 2014) because of sediments contaminated with polychlorinated biphenyls (PCBs) and chlordane from industrial point sources. The section of the Emory River above the influence of the Watts Bar impoundment is listed as impaired because of mercury from long-range atmospheric deposition (settling in the water from airborne sources). Several tributaries of the Emory River upstream of KIF are also listed as impaired because of manganese and iron concentrations and low pH; these conditions have most likely occurred as a result of historic coal mining activities. A few of these upstream tributaries are also impacted by sediment due to construction and development, or by pathogens from agriculture.

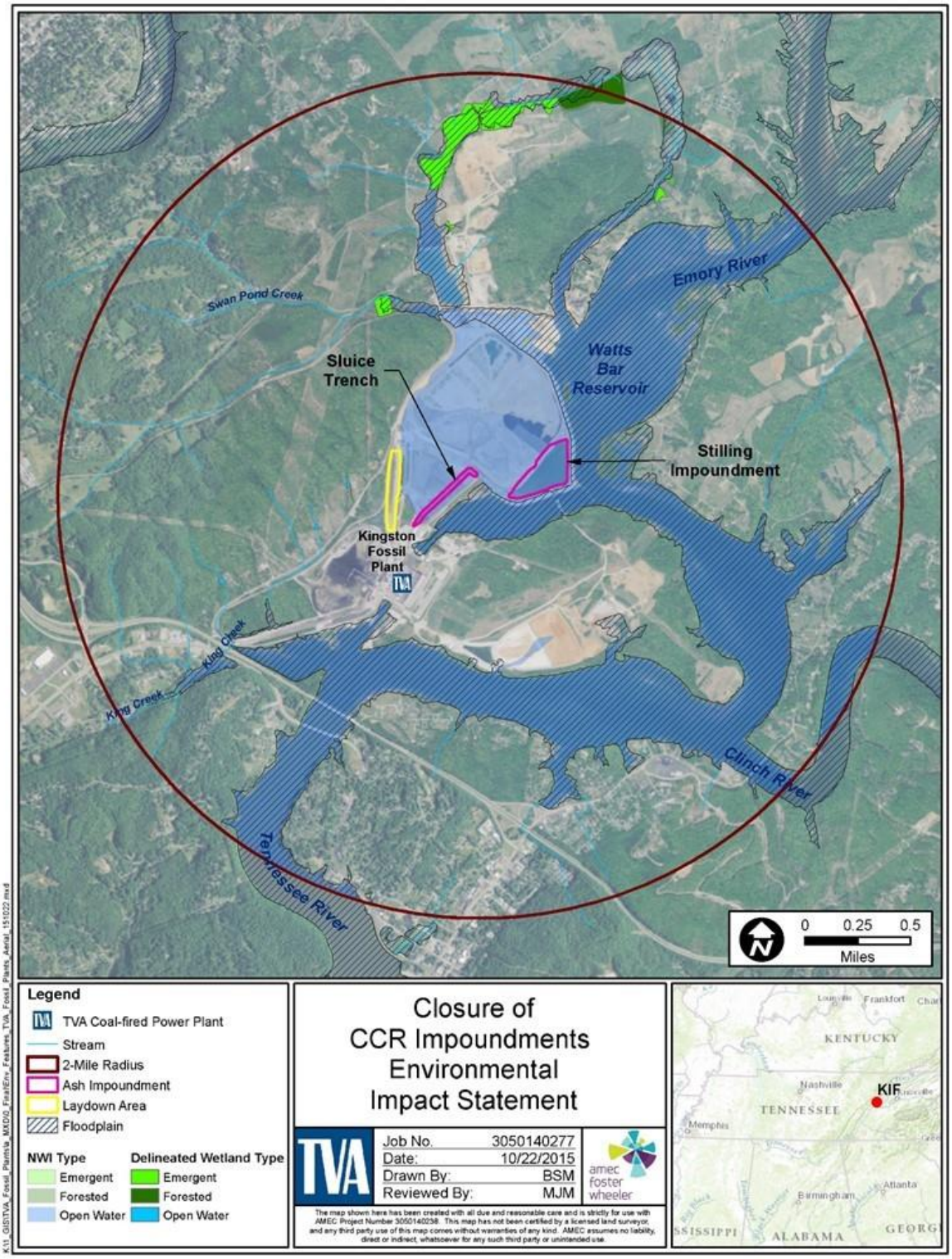

Figure 3-2. Environmental Features in the Vicinity of KIF

TVA conducted the Vital Signs Monitoring Program (VSMP) on Watts Bar Reservoir annually from 1991 through 1994 to establish baseline data on the reservoir's ecological health under a range of weather and flow conditions. Since 1994, Watts Bar Reservoir has been evaluated every other year. The VSMP uses five metrics to evaluate the ecological health of TVA reservoirs: chlorophyll concentration, fish community health, bottom life, sediment contamination and dissolved oxygen. Values of "good," "fair," or "poor" are assigned for each metric monitored by TVA.

The reservoir ratings for Watts Bar have fluctuated between "good," "fair," and "poor," and have generally been influenced by reservoir flow conditions with the lowest ratings during droughts. Of the indicators included in the VSMP, dissolved oxygen is the most responsive to flow rates (TVA 2012). The most recent evaluation rated the reservoir as "fair" in 2012, with dissolved oxygen rated "poor" at the forebay and good at the mid-reservoir location. Chlorophyll rated "poor" at both locations due to elevated concentrations. The fish assemblage rated "good," while bottom life rated good at the mid reservoir location, "fair" at the forebay and Clinch inflow locations and "poor" at the Tennessee River inflow. Sediment quality rated "fair" at the forebay and mid-reservoir locations due to contaminants.

3.2.1.2 Water Quality (KIF Ash Spill Recovery, 2009 to Present)

The December 2008 KIF dike failure released approximately 5.4 million yd^3 of coal ash and about 327 million gallons of water. This ash and water spread over nearly 300 ac of land and water adjacent to the plant and into the Emory River. After the release, the EPA, TDEC and TVA crews sampled surface water to assess the quality (both near the spill and at multiple downstream locations). Results of routine (non-rainfall event) surface water sampling indicated that concentrations of metals were highest in the area of the release, suggesting that cleanup dredging operations or residual CCR may have contributed to elevated concentrations in the river (TVA 2015). Results of rainfall event monitoring were generally similar to non-rainfall event sampling. Due to decreasing concentrations of metals in sampling results after the completion of cleanup dredging, TDEC and TVA agreed to reduced river sampling.

The effects of the spill were intensively studied by EPA, the TDEC, TVA and others. This included CERCLA natural resource trustees. The trustees determined that coal ash contains a variety of contaminants of concern including arsenic, cadmium, chromium, copper, lead, mercury, nickel, polycyclic aromatic hydrocarbons, selenium, vanadium, and zinc. The trustees concluded that there was little evidence of substantial-toxicity damage, no exceedances of sediment toxicity guidelines and extremely limited exceedances of adverse thresholds for fish and birds resulting from the ash release (Natural Resources Trustees 2015). The Kingston ash spill represents the most significant contamination of surface water with coal ash, yet resulting harm to the environment was relatively trivial.

The chemical constituents of greatest concern are the metals contained in the ash. These trace constituents are chemically combined with the ash. Depending on the temperature, pH and oxygen availability in the water, the metals may disassociate from the ash and become dissolved in the water column.

Surface water monitoring has been conducted pursuant to the May 2009 Administrative Order and Agreement on Consent (the Order) between EPA Region 4 and TVA to address the December 2008 ash release from the KIF dike failure (EPA 2009).

As TVA's remediation efforts progressed from completion of the time-critical removal action to implementation of the non-time-critical removal action for the Swan Pond Embayment and Dredge Cell, surface water monitoring was tailored to collect data to assess the impact of these actions on river system water quality.

According to the monitoring results, samples collected from September 2009 until June 2010 from the Swan Pond Embayment contained one or more concentrations of arsenic, mercury, selenium, or thallium that exceeded relevant TDEC Tennessee water quality criteria (TWQC) established for these parameters. Various Emory River locations ranging from Emory River Mile (ERM) 0.1 to 2.1 exhibited arsenic, lead and thallium concentrations that exceeded the applicable TWQC. Dredge plume samples collected from the most turbid parts of visual dredge plumes during the Emory River dredging operations indicated that one or more concentrations of these constituents exceeded one of the applicable criteria as well.

Samples from the comparison of the maximum and average concentrations for dredge plume and downstream Emory River at ERM 0.1 indicate that even during dredging activities, ash-related constituents settled out of the water column quickly. Additionally, the local drinking supply and groundwater wells were all frequently tested and all samples consistently met public health standards and MCLs were not exceeded.

Except for long-term monitoring, the remediation of Kingston ash spill has been successfully completed and TVA has asked EPA to formally close the consent order. The 2014 project Data Summary Report for groundwater and surface water showed trends in concentrations of arsenic and selenium (representative of ash-related constituents). Concentrations of arsenic and selenium in the Clean Water Ditch declined in 2014 from previous years as ash removal from the Middle Embayment and covering of exposed ash in the Dredge Cell was completed. Concentrations of arsenic and selenium have remained low in the Stilling Impoundment since late September 2011. Although the report indicated some elevated concentrations of arsenic, there were no reported results greater than the establish MCL for arsenic.

Presently, the Clinch River and Emory River arms of Watts Bar Reservoir are listed on the TDEC 303(d) list (TDEC 2014) due to past activities associated with the Department of Energy's Oak Ridge Reservation. The Clinch River arm continues to be listed because of PCBs, mercury and chlordane contamination of the sediment from legacy (historical) pollutants, industrial point source discharges and from atmospheric deposition. Additionally, the Clinch River is listed as threatened by loss of native mussel species for unknown reasons. Nearby tributaries to the Clinch River are also listed for PCBs, chlordane and mercury; one nearby tributary downstream is listed for arsenic.

The Emory River arm is also listed on the state 303(d) list (TDEC 2014) because of PCBs, mercury and chlordane contamination of the sediment from legacy (historical) pollutants, industrial point source discharges and from atmospheric deposition. Additionally, the Emory River arm, including Swan Pond Creek embayment and the unnamed embayment, was previously listed because of ash spill-related contamination including arsenic and coal ash deposits; however, these areas have subsequently been delisted in the Proposed Final TDEC 2014 303(d) list due to recovery efforts.

3.2.1.3 Surface Water of KIF Stilling Impoundment

As described in Section 2.1, KIF has several existing wastewater streams that are permitted under NPDES Permit TN0005410. Because the Stilling Impoundment discharge (Outfall 001) is the primary stream potentially affected by the proposed project, it is the only existing KIF wastewater stream discussed here.

Stilling Impoundment (Outfall 001)

On average, 15.3 MGD plant flows are discharged from the Stilling Impoundment via Outfall 001. The largest source is the station sump discharge (7.7 MGD). The station sump primarily receives equipment cooling water, unit leakage, etc. The parameters of interest in the station sump discharge are pH, total suspended solids (TSS) and oil and grease. However, the sump discharge pH and alkalinity are usually comparable to that of the KIF intake water.

Currently, TVA is assessing the potential impacts of dewatering the Bottom Ash Sluice waste stream (6.8 MGD). If TVA decides to do this, the water waste stream post dewatering would either be treated and discharged out NPDES Outfall 001 or would be recirculated back to the plant.

Coal yard runoff flows are driven by precipitation. Following a 10-year, 24-hour rainfall event of 4.9 inches per day, the estimated coal yard runoff could increase to approximately 10.9 MGD. Based on the NPDES permit flow schematic for KIF, the average annual daily flow for the coal yard runoff is 0.145 MGD. This is less than 1.0 percent of the total flow through Outfall 001. However, during a design storm event, the daily coal yard runoff flow could be approximately 71 percent of the current flow through Outfall 001. With the current coal blend being burned at KIF, the coal yard runoff ranges from neutral to slightly acidic (pH 6.8). The primary constituents of interest in the coal yard runoff are pH and TSS.

Other minor effluent streams that are also contained in the discharge from Outfall 001 include air pre-heater washes (up to 0.1 to 0.2 MGD) that may be acidic in nature resulting from the residues of sulfur and other compounds from the flue gas that have accumulated on the air pre-heater surfaces.

These non-CCR sources currently are treated through neutralization with other wastewaters and sedimentation in the Stilling Impoundment system. Outfall 001 discharges directly into the 1,347 MGD plant intake. TVA is required to meet permitted effluent limits including a minimum pH of 6.0 standard units and a monthly average TSS concentration of 29.9 mg/L. Outfall 001 also has to meet a monthly average oil and grease concentration of 14.4 mg/L.

To evaluate and characterize the current discharges from Outfall 001, Table 3-1 displays the discharges from KIF under current operations and the instream mixing concentrations are presented. For the current operations analysis, metals data were collected from the Outfall 001 Stilling Impoundment discharge and the plant intake, from special studies of these waste streams. Metals data for the contributing streams were collected during a special TVA study to evaluate impacts of bottom ash dewatering.

Table 3-1. KIF Mixing Analysis of Current Operations

	Current Baseline	Current Operations		
Element	Intake (mg/L)	Ash Stilling Impoundment (mg/L)	Projected Mixed Conc. At Outfall 001 and Intake on Emory River (mg/L)	Water Quality Criteria[1] (mg/L)
Aluminum	0.484	0.793	0.4892762	
Antimony	<0.002	<0.002	0.0010000	0.0056
Arsenic	<0.002	0.00544	0.0010758	0.01
Barium	0.023	0.051	0.0234747	2.0
Beryllium	<0.002	<0.002	0.0010000	0.004
Cadmium	<0.001	<0.001	0.0005000	0.002
Chromium	0.00411	0.0022	0.0040774	0.1
Copper	0.00204	0.0033	0.0020619	0.013
Iron	0.454	1.01	0.4634937	
Lead	<0.002	<0.002	0.0010000	0.005
Manganese	0.0334	0.116	0.0348104	
Mercury	0.00000291	0.00000448	0.000002937	0.00005
Nickel	<0.002	0.00445	0.0010589	0.1
Selenium	<0.002	<0.002	0.0010000	0.02
Silver	<0.002	<0.002	0.0010000	0.0032
Thallium	<0.002	<0.002	**0.0005000**[2]	0.00024
Zinc	<0.0250	0.0259	0.0127288	0.13

Notes: lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.; Analysis performed to assess Outfall 001 to Emory River and not intended to reflect plant-wide mass balance.
CCW flow = 1281; Stilling Impoundment flow= 22.3 MGD
[1] TDEC Criteria, Rule 1200-4-3-03
[2] **bold**-exceeds WQC

Results of the mixing analysis summarized in Table 3-1 demonstrates that all of the constituents meet the TDEC lowest criteria (i.e., limit equal to minimum of the drinking water and aquatic toxicity limits), except for thallium. 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 0.002 mg/L exceeds the TDEC criterion of 0.00024 mg/L. The mixing analysis indicates that the overall impact of current operations from this outfall does not have an adverse impact on surface water quality. Impacts associated with re-routing of these waste streams would be evaluated at a later time in a subsequent NEPA evaluation and design process. However, the water quality of these waste streams would not be expected to negatively impact surface water quality with proper treatment implementation.

Additionally wastewater treatment would be introduced as appropriate to ensure that outfalls receiving diverted flows comply with NPDES permit limits, TDEC water quality criteria and EPA's new Effluent Limitation Guideline for coal-fired power plants (80 Federal

Register 67838-67903) (November 3, 2015). TVA is reviewing the final Effluent Limitation Guideline to determine what actions may be required to comply with it.

3.2.2 Environmental Consequences

3.2.2.1 Impoundment Closure

Historically, the Stilling Impoundment was formed by placing rock into the embayment to above water levels and then a clay dike was constructed around the eastern and southern perimeter up to an elevation of approximately 750 ft. A raised dike was added up to the current elevation of approximately 765 ft with a portion constructed out of clay and a portion constructed out of constructed soil and ash fill. In 2009, after the dredge cell failure, the Dike C Buttress was constructed for seepage control with some additional stability for the lower dike. The buttress consisted of a filter containing sand and layers of increasingly larger gradations of aggregate to meet filter criteria. The exposed surface consisted of Class 'B' machined riprap for scour protection. The northeastern boundary of the Stilling Impoundment is the Divider Dike, which separated the Ash Disposal Area from the Stilling Impoundment prior to closure of the ash impoundment during the Kingston Ash Recovery Project. The Divider Dike consists of constructed ash. As part of the ash spill Recovery Project, 4 ft wide by 60 ft long cement bentonite shear walls were constructed along the divider dike from elevation 762 ft to 4 ft below bedrock. The spacing between these shear walls is approximately 19 ft (center to center). On top of the shear walls, a 5-ft tall earthen berm was constructed to a top elevation of approximately 767 ft (Stantec 2015).

The Sluice Trench is an unlined trench that was used for dewatering of bottom ash sluice water. This trench was also used for conveyance of other non-CCR waters to the Stilling Impoundment.

Under this alternative, the KIF Stilling Impoundment would be dewatered and all remaining CCR material would be consolidated and compacted. Structural fill would be imported, placed and compacted on top of existing CCR up to the liner subgrade elevation. An approved cover system consisting of a geosynthetic liner coupled with protective cover soil and a geocomposite drainage layer would be installed as described in Part I, Chapter 2. Plant discharges would continue to discharge through Outfall 001.

Wastewaters generated during the proposed project may include construction storm water runoff, dewatering of work areas, domestic sewage, 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.

3.2.2.2 Operational Impacts

The main operational change that would take place with the closure of the impoundments would be the change in management of the on-site storm water and process waste water that is currently treated and discharged from the Stilling Impoundment. Storm water, if possible, would be segregated and directly discharged to the appropriate adjacent receiving streams. BMPs would be utilized, as needed, to mitigate any pollutant discharge.

Bottom ash would continue to be stored wet until a dewatering facility is constructed and brought on-line. This option is currently being evaluated and if approved could be operational by 2017. For the interim period, TVA has constructed freestanding tanks to hold bottom ash until it can be dredged and placed in a landfill.

The analysis summarized in Table 3-1 demonstrates that current operations from Outfall 001 do not have an adverse impact on surface water quality. At this time, there is not enough information available to produce future operations mixing analysis. However, it is anticipated that the quality of the water would be maintained because these flows would be treated in a lined treatment impoundment and channel, thus eliminating any potential seepage. Additionally, waste water treatment would be introduced as appropriate to ensure compliance of discharge waters with NPDES permit limits and TDEC water quality criteria.

As described in Part I, Section 3.7, a recent study conducted by EPRI has evaluated the impact of impoundment closure on surface water for a hypothetical CCR impoundment in Tennessee. Under a closure scenario similar to Alternative B, EPRI analyzed the potential for constituents of concern (COC) releases from groundwater and the resultant effect on receiving surface waters. EPRI analyzed two scenarios: one in which all CCR materials were located above the water table, and a second in which the groundwater intersected the CCR materials. Under both closure scenarios, EPRI found that the in-place closure scenario provided a positive impact compared to baseline (i.e., concentrations of all COCs, with the exception of Arsenic(V), are less than 100 percent of baseline), ranging from a 2.5 to 7-fold increase in positive impact. Arsenic (V) migrates very slowly, thus, surface water concentrations are the same for all scenarios including baseline (EPRI 2016b).

This alternative would reduce the potential for any future lateral movement (seepage) from berms and possible release to surface waters. Consequently, any pathways for transport of COCs as a result of lateral movement through the berms and groundwater flow to adjacent surface waters would be minimized.

EPRI also qualitatively compared its hypothetical site analysis to KIF using site-specific data (EPRI 2016a). With respect to surface water, EPRI's sensitivity analysis indicated that this alternative had a negligible difference from the hypothetical site with respect to both low and high mobility constituents under both the non-intersecting groundwater condition and the intersecting groundwater condition.

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

3.3 Floodplains

3.3.1 Affected Environment

The Stilling Impoundment and Sluice Trench at KIF are located on Watts Bar Reservoir between EMR 1.8 and EMR 2.1. The 100-year flood elevations on Watts Bar Reservoir range from 748.1 ft at EMR 2.1 (Stilling Impoundment) to 747.8 ft at EMR 1.8 (Sluice Trench). The 500-year flood elevations on Watts Bar Reservoir range from 750.7 ft at EMR 2.1 (Stilling Impoundment) to 750.2 ft at EMR 1.8 (Sluice Trench).

The Stilling Impoundment and Sluice Trench are depicted on Roane County, Tennessee, Flood Insurance Rate Maps as being located outside the limits of the Emory River 100-year floodplain (see Figure 3-2). The lowest crest of the Stilling Impoundment is elevation 764.5 and the lowest elevation surrounding the Sluice Channel is elevation 762.0. The lowest crest elevations of each facility are located above the 100-year and 500-year flood elevations of the Emory River.

3.3.2 Environmental Consequences

Under Alternative B – Closure-in-Place, ash material would be relocated within the existing footprints of the Sluice Trench and Stilling Impoundment. These facilities are located outside the 100-year floodplain and above the 100-year flood elevation of the Emory River, which would be consistent with EO 11988. Current design plans would also remove the raised dike of Dike C down to a minimum elevation of 754 ft, which would also be above the 100-year elevation.

The proposed laydown area would be located outside 100-year floodplains, 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 Trench and Stilling Impoundment.

3.4 Vegetation

3.4.1 Affected Environment

KIF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion of Tennessee. Dominated by cherty clay, this ecotype was historically composed of mixed deciduous/evergreen forest and is currently used primarily as cropland and pasture (Griffith et al. 2001).

KIF has been heavily disturbed by construction, maintenance and operation of the facility for over 50 years. As a result of this alteration of the physical landscape, no portion of the potential project area supports a natural plant community (TVA 2015). Most areas within the potential project area on the KIF site are un-vegetated, gravel, or paved lots, but a few very small locations do contain early successional plant communities dominated by non-native weeds. These vegetated areas primarily form the edges of parking lots and roadways.

Land cover within a 2-mi radius of the plant is primarily deciduous forest (2,413.0 ac), open water (1,519.4 ac) and hay/pasture (1,227.3 ac) (Table 3-2). Land cover mapped within the permanent and temporary use areas is dominated by open water (26.7 ac) and developed land (11.4 ac) (Figure 3-3). The Stilling Impoundment, Sluice Trench and associated laydown area are characterized by predominantly open water and various “developed” land cover types that are predominantly exposed and barren lands within the impoundment. Sparse vegetated areas exist along the fringe of the Stilling Impoundment. No unique plant communities are present within the proposed project footprint at KIF.

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

Land Cover Type	Impact Area[1] (ac)	2-mi Radius (ac)
Barren Land	3.4	151.2
Cultivated Crops	0	4.4
Deciduous Forest	0	2413.0
Developed, High Intensity	0	200.0
Developed, Low Intensity	11.4	715.7
Developed, Medium Intensity	0	420.6
Developed, Open Space	0	889.5
Emergent Herbaceous Wetlands	0	20.0
Evergreen Forest	0	152.5
Hay/Pasture	0	1227.3
Herbaceous	1.0	133.6
Mixed Forest	0	86.6
Open Water	26.7	1519.4
Shrub/Scrub	0	20.1
Woody Wetlands	0	88.1
Total	**42.5**	**8042.0**

[1]Permanent Use Area: existing CCR Impoundment; Temporary Use Area: Laydown Areas
Source: USGS 2011.

3.4.1 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 are poorly represented at KIF and potential impacts are small relative to the abundance of similar cover types within the vicinity, impacts from site construction activities would be negligible. No tree removal would be required under this alternative.

Under Alternative B, impoundments would be filled with borrow material from a previously permitted borrow site. 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.

Lands within the ash impoundments would also be restored with a cover system that includes the establishment of an herbaceous cover. Temporary laydown areas would 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. It is anticipated that post-construction vegetation impacts would have a minor long-term beneficial impact as cover would have more desirable vegetation where currently limited or absent.

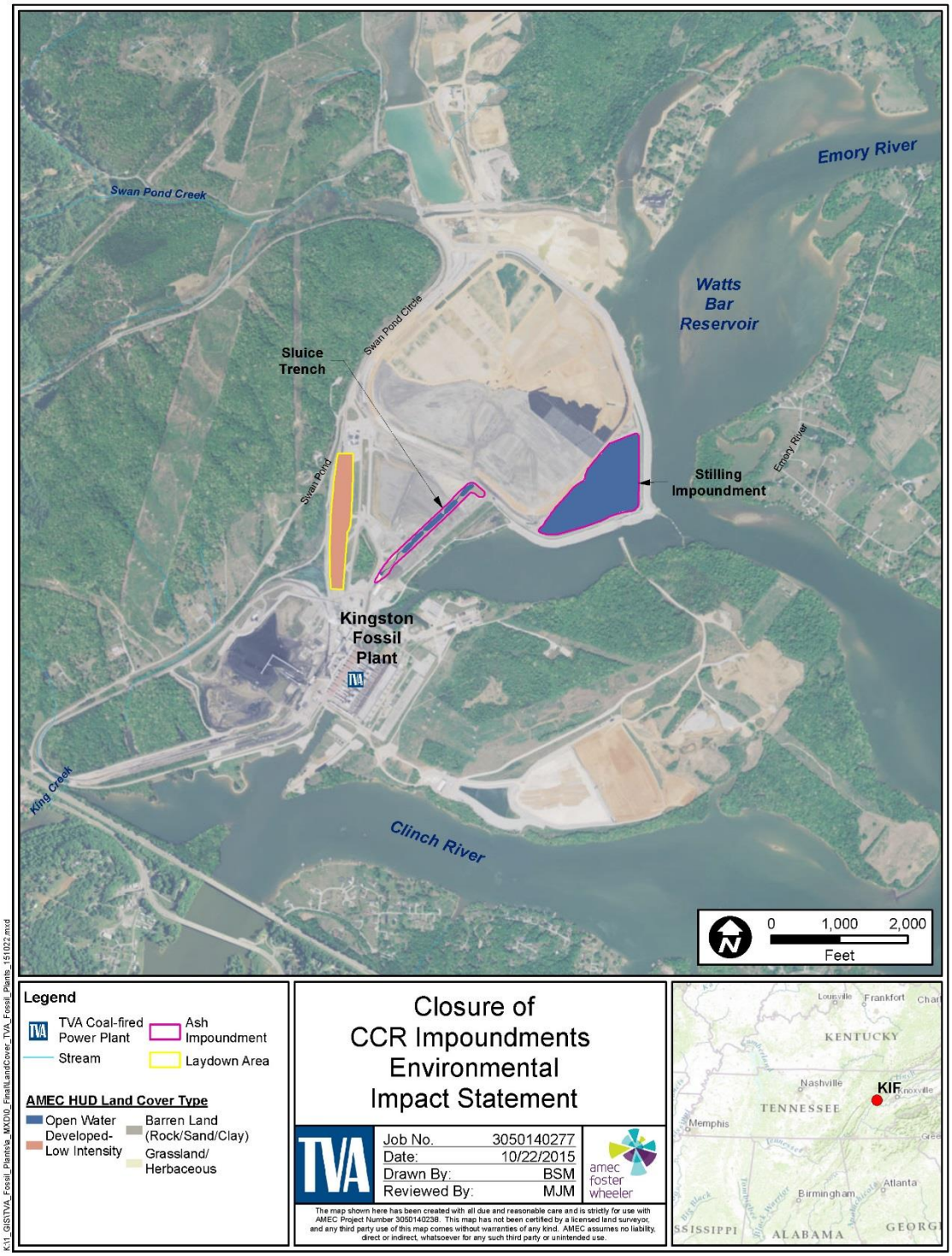

Figure 3-3. Land Cover Types Associated with Ash Impoundment Closure at KIF

3.5 Wildlife

3.5.1 Affected Environment

The area evaluated for wildlife impacts includes the existing Stilling Impoundment and Sluice Trench, a laydown area west of the Sluice Trench and their immediate surroundings, which include roads and maintained grassed berms. The project area is generally devoid of vegetation except for some maintained grass/shrub areas and scattered trees and shrub-layer vegetation along Watts Bar Lake/Clinch River/Emory River. The maintained impoundments do provide suitable habitat for waterfowl, wading birds, shorebirds, gulls and other wildlife.

The maintained pond areas and riprapped berms of the Stilling Impoundment offers low quality habitat for wildlife species. Similarly, the Sluice Trench is heavily industrialized and lacks any established habitat. Consequently, use of the Sluice Trench area by terrestrial wildlife is generally low or absent. Species present along the perimeter of the Stilling Impoundment intermittently include map turtle, painted turtle, red- eared slider, softshell turtle, belted kingfisher, black-crowned night heron, black vulture, coot, double-crested cormorant, green heron, great blue heron, hooded merganser, pied-billed grebe, mallard, mourning dove, red-winged blackbird, rock dove, wood duck, raccoon and coyote (TVA 2014).

In the past, shorebirds such as killdeer, least sandpiper, lesser yellowlegs, pectoral sandpiper, semi-palmated sandpiper, spotted sandpiper and western sandpiper were found on ash impoundments at KIF (TVA 2015). Most of these birds utilized the ash ponds as stop-over grounds during migration events. However, due to a CCR release event that occurred in 2008 and the resulting emergency cleanup efforts, many of the areas previously used by shorebirds were impacted. Approximately 300 acres were affected by the CCR release (TVA 2015). A natural resource damage assessment was prepared and a restoration and compensation determination plan was developed for portions of Emory, Clinch and Tennessee Rivers and Watts Barr Reservoir downstream to the Watts Bar Dam. Restoration of this area (i.e., planting of trees, shoreline buffer restoration, installation of heron and osprey platforms, planting of native grasses, construction of a 3-ac wetland and enhancement of existing wetlands) has addressed damages from the spill and restored much of the shorebird habitat.

As of January 2015, the TVA Regional Natural Heritage database indicated that no records of caves exist within 3 mi of the project area and none were found on the project site during field reviews on December 31, 2014 (TVA 2015). However, five heron rookeries have been reported within 3 mi of the proposed project area. Only one of these is still extant and is approximately 1.6 mi away. In addition, 11 osprey nests have been reported within 3 mi of the project; however, only seven of these nests are known to be in use. There is a record of an extant osprey nest on a lighting structure next to the railroad tracks approximately 400 ft from the proposed laydown area.

3.5.2 Environmental Consequences

The project site occurs within a highly fragmented, industrial landscape that offers low quality habitat for wildlife. Under this alternative, the resident, common and habituated wildlife found in the project area would continue to opportunistically use available habitats within the project area. Construction phase activities may temporarily displace incidental wildlife to similarly disturbed environments in surrounding areas.

The closure of the Stilling Impoundment and Sluice Trench would result in a loss of marginally suitable waterfowl, shorebird and wading bird habitat. However, there is abundant, higher quality habitat elsewhere in the project vicinity along Watts Bar Lake and the Emory River. Thus, this loss of on-site bird habitat would be minor. Based on review of aerial photography, there is limited suitable habitat for heron colonies available within the project footprint. Work activities should not affect heron rookeries or other aggregations of migratory birds.

While an active osprey nest has been recorded to occur at KIF, this location is distant from proposed construction activities related to the closure of either the Sluice Trench or Stilling Impoundment. Although this nest is relatively close to the proposed laydown area for this project, they are separated by 10 lanes of railroad tracks that are used frequently. Heavy equipment also is frequently used in the ash storage area approximately 350 ft away from the nest. Consequently, this nesting bird is habituated to loud disturbances in close proximity and no project impacts to this species are expected to occur.

Additionally, in consideration of the absence of documented heron rookeries on-site, no impacts to these nesting herons are expected.

Following the construction period, some limited wildlife use of the closed impoundment may be expected. The Stilling Impoundment and Sluice Trench are proposed to be closed by using a geosynthetic and protective soil cover system and may therefore, 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, the availability of higher quality wildlife habitat in the proximity and the potential functional value of the installed vegetated cover system, potential direct and indirect impacts to associated wildlife are expected to be minor and potentially slightly beneficial in the long term.

3.6 Aquatic Ecology

3.6.1 Affected Environment

KIF is located on a peninsula at the confluence of the Emory and Clinch rivers on Watts Bar Reservoir. The KIF discharge point is located across the peninsula at CRM 2.6, while the intake is located at ERM 1.9. The Watts Bar Dam impounds the 39,090-ac Watts Bar Lake.

The area considered for ash impoundment closure activities at KIF is located on the shore of a portion Emory River in Watts Bar Lake. There are no other waters directly adjacent or in the immediate vicinity of the ash impoundment. TVA has systematically monitored the ecological conditions of its reservoirs since 1990 as part of its VSMP.

Shoreline and substrate sections were evaluated for aquatic habitat upstream and downstream of KIF in 2013. The shoreline sections had average scores of "fair," while limited aquatic macrophytes were noted along approximately 25 percent of the banks during the shoreline evaluation. The substrate was dominated by clay (56.8 percent), silt (14.9 percent) and bedrock (9.3 percent) downstream of KIF and by clay (36.7 percent), detritus (19.4 percent) and sand (14.7 percent) upstream of KIF (TVA 2014).

TVA has evaluated the health of the fish community near CRM 1.5 downstream of KIF and at CRM 4.4 upstream of KIF. The fish community rated "good" at both of these locations in 2013. Historically, the fish community has rated "good" at these locations.

During the 2013 study, 31 indigenous species were collected at the downstream site and 31 at the upstream site; this includes 16 commercially valuable and 23 recreationally valuable species as follows:

- Common centrarchid species present at KIF included bluegill, longear sunfish, redear sunfish, warmouth and green sunfish.
- Benthic invertivore species present included black redhorse, freshwater drum, logperch, northern hogsucker, spotted sucker, golden redhorse and silver redhorse.
- Top carnivore species present included largemouth bass, skipjack herring, smallmouth bass, spotted gar, yellow bass, striped bass, spotted bass, hybrid bass, sauger, walleye, rock bass and flathead catfish.
- Intolerant species present included skipjack herring, northern hogsucker, spotted sucker, black redhorse, longear sunfish, smallmouth bass, brook silverside and rock bass. In addition, two thermally sensitive species, spotted sucker and logperch, were present.
- Aquatic nuisance species included common carp, redbreast sunfish, striped bass and Mississippi silverside that were collected at the downstream and upstream of KIF and yellow perch that was collected upstream of KIF (TVA 2014).

Benthic community data was collected from three sites upstream and downstream of KIF in 2013. Monitoring results for 2013 support the conclusion that balanced indigenous population of benthic macroinvertebrates is maintained downstream of KIF. Sites had taxa averages of 17.0, 14.1 and 17.5 at CRM 1.5, 2.2 and 3.75, respectively. The Ephemeroptera, Plecoptera and Trichoptera taxa present were 1.2, 1.7 and 1.5 at CRM 1.5, 2.2 and 3.75, respectively, mid- to high-range numbers. In addition, the proportion of oligochaetes were 15 percent, 7.2 percent and 10 percent, also mid- to high-range numbers (TVA 2014).

The mussel fauna in the Emory River near KIF has been substantially altered by the impoundment of Watts Bar Reservoir while upstream impacts include mining and urbanization. Six mussel species (the giant floater, fragile papershell, pistolgrip, pimpleback, wartyback and three-horn wartyback) and a common aquatic snail (hornsnail) were found in a survey of this area (Yokley 2005; Parmalee and Bogan 1998). All of these species, except pistolgrip, are considered tolerant of reservoir conditions.

3.6.2 Environmental Consequences

Under Alternative B, no direct impacts to aquatic ecosystems are expected from the in-place closure of the Stilling Impoundment and the Sluice Trench at KIF. Previously disturbed areas would be used as a temporary laydown area to support closure activities.

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 (i.e., NPDES Outfall 001) in accordance with the NPDES permit. Additionally, any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources in Watts Barr Lake. Therefore, adverse effects to aquatic resources are expected from the in-place closure of Stilling Impoundment at KIF are expected to be minor and temporary.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

A review of the TVA Natural Heritage Database in September 2015 revealed occurrence records for one federally endangered mussel species and four state listed plant species within a 2-mi radius of KIF as summarized in Table 3-3. Two additional federally listed bat species, the Indiana bat and northern long-eared bat (NLEB), are known to occur throughout the region and, thus, are included in Table 3-3. Occurrence records for listed terrestrial zoological species do not occur within the 2-mi vicinity. In addition, five historical colonial wading bird rookeries are known to occur within 2-mi of KIF, at least three of which are still active. These rookeries consist primarily of great blue herons but also include black-crowned night herons.

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

Common Name	Scientific Name	Status	
		Federal[1]	State[2] (Rank[3])
Mammals			
Indiana bat[4]	*Myotis sodalis*	LE	END(S1)
Northern long-eared bat[4]	*Myotis septentrionalis*	LT	(S1S2)
Mussels			
Orange-foot Pimpleback	*Plethobasus cooperianus*	LE	END(S1)
Plants			
Spreading False-foxglove	*Aureolaria patula*	--	END (S1)
Northern Bush-honeysuckle	*Diervilla lonicera*	--	THR(S2)
Fetter-bush	*Leucothoe racemosa*	--	THR(S2)
Mountain Honeysuckle	*Lonicera dioica*	--	SPCO(S2)

1 Federal Status Codes: DM = Delisted, Recovered and Being Monitored; LE = Listed Endangered; LT = Listed Threatened; PE = Proposed Endangered; CAND = candidate for federal listing

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; NOST = no 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.

Northern bush honeysuckle is a deciduous shrub inhabiting mountain woodlands, bluffs and streambanks (Center for Plant Conservation 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). According to the Tennessee Rare Plant List (2014), fetter bush prefers acidic wetlands and swamps whereas the mountain honeysuckle prefers mountain woods and thickets. A desktop review of KIF indicated that no habitat for listed plant species occurs in the potential affected area. Available habitat on the KIF site has been severely degraded and is populated primarily with weedy non-native species. No designated critical habitat for plants occurs in the proposed project area. Because of the lack of suitable habitat for any listed plant species within the project area, no further analysis of listed plant species is presented.

The orange-foot pimple back requires medium to large rivers with sand and gravel substrates. This mussel is currently known only from the Tennessee, Cumberland and lower Ohio rivers (Ahlstedt 1984). Aquatic habitat within the proposed project site is limited to the highly disturbed ash impoundments at KIF. As such, suitable habitat for the orange-foot pimple back is absent from KIF and no further analysis of this species is warranted.

Indiana bats hibernate in caves in winter and use areas around them for swarming (mating) in the fall and staging in the spring, prior to migration back to summer habitat. During the summer, Indiana bats roost under the exfoliating bark of dead snags and living trees in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007, Kurta et al. 2002). No records of Indiana bat are known from Roane County, Tennessee. The closest Indiana bat record is a summer mist net capture on Oak Ridge National Laboratory approximately 16.9 mi away. The closest known Indiana bat hibernaculum is approximately 24.6 mi away. No known caves or suitable winter roosting structures exist on the project footprint. Furthermore, tree clearing is not anticipated to occur as a result of implementing the proposed action.

The NLEB was listed as federally threatened by US Fish and Wildlife Service (USFWS) in 2015. In winter, this species roosts in caves or cave-like structures, while summer roosts are typically in cave-like structures as well as live and dead trees with exfoliating bark and crevices. There are no known records of NLEB winter hibernacula from Roane County, Tennessee. The nearest known NLEB hibernaculum is a cave approximately 28.4 mi away in adjacent Meigs County, Tennessee and the closest occurrence record is a mist net capture approximately 8.4 mi from KIF in Roane County. No known caves or suitable winter roosting structures exist on the project footprint. No suitable summer roosting habitat exists within the project footprint. Furthermore, tree clearing is not anticipated to occur as a result of implementing the proposed action.

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 ash impoundments at KIF do not provide suitable habitat for listed aquatic species and the terrestrial habitat on-site has been severely degraded and is populated primarily with weedy non-native species. Although low-quality foraging habitat may be available for Indiana bats and NLEB in open water areas of the ash impoundments, suitable roosting habitat is absent from within the project area and tree clearing is not anticipated with the proposed action.

Because suitable habitat for the species in Table 3-3 is either absent or degraded within the ash impoundments and temporary laydown areas at KIF 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 Environment

The proposed project lies within the KIF property along the Emory River near the Clinch River confluence. KIF is located in the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion (Griffith et al 2001).

The proposed construction footprint includes the Stilling Impoundment, the Sluice Trench and a temporary laydown area as depicted in Figure 1-2. National Wetland Inventory mapping includes 25.2 ac of open water within the Stilling Impoundment, 5.8 ac of open water in the Sluice Trench and 0.2 ac of open water within the temporary laydown area.

In January 2015, wetland surveys were conducted for a separate project within the proposed dewatering facility site boundary (TVA 2015). Three emergent wetlands were identified and mapped, all of which are located adjacent to the proposed laydown area (see Figure 3-2). The largest wetland area identified is a linear drainage feature bound on either side by gravel haul roads. The drainage is man-made for the purpose of channeling water on the site. Dominant vegetation consisted of cattails and soft path rush. The other two wetland features are small ponded areas connected to the linear feature through an intermittent stream. Based on the connectivity of these wetlands via an intermittent stream upgradient and to the Emory River downgradient, they were considered waters of the U.S. under the jurisdiction of the US Army Corps of Engineers (USACE) and State of Tennessee.

Although the USFWS mapped National Wetlands Inventory features within the Stilling Impoundment and Sluice Trench, these water features are KIF treatment systems and would not be regulated as waters of the U.S. under Section 404 of the Clean Water Act. The Stilling Impoundment appears to consist mostly of open water, riprap banks and some opportunistic wetland vegetation. The NPDES outfall from the Stilling Impoundment discharges through an outfall to the Emory River. The temporary laydown area is located in a disturbed open area on the KIF site as depicted in Figure 1-2 and has been configured to avoid an adjacent linear wetland area.

3.8.2 Environmental Consequences

Closure of the impoundment would include filling the Stilling Impoundment and Sluice Trench with earthen material, geosynthetic liner cover system, protective soil cover and herbaceous vegetation. The temporary laydown area would be used to store equipment and materials during the construction phase and would be restored to existing contours and planted with native herbaceous cover upon completion.

Impacts to jurisdictional wetlands are not expected to occur within the Stilling Impoundment or Sluice Trench because these open water features are considered KIF treatment systems and would be excluded from regulation under Section 404 of the Clean Water Act. Because there are no other jurisdictional wetlands within the Stilling Impoundment or Sluice Trench, permanent direct impacts to jurisdictional wetlands are not anticipated.

Indirect impacts to nearby jurisdictional or non-jurisdictional wetlands could potentially result from the alteration of hydraulic inputs to the wetland system resulting from the closure of the impoundments. However, no nearby jurisdictional or non-jurisdictional wetlands near the impoundments have been identified.

Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into off-site wetlands but BMPs would be implemented to minimize this potential. Any temporary 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" formally requires Federal agencies to incorporate Environmental Justice (EJ) as part of NEPA. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income. Although TVA is not one of the agencies subject to this order, TVA routinely considers EJ impacts as part of the project decision-making process.

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 proximate to the construction site and 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 would use existing arterial or interstate roadways. Given the location of KIF, Swan Pond Road would have to be used to access the site and Interstate 40 would be the primary route used to reach Swan Pond Road. Therefore for this analysis, potentially affected communities were defined as any census block group that included the CCR facilities to be closed and any block group along the anticipated route between Interstate 40 and Swan Pond Road. The geographic distribution of the block groups studied are shown on Figure 3-4.

The area surrounding KIF consists for the most part of semi-rural, sparsely populated areas. The geographic distribution of the block groups in the area are shown on Figure 3-4. Total minority populations comprise between 4.6 percent and 21.2 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 Roane County (6.9 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 8.3 to 40.6 percent. The block group with 40.6 percent of persons living below the poverty rate is 25.6 percent above the corresponding rate for Roane County (15 percent). Therefore, this block group, which is located adjacent to Interstate Highway 40, contains a potential EJ population. No other concentrated areas of sensitive low-income populations were identified in the surrounding area.

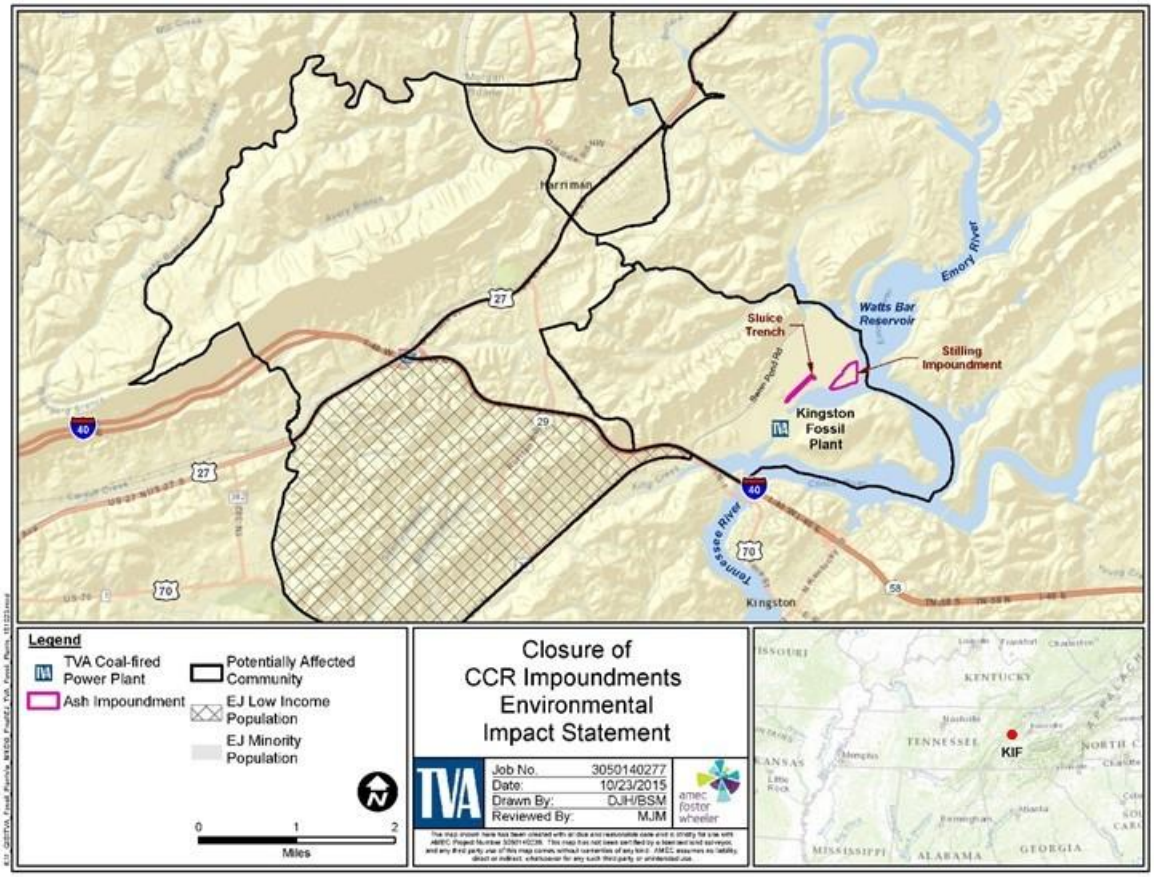

Figure 3-4 Environmental Justice Populations near KIF

3.9.2 Environmental Consequences

No minority or low-income populations subject to EJ consideration were identified in the immediate vicinity of the KIF ash impoundment closure site. The ash impoundments at KIF 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.

Although the location of the permitted borrow material site is not known, given the location of KIF, the haul route to the construction site would utilize Interstate Highway 40 to reach Swan Pond Road. One block group along this route was identified as low-income subject to EJ considerations. The transport of borrow material would only occur at selected times during the construction period and hauling trips would be dispersed throughout the day and would fit in with familiar traffic patterns along this roadway. Residents in this area do not abut the highway and, therefore, attenuation of noise and impacts from fugitive dust would be minimized. Therefore, given the temporary nature of the action and the implementation of BMPs designed to minimize dust emissions during transport, indirect impacts associated with the transport of borrow material would be minor and temporary.

Minor and temporary impacts associated with the transport of borrow material are short term and minor in nature and would be consistent across all communities (EJ and non-EJ) along the transport route and would not be disproportionate to the area identified as an EJ

populations. Conversely, it should also be noted that potential opportunities would be provided to residents with some construction phase employment.

3.10 Natural Areas, Parks and Recreation

3.10.1 Affected Environment

KIF is located adjacent to Watts Bar Reservoir and there are numerous water-based recreational opportunities in the area including general boating, boat and bank fishing, swimming, water sports and shoreline picnicking. As illustrated in Figure 3-5, several managed areas occur within 2 mi of the plant, including Kingston City Park, Ladd Delaney Park and Greenway and the Rayburn Bridge and Sugar Grove TVA Habit Protection Areas (HPA). Two day-use recreation areas, the North Embayment Park and Swan Pond Park, are have been developed on the KIF facility as part of the restoration activities related to the ash spill. In addition, there is a boat launching ramp on the plant site that is accessible to the public (TVA 2015). This section addresses managed areas that are on or close to the impoundments to be closed at KIF as potential impacts from closure activities would generally occur within close proximity of these impoundments.

3.10.2 Environmental Consequences

Under Alternative B, TVA would close the Stilling Impoundment and Sluice Trench in place. Off-site borrow material to complete the closure would be obtained from a previously permitted site. The boat launching ramp on TVA property would remain open during closure. There would be no direct impact to managed areas as the impoundments to be closed are located on an industrial area and borrow material would be obtained from a previously permitted site.

The on-site recreation areas are located at a sufficient distance from the closure sites as to not be directly impacted by closure activities. There may be indirect impact to users of the boat launch and fishing area on the reservation due to increased truck traffic during construction. However, this impact would be minor and temporary.

Given the location of KIF, access to the site to transport borrow material would utilize Swan Pond Road from US 70. Trucks travelling to KIF from I-40 or State Route 27 would travel east on US 70 to Pine Ridge Road. There are no managed areas (i.e. natural areas, parks, wildlife management areas, recreational areas, etc.), in the vicinity of this route. Although the exact location of the borrow material site is not known, as identified in Part I, Section 3.15, 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.

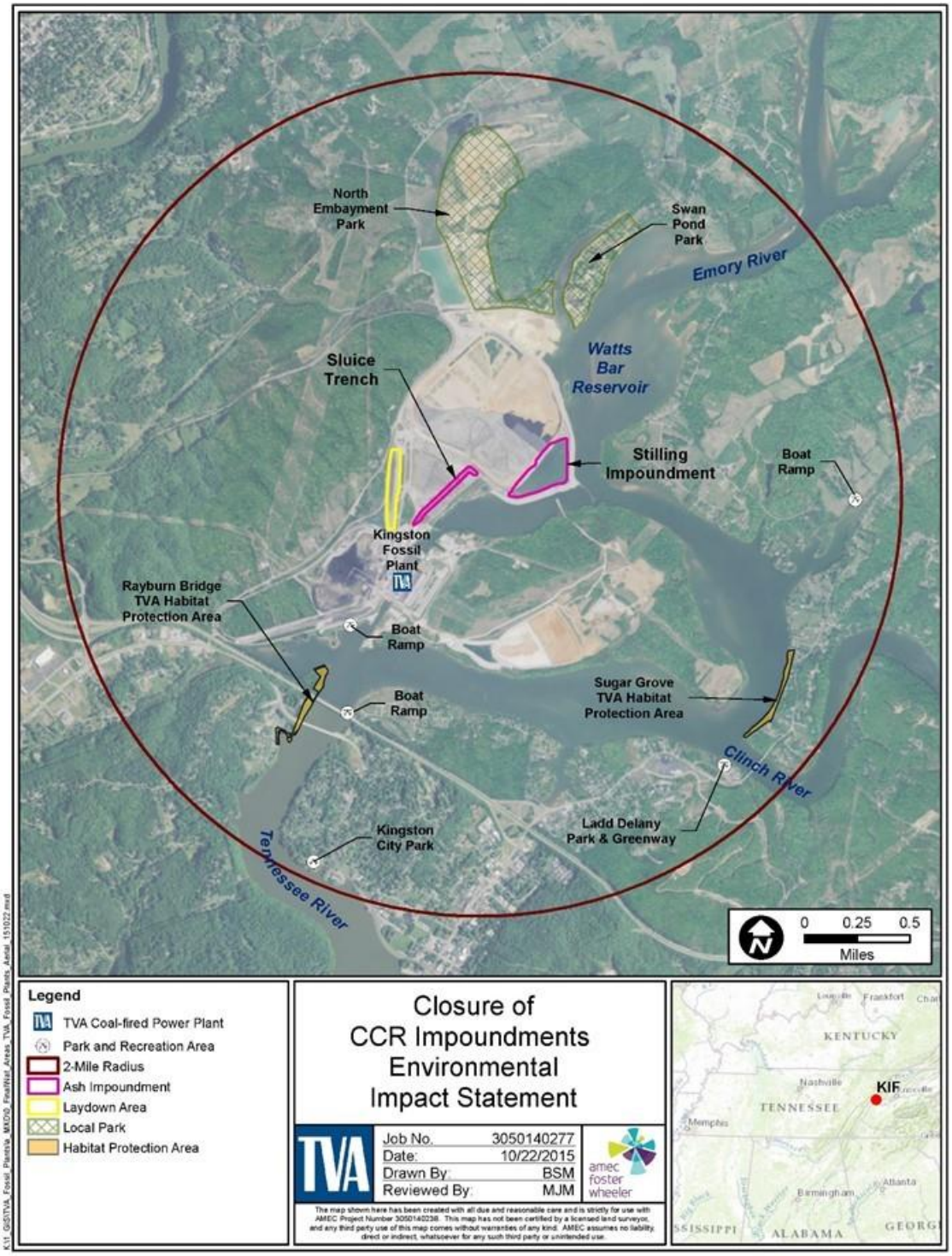

Figure 3-5. Natural Areas, Parks and Recreational Facilities Near KIF

3.11 Transportation

3.11.1 Affected Environment

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

Interstate and state highways provide ample access in the immediate vicinity of KIF. Principal access at KIF is via Swan Pond Road, which is two lanes wide. From Swan Pond Road, access to I-40 is via US 70 and Pine Ridge Road, both of which are four lane roadways. The intersection of US 70 and Pine Ridge Road is approximately 0.6 mi west of Swan Pond Road.

The exact roadways to be used as the proposed borrow material haul route have not been identified. Therefore, a 30-mi radius has been determined to define the affected environment for KIF. Within a 30-mi radius of KIF, the transportation network is extensive and contains hundreds of miles of roads and bridges, rail lines and navigable waterways and it contains I-75, I-40, Kingston, Crossville, Oak Ridge and the Knoxville metropolitan area. 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 KIF for Swan Pond Road, US 70 and I-40 are indicated in Table 3-4.

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

Roadway	Average Annual Daily Traffic (AADT)
Swan Pond Road just west of KIF	3,038
US 70 west of Pine Ridge Road	9,970
US 70 east of Pine Ridge Road	12,413
Pine Ridge Road north of I-40	8,735
Pine Ridge Road between I-40 and US 70	13,408

Source: Tennessee Department of Transportation (TDOT) 2013a, 2013b and 2013c.

3.11.2 Environmental Consequences

Traffic generated by the closure of the Stilling Impoundment and the Sluice Trench 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. The peak period of transportation-related closure activities is not expected to last more than twelve months.

The number of daily haul truckloads of borrow would be 122 and would be done by 15-yard tandem dump trucks. This activity would result in a traffic count of 244 trucks per day along the haul route. The construction workforce traveling to and from KIF would contribute to the traffic on the local transportation network. A construction workforce of 75 to 100 could be 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 Stilling Impoundment or the Sluice Trench 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.

Traffic generated by the hauling of borrow material 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 KIF and is considered to reflect the maximum potential impact on transportation. Once construction is completed, maintenance phase traffic associated with the closed impoundment would negligible.

The exact borrow haul route and travel patterns of the construction workforce are not known. However, for this analysis it has been assumed that the transport of borrow material, the construction workforce and the shipment of equipment would use Swan Pond Road and US 70 to access KIF. As a conservative analysis, it was also assumed that all haul vehicles would follow the exact same path either from the east or west of KIF. The total traffic count associated with the hauling of borrow to KIF would be approximately 244 trucks per day (Table 3-5).

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

Roadway	2013 Traffic (AADT)	Construction Phase Traffic (AADT)	Traffic Increase (Percent)
Swan Pond Road	3,038	3,282	8.0
To/From the West			
US 70 west of Swan Pond Road	9,970	10,214	2.4
Pine Ridge Road north of I-40	8,735	8,979	2.8
Pine Ridge Road between I-40 and US 70	13,408	13,652	1.8
To/From the East			
US 70 east of Swan Pond Road	12,413	12,657	2.0

The percentage increase on Swan Pond Road is 8.0 percent. While this seems like an elevated number, the estimated traffic count is 3,282 vehicles per day, which can easily be accommodated by a two-lane road. The percentage increases in traffic on the remaining surrounding road network (US 70 and Pine Ridge Road) resulting from the Closure-in-Place of the KIF ash impoundments are negligible. US 70 and Pine Ridge Road are both four lanes wide and can easily accommodate these very marginal traffic count increases. As mentioned previously, the assignment of all of the construction traffic in the same direction is conservative. In actuality, traffic associated with this alternative would be distributed throughout the road network and volumes would decrease with greater distances from KIF. 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.

3.12 Cultural and Historic Resources

3.12.1 Affected Environment

Sections of KIF have been previously surveyed for cultural resources. These surveys were conducted to satisfy the requirements of Section 106 of the National Historic Preservation Act (NHPA) (see Part I, Section 3.18). No archaeological sites or architectural properties listed or eligible for listing on the National Register of Historic Places were identified within the footprint of the ash impoundments or within the plant boundaries.

3.12.2 Environmental Consequences

Under Alternative B, TVA would close the Stilling Impoundment and Sluice Trench in place. Off-site borrow material to complete the closure would be obtained from a previously permitted site. For the laydown area, TVA anticipates using 5 to 10 ac temporarily during construction for parking and equipment and material storage. The proposed laydown area has previously been determined to have no effect on cultural resources (TVA 2016).

As discussed in Part I, Section 3.18, there would be no direct impact to cultural resources as the ash impoundments and laydown area are located on a previously disturbed industrial area and borrow material would be obtained from a previously permitted site. 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. Access to the site would utilize Swan Pond Road from US 70. Trucks travelling to KIF from I-40 or State Route 27 would travel east on US 70 to Pine Ridge Road.

3.13 Noise

3.13.1 Affected Environment

The area surrounding KIF consists for the most part of semi-rural, sparsely populated areas. There are some small waterfront subdivisions along the bank of the Emory River south of KIF. The closest residence is located approximately 1,800 ft west of the Sluice Trench. Residences located along the bank of the Emory River are located approximately 1,800 ft south of the Stilling Impoundment. The closest residence to the propose laydown area is located approximately 600 feet to the west along Swan Pond Road. Overall, the homes in the area experience relatively low noise levels much of the time (below 55 decibels A-weighted [dBA]); however, there are intermittent periods when noise levels caused by passing trains and coal delivery trains can approach 73 dBA (TVA 2015).

There are no federal, state, or local regulations for community noise in Roane County; however, EPA (1974) guidelines recommend day-night sound level (Ldn) not exceed 55 dBA. 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

3.13.2.1 Alternative B – Closure-in-Place

As discussed in Part I, Section 3.19, noise impacts under this alternative would be associated with on-site closure activities, 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 63.3 dBA at the nearest residence west of the laydown area, 53.8 dBA at the nearest residence west of the Sluice Trench and 53.5 dBA at the nearest residence south of the Stilling Impoundment. However, the actual noise would probably be lower in the field, where objects and topography would

cause further noise attenuation. Noise levels at the residences closest to the Sluice Trench and Stilling Impoundment do not exceed the EPA noise guideline for Ldn of 55 dBA. However, the estimated noise level at the residence proximate to the laydown area exceeds the EPA noise guideline for Ldn of 55 dBA, but is less than 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. Although the exact haul route from the borrow site and travel patterns of other construction-related traffic are not known, noise impacts associated with the transport of borrow material and construction-related traffic are anticipated to be minor. However, construction-related traffic on roads in the vicinity of KIF could increase traffic volumes and the associated traffic noise. Given the location of KIF access to the site would utilize Swan Pond Road and US 70 and traffic volumes along these roads would increase during the construction period. Residences are located proximate to these roads and these receptors would be impacted by the noise generated by the transport of borrow material and construction related traffic.

As identified in Section 3.11, the percentage increases in traffic on the surrounding road network resulting from the Closure-in- of the KIF ash impoundment are minor. 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 semi-rural nature of this area, the projected traffic count of 244 trucks per day during the closure period would result in noise emissions corresponding to the frequency of these trips. Given the temporary and intermittent nature of closure activities and increase in noise levels, indirect impacts would be minor, but not significant.

3.14 Cumulative Effects

This section tiers from the analysis in Part I. Based on the resources of potential concern and the geographic area in which potential adverse effects from site-specific activities have the potential to alter (degrade) the quality of the regional environmental resource. The appropriate geographic area of analysis for KIF is therefore limited to the immediate project area and vicinity (2 mi radius) surrounding KIF and the associated haul routes. For air quality, the geographic area is the county.

This analysis is limited to only those resource areas potentially adversely affected by project activities under Alternative B, the preferred alternative, at the site. Resources that are not affected or that have an overall beneficial impact as a result of the proposed action are not considered for cumulative effects. Accordingly, land use, prime farmland, geology and seismology, floodplains, surface water, groundwater, vegetation, wildlife, aquatic ecology, threatened and endangered species, natural areas, visual, cultural, hazardous materials/waste and safety resources are not included in this analysis as these resources are either not adversely affected, or the effects are considered to be minimal or beneficial. Primary resource categories specifically considered in this cumulative effects assessment include air quality, environmental justice, transportation and noise.

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.

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
Dewatering Facility	Installation of dewatering facility to create dry CCR product	Reasonably Foreseeable Future

TVA is currently evaluating the option of installing a dewatering facility at the KIF plant to allow for dry storage (Table 3-6). If approved, TVA would construct a bottom ash mechanical dewatering facility at KIF to create dry products for disposal in an existing on-site landfill. The bottom ash dewatering equipment would be located north of the powerhouse. A new drainage line running from the dewatering facility to the existing municipal infrastructure would be constructed, allowing a tie-in for sewage and wastewater from the new facility to KIF’s existing system. Water generated from the dewatering process would return to the new Sluice Trench and be discharged through a permitted outfall. Approximately 65 full and part-time jobs would be gained during construction with two to three full-time employees required to operate the facility.

3.14.2 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the Stilling Impoundment and Sluice Trench was considered in conjunction with the environmental impacts presented in Chapter 3. 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 each of the identified environmental resources of concern are analyzed below for the preferred alternative.

Air Quality: The installation of the dewatering facility at KIF would have minor short-term impacts to air quality during the construction phase. During operations, emissions from the dewatering facility would be in compliance with the regulations set by the State of Tennessee for process and fugitive dust and would not exceed significance levels.

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 dust. These activities include, grading and compaction of CCR, transport of borrow material and installation of approved closure systems. Since the other identified actions would have minor and temporary impacts on air quality, no cumulative effects to air quality are anticipated as a result of this alternative.

Environmental Justice: As identified previously, the construction of the dewatering facility would generate temporary jobs that could have a positive impact on EJ communities.

No minority or low-income populations subject to EJ consideration were identified in the immediate vicinity of the KIF ash impoundment closure site. Minor and temporary impacts associated with the transport of borrow material are short term and minor in nature and would be consistent across all communities (EJ and non-EJ) along the transport route and would not be disproportionate to the area identified as an EJ population. Additionally, employment opportunities would be provided to local residents to support the impoundment closure and construction of the dewatering facility, 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: Transportation-related concerns for the surrounding roadway infrastructure for the installation of the dewatering facility would be minor and would consist primarily of temporary increases of construction traffic to and from the facility. Truck traffic volumes in the vicinity could increase temporarily for approximately 8 months, having a short-term impact on the roadway system in the area. During future operations, CCR material would be hauled to an on-site landfill, therefore there would be no impacts to the local roadway network.

Traffic generated by the closure of the Stilling Impoundment and Sluice Trench at KIF 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. Traffic generated by the hauling of borrow material to the site, along with the construction workforce traffic, would occur in addition to the existing traffic generated by the operation of KIF and is considered to reflect the maximum potential impact on transportation. Once construction is completed, maintenance phase traffic associated with the closed impoundment would negligible.

While the existing roadway network is expected to have sufficient capacity to absorb the expected temporary construction traffic increase, potential localized impacts on roadway transportation could occur as closure activities would coincide with the installation of the dewatering facility on-site. If needed, TVA will coordinate with TDOT and County transportation officials to develop appropriate mitigation measures to reduce localized transportation effects. Therefore, cumulative effects to transportation resources are not anticipated as a result of this alternative.

Noise: Installation of the dewatering facility at KIF would result in minor increases in noise emissions during the construction phase as a result of traffic operations and construction equipment. Due to the temporary nature of construction and the site's semi-rural location and distance to the nearest sensitive noise receptors, noise from construction is not expected to cause significant adverse impacts. Operation of the dewatering facility would result in low noise levels that would be contained in a building and would be un-audible to local residence.

As discussed in Part I, Section 3.25 the potential for cumulative noise impacts from the proposed action 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.

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Appendix A – Conceptual Closure Plans, Preferred Alternative

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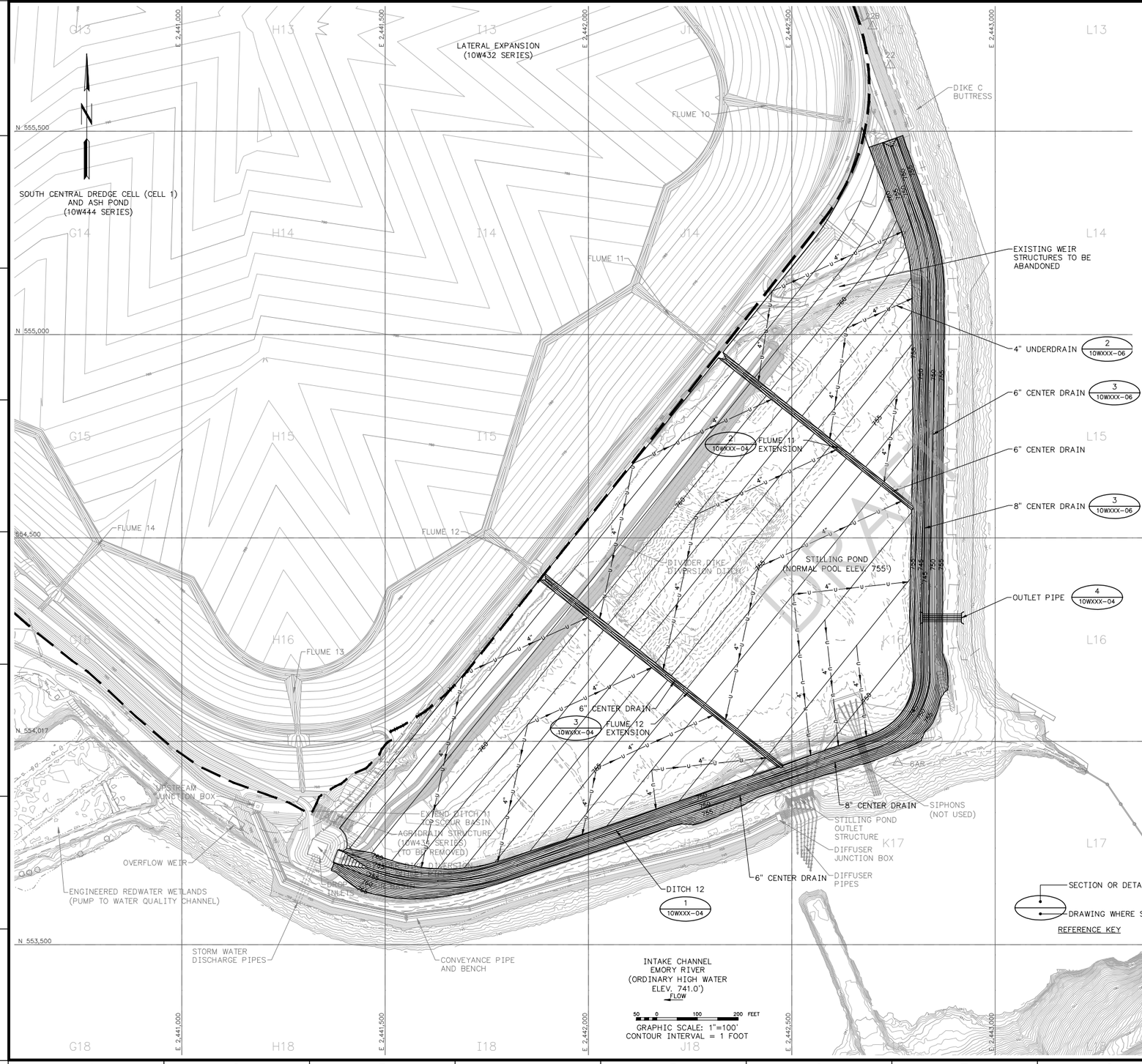

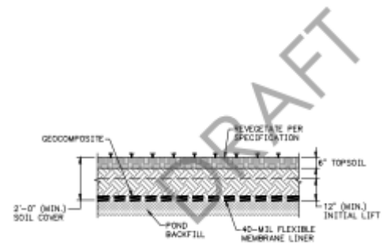

NOTES:
1. GEOCOMPOSITE SHALL CONSIST OF FLOW NET WITH NON-WOVEN GEOTEXTILE ON BOTH SIDES.
2. THE SOIL COVER MAY BE PLACED IN MULTIPLE LIFTS, HOWEVER THE INITIAL COVER OVER THE GEOCOMPOSITE SHALL BE A MINIMUM OF 12 INCHES.
3. IF POND BACKFILL CONTAINS STONES, CUSHION GEOTEXTILE SHALL BE PLACED PRIOR TO LINER PLACEMENT.

5 10WXXX-06 DETAIL – CLOSURE CAP SCALE: 1/2"=1'-0"

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

NOTES:

1. TOPOGRAPHIC MAPPING WAS GENERATED FROM A LIDAR SURVEY PERFORMED ON APRIL 24, 2014, BY TUCK MAPPING SOLUTIONS, INC. AND SUPPLEMENTED BY HYDROGRAPHIC SURVEYS PERFORMED BY TVA ON SEPT. 26, 2012, PROPOSED GRADING FROM THE INTERIM DREDGE CELL ASH STACKING PLAN PROVIDED BY JACOBS ON APRIL 14, 2011, AND DESIGN PACKAGES RDP-0113-E, RDP-0113D-RO, RDP-0113-F, RDP-0113-J, RDP-0114-A, RDP-0113-G, RDP-0114-B, RDP-0114-C, RDP-0114-H, RDP-0114-G, RDP-0114-D, RDP-0114-E, RDP-0113-I, FCN NO. 62 ,FCN NO. 68., FCN NO. 74, RDP-0113-4, RDP-0114-F, CONTOURS PROVIDED BY TVA FOR THE BALL FIELD AREA AND LIDAR SURVEY IN THE COAL YARD DRAINAGE POND DATED FEBRUARY 16, 2011.
2. CERCLA BOUNDARY CONSTITUTES BOUNDARY OF KINGSTON ASH RECOVERY PROJECT.
3. CENTER DRAIN PIPES NOT SHOWN FOR THE PURPOSE OF CLARITY.

LEGEND

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	EXISTING INTERMEDIATE CONTOUR
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X X X X X	FENCE LINE
	EDGE OF UNPAVED ROAD
	EDGE OF WATER
	PIPE
+ 411.9	SPOT ELEVATION
+ 950.0	PROPOSED GRADE SPOT ELEVATION
400	PROPOSED INDEX CONTOUR
	PROPOSED INTERMEDIATE CONTOUR
	PROPOSED LIMITS OF GRADING
	PROPOSED PIPE
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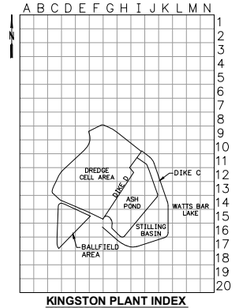

KINGSTON PLANT INDEX
NOT TO SCALE

10% SUBMITTAL
ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

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SCALE: 1"=100' EXCEPT AS NOTED

YARD
STILLING POND

STILLING POND FINAL CLOSURE GRADING PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.D. LINDQUIST	D.M. GRAHAM	D.E. HERRON	M.J. STEELE	R.B. COMBS	M.S. TURNBOW	J.C. KAMMEYER

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2010 | DATE 04/27/15 | 36 | C | 10WXXX-03 | R A

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www.stantec.com

SEE 10WXXX-01 FOR LIST OF DESIGN, COMPANION, REFERENCE DRAWINGS AND SUPPORTING DESIGN CALCULATIONS NUMBER.

STANTEC	A
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY