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# FINAL
# ASH IMPOUNDMENT CLOSURE PROGRAMMATIC EIS

# PART II – SITE-SPECIFIC NEPA REVIEW: COLBERT FOSSIL PLANT

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# Symbols, Acronyms, and Abbreviations

| | |
|---|---|
| **<** | Less Than |
| **AADT** | Average Annual Daily Traffic |
| **ADEM** | Alabama Department of Environmental Management |
| **ADPH** | Alabama Department of Public Health |
| **BMP** | Best Management Practices |
| **CCR** | Coal Combustion Residuals |
| **COC** | Constituents of Concern |
| **COF** | Colbert Fossil Plant |
| **dBA** | Decibels, A Weighted |
| **EO** | Executive Order |
| **EPA** | U.S. Environmental Protection Agency |
| **EPRI** | Electric Power Research Institute |
| **HUD** | U.S. Department of Housing and Urban Development |
| **kW** | Kilowatts |
| **Ldn** | Day-Night Sound Level |
| **µg/L** | Micrograms per Liter |
| **Mg/L** | Milligrams per Liter |
| **MGD** | Million Gallons Per Day |
| **NEPA** | National Environmental Policy Act |
| **NPDES** | National Pollutant Discharge Elimination System |
| **RIF** | Relative Impact Framework |
| **TRM** | Tennessee River Mile |
| **TVA** | Tennessee Valley Authority |
| **WQG** | Water Quality Goals |
| **$yd^3$** | Cubic Yards |

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# CHAPTER 1 – PURPOSE AND NEED FOR ACTION

## 1.1 Introduction and Background

Colbert Fossil Plant (COF) was constructed in the 1950s (Figure 1-1). The plant is located on 1,354 acres (ac) on the south shore of Pickwick Landing Lake in Colbert County, Alabama. Construction began in 1951 and the generators placed into service in 1955. A fifth unit with a generating capacity of 500,000 kilowatts (kW) was added in 1962. The plant has a combined net generating capacity of 1,204 megawatts. At its peak, COF generated approximately 7.8 billion kW-hours of electricity per year, or enough to meet the needs of about 550,000 homes. TVA idled Unit 5 in 2013 and retired the remaining four units in April 2016. As part of this proposed action, Tennessee Valley Authority (TVA) plans to close Ash Impoundment No. 4.



**View of Ash Impoundment No. 4**

Ash Impoundment No. 4 is considered an "active impoundment" under U.S. Environmental Protection Agency (EPA)'s new coal combustion residuals (CCR) Rule because the impoundment received CCR after October 19, 2015, the effective date of the CCR Rule. Ash Impoundment No. 4 stopped receiving most CCR material shortly after the plant's generating units were retired on March 23, 2016, but it may receive wash-down flows for several additional months.

Figure 1-2 identifies Ash Impoundment No. 4 at COF. Ash Impoundment No. 4 is located about 3,000 feet (ft) south of the plant's powerhouse. Table 1-1 summarizes characteristics of Ash Impoundment No. 4. Ash Impoundment No. 4 is bordered by the plant access road on the west, U.S. Highway 72 (US 72) on the south, and Cane Creek on the south and north and east. It encompasses about 52 ac impounded by an earth fill dike about 6,700 ft in length. The height of the embankment ranges in height from about 20 to 40 ft. When the plant was generating power using all five units, approximately 30,000 tons per year of bottom ash were wet-sluiced to Ash Impoundment No. 4. Beginning in about 1999, work was initiated to excavate, dewater and stack bottom ash on the west side of the impoundment area.

Ash Impoundment No. 4 was constructed in 1972 and received sluiced bottom ash and fly ash. Originally, the impoundment consisted of 20-ft high clay embankments abutting a topographic bench on the west side. In 1984, the Ash Impoundment No. 4 embankment was raised about 20 ft by extending the outside slope upward toward the inside of the impoundment. The 6,700-ft long raised embankment changed the configuration of Ash Impoundment No. 4 to a diked impoundment.

In 2010-2011, TVA replaced the original spillway system, lowered a 900-ft section of the impoundment embankment as an emergency spillway to prevent topping of the dike, added a sub-surface flow collection system, and lowered the operating pool elevation (Dewberry 2013). Fly ash is currently collected on a dry basis and deposited in the onsite dry stack disposal area and Ash Impoundment No. 4 only receives bottom ash.

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

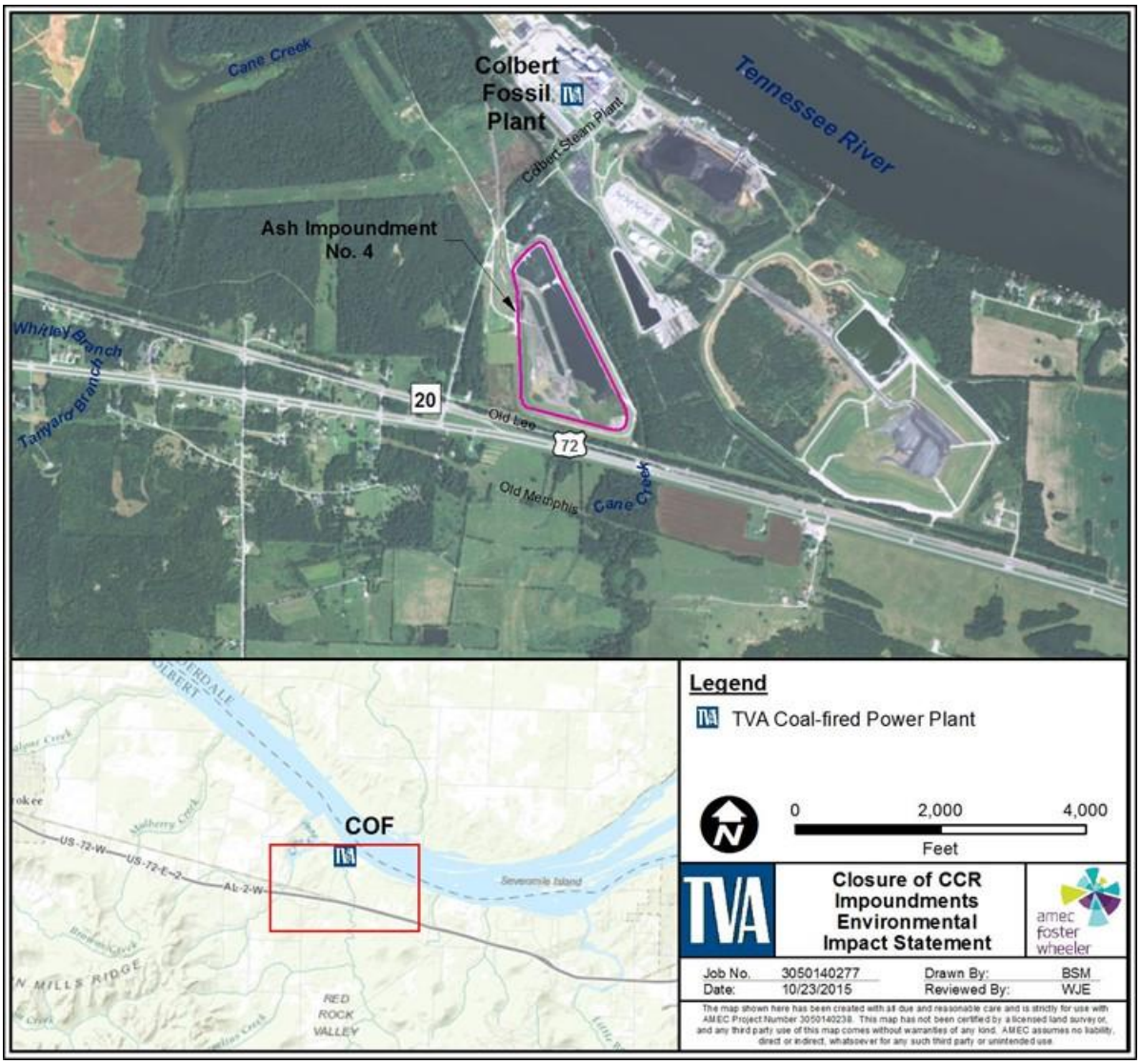


**Figure 1-1. COF Project Location**

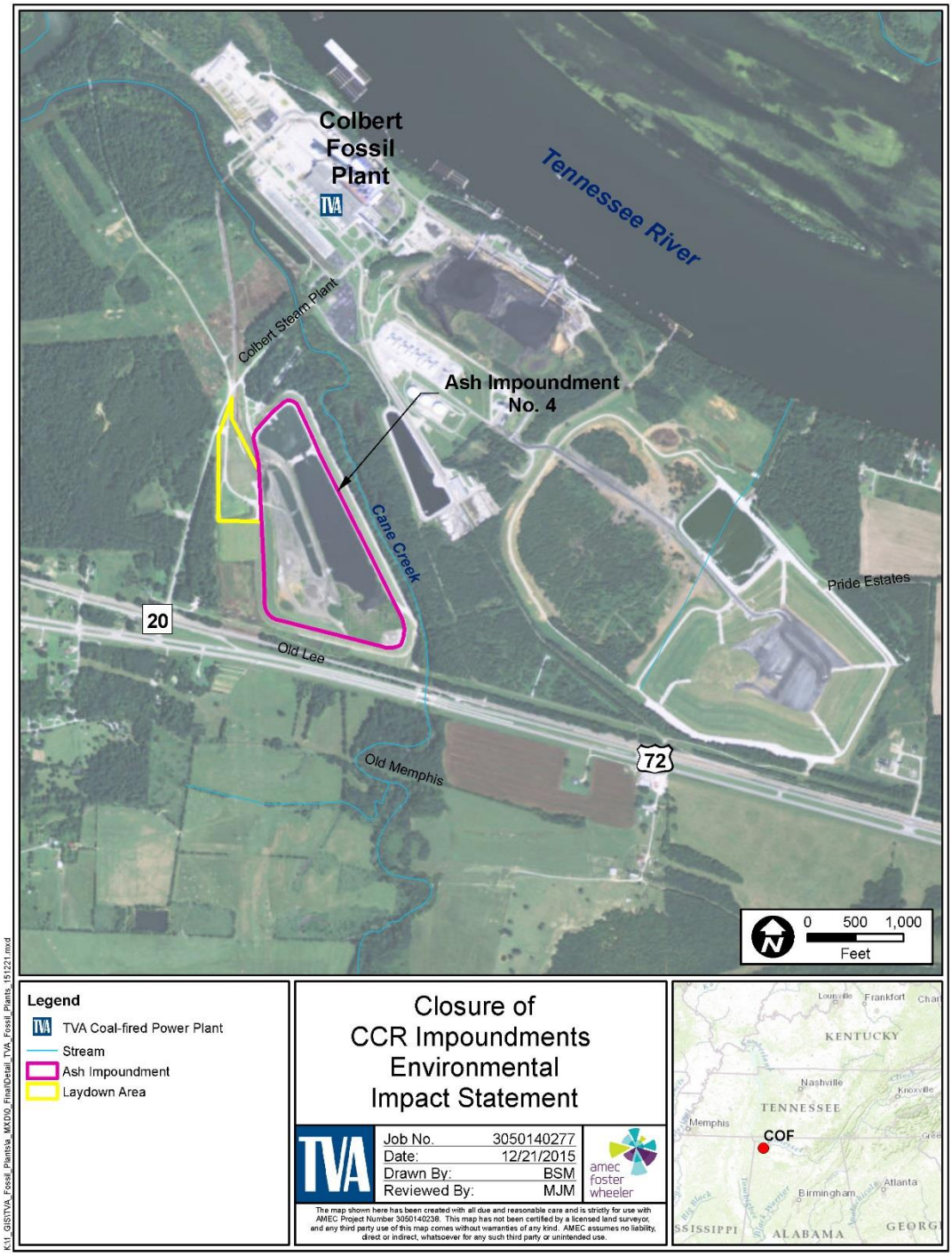


**Figure 1-2. Ash Impoundment Closure Utilization Areas at COF**

**Table 1-1. Summary of Ash Impoundment No. 4 Characteristics**

| Attribute | Description |
|---|---|
| Location | Colbert/Tuscumbia Counties, Tennessee |
| Impoundment Name | Ash Impoundment No. 4 |
| Impoundment Status | Active |
| Size | 52 ac |
| CCR Material | Fly Ash and Bottom Ash |
| CCR Volume | 3.2 million cubic yards ($yd^3$) |
| Borrow Material Volume | 100,000 $yd^3$ |
| Temporary Laydown Areas | 5 to 10 ac |
| Proposed Closure Completion Date | Within 5 years |

## 1.2 Decision to be Made

TVA must decide how to close a wet management facility at COF. 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 Ash Impoundment No. 4 at COF, and to assist TVA in complying with EPA's CCR Rule.

## 1.4 Summary of Proposed Action

TVA proposes to close the active Ash Impoundment No. 4 at COF 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 Ash Impoundment No. 4 Operations

Sluiced bottom ash enters Ash Impoundment No. 4 near the northwest corner of the impoundment. An interior ash dike channels the sluiced water toward the southeast end of the impoundment where it discharges into the main settling area. The Ash Impoundment No. 4 outlet system is located at the north end of the impoundment. The siphon and overflow spillway discharge into a common drainage channel that empties into Cane Creek.

There are several existing wastewater streams that are permitted under National Pollutant Discharge Elimination System (NPDES) Permit No. AL0003867, which was issued by the Alabama Department of Environmental Management (ADEM) in 2005. TVA discharges about 8.83 million gallons per day (MGD) of effluent from the ash impoundment through NPDES Outfall 001 at river mile 48. Primary contributing sources (greater than 1 MGD) include the bottom ash sluice water (5.4 MGD) and powerhouse sump flows (2.1 MGD). Other contributing flows include those from the coal pile runoff impoundment, nonchemical metal cleaning wastes (except air heater), precipitator and air preheater washes (Outfall 001b), septic tank through Outfall 001a and other sumps.

The permit regulates water discharges at COF, which are monitored and sampled for compliance with the permit's discharge limits. Drainage from the COF site primarily discharges to Cane Creek just upstream of the confluence of Cane Creek and the Tennessee River. This includes Outfall 001-Ash Impoundment No. 4, Outfall 002-Condenser Cooling Water, Outfall 012-Construction Laydown Area Runoff and Outfall 013-Wetlands Treatment Runoff (lateral movement of water from Ash Impoundment No. 4 dike) (ADEM 2005).

The process and storm water streams that discharge directly to the Tennessee River include Outfall 003-Intake Screen Backwash, Outfall N005-Northeast Yard Runoff and Office Wing AC Cooling Water, Outfall 006-Coal Unloading Area Runoff, Outfall 008 Construction Dock Area Runoff, Outfall 009-Utility Building Area Runoff and Outfall 010-Ash Impoundment No. 5 (stilling impoundment for the dry fly ash stacking area runoff).

Process wastewater discharges from the facility are permitted under the NPDES permit and include outfalls that are sampled, monitored, and reported on monthly discharge monitoring reports. Outfalls that are related to the proposed closure action include the outfall from Ash Impoundment No. 4 (Outfall 001), the metal cleaning wastes discharge to Ash Impoundment No. 4 (Outfall 001B) and the constructed wetlands outfall associated with Ash Impoundment No. 4 (Outfall 013). ADEM has administratively continued Permit No. AL0003867 as ADEM reviews TVA's permit renewal application.

## 2.2 Project Alternatives

TVA evaluated the three alternatives for closing COF's Ash Impoundment No. 4: 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 Ash Impoundment No. 4 at COF and the feasibility of undertaking closure activities (Figure 2-1). Key factors that TVA considered are identified in Part I, Section 2.2.5 and include the following:

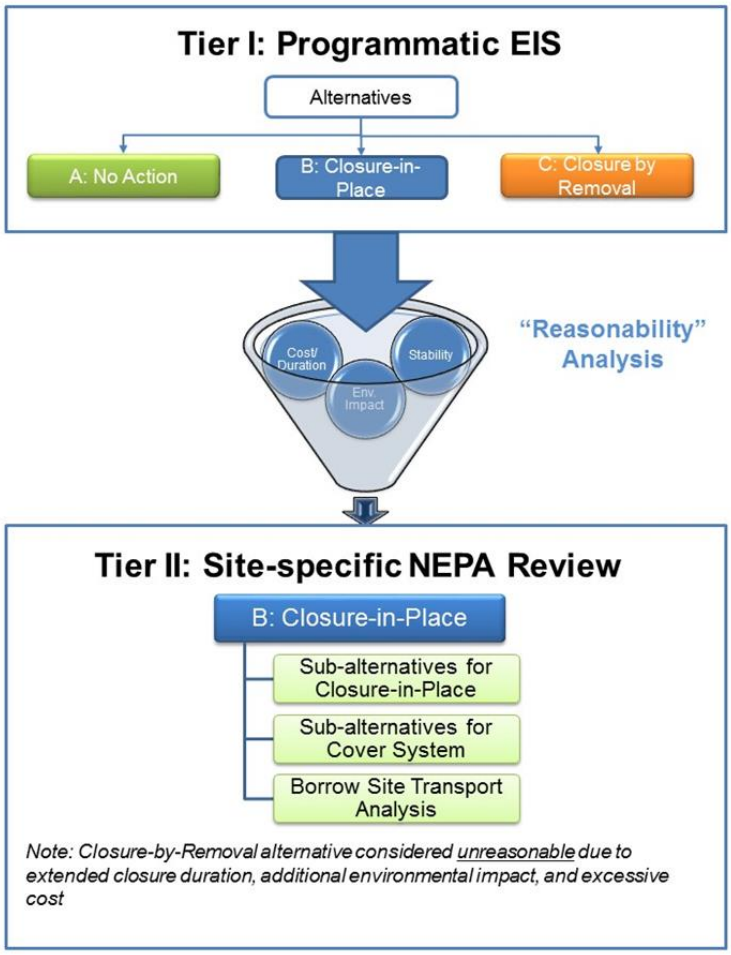


**Figure 2-1. Reasonable Alternatives Analysis for COF Sluice Trench and Fly Ash Impoundments**

- *Volume of CCR Materials.* The size of an ash impoundment and volume of CCR may affect closure activities and appropriateness of an alternative. Ash Impoundment No. 4 at COF is estimated to contain 3,200,000 $yd^3$ of CCR.
- *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 utilities to cease disposing of CCRs in impoundments by October 19, 2015, and complete closure activities by April 17, 2018. 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 and reinitiate review of it because the agency failed to provide an opportunity for notice and comment on the exemption. This change does not affect EPA's technical determination that removing the hydraulic head by dewatering and closing impoundments substantially reduces the risks of structural failures and groundwater contamination. Because of this pending regulatory change, TVA decided not to use the April 2018 incentive closure date as a significant factor in its consideration of the reasonableness of Closure-in-Place or Closure-by-Removal. Instead, TVA takes into account the 5-year timeframe that

EPA set for completing impoundment closures, 40 CFR §257.102(f). Closing earlier rather than later is preferable from an environmental standpoint, and this still remains an important consideration in TVA's analyses.

- *Stability*. Stability of the CCR facilities was evaluated by TVA (Dewberry Consultants, Inc. (2013) and Stantec Consulting Services (2010)). Safety ratings under static conditions were determined to be adequate for Ash Impoundment No. 4. TVA is currently implementing additional modifications to the berms of Ash Impoundment No. 4 to ensure that the berm stability is adequate under seismic conditions. The proposed closure grades of the facilities will be evaluated prior to construction and any needed improvements to the berms will be made as part of the closure system construction. Ash Impoundment No. 4 will cease receipt of CCR materials and boiler slag in 2016 and enhancing stability.

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

  Closure-by-Removal also would require a substantially greater number of truck movements into and out of the site which would increase the risk of injuries and fatalities associated with truck crashes (see Part I, Chapter 2). As the number of truck movement miles increase, both for Alternatives B and C, the risk of traffic crashes, including personal injuries and fatalities, increases.

- *Mode and Duration of Transport Activities.* As described in Part I, Section 2.2, the activities related to transport of borrow (Alternative B) and CCR removal and transport (Alternative C) by truck or rail require the use of large numbers of vehicles and operators. For those sites like Ash Impoundment No. 4 that have more than 600,000 $yd^3$ of CCR, TVA determined that insufficient time is available within the construction schedule to effectively remove the CCR materials by truck or rail and achieve closure within the 5-year period of closure. It is estimated that it would take 22.7 years to transport COF's CCR by truck and 22.3 years by train to a permitted landfill.

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

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

- *Potential Effects to Water Resources.* Potential human health risk was also considered by reviewing the results of groundwater monitoring and the incidence of surface water releases from Ash Impoundment No. 4 to receiving waterbodies. No records of releases or issues of concern are known that represent a risk to human health from CCR constituents associated with the existing impoundments.
- *Potential Effects to Wetlands.* Under the Clean Water Act, wetlands are considered 'special aquatic sites' deserving of special protection because of their ecologic significance. Wetlands are important, fragile ecosystems that must be protected, and the 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 result in only minor effects to wetlands and not cause or contribute to significant degradation of wetlands; and that appropriate measures could be taken to avoid and mitigate any unavoidable 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. TVA is currently conducting studies to identify the uppermost aquifer and this depth is not yet known at COF.

  Initial screening analysis by TVA determined that for both Alternatives B and C, proposed actions would not cause or contribute to violations of any applicable state water quality standard, violate any applicable toxic effluent standard or prohibition, or jeopardize the continued existence of endangered or threatened species or critical habitats.
- *Excessive Cost.* Excessive cost may affect 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 No Action Alternative*

The No Action Alternative was fully evaluated in Part I and was determined to not meet the purpose and need of achieving the TVA goal of closing 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 COF. Alternative C – Closure-by-Removal was eliminated from further consideration as it was determined to be unreasonable. Key factors contributing to this determination included:

- Excessive volume of CCR materials (3.2 million $yd^3$)
- Removal of CCR by rail was also considered by TVA for Closure-by-Removal of Ash Impoundment No. 4. In Part I, Chapter 2, TVA identified factors to determine whether transport of CCR by rail would be reasonable. Those factors include volume of material; distance from the impoundment to a permitted landfill; availability of the infrastructure to manage the transfer of material; cost effectiveness; and schedule. Applying these factors to the removal of CCR from the Ash Impoundment Complex, transport by rail is unreasonable due to the cost and closure schedule (see Table 2-1). Rail transport would require the installation of loading infrastructure, and a rail transportation service in the form of a rail carrier. Additional rail infrastructure may need to be constructed at or very near a Subtitle D landfill. The components of a rail unloading infrastructure may include: clamshell buckets to move the CCR off the train to a stockpile area prior to being placed on trucks and conveyors or loaders to load the CCR onto trucks; and infrastructure to support trucking to the landfill site. The necessary environmental and construction permits to construct these facilities could easily take 18 to 24 months to acquire. Rail cars may need to be lined to prevent spills or releases as was the case for the removal of CCR at KIF. After the Kingston Fossil Plant spill in 2008, rail was used to ship CCR to Arrowhead Landfill in Perry County, Alabama. Arrowhead Landfill can accept up to 15,000 $yd^3$ per day (Arrowhead 2015). However, as described in Part I, Section 2.0, rail transport was determined to be a mode of transport that is not feasible or cost effective for impoundments having a lower volume of CCR or those having a relatively short duration closure schedule. Given the closure schedule for this impoundment, the costs and environmental impacts associated with development and permitting of the required loading and unloading infrastructure, use of rail to transport CCR from this site would not be feasible.
- Extended duration of normal removal operations (estimated to be almost 23 years of trucking at 100 trucks per day).
- 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/approvals and planning will take 6 months and post-closure site restoration and permit close-out will take 6 months. Thus, a 4-year window is used for the timeframe for hauling of CCR from the site. So the number of trucks to accomplish removal within a 4-year construction schedule would result in 320,000 total truckloads (533 truckloads per day, Figure 2-2) to the nearest Subtitle D landfill. It is estimated that this would equate to approximately 59 loaded trucks passing by a given location each hour (one truck per minute) or a total truck count of 118 truck trips per hour (accounting for the return trip).
- Potential safety concerns associated with increased motor vehicle crashes as described above and in Part I, Chapter 2.
- Potential impacts related to increased air and noise emissions associated with transport of CCRs to the nearest permitted Subtitle D Landfill.

- Potential impacts to environmental justice populations located adjacent to the truck or rail haul route to the nearest permitted Subtitle D Landfill.
- Potential concerns associated with worker safety as described above and in Part 1, Chapter 2.
- Excessive removal cost in comparison to Closure-in-Place ($249 million for truck transport and $228 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 Commissioner 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.

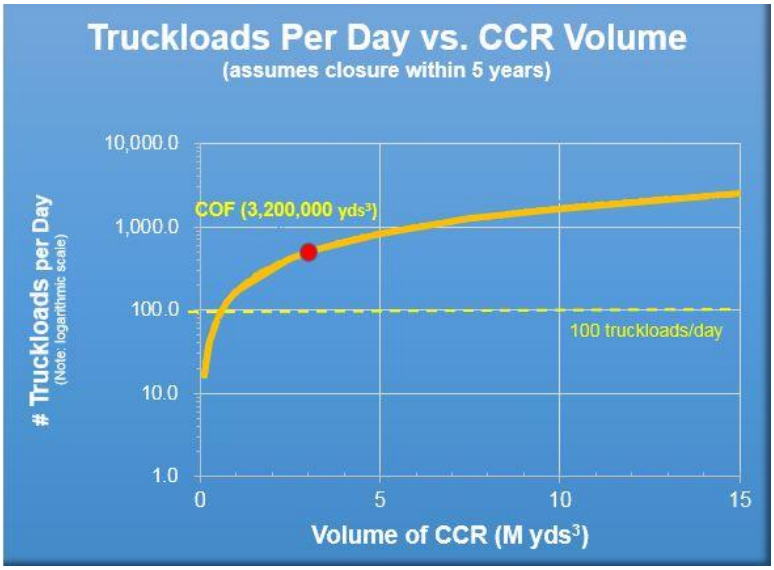


**Figure 2-2. Number of Truckloads vs. CCR Removal Volume**

### 2.2.2 Reasonable Alternatives Retained for Further Analysis

Alternative B was determined to be the only reasonable alternative for detailed consideration of closure of Ash Impoundment No. 4.

Construction activities associated with the closure of Ash Impoundment No. 4 will entail direct disturbance of the ash impoundment and disturbance of supporting laydown areas. TVA anticipates temporarily using approximately

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

5-10 ac for vehicle and equipment parking, materials storage, and construction administration. Conceptual designs for the in-place closure of Ash Impoundment No. 4 are provided in Appendix A. Under this alternative approximately 100,000 $yd^3$ of borrow material would be hauled using tandem dump trucks from one of two identified sites (Figure 2-3).

Activities associated with this action would include the following:

1. Dewatering activities
2. Reroute conveyances sending storm water to Ash Impoundment No. 4
3. Decommission and remove existing NPDES outfall
4. Grade and reconfigure CCR (Category C) to consolidate CCR, reduce footprint and promote site drainage
5. Acquire and transport borrow material for approved cover system
6. Install geosynthetic liner cover system (Geosynthetic-Protective Soil Cover System)
7. Install protective soil cover and establish non-invasive vegetation
8. Install and operate groundwater monitoring system per federal and any additional state requirements
9. Complete and submit closure documentation

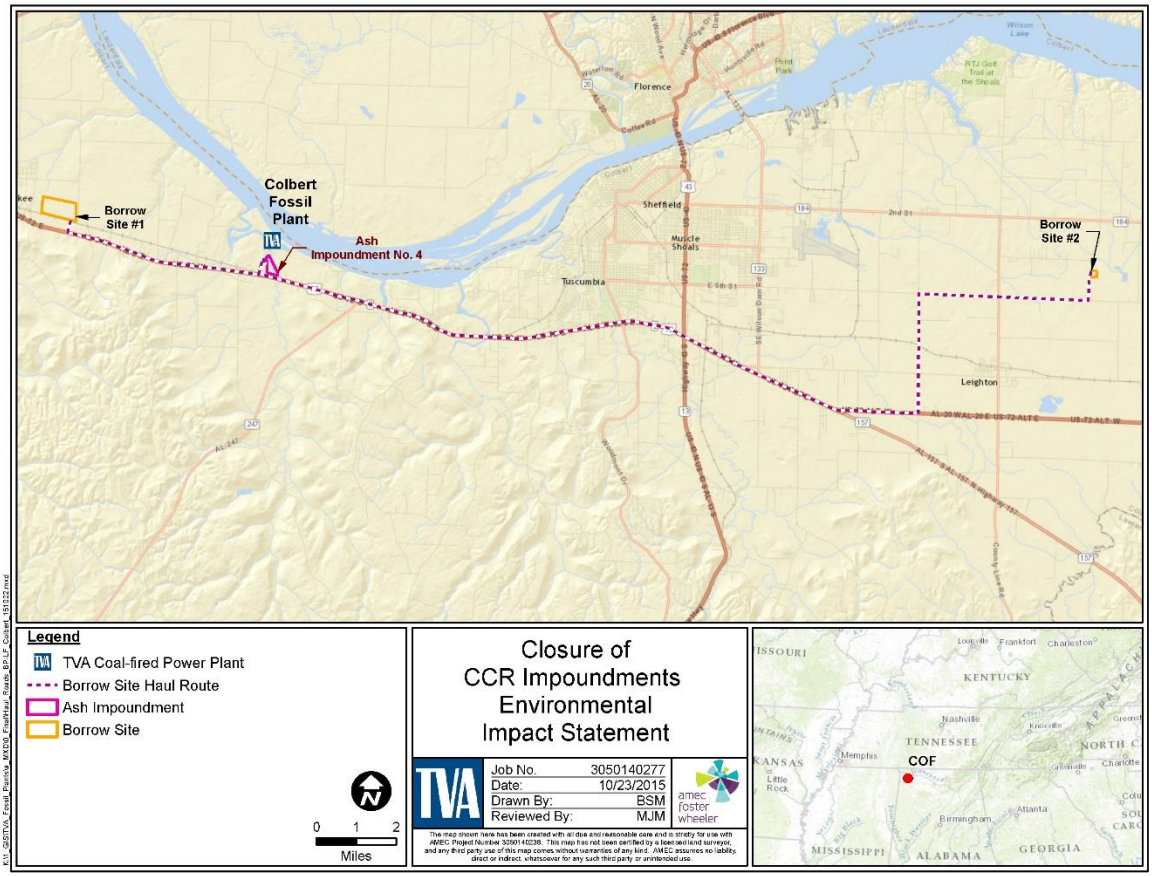


**Figure 2-3. Proposed Borrow Site Locations and Haul Routes**

Ash Impoundment No. 4 was not considered to have a static stability risk (Dewberry 2013). TVA has undertaken a construction program to strengthen the berm for seismic stability and no further measures to improve stability are anticipated during the closure process.

TVA can complete Closure-in-Place of Ash Impoundment No. 4 within a reasonable timeframe (i.e., within 5 years). However, considering the expected scope and sequencing of the project, closure may be completed within 1.7 years

Alternative B is estimated to cost $10 million.

This closure alternative is evaluated in the Environmental Consequences section as it is an alternative that could meet the purpose and need of the project; it could be accomplished within a reasonable construction schedule and it could be accomplished within 5 years.

**Table 2-1. Cost and Duration for Closure of the Ash Impoundment Complex at COF**

| 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)** |
| $10 | 1.7 | $249 | 2,390% | 22.7 | $228 | 2,180% | 22.3 |

## 2.3 EPRI Relative Impact Framework

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

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

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

programmatic conclusions about the merits of and relative differences between the two closure methods.

## 2.4 Comparison of Alternatives

The environmental impacts of Alternative B are analyzed in detail in this section and are summarized in Table 2-22. This summary is 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 of Impacts of Alternative B by Resource Area**

| Issue Area | Alternative B – Closure-in-Place |
|---|---|
| Closure Cost | $10 million |
| Air Quality | Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles. |
| Climate Change | Construction and trucking operations of borrow material contributes to emissions of GHG. |
| Land Use | No impact as no change in industrial land use |
| Prime Farmland | No impact |
| Geology and Seismology | Stable under static conditions. Stability increased by removal of hydraulic head. Seismic stability under evaluation and mitigable. |
| Groundwater | Reduction of hydraulic input reduces risk of migration of constituents to groundwater. |
| Surface Water | Risk to surface water would be reduced. Construction-related impacts would be negligible. |
| Floodplains | Reduces risk and extent of CCR migration into surface water during potential flooding event. |
| Vegetation | Minor and adverse impact in the short term to largely industrialized environmental settings that lack notable plant communities, but minor and positive in the long term |
| Wildlife | Minor impact to predominantly previously disturbed low quality habitats. Potential beneficial impacts in the long term. |
| Aquatic Ecology | No impact |
| Threatened and Endangered Species | No effect on threatened or endangered species. |
| Wetlands | No impact to jurisdictional wetlands |
| Socioeconomic Resources | Short-term beneficial increases in employment, payroll, and tax payments during construction |
| Environmental Justice | No disproportionate adverse impacts to low-income or minority communities. |
| Natural Areas, Parks and Recreation | No impacts |
| Transportation | Temporary minor impacts due to transport of borrow material. |
| Visual Resources | Minor impacts during construction. Beneficial in the long term. |
| Cultural Resources | No impacts due to use of previously disturbed lands. |
| Noise | Temporary minor impact from construction and borrow transport 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 potential for impacts during construction activities and transportation of borrow material. |
| Cumulative Effects | Minor cumulative impacts. |

## 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, truck wash station) will ensure that surface waters are protected from construction impacts. Consistent with Executive Order (EO) 13112, disturbed areas will be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs will be used during construction activities to minimize and restore areas disturbed during construction.
- Under the CCR Rule, TVA will be required to install or upgrade groundwater monitoring systems for COF CCR facilities. Data from these systems will be used to assess groundwater contamination that could trigger 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 Ash Impoundment No. 4 within a reasonable five-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 COF. 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 COF's existing NPDES permit to reflect the decommissioning of Outfall 001-Ash Impoundment No. 4.
- Modification to the Alabama NPDES Permit for Industrial Storm Water discharges would be made for the addition of new storm water outfalls.
- COF's Storm Water Pollution Prevention Plan would be revised to include the closed Ash Impoundment No. 4.

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# CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the baseline environmental conditions potentially affected by the proposed closure of the ash impoundment at COF 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 contains discussions only on resources found in the planning area and site-specific conditions that would change the impact analysis presented in Chapter 3, Part I. Thus the following topics are not addressed in this analysis:

- Air Quality and Climate Change
- Land Use
- Prime Farmland
- Geology and Seismology
- Socioeconomics and 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***

COF is located in the Interior Low Plateau physiographic province adjacent to Pickwick Reservoir on the Tennessee River, in Colbert County, Alabama. The CCR surface impoundment addressed in this report is Ash Impoundment 4. This site is underlain by a Mississippian carbonate sequence that includes two major aquifers, the Tuscumbia-Fort Payne aquifer and the Bangor aquifer. The Tuscumbia-Fort Payne aquifer includes mostly Tuscumbia Limestone, Fort Payne Chert and a small area of the Monteagle Limestone. The Bangor aquifer includes the Bangor Limestone and Hartselle Sandstone. Both of these aquifers possess highly-variable secondary porosity and permeability related to fractures that have been enlarged, sometimes to cavernous proportions, due to solution processes. Significant quantities of ground water are available from each of the aquifers.

Water levels at nearly 2,000 wells indicate that, for each aquifer, general groundwater movement is from topographically high to low areas. Many springs in Colbert County are used as water supplies for domestic and stock needs and a few are used for municipal and industrial requirements (ADEM 1987).

Each of the aquifers is recharged throughout its outcrop within the study area. Generalized topographic settings such as closed-contour depressions and specific features such as sinkholes also are identified (ADEM 1987).

The Tuscumbia Limestone represents the principal aquifer in the site locality. Groundwater occurs in bedrock fractures, joints, and bedding planes, many of which have been enlarged by dissolution of carbonate minerals present in the rock matrix. Borehole flowmeter tests in ten site wells indicate that hydraulically active fractures are typically limited to the upper 45 feet (ft) of bedrock, with the most transmissive zones occurring between elevations 377 and 413 ft above mean sea level (Lindquist et al. 1994).

Local recharge to the bedrock aquifer occurs from several sources including downward sub-surface flow from the soil overburden, direct infiltration of surface runoff through sinkholes and streams and lateral inflow along the southern boundary of the plant reservation. Groundwater in the Tuscumbia generally flows northward and ultimately discharges into the Tennessee River (ADEM 1987).

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 COF 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 COF for the purposes of better identifying the uppermost aquifer. Based upon the findings of these studies, and in consultation with ADEM, TVA will evaluate the depth to the uppermost aquifer at Ash Impoundment No. 4.

#### *3.1.1.2 Groundwater Use*

Several private water-supply wells are located along the shoreline of the Tennessee River approximately 1 mile (mi) east northeast of Ash Impoundment No. 4. Private wells are not required to be registered with the Colbert County or Alabama; therefore, a records search may not yield all existing private wells. Records located within TVA's files indicate that there were 6 private wells north of the facility, 5 private wells east of the facility and 14 private wells to the south of the facility, primarily across US 72. City water is available to all homes with private wells. TVA closed private well P-2, owned by Ms. Terry Walker, on January 30, 2014, in accordance with the May 2013 Consent Decree with ADEM (URS 2014). With one exception, the wells to the north of the facility along the river, are used as backup water supplies and for nonpotable uses, such as lawn-garden irrigation and car washing. Well depths range from 136 to 265 ft suggesting that all are completed in the Tuscumbia aquifer. Prior monitoring of wells has indicated that none have been affected by plant operations (Lindquist et al. 1994; Milligan 2001).

#### *3.1.1.3 Groundwater Quality*

Several monitoring wells are installed in the vicinity of Ash Impoundment No. 4 that can be used to characterize existing groundwater quality (Figure 3-1). While the actual depth to the uppermost aquifer has not yet been determined by TVA, wells downgradient of the impoundment provide some information that is useful in characterizing the local groundwater conditions.


**Figure 3-1 Groundwater Monitoring Wells at COF Ash Impoundment No. 4**

Time series analysis has been performed on constituents analyzed for monitoring wells CA17A, CA17B, CA30B and CA31A using laboratory analytical results. The results for wells CA17A are from 2000 through April 2015. Wells CA17B, CA30B and CA31A were all installed in 2010 in connection with a voluntary coal ash impoundment monitoring program, so the time series for the constituents from those wells begun in 2011. These wells are now monitored as they relate to the May 13, 2013 Consent Order with ADEM, to evaluate groundwater trends related to Ash Impoundment No. 4. Time series have been developed for aluminum, ammonia, antimony, arsenic, boron, chromium, copper, iron, lead, lithium, manganese, molybdenum, nitrate-nitrite, phosphorus, strontium, sulfate, vanadium and zinc. The metals time series reflect total metals analysis results.

Groundwater concentrations have exceeded their applicable Water Quality Goals (WQG) for wells down gradient of Ash Impoundment No. 4 for aluminum (though none since 2011), iron, manganese, sulfate and vanadium. For well CA17A, iron levels ranged from a high of 23 milligrams per liter (mg/L) in 1991, to a level not detectable in the April 2015 sampling event. In well CA17B iron has been as high as 65.4 mg/L in 1986, and at 16 mg/L in April 2015. Well CA31A had the iron level at its highest in October 2013 at 1.5 mg/L, and a level of .44 mg/L in April 2015. Well CA30B had a high of 1.4 mg/L in October 2011, and the April 2015 result was 0.52 mg/L. The WQG for iron is 1.1 mg/L. Manganese exceedances above the WQG of 88 micrograms per liter (ug/L) have been exhibited in CA17B and CA30B since sampling began in 2011. Wells, 17A and CA31A exhibited exceedances near the WQG in 2011, but have steadily decreased since then to below the WQG. Of the four

wells, CA17B is the only well to have sulfate exceeding the WQG of 250 mg/L. Levels of sulfate have varied from below 200 mg/L to 1000 mg/L since 2011 when the well was installed. Vanadium exceedances above the WQG of 3.6 ug/L have been observed in CA17A during five sampling events and CA31A had one exceedance in 2013 The WQGs for aluminum was exceeded six times since 2000, but has had no exceedances since 2011. Overall the trends generally appear stable or non-detectable, with the exception of iron in well CA17B. Iron concentrations in CA17B appear to have an upward trend above the WQG. Closing Ash Impoundment No. 4 with a geomembrane cap is the industry standard for the most likely method to improve groundwater quality.

### 3.1.2 Environmental Consequences

As part of this alternative, the dewatering and subsequent lack of rainfall infiltration into the CCR materials in the impoundment, would provide an immediate reduction in the potential subsurface flow. Under Alternative B, surface water and all contributing surface inputs would be minimized to Ash Impoundment No. 4, resulting in reduced subsurface flow resulting in a general improvement in groundwater quality. Additionally, the installation of an approved closure system (Chapter 2) would further reduce infiltration and subsurface flow to the groundwater.

TVA is evaluating the existing groundwater monitoring system to determine if changes are needed to meet the requirements of the EPA CCR Rule. In addition to any federal requirements that may apply to Ash Impoundment No. 4 after closure is completed, TVA will implement supplemental mitigative measures as required by ADEM, as well as its approved closure plan, which could include additional monitoring, assessment or corrective action programs. These measures would further minimize any risk from closed impoundments.

Consistent with EPA's determination in the CCR Rule and the results of the EPRI model, TVA anticipates that 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 will effectively reduce potential subsurface flows to groundwater. The activities associated with Alternative B would therefore, reduce or potentially eliminate groundwater risk related to this impoundment.

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

The beneficial effects of the Closure-in-Place Alternative indicate that the impacts of Alternative B are beneficial to groundwater, as compared to the No Action Alternative.

Reduction of the hydraulic head by dewatering surface water, coupled with the removal of potential additional infiltration from precipitation, surface water runoff, or other water additions to the impoundment would effectively reduce or potentially eliminate groundwater risk related to this impoundment.

## 3.2 Surface Water

### 3.2.1 Affected Environment

COF is located on TVA's Pickwick Reservoir on the Tennessee River in Alabama at Tennessee River Mile (TRM) 245 near the community of Barton (Figure 3-2). The nearest major cities are Florence, Sheffield, Muscle Shoals and Tuscumbia, Alabama, about 10 mi east of the site. The site is drained by Cane Creek, which is classified for the uses of swimming and fish and wildlife. The Tennessee River is classified for the uses of public water supply, fish and wildlife, swimming and other whole body water contact sports (ADEM 2014b).

River flow rates past the site are regulated by Wilson Dam upstream and Pickwick Dam downstream. The Tennessee River in the vicinity of the site has experienced historical pollution problems due to poor treatment from municipal and industrial treatment facilities and nonpoint sources (TVA 2003).

The overall ecological health condition of Pickwick Reservoir was rated fair in 2012, with a score of 63. Pickwick Reservoir has scored lower the past three years sampled compared to other years due primarily to three indicators (dissolved oxygen, chlorophyll and bottom life) concurrently rating near the low end of their historic ranges at several monitoring locations. Pickwick, however, typically scores near (slightly above or slightly below) the break point between a good and fair rating, with year-to-year variation primarily dependent on chlorophyll concentrations (which are affected by reservoir flows) and conditions in the Bear Creek embayment, which generally rates lower than at other monitoring locations on the reservoir (TVA 2015b).

ADEM has designated the section of Pickwick Reservoir that extends from the Alabama/Tennessee state line to the lower end of Seven Mile Island for public water supply, swimming and fish and wildlife. ADEM has also listed this section on their 2014 303(d) list as impaired because of nutrients from agriculture (ADEM 2014a).

Cane Creek also runs through the COF site. The Alabama Department of Public Health (ADPH) states in their Fish Consumption Advisories, released June 2015, that there are no restrictions on Pickwick Reservoir or on Cane Creek (ADPH 2015).

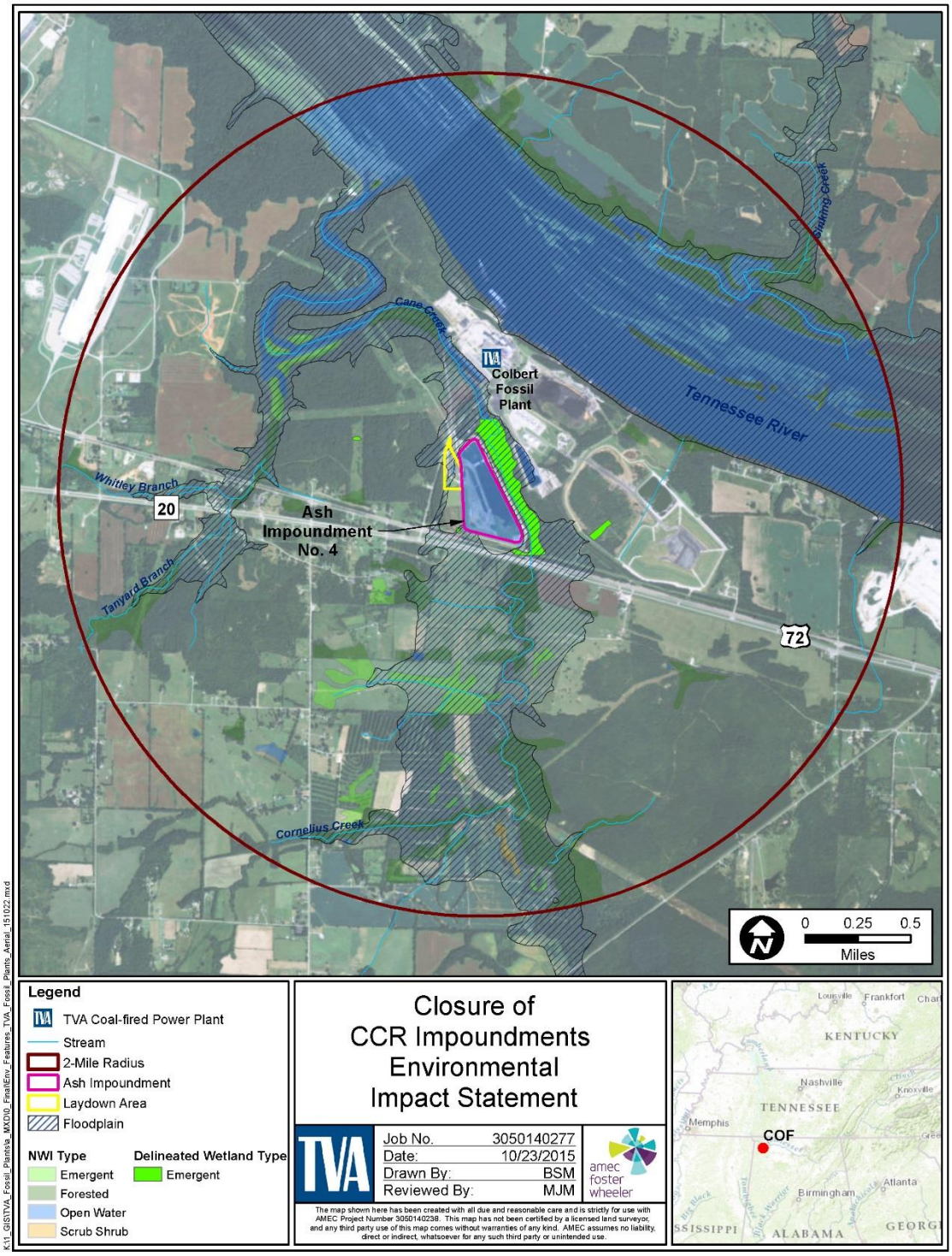


**Figure 3-2. Environmental Features in the Vicinity of COF**

### 3.2.2 Environmental Consequences

COF is expected to close its coal-fired power plant in April 2016. Under this alternative, no alteration or modification of surface water resources would occur within the immediate project site or associated laydown areas.

Under this alternative, Bottom Ash Impoundment No. 4 would be dewatered and all remaining CCR material would be consolidated and compacted. An approved cover system consisting of a geosynthetic liner coupled with cover soil would be installed as described in Part I, Section 2.2. In conjunction with impoundment closure activities, all systems currently discharging to the impoundment would be rerouted to other areas of the site.

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

#### *3.2.2.1 Operational Impacts*

The main operational change that would take place with the closure of the impoundment would be the change in management of the on-site storm water and process wastewater that is currently treated in impoundments and discharged from Ash Impoundment No. 4. The other process streams would be reduced as the coal-fired units are shut down and would be redirected to other treatment systems as necessary to comply with a modified NPDES permit. EPA's new Effluent Limitation Guideline for coal-fired power plants does not appear to apply to COF as the coal-fired units will be shut down in mid-2016.

As discussed in Part I, programmatic evaluation of surface water impacts, closing Ash Impoundment 4 along with the plant closure would reduce a discharge that has averaged 5.4 MGD in the past, which contained various levels of suspended solids, metals and other pollutants. The total suspended solids no longer discharged could potentially be 678 pounds per day. The reduction of the loadings from other constituents in the current CCR impoundment discharge should be proportional to their concentrations.

The specific characteristics of future discharges are unknown at this time. As described above, the total loadings to Cane Creek and the Tennessee River should decrease. Since the current discharge is sustaining the presence of a balanced indigenous population in the Tennessee River, the new reduced discharges should not cause any adverse impacts on resident biological communities.

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

Lateral movement of water (seepage) from berms at Ash Impoundment No. 4 is not known to occur. Nonetheless, this alternative would reduce the potential for any future lateral movement of water (seepage) from berms and groundwater flow and their subsequent release to surface waters. Consequently, any pathways for transport of constituents of

concern as a result of lateral movement of water through the berm or groundwater flow to adjacent surface waters would be minimized.

EPRI also qualitatively compared its hypothetical site analysis to COF using site-specific data (EPRI 2016a). With respect to surface water, EPRI's sensitivity analysis indicated only a negligible difference between the Closure-in-Place and Closure-by-Removal Alternatives with respect to both low and high mobility constituents under both the non-intersecting groundwater condition and the intersecting groundwater condition. It is expected that both closure alternatives would have similar benefits for surface water.

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

Ash Impoundment No. 4 and the proposed laydown yard at COF are located at Cane Creek River Mile 2.8 in Colbert County, Alabama. Cane Creek enters Pickwick Reservoir at TRM 244.1. Flood elevations on Cane Creek are influenced by surface water elevations on the Tennessee River. The 100- and 500-year flood elevations on Cane Creek at this location would be 422.6 and 423.6 ft, respectively.

According to Colbert County, Alabama, Flood Insurance Rate Maps, Ash Impoundment No. 4 is located outside the limits of the 100-year floodplain of Cane Creek, which would be consistent with EO 11988. The low berm crest elevation of Ash Impoundment No. 4 is 457.6 ft, which is well above both the 100- and 500-year flood elevations of Cane Creek.

### 3.3.2 Environmental Consequences

Under this closure alternative, CCR material will be managed within the existing footprint of Ash Impoundment No. 4. Ash Impoundment No. 4 is located outside the 100-year floodplain of Cane Creek based on Flood Insurance Rate Maps, which would be consistent with EO 11988.

A portion of the proposed laydown area has been identified as being located within the 100-year floodplain based on Flood Insurance Rate Maps. The proposed laydown area would be used during construction of the closure system. Potential flooding of the laydown area could occur from Cane Creek. Based on topographic maps, however, the elevation of the laydown area is about 430 ft above mean sea level. Therefore, the laydown area would be above the identified 100-year flood elevation of Cane Creek, which is approximately 423 ft above mean sea level. There would be no impacts to floodplains or floodplain resources due to construction of the final closure system of Ash Impoundment No. 4 and the associated laydown area.

## 3.4 Vegetation

### 3.4.1 Affected Environment

COF is located within the Eastern Highland Rim section of the Interior Plateau Ecoregion. Clay soils dominate the region. Historically, oak-hickory forests were the primary vegetation. Current land use is cropland and pasture (Griffith et al. 2001).

The area in and around COF has been heavily impacted and altered as a result of the construction and operation of the facility. Vegetated areas consist of lawns, early successional thickets and early to mid-successional forests (estimated 30 to 40 years). Open fields are typically dominated by grass species including Bermuda grass, Dallis grass, Johnsongrass and crab grass. Early successional thickets include a mixture of herbaceous and woody vegetation (estimated age 8 to 15 years) including ragweed, evening primrose, crab grass, sericea lespedeza, wild cherry, black locust, sweet gum, sycamore and green ash. An early to mid-successional forest occurs along the coal barge unloading area and along the slopes adjacent to the existing road leading to this site. Common canopy species in these roadside forests include sassafras, box elder, sycamore, southern red oak, green ash and autumn olive. Water oak and scattered loblolly pine occur on wetter sites. One sparsely vegetated limestone bluff area occurs adjacent to an existing road. Rock cress and Japanese honeysuckle are the dominant plant species in this area (TVA 2003).

The proposed project areas consist primarily of open field and previously developed land. Small inclusions of early successional thickets and forests occur along the edges of Bottom Ash Impoundment No. 4. Within a 2-mi radius, the land cover is primarily hay/pasture (1,545.6 ac), open water (1,341.2 ac) and deciduous forest (1,310.6 ac) (Table 3-1). Land use/land cover of the impoundment and laydown area is characterized by predominantly open water (21.4 ac) and early successional herbaceous land cover types (14.1 ac) within exposed ash in upper portion of impoundment (Figure 3-3). No unique plant communities are present within the proposed project footprint at COF.

### 3.4.2 Environmental Consequences

As discussed in Part I, Section 3.9, impacts to vegetation would result from earthmoving activities related to shaping the CCR within the impoundment, inward reconfiguration of berms and grubbing of laydown areas. Because plant communities are poorly represented at COF (limited to early successional herbaceous land cover types within exposed CCR in upper portion of impoundment) and potential impacts are very small relative to the abundance of similar cover types within the vicinity, direct impacts from site construction activities would be negligible. No tree removal would be required under this alternative.

Under Alternative B, Bottom Ash Impoundment No. 4 will be covered with 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 will be minimized by use of BMPs that include covering loads during transport.

Lands within the impoundment will also be restored with a cover system that includes the establishment of an herbaceous cover. Temporary use areas will be revegetated to their current land cover type or replanted with herbaceous vegetation. Although transportation of borrow material has the potential to introduce invasive plants, BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate that risk. Therefore, impacts to vegetation under the Closure-in-Place Alternative would be beneficial relative to the existing condition.

**Table 3-1. Land Use/Land Cover within the Vicinity of COF**

| Land Cover Type | Impact Area[1] (ac) | 2-Mi Radius (ac) |
|---|---|---|
| Barren Land | 0.07 | 43.0 |
| Cultivated Crops | 0 | 586.0 |
| Deciduous Forest | 0 | 1,310.6 |
| Developed, High Intensity | 0 | 42.7 |
| Developed, Low Intensity | 19.9 | 263.8 |
| Developed, Medium Intensity | 0 | 122.7 |
| Developed, Open Space | 0 | 357.4 |
| Emergent Herbaceous Wetlands | 5.18 | 0 |
| Evergreen Forest | 0 | 555.8 |
| Hay/Pasture | 0 | 1,545.6 |
| Herbaceous | 14.1 | 271.0 |
| Mixed Forest | 0 | 205.0 |
| Open Water | 21.4 | 1,341.2 |
| Shrub/Scrub | 0 | 985.8 |
| Woody Wetlands | 0 | 411.8 |
| **Total** | 60.5 | 8,042.4 |

Source: USGS, 2011.

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

## 3.5 Wildlife

### 3.5.1 Affected Environment

Much of the area within the COF site has been heavily impacted and altered as a result of construction and operation of the existing facility. Medium quality forested habitats occur within and adjacent to the project area, including some areas adjacent to Ash Impoundment No. 4. The impoundment may intermittently support variable numbers of waterfowl, wading birds, shorebirds, gulls and other wildlife.

The maintained pond areas and grassed berms offer little suitable habitat for wildlife species, but can be used by many common species, especially when the landscape still retains a few trees. Generalist wildlife species described in Part I, Section 3.9 could be expected to occur within the potentially affected habitats. Species observed in the vicinity of COF during biological monitoring of the Tennessee River generally reflect typical species found in riparian areas and floodplain habitats in the area. Identified species included eastern grey squirrel, red fox, American coot, belted kingfisher, blue jay, diving duck, great blue heron, gull, hawk, killdeer and vulture (TVA 2012).

A review of the TVA Natural Heritage Database indicated that two heron colonies and 101 caves have been reported in Colbert and Lauderdale Counties (TVA 2003). Eight caves have been recorded within 3 mi of the project footprint. The nearest cave is approximately 0.4 mi away and would not be impacted by the proposed actions. No caves were observed in the project footprint during field reviews on April 16, 2015. There are no reported habitats unique or important to terrestrial animals within 3 mi of the proposed project (TVA 2015a).

The maintained pond areas and grassed berms offer little suitable habitat for wildlife species, but can be used by many common species, especially when the landscape still

retains a few trees. Generalist wildlife species described in Part I Section 3.9 could be expected to occur within the potentially affected habitats. Species observed in the vicinity of COF during biological monitoring of the Tennessee River generally reflect typical species found in riparian areas and floodplain habitats in the area. Identified species included eastern grey squirrel, red fox, American coot, belted kingfisher, blue jay, diving duck, great blue heron, gull, hawk, killdeer and vulture (TVA 2012).

### 3.5.2 Environmental Consequences

The project site occurs within a highly fragmented, industrial landscape that offers minimal 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. No tree clearing would occur in conjunction with closure activities within the ash impoundment area or associated laydown area (see Table 3-1 and Figure 3-3). As a result, no impacts would occur to tree roosting/nesting bird or mammal species. During construction, most wildlife present within the project site would likely disperse to adjacent and/or similar habitats.

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

Following the construction period, some limited wildlife use of the closed impoundment may be expected. Ash Impoundment No. 4 is proposed to be closed by using the geosynthetic-protective soil cover system and may, therefore, be expected to provide limited foraging and nesting habitat for grassland 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.

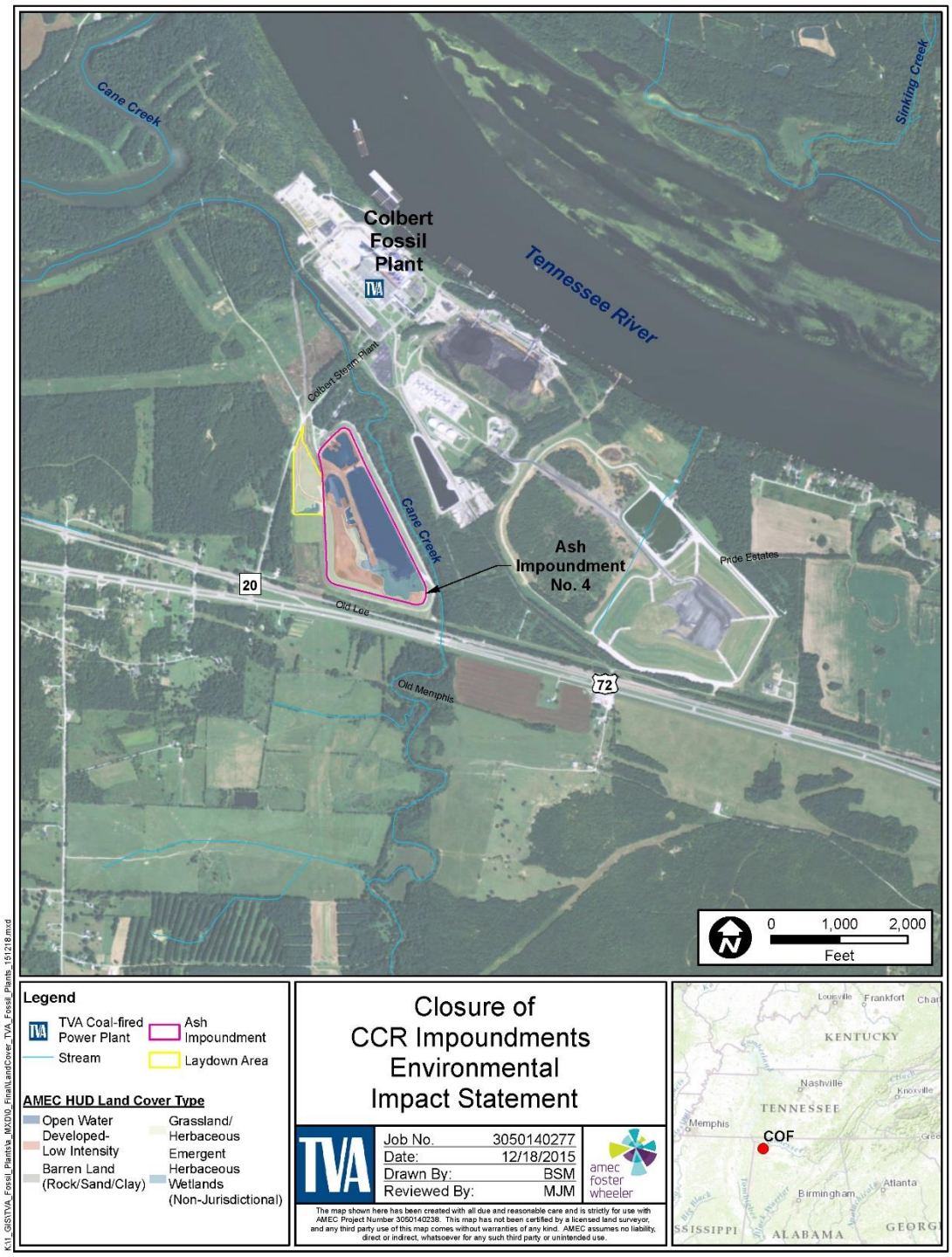


**Figure 3-3. Land Cover Types Associated with Ash Impoundment Closure at COF**

## 3.6 Aquatic Ecology

### 3.6.1 Affected Environment

COF is located approximately 8 mi east of Cherokee, Alabama and 13 mi west of Muscle Shoals, Alabama on the south shore of Pickwick Reservoir at TRM 245. The Pickwick Landing Dam impounds the 43,100-ac Pickwick Lake and its tailwaters are part of Kentucky Lake. Ash Impoundment No. 4 is located south of the facility along Cane Creek, just upstream of its confluence with the Tennessee River in Pickwick Lake.

TVA has systematically monitored the ecological conditions of its reservoirs since 1990 as part of its Vital Sign Monitoring Program. It is expected that aquatic resources within Cane Creek are similar to Pickwick Lake, given adjacency and the impounded nature of the lower portions of Cane Creek near the facility.

Shoreline and substrate sections were evaluated for aquatic habitat upstream and downstream of COF in 2011. The shoreline sections had average scores of "fair," while limited aquatic macrophytes (<5 percent) were noted along the banks during the shoreline evaluation. The substrate was dominated by silt (36 percent), sand (30 percent) and mollusk shell (12 percent) downstream of COF and by gravel (31 percent), silt (17 percent) and mollusk shell (16 percent) upstream of COF (TVA 2012).

TVA has evaluated the health of the fish community near TRM 242, downstream of COF and at TRM 247.5, upstream of COF. The fish community rated "good" at both of these locations in 2011. Historically, the fish community has rated "good" at these locations.

During the 2011 study, 31 indigenous species were collected at the downstream site and 29 at the upstream site; this includes 11 commercially valuable and 25 recreationally valuable species:

- Common centrarchid species present at COF included black crappie, bluegill, longear sunfish, redear sunfish, warmouth, green sunfish and redbreast sunfish.
- Benthic invertivore species present included black redhorse, freshwater drum, river redhorse, silver redhorse, spotted sucker, golden redhorse, logperch and smallmouth redhorse.
- Top carnivore species present included black crappie, flathead catfish, largemouth bass, longnose gar, smallmouth bass, spotted bass, white bass, yellow bass, sauger, spotted gar, bowfin, rock bass and skipjack herring.
- Intolerant species present included black redhorse, river redhorse, longear sunfish, smallmouth bass and spotted sucker. In addition, two thermally sensitive species, spotted sucker and logperch, were present.
- Two aquatic nuisance species, common carp and Mississippi silverside, were collected at the downstream and upstream sites (TVA 2012).

Benthic community data was collected from three sites, upstream and downstream of COF, in 2011. Monitoring results for 2011 support the conclusion that balanced indigenous populations of benthic macroinvertebrates are maintained downstream of COF. Sites had taxa averages of 20.0, 16.9 and 7.3 at TRM 240.4, 244.0 and 246.0, respectively. The Ephemeroptera, Plecoptera and Trichoptera taxa present were 2.5, 1.1 and 0.1 at

TRM 240.4, 244.0 and 246.0, respectively, high- to low-range numbers. However, the proportions of oligochaetes were 9.2 percent, 4.4 percent and 6.3 percent, receiving the highest score (TVA 2012).

### 3.6.2 Environmental Consequences

Under Alternative B, no direct impacts to aquatic ecosystems are expected from the in-place closure of Ash Impoundment No. 4 at COF. Temporary laydown areas supporting closure activities are located within previously disturbed upland areas. Consequently, no direct impacts to aquatic ecosystems would occur in conjunction with planned closure activities.

The wastewater discharges during dewatering will meet existing permit limits and compliance sampling will continue to be performed at the approved outfall structure in accordance with the NPDES permit to demonstrate compliance. Additionally, any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources in Cane Creek and the Tennessee River. Therefore, adverse effects to aquatic resources from the in-place closure of Ash Impoundment No. 4 at COF 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 the occurrence of five federally listed endangered mussel species, one federally listed endangered bat species (gray bat), seven additional state-listed species and 21 caves within 2-mi of COF. Two additional federally-listed bat species, the Indiana bat and northern long-eared bat, are known to occur throughout the region and thus are included in Table 3-2. No occurrence records exist for federal- or Alabama state-listed plant species within 2-mi of COF.

In the southeastern United States, gray bats typically roost in caves along rivers and reservoirs. Although the adjacent Pickwick Reservoir provides foraging habitat for this species, open water areas of the CCR impoundment provides only low-quality foraging habitat within the project site. Cave roosting habitat does not occur within the project site. As stated above, several caves exist off-site in the vicinity of COF but suitable roosting cave habitat is absent from within the CCR impoundment and temporary laydown area.

The Indiana bat is listed as federally endangered by the USFWS (2007). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). Indiana bats disperse from wintering caves to areas throughout the eastern United States. This species range extends from New York and New Hampshire in the north to Alabama, Georgia and Mississippi in the south and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees with suitable roost characteristics in close proximity to suitable snags has also been documented. Multiple roost sites are generally selected. The availability of trees of a sufficient bark condition, size and sun exposure is another important limiting factor in how large a population an area can sustain (Tuttle and Kennedy 2002; Harvey 2002; Kurta et al. 2002). Several cave sites are known to occur within 2 mi of the plant. Suitable summer roosting habitat may be

present on-site or in the vicinity of COF but such habitat does not occur within the CCR impoundment or temporary laydown area.

**Table 3-2. Species of Conservation Concern within the Vicinity of COF**

| Common Name | Scientific Name | Status | |
|---|---|---|---|
| | | Federal[1] | State[2] (Rank[3]) |
| **Invertebrates** | | | |
| Beetle | *Batrisodes jonesi* | -- | TRKD(S2) |
| Ground beetle | *Rhadine caudata* | -- | TRKD(S2) |
| Springtail | *Folsomia candida* | -- | TRKD(S1) |
| **Mammals[3]** | | | |
| Gray Bat | *Myotis grisescens* | LE | PROT(S2) |
| Indiana Bat[4] | *Myotis sodalis* | LE | END(S1) |
| Long-tailed Weasel | *Mustela frenata* | -- | PROT(S3) |
| Northern Long-Eared Bat[4] | *Myotis septentrionalis* | LT | (S1S2) |
| Tricolored Bat | *Perimyotis subflavus* | -- | NOST(S3) |
| **Reptiles[3]** | | | |
| Coal Skink | *Plestiodon anthracinus* | -- | TRKD(S3) |
| **Mussels[5]** | | | |
| Fanshell | *Cyprogenia stegaria* | LE | PROT(S1) |
| Pink mucket | *Lampsilis abrupta* | LE | PROT(S1) |
| Ring pink | *Obovaria retusa* | LE | PROT(S1) |
| Sheepnose | *Plethobasus cyphyus* | LE | PROT(S1) |
| Slowwater Elimia | *Elimia interveniens* | -- | TRKD(S2) |
| White Wartyback | *Plethobasus cicatricosus* | LE | PROT(S1) |

Source: TVA Regional Natural Heritage database, accessed 09/18/2015; Species documented within 2 mi of COF
[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; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).
[4] Known from the region but no occurrence records within 2-mi of the project site.
[5] State- and Federal-Listed Aquatic Animal Species Reported From the Tennessee River (Pickwick Reservoir) and its tributaries downstream of COF.

The northern long-eared bat is found in the United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F), high humidity and minimal air currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter ≥3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, tree-lined corridors and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2014). Suitable summer roosting habitat may be present on-site or in the vicinity of COF but such habitat does not occur within the CCR impoundment or temporary laydown area.

The tri-colored bat has a state rank of S3 (vulnerable) with a distribution throughout most of the eastern United States, southeastern Canada and southward through eastern Mexico to Central America. Caves, mines and rock crevices are used as winter hibernacula and as summer roosting sites, although most individuals roost in trees during the summer (Tennessee Bat Working Group 2015). Several caves occur off-site in the vicinity of COF but winter and summer habitat are not present in the ash impoundment and laydown areas of the project site.

The long-tailed weasel is protected by the state with a rank of S3 (vulnerable). This species prefers habitats with abundant fossorial mammal dens in proximity to cover. Weasels often take residence in dens previously occupied by prey such as moles or gophers. Prey includes mice, chipmunks, shrews, rats, young rabbits, birds, reptiles and eggs. The remains of skunks, woodchucks and other weasels have been found in their dens. Population densities of the long-tailed weasel are thought to be limited by food supply and predatory raptors (McKinney 2008). Habitat for this species may occur at COF but is not available in the CCR impoundment and laydown areas.

Coal skinks are found in humid wooded areas with abundant leaf litter and loose rocks. Suitable habitat for this species does not exist within the project site (TVA 2003). No heron colonies or wading bird colonies occur within 2 mi of COF.

The springtail is tracked by the state with a rank of S1. This is a relatively common and somewhat widespread soil arthropod. The beetle and ground beetle are tracked by the state of Alabama each with a rank of S2 (very rare and imperiled) as noted in Table 3-2. All three species would inhabit the soil and may occur in the vicinity of COF but would not be located in the highly disturbed soils in the ash impoundment and laydown areas.

Six listed freshwater mussel species are recorded within a 2-mi radius of COF as summarized in Table 3-2. All of these aquatic species require freshwater riverine systems with flowing water (Ahlstedt 1984, Ahlstedt 1985, Outdoor Alabama 2015, USFWS 1997a, USFWS 1997b, USFWS 2015). Such habitat does not occur within the project boundary.

### 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 3-2. Ash Impoundment No. 4 does not provide suitable habitat for listed mussel species and the terrestrial habitat on-site has been severely degraded and is populated with weedy, non-native species. Although low-quality foraging habitat for the gray bat, Indiana bat, northern long-eared bat and tri-colored bat may occur in the open water areas of the CCR impoundment, suitable roosting habitat is absent from within project area and tree clearing is not anticipated with the proposed action. Suitable habitat may occur on-site and in the vicinity of COF for the long-tailed weasel, coal skink and soil invertebrates, but such habitat is not expected to occur within the highly disturbed project area.

Because suitable habitat for the species in Table 3-2 is either absent or degraded within the CCR impoundment and temporary laydown areas at COF and 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

COF is located within the Eastern Highland Rim section of the Interior Plateau Ecoregion, which includes nearly level to gently rolling topography with some sinkholes and depressions (Griffith et al. 2001). Natural vegetation includes mostly oak-hickory forests with some areas of cedar glades and bottomland hardwoods.

The proposed construction footprint includes Ash Impoundment No. 4 and a temporary laydown area as depicted in Figure 3-2. National Wetlands Inventory (NWI) mapping includes 51.3 ac of open water within the CCR impoundment and 1.2 ac of open water within the temporary laydown area. The NPDES outfall from Ash Impoundment No. 4 discharges through a riprapped channel to Cane Creek.

Although the NWI mapped 51.3 acres of wetland features within the CCR impoundment, this water feature is a COF treatment system and is not considered a wetland. The temporary laydown area is located in a disturbed open area on the COF site. A field survey of the NWI feature within the laydown area was conducted in December 2015. The survey concluded that this feature is not considered a jurisdictional wetland due to its location within and adjacent to the permitted ash disposal site. A site survey was conducted at the facility in 2002 and wetland features were identified, although these wetlands were not located within the ash impoundment or laydown area (TVA 2003).

### 3.8.2 Environmental Consequences

Closure of the impoundment would include covering the CCR with earthen material and installation of a geosynthetic cover system and a protective layer with 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 herbaceous cover upon completion. No jurisdictional wetlands were identified within the footprint of Ash Impoundment No. 4 or within the identified laydown area.

Indirect impacts to nearby jurisdictional or non-jurisdictional wetlands could potentially result from the alteration of hydrologic inputs to the wetland system resulting from closure of the impoundments. Jurisdictional wetlands adjacent to the ash impoundment have a hydrology that is dominated by water levels within the adjacent Cane Creek and Tennessee River. Therefore, any modification of hydrologic inputs from the ash impoundment is expected to have a negligible effect on these wetlands. This cannot be avoided if these facilities are closed under either closure method. In terms of EO 11990, there is no practicable alternative that would avoide impacting such wetlands.

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

## 3.9 Natural Areas, Parks and Recreation

### 3.9.1 Affected Environment

As illustrated on Figure 3-4, the Seven Mile Island State WMA and a boat launching ramp that provides access to Cane Creek near the Tennessee River, occur within 2 mi of Ash

Impoundment No. 4 (TVA 2003). No other recreational areas are on or near the CCR impoundment.

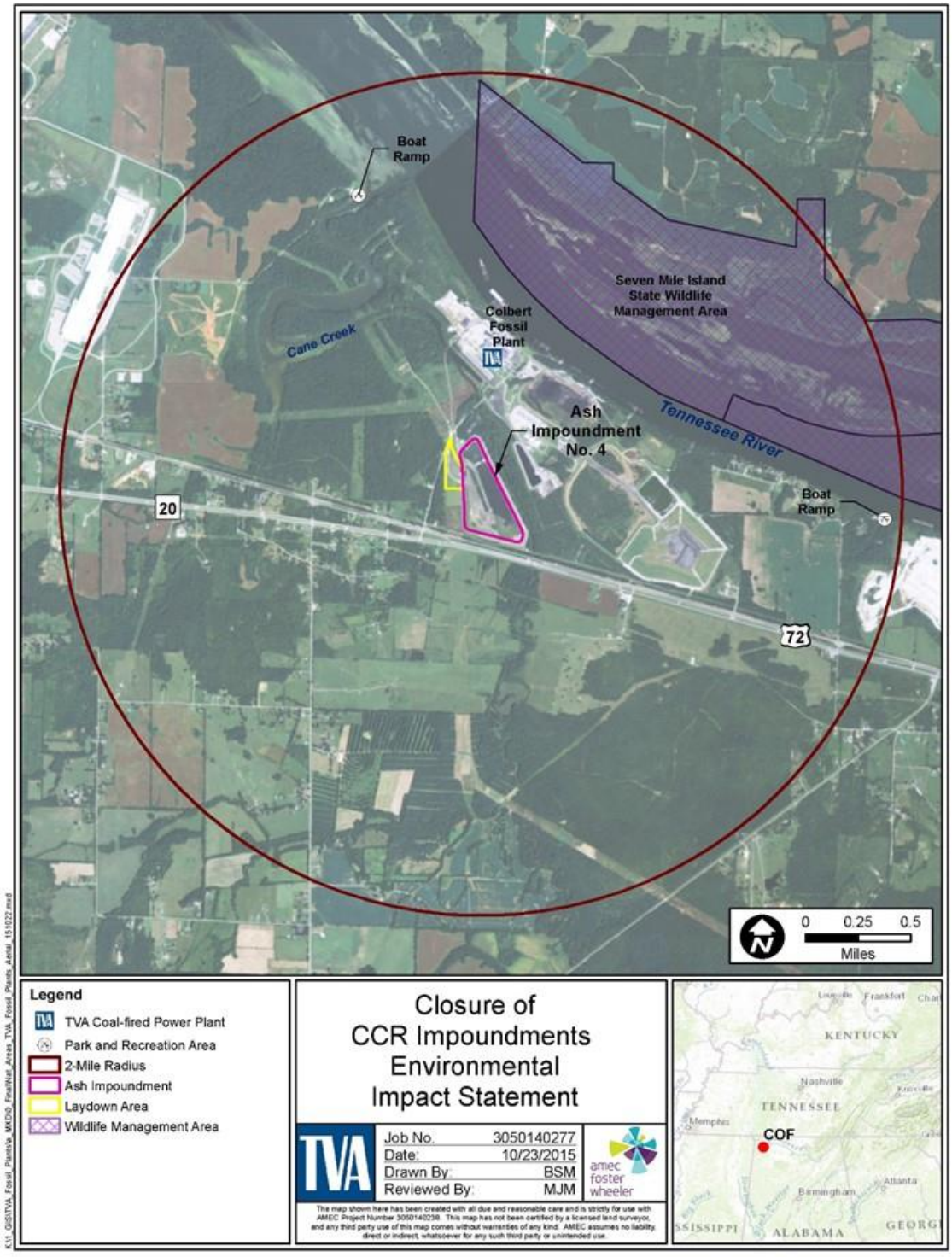


**Figure 3-4. Natural Areas, Parks and Recreational Facilities Near COF**

### 3.9.2 Environmental Consequences

Under Alternative B, TVA would close Ash Impoundment 4. Two permitted sites have been identified for borrow material. One site, the future development site for the Vulcan Cherokee Quarry, is located approximately 5.8 mi west of COF on the north side of US 72. The second borrow material site is a farm area (Stutts), located approximately 25 mi east of COF in Leighton, Alabama. As discussed in Part I, Section 3.15 there would be no direct impact to natural areas, parks or recreation areas as the ash impoundment is located on an industrial area and borrow material would be obtained from a previously permitted site.

There would be no indirect impacts from on-site construction activities given the existing industrial setting of the project location and the distance between the natural areas, parks or recreational facilities and the construction site.

Review of the route used to transport borrow material to the COF project site (see Figure 2-3) indicates that transport of material obtained from Borrow Site 1 Vulcan site would not have an indirect impact to natural areas, parks or recreation areas as none of these facilities are present in the vicinity of the haul route (US 72). Use of the Stutts site (Borrow Site 2) may have a minor indirect impact on recreational sites that would be located adjacent to the haul route. The probable haul route from this site would utilize 6$^{th}$ Street and Marthaler Lane to reach Wheeler Highway (US 72/Alternate 20) and eventually US 72. Users of parks and recreational facilities located adjacent to this route (such as the Tennessee Valley Country Club) would potentially be impacted by increased traffic, fugitive dust and noise during the construction period. This impact would be negligible given implementation of BMPs designed to minimize fugitive dust and the temporary nature of the action.

## 3.10 Transportation

### 3.10.1 Affected Environment

Traffic generated by COF is expected to be composed of a mix of cars and light duty trucks, as well as medium duty to heavy duty trucks.

Two borrow sites have been identified for potential use in impoundment closures activities at COF. One site is approximately 5.8 mi west of the CCR impoundment and the other is approximately 25 mi to the east. The principal access at COF is via US 72 (Lee Highway), which is oriented in an east/west direction along the south side of COF. US 72 is a four-lane divided highway. The Tennessee River forms the northern edge of COF.

Roadways to be incorporated as the proposed haul route to Borrow Sites 1 and 2 are identified in Figure 2-3. Table 3-3 indicates the 2014 Average Annual Daily Traffic (AADT) for the primary roads used for the proposed haul routes to Borrow Sites 1 and 2.

**Table 3-3. Average Daily Traffic Volume (2014) Along the COF Proposed Haul Route**

| Roadway | Average Annual Daily Traffic (AADT) |
|---|---|
| **Borrow Site #1** | |
| US 72 (Lee Highway) west of COF | 10,210 |
| **Borrow Site #2** | |
| US 72 (Lee Highway) immediately east of COF | 10,480 |
| Wheeler Highway (US 72/ALT 20) | 7,970 |

Source: ALDOT 2014.

### 3.10.2 Environmental Consequences

Traffic generated by the closure of Ash Impoundment No. 4 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 are not expected to last more than 12 months.

The construction workforce traveling to and from COF 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 Ash Impoundment No. 4 on flatbed trailers during 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.

The approximate number of daily truckloads (of borrow material) is estimated to be 25 and would be achieved using 15-yard tandem dump trucks. This would result in a traffic count of 50 truck trips per day.

COF is scheduled to cease operations in 2016. Therefore, traffic from plant operations would be minimal. Maintenance phase traffic associated with maintaining the closed impoundment would be negligible.

Transport of borrow material would depend on the borrow site being used. If Borrow Site 1 is used, an increase in the traffic count of 50 trucks per day would be expected on US 72 west of COF to meet the construction schedule. If Borrow Site 2 is used to meet the construction schedule, an increase in the traffic count of 50 additional trucks per day would be expected on US 72 east of COF. These 50 trucks per day associated with the transport of borrow would continue east of Tuscumbia and would be added to Wheeler Highway (Table 3-4).

Transport of borrow material is assumed to take the following haul route from Borrow Site 1 to the COF ash impoundment: South 0.3 mi on Bugle Lane; then east on US 72 for 4.9 mi; then north on Colbert Steam Plant Road for 0.4 mi to Ash Impoundment No. 4. The hauling of borrow material is assumed to take the following haul route from Borrow Site 2 to Ash Impoundment No. 4: South 0.7 mi on Hatton School Road; then west on 6th Street for 4.3 mi; then south on Marthaler Lane for 3.0 mi; then west on Wheeler Highway for 2.0 mi;

then west on US 72 for 15.1 mi; then west on US 20 (Old Lee Highway) for 950 ft; then north on Colbert Steam Plant Road for 0.4 mi to Ash Impoundment No. 4. Along these routes, the traffic count is expected to increase by 50 trucks per day along the route (see Table 3-4).

**Table 3-4. Traffic Impacts Associated with the Closure-in-Place of the Ash Impoundment No. 4**

| Roadway | 2013 Traffic (AADT) | Construction Phase Traffic (AADT) | Traffic Increase (Percent) |
|---|---|---|---|
| **To/From Borrow Site #1** | | | |
| US 72 (Lee Highway) west of COF | 10,210 | 10,260 | 0.5 |
| **To/From Borrow Site #2** | | | |
| US 72 (Lee Highway) immediately east of COF, THEN | 10,480 | 10,530 | 0.5 |
| Wheeler Highway (US 72/ALT 20) | 7,970 | 8,020 | 0.6 |

The percentage increases in traffic on the surrounding road network resulting from the Closure-in-Place of the COF CCR impoundment is minor. Because the existing roadway network is expected to have sufficient capacity to absorb the expected temporary construction traffic increase, potential impacts on roadway transportation are expected to be minor and temporary.

## 3.11 Cultural and Historic Resources

### 3.11.1 Affected Environment

Parts of COF have been previously surveyed for cultural resources. These surveys were conducted to satisfy the requirements of Section 106 of the National Historic Preservation Act of 1966 (Part I, Section 3.18).

No archaeological sites or architectural properties listed or eligible for listing on the National Register of Historic Places have been previously identified within the footprint of Ash Impoundment No. 4 or on the plant property.

### 3.11.2 Environmental Consequences

Under Alternative B, TVA would close Ash Impoundment No. 4 in place. As discussed in Part I, Section 3.18, there would be no direct impact to cultural resources as Ash Impoundment No. 4 is located on a previously disturbed industrial area and no cultural resources have been identified within the footprint of the ash impoundment. 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 been previously surveyed for cultural resources and no archaeological sites were identified. The Alabama Historical Commission concurred that the project will have no effect on any cultural resources listed on or eligible for the National Register of Historic Places (Alabama Historical Commission 2016) (see Part I, Appendix C).

Two permitted sites have been identified for borrow material. One site, the future development site for the Vulcan Cherokee Quarry, is located approximately 5 mi southeast of COF on the north side of US 72. The second borrow material site is a farm area (Stutts), located approximately 30 mi east of COF in Leighton, Alabama. As discussed in Part I,

Section 3.18, TVA determined that there would be no impact to cultural resources as the borrow material would be obtained from a previously permitted site.

No indirect impacts from on-site construction activities is anticipated given the existing industrial setting of the project location and the absence of identified cultural resource in adjacent lands. Review of the probable primary route used to transport borrow material to the COF project site indicates that transport of material obtained from the Vulcan site would not have an indirect impact on cultural resources as no known cultural resource sites are present in the vicinity of the probable haul route (US 72). Use of the Stutts site, does not appear to have any indirect impacts on known cultural resource sites located adjacent to the haul route. The probable haul route from this site would utilize 6th Street (County Highway 24) and County Highway 48 to reach US 72.

## 3.12 Noise

### 3.12.1 Affected Environment

COF is surrounded on three sides by wooded hills, gently sloping farmland and sparse residential development. The nearest sensitive receptors to Ash Impoundment No. 4 are a residence located on the south side of US 72 and a residence located on the plant entrance road, near the intersection of Old Highway 72. These residences are located 900 ft and 1,192 ft respectively, from the Ash Impoundment No. 4 construction site.

Operations at the existing coal plant generate varying amounts of environmental noise. Noise generating activities associated with the existing plant include coal unloading activities, dozer operations associated with coal pile management and rail and truck operations. Existing noise emission levels associated with these activities typically ranges from 59 to 87 decibels A-weighted (dBA) (TVA 2014). Ambient noise levels measured in two locations near the entrance to COF in 2003 ranged from 54.9 dBA to 96.7 dBA (TVA 2004). The primary noise sources at these locations were truck and railroad noise. The COF will be retired in April 2016 and therefore noise emissions from the fossil-fuel plant and related operational activities will cease. Once retired, ambient noise will primarily be limited to periodic operation of the combustion turbine plant.

Although there are no federal, state, or local regulations for community noise in Tuscumbia County, Alabama, EPA (1974) guidelines recommend that day-night sound levels (Ldn) do not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985).

### 3.12.2 Environmental Consequences

As discussed in Part I, Section 3.19, noise impacts under this alternative would be associated with on-site closure activities and transport of borrow material and other construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the work 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 59.9 dBA at the nearest residence southwest of Ash Impoundment No. 4 and 57.4 dBA at the residence located on the plant entrance road. However, the actual noise would probably be lower as objects and topography would cause further noise attenuation. These levels exceed the EPA noise

guideline for Ldn of 55 dBA, but are 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. However, as stated in Part I, Section 3.19, impacts from construction related traffic are minor.

Two permitted sites have been identified for borrow material. One site, the future development site for the Vulcan Cherokee Quarry, is located approximately 5 mi southwest of COF on the north side of Old Lee Highway. The second borrow material site is a farm area (Stutts), located approximately 30 mi east of COF in Leighton, Alabama. Haul routes from these sites are identified in Figure 2-3. Residents are located near the roads that would be utilized to access COF and these receptors would be impacted by the noise generated by the transport of borrow material and construction related traffic.

As identified in Section 3.10, the percentage increases in traffic on the surrounding road network is 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, for receptors along the local roadway system serving the plant, noise-related effects may be more pronounced during the construction period. This increase would be minor due to the projected increase of 50 trucks per day (0.1 trucks per minute) passing near these residences. In addition, traffic noise related to closure activities would offset by the reduction in workforce traffic noise and stoppage of noise from delivering coal because of the retirement of the four coal-fired units. Therefore, given the temporary and intermittent nature of closure activities and negligible increase in noise levels, indirect impacts associated with this alternative would be minor.

## 3.13 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 COF is therefore limited to the immediate project area and vicinity (2-mi radius) surrounding COF and the associated haul routes. For air quality, the geographic area is the county.

This analysis is limited to only those resource issues potentially adversely affected by project closure activities under Alternative B, the preferred alternative. 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, socioeconomics, environmental justice, 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, transportation and noise.

### 3.13.1 Identification of "Other Actions"

Past, present and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-5. 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 3-5. Summary of Other Past, Present or Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Project**

| Actions Description | Description | Timing and Reasonable Foreseeability |
|---|---|---|
| Flue Gas Desulfurization System | Installation of equipment to reduce sulfur dioxide emissions at TVA plant | Past |
| Retirement of Fossil Plant | TVA plans to retire the fossil plant at COF by mid-April 2016. | Past |

#### *3.13.1.1 Flue Gas Desulfurization System*

In 2004, TVA proposed the installation of flue gas desulfurization equipment at COF Unit 5 to reduce sulfur dioxide emissions. TVA needed to reduce emissions at COF in order to meet requirements under the 1990 Clean Air Act amendments. The installation of this equipment resulted in a beneficial effect to the regional air quality by significantly decreasing sulfur dioxide emissions. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

#### *3.13.1.2 Retirement of Fossil Plant*

COF currently has five coal-fired generators on-site, Units 1-5. Unit 5 was idled in 2013 and TVA retired the remaining units on March 23, 2016,. As a result, virtually all coal unit operational measures have been discontinued and the plant will be subject just to basic care and maintenance measures. At this time, TVA is planning to continue operations of the gas-fired turbine generators located at the facility. As a result of the closure of the fossil plant, overall air emissions will greatly decrease and employment at the TVA facility has been reduced.

### 3.13.2 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding Ash Impoundment No. 4 was considered in conjunction with the environmental impacts presented in Chapter 3 and as described programmatically in Part I, Chapter 3. These combined impacts are defined by the Council of Environmental Quality as “cumulative” in 40 CFR § 1508.7 and may include individually minor but collectively significant actions taking place over a period of time. The potential for cumulative effects to the identified environmental resources of concern are analyzed below for the preferred alternative.

*Air Quality:* Other identified actions within the geographic area that have the potential to contribute to additional air quality impacts include the installation of the flue gas

desulfurization system and closure of the coal-fired units. Both of these actions have or will in the near future, greatly reduce the emissions from COF. Additionally, primary operational measures that would be discontinued include daily coal barge operations and coal pile management would further decrease air emissions.

As discussed in Part I, Section 3.1, Alternative B would involve several activities that would potentially result in temporary air emissions and dust. These activities include equipment removal, grading and compaction of CCR, transport of borrow material and installation of approved cover systems. Since the other identified actions would have beneficial impacts on air quality, no cumulative effects to air quality are anticipated as a result of this alternative.

*Transportation*: The potential for cumulative effects to transportation from other identified actions includes the closure of the coal-fired units at COF. Traffic generated due to operations of the coal-fired units would cease and the workforce-generated traffic would also decrease.

Traffic generated by the construction workforce for the closure of Ash Impoundment No. 4 is the controlling factor in assessing impacts to the local roadway network. It is anticipated that the existing roadway network will have sufficient capacity to absorb the expected temporary construction traffic increase. Therefore, potential impacts of construction on roadway transportation are expected to be minor and temporary. With the scheduled closure of COF in 2016, traffic from plant operations would be minimal. Furthermore, traffic associated with maintaining the closed impoundment would be negligible. Therefore, cumulative effects to transportation resources are not anticipated as a result of this alternative.

*Noise:* Among the other identified actions within the geographic area, the closure of the coal-fired units would have a beneficial impact to noise levels. Operations at the existing coal plant generate varying amounts of environmental noise associated with coal unloading activities, dozer operations associated with coal pile management and barge, rail and truck operations. The COF will be retired in 2016 and therefore noise emissions from the fossil-fuel plant will cease. Once retired, ambient noise will primarily be limited only to periodic operation of the combustion turbine plant.

As discussed in Part I, Section 3.19, 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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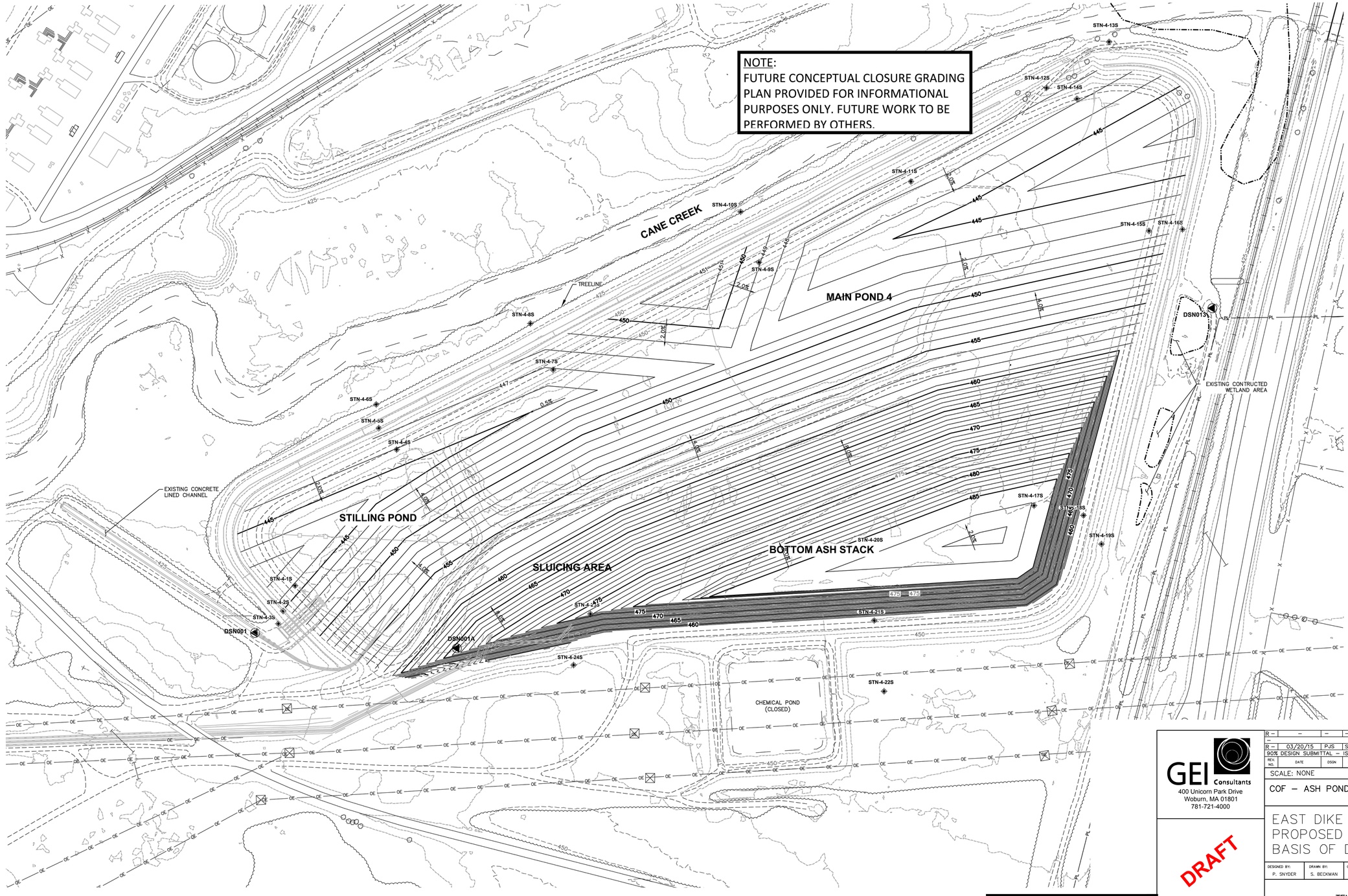
NOTE:
FUTURE CONCEPTUAL CLOSURE GRADING PLAN PROVIDED FOR INFORMATIONAL PURPOSES ONLY. FUTURE WORK TO BE PERFORMED BY OTHERS.

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SCALE IN FEET

**LEGEND**

- EXISTING VEGETATION
- EXISTING PROPERTY LINE
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING HAUL ROAD
- EXISTING CREEK
- EXISTING WETLANDS
- EXISTING TURBIDITY CURTAIN
- EXISTING BENCH MARKS
- EXISTING PIEZOMETERS

**ISSUED FOR BID**
**NOT FOR CONSTRUCTION**

SEE XXWXXX–XXX FOR LIST OF DESIGN, COMPANION, REFERENCE DRAWINGS AND SUPPORTING DESIGN CALCULATIONS NUMBER.

GEI Consultants
400 Unicorn Park Drive
Woburn, MA 01801
781-721-4000

DRAFT

| REV. NO. | DATE | DSGN | DRWN | CHKD | SUPV | RVWD | APPD | ISSD | PROJECT CO. | AS CONST | REV. CH. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| R – | 03/20/15 | PJS | SNB | PJS | – | JFN | WHW | – | – | – | – |
| 90% DESIGN SUBMITTAL – ISSUED FOR BID | | | | | | | | | | | |

SCALE: NONE EXCEPT AS NOTED

COF – ASH POND 4

# EAST DIKE SEISMIC IMPROVEMENT PROPOSED FINAL GRADING FOR BASIS OF DMM WALL DESIGN

| DESIGNED BY: | DRAWN BY: | CHECKED BY: | SUPERVISED BY: | REVIEWED BY: | APPROVED BY: | ISSUED BY: |
|---|---|---|---|---|---|---|
| P. SNYDER | S. BECKMAN | P. SNYDER | | J. NICKERSON | W. WALTON | |

COLBERT FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

| AUTOCAD R 2012 | DATE 3/20/15 | XX | C | 10WXXX–500 | R – |
|---|---|---|---|---|---|

DISCIPLINE INTERFACE

| GEI Consultants | – |
|---|---|
| TASK COMPLETED BY: | REV NO. |

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY