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PARADISE CCR MANAGEMENT OPERATIONS ENVIRONMENTAL ASSESSMENT

Muhlenberg County, Kentucky

Prepared by:
TENNESSEE VALLEY AUTHORITY
Paradise, Kentucky

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To request further information, contact:
Ashley Pilakowski
NEPA Compliance
Tennessee Valley Authority
400 W Summit Hill Drive
Knoxville, TN 37902
Phone: 865- 632-2256
E-mail: aapilakowski@tva.gov

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Executive Summary

With a long-standing commitment to safe and reliable operations and to environmental stewardship, Tennessee Valley Authority (TVA) has prepared the following final Environmental Assessment (EA) (pursuant to the National Environmental Policy Act (NEPA)) to assess the environmental impacts of implementing projects proposed to support dry storage and Coal Combustion Residual (CCR) Rule compliance at Paradise Fossil Plant. The plant is located in western Kentucky on the Green River in Muhlenberg County 10.5 miles northeast of Greenville. The action proposed in this final EA would help TVA achieve its goal to convert CCR storage from wet to dry, and would inform TVA decision makers, regulators and the public about the environmental consequences of the proposed action. TVA's preferred alternative is to implement the following projects:

- construct and operate a Gypsum Dewatering Facility
- construct and operate a Dry Fly Ash Handling System
- construct and operate an onsite CCR landfill
- close the Gypsum Disposal Area
- close Slag Impoundment 2A/2B and Stilling Impoundment 2C
- close the Peabody Ash Impoundment

TVA evaluated the potential effects of these proposed actions to environmental resources including air quality, climate change, land use, prime farmland, geology, groundwater and surface water, floodplains, vegetation, wildlife, aquatic ecology, threatened and endangered species, wetlands, socioeconomics and environmental justice, natural areas, transportation, visual resources, cultural and historic resources, noise, solid waste and public health and safety. No significant impacts to these resources were identified. Unavoidable impacts would be mitigated as required by both state and federal agencies.

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Symbols, Acronyms, and Abbreviations

<	Less Than
>	Greater Than
AADT	Annual Average Daily Traffic
ACS	American Community Survey
APE	Area of Potential Effect
BMP	Best Management Practices
CAA	Clean Air Act
CCR	Coal Combustion Residual
CCW	Condenser Cooling Water
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	Carbon Dioxide
CO_3	Carbon Trioxide
CT/CC	Combustion Turbine/Combined Cycle
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted decibel
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
EPRI	Electric Power Research Institute
ESA	Endangered Species Act of 1973
FEMA	Federal Emergency Management Agency
FGD	Flue Gas Desulfurization
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
g	Gravitational Pull
GHG	Greenhouse Gases
gpm	Gallons per Minute
GRM	Green River Mile
HDPE	High Density Polyethylene
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
IBI	Index of Biotic Integrity
IPaC	Information for Planning and Conservation
KAR	Kentucky Administrative Regulations
KDEP	Kentucky Department of Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KGS	Kentucky Geological Survey
KPDES	Kentucky Pollutant Discharge Elimination System
KRS	Kentucky Revised Statutes
KSNPC	Kentucky State Nature Preserves Commission
KYTC	Kentucky Transportation Cabinet
LiDAR	Light Detection and Ranging
LOMR	Letter of Map Revision
LOS	Level of Service
MBI	Macroinvertebrate Bioassessment Index
MCL	Maximum Contaminant Level

MGD	Million Gallons Per Day
mg/l	Milligrams per Liter
msl	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OSH	Kentucky Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAF	Paradise Fossil Plant
PEIS	Programmatic Environmental Impact Statement
RCRA	Resource Conservation and Recovery Act
RIF	Relative Impact Framework
ROD	Record of Decision
SCR	Selective Catalytic Reduction Systems
SO_2	Sulfur Dioxide
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
SR	State Route
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	United States Census Bureau
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WMA	Wildlife Management Area
WWT	Water Treatment
yd^3	Cubic Yard

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

Tennessee Valley Authority's (TVA) Paradise Fossil Plant (PAF) is located in Muhlenberg County in western Kentucky, approximately 35 miles northwest of Bowling Green and 95 miles southwest of Louisville (Figure 1-1). The plant is on a large reservation of approximately 3,400 acres located on the west bank of the Green River near the Village of Paradise.

TVA has three coal-fired cyclone generating units at PAF. Units 1 and 2 went on-line in 1963, each with a generation capacity of 704 megawatts. A third unit became operational in 1970 with a capacity of 1,150 megawatts. Combined, the three units have a generating capacity of 2,558 megawatts. The plant produces more than 14 billion kilowatt hours of electricity each year, enough to supply more than 950,000 homes. As part of its commitment to expand fuel diversity, TVA is replacing Units 1 and 2 with a natural gas plant having a 1,200-megawatt generation capacity. Paradise Units 1 and 2 were retired in April 2017. Unit 3 will continue operation.

In July 2009, the TVA Board of Directors passed a resolution for staff to review TVA practices for storing Coal Combustion Residuals (CCR) at its generating facilities, including PAF, which resulted in a recommendation to convert the wet CCR management system at PAF to a dry storage system. On April 17, 2015, the U.S. Environmental Protection Agency (EPA) published the Final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule) in the Federal Register.

In June of 2016, TVA issued a Final Programmatic Environmental Impact Statement (PEIS) that analyzed methods for closing impoundments that hold CCR materials at TVA fossil plants and identified specific screening and evaluation factors to help frame its evaluation of closures at additional facilities. A Record of Decision (ROD) was released in July 2016 that would allow future environmental reviews of CCR impoundment closures to tier from the PEIS.

TVA has prepared this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA) to assess the environmental impacts of implementing projects proposed to support dry handling and CCR Rule compliance at PAF. This NEPA document tiers from the 2016 PEIS to evaluate the closure alternatives for the PAF ash impoundments (Gypsum Stack, Slag Impoundments 2A/2B and Stilling Impoundment 2C, and the Peabody Ash Impoundment). In addition, the EA analyzes the impacts of construction and operation of two dewatering facilities (gypsum dewatering and dry fly ash conversion) and the option selected to accommodate future dry CCR disposal actions (see Figure 1-1).

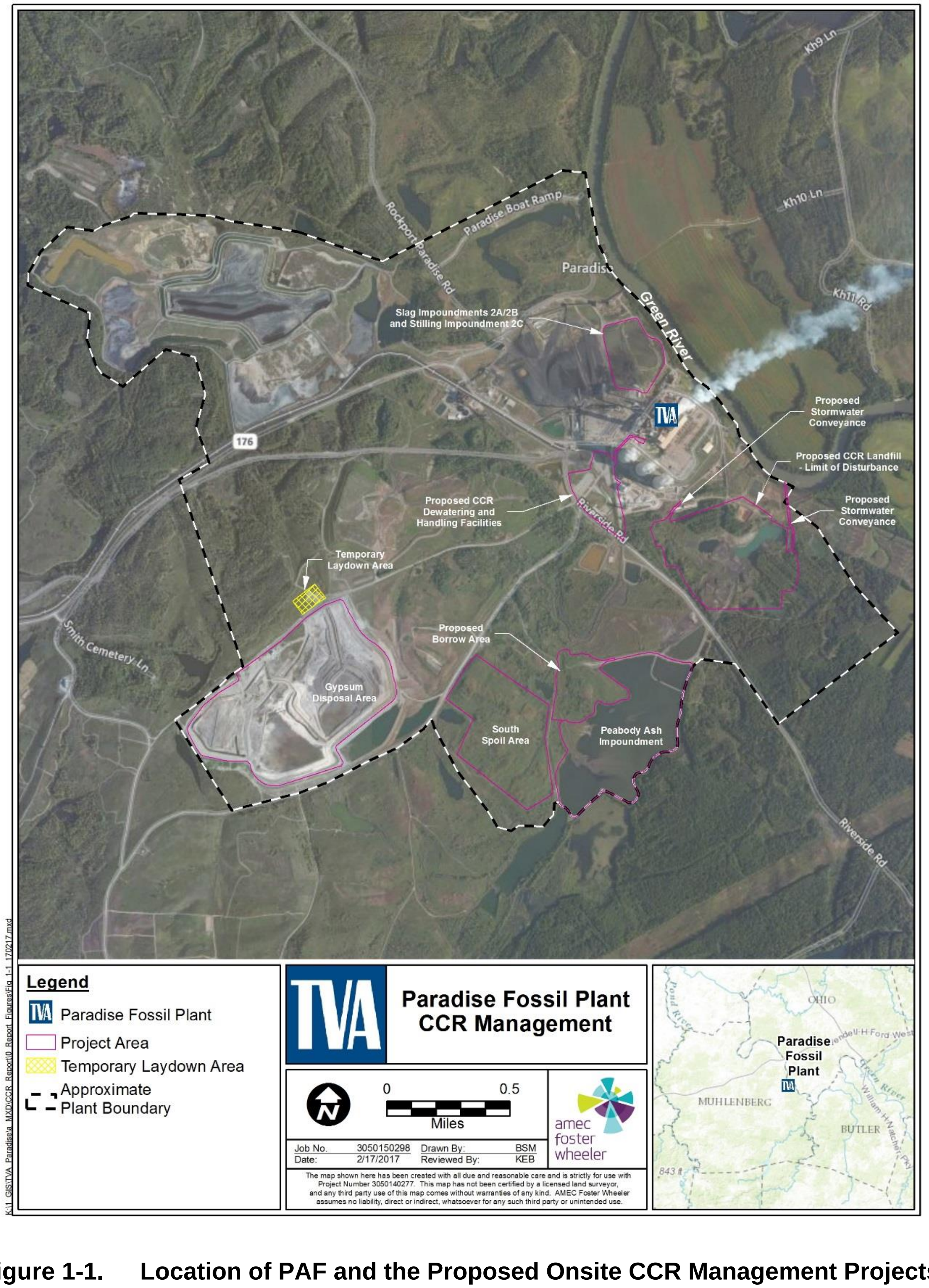

Figure 1-1. Location of PAF and the Proposed Onsite CCR Management Projects

1.2 Current Management of CCR Material at PAF

About 8 percent of coal burned at PAF remains as ash. All of the fly ash from Unit 3 is sluiced to the Peabody Ash Impoundment as part of process water treatment under a Kentucky Pollutant Discharge Elimination System (KPDES) permit. Approximately 90 percent of fly ash from Units 1 and 2 are comingled with gypsum and are sluiced to the gypsum stack at the north end of the Gypsum Pond Disposal Complex. Gypsum slurry from the Unit 3 wet Flue Gas Desulfurization (FGD) scrubber system is sluiced to the western portion of the disposal complex. Boiler slag is currently sluiced to the ash impoundment known as Slag Impoundment 2A/2B. After settling, the slag is removed and placed in small piles with free water returning to the impoundment. Most of the piled material is reclaimed and marketed as a beneficial reuse product. Co-product unused is returned to PAF and placed in CCR impoundments. The production of fly ash and gypsum is expected to decrease significantly upon retirement of Units 1 and 2. Based on future generation plans for PAF, after the retirement of Units 1 and 2, the CCR production is estimated to be approximately 500,000 tons per year.

What are CCRs"?

CCRs are byproducts produced from burning coal and include fly ash, bottom ash, and FGD materials.

Fly Ash: Fly ash is composed mainly of non-combustible inorganic material contained in the coal. Fly ash typically consists of fine particles that are entrained in the combustion exhaust gas.

Bottom Ash: Bottom ash is comprised of the incombustible coarse particles that settle to the bottom of the combustion chamber of a boiler. Bottom ash or boiler slag slurry is produced from washing the boiler bottom with a water jet stream.

Flue Gas Desulfurization Materials: The burning of coal in boilers produces flue gas, which is the combustion exhaust gas that eventually exits via the stack. It is composed mostly of nitrogen, carbon dioxide, water vapor, and oxygen. Flue gas also contains pollutants such as particulate matter (PM), nitrogen oxides, and sulfur oxides. FGD systems or scrubbers remove sulfur oxides from the flue gas using limestone. Gypsum is produced in the chemical reaction between the limestone and the sulfur oxides in the flue gas.

1.3 Purpose and Need

The generating capacity provided by PAF is important in maintaining an adequate and reliable power supply to the north-central portion of TVA's service area. Accordingly, the retirement of Units 1 and 2 and construction of a combined cycle plant at PAF were identified in TVA's 2015 Integrated Resource Plan (TVA 2015) as measures to support the continued operation of PAF. TVA has historically managed storage of CCR materials generated at PAF in a combination of onsite dry stacks, wet stacks, and impoundments. The purpose of the proposed action is to convert the management of CCR produced at PAF from wet to dry storage. The proposed individual projects are needed to support the goal established by TVA to convert CCR management from a wet system to dry storage. This included closing wet CCR impoundments. The project is also needed to comply with present and future regulatory requirements related to CCR production and management.

1.4 Decision to Be Made

This EA has been prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether or not to construct and operate the projects identified to manage CCR produced at PAF on a dry basis, which would allow TVA to "go dry." TVA will use this EA to support the decision-making process and to determine whether an Environmental Impact Statement (EIS) should be prepared or whether a Finding of No Significant Impact may be issued.

1.5 Related Environmental Reviews

The following environmental reviews have been prepared for actions related to CCR management at PAF:

Final Ash Impoundment Closure Environmental Impact Statement (TVA 2016a). The EIS was prepared to address the closure of CCR impoundments at all of TVA's coal-fired power plants. The report consists of two parts: Part I – Programmatic NEPA Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considered environmental effects of closure of ash impoundments using two primary closure methods: (1) Closure-in-Place and (2) Closure-by-Removal. A ROD was released in July of 2016 that would allow future environmental reviews of CCR impoundment closures to tier from the PEIS. This EA tiers from the 2016 PEIS to evaluate the closure alternatives for the existing ash impoundments at PAF.

Shawnee Fossil Plant Bottom Ash Process Dewatering Facility EA (TVA 2016c). The EA evaluated the installation of equipment to remove water from bottom ash generated at the Shawnee Fossil Plant. The bottom ash dewatering equipment proposed at SHF is similar to what is being considered for dewatering of bottom ash at PAF.

Integrated Resource Plan, 2015 Final Report (TVA 2015). The plan provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. The document and the associated Supplemental Environmental Impact Statement evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future power demand economically while supporting TVA's equally important mandates for environmental stewardship and economic development across the Tennessee Valley. The report indicated that a diverse portfolio is the best way to deliver low-cost, reliable electricity. TVA released the accompanying Final Supplemental EIS for TVA's Integrated Resource Plan in July 2015 (TVA 2015).

Final EA, Paradise Fossil Plant Units 1 and 2 Mercury and Air Toxics Standards Compliance Project, Muhlenberg County, Kentucky (TVA 2013). The EA evaluated two alternatives to comply with EPA's 2010 Mercury and Air Toxics Standards. These included installation and Operation of Pulse Jet Fabric Filter Systems or as an alternative to installation of emission control equipment on PAF, replacing Units 1 and 2 with a combustion turbine/combined cycle (CT/CC) plant. The decision to retire Units 1 and 2 has relevance to needs for CCR management at PAF.

Kingston Dry Fly Ash Conversion, Roane County, Tennessee (June 2010). The EA evaluated the installation of equipment to remove the current wet fly ash handling system at Kingston Fossil Plant and convert the system into a dry collection system. The fly ash dewatering equipment proposed at the Kingston is similar to what is proposed for dewatering of bottom ash at PAF.

Installation of Flue Gas Desulfurization System on Paradise Fossil Plant Unit 3, Muhlenberg County, Kentucky (March 2003). This EA evaluated the proposal to reduce sulfur dioxide (SO_2) emissions from Unit 3 at PAF by installing FGD equipment (scrubbers) that employs the wet limestone forced oxidation technology. Installation of this equipment resulted in an increase in the amount of gypsum that is disposed in the gypsum disposal area, impacting the long-term disposal capacity at PAF.

Development of Ash Disposal Capacity at Paradise Fossil Plant, Tennessee Valley Authority (August 1996). The EA evaluated alternatives for disposal of fly ash produced at PAF and considered the expansion of the Peabody Ash Impoundment.

1.6 Scope of the Environmental Assessment and Summary of the Proposed Action

This EA evaluates the potential environmental, and socioeconomic impacts of proposed construction and operation projects to manage CCR produced at PAF. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

TVA prepared this EA to comply with NEPA and regulations promulgated by the Council on Environmental Quality (CEQ), and TVA's procedures for implementing NEPA. TVA considered the possible environmental effects of the proposed action and determined that potential effects to the environmental resources listed below were relevant to the decision to be made. Potential impacts on these resources are assessed in detail in this EA.

- Air Quality
- Climate Change
- Land Use
- Prime Farmland
- Geology and Seismology
- Groundwater
- Surface Water
- Floodplains
- Vegetation
- Wildlife
- Aquatic Ecology
- Threatened and Endangered Species
- Wetlands
- Socioeconomics and Environmental Justice
- Natural Areas, Parks and Recreation
- Transportation
- Visual Resources
- Cultural and Historic Resources
- Noise
- Solid Waste and Hazardous Waste
- Public Health and Safety

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

1.7 Public and Agency Involvement

TVA's public and agency involvement includes publication of a notice of availability and a 30-day public review of the draft EA. The availability of the draft EA was announced in newspapers that serve the Muhlenberg County area: *Central City Leader News*, and *Central City Times Argus*. Copies of the draft EA were made available in the Central City, Kentucky, Public Library. The draft EA was also posted on TVA's Web site. TVA's agency involvement includes circulation of the draft EA to local, state, and federal agencies and federally recognized tribes as part of the review. Chapter 5 provides a list of agencies, tribes, and organizations notified of the availability of the draft EA. Comments were accepted from March 28, 2017 through April 27, 2017 via TVA's Web site, mail, and e-mail.

During the public comment period on the draft EA, TVA conducted a public meeting at the Muhlenberg North Middle School in Greenville Kentucky. The meeting was attended by 10 members of the public. No comments were submitted at the public meeting. A copy of the fact sheet distributed at the public meeting is included in Appendix A.

Comments were received from the U.S. Fish and Wildlife Service (USFWS) and Kentucky Ecological Services Field Office. In addition, the EA was reviewed by the appropriate state agencies in the Kentucky State e-Clearinghouse. All comments were carefully reviewed, and the text of the EA was edited as appropriate. Appendix A contains comments on the draft EA and TVA's responses to those comments.

1.8 Necessary Permits or Licenses

TVA would obtain necessary permits, licenses, and approvals required for the alternative selected. TVA anticipates that the following may be required for implementing either of the build alternatives:

- Storm Water Best Management Practices (BMPs) and KPDES permit application and/or modification.
- Actions involving wetlands and/or stream crossings would be subject to federal CWA Section 404 permit requirements as well as state Section 401 water quality certification.
- Any outfall relocations would require a notification or permit modification request to the Kentucky Division of Water (KDOW) and possibly the United States Army Corps of Engineers (USACE).
- Air permitting regulations under the CAA require TVA to secure an Air Pollution Control Permit to Construct prior to the commencement of the proposed construction. The project would likely require revisions to TVA's Title V Permit under the CAA for operations.
- Issuance of KPDES Permit for construction activities for all stormwater discharges associated with construction activity that disturbs one acre or more.

Necessary permits would be evaluated and obtained based on site-specific conditions.

CHAPTER 2 – ALTERNATIVES

PAF produces electricity using one active coal-fired cyclone generating unit, which produces fly ash, gypsum and boiler slag (or bottom ash). PAF Units 1 and 2 were retired in April 2017 and no longer produce CCR. The management of CCR produced by Unit 3 is addressed in the proposed projects. These projects include the construction and operation of dewatering facilities, closure of existing ash impoundments, and management and storage of future operation-related CCR.

2.1 Description of TVA's Proposed Projects for Management of CCR and Preliminary Alternatives

2.1.1 CCR Dewatering and Handling Facilities

TVA intends to transition from a wet sluiced ash disposal system to dry CCR handling and disposal at PAF to comply with the TVA Board's recommendation to close all wet impoundments containing CCR. At PAF, this will include the impoundments that currently receive wet sluiced gypsum, fly ash and boiler slag. To enable this wet-to-dry conversion, TVA would construct and operate a Gypsum Dewatering Facility and a Dry Fly Ash Handling and Disposal System at its coal fired electric generating unit, Unit 3. All proposed dewatering equipment would be constructed within a 29.1-acre previously disturbed site located south of Units 1, 2 and 3 (Figure 2-1). Construction of the dewatering facilities are expected to take place over a 12- to 24-month period. Truck scales would be installed at the exit from the project site loading area which would be used by both facilities.

A separate dewatering facility would be required to address boiler slag produced at PAF. Unit 3 produces about 132,000 tons of boiler slag annually. This material is produced as a molten ash in the bottom of the boiler and is quenched in water to form a hard, glassy slag. This material is sluiced to a series of water treatment ponds (Slag Impoundment 2A/2B, and a Slag Stilling Impoundment 2C) operating under a KPDES permit. Most of the slag is reclaimed by Harsco Minerals Corporation for processing and sold for use as industrial abrasives and for roofing granules. Slag Impoundment 2A/2B and Slag Stilling Impoundment 2C would be closed under the proposed action to comply with the TVA Board's recommendation identified above. Accordingly, TVA is considering the option to develop a bottom ash dewatering facility. There is little information available regarding this facility and, therefore, site-specific impacts associated with the construction and operation of this potential facility would be evaluated in a separate NEPA document when the details of that facility become less speculative. Consequently, boiler slag would be managed on an interim basis by relocating the current Harsco operations approximately 400 feet closer to the plant where slag can be reclaimed from the pumps, stacked and dried. Precipitation runoff from this area would be collected in two man-made ponds located upstream and downstream of Stilling Impoundment 2A. All of these operations will be contained within the existing previously disturbed area encompassing the slag impoundments as described in Section 2.1.2.3.

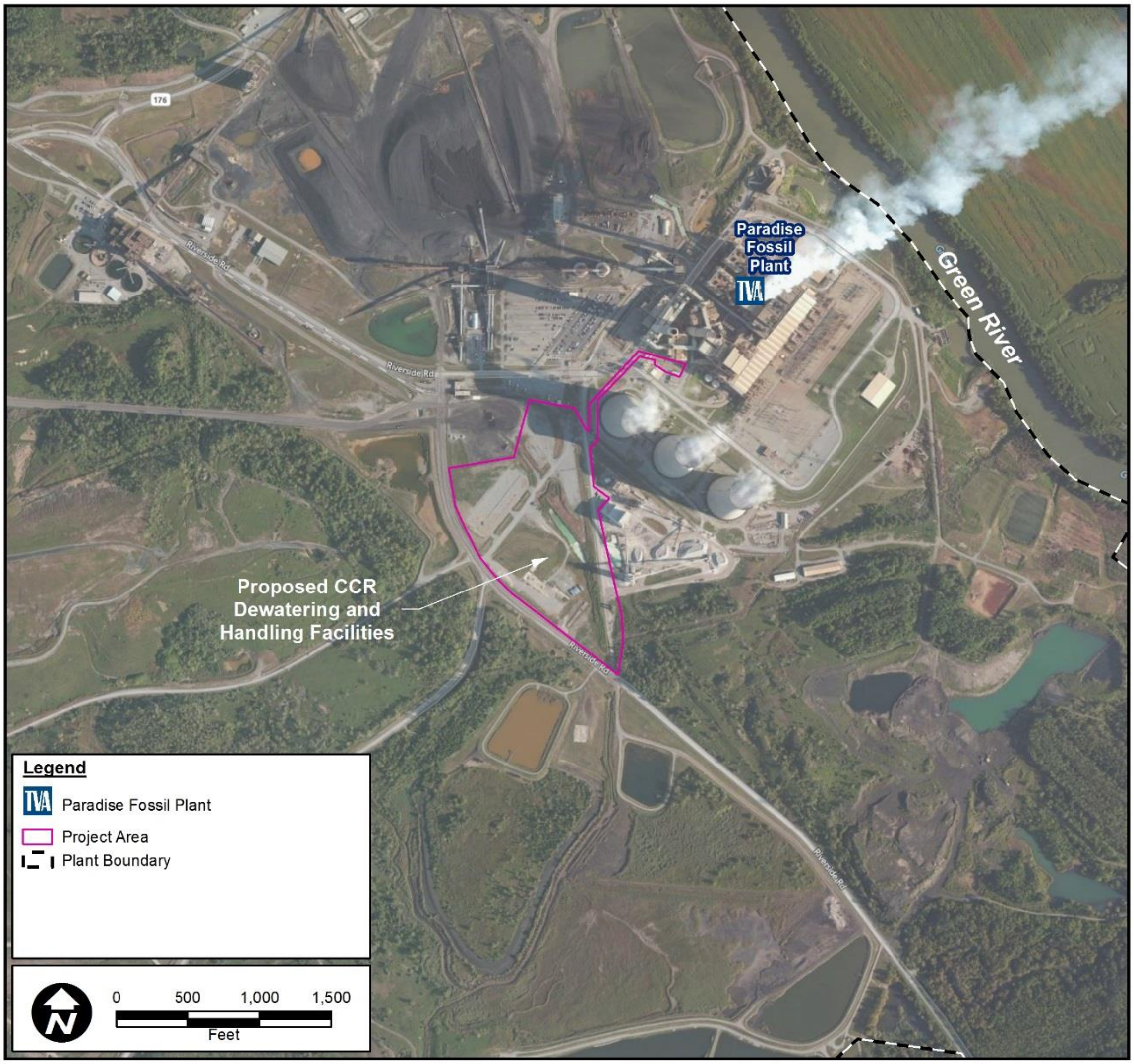

Figure 2-1. Project Area for Proposed CCR Dewatering and Handling Facilities at PAF

2.1.1.1 Construct and Operate a Gypsum Dewatering Facility

Currently, the PAF Unit 3 FGD Absorber discharges 80 tons per hour of dry gypsum in a suspended solid slurry stream. This gypsum slurry is pumped from Unit 3 to the existing Gypsum Pond Disposal Complex where it is allowed to dewater in parallel trenches. Dried gypsum is excavated from the trench and placed in the Gypsum Stack.

Under the proposed action alternative, gypsum slurry would be delivered to one of two gypsum slurry storage tanks located adjacent to a gypsum dewatering building located within the area identified in Figure 2-1. The tanks would be approximately 50 feet in diameter and 45 feet high. Gypsum would be pumped from the storage tanks to the Gypsum Dewatering Facility located within the gypsum dewatering building where it would be mechanically dewatered using vacuum belt filters. The Gypsum Dewatering Facility would include two 100 percent capacity dewatering trains, each consisting of a horizontal vacuum belt filter and all associated ancillary equipment. It would also be equipped with redundant power supplies, electrical equipment and control systems. The dewatered gypsum would be conveyed from the facility and stacked in a pile on a concrete storage pad adjacent to the dewatering facility. The concrete pad and conveying equipment would be capable of storing three days (80 hours) at the maximum design rate of gypsum production. The maximum height of the storage pile would be 30 feet at full capacity. The gypsum would be reclaimed from the storage pile and trucked to a landfill or offsite for marketing. Discharge waste water from the gypsum dewatering system would initially be routed to new clarifiers for further treatment before being sent to the equalization basins (described in Subsection 2.1.2.3.2) and then ultimately discharged out Outfall 002. Effluent quality would be monitored and treated as needed to ensure compliance with KPDES permit limits.

This project would include the construction and operation of:

- Dewatering facility building.
- Two de-aeration tanks and two gypsum effluent water clarifiers.
- Gypsum Storage Pad Area. This would include the main gypsum storage pile and an emergency pile that would hold up to an additional 15 hours of gypsum production. The containment area would be provided with equipment-backing walls to facilitate handling by earth moving equipment.

TVA is considering the option to develop an onsite waste water treatment facility which could receive gypsum discharge waste water. There is little information available regarding this facility and therefore site-specific impacts associated with the construction and operation of this potential facility would be evaluated in a separate NEPA document when additional information becomes available.

2.1.1.2 Construct and Operate a New Dry Fly Ash Handling System

Dry fly ash from PAF Unit 3 is collected in the hoppers of three different systems: economizer, selective catalytic reduction, and four precipitators. Fly ash from each of these systems is currently sluiced to the Peabody Ash Impoundment. The proposed new Dry Fly Ash Handling and Storage System would pneumatically convey fly ash from Unit 3 to a transfer station within the existing power plant and onto storage/disposal silos located adjacent to the future Gypsum Dewatering Facility. The dry fly ash may be mixed with water during loading to facilitate compaction and transported to a landfill for disposal. Provisions would be made for marketing or other beneficial reuse.

This project would include the construction and operation of:

- Two storage silos with a total storage capacity of three days (80-hours) at the maximum design rate of fly ash production. Each silo would have one truck loading position.
- If the dry fly ash is sold or transported offsite for other beneficial reuse, one dry unloading spout and truck weigh scale would be required under each silo.

2.1.1.3 Dewatering Alternatives Considered, but Eliminated from Detailed Consideration

TVA considered a range of options for layout and configuration of dewatering facilities on TVA properties. Reduction of environmental impact, compatibility with current operations, and enhancing engineering feasibility/constructability were important factors that led to the elimination of alternative layout options. Key considerations included the following:

- Use of Other Constructed Assets. The location of the proposed dewatering facilities provides important benefits in the use of existing, previously constructed assets that effectively minimize project costs. Specifically, this location was chosen due to its proximity to the plant and access to roads to transport dry CCR for disposal.
- Use of Previously Disturbed Lands. The proposed dewatering site and primary laydown area is located exclusively on the TVA-owned lands at the PAF site. The construction site is previously disturbed and lacks highly sensitive environmental resources (wetlands, surface water resources, sensitive species, cultural resources, sensitive land uses, residential receptors, etc.). Therefore, the proposed site offers important advantages in reducing overall environmental impacts.

In summary, no other potential site is likely to have the same advantages of the proposed site or be environmentally preferable.

A summary of the primary characteristics of the proposed dewatering facilities are provided in Table 2-1.

Table 2-1. Primary Characteristics of the Proposed Dewatering Facilities

Project Feature	Characteristic	Construction/ Operation of New Gypsum Dewatering Facility	Construction/ Operation of a Dry Fly Ash Handling System
Plant Area	Construction and Operation – Permanent Land Use	29.1 acres	29.1 acres
Height	Maximum Height of Dewatering Facility or Components	Gypsum slurry storage tanks – 45 feet	Silos – 139 feet
Employment Workforce	Construction	20-50	20-50

2.1.2 Ash Impoundment Closures

2.1.2.1 Programmatic Environmental Impact Statement

In June 2016, TVA issued a Final PEIS that analyzed methods for closing impoundments that hold CCR materials at TVA fossil plants. The PEIS identified specific screening and evaluation factors to help frame the assessment of future closure actions at TVA facilities. A ROD was released in July 2016. The ROD determined that future environmental reviews of CCR impoundment closures at TVA facilities could tier from the PEIS if the impoundments fit into the framework established in the PEIS. Figure 2-2 provides the conceptual framework used to evaluate ash impoundment closures to determine if the conclusions reached from the PEIS would be applicable to the proposed impoundment closures at PAF.

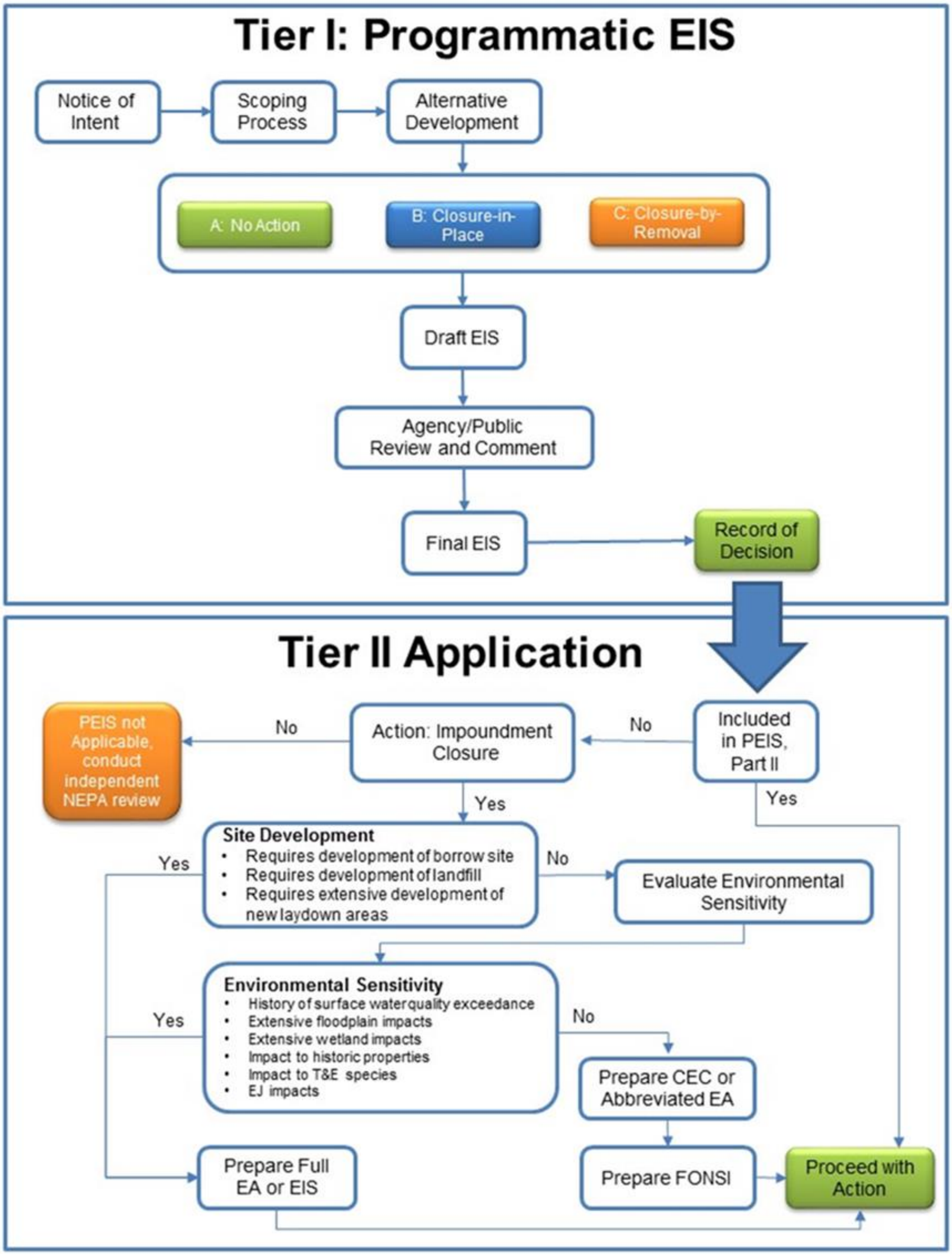

Figure 2-2. Tiered NEPA Process for TVA Ash Impoundment Closure

The PEIS programmatically considered all TVA ash impoundment closures and the environmental effects of two primary ash impoundment closure methods:

1. *Closure-in-Place*. Closure-in-Place involves stabilizing the CCR in place and installing an approved cover system.
2. *Closure-by-Removal*. Closure-by-Removal involves excavating and relocating the CCRs from the ash impoundment in accordance with federal and state requirements to an approved onsite or offsite disposal facility. The CCR may also be beneficially used in products or structural fills.

At the programmatic level, TVA concluded that both closure options can be equally protective of human health and the environment, provided that they are implemented properly. In most situations, Closure-in-Place is expected to be more environmentally beneficial and less costly than Closure-by-Removal, especially when the amount of CCR material that must be moved from the site exceeds 600,000 cubic yards (yd^3) and the amount of borrow that needs to be delivered to the site exceeds 200,000 yd^3.

For Closure-in-Place, TVA's analyses also confirmed EPA's determination that dewatering and capping impoundments would reduce groundwater contamination and structural stability risks because the hydraulic head (water pressure) would be reduced. Compared to Closure-by-Removal, this alternative would have significantly less risks to workforce health and safety and those related to offsite transportation of CCR (crashes, derailments, road damage and other transportation-related effects).

Closure-by-Removal would reduce groundwater contamination risks more than Closure-in-Place over the long term when CCR intersects with groundwater because CCR material would be excavated and moved to a permitted landfill. However, this alternative would result in notably greater impacts associated with other environmental factors (e.g., air quality, noise) and would increase the potential for impacts on worker-related and transportation-related health and safety.

Furthermore, as was described in Part I, Section 2.3 of the PEIS, Electric Power Research Institute (EPRI) has developed a comprehensive analytical tool, the "Relative Impact Framework" (RIF) to assess and compare the potential health and environmental impacts of the two CCR impoundment closure alternatives, Closure-in-Place and Closure-by-Removal (EPRI 2016). EPRI qualitatively applied its RIF to specific CCR facilities that TVA proposed to close in Part II of the PEIS. EPRI's site-specific analyses confirmed TVA's programmatic conclusions about the merits of and relative differences between the two closure methods.

2.1.2.2 Tiering from Ash Impoundment Closure PEIS

This section considers the applicability and appropriateness of the ash impoundment closures at PAF for second tier NEPA analysis under the PEIS. As such, this analysis considers both the characteristics of the impoundments being considered for closure, and the nature of activities proposed under the closure action. Substantial deviations in either the impoundment characteristics or the type and extent of proposed actions to conduct closure may either negate the applicability of tiering or necessitate additional specialized site-specific analyses. Applicability of impoundment closures under consideration at PAF to the characteristics of impoundment closures considered in the PEIS is demonstrated in Table 2-2.

Table 2-2. Factors Evaluated to Determine Reasonability of Closure Activities in the PEIS and Related Attributes of the Impoundments at PAF

Screening Factor	Programmatic Attribute	PAF Characteristics
Volume of CCR Materials	The size of an ash impoundment and volume of CCR affect closure activities, potential environmental impacts and cost. CCR volume within ash impoundments considered in the PEIS ranged from 10,000 to 25,000,000 yd^3.	Volumes of CCR in the ash impoundments at PAF are: • Boiler Slag Impoundment 2A/2B and Stilling Impoundment 2C = 1.1 million yd^3 • Gypsum Disposal Area = 11.8 million yd^3 • Peabody Ash Impoundment = 1.4 million yd^3.
Schedule/ Duration of Closure Activities	Time necessary to complete closure activities at an ash impoundment affects the reasonability of closure alternatives. The range of closure durations determined in the PEIS were as follows: • Closure-in-Place: Less than 5 years • Closure-by-Removal: 2.7 years to 170 years	Based upon analyses of the PEIS and the total volume of CCR, the ash impoundments at PAF could be closed within 5 years using Closure-in-Place. Time to close each impoundment using Closure-by-Removal is as follows: • Boiler Slag Impoundment 2A/2B and Stilling Impoundment 2C = 8.4 years • Gypsum Disposal Area = 80.9 years • Peabody Ash Impoundment = 10.5 years
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. Excavations associated with 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 the PEIS, sites having large volumes of CCR that are considered for Closure-by-Removal would also result in extensive trucking operations that would increase transportation risks.	TVA considered worker safety in the evaluation of closure options for the impoundments at PAF. Closure-in-Place minimizes impacts associated with onsite worker safety by avoiding excavations and public safety related to the transport of large volumes of CCR on public roadways.
Surface Water Resources	Consistent with EPA's determination in the CCR Rule and the results of the EPRI model, TVA anticipates that surface water 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 runoff or other water additions to the impoundment through the capping process will	The Gypsum Disposal Area and Peabody Ash Impoundment at PAF would be dewatered and all remaining CCR material would be consolidated and compacted and covered with an approved cover system. In conjunction with impoundment closure activities, all systems currently discharging to the impoundment would be rerouted to other areas of the site. Some CCR would be excavated from Slag Impoundment 2A/2B to achieve the desired depth. This material would be transported to

Screening Factor	Programmatic Attribute	PAF Characteristics
	effectively reduce and control and minimize impacts to surface water resources.	the Peabody Ash Impoundment. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be lined with a geosynthetic liner system and would serve as equalization basins.
Groundwater Resources	Both Closure-in-Place and Closure-by-Removal reduce groundwater contamination. While Closure-by-Removal would reduce groundwater contamination more than Closure-in-Place over the long term when CCR intersects groundwater, Closure-in-Place still reduces contamination in such situations.	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. TVA is assessing the groundwater conditions near the ash impoundments at PAF and is currently developing a Groundwater Optimization Plan for the PAF facility. Information derived from that Plan will be used to arrive at the certified groundwater monitoring network due to be completed October 17, 2017. The upper most aquifer determinations for all CCR facilities are due October 17, 2018. In addition to any federal requirements that may apply to the impoundments at PAF after closure is completed, TVA would implement supplemental mitigative measures as required by the Kentucky Department of Environmental Protection (KDEP), as well as its approved closure plan, which could include additional monitoring, assessment or corrective action programs. However, as noted in the PEIS, TVA expects any groundwater impacts to be notably reduced following impoundment closure.
Wetlands	Analyses presented in the PEIS determined that for both Closure-in-Place and Closure-by-Removal alternatives, proposed actions would not cause or contribute to significant degradation of wetlands because laydown areas were minimized and wetlands are generally lacking from ash impoundments. Additionally, appropriate measures could be taken to avoid and minimize or compensate for impacts to wetlands and ensure no net loss of wetlands.	No jurisdictional wetlands are located in the footprints of the ash impoundments at PAF or any associated laydown areas.

Screening Factor	Programmatic Attribute	PAF Characteristics
Risk to Other Adjacent Environmental Resources	The analyses performed as part of the PEIS determined that risk of potential release and degradation of environmental resources (cultural resources, ecological receptors, and factors related to the human environment) was generally low for both Closure-in-Place and Closure-by-Removal alternatives. However, potential air and noise emissions were expected to be markedly greater for the Closure-by-Removal alternative due to offsite transport and trucking operations.	Potential areas of disturbance associated with impoundment closure at PAF would be largely confined to previously disturbed lands. Additionally, no adjacent sensitive receptors are located proximate to ash impoundments at PAF.
Mode and Duration of Transport Activities – Trucking	For those sites with CCR volumes exceeding 600,000 yd^3, TVA determined that insufficient time is available within the construction schedule to effectively remove the CCR materials by truck or rail and achieve closure of impoundments within the 5-year period for closure.	The volume of CCR to be removed from the CCR impoundments at PAF ranges from 1.1 million yd^3 at Slag Impoundment 2A/2B and Stilling Impoundment 2C to 11.8 million yd^3 at the Gypsum Disposal Area. Based upon analyses of the PEIS and the total volume of CCR, the ash impoundments at PAF could be closed in place within 5 years, whereas Closure-by-Removal of the impoundments ranges from approximately 8.4 years for Slag Impoundment 2A/2B and Stilling Impoundment 2C to approximately 80.9 years for the Gypsum Disposal Area.
Excessive Cost	Excessive closure costs may affect the reasonableness of an alternative. Costs for Closure-by-Removal by truck were demonstrated to be 168 to 2,390 percent greater than Closure-in-Place alternatives at the sites evaluated in the PEIS.	Estimated closure costs for Closure-in-Place of the impoundments at PAF: • Slag Impoundment 2A/2B and Stilling Impoundment 2C = $6,095,500 • Gypsum Disposal Area = $64,033,000 • Peabody Ash Impoundment = $39,571,325 Estimated closure costs for Closure-by-Removal of the impoundments at PAF: • Slag Impoundment 2A/2B and Stilling Impoundment 2C = $211,860,000 • Gypsum Disposal Area = $2,272,680,000 • Peabody Ash Impoundment = $267,714,000 Costs of Closure-by-Removal are estimated to range from 576 percent to over 3,000 percent higher than the cost of Closure-in-Place.

As illustrated in Table 2-3, the characteristics of ash impoundment closure at PAF would be bounded by the analysis in the PEIS for Closure-in-Place. Therefore, TVA has determined that it is appropriate to tier the NEPA analysis of impoundment closures proposed at PAF from the PEIS.

Primary actions common to all impoundment closures under the Closure-in-Place alternative were identified in the PEIS. Table 2-3 summarizes these actions and demonstrates the consistency and applicability of the closure alternatives for the impoundments at PAF with the constraints of the analyses performed as part of the PEIS. As such, because the characteristics and proposed actions associated with the closure of ash impoundments at PAF are sufficiently bounded by the previous assessments performed for the PEIS, TVA proposes to close all impoundments at PAF in-place.

Table 2-3. Primary Actions Associated with Closure-in-Place of Ash Impoundments

Closure Activity	Programmatic Impoundment Closure Activity	Proposed PAF Impoundment Closure Activity
Ensure Berm Stability	For impoundments that are Closed-in-Place, TVA will make appropriate investigations and/or modifications to ensure that the berm stability is at a level that meets or exceeds industry acceptable factors of safety using conservative assumptions. The proposed closure grades of the facilities will be evaluated prior to construction, and any needed improvements to the berms will be made as part of the closure system construction.	TVA has evaluated the structural stability at the surface impoundments at PAF per requirements of the CCR Rule and as part of the development of conceptual closure plans. All berms are demonstrated to meet all appropriate static and seismic stability safety factors.
Consider Opportunities for Beneficial Use of Ash	Beneficial reuse is considered by TVA as part of all ash management activities. Such reuse may include incorporation of ash from CCR impoundments as part of the impermeable cover system.	Closure and reuse of the ash impoundments at PAF include grading and reconfiguring of CCR to consolidate CCR, reduce footprint, and promote site drainage prior to cover system placement. Closure of the impoundments at PAF would reuse CCR from adjacent portions of the impoundments to develop design grades to support the final cover system. Some CCR in Slag Impoundment 2A/2B would be excavated and used as fill to support closure of the Peabody Ash Impoundment.
Lower Ash Impoundment Water Level	Dewatering will be undertaken in a manner to comply with conditions of existing KPDES permits or TVA will work with appropriate federal/state agency to obtain necessary approvals. Dewatering activities which could include decanting or drawdown, which is the removal of free or ponded liquid from an	Dewatering of impoundments at PAF would comply with KPDES permit requirements.

Closure Activity	Programmatic Impoundment Closure Activity	Proposed PAF Impoundment Closure Activity
	impoundment and must meet current permit limits, up to the removal of pore water from the impoundment. With the understanding that these activities could require additional monitoring or meeting additional limits from state regulators.	
Identify Temporary Laydown Areas and Borrow Areas	TVA anticipates temporarily using approximately 5 to 10 acres per site for vehicle and equipment parking, materials storage, and construction administration.	TVA would use an approximately 5-acre previously disturbed site located adjacent to the Gypsum Disposal Area for temporary laydown during construction activities. Borrow is anticipated to be obtained from two areas identified onsite, the 104-acre South Spoil Area and an additional 37-acre area identified adjacent to the Peabody Ash Impoundment. Both areas have been previously disturbed by mining activities.
Grade to Consolidate CCR, Reduce Footprint and Promote Site Drainage	CCR layer is stabilized such that it is structurally suitable as a base layer. This stabilization could include pore dewatering, addition of amendments (e.g., Portland cement), and/or compaction. TVA will try to optimize the use of existing CCR material to achieve final grade. Fill/borrow material would be used to supplement CCR material and contoured to provide adequate storm water management.	Closure of the ash impoundments at PAF include grading and reconfiguring CCR to consolidate CCR, reduce footprint, and promote site drainage prior to cover system placement.
Install Cover System	TVA will install a cover system which either meets or exceeds CCR Rule cover system performance standards ($1x10^{-5}$ permeability) or state cover system requirements. Storm water management infrastructure will maintain positive drainage. The cover system must control, minimize, or eliminate to the maximum extent practicable, post-closure infiltration of liquids into the CCR and releases of CCR, leachate, or contaminated run-off to groundwater or surface waters.	Closure of the Peabody Ash Impoundment and Gypsum Disposal Area include the use of composite geosynthetic protective cover system that meets or exceeds the CCR Rule performance standard. Slag Impoundment 2A/2B and stilling impoundment 2C will be lined with a composite geosynthetic liner system.

Closure Activity	Programmatic Impoundment Closure Activity	Proposed PAF Impoundment Closure Activity
Install or Expand Groundwater Monitoring System	A groundwater monitoring system will be installed to ensure that an adequately robust system is in place that meets or exceeds federal or state requirements. States may require groundwater monitoring, assessment, and if appropriate, corrective action.	TVA would install and operate groundwater monitoring system per KPDES requirements at all closed impoundments.
Closure Documentation	Prepare documentation to demonstrate that appropriate closure activities were successfully implemented	Preliminary closure plans have been prepared for all of the impoundments at PAF. Closure plans would be finalized upon successful completion of the NEPA review.
Post Closure Care	Long-term operations and maintenance activities (e.g., maintaining the cover system, monitoring, and reporting) are implemented, as necessary.	Post closure plans would be finalized upon successful completion of the NEPA review.

2.1.2.3 Proposed Ash Impoundment Closures at PAF

Specific activities associated with each of the impoundments at PAF are described below.

2.1.2.3.1 Slag Impoundment 2A/2B and Stilling Impoundment 2C

Slag Impoundment 2A/2B and Stilling Impoundment 2C encompass 34.2 acres and lie to the north of the plant (Figure 2-3). Construction activities associated with closure of Slag Impoundment 2A/2B and Stilling Impoundment 2C would entail direct disturbance of the CCR impoundment and Stilling Impoundment. No additional laydown areas are anticipated.

Impoundment 2A/2B serve as an ash management facility for the storage and settling of boiler slag. Influent into this impoundment consists of sluiced boiler slag, which flows into the southeastern portion of Impoundment 2A via a series of ash inlets. Slag impoundment 2A/2B also receive process water from many areas surrounding the impoundments. The impoundments are divided by an internal divider dike, with 2A located to the west and 2B located east of the dike. Flow from 2A travels to 2B through culverts installed within the internal divider dike. Flow is then directed into Stilling Impoundment 2C which discharges to the Green River through a permitted outfall. A pump platform is located at the head of the stilling impoundment where an annual average of 16.85 million gallons per day (MGD) of water is pumped from the stilling impoundment to the Peabody Ash Impoundment.

Under this alternative, some CCR would be excavated from the impoundments to achieve the final desired grade. This excavated CCR would be consolidated into the Peabody Ash Impoundment or would be recovered by Harsco for marketing where feasible. The impoundment would be converted to lined process water ponds (equalization basins) and the excavated surface would be covered with a composite geosynthetic liner which may include a 60-mil high density polyethylene (HDPE) flexible membrane liner and geotextile cushion drainage layer to meet or exceed applicable permeability requirements. The equalization basin would treat flows prior to discharge to the Green River via Outfall 002. TVA is considering a waste water treatment (WWT) system to treat gypsum dewatering effluent. As planning for this facility has not been completed, the WWT facility would be evaluated in a separate NEPA document. The potential cumulative effect of this facility is identified in Section 3.24.2. A conceptual grading plan for the equalization basins is included in Appendix B.

2.1.2.3.2 Gypsum Disposal Area

The Gypsum Disposal Area is an active gypsum wet stack located in the southwest corner of PAF. Operating under a KPDES permit, approximately 940,000 tons per year of gypsum and fly ash are currently being sluiced from Units 1, 2 (fly ash and gypsum) and 3 (gypsum only) to the Gypsum Disposal Area. The Gypsum Disposal Area has been used for gypsum disposal since 1986. The facility was initially operated as a gypsum pond until 1996 when the complex was converted to a wet stacking facility (gypsum stack) which involves mechanical stacking on top of historically hydraulically placed gypsum/ash deposits. Some fly ash from Units 1 and 2 was introduced into the sluice flows beginning in the late 1990s, and in 2002 all fly ash from Units 1 and 2 was combined with the gypsum sluice flows to the gypsum stack.

The Gypsum Disposal Area consists of two adjoining ponds, the East Impoundment and the West Impoundment, which are separated by a divider dike and are adjacent to two stilling basins to the south, the Upper and Lower Stilling Basin (Figure 2-4).

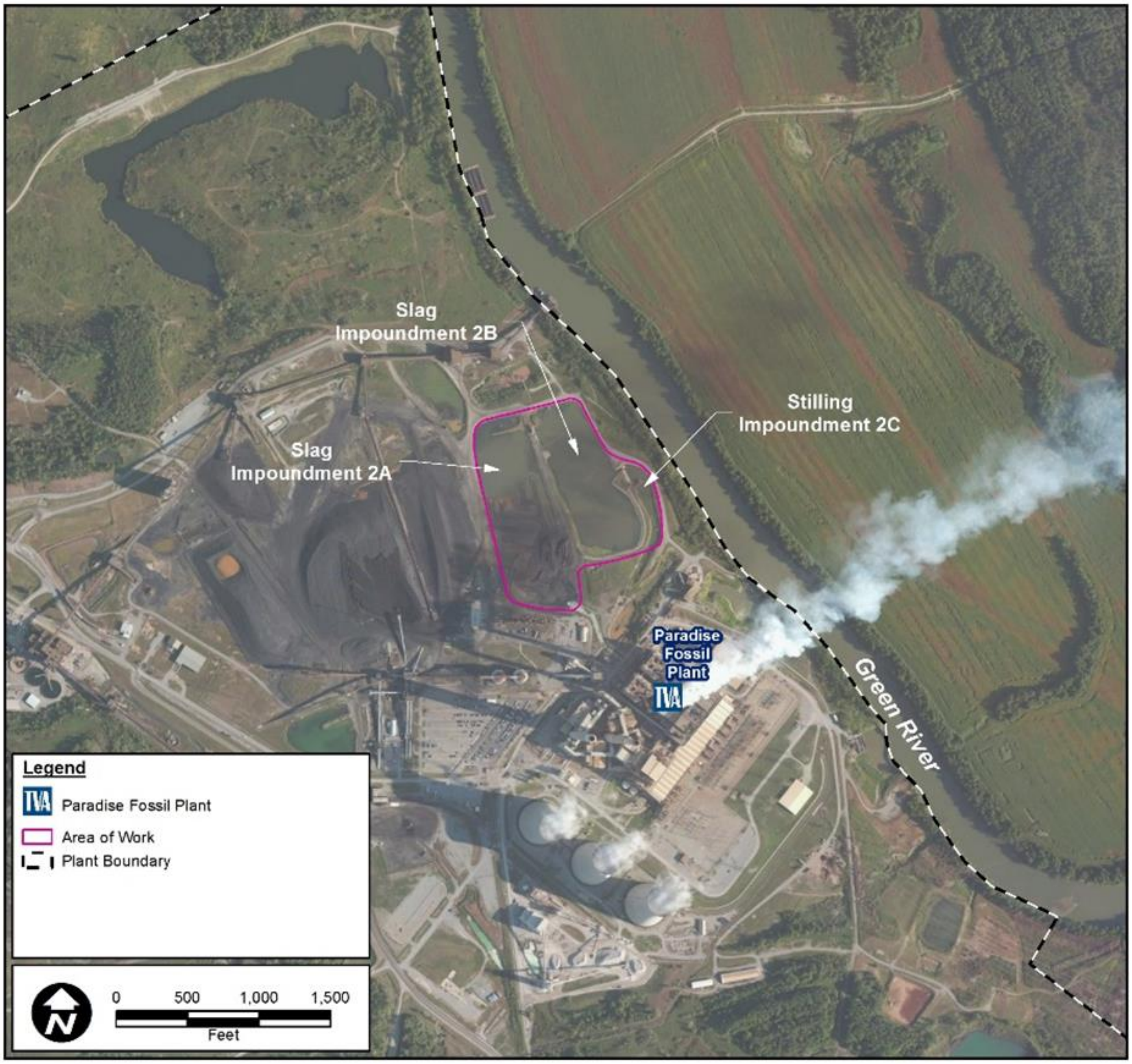

Figure 2-3. Slag Impoundment 2A/2B and Stilling Impoundment 2C

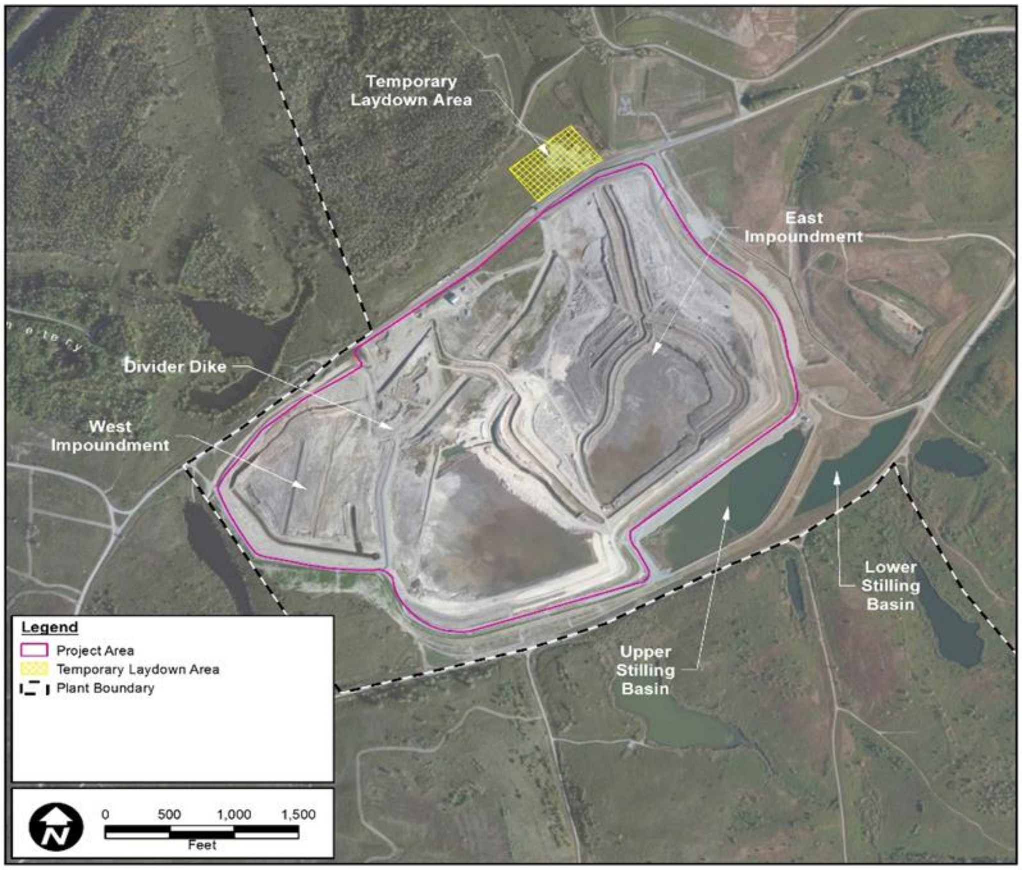

Figure 2-4. Gypsum Disposal Area

Construction activities associated with the closure of the 232.9-acre Gypsum Disposal Area would entail re-grading of the CCR impoundment and disturbance of a supporting laydown area (see Figure 2-4). TVA anticipates temporarily using this approximately 5-acre previously disturbed site for vehicle and equipment parking, materials storage, and construction administration. CCR material would be excavated from the Upper Stilling Basin, decanted and re-used as fill material to create design grades for the final cover system. Additional fill material as needed would be obtained from the 137-acre South Spoil Area and/or the 37-acre proposed borrow area adjacent to the Peabody Ash Impoundment (Figure 2-5). A composite geosynthetic protective cover system which may include a geomembrane and geocomposite drainage layer, 18 inches of protective cover and 6 inches of top soil would be placed over the entire Gypsum Disposal Area. The final cover system would be vegetated to minimize erosion and the need for future maintenance. The grading of the final cover system would promote drainage to the existing perimeter ditches and stilling basins. The PEIS describes one of the “Closure-in-Place” methods reconfigure and supplement, and the closure option identified for this impoundment is similar to the criteria identified in the PEIS. A conceptual final grading plan is included in Appendix A.

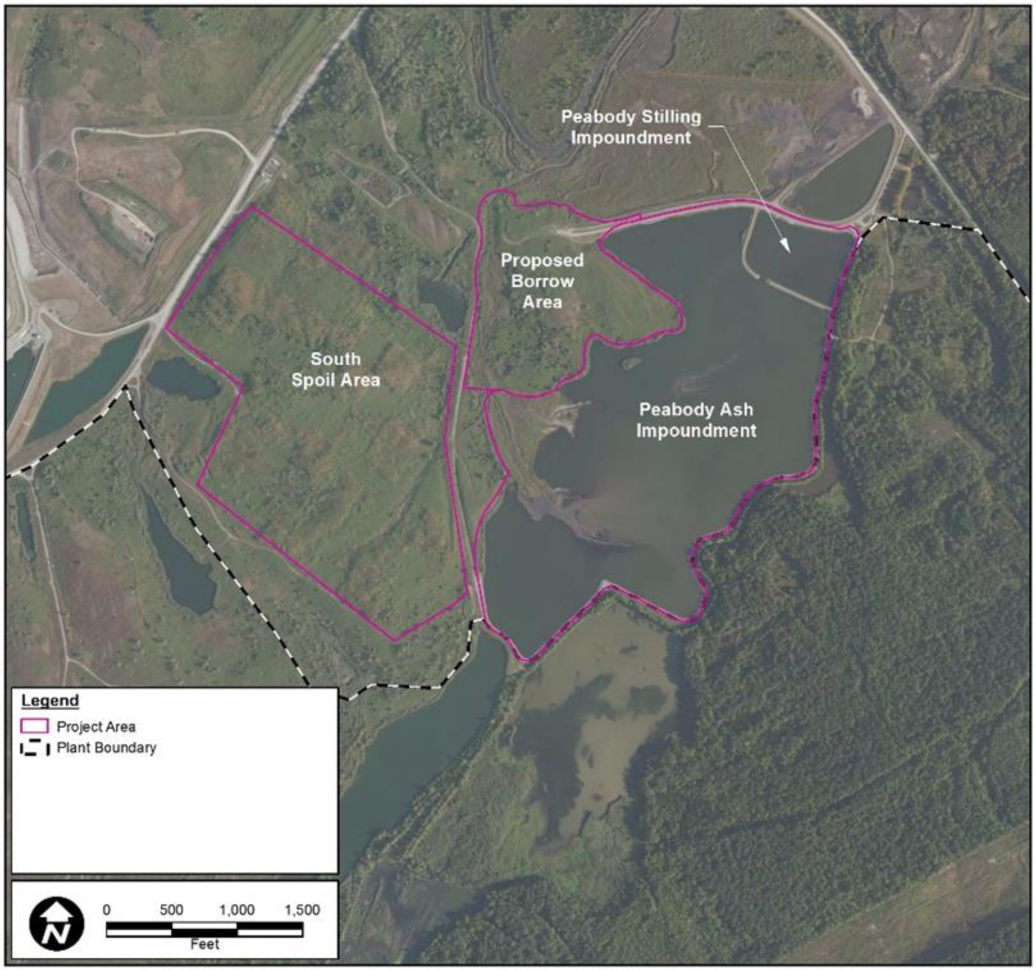

Figure 2-5. Peabody Ash Impoundment

2.1.2.3.3 Peabody Ash Impoundment

The Peabody Ash Impoundment is approximately 133.8 acres including the stilling impoundment and is located within the southeastern quadrant of PAF. This impoundment was a former surface-mining impoundment, which was converted to a fly ash impoundment in the late 1990s. It operates under a KPDES permit, serving as an ash impoundment management facility for the storage and settling of fly ash. Influent into this impoundment consists of fly ash sluice and bottom ash sluice from Slag Impoundment 2A/2B, which flows into the southwest portion of the impoundment via a hydroditch to the west. The impoundment also receives decanted water flows from the Gypsum Disposal Stilling basins and other non-CCR waste waters.

Construction activities associated with closure of the Peabody Ash Impoundment entails the direct disturbance of the entire Peabody Ash Impoundment. No additional laydown areas are anticipated (see Figure 2-5).

Closure activities would begin with dewatering the impoundment to sufficiently remove free liquids. This, along with proper compaction of the subgrade prior to final cover installation, would provide a stable and competent base for the construction of the final cover system. A divider dike would be constructed between the northern and southern portions, and CCR from the northern portion (approximately 70 acres including the stilling pond) would be excavated, decanted and re-utilized as fill material in the southern portion of the impoundment. The northern portion of the eastern dike would be lowered after dewatering to elevation of 392 feet, and the southern portion of the eastern dike would be lowered to an elevation of 405 feet. The southern portion (approximately 64 acres) would be Closed-in-Place. CCR materials from the northern portion, together with additional material from the South Spoil Area and the adjacent 37-acre borrow area, would be used to construct design grades prior to the installation of the final cover system. As with the Gypsum Disposal Area, the closure option identified for this impoundment is similar to the criteria identified for the reduced footprint option in the PEIS. A conceptual final grading plan is included in Appendix A.

The final cover system would be installed over the southern portion (approximately 64 acres) of the impoundment. TVA would be proposing a composite geosynthetic protective cover system which may include a geomembrane and geocomposite drainage layer, 18 inches of protective cover soil, and 6 inches of topsoil that is capable of sustaining herbaceous native plant growth.

2.1.2.3.4 Closure Alternatives Eliminated from Further Consideration

Consistent with the programmatic analysis in the PEIS, Closure-By-Removal for the impoundments at PAF was eliminated from detailed consideration as it was determined to be unreasonable. Key screening factors identified in Table 2-3 that contributed to the elimination of this alternative from further consideration at PAF included:

- *Impoundment Size*. The size of an impoundment and volume of CCR may affect closure activities and appropriateness of an alternative. As described in Table 2-3, volumes of CCR in the ash impoundments at PAF exceed 1 million yd^3 at all of the impoundments and as such exceed the 600,000 yd^3 volume considered to be limiting for Closure-by-Removal.
- *Schedule/Duration of Closure Activities*. Given the volume of CCR to be removed from the impoundments at PAF, the construction schedule for Closure-by-Removal would be considerably longer (ranging from 8.4 years to 81 years[1]) as compared to Closure-in-Place (approximately 2 years). As such, Closure-by-Removal would not support closure within the desired 5-year period.
- *Mode and Duration of Transport Activities*. CCR removal and transport require the movement of a large number of vehicles and operators. For those impoundments containing greater volumes of CCR, the duration of removal activities would extend for prolonged periods which results in potential safety concerns associated with increased motor vehicle crashes as described above and in the PEIS. CCR excavated from Slag Impoundment 2A/2B would be transported to the Peabody Ash Impoundment using onsite access roads, which would eliminate potential safety concerns associated with offsite transport of CCR.

[1] Based upon analyses of the PEIS.

- *Increased Environmental Emissions*. In conjunction with the extended period of offsite (trucking) operations required for Closure-by-Removal, potential air and noise emissions associated with transport of CCRs to the nearest permitted Subtitle D Landfill would be substantially greater under Closure-by-Removal than Closure-in-Place.
- *Excessive Cost*. Using the analysis presented in the PEIS, the cost of Closure-by-Removal of the Gypsum Disposal Complex and Peabody Ash Impoundments is estimated to range from 576 percent to over 3,000 percent higher than the cost of Closure-in-Place.

2.1.3 Long-Term Storage

TVA considered numerous options for long-term storage of dry CCRs produced at PAF. Initially, TVA estimated that approximately 23.5 million yd^3 of disposal capacity was needed to provide for long-term management of CCR. However, subsequent to the decision to retire Units 1 and 2, the target volume was lowered. Based on current estimates of future energy production and consumption rates, TVA has determined that approximately 8.6 million yd^3 of disposal capacity is needed to meet the operational timeline of PAF.

2.1.3.1 CCR Disposal Alternative Analysis

In September 2010, Stantec completed a Phase IA Landfill Siting Study for TVA which evaluated suitable sites to accommodate dry CCR storage upon closure of the existing storage facilities at the Gypsum Disposal Complex (Stantec 2010). The study consisted of multi-stage suitability analysis that identified areas of opportunity and constraint within the PAF property limits, and then directly compared the resultant potential sites. The analysis identified the following five alternate sites for development of a CCR landfill.

- Site 1 – North Spoils Area
- Site 2 – Dredge Cell Area
- Site 3 – South Spoils Area
- Site 4 – Horseshoe Pond Area
- Site 5 – Slag Mountain Area

Location of alternate sites are shown on Figure 2-6.

Conceptual level construction cost estimates were developed for each site to estimate costs of development. An analysis was performed for the conceptual landfill at each site comparing variables such as site location, geotechnical and subsurface considerations, regulatory issues, design and construction elements, economics, and environmental justice.

Based on the preliminary analysis in the 2010 study, two of the five sites, Site 4 (Horseshoe Pond) and Site 1 (North Spoils Area) were selected for further evaluation during the Phase 1B Landfill Siting Study (Stantec 2011). The scope of the Phase 1B Study included initial surveys that identified environmental features (streams, wetlands, open water, and bat habitat), and preliminary geotechnical explorations at the two selected sites to evaluate the existing subsurface conditions and to further develop conceptual landfill designs. During the site surveys, it was noted that wetlands, streams, and Indiana bat habitat were present on both sites. Approximately 60 percent of the North Spoil site was heavily wooded. A cemetery and abandoned exploratory oil well were also observed on the North Spoil site (Site 1). The two potential landfill sites were compared in a quantitative manner using the same criteria evaluated in the 2010 study. Based on the results of the 1B siting study, the Horseshoe Pond Area (Site 4) was selected as the preferred site for a new landfill facility.

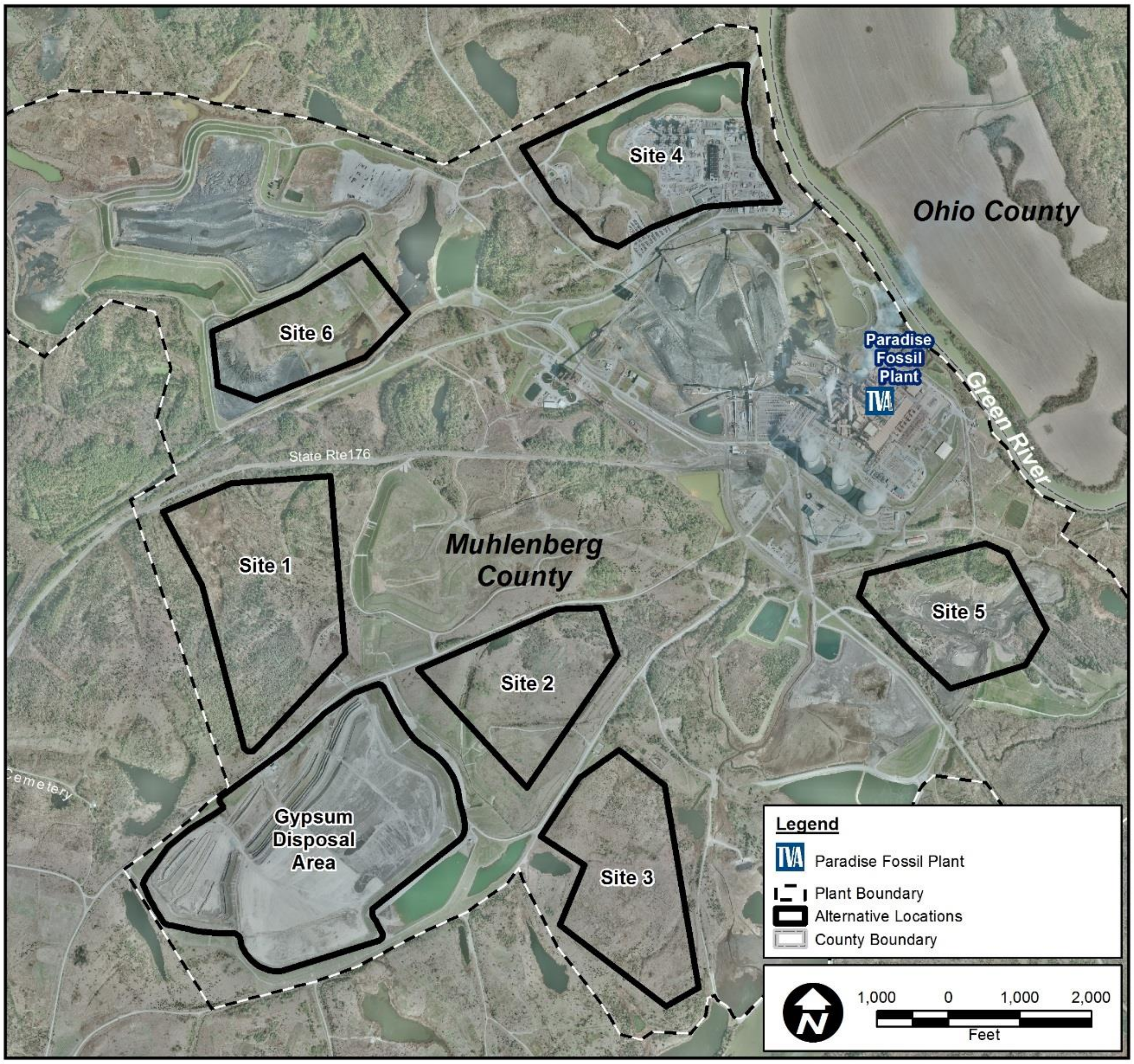

Figure 2-6. Alternative Onsite Landfill Options Considered

In February 2012, TVA completed a screening study that considered three additional alternatives (Stantec 2012):

- Modify/Upgrade the Existing Gypsum Stack
- Construct a new Dry Storage CCR Landfill at an Offsite Location
- Disposal in Existing Offsite Landfills

This screening analysis determined that based on available mine mapping, extensive deep mining has occurred under the Gypsum Stack; therefore, permitting a new CCR Landfill at that site would require a variance and there would be logistical challenges accommodating interim CCR sluicing operations at the Gypsum Stack until landfill construction was complete. Options to construct a new offsite landfill or to use existing offsite landfills were considered to be cost prohibitive due to land acquisition costs and higher transportation costs. In addition, the study noted that deep mining in the surrounding area may require extensive subgrade preparation to enhance stability which would be cost prohibitive. Therefore, Site 4 (Horseshoe Pond) continued to be the favored alternative for the disposal of CCR.

Subsequent to this study, TVA made the decision to retire Units 1 and 2 and replace them with a CC gas-fueled plant. The best location for the new CT/CC plant included land that is part of the preferred landfill site, Horseshoe Pond, Site 4.

In response to the decision to develop a CT/CC gas-fueled plant within Site 4, TVA completed a subsequent Phase I Landfill Siting Study in August 2015 (AECOM 2015). The 2015 siting study re-opened an evaluation of previous onsite CCR storage alternatives and added an additional site, Site 6, situated west of Site 4 and north of Site 1. The analyses identified seven potential locations for construction of a dry storage landfill on PAF property (see Figure 2-6). Site 5 was originally screened out due to the potential impact to Jacobs Creek, the floodplain of the Green River, and suspected presence of deep mining activity. However, the location of the Site 5 was modified to avoid impacts to Jacobs Creek and the floodplain of the Green River. In addition, further study by TVA noted a lack of deep mining in the area. After consideration of these factors as well as others related to environmental constraints, constructability, costs as well as the proximity of this site to the proposed dewatering facilities, Site 5 was the only onsite alternative determined to be viable for further consideration.

In addition, this study identified four offsite candidate locations for construction of a new landfill and identified potential third party options (existing permitted landfills) to be considered for disposal of CCR generated at PAF. These offsite candidate sites are discussed below.

Lastly, previous studies evaluated four existing permitted landfills within the area surrounding PAF. Three of these landfills are located in nearby counties: the Ohio County Balefill Landfill, Daviess County Landfill and the Hopkins County Regional Landfill. The fourth landfill, Southern Waste Services was located 32 miles from PAF, but it was preparing to close at the time of the previous study. Daviess County Landfill is located greater than 45 miles from PAF and it has limited capacity; therefore, it was eliminated from further consideration. The road network between PAF and the Ohio County Balefill Landfill is very poor. Consequently, this landfill was eliminated from further consideration.

2.1.3.2 Sites Retained for EA Screening Analysis

As described above, TVA conducted numerous siting studies between 2010 and 2015 to evaluate alternatives for long-term storage of CCR generated at PAF. Based on conclusions from the previous landfill siting studies, TVA determined that six sites (one onsite and five offsite) identified in these studies be considered as potential alternatives for long-term management of CCR at PAF and assessed for further analysis in this EA. Four of the five offsite alternatives are new landfill sites and the fifth one is an existing third-party permitted landfill (Figure 2-7).

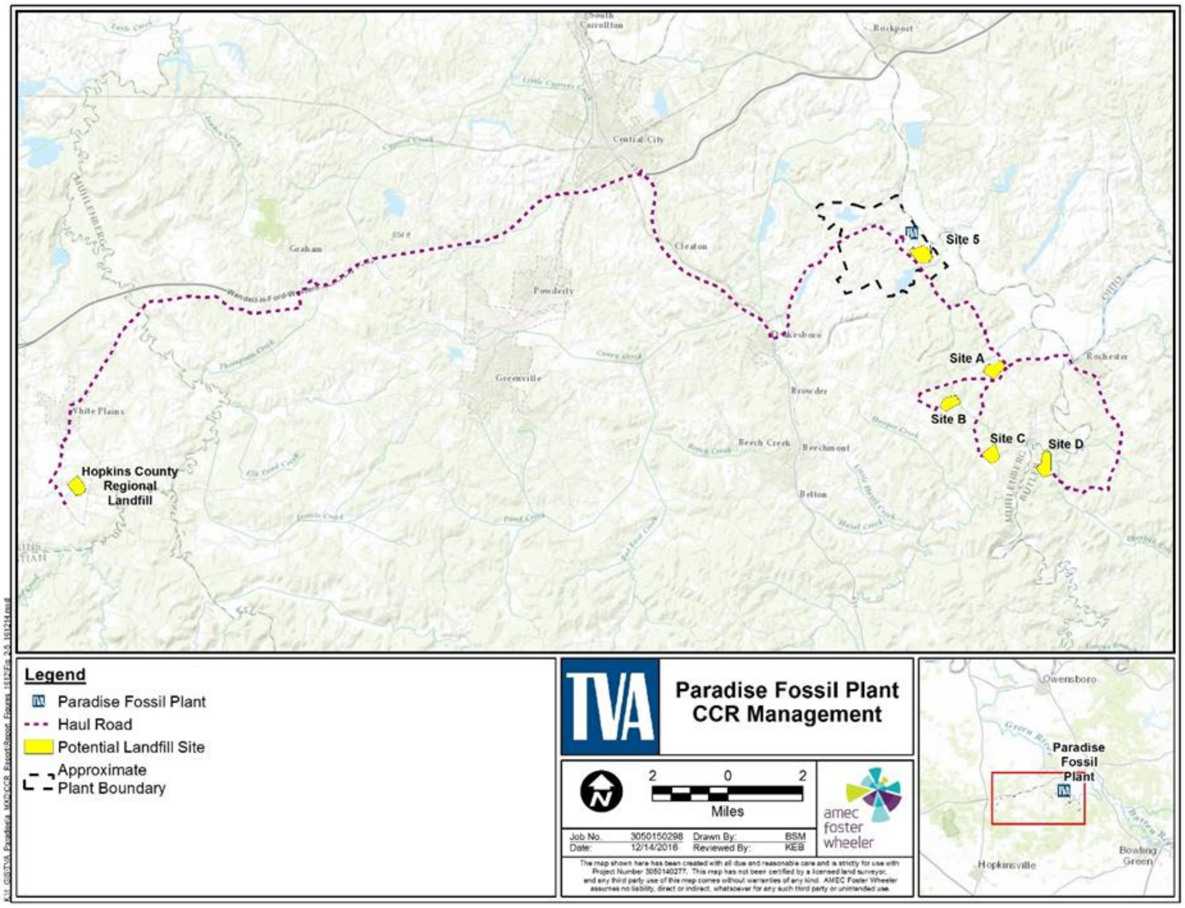

Figure 2-7. Alternative Landfill Sites Retained for Screening Analysis

2.1.3.2.1 Site 5 (Onsite)

Site 5 is located approximately 1,500 feet south of PAF and encompasses approximately 123.8 acres. Site 5 is located within the PAF property boundaries where previous mining and plant operations have altered the topography resulting in a topographic relief of 118 feet across the site. The conceptual landfill footprint design of 80 acres would potentially provide 13.8 million yd^3 of storage capacity, yielding an estimated 32 years of landfill life (based on current estimates of consumption rates). The site is approximately 32 percent wooded and lies approximately 700 feet south of the Green River.

2.1.3.2.2 Site A (Offsite)

Site A is located approximately 4.0 miles southeast of PAF in Muhlenberg County along State Highway 70. The conceptual landfill footprint design of 101 acres would be sufficient to meet the storage capacity needed to meet a long-range service life. The site is located in an area of moderately rolling topography with topographic relief of approximately 70 to 80 feet across the site. Daniels Branch, a tributary to the Green River, flows just north of the site. The site is approximately 61 percent wooded. Access between Site A and PAF would be via Riverside Road.

2.1.3.2.3 Site B (Offsite)

Site B is located approximately 4.4 miles south of PAF in Muhlenberg County south of State Highway 70. The conceptual landfill footprint design of 89 acres would be sufficient to accommodate the 8.6 million yd^3 of storage capacity. The site is located in an area of moderately rolling topography with topographic relief of approximately 100 feet. Canfield Branch, a tributary to the Mud River, flows through the eastern portion of the site. The site is approximately 50 percent wooded. Access between Site B and PAF would be via Riverside Road, State Highway 70, State Highway 2270 and Wooten Lane.

2.1.3.2.4 Site C (Offsite)

Site C is located approximately 6.0 miles southeast of the PAF in Muhlenberg County approximately 1.8 miles south of State Highway 70. The conceptual landfill footprint design of 94 acres would be sufficient to handle the 8.6 million yd^3 of storage capacity needed to meet a long-range service life. The site is located in an area of mildly rolling topography with topographic relief of approximately 50 feet. Canfield Branch, a tributary to the Mud River, flows east of the site. The site is approximately 56 percent wooded. Access between Site C and PAF would be via Riverside Road, State Highway 70, Forest Oak Church Road and Bechannas Road.

2.1.3.2.5 Site D (Offsite)

Site D is located approximately 6.9 miles southeast of PAF in Butler County approximately 1.6 miles west of State Highway 106. The conceptual landfill footprint design of 118 acres would be sufficient to handle the 8.6 million yd^3 of storage capacity needed to meet a long-range service life. The site is located in an area of moderately rolling topography with topographic relief of approximately 100 feet. The northern border of the site lies approximately 150 feet south of the Mud River. The site is approximately 67 percent wooded. Access between Site D and PAF would be via Riverside Road, State Highway 70, State Highway 106 and East Blaine Road. The access route crosses the Mud River into Butler County from Muhlenberg County just west of Rochester. Development of this site would require relocation of several transmission towers and would require the removal of approximately 0.7 mile of East Blaine Road, a public road.

2.1.3.2.6 Hopkins County Regional Landfill

The Hopkins County Regional Landfill opened in November 2005. The landfill serves western Kentucky and is permitted to receive CCR. The landfill is located approximately 33 miles west of PAF and encompasses approximately 95 acres. Capacity at this landfill can accommodate TVA's requirement for 20 years of storage of CCRs generated from Unit 3 at PAF.

The Hopkins County Regional Landfill site is an existing landfill and many of the siting criteria analyzed in this document would not apply; therefore, the comparative analysis provided in this report is limited to the evaluation of transportation of CCR from PAF to Hopkins County Regional Landfill.

The impact of development and/or use of each of these sites were evaluated against more than 30 environmental and engineering resource factors in four general categories: (1) Natural Environment; (2) Geology; (3) Human Environment; and (4) Engineering and Transportation Considerations.

Factors considered as part of the impact of each of the alternative sites to the natural and human environment included:

- Streams
- Wetlands
- Sensitive Species
- Managed Areas
- Vegetation/Wildlife
- Air Quality
- Noise
- Hazardous Waste
- Visual Environment
- Prime Farmland
- Floodplains
- Land Use
- Zoning/Siting Requirements
- Displacements
- Property Acquisition
- Farmland Impacts
- Public/Semi Public Lands
- Cultural Resources Environmental Justice
- Economic Impacts
- Visual Environment

Geologic constraints considered as they related to development of each of the alternative sites included:

- Mining
- Karst Conduit Potential
- Sinkholes and Caves
- Groundwater Resources
- Seismic Zones

Engineering feasibility and transportation factors considered for each of the alternative sites included:

- Site Capacity
- Distance to PAF
- Potential for Rail Transport
- Potential for Barge Transport
- Transportation Cost
- Traffic Operations

2.1.3.3 Summary of Alternative Landfill Site Evaluation

Alternative Site 5 is located within the PAF property boundary and would have relatively low impacts associated with the hauling of CCR. Use of this site would easily provide needed storage of CCRs from PAF. Additionally, development and operation of the site would result in relatively low impacts on the natural environment as this site has been previously disturbed through past mining and TVA operations. Therefore, this site is recommended to be carried forward for further study.

Alternative Site A would result in relatively high impacts to the human environment including land use and property acquisition. In addition, this site would have the greatest relative impact from previous mining as available mapping indicates that there are records of past mining in the area surrounding the site. In addition, given the land cover on the site and surrounding area, this site would have an impact on forested land cover and the visual environment. Therefore, this site is not recommended to be carried forward for further study.

Construction and operation at Site B and its associated haul routes would potentially impact 62 noise sensitive receptors. It also impacts Canfield Branch, a tributary to the Green River and it has the only known impact to a fault zone. Therefore, this site is not recommended to be carried forward for further study.

Approximately 47 acres of Site C are classified as prime farmland soils. This site also contains a large tract of forest cover (56 percent of the site is forested). Therefore, this site is not recommended to be carried forward for further study.

Alternative Site D would result in relatively high impacts to utilities (transmission line and associated transmission towers), stream impacts (tributary to Mud River), vegetative cover and prime farmland. In addition, this site has a higher probability to impact cultural resources (close proximity to high probability archeological sites). For these reasons, this site is not recommended to be carried forward for further study.

The Hopkins County Regional Landfill is an existing, permitted landfill. Accordingly, development of a landfill would not be required and would not result in any new impacts to the natural or human environment. The Hopkins County Regional Landfill has sufficient capacity to meet the need for long-term storage of CCR from PAF. The primary impacts identified with this site are related to the cost associated with transportation of CCR from PAF to the site and the transportation impacts associated with the 33-mile haul route. In spite of the longer haul route and increased cost, this site is recommended to be carried forward for further study.

2.1.3.4 Landfill Alternatives Retained for Detailed Analysis

2.1.3.4.1 Onsite Landfill (Site 5)

TVA would construct and operate a landfill for disposal of dry CCRs generated at the plant on PAF property located approximately 0.5 mile southeast of the plant.. This site encompasses 123.8 acres with a landfill footprint of approximately 80 acres. Much of the land within the footprint includes areas that are subject to a current slope stabilization project and are, therefore, substantially disturbed. The estimated capacity of the landfill is 13.8 million yd^3 which would provide up to 32 years of disposal capacity based on estimated energy production and consumption rates. The estimated capacity conservatively provides more than adequate CCR storage for long range planning purposes; however, TVA believes this conservative estimate of capacity is needed to account for potential changes in future consumption. In addition, the landfill would be built in a series of four cells (each with two subcells) that can be developed over time as needed.

The landfill would be approximately 210 feet tall measured from the perimeter access road. The limits of disturbance of the landfill include two leachate lagoons located to the west of the proposed limit of waste and two stormwater ponds each, one to the east of the limit of waste and one to the west. Conceptual design drawings of the landfill illustrating the bottom of the excavation/bottom of the liner are included in Appendix B. Features of the proposed landfill are shown on Figure 2-8.

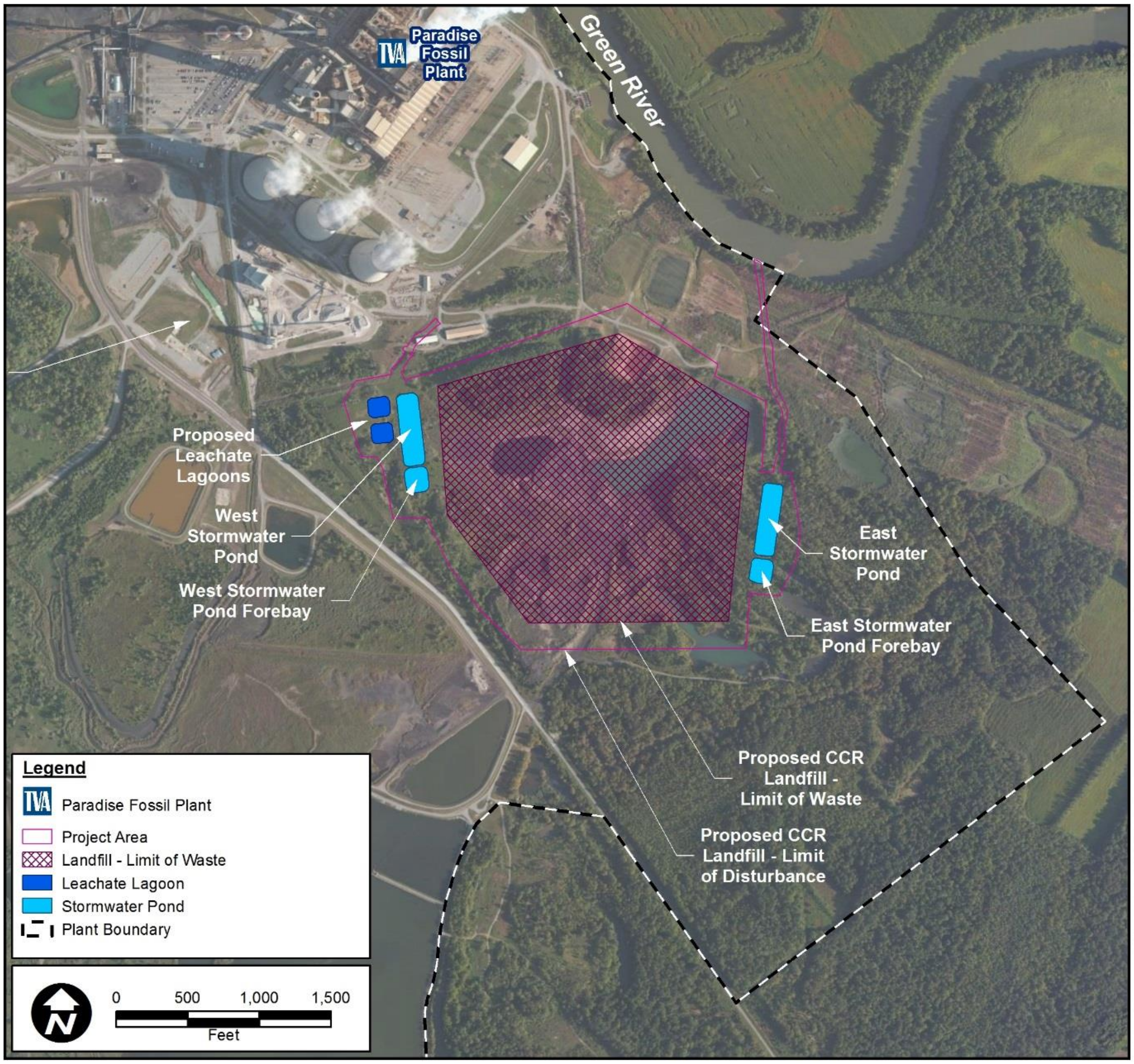

Figure 2-8. Project Features of Site 5 – Proposed Onsite Landfill

2.1.3.4.1.1 Landfill Development

The proposed landfill would be designed and constructed to meet CCR Rule requirements for new landfills. To meet these requirements, the following components are proposed:

1. Composite Liner System. The proposed composite liner system would consist of the following components (or equivalent).

    - Five feet of geologic buffer material if necessary to achieve separation from the uppermost aquifer
    - Two-foot layer of low permeability liner material (maximum permeability of 10^{7}centimeters per second)

- 60 mil HDPE flexible membrane liner
- Geocomposite drainage layer
- Protective Cover (CCR material or sand)

2. Leachate Collection and Treatment System.

   - A leachate collection system designed to facilitate the free drainage of leachate would be provided immediately above the liner. Leachate collected would be handled separately from contained surface runoff and would be sent to the onsite lagoons where it would be conveyed to the Green River through a KPDES permitted outfall. It is assumed that the leachate and storm water flows would co-mingle in the conveyance to the permitted outfall.
   - The leachate collection system would be capable of removing leachate from the landfill during its active life and the 30-year post-closure period.

3. Stormwater Management

   New perimeter drainage ditches would be constructed to convey storm water runoff from the new landfill area to two stormwater ponds. The west stormwater pond would discharge to an existing KPDES permitted outfall to the Green River, and the east stormwater pond would discharge to the Green River through a new permitted outfall. Drainage structures including ditches, benches, and culverts would be designed using standards outlined in the Final CCR Rule.

4. Final Cover System. The proposed final cover design would be developed in accordance with the CCR Rule, and is anticipated to consist of the following components:

   - Textured 40 mil linear low-density polyethylene flexible membrane liner
   - Geocomposite drainage layer
   - Protective soil cover (18-inch layer)
   - Vegetative cover (6-inch layer).

Borrow materials would be obtained onsite. TVA is considering a range of locations for obtaining borrow that may include the South Spoil Area and the borrow area located between the Peabody Ash Impoundment and the Gypsum Disposal Area (see Figure 2-5).

A summary of the primary characteristics of the landfill during both construction and operation is provided in Table 2-4.

Table 2-4. Primary Characteristics Related to Construction and Operation of a Landfill on PAF Property

Project Feature	Characteristic	Value
Construction	Limits of disturbance (includes leachate ponds, stormwater ponds, and conveyances, and access roads)	123.8 acres
Capacity	Total capacity (Note constructed in a series of four cells each with two subcells)	13.8 million cubic yards
Limit of Waste	Landfill footprint	80.2 acres
Stability	Recommended measures to support stability	Stability of existing underground mines would be ensured through placement of fill material to create false pillars or by large-scale filling of the mine. Exact measures would be developed based on continued analysis of stability and adjusted based on field conditions.
Height	Maximum height of landfill relative to access roads	210 feet
Leachate Management	Two leachate lagoons	Discharge to Green River through an existing KPDES permitted outfall
Stormwater Management	East and West Pond	West stormwater pond would discharge to existing permitted outfall on the Green River. East stormwater pond would discharge to a new permitted outfall on the Green River.
Employment Workforce	Construction	35 workers
	Operation	5 workers
Projected Ash Production	CCR to be managed in the landfill	Based on the future generation plan for PAF, the CCR production is estimated to be approximately 500,000 tons per year.
Transport Distance	Distance from dewatering facilities to onsite landfill	0.25 mile
Articulated dump truck traffic volume	Number of fully loaded truckloads needed to haul CCR from the dewatering facilities to the proposed landfill via a private onsite access road	108 truckloads per day. Equates to a traffic count of 216 trips per work day or approximately 24 trucks per hour

2.1.3.4.2 Offsite Disposal of CCR in an Existing Permitted Landfill (Hopkins County Regional Landfill)

Under this alternative, CCR from PAF would be transported to an existing offsite permitted landfill. The Hopkins County Regional Landfill is located approximately 33 miles west of PAF. The landfill is owned and operated by Waste Connections and serves western Kentucky and is permitted to receive CCR. Capacity at this landfill can be expanded to accommodate TVA's requirement for long-term storage of CCR generated at PAF. Under this alternative, dry CCR generated at PAF would be transported by over-the-road tandem dump trucks on existing roadways to the Hopkins County Regional Landfill for disposal.

Based on the estimated volume of CCR production and the use of over-the-road tandem dump trucks (capacity of 15 yd^3), approximately 165 truckloads per day throughout the life of the landfill (estimated at 20 years) would be needed to transport CCR to the offsite landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize the following public roads: Kentucky State Highway 176 (SR 176), US 431, Western Kentucky Parkway, SR 175, US 62, SR 813, and Claude Young Road (Figure 2-9).

The Hopkins County Regional Landfill is an existing landfill already permitted to accept CCR, and new impacts to the natural environment as a result of disposing CCR at this landfill are not anticipated. Therefore, the analysis provided in this EA is limited to the evaluation of characteristics related to transportation of CCR from PAF to the Hopkins County Landfill. These characteristics are summarized in Table 2-5.

Table 2-5. Primary Characteristics Transport of CCR from PAF to the Hopkins County Regional Landfill

Project Feature	Characteristic	Value
Size	Size of current landfill	95 acres
Location	Distance from PAF	33 miles
Tandem Dump Truck Traffic Volume	Number of truckloads needed to haul CCR from PAF to an offsite landfill (Hopkins County)	165 truckloads per day. Equates to a traffic count of 330 trips per work day or approximately 37 trucks per hour

Although PAF has both rail and barge facilities, which were considered in the previous Siting Studies, these facilities are neither configured nor designed to support loading and transport of CCR offsite. Since additional infrastructure is required for loading, the facilities were not considered feasible options for the proposed action. Further, barge and rail unloading facilities are not typical near permitted landfills and are not available at the Hopkins County Regional Landfill so CCR hauled by barge or rail for landfill disposal would still entail trucking. This eliminates any advantage gained. Accordingly, these forms of transport are not considered reasonable modes of transportation at PAF.

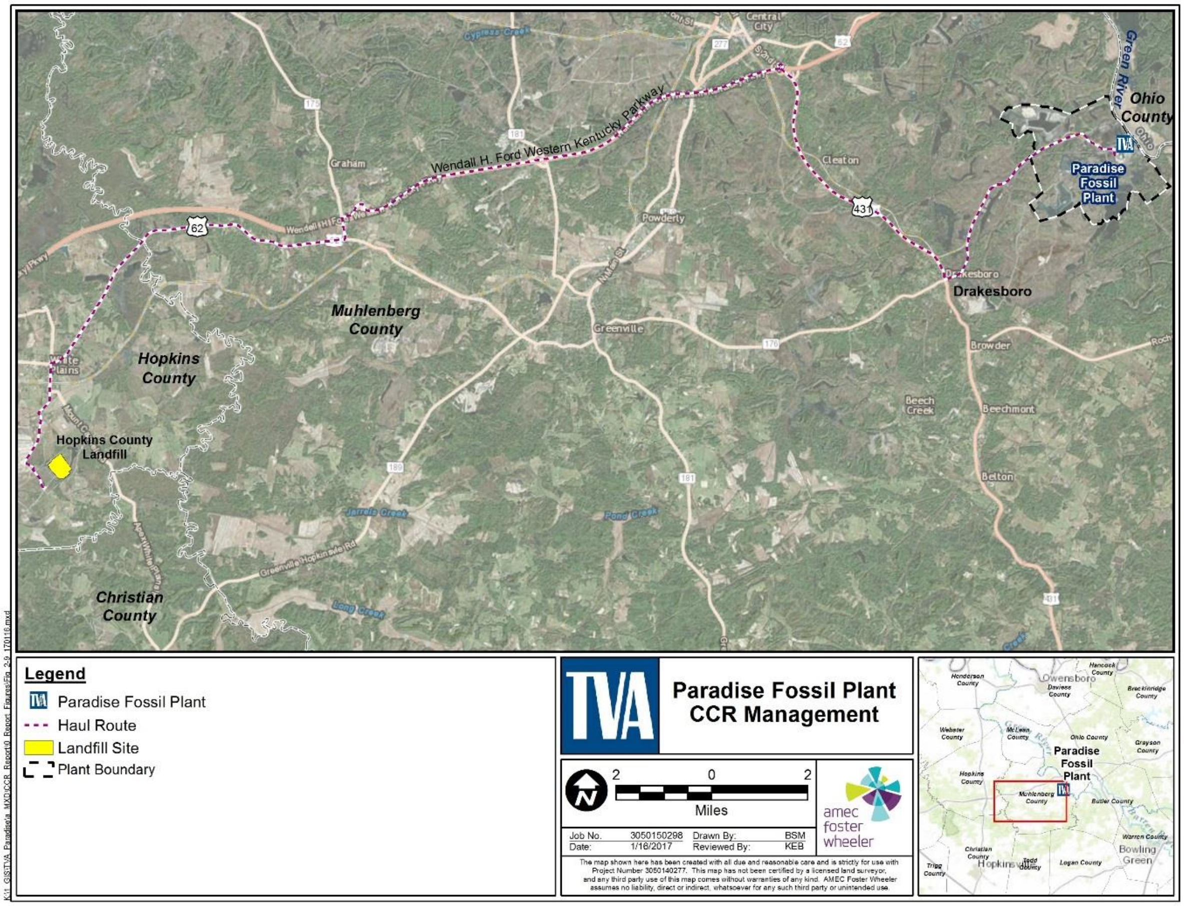

Figure 2-9. Haul Route to the Hopkins County Regional Landfill

2.2 Alternative Retained for Detailed Analysis

Based on the extensive analysis of options to manage CCRs produced at PAF, TVA retained the following alternatives for detailed evaluation in this EA:

- Alternative A – No Action
- Alternative B – Construction of an onsite CCR landfill, implementation of CCR dewatering and handling projects and impoundment closures.
- Alternative C – Offsite disposal of CCR in an existing permitted landfill (Hopkins County Regional Landfill), implementation of CCR dewatering and handling projects and impoundment closures.

2.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not construct dewatering facilities to manage CCRs produced at PAF in a dry ash disposal system. TVA would not close the ash impoundments. Accordingly, TVA would not seek additional disposal options for dry placement of CCR generated at PAF. Rather, CCR would continue to be managed in the current impoundments for as long as storage capacity is available. As such, the No Action Alternative would not support the decision made by the TVA Board of Directors to eliminate all wet CCR storage at its coal plants, which would also foster TVA's compliance with present and future regulatory requirements related to CCR production and management (CCR rule); nor would it support TVA's plan to operate PAF as a base load facility in accordance with the 2015 TVA Integrated Resource Plan (TVA 2015). Consequently, this alternative would not satisfy the project purpose and need and, therefore, is not considered viable or reasonable. It does, however, provide a benchmark for comparing the environmental impacts of implementation of Alternatives B and C.

2.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

Under this alternative, TVA would construct and operate a series of actions to manage CCRs produced at PAF. These actions include:

1. Construction and operation of CCR dewatering and handling facilities
    a. Gypsum Dewatering Facility
    b. Dry Fly Ash Handling System
2. Closure of the following ash impoundments
    a. Slag Impoundment 2A/2B and Stilling Impoundment 2C
    b. Gypsum Disposal Area
    c. Peabody Ash Impoundment
3. Long-term management of CCRs at PAF – Construct and operate an onsite CCR landfill at PAF

2.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

This alternative is substantially similar to Alternative B, except it considers long-term management of CCRs at an offsite existing permitted landfill rather than construction of a landfill on PAF property. Under this alternative, TVA would construct and operate a series of related actions to manage CCRs produced at PAF. These actions include:

1. Construction and operation of CCR dewatering and handling facilities
    a. Gypsum Dewatering Facility
    b. Dry Fly Ash Handling System
2. Closure of the following ash impoundments
    a. Slag Impoundment 2A/2B and Stilling Impoundment 2C
    b. Gypsum Disposal Area
    c. Peabody Ash Impoundment
3. Long-term management of CCRs at PAF – Transport CCR generated at PAF to the Hopkins County Regional Landfill

2.2.4 Comparison of Alternatives

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-6. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-6. Summary and Comparison of Alternatives by Resource Area

Resource Issue Area	Alternative A – No Action	Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures	Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures.
Air Quality	No impact.	Temporary minor impacts from emissions from equipment and during construction of dewatering facilities, pond closure and landfill construction. Air emissions associated with operations would be minimized through adherence to air operating permit conditions and would not exceed National Ambient Air Quality Standards (NAAQS).	Similar to Alternative B. No impact associated with landfill construction. However, emissions from the additional trucks needed to manage the transportation and management of CCR from PAF to the Hopkins County Regional Landfill are expected to result in long-term localized emissions that are considered to be minor in their effect, but greater than those evident under Alternative B.
Climate Change and Greenhouse Gases	No impact.	Localized emissions, negligible impact.	Localized emissions, negligible impact.
Land Use	No impact.	No impact. No change in land use.	No impact. No change in land use.
Groundwater and Geohydrology	Risk to groundwater is not reduced. However, groundwater protection processes will be implemented as needed to comply with the CCR Rule.	Minimal impacts to groundwater during construction with the use of BMPs. Long-term beneficial impacts due to reduction of risk to groundwater due to reduced hydraulic head risk which reduces risk of migration of constituents to groundwater and improved water quality in comparison to the No Action Alternative.	Similar to Alternative B. However, no impacts associated with landfill construction. No impact associated with transport to the existing permitted landfill.

Resource Issue Area	Alternative A – No Action	Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures	Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures.
Geology	No impact. TVA would ensure that all impoundment dikes would be stable under static and seismic conditions and meet appropriate safety factors.	Short-term minor construction related impacts minimized through BMPs. Minor positive impact as both the static and seismic factors of safety would be increased through impoundment closure.	Similar to Alternative B. However, no impacts associated with landfill construction. No impact associated with transport to the existing permitted landfill.
Surface Water	No change from existing conditions.	Minor temporary impacts due to runoff during construction. Requirements for dewatering of impoundments would be included in KPDES permits to ensure this action is performed in a manner protective of water quality. Direct permanent impacts to the ephemeral stream on the landfill site, which would be mitigated as a result of adherence to permit requirements. Dewatering facilities would result in a long-term beneficial impact associated with reduction in mass loading and reduced water usage due to operation of dewatering facilities.	Similar to Alternative B. Minor impacts associated with construction of the onsite landfill would not occur.
Floodplains	No additional impacts.	Reduced berm height of northern portion of Peabody Ash Impoundment following CCR removal would expand effective flood storage area of Jacobs Creek a small amount.	Similar to Alternative B.

Resource Issue Area	Alternative A – No Action	Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures	Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures.
Vegetation	No impact.	Minor impact resulting from the disturbance of a predominantly previously disturbed area that lacks notable plant communities. Expanded area of herbaceous vegetative cover by ash impoundment closure.	Similar to Alternative B. No loss of vegetation associated with landfill construction.
Wildlife	No impact.	Minor impact to predominantly previously disturbed low-quality habitats.	Similar to Alternative B. However, there would be no impact to low quality habitat due to loss of vegetation associated with landfill construction.
Aquatic Ecology	No impact.	Minor temporary impacts during construction activities that would be minimized through the use of erosion control BMPs. Minor impact to small (2-acre) dissipation basin. Minor indirect impact due to reduced flow in Jacobs Creek. No impact from operation as discharge would be compliant with KPDES requirements.	Similar to Alternative B. No temporary impact associated with landfill construction.
Threatened and Endangered Species	No impact.	No impact.	No impact.
Wetlands	No impact.	Direct impact to 1.8 acre of wetland. However, these impacts would be mitigated as required by both state and federal agencies.	Direct impact to 0.7 acre of wetland. However, these impacts would be mitigated as required by both state and federal agencies. Less impact than Alternative B as a result of transport of CCR to the offsite landfill.

Resource Issue Area	Alternative A – No Action	Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures	Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures.
Solid and Hazardous Waste	No impact associated with current management of CCR at PAF. Long-term impacts related to inability to operate Unit 3 due to loss of CCR management facilities would theoretically result in a decrease in solid waste produced at PAF.	Minor impact during construction and operation. Long-term impact associated with the management of solid wastes as CCR produced at PAF would be disposed in a new onsite landfill.	Similar to Alternative B. No temporary impact associated with landfill construction. Long-term impact to the capacity of an existing landfill.
Visual Resources	No impact.	Minor temporary impact due to change in visual landscape during construction. Negligible long-term impact.	Similar to Alternative B.
Cultural and Historic Resources	No impact.	No impact.	No impact.
Natural Areas, Parks and Recreation	No impact.	Minor temporary impact due to increased noise, erosion and sedimentation. Minimized through the use of BMPs. Minor indirect impact during construction due to increased vehicles on surrounding roadways. No impact during operation.	Minor indirect impact to facilities along the haul road, but greater impact relative to Alternative B.
Transportation	No impact.	Minor temporary impact during construction. No impact during operation.	Minor impact related to increased traffic and potential increase in crash rates during operation.

Resource Issue Area	Alternative A – No Action	Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures	Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of CCR Dewatering and Handling Projects and Impoundment Closures.
Noise	No impact.	Increase in local noise levels during construction. No impact to sensitive receptors.	Minor indirect impact to facilities along the haul road, but greater impact relative to Alternative B.
Socioeconomics	No impact.	Minor short-term beneficial impact due to construction related employment and beneficial economic impacts.	Minor impact due to anticipated minimal employment increase. However, positive economic impacts would be slightly reduced with the exclusion of landfill construction.
Environmental Justice	No impact.	No impact.	Moderate impact to potential Environmental Justice (EJ) community due to additional traffic noise and dust associated with transport of CCR. However, this impact would not be disproportionate.
Public Health and Safety	No impact.	No impact.	Increase in traffic on existing roadways would potentially increase the risk of injuries and fatalities associated with traffic incidents
Cumulative Effects	No impact.	No impact.	No impact.

2.3 TVA's Preferred Alternative

TVA's preferred alternative is Alternative B-Construction of the Onsite CCR Landfill and Implementation of CCR Dewatering and Handling Projects and Impoundment Closures. Alternatives B and C both provide long-term benefits, and meet the purpose and need of the project as both of these alternatives would transition the plant to dry storage of CCRs and close wet CCR impoundments. Implementation of these alternatives would also facilitate compliance with current and potential future regulatory requirements related to CCR production and management, including requirements of EPA's CCR rule. Implementation of either alternative would result in minimal impacts to the environment. However, Alternative B avoids the offsite transport of CCR along public roads, which eliminates the long-term impacts associated with air emissions, increased traffic and associated long-term safety risks, and disruptions to the public that would be associated with such offsite transport.

2.4 Summary of Mitigation Measures and BMPs

Mitigation measures and BMPs identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. Additional project-specific BMPs may be applied as appropriate on a site-specific basis to enable efficient maintenance of construction projects and further reduce potential impacts on environmental resources including air, surface water and groundwater.

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other BMPs (CAA Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences) would ensure that surface waters are protected from construction impacts.
- Consistent with EO 13112, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs as described in "A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority" (Bowen et al. 2012) would be used during construction activities to minimize impacts and restore areas disturbed during construction.
- Following completion of the Groundwater Optimization Plan (due to be completed in fall of 2017), TVA will implement supplemental groundwater mitigative measures that could include monitoring, assessment, or corrective action programs as mandated by state requirements.
- TVA would perform a study to evaluate the functionality of the equalization basin prior to the operation of the dry fly ash conversion system and Gypsum Dewatering Facility to ensure that all permit limits would be met. Water treatment measures would be identified, as needed, to ensure the discharge from the Gypsum Dewatering Facility and bottom ash operations and the altered receiving waters into the equalization basin have no significant impact on the receiving stream or outfall.
- Impacts to wetlands would be mitigated in accordance with USACE 404 permit as well as state Section 401 water quality certification permit requirements.

In addition, TVA has identified the following actions to minimize adverse impacts to floodplains:

- TVA will submit documentation to update current and future site topography for both the CCR landfill and the Peabody Ash Impoundment, when appropriate. Changes in topography will be documented with Federal Emergency Management Agency (FEMA) through completion of a Letter of Map Revision (LOMR).

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The proposed project sites associated with both alternatives are located in previously disturbed areas which support industrial land uses. There are no prime farmland soils mapped within the proposed temporary and permanent use areas. Therefore, there would be no impacts to prime farmland soils and this resource is not evaluated in this EA.

3.1 Air Quality

3.1.1 Affected Environment

Regulatory Framework for Air Quality

In accordance with the CAA Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with the National Ambient Air Quality Standards (NAAQS). These designations are either attainment, nonattainment, or unclassifiable. An area with air quality better than the NAAQS is designated as “attainment;” whereas an area with air quality worse than the NAAQS is designated as “non-attainment.” Non-attainment areas are further classified as extreme, severe, serious, moderate, and marginal. An area may be designated as unclassifiable when there is a lack of data to form a basis of attainment status. New or expanded emissions sources located in areas designated as nonattainment for a pollutant are subject to more stringent air permitting requirements.

Muhlenberg County and the surrounding counties (Butler, Christian, Hopkins, Logan, McClean, Ohio, and Todd) are all in attainment with applicable NAAQS (EPA 2016a) and ambient air quality standards referenced in the Kentucky Administrative Regulations (KAR), Title 401 Chapters 51 and 53. The proposed dewatering facility, landfill, and impoundment closure activities would be subject to both federal and state (Kentucky Division of Air Quality) regulations. These regulations impose permitting requirements and specific standards for expected air emissions. The standards and regulations that pertain to the proposed dewatering facility and landfill as well as impoundment closures are included in the KAR, Fugitive Emissions; Chapter 63:010.

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action Alternative

Under this alternative, existing CCR management operations at PAF would continue. Consequently, there would be no additional emissions related to project construction activities or the transport of CCR materials to receiving landfills. Therefore, no impacts to air quality are anticipated.

3.1.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.1.2.2.1 CCR Dewatering and Handling Projects

Construction Impacts

Under this alternative, transient air pollutant emissions would occur during construction of the CCR dewatering and handling facilities. Construction-related air quality impacts would be primarily related to operation of internal combustion engines and site preparation activities.

Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of particulate matter, nitrogen oxides, carbon monoxide, volatile organic compounds, and sulfur dioxide during the site preparation and construction period. However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions. Additionally, it is expected that all vehicles would be properly maintained which would also reduce emissions. Therefore, emissions from internal combustion engines would result in minor short-term local effects on air quality due to the relatively low number of vehicles, adherence to equipment maintenance requirements, and continued improvement of emission control measures and fuel blends.

Site preparation and vehicular traffic over paved and unpaved roads at the construction site would result in the emission of fugitive dust during active construction periods. Based on analyses presented for similar dewatering facilities proposed at Kingston (TVA 2016b) and Bull Run (TVA 2012b), it is expected that the largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the construction site boundaries. All TVA power plants have fugitive dust control plans as required under existing Title V permits, and TVA requires all contractors to keep construction equipment properly maintained and to use BMPs (such as covered loads and wet suppression) to minimize dust, if necessary. Air quality impacts from construction activities would depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture and other factors. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on offsite air quality and would be well below the applicable ambient air quality standard.

3.1.2.2.1.1 Operation Impacts

Operation of the dewatering facilities is subject to specific state air quality regulations and fugitive dust regulations. The proposed dewatering facilities would be operated in compliance with state regulations.

Fugitive dust emission standards state that fugitive dust may not be emitted in quantities that produce visible emissions beyond the property. Gypsum would be conveyed from the Gypsum Dewatering Facility and stacked in a pile on a concrete pad and moistened with water as necessary to control fugitive emissions (i.e., dust blown off the top of the pile). The gypsum would be reclaimed from the storage pile and transported either to the onsite landfill or offsite for beneficial reuse.

Management of boiler slag would be similar to current operations and therefore there would be no appreciable change in air emissions associated with this interim measure.

Fly ash would be conveyed pneumatically to a transfer station within the existing power plant and onto storage/disposal silos located adjacent to the future Gypsum Dewatering Facility. Fly ash loaded into open containers would be conditioned (moistened) with approximately 20 percent water to facilitate compaction and has the effect of reducing fugitive emissions (i.e., dust blown off the loaded ash during transport). The trucks would then be covered, and the material would be transported to the onsite landfill or offsite for beneficial reuse.

The fugitive dust control BMPs would reduce potential impacts to air quality, and the dewatering facilities are expected to be in compliance with fugitive dust emission standards. Therefore, air quality impacts associated with the dewatering project operations would be minor and would not exceed NAAQS.

3.1.2.2.2 Ash Impoundment Closure

Impoundment closure involves several activities that potentially would result in air emissions. These activities include dewatering, grading and compaction of CCR, and the installation of approved closure systems. All borrow material is expected to be obtained onsite which minimizes emissions from the transport of this material. Potential air quality impacts associated with these activities include dust and emissions from equipment, earth-moving activities (dozing, grading, and fill placement) and equipment movement on access roads on the site.

As noted in the PEIS (TVA 2016a) and discussed above in the dewatering section, fugitive dust emissions from construction activities would be reduced with the implementation of BMPs as well as adherence to measures identified in the site fugitive dust plan.

Overall, as with the dewatering projects, the impoundment closures are expected to have minor short-term local impacts on air quality and are not expected to exceed NAAQS. Regional impact on air quality would be negligible.

3.1.2.2.3 Landfill

3.1.2.2.3.1 Construction Impacts

Construction of the proposed landfill and its associated access road would require the use of earthmoving, compacting and paving equipment as well as trucks for hauling materials. All construction activities would be carried out onsite, and no offsite activities are anticipated. These activities would generate fugitive dust during active construction periods similar to the dewatering projects and impoundment closure construction activities.

Equipment expected to be required for this alternative includes excavators, bulldozers, water trucks, loaders, pickup trucks, and semi-trailers. All equipment would be used onsite and any air quality impacts would be limited to the immediate site area. Emissions associated with the combustion of gas and diesel fuels would generate local emissions during the construction period. Given the relatively low number of vehicles and equipment that would be used for the initial construction activities, adherence to equipment maintenance requirements, continued improvement of emission control measures and fuel blends and the intermittent nature of construction, emissions from construction equipment would be minor and temporary in nature.

Operation Impacts

Operation of the proposed landfill would comply with Kentucky regulations for fugitive emissions and PAF’s air operating permit conditions. CCR handling, transport and placement activities would utilize methods similar to other TVA landfill operations. Moisture-conditioned CCR would be transported to the working face of the landfill using heavy-duty dump trucks over paved access roads contained within the boundaries of the plant. Based solely on the estimate of CCR produced daily and the safe capacity of an articulated dump truck, approximately 108 truckloads of conditioned CCR per day would be needed to transport CCR to the proposed onsite landfill. That would result in a traffic count of 216 trips per day between the dewatering and dry ash handling sites and the proposed onsite landfill or approximately 24 truck trips per hour over a typical nine-hour workday. It is anticipated that all trucks used to transport CCR would be maintained in good working condition with current emission control technologies to minimize local air quality impacts.

Once placed within the landfill, the CCR material would be spread and compacted. The compacted surface further limits fugitive dust. As each cell of the landfill reaches its capacity, it would be covered with an approved cover system. Equipment used for placement and compaction of CCRs would be similar to what is currently in use at the existing Gypsum Disposal Area so there would be no substantive change in emissions as compared to base conditions. Therefore, landfill operation air quality impacts are anticipated to be minor and would not exceed NAAQS.

3.1.2.2.4 Summary of Environmental Consequences of Alternative B

As summarized in Table 3-1, TVA has determined that all air quality impacts related to the CCR management projects with the implementation of Alternative B are minor and would not have an impact on NAAQS.

Table 3-1. Summary of Impacts to Air Quality Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Projects Ash Impoundment Closure Landfill Construction	Construction impacts associated with emissions from vehicles and equipment as well as generation of fugitive dust.	Minor temporary impact. No exceedance of NAAQS expected.
CCR	Emission of fugitive dust associated with dewatering operations.	Minor temporary impact. No exceedance of NAAQS expected.
Landfill	Operational impacts are related to trucks transporting CCR to the onsite landfill as well as equipment used to manage the CCR at the landfill.	Localized impact due to emissions from increase in trucks and equipment used to transport and manage CCR at the onsite landfill but no exceedances of NAAQS expected.

3.1.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, air quality impacts associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. For Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill (Hopkins County Regional Landfill) and not disposed of onsite.

Because the Hopkins County Regional Landfill is an existing permitted landfill, there would be no changes from the existing environment associated with construction of a landfill. Operations at the Hopkins County Regional Landfill would remain unchanged or would result in minor additional air emissions associated with the use of additional equipment needed to manage the additional CCR from PAF.

The primary impact to air quality would be from transportation of CCR to the Hopkins County Regional Landfill. Over-the-road tandem dump trucks would be used to haul CCR between PAF and the landfill along the haul route described in Section 3.17. Based on the estimate of CCR produced daily and the capacity of an over-the-road tandem dump truck, 165 truckloads of CCR would be needed to transport CCR generated at PAF to the landfill. This would result in a traffic count of 330 trips per day along the haul route or approximately 37 truck trips per hour over a typical nine-hour workday. Transport of CCR would occur daily (during a typical five-day work week) over a period of approximately 32 years. As with the onsite landfill, it is anticipated that all trucks used to transport CCR would be maintained in good working condition with current emission control technologies to minimize air quality impacts. Local and regional impacts on air quality would be minor given the relatively low traffic volumes in the vicinity of PAF and the Hopkins County Regional Landfill.

Overall, air quality impacts associated with Alternative C would not result in an exceedance of NAAQS. However, emissions from the additional trucks needed to transport CCR from PAF to the Hopkins County Regional Landfill are expected to result in long-term local effects that would be minor, but greater than those evident under Alternative B.

3.2 Climate Change and Greenhouse Gases

3.2.1 Affected Environment

Regulatory Framework for Climate Change and Greenhouse Gases

“Climate change” refers to any substantive change in measures of climate, such as temperature, precipitation, or wind (USEPA 2016). The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades, by these studies, is directly linked to the cumulative global emissions of greenhouse gases (GHGs) (e.g., carbon dioxide [CO_2], methane). By the end of this century, the 2014 National Climate Assessment concluded a 3° Fahrenheit (F) to 5°F rise can be projected under the lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo et al. 2014).

Climate change is primarily a function of too much CO_2 in the atmosphere. CO_2 is the primary GHG emitted through human activities. In 2014, CO_2 accounted for about 80.9 percent of all U.S. GHG from human activities (USEPA 2016a). This carbon overload is caused mainly by activities that burn fossil fuels such as coal, oil and gas or by releasing stored carbon by cutting down forests. Generally, climate change results in Earth’s lower atmosphere becoming warmer and moister, resulting in the potential for more energy for storms and certain severe weather events (USEPA 2016a).

TVA has adopted a climate adaptation plan that establishes adaptation planning goals and describes the challenges and opportunities climate change may present to its mission and operations. The goal of TVA’s adaptation planning process is to ensure that TVA continues to achieve its mission and program goals and to operate in a secure, effective and efficient manner in a changing climate.

TVA manages the effects of climate change on its mission, programs and operations within its environmental management processes. TVA’s Environmental Policy includes the specific objective of stopping the growth in volume of emissions and reducing the rate of carbon emissions by 2020 by supporting a full slate of reliable, affordable, lower-CO_2 energy-supply opportunities and energy efficiency.

Activities associated with the CCR management projects at PAF that produce CO_2 are primarily related to emissions from fossil-fuel-powered equipment (e.g., bulldozers, loaders, haulers, trucks, generators, etc.) during construction, transport and long term management of CCR.

Forested areas that absorb and store CO_2 from the atmosphere via a process known as carbon sequestration help to reduce levels of CO_2 in the atmosphere. Approximately 0.18 acre of forested land is present within the dewatering facility footprint, and approximately 37.3 acres of forested land is present within the proposed landfill limits of disturbance. There is no forested land within the impoundment areas.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under this alternative, there would be no change to CCR management operations at PAF. Therefore, there would be no impact to GHGs and climate change.

3.2.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.2.2.2.1 CCR Dewatering and Handling Projects

3.2.2.2.1.1 Construction Impacts

GHG emissions, primarily CO_2, would occur during construction of the dewatering facilities. As discussed above, CO_2 construction-related emissions would occur through the use of internal combustion engines during site preparation and facility construction. Due to the small number of vehicles and construction equipment involved, only a minor temporary increase in CO_2 emissions would be anticipated as a result of the construction of the dewatering facilities. Such emission levels are *de minimis* in comparison to the regional and world-wide volumes of CO_2. Therefore, local and regional GHG levels would not be adversely impacted by CO_2 emissions from construction activities.

The EPA (2017) has developed conversion factors to estimate the carbon sequestration that may be lost from the conversion of forested land. Assuming that 0.18 acre of forested areas (the land cover with the greatest potential carbon sink) are completely cleared from the dewatering facilities limits of disturbance and forest composition and age is typical for the region (Kentucky), the conversion of these forested lands would result in the loss of carbon stock equivalent to 0.19 metric tons of carbon sequestered in one year. The loss of carbon sequestered or stored is very small relative to the local and regional carbon sequestered in forested areas. Overall, forest carbon sequestration in the region has increased due to net increases in forest areas (e.g., conversion of farmland to forested areas), improved forest management, as well as higher vegetation growth productivity rates and longer growing seasons. Within the 5-mile radius of PAF, it is estimated that existing forested lands sequester approximately 43,485.6 metric tons of carbon per year. By comparison, therefore, no impact on climate change is anticipated.

3.2.2.2.1.2 Operation Impacts

Operations at the dewatering facility would require the use of electricity provided by PAF and would be taken from energy already being produced. The energy required to operate the dewatering facility would not increase the amount of fossil fuel burned or CO_2 emitted at PAF and, therefore, is not anticipated to have local and regional GHG level impacts or impacts on climate change.

3.2.2.2.2 Impoundment Closure

Construction-related CO_2 emitting activities associated with the impoundment closures would be similar to those described for the dewatering projects. The impoundment closures, however, may generate slightly greater CO_2 emissions due to the large amounts of grading, transportation of borrow material, and installation of approved closure liner systems. New emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions which would minimize the impact associated with increased levels of construction equipment use.

Since the impoundment areas have no forested areas that would be affected by closure activities, no carbon sequestration would be lost.

It is expected that CO_2 emissions would have potential minor short-term local effects on GHG levels but overall, regional impact on GHG levels and climate change would not be impacted.

3.2.2.2.3 Landfill

3.2.2.2.3.1 Construction Impacts

Construction of the proposed landfill would require the use of earthmoving and compacting equipment as well as trucks for hauling materials. All construction activities would be carried out onsite, and no offsite activities are anticipated. Equipment expected to be required for this alternative includes excavators (two), bulldozers (three), a water truck, a loader, pickup trucks (five) and semi-trailers. These activities would generate CO_2 emissions during active construction periods. As with the dewatering and impoundment closure projects, due to the relatively low number of vehicles and construction equipment involved, only minor CO_2 emissions would be anticipated in comparison to the regional and world-wide volumes of CO_2 generated. Therefore, local and regional GHG levels would not be adversely impacted by the project.

TVA assumed 37.3 acres of forested land would be cleared for the landfill project. Using the same quantification tool described for the dewatering facilities analysis to evaluate the carbon sequestration that may be lost from the conversion of forested land, TVA estimates that the conversion of these forested lands would result in the loss of carbon stock equivalent to 39.5 metric tons of carbon sequestered in one year. As described above, loss of carbon sequestration is small relative to the local and regional carbon sequestered in forested areas, and would be offset by increases in forest carbon sequestration in the region and no impact on climate change is anticipated.

3.2.2.2.3.2 Operation Impacts

CCR would be transported to the proposed landfill using dump trucks over access roads within the boundaries of the plant. Based solely on the estimate of CCR produced daily and the capacity of an articulated dump truck, approximately 108 truckloads of CCR per day would be needed to transport CCR to the onsite landfill and would result in a traffic count of 216 trips per day to cover both the delivery and return trips. Due to the relatively low number of trucks and minimal transport distance (0.25 mile), the trucks would produce a minor amount of CO_2 emissions but are not anticipated to increase regional GHG levels or impact climate change.

Equipment which produces CO_2 emission (e.g., bulldozers) would be used to spread and compact the CCR. The equipment used for landfill operations would be similar to what is currently in use at the existing gypsum stack and, therefore, there would be no substantive change in CO_2 emissions as compared to base conditions.

3.2.2.2.4 Summary of Environmental Consequences of Alternative B

Impacts to Climate Change associated with the implementation of Alternative B are summarized in Table 3-2. In summary, no impact to climate change is anticipated based on the limited CO_2 emissions generated from these CCR management projects in comparison to the regional and world-wide volumes of CO_2 generated.

Table 3-2. Summary of Impacts to Climate Change – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Projects Ash Impoundment Closure Landfill Construction	Increase in construction-related emissions would occur through the use of internal combustion engines during site preparation and facility construction.	Minor temporary CO_2 emission increases but no impact to regional GHG levels or climate change.
Dewatering and CCR Handling Facilities Landfill Construction	Impact to carbon sequestration due to loss of forested area.	No impact.
Landfill	Operational impacts related to increase in trucks used to transport CCR to the landfill as well as equipment used to manage the CCR at the landfill.	Localized impact due to higher CO_2 emissions but no impact to regional GHG levels or climate change.

3.2.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, CO_2 emissions associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. For Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill (Hopkins County Regional Landfill) and not be disposed of onsite.

Because the Hopkins County Regional Landfill is an existing permitted landfill, construction-related CO_2 emissions would not occur. CO_2 emissions from landfill operations would remain unchanged or there would be a minor increase in emissions if additional equipment or equipment use would be necessary to manage the CCR from PAF. Therefore, impacts associated with this alternative are related to the transport of CCR from PAF to the Hopkins County Regional Landfill.

As discussed in the Air Quality Section 3.1, over-the-road tandem dump trucks would be used to haul CCR between PAF and the Hopkins County Regional Landfill along the haul route described in the Section 3.17. It is estimated that 165 truckloads would be needed to transport CCR generated at PAF to the landfill on a daily basis and would result in a traffic count of 330 trips per day to cover both the delivery and return trips.

Overall, CO_2 emissions associated with Alternative C would be minor and are not anticipated to result in increases in regional GHG levels or impact climate change. The CO_2 emissions would be greater under Alternative C than those evident under Alternative B.

3.3 Land Use

3.3.1 Affected Environment

The PAF facility is located in Muhlenberg County, Kentucky along the western bank of the Green River. The plant property occupies approximately 3,400 acres of land that supports industrial development for the facility itself and supporting infrastructure.

Surrounding land use is dominated by open land consisting of reclaimed mine lands passively managed for wildlife habitat and forestry. Land used for agriculture (cropland) is located in the bottomland along the Green River. No residential or commercial land uses occur in the immediate vicinity of PAF.

The nearest residential areas are located on the west side of the Green River about 2.5 miles from the southern edge of the PAF property. The nearest community is the town of Drakesboro about 3 miles to the southwest. The nearest residences east of the Green River are about 2 miles from PAF. No residences exist along SR 176, which connects the plant to US Highway (US) 431 west of PAF at Drakesboro.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, there would be no change in the management of CCR produced at PAF, and no work would be conducted that could result in a change in land use. Therefore, no project-related environmental impacts with respect to land use would occur under this alternative.

3.3.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.3.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering and handling facilities would be constructed on sites that are already used for heavy industrial use. Accordingly, no changes in land use would occur with this project.

3.3.2.2.2 Ash Impoundment Closure

Closure of the Gypsum Disposal Complex and the Peabody Ash Impoundment would include the installation of a cover system which would convert the existing industrial facilities largely devoid of vegetation to areas with herbaceous terrestrial land cover. However, these areas would still be located within the TVA plant site and be used for industrial purposes; therefore, closure would not result in the conversion of any land uses in the foreseeable future. Over a longer period, it is possible that these closed impoundments could be put to other uses. If this is proposed, additional environmental reviews would be conducted. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be converted to lined equalization basins and would continue to be used for industrial purposes.

Closure of the impoundments would incorporate a large amount of fill material and soil material that would be obtained onsite. During closure, TVA would use a 5-acre vacant area located next to the Peabody Ash Impoundment as a laydown area to support various construction-related activities (e.g., vehicle and equipment parking, storage, and construction administration).

These activities would occur on land located within the plant boundary which is dedicated to industrial use. Therefore, no changes in land use would occur with this project.

3.3.2.2.3 Landfill Construction and Operation
Lands expected to be used for construction and operation of the proposed projects are already used for heavy industrial use. Accordingly, no changes in land use would occur with this project.

3.3.2.2.4 Summary of Environmental Consequences of Alternative B
Impacts to land use associated with the implementation of Alternative B are summarized in Table 3-3. Under this alternative, construction and operation of the proposed projects would be located in an area that is already used for heavy industrial use. Accordingly, no changes in land use would occur.

Table 3-3. Summary of Impacts to Land Use Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities Ash Impoundment Closure Landfill	Construction and operation would occur on land currently supporting industrial land use. There would be no change in land use.	No impact.

3.3.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering and handling projects and ash impoundment closure would be the same as identified under Alternative B. However, under Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill. For the purposes of this EA, impacts associated with this alternative are analyzed based on the transport to the Hopkins County Regional Landfill. Because this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative. The haul route to the landfill would utilize previously constructed roads which are already subjected to vehicular traffic, and no new roads would need to be constructed. Therefore, there would be no impact.

3.4 Groundwater/Geohydrology

3.4.1 Regulatory Framework for Groundwater

The regulatory framework established to protect groundwater is defined in the PEIS. These include the Safe Drinking Water Act of 1974, Wellhead Protection Program, and CCR Rule. As this document tiers off of the Final PEIS, the standards established by these requirements are also applicable to the proposed actions.

3.4.2 Affected Environment

3.4.2.1 Regional Aquifers

Regional aquifers within 5 miles of PAF are represented by the bedrock carbonate aquifer and the alluvial aquifer associated with the Green River.

Carbonate rocks are a class of aquifers that are represented in the Highland Rim physiographic region around PAF. Carbonate rocks, such as limestone and dolomite, contain a high percentage of carbonate minerals (e.g., calcite) in the rock matrix. Carbonate rocks in some parts of the region readily transmit groundwater through enlarged fractures (cracks) and cavities created by dissolution of carbonate minerals by acidic groundwater.

The alluvial aquifer consists of the water bearing sand and gravel deposits associated with streams and floodplains. The alluvium may yield as much as 100 gallons per minute (gpm) from sands and gravel along the Green River (Duvaul and Maxwell 1962). The alluvium yields enough water for a modern domestic supply (more than 500 gallons per day) to wells in valleys of the Green River and its larger tributaries (Starn et al. 1993). It yields practically no water to wells in small valleys where it is thin and fine grained. Water is hard or very hard, and may contain objectionable amounts of iron (Carey and Stickney 2004).

The availability of groundwater from bedrock sandstone in the Western Coal Field region varies widely. Prior to mining, the area was underlain by the three identifiable aquifers: the Lisman aquifer located near the surface (in the Sturgis formation), the Carbondale aquifer at an intermediate depth, and the Caseyville aquifer located more than 600 feet below the surface. Elsewhere in the region, usable groundwater is also found in the Tradewater Formation. The Lisman is exposed in a part of the region, but has been largely removed by coal stripping and replaced by mining spoil in the upland areas. Where sandstone units of the Lisman or Carbondale aquifers are exposed at the surface, they receive direct infiltration and are susceptible to potential contamination. In undisturbed areas where the sandstone units are overlain by shale and coal beds, the sandstone is protected from direct recharge and less susceptible to potential contamination (TVA 2013).

Groundwater derived from carbonate formations of the Highland Rim is generally slightly alkaline and high in dissolved solids and hardness. The quality of groundwater from shallow bedrock aquifers is generally soft to moderately hard, but may contain undesirable amounts of iron. Most water from the alluvium along the Green River is generally harder and contains more iron than water from the bedrock aquifers. Iron and common salt (saline water) are the main naturally occurring constituents affecting the taste of the groundwater (Carey and Stickney 2004).

Horizontal groundwater gradients in the overburden generally follow surface topography with flow toward the Green River and Jacobs Creek. Groundwater movement in the underlying Carbondale formation occurs primarily through bedrock fractures and bedding planes (TVA 2003). The Carbondale receives recharge from the overburden and from lateral inflow along the western boundary of the reservation. Although horizontal groundwater gradients in the Carbondale formation are similar to those of the overburden, the groundwater potentiometric surface of the Carbondale averages about 5 feet lower than that of the overburden.

In general, groundwater in the vicinity of TVA's ash impoundments is influenced by the surrounding upland, local geological conditions, and the hydrologic influence of the receiving waterbody. Depths to the uppermost aquifer will be investigated by TVA at ash impoundments in accordance with the requirements of the CCR Rule.

The potential groundwater mounding under the unclosed impoundments as defined above may be expected to remain somewhat elevated even for an inactive impoundment (i.e., no additional CCR material inputs), due to the continued addition of storm water and other process wastewaters into the impoundment.

According to EPRI (TVA 2016a) because of this continued input of water to the impoundment, the quantity of water seeping vertically ("leachate" water) downward beneath the impoundment, subsurface flow may also be considered constant. The extent to which such leaching may occur and how it may interact with the uppermost aquifer and receiving surface waters is dependent upon site-specific conditions such as soil permeability, water depth within the impoundment, volume of CCR materials and their composition and depth to the uppermost aquifer, etc. TVA has prepared a Groundwater Optimization Plan for the PAF facility which will be used to arrive at the certified groundwater monitoring network due to be completed October 17, 2017, and the upper most aquifer determinations for all CCR facilities that is due October 17, 2018. Actual groundwater levels and directional flow are under further investigation by TVA.

3.4.2.2 Groundwater Use

According to the most recent data regarding public water use, Muhlenberg County had an estimated population of 31,183 in 2015 (USCB 2016b). An estimated 94 percent of the population is served by surface water provided by a water utility. In areas not served by public water, about 70 percent of the households use wells and 30 percent use other sources (Carey and Stickney 2004).

The Carbondale yields enough water for a modern domestic supply to wells penetrating sandstone. It yields practically no water to wells penetrating only shale. Wells are known to produce as much as 30 gpm. Water is hard or very hard, but otherwise of good quality. It yields either no water or water containing iron sulfate in areas where the Kentucky No. 9 coal has been mined as it has been at the PAF facility. Previous studies identified four wells within 2 miles of the plant reservation. These include one domestic well completed in the Sturgis formation. Three wells (two domestic and one industrial) were developed in the Carbondale. The two Carbondale domestic wells were reviewed in 2003 by TVA and found to no longer exist. The third Carbondale well is an industrial well upgradient of PAF. No new public drinking water sources have been located near the PAF (TVA 2013).

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program which regulates certain activities in areas where the aquifer (water-bearing geologic formations) provides at least half of the drinking water consumed in the overlying area. No sole source aquifers exist in the vicinity of PAF (EPA 2015a).

No directly applicable groundwater monitoring data are available from TVA's monitoring network for the facilities that are the subject of this EA. Groundwater monitoring of other site features occurs semiannually and results are reported to the Kentucky Division of Waste Management in the Semi-Annual Groundwater Report for the Residual Landfill and the FGD Pond Voluntary Monitoring Report. As of June 2013, the residual landfill had no maximum contaminant level (MCL) exceedances from the groundwater. Statistical exceedances of sodium, conductance, chloride, and total dissolved solids were reported and have been observed in the past. In June 2013, a statistical exceedance for boron was reported. Analytical results for the 2012 FGD Pond Voluntary Monitoring Report indicated that all constituent contaminants were below MCLs (TVA 2013).

3.4.3 Environmental Consequences

3.4.3.1 Alternative A – No Action Alternative

Under Alternative A, no excavations would occur in conjunction with the construction of dewatering facilities or landfill construction, and impoundments will remain operational. TVA would continue current plant operations and not construct dewatering facilities to manage CCRs produced at PAF. No impoundment closure activities (e.g., dewatering of surface water or cover system construction) will occur. Accordingly, TVA would not seek additional disposal options for dry placement of CCR generated at PAF. The impoundments would not be dewatered or covered, and there would be no reduction in hydraulic head or corresponding reduction in risk of migration of constituents to groundwater.

Groundwater monitoring of the impoundments will be undertaken in conjunction with the Groundwater Optimization Plan for the PAF facility which will be used to arrive at the certified groundwater monitoring network due to be completed October 17, 2017. Under this plan, TVA will continue to work with the state to obtain and evaluate groundwater quality associated with the CCR management facilities at PAF. As described in the PEIS (TVA 2016a), TVA has outlined the following process as a built-in mitigation measure that will be implemented as appropriate, in coordination with state regulatory agencies to help ensure environmental protection for closure of inactive impoundments:

1. Design and implement a groundwater monitoring system.
2. Identify statistical procedures for evaluation of groundwater monitoring data.
3. Further assess groundwater conditions in proximity to closed ash impoundment.
4. If needed, identify corrective measures to prevent further releases or remediate identified releases.

For active ash impoundments (under the No Action Alternative), a similar process for groundwater assessment and protection will be implemented to ensure compliance with CCR Rule requirements and minimize environmental impacts.

3.4.3.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.4.3.2.1 CCR Dewatering and Handling Projects

3.4.3.2.1.1 Construction Impacts

The majority of excavations associated with the proposed dewatering facility would be shallow (less than about 8 feet deep) and would not be expected to encounter groundwater. No pilings are anticipated for the gypsum dewatering or dry fly ash conversion projects. If further analysis shows pilings to be required to support the dewatering facility or fly ash storage silos, they would be drilled deeper than the majority of the excavations, at approximately 20 feet in depth. If required, pilings would be constructed of reinforced concrete and would be in the groundwater zone. A concrete pad (pile cap) would be installed above the pilings as the foundation of the dewatering facility and storage silos to prevent any interaction between surface activities and constituents related to ash management and groundwater. Water control, if needed, would be limited to short-term dewatering from excavations. BMPs, as described in “A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority” (Bowen et al. 2012), would be used to avoid contamination of groundwater in the project area and would be used to control sediment infiltration from storm water runoff during construction phases of the project. With the use of BMPs, impacts to groundwater would be minor and temporary.

3.4.3.2.1.2 Operation Impacts

Potential sources of groundwater contamination resulting from operations of the proposed dewatering and handling facilities include releases resulting from the transfer pipe systems and run-off from the covered storage silos. Much like the construction-related effects, these potential impacts can be sufficiently mitigated with the use of appropriate BMPs including but not limited to containment walls, site grading and sumps equipped with transfer pumps.

Under current operations, gypsum and fly ash are wet sluiced to the Gypsum Disposal Area, and fly ash is sluiced to the Peabody Ash Impoundment. With the implementation of the dewatering facilities, CCR would be conveyed to the onsite CCR Landfill. Accordingly, the volume of water used for sluicing would be reduced relative to the No Action Alternative. This reduction in water use would result in a corresponding reduction in the potential for movement of constituents from surface water systems (sluice trenches and impoundments) to groundwater. Therefore, impact of this alternative on groundwater are considered to be beneficial and minor.

3.4.3.2.2 Ash Impoundment Closure

Under Alternative B, the dewatering and subsequent grading and stabilization of the CCR materials in the impoundment provides an immediate reduction in the potential influx of leachate water moving from the impoundment through the subsurface vadose zone.

Some CCR would be excavated from Slag Impoundment 2A/2B and Stilling Impoundment 2C in order to achieve the final desired grade. This excavated CCR would be consolidated into the Peabody Ash Impoundment or reclaimed for marketing. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be converted to equalization basins and would be covered with a geosynthetic liner, and cushioned geotextile drainage layer that complies with applicable permeability requirements. As described in Chapter 2, the closure of the Gypsum Disposal Area and the Peabody Ash Impoundment would entail dewatering and closure consisting of a geomembrane and geocomposite drainage layer, 18 inches of protective cover and 6 inches of top soil.

The cover system with an approved closure system over the compacted CCR not only prevents additional infiltration from precipitation, but also would facilitate management of storm water runoff. Elimination of the hydraulic inputs to the impoundment reduces the potential for migration of leachate to groundwater beneath the impoundment and to receiving surface waters.

Closure-in-Place activities would reduce risk to groundwater and improve water quality in comparison to the No Action Alternative. Even in cases where the elevation of the upper most aquifer is unknown, Alternative B provides the following benefits:

1. Elimination of sluice water reduces the hydraulic head, thereby reducing the pressure of water forcing ash contaminants into groundwater.

2. Installing a cover system improves groundwater quality by virtually eliminating rainfall infiltration through the impoundment, and reducing downward migration of contaminants into groundwater.

3. KPDES outfall water quality improves as contact with ash would cease following installation of a cover system; and the receiving river water quality would also improve.

TVA's on-going monitoring of similar ash management facilities at its plants also points to the effectiveness for those benefits mentioned above. In the case of the Cumberland Fossil Plant, when sluicing of CCRs changed from an open impoundment to sluicing in geomembrane-lined channels, groundwater parameters changed from exceeding the MCLs to falling below the MCLs and have maintained these levels for approximately three years. Closure-in-Place with a geomembrane is considered to be one of the best options for improving groundwater quality beneath or downgradient of an ash impoundment or landfill (TVA 2016a).

Notably, a recent study conducted by EPRI has evaluated the impact of impoundment closure on groundwater constituents of concern for a hypothetical CCR impoundment in Tennessee. EPRI analyzed two scenarios: One in which all CCR materials were located above the water table and a second in which the groundwater intersected the CCR materials. Under both closure scenarios, EPRI (TVA 2016a) found that the in-place closure scenario provided a positive impact compared to baseline (i.e., concentrations of all constituents of concern were less than 10 percent of baseline), ranging from a 1.7- to 13.3-fold increase in positive impact (i.e., reduction in concentration).

Considering the beneficial effects of removal of the hydraulic head from ash impoundments, the associated reduction in potential subsurface releases from ash impoundments and the commitment to supplemental mitigative measures such as groundwater monitoring, as appropriate, the impacts of this alternative on groundwater would be beneficial and considerable, as compared to the No Action Alternative.

3.4.3.2.3 Landfill Construction and Operation

In accordance with Federal Subtitle D Resource Conservation and Recovery Act (RCRA) regulations and EPA CCR requirements, the proposed landfill design would incorporate a composite geosynthetic liner system that meets performance standards for liner impermeability (e.g., $1x10^{-7}$ centimeters per second). The landfill design would reduce groundwater impacts by including a storm water management system, a leachate collection systems, a composite geosynthetic cap system and a groundwater monitoring program. BMPs would be used to control sediment infiltration from storm water runoff during all construction phases of the project.

The inclusion of these design components is anticipated to have a positive effect on the groundwater quality since they serve to limit leachate and stormwater runoff from within the limit of waste. Through the use of BMPs and adherence to design requirements, impacts to groundwater from the proposed action are expected to be positive.

3.4.3.2.4 Summary of Environmental Consequences of Alternative B

Based on the analysis summarized above, impacts to groundwater associated with this alternative would be short-term and minor with the potential for long-term beneficial impacts. Impacts to groundwater associated with implementation of Alternative B are summarized in Table 3-4.

Table 3-4. Summary of Impacts to Groundwater – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Construction and Operation	Minor and temporary, potential risk to groundwater minimized with BMPs. Minor beneficial impact due to reduction in water use, reducing the potential for movement of constituents from surface water systems (sluice trenches and impoundments) to groundwater.
Ash Impoundment Closure	Dewatering coupled with reduction of hydraulic input and construction of low permeability cover system reduces hydraulic head and risk of migration of constituents to groundwater.	Considerable beneficial impact. TVA also committed to supplemental mitigative measures such as groundwater monitoring and corrective measures, as appropriate.
Landfill	Construction and operation.	Positive impacts to groundwater due to effective landfill liner design coupled with use of BMPs and adherence to landfill regulations.

3.4.3.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. CCR from PAF would be transported to an existing offsite permitted landfill, the Hopkins County Regional Landfill. Because this landfill is an existing permitted landfill, there would be no additional direct impacts to groundwater resources that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to groundwater are expected to occur with this alternative.

3.5 Geology

3.5.1 Affected Environment

Stratigraphy and Geologic Setting

PAF lies within the Shawnee Hills section of the Interior Low Plateau Physiographic Province in Northwestern Kentucky (University of Chicago, The Journal of Geology, Flint 1928). PAF is underlain by the Sturgis (formerly Lisman) (Kehn 1973) and Carbondale

Formations. The Sturgis Formation is described as interbedded sandstone, siltstone, shale, limestone and coal. This formation is largely concealed by loess, alluvium, and colluvium. In the area around the plant, this formation has largely been stripped by mining practices in order to reach the coal seams within the Carbondale formation. The Carbondale consists of cyclic sequences of fine-grained sandstone, sandy shale, coal, and silty underclay. The most extensively mined coal seams listed within this formation include the No. 9 and No. 11 seams (Stantec 2011). The No. 9 coal seam, the most prevalent in the Western Kentucky Coal Region, underlie most the PAF reservation prior to mining at the site. After stripping the overlying rock to extract the coal, the remaining overburden was placed back in the area as spoils which covers a large area around the plant. Alluvial deposits from the Green River underlie eastern portions of the plant near the Green River. Also, alluvium deposits underlie the areas across the river to the east of the plant (Kentucky Geological Survey [KGS] 2016).

3.5.1.1.1 Geologic Hazards

<u>Seismic Events</u>

The U.S. Geological Survey (USGS) information and geologic studies carried out by TVA indicate that the proposed site and surrounding area may be subject to minor seismic events. Seismic events affecting the central portion of western Kentucky, and thus the plant site, primarily emanate from two zones of earthquake activity – the New Madrid Seismic Zone of the central Mississippi Valley and the Wabash Valley Seismic Zone located along the border between Illinois and southwestern Indiana. Although the majority of the events emanating from these zones are too small to be felt at the surface, the Wabash Valley Seismic Zone has produced three earthquakes within the last 20 years with magnitudes of 5 or greater and the New Madrid Seismic Zone produced a series of four earthquakes between December 1811 and early February 1812 each exhibiting estimated magnitudes on the order of 7.0 to 8.0 (Stantec 2009).

Pursuant to the Code of Federal Regulations (CFR) Title 40 Part 257: Criteria for Municipal Solid Waste Landfills, Seismic impact zone means an area with a 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 gravitational pull (g) in 250 years. According to USGS maps PAF is located in an area where the expected Peak Ground Acceleration, is 0.16 g to 0.18 g (TVA 2016a). Therefore, site specific analysis of the potential for exceedance, based on subsurface conditions would be conducted and the landfill would be designed to meet the requirements to designated Seismic Site Class D, as defined in the ASCE Standard “Minimum Design Loads for Buildings and Other Structures”.

<u>Faults</u>

PAF is located between two subparallel, east-northeast trending fault systems: the Pennyrile fault system, located about 3 miles southeast of the plant site, and the Rough Creek fault system, situated approximately 17 miles northwest of the site. Based on a review of the USGS website which contains information on faults and associated folds in the United States that are believed to be sources of M>6 earthquakes during the Quaternary Period (the past 1,600,000 years including Holocene Epoch), there are no known faults of this age located within the vicinity of PAF. Despite the presence of major fault systems in the region, no evidence of significant faulting has been observed at the plant site (TVA 2003).

TVA has evaluated the static stability of all impoundments at existing coal-fired facilities. Where necessary, TVA has implemented recommendations to improve stability, and as a result, dike stability for all impoundments at PAF have been found to meet minimum safety factors under static conditions (USEPA 2016b). TVA is also currently investigating seismic stability for all of its ash impoundments. Any identified deficiencies or unacceptable seismic risks at existing ash impoundments at PAF will be addressed through appropriate mitigative measures that may include rock toe, soil berm construction, and concrete/steel pile installation, or other measures, as appropriate.

Karst Topography

"Karst" refers to a type of topography that is formed when rocks with a high carbonate (CO_3) content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs and underground drainage systems. Karst topography forms in areas where limestone and dolomite are near the surface. Muhlenberg County and the counties surrounding the project site are located in an area identified by the KGS as having no potential for karst (KGS 2016). Karst features such as sinkholes and springs are not known to occur within the PAF property or surrounding areas.

Mining

Extensive underground and strip mining operations across the area occurred from the 1960s through the 1980s, which significantly altered the topography and unconsolidated subsurface materials within the vicinity of PAF. As such, large areas of the property are underlain by deep mines and strip mine spoil deposits consisting of a heterogeneous mix of excavated soil, coal, shale, and sandstone bedrock materials. As a result of geotechnical exploration within the boundaries of PAF. It was determined that deep mine works have the potential to cause subsidence issues within some areas within the plant boundaries. However, engineering design measures may be taken to mitigate potential subsidence in those areas affected by deep mining (Stantec 2013).

Extensive strip mining operations have significantly altered the topography and geology within the vicinity of the plant and, as such, large areas of the property are underlain by deep mine spoil deposits. The main plant and surrounding area are built on fill and are primarily flat. Elevations on the PAF property range from less than 400 feet above mean sea level (msl) to over 550 feet msl near the top of the gypsum disposal complex

3.5.1.1.2 Soils

According to the Natural Resources Conservation Service web soil survey (NRCS 2016), most of the soils on PAF are mapped as dumps and Udorthents (fill material). Unconsolidated overburden materials overlying bedrock include alluvial and residual soils and strip mine spoil. Past coal mining in upland areas has left the western half of the site covered by up to 100 feet of mine spoil consisting of a heterogeneous mixture of clay, silt, sand, coal, and rock fragments having dimensions of up to several feet in diameter. Quaternary alluvial clay and silt deposits averaging 19 feet in thickness mantle the Green River floodplain along the eastern boundary of the site. Unmined areas above approximate elevation 395 feet msl are generally underlain by older terrace alluvium and/or by residual soils derived from weathering of the underlying bedrock (TVA 2003).

3.5.2 Environmental Consequence

3.5.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations, and no work would be conducted that could result in excavation of soils or geological resources. Project-related environmental conditions in the project area with respect to geology are not expected to change. Additionally, under the No Action Alternative, TVA would ensure that all impoundment dikes would be stable under static and seismic conditions and meet appropriate safety factors. Thus, continued operations at PAF under the No Action Alternative would not be expected to result in reduced safety under either static or seismic conditions.

3.5.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.5.2.2.1 CCR Dewatering and Handling Projects

3.5.2.2.1.1 Construction Impacts

The proposed dewatering facilities would be constructed on a site that is heavily disturbed and comprised of fill material. Site excavation and foundation construction is expected to be limited to this horizon and not expected to disrupt bedrock geology.

3.5.2.2.1.2 Operational Impacts

Operational impacts would be associated with the potential effect of earthquakes on the proposed dewatering operations. TVA would consider earthquake loads (and the secondary effects of strong ground shaking) as part of the design of new facilities at the project site. These design considerations are expected to mitigate the potential seismic risk of impact to the proposed facilities and associated structures. Therefore, no notable seismic impacts are expected to occur from dewatering facility construction and operation.

3.5.2.2.2 Ash Impoundment Closure

As identified in the PEIS, impoundments would be dewatered to allow for consolidation of CCR materials and the installation of a low permeability closure system. Structural integrity criteria for existing CCR surface impoundments (EPA 2015b, Section 257.73(e) of the Rule), establish guidelines for conducting initial and periodic static, seismic, and liquefaction safety factor assessments. Impoundment dikes would be assessed to ensure they meet guidelines requiring stability under static and seismic conditions.

Closure of the impoundments would incorporate a large amount of fill material and soil material. Proposed closure plans entail re-utilization of CCR as fill material to construct design grades prior to the installation of the final cover system. CCR from the Gypsum Disposal Area and Slag Impoundments can be reused for fill in the Peabody Ash Impoundment. If needed, additional borrow material would be obtained from the South Spoils Area or the proposed borrow site located adjacent to PAF.

Specific conditions of the ash impoundments at PAF fall within the parameters of the impact analysis presented in the Final PEIS. Impacts from ash impoundment closure at PAF are, therefore, expected to be positive as both the static and seismic factors of safety would be increased by dewatering the impoundments under this alternative.

3.5.2.2.3 Landfill

3.5.2.2.3.1 Construction Impacts

Construction of the proposed landfill would involve ground disturbing activities that would include grubbing, grading, and excavation. Excavation activities are anticipated across the majority of the landfill footprint to reduce the higher elevation areas across the site. Excavations are anticipated to extend less than 1 foot to more than 50 feet, with an average excavation near 22 feet. As described above, geology of the proposed site is composed of deep mines and strip mine spoil deposits. Proposed excavation is expected to be limited to the mine spoils and not expected to disrupt bedrock geology or the mines underlying the bedrock. Removal of vegetation, grading and construction activities have the potential to disturb soil stability and increase erosion. Despite this, impacts to soil resources associated with surface disturbances related to the proposed construction, excavation, blasting, clearing and grubbing activities are expected to be minor, as BMPs outlined in the Storm Water Pollution Prevention Plan (SWPPP) designed to minimize erosion during land clearing and site preparation would be implemented.

Per 401 KAR 45:130 Section 1(2), a landfill must be located outside the zone of collapse and critical angle of draw of underlying deep mine workings unless an engineering demonstration can be made concerning the stability of the underground mines and/or backfilling of the underground mines prior to conventional landfill development at the PAF facility. TVA is currently conducting a deep mine investigation at the proposed landfill site to ensure that the landfill is properly designed and would not be vulnerable to subsurface voids/subsidence. As noted in Table 2-4, TVA anticipates that the stability of the existing underground mines would need to be bolstered to manage the ultimate load of the proposed landfill. This would be accomplished by either the placement of fill material in select areas of the mine to create load-bearing pillars or by large-scale filling of the mine. The final design recommendations would be developed based on the continued analysis of the stability of the existing underground mines and would be adjusted based on field performance at the time of construction.

Onsite and local geologic and geomorphic features within and around the proposed landfill's footprint were evaluated during the screening level geotechnical investigation of the proposed landfill site. The geotechnical exploration did not encounter any onsite features that would prohibit development of a landfill for CCR storage. As identified in the report, the design of the landfill would address soils and materials susceptible to liquefaction, deep mine subsidence and evaluation, soil strength and slope stability, differential settlement potential, and fill material selection and compaction requirements. These design considerations are expected to minimize any effects on geological and soil resources.

3.5.2.2.3.2 Operational Impacts

There are two general categories of earthquake hazards that may impact operation of the landfill: primary and secondary. Primary hazards include fault ground rupture and strong ground shaking. If an earthquake is larger than about magnitude 5.5, ground rupture may occur on the fault. The amount of displacement generally increases with the magnitude of the earthquake. Structures located on a fault, can be displaced or damaged by fault ground rupture. The best mitigation for potential fault ground rupture to structures is to accurately locate the fault and set back structures a safe distance from the fault. Where structures and other facilities cannot be located to avoid faults, there are several geotechnical and structural design measures that can be implemented to mitigate the potential for fault ground rupture.

Secondary hazards include liquefaction/lateral spreading, landsliding, and ground settlement. Liquefaction is essentially loss of strength in generally granular, saturated materials including alluvial and fluvial deposits subjected to ground shaking. Liquefaction can result in ground settlement, and where there is a free face such as river bank, can result in ground spreading toward the free face. Liquefaction can damage foundations, pavement, and pipelines and underground utilities. Such effects, however, can be mitigated by various geotechnical and structural design measures including ground improvements and foundation design. Earthquake-induced landsliding can occur where landslides are present or where colluvial deposits or unstable materials are present on slopes. Potential landslides can be mitigated, if present, with adequate siting and with various geotechnical and structural design measures. Ground settlement can occur in soft, weak materials, including non-engineered fill, due to ground shaking, and can be mitigated, by various geotechnical and structural design measures, including ground improvements and adequate foundation design.

The potential for surface fault rupture at the proposed landfill site is considered to be low as there are no known faults located within 200 feet of the proposed landfill site, and no evidence of significant faulting has been observed at the plant site.

PAF is located in an area where the expected Peak Ground Acceleration is 0.16 g to 0.18 g. Consequently, the disposal facility has been designed to withstand a probabilistic earthquake. The constructed components are expected to mitigate the potential seismic impact to the landfill as a whole.

3.5.2.3 Summary of Environmental Consequences of Alternative B

Impacts associated with geological resources with the implementation of Alternative B are summarized in Table 3-5. Impacts associated with geological resources would be minor and mitigated by appropriate design measures.

Table 3-5. Summary of Impacts to Geological Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Construction impacts associated with ground disturbance and foundation construction.	Minor, minimized through implementation of BMPS outlined in the SWPPP.
	Operational impacts related to potential seismic hazard.	Minor. Mitigated by appropriate design.
Ash Impoundment Closure	Static and seismic factor of safety would be met for all dewatered impoundments under this alternative.	No impact or risk of failure.
Landfill	Construction related impacts would be related to ground disturbing activities and stabilization of existing underground mines.	Minor. Mitigated with proper design and construction.
	Operational impacts are related to primary and secondary earthquake hazards.	

3.5.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. CCR from PAF would be transported to an existing offsite permitted landfill, the Hopkins County Regional Landfill. Because this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative. There would be no impacts to geological resources associated with landfill construction.

The haul route to the Hopkins County Regional Landfill would utilize existing roads which are already subjected to vehicular traffic and, therefore, the transport of CCR would not have an impact on geological conditions.

3.6 Surface Water

3.6.1 Affected Environment

3.6.1.1 Surface Water – Green River

PAF is drained by permitted storm water outfalls, wet weather conveyances, red water ditches (which ultimately flow to either the slag impoundment or the Peabody Ash Impoundment), the condenser cooling water discharge (Outfall 005), and process and storm water discharges from the Peabody Ash Impoundment (Outfall 001) and slag impoundment system (Outfall 002). The plant intake for Units 1 and 2 is located at approximate Green River Mile (GRM) 100.6 and the intake for Unit 3 is located at GRM 100.3. The plant intakes water for cooling and process purposes (USACE 2011a).

The Green River basin contains approximately one-fourth of Kentucky's land area and is the largest drainage basin in the state with a total of 18,858 acres (KDEP 2014). Reservoirs have been constructed by the USACE on the Rough, Nolin, and Barren rivers, as well as on the main stem of the Green River in the upper basin. Major sources of stream contamination in the upper basin are agriculture (sediment, nutrients, and pesticides); mining or drilling (chlorides); onsite and municipal wastewater-treatment systems (decomposable organic matter, nutrients, and bacteria); and urban storm water runoff (metals, nutrients, and sediment). The high values possibly were due to agricultural and urban runoff and municipal wastewater discharges (TVA 1995).

Overall, water quality is good in the Green River Basin. However, two segments of the Green River and the entire 8,210-acre Green River Reservoir are listed on the state 303(d) report as impaired, and only partially support their designated uses. The 303(d)-listed Green River sites are upstream of the project site. No Nationwide Rivers Inventory streams or Wild and Scenic Rivers are near the proposed action. Jacobs Creek and the portion of the Green River adjacent to PAF are currently not assessed for water quality by the state of Kentucky.

3.6.1.2 Onsite Surface Water Features

Jurisdictional streams and wetlands were delineated within the project areas in November 2016 (AECOM 2016). The field survey of the site documented one ephemeral stream (total linear footage of 437.8) within the South Spoil Area and two storm water ditches (total linear footage of 3,095) on the proposed landfill site (Figure 3-1). Stream flow data were not available for the unnamed stream. All of the proposed landfill area has been previously

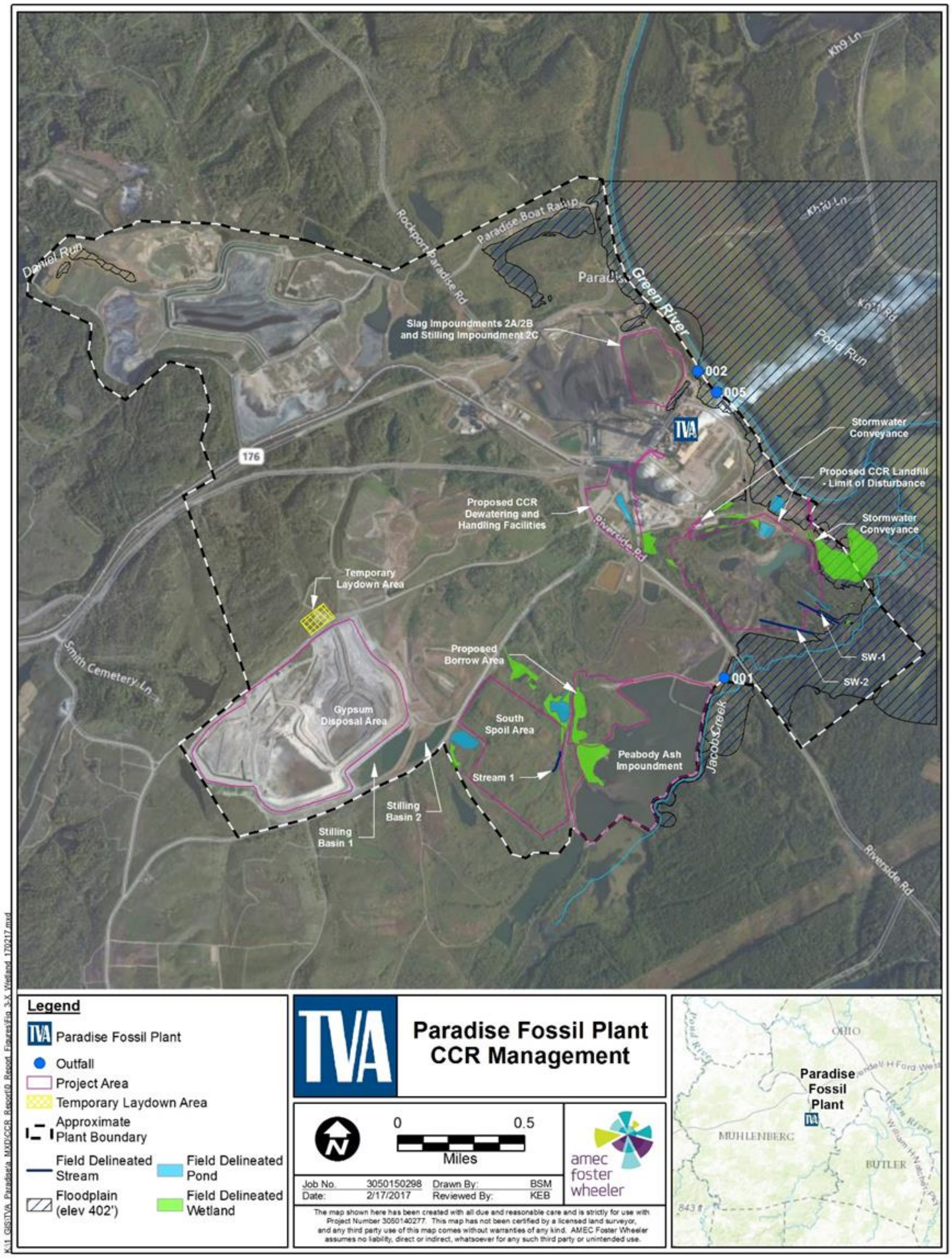

Figure 3-1. Surface Water Features of the PAF Project Areas

disturbed, originally by mining of coal and later by disposal impoundments or plant site activities. Drainage on the property flows generally to the east and south to Jacobs Creek. Several ponds resulting from prior mining activity are evident on aerial imagery within the proposed landfill site; these open water bodies previously had been drained and no longer exist.

3.6.2 Existing PAF Wastewater Streams

3.6.2.1 Condenser Cooling Water (CCW)

The largest wastewater discharge at PAF is the CCW whose average daily annual flow is approximately 306 MGD through Outfall 005. Because Unit 3 operates in closed cycle utilizing cooling towers, essentially all of the flow from Outfall 005 is condenser cooling water and miscellaneous equipment cooling water from Units 1 and 2. Unit 1 and Unit 2 actually generate an average daily flow of approximately 337 MGD, but part of that flow is recycled and used for ash sluice water and other processes and currently discharged through Outfall 001 or Outfall 002.

3.6.2.2 Coal Combustion Residuals

The existing systems for handling CCR include several areas that receive and treat CCR wastewater streams, including Slag Impoundment 2A/2B, and Stilling Impoundment 2C; the Peabody Ash Impoundment and the Gypsum Disposal Area.

3.6.2.2.1 Slag or Bottom Ash

Slag or bottom ash collects in the bottom of the boiler. It is washed from the boiler bottoms with jets of water and sluiced to Slag Impoundment 2A where suspended solids are settled. As shown in Table 3-5, boiler ash sluice flow at PAF averages approximately 30 MGD. Much of the settled ash or slag is reclaimed by Harsco Mineral and beneficially reused in the production of roof singles. Precipitation runoff from the coal storage area drains to three separate impoundments. Impoundment 2A discharge flows through a culvert to Impoundment 2B for further settling. Impoundment 2B discharges into a stilling impoundment and the stilling impoundment discharges into the Green River through Outfall 002 (see Figure 3-1). Discharge from Outfall 002 has an average flow of approximately 28 MGD. A pump platform is located at the head of the Stilling Impoundment 2C which pumps an annual average of 17 MGD to the Peabody Ash Impoundment to aid in regulating total dissolved solids that discharge from the Peabody Ash Impoundment through Outfall 001. TVA is required under KPDES Permit No. KY0004201 to meet pH, total suspended solids, oil and grease, and acute toxicity limits on this discharge (TVA 2003).

The sluice from all three units at PAF makes up about 67 percent of the inflow to the slag impoundments system. It is estimated that approximately half of that flow or 15 MGD is from Unit 3. Station sumps for all three units plus Unit 1 and 2 dewatering sumps make up approximately 21 percent of the inflow. Approximately 17 MGD (38 percent) of the total flow is pumped to the Peabody Ash Impoundment. This leaves approximately 28 MGD to be discharged to the Green River through Outfall 002. These values are based on information gathered for the current KPDES permit application and represent average daily flows on an annualized basis, and would be reduced with the recent retirement of Units 1 and 2.

Table 3-6. Inflow Average Annual Daily Flow Sources to Slag Impoundments Prior to Retirement of Units 1 and 2 and Dewatering Projects

Source	Inflow to BAP (MGD)	Percent of Total Inflow (%)
Bottom ash sluice, Units 1, 2 and 3	29.638	66.71
Station Sumps, Units 1, 2 and 3	5.088	11.45
Units 1 and 2 Unwatering Sumps	4.421	9.95
Red Water Ditch #1 and #2	1.951	4.39
Ash Slurry Sump, Unit 3	1.162	2.62
Coal Yard Drainage	0.539	1.21
Unit 3 Ext. Area Sump	0.201	0.45
Miscellaneous Minor Streams	1.430	3.22
Total	**44.430**	**100**

Source: Flow schematic in 2016 permit renewal application for KPDES Permit KY0004201.

3.6.2.2.2 Fly Ash

About 8 percent of coal burned at PAF remains as ash, of which approximately 70 percent is slag/bottom ash and 30 percent is fly ash, but these ratios vary slightly. Approximately 436,377 dry tons of ash is wet-sluiced to either the slag or fly ash impoundments each year. Most of the fly ash from Units 1 and 2 (approximately 70,148 tons per year) is captured by the existing FGD system and is sluiced with the scrubber gypsum to the Gypsum Disposal Area. All of the fly ash from Unit 3 (approximately 38,947 tons per year) is sluiced to the Peabody Ash Impoundment at an average annual flow of approximately 11 MGD. Some ash is collected at the Selective Catalytic Reduction System (SCR) in ash hoppers and then sluiced to the Peabody Ash Impoundment (TVA 2003).

TVA is required under KPDES Permit No. KY0004201 to meet pH, total suspended solids, oil and grease, and chronic whole effluent toxicity limits on the Peabody Ash Impoundment discharge. The KPDES permit also requires monitoring for a series of total recoverable metals including antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc (KPDES 2004).

Three sources (slag/bottom ash basin, and fly ash and FGD sluicing) comprise almost 98 percent of the total in-flow to the Peabody Ash Impoundment. The Slag Impoundment flow averages almost 17 MGD which is approximately 50 percent of the total inflow to the Peabody Ash Impoundment. Fly Ash Sluice Water from Unit 3 and Air Preheater Hopper Wastewater from Units 1and 2 average almost 11 MGD (33 percent) and FGD flows average approximately 5 MGD (15 percent).

Precipitation/evaporation is approximately 1.6 percent of the total flow; chemical metal cleaning waste is 0.11 percent and all other sources make up only 0.038 percent. These values are based on information gathered for the current KPDES permit application and represent average daily flows on an annual basis.

The Peabody Ash Impoundment provides settling of suspended solids, ammonia removal, and limited metals precipitation before treated water flows to a stilling impoundment for further settling. Effluent (about 33 MGD) from the stilling impoundment is discharged into

Jacobs Creek through KPDES Outfall 001 (see Figure 3-1). Normal operating conditions can result in lower discharge flows in the range of 17 to 20 MGD. The pH of effluent discharged from the Peabody Ash Impoundment generally ranges from 6.0 to 9.0, however a CO_2 system is in place to provide pH control when needed to meet discharge limits. A numerical model, FLOWPATH, for determining subsurface discharges at the impoundment boundaries indicated that impoundment seepage entering Jacobs Creek is minute compared to the surface discharge to the creek (TVA 2003).

3.6.2.2.3 FGD Scrubber Gypsum Byproduct

PAF has installed SCRs on all three units and most fly ash removal for these units is performed by the FGD system for Units 1 and 2. FGD makeup water and the lime feed slurry are approximately 3.15 MGD of the FGD impoundment discharge of approximately 5 MGD.

When the gypsum concentration reaches about 15 percent, solution blowdown is initiated to maintain equilibrium. This blowdown stream is pumped to the Gypsum Disposal Area. The Gypsum Disposal Area consists of the main disposal unit with wet stacks for CCR materials, and two treatment settling impoundments identified as the Stilling Basin 1 and Stilling Basin 2 (see Figure 3-1). The stilling impoundments discharge to the Peabody Ash Impoundment through the FGD channel.

Some ammonia may slip through the SCRs. Most of the ammonia slip would be removed from the stack gases in the FGD scrubber for that unit and become part of the FGD scrubber gypsum/fly ash byproduct impoundment wastewater (TVA 2003). PAF performs monthly monitoring of ammonia in the intake, and slag impoundment and Peabody Ash Impoundment discharges under a monitoring plan required by KPDES Permit KY0004201. The ammonia levels ranged from below detection (<0.25 milligrams per liter [mg/L]) to 3.05 mg/L for Outfall 001 and ranged from <0.25 mg/L to 1.21 mg/L for the Outfall 002. Intake data, which would be assumed to be representative of the Green River, was generally below detection at <0.25 mg/L with one concentration above detection of 0.7 mg/L.

3.6.2.3 Other Surface Runoff

Plant site runoff is also regulated under the KPDES Permit KY0004201. Existing facilities and BMPs are used to ensure compliance with the permit conditions. Some plant runoff is directed through the Peabody Ash Impoundment and slag impoundment systems and then Outfalls 001 and 002 as discussed above, whereas other runoff is discharged through other permitted outfalls.

3.6.2.4 Sanitary Wastewater Treatment

Most sanitary wastewater at PAF is treated onsite in a small, extended aeration package plant that discharges as an internal outfall (Outfall 004) to Red Water Ditch #1. Red Water Ditch #1 then discharges to the slag impoundment system. Outfall 004 has limitations on carbonaceous biochemical oxygen demand and fecal coliform bacteria. The average annual flow from Outfall 004 is 0.02 MGD. During outages, an additional 100 workers may be onsite, and portable toilets are provided because of the distance to the permanent sanitary facilities. The wastewater from the portable toilets is pumped and hauled to a nearby municipal wastewater treatment facility.

3.6.2.5 Paradise Combined Cycle Plant

This combined cycle plant was added to the grid for a test run in late 2016 and is projected to begin commercial operation in 2017. The KPDES permit (KY011902) for this facility was effective on September 1, 2016. This facility is located on the total PAF site, but is not involved in the proposed projects.

3.6.3 Environmental Consequences

3.6.3.1 Alternative A – No Action Alternative

Under the No Action Alternative, there would be no change in the management of CCR at PAF. The existing wastewater streams would continue to be authorized under KPDES Permit KY0004201. However, retirement of Unit 1 and Unit 2 could potentially reduce flows and loadings for some wastewater streams. Discharges would continue to comply with all applicable permit limits and therefore, surface water quality adjacent to PAF should remain approximately the same. Thus, continued operations at PAF under the No Action Alternative would not be expected to cause any additional direct or indirect effects to local surface water resources.

3.6.3.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.6.3.2.1 Construction Impacts

Wastewaters generated during construction of the proposed projects may include construction-related storm water runoff, drainage of work areas, non-detergent equipment washings and dust control, hydrostatic test discharges and domestic sewage.

Soil disturbances associated with construction activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and impact aquatic life. TVA would comply with all appropriate state and federal permit requirements. Construction activities would be located on the plant property that already supports heavy industrial uses. Appropriate BMPs would be detailed in a project-specific BMP Plan based on requirements from the Kentucky General Construction Storm Water Permit and the Kentucky Erosion Prevention and Sediment Control Field Guide. All proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized.

Landfill construction activities could include, but are not limited to, the clearing and grading of the project site and grading of new separate storm water and leachate impoundments; the installation of the landfill facility (including liner and leachate collection fields) and the installation of a forced main to pump leachate to its discharge outfall.

A total of 1.8 acres of wetland would be impacted by the proposed projects. These impacts are discussed in detail in Section 3.12. A field survey conducted in November 2016 identified two storm water ditches in the landfill project area and one ephemeral stream located in the South Spoil area (AECOM 2016). The stream has been determined to be potentially jurisdictional and, therefore, filling of the ephemeral stream in the South Spoil Area would require a state water quality certification under Section 401 of the CWA and federal permits under Section 404. The terms and conditions of these permits would likely require mitigation from these proposed activities. The storm water ditches discharge storm water via Outfall 016. According to the preliminary jurisdictional determination conducted by the USACE, these features were considered to be non-jurisdictional upland ditches.

All borrow material is expected to be obtained from two areas identified on site, the South Spoil Area and an additional 37-acre area identified adjacent to the Peabody Ash Impoundment (see Figure 3-1). The onsite KPDES BMP Plan would cover any needed BMPs that would be required to ensure that no adverse impacts to surface water would be expected from the use of these borrow areas.

Equipment washing and dust control discharges would be handled in accordance with BMPs described in the BMP Plan required by the site's KPDES permit to minimize construction impacts to surface waters. Onsite hydrostatic testing would have the option to use potable or surface waters and would be covered under the current permit as well. Sanitary wastes generated during construction activities would be collected by the existing sewage treatment system, onsite septic system(s) or by means of portable toilets.

With the implementation of appropriate BMPs, only temporary minor, impacts to surrounding surface waters would be expected from construction activities.

3.6.3.2.2 Operational Impacts

3.6.3.2.2.1 PAF Surface Water Withdrawal and Discharge Rates

PAF Unit 3 operates in closed cycle cooling mode only. However, there would be a discharge of Unit 3 cooling tower blowdown, which is currently used for ash sluicing. With the conversion to dry handling of fly ash and the future dewatering and possible recirculation of bottom ash sluice, there would likely need to be a future new outfall for cooling tower blowdown, which would require a modification of PAF's KPDES permit.

The projects detailed, with the implementation of Alternative B, would yield positive surface water impacts with the reduction of both intake demand for surface withdrawals and the reduction in loading to surface water discharged from the facility.

3.6.3.2.2.2 Dewatering Projects

Gypsum Dewatering Facility Operational Impacts

The gypsum dewatering system is designed to process a total gypsum slurry flow rate of 80 tons per hour from the FGD system. The resulting annual throughput would be approximately 166,400 tons per year. Gypsum blowdown slurry would be routed from the absorber to the new dewatering facility. The maximum flowrate from the Unit 3 FGD absorber would be approximately 1,166 gpm at approximately 25 percent solids by weight. This slurry would be conveyed via pipelines from the absorber bleed pumps and would be routed to the dewatering facility.

Discharge waste water from the gypsum dewatering system would initially be routed to clarifiers for further treatment before being discharged to the equalization basin and would ultimately be discharged through Outfall 002. The normal discharge rate from the dewatering facility would average approximately 1,000 gpm for 24 hours a day, seven days a week (approximately 1.44 MGD). This flow rate could possibly range up to 1,400 gpm. The facility would run 24 hours a day and seven days a week under normal operation. This would be a reduction of approximately 3.07 MGD from the current flow from all three units.

The process wastewater or blowdown from the proposed gypsum dewatering system would be treated in clarifiers, thickeners and a filter press and routed to the equalization basin prior to discharge to the Green River via Outfall 002. The equalization basin would be designed and operated to ensure compliance with permit limits. In addition, there would be no discharge of any visible scum, floating materials, or objectionable color contrast, nor a significant discharge of total suspended solids.

There would be outage washes associated with the Gypsum Dewatering Facility. These washes would include the discharge of diluted gypsum slurry from the FGD during outages, which would be treated and then discharged to the equalization basin and ultimately from Outfall 002.

More details about these flows and other minor miscellaneous flows are described in a Technical Memorandum prepared to describe surface water impacts of this project (Appendix C).

Dry Fly Ash Conversion Operational Impacts

Conversion to a dry fly ash handling system would reduce existing water needs for PAF by approximately 11 MGD from approximately 33 MGD to approximately 22 MGD. This Outfall 001 discharge flow would be ultimately reduced even further with the retirement of Units 1 and 2, resulting in an estimated discharge of approximately 19 MGD. Changing the volumes of ash impoundment sources could affect the assimilative capacity currently used for treating storm water, air pre-heater washes, low volume waste streams, and station sump discharges. Certain process water flows (e.g., sumps) would be rerouted to the proposed equalization basin prior to closure of the Peabody Ash Impoundment. Stormwater and non-process water flows from the closed Peabody Ash Impoundment would continue to be discharged through Outfall 001.

No discharge flows would be expected from the dry fly ash system except for non-contact storm water. Metals and other constituents that are currently leached from fly ash during the wet sluicing process would no longer be leached from this waste stream, except for a low level storm water contact flow and low level leachate waste stream that is described in the Gypsum Dewatering Facility and onsite landfill operational impacts. These impacts would be representative for all CCR waste streams stored in this onsite facility. Literature suggests that arsenic, boron, chloride, fluoride, sulfur, and selenium are concentrated on the surface of fly ash at higher levels than in bottom ash (TVA 2010); therefore, loadings of these constituents would be reduced when fly ash is no longer sluiced. Removal of fly ash from the wet ash handling system could reduce the mass loading of pollutants to the ash impoundment by as much as 80 percent (TVA 2010). Under current operations, the change to dry ash handling would, therefore, substantially reduce the mass of metals presently discharged to Jacobs Creek and ultimately the Green River. Please see the PAF CCR EA Technical Memorandum for details (Appendix C).

There are no outage washes associated with the dry fly ash pneumatic handling system, however, air preheater outage washes would still take place as needed. These washes would be discharged to the equalization basin or a treatment system as needed prior to discharge through a permitted outfall.

Reductions in Metals Loadings from Proposed Dewatering Projects

Currently, any discharges from the Peabody Ash Impoundment and the Gypsum Disposal Area leave the facility through Outfall 001. The dewatering projects would change the dynamics of the ash impoundment by eliminating ash transport water and decreasing FGD discharges that would be treated by the ash impoundment. Conversion of the Slag Impoundment 2A/2B and Stilling Impoundment 2C to equalization basin(s) would be used to handle future process water flow. The equalization basin(s) would be designed and operated to ensure compliance with all KPDES permit limits. However, as design is still preliminary, discharges from the equalization basin would be further evaluated in a subsequent NEPA review.

The Peabody Ash Impoundment discharge flow is currently approximately 33 MGD and the Slag Impoundments discharge is approximately 44 MGD. Once the ash and gypsum dewatering/pneumatic implementation takes place, the remaining flows would be routed to the new equalization basin(s). The estimated flows from Outfall 001 that would remain after implementation of the above evaluated dewatering/dry handling projects would be approximately 19 MGD. The post-conversion flows sources are displayed in Table 3-7. In order to evaluate and characterize the changes that would occur once this reduction in specific waste streams takes place, each waste water's stream flow and chemical composition were evaluated. Additional detail regarding this evaluation is included in the technical memorandum in Appendix C.

Table 3-7. Inflow Average Annual Daily Flows Sources to Peabody Ash Pond – Post Dry Ash Conversion and Gypsum Dewatering

Source	Inflow to Ash Impoundment (MGD)
Bottom Ash Impoundment Outfall 002	16.85
Fly Ash Sluice Water U3 and Air Preheater Hopper Wastewater U1 and 2	0
FGD Impoundments	1.906
Chemical Metal Cleaning Waste	0.0183
Precipitation-Evaporation	0.5262
Miscellaneous Minor streams	0.0128
Total	**19.31**

Source: Flow schematic in 2016 for KPDES Permit application KY0004201

Please note all streams that are storm water driven are denoted in average annual daily flows; however, a storm event can produce flows greater than these amounts in a 24-hour period.

Ancillary streams flow into these major streams, but are not mentioned in this table.

The future wastewater evaluation showed a reduction in loading for future operations (i.e., following the gypsum dewatering and fly ash dry handling). Although the majority of concentrations would be expected to decrease with the removal of the fly ash sluice and the reduction of the gypsum waste streams, this project is not expected to remove all concentrations of the constituents evaluated. The analysis indicates that the future dewatering and dry handling operations would have a long-term positive impact to surface water quality due to reduction in mass loading of constituents. Discharges from the equalization basin and Outfall 002 would meet KPDES permit limits and thereby comply with Kentucky water quality standards.

3.6.3.2.2.3 Ash Impoundment Closures

As identified in the Programmatic EIS (TVA 2016a), closure in place minimizes surface water flow which enhances stability of the berms due to a reduction of hydraulic inputs. As all work would be done in compliance with applicable regulations, permits and BMPs, potential impacts of this alternative to surface water would be negligible.

The KDOW has stated that requirements for dewatering CCR impoundments will be included in KPDES permits to ensure these actions are performed in a manner protective of water quality. These requirements would likely include accelerated monitoring for solids, metals, and whole effluent toxicity. In addition, permittees, including TVA, have been asked to submit updated applications with discussions of planned CCR impoundment removal activities and updated BMP plans related to CCR impoundment dewatering. KDOW plans to reissue the KPDES permit for PAF no later than July 2018. For any dewatering performed during the interim, KDOW would issue a supplemental letter.

The main operational change that would take place with the closure of the impoundments at PAF is the change in management of the onsite storm water and process waste water that is currently treated. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be closed and converted to equalization basin(s) to treat flows before discharge through Outfall 002. The equalization basin(s) would be designed and operated to ensure compliance with all permit limits.

Existing outfall structures associated with the Peabody Ash Pond and Gypsum Disposal Area would be removed and replaced with new ditches and/or outfall structures as needed to manage the precipitation driven runoff from the closed impoundments, which should have much lower loadings of suspended solids, metals, and other constituents than current process wastewaters. Final drainage would be routed to existing or new discharge points and comply with the KPDES permit to ensure that no adverse impacts to surface waters would occur. Mitigation measures would be identified, as needed, to ensure the discharges meet permit limits which may or may not require a permit modification.

3.6.3.2.2.4 Landfill Operation

The CCR by-products that would be placed in the landfill are expected to potentially include fly ash, bottom ash, bottom ash rejects and dewatered wet FGD waste (gypsum). By-product generation and characterization would be dependent on the coal source and other operational factors such as ammonia slip from the SCRs. Therefore, a maximum design coal blend for design, construction, and environmental evaluation has been determined. The design coal for the CCR landfill considerations would be based on the current 100 percent Illinois basin blend.

The wastewater streams, which could change substantively under this alternative are:

- The addition of the landfill leachate stream and storm water run-off.
- Non-contact surface runoff from the proposed landfill drainage area.

Details of the CCR by-product evaluation are in the PAF CCR EA Technical Memorandum. (Appendix C). The estimated average daily leachate flow from the proposed landfill could be approximately 0.051 MGD with a maximum peak flow of 0.186 MGD (AECOM 2016b). The non-contact storm water run-off, based on the design storm of 24-hour and 25-year event could be expected to have peak flows of 9.5 MGD for the East Impoundment and

8.5 MGD for the West Impoundment and an estimated daily flow of 0.04 MGD from both storm water impoundments. Since storm water flows from the site would be discharged from storm water outfalls 013, 014, and 015, the flow volumes would potentially be equivalent; however, the leachate and landfill contact run-off streams could have the potential to be a higher-concentration low flow stream which is expected to be alkaline in nature with the potential for higher metals and ammonia levels than non-contact storm water. It is assumed that the leachate and storm water flows would co-mingle in the conveyance to the permitted outfall.

<u>Onsite Landfill Leachate and Run-off</u>
This proposed landfill system would have a liner system and a leachate collection system. The leachate would be discharged via an existing modified outfall or a new outfall. Ammonia concentrations in the landfilled materials would be dependent on SCR process and plant specifics. To limit ammonia loads from the dry fly ash stack, the amount of CCR exposed would be restricted to 10 acres or less. The by-product disposal landfill was evaluated for potential impacts associated with metals in-stream loading. Details of the proposed landfill leachate and runoff are in the technical memorandum (Appendix C).

The leachate would be treated as required to meet all applicable KPDES permit requirements and in-stream water quality standards, therefore potential impacts to surface water would be expected to be minor.

<u>Metals Loading</u>
The concentration of metals in the Green River after receiving discharges from the proposed landfill was evaluated. Details of the metals loading evaluation are in the technical memorandum (Appendix C).

The evaluation showed that added loadings from the leachate collection system discharge and the combined storm water from the storm water ponds would be unlikely to increase the metals concentrations at the Green River at or near the location where this stream would discharge. Additionally, the concentrations would not exceed KPDES water quality standards, with the possible exception of cadmium. The highest, most conservative estimated cadmium concentration in the Green River would be 0.0005 mg/l while the most stringent water quality criteria for cadmium is 0.0003 mg/l. However, this analysis represents the estimated maximum discharges from this site, since the leachate flow used would be the peak flow during Phase III of the landfill operation, and also uses the low 7Q10 river flow. In addition, water quality standards are typically applied as an in-stream concentration after mixing which would be expected to be lower than the most stringent water quality criteria. Therefore, actual instream exceedances are not expected to occur based on this discharge.

Even after accounting for the impacts of the landfill leachate, the impacts after mixing with the Green River would be minor. Additionally, TVA would conduct a characterization of the leachate and run-off streams and monitor altered Outfall 001 discharges to ensure that concentrations of metals and other parameters adhere to permit limits and do not adversely impact water quality of the surrounding surface waters. If determined to be necessary, appropriate mitigative measures would be evaluated and implemented to ensure that the KPDES permit discharge requirements for the water quality parameters would be met.

3.6.3.3 Summary of Environmental Consequences of Alternative B

Impacts to surface water associated with the implementation of Alternative B are summarized in Table 3-8. Impacts to surrounding surface water would be minor and mitigated through adherence to permit requirements and BMPs.

Table 3-8. Summary of Impacts to Surface Water Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities Ash Impoundment Closure Landfill	Construction impacts associated with ground disturbance and filling 437.8 feet of ephemeral stream.	Minor; minimized through implementation of BMPS. Impacts to surface water features onsite would be mitigated as a result of adherence to permit and BMP requirements.
CCR Dewatering and Handling Facilities	Operational impacts related to reduced water usage and reduction in mass loading of constituents.	Beneficial impact.
Ash Impoundment Closure	The equalization basin would be used to manage onsite storm water and process water flows.	Minor impact. All discharges would comply with current or potential KPDES permit measures and other state and federal regulations. With appropriate BMPs, the impact due to impoundment dewatering should be minor and temporary.
Landfill	Collection of landfill leachate and collection of contact and noncontact storm water runoff.	Minor. Leachate and storm water flow would meet all applicable KPDES permit requirements.

3.6.3.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closures would be the same as identified under Alternative B. Minor impacts associated with construction and operation of the onsite landfill would not occur as CCR produced by PAF would be transported to an existing offsite permitted landfill. It is assumed the pre-existing landfill would have necessary permits that would be protective of water quality. Because this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative.

3.7 Floodplains

3.7.1 Affected Environment

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a 1 percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2 percent chance of flooding in any given year is normally called the 500-year floodplain.

Paradise Fossil Plant property is located adjacent to the Green River from miles 99.3 to 102.5, and adjacent to Jacobs Creek from its mouth to about creek mile 2.6. Slag Impoundment 2A/2B and Stilling Impoundment 2C are located adjacent to the Green River from miles 100.0 to 100.2. Peabody Ash Impoundment is located adjacent to Jacobs Creek miles 1.3 to 2.6. TVA property ends at about Jacobs Creek Mile 2.6.

The water surface profiles for the Green River in this area are provided on Panel 5P of the 2013 Muhlenberg County Flood Insurance Study (FIS). The 100- and 500-year flood elevations of the Green River where Impoundments 2A/2B and 2C are located at mile 100.2, as well as the location of the proposed CCR landfill and the remaining facilities along Jacobs Creek are presented in Table 3-9.

Table 3-9. Green River Flood Elevations

Return Period (years)	Elevation at Green River Mile 100.2 (feet NAVD 88)	Elevation at Green River Mile 102.0 and on Jacobs Creek (feet NAVD 88)
10	397.3	397.7
50	400.2	400.6
100	401.8	402.2
500	404.4	404.8

NAVD 88 = North American Vertical Datum of 1988
Source: FEMA 2013

The floodplain of Jacobs Creek is depicted as Zone A in the FIS, which means flood elevations on Jacobs Creek have not been determined. However, the Flood Insurance Rate Map (FIRM) also depicts the 100-year flood elevations on Jacobs Creek as being influenced by backwater from the Green River, up to about Jacobs Creek Mile 3.3 (Figure 3-2). Therefore, based on the 100- and 500-year flood elevations on the Green River at mile 102.0, the 100- and 500-year flood elevations on Jacobs Creek in the vicinity of Peabody Ash Impoundment and the proposed CCR landfill would be 402.2 and 404.8 feet, respectively.

The ash impoundment dike is listed on the National Inventory of Dams, and TVA maintains the dike in accordance with the Federal Guidelines for Dam Safety.

Discrepancies exist between the 2013 FIRM 100-year floodplain boundary (402-foot contour) and the 402-foot contour developed using 2012 Light Detection and Ranging (LiDAR) data of the PAF facility. Figure 3-3 illustrates the floodplain boundary based on the Green River 100-year flood elevation (402 feet NAVD). Two areas of principal deviation are the Peabody Impoundment Area and the proposed landfill area. The FIRM depicts Peabody Ash Impoundment within the 100-year floodplain of Jacobs Creek. However, the low crest of the Peabody Ash Impoundment containment dike is 408 feet, or approximately 6.0 feet higher than the 100-year flood elevation.

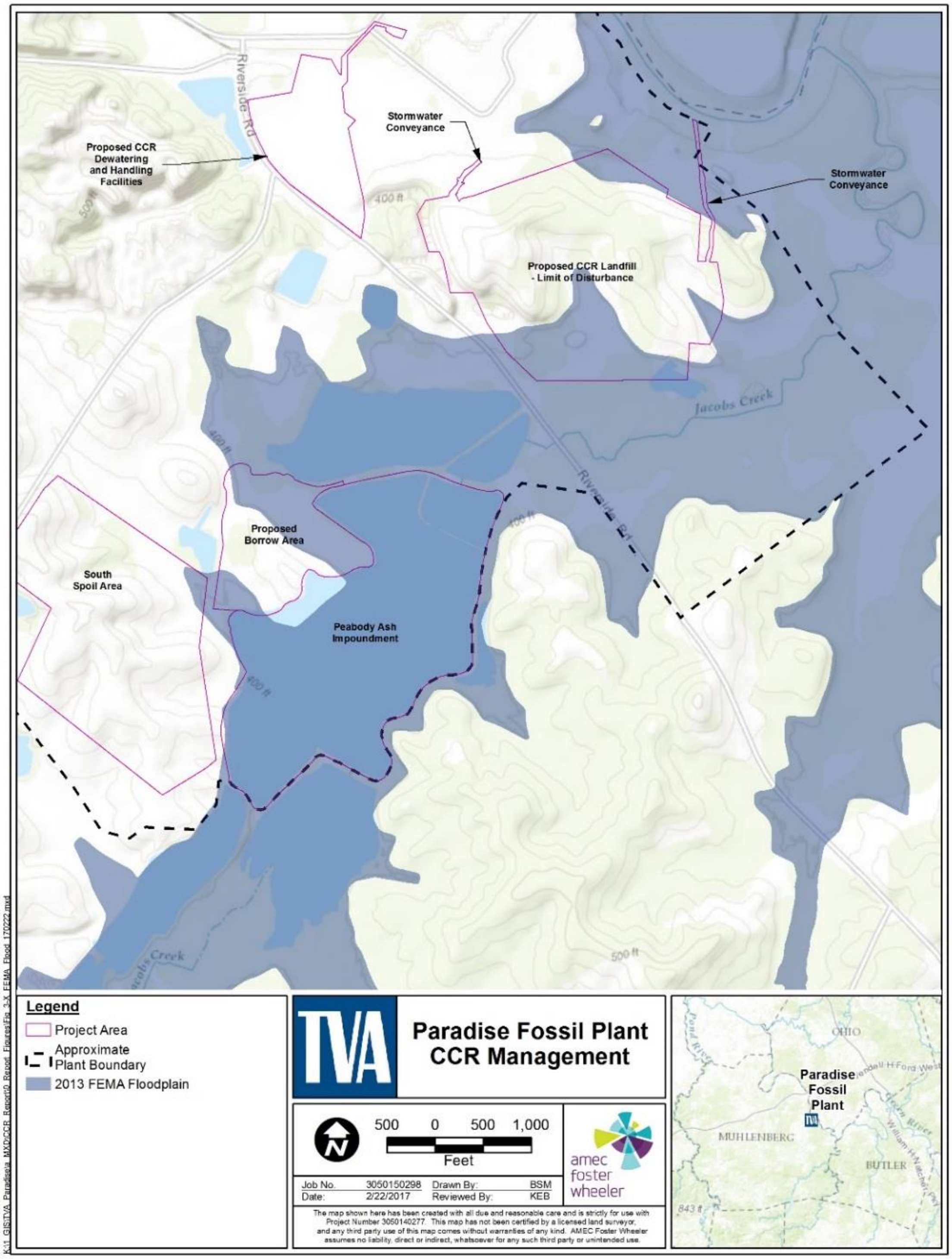

Figure 3-2. FEMA Mapped Floodplain at PAF

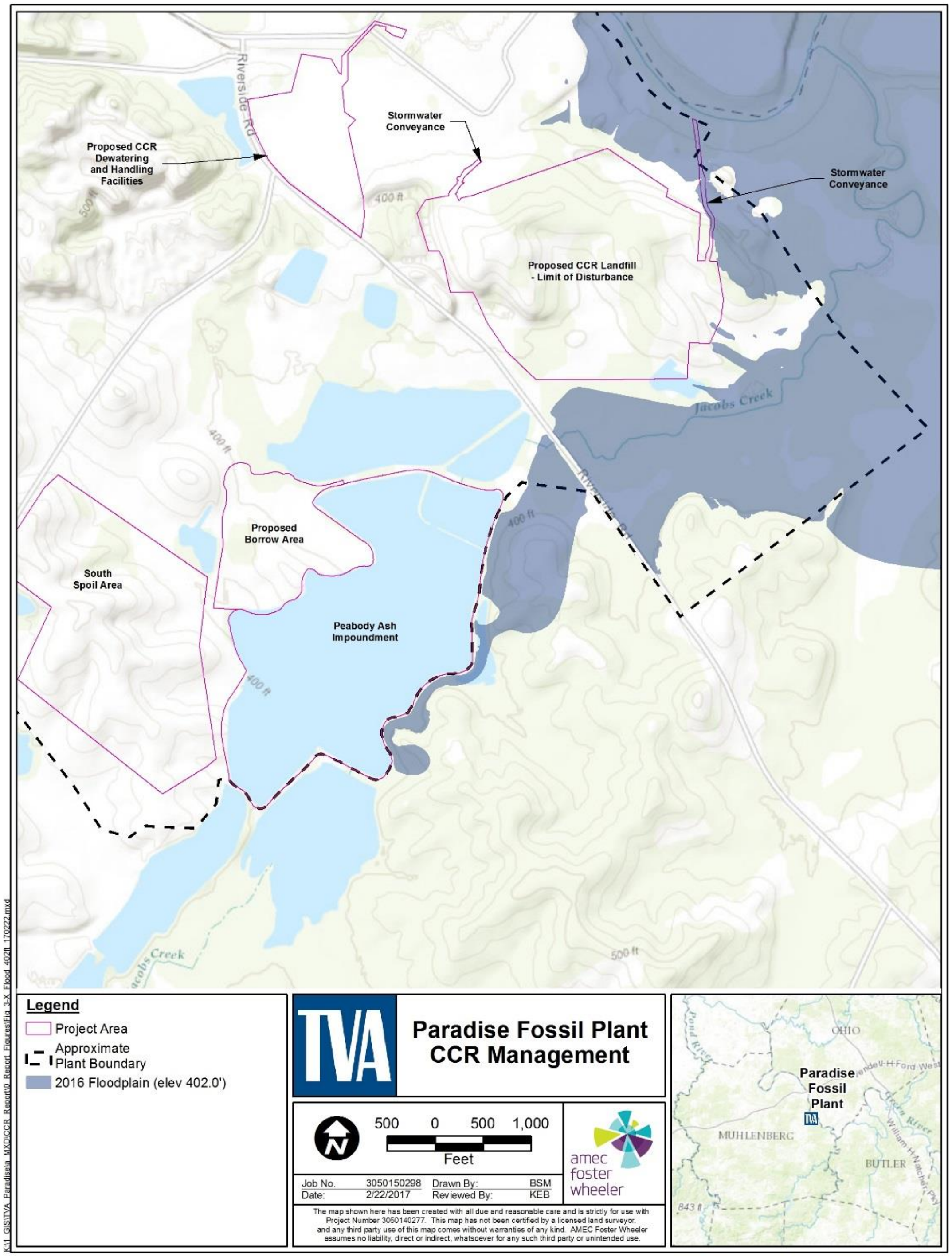

Figure 3-3. Floodplain Boundary at PAF based on 2012 LiDAR data.

The Commonwealth of Kentucky used a 10-meter Digital Elevation Model to develop floodplain boundaries in the current FIS. LiDAR collected by Kentucky in 2012 was not incorporated into the FIS (personal communication February 1, 2017). TVA would submit documentation to the Commonwealth of Kentucky to update the effective FIS and FIRMs based on current topography as well as to incorporate the proposed CCR landfill and future closed Peabody Ash Impoundment, as appropriate.

3.7.2 Environmental Consequences

It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of EO 11988 (Floodplain Management). The objective of the Executive Order is "…to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (EO 11988). The Executive Order is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

For certain "Critical Actions," the minimum floodplain of concern is the 500-year floodplain. "Critical actions include, but are not limited to, those which create or extend the useful life of structures or facilities: …(d) such as generating plants, and other principal points of utility lines" (44 CFR Chapter 1, Part 9.6, Floodplain Management and Protection of Wetlands, Definitions, last amended October 1, 1985). Therefore, the projects included within the proposed action would be considered "critical actions" as they are needed to facilitate the management of ash on a dry basis.

Muhlenberg County participates in the National Flood Insurance Program (NFIP), and any development must be consistent with these regulations.

3.7.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations, and no work would be conducted that would result in a change in floodplain conditions. Therefore, project-related environmental conditions in the project area with respect to floodplains are not expected to change.

3.7.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.7.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering facilities would be constructed at a location outside the 100-year floodplain and above the 500-year flood elevation 404.8. Therefore, there would be no impacts to floodplains with regard to the dewatering and CCR handling facilities.

3.7.2.2.2 Ash Impoundment Closure

Under Alternative B, primary construction activities would be located within the footprint of the existing impoundments and proposed borrow areas. Based on 2012 LiDAR data, these areas are located outside the 100-year floodplain and above elevation 402; therefore, there would be no impacts to floodplains. Final closure of the Peabody Ash Impoundment would involve relocating ash within approximately half of the existing footprint of the impoundment, to the other half of the Peabody impoundment. Following the relocation of ash as described above, a portion of the existing impoundment dike would be lowered to elevation 392 feet, or 10 feet below the 100-year flood elevation. This area would be used as a storm water basin (see the conceptual closure plan, Appendix B). As a result, this portion of the former ash impoundment would then be open to inundation during flood events on Jacobs Creek, thus potentially increasing the effective flood storage area of Jacobs Creek a small amount. Because the topography in the vicinity of Peabody Ash Impoundment would change, the FEMA FIRM would be updated with a LOMR.

3.7.2.2.3 Landfill Construction and Operation

Construction of the landfill would involve earthwork that would modify the topography within the footprint of the landfill facility, including construction of two stormwater system ponds and leachate lagoons followed by fill during operations. A portion of the landfill would be located within the 100- and 500-year floodplains as shown on the FIRM; however, based on 2012 LiDAR, the landfill would be located outside the 500-year floodplain and above the 500-year flood elevation, which would be consistent with EO 11988 for critical actions. The stormwater conveyance corridor from the East Stormwater Pond would extend into the floodplain and floodway of the Green River. Stormwater infrastructure would be considered a functionally dependent use of the floodplain that is acceptable provided that floodplain impacts are minimized. The conveyance system would be an excavated feature and there would be no net fill placed in the floodplain or floodway, thus there would be no encroachment within the floodway, which would be consistent with the NFIP and EO 11988. Adverse impacts would be minimized by adhering to standard BMPs associated with construction and maintenance requirements appropriate for stormwater ponds associated with CCR landfills.

3.7.2.3 Summary of Environmental Consequences of Alternative B

Changes to topography on the Paradise plant site would be documented with FEMA through completion of a LOMR. Based on current topographic conditions, all of the project areas would be located outside the 100- or 500-year floodplain, which would be consistent with EO 11988. Additionally, this alternative would result in an increase in the effective flood area along Jacobs Creek. Therefore, no adverse impacts to floodplains are expected.

Proposed laydown areas, haul roads and staging areas would also be outside 100-year floodplains, which would be consistent with EO 11988. Other than increasing the area open to inundation during flood events on Jacobs Creek by a small amount, there would be no permanent impacts to floodplains or floodplain resources due to construction and operation of the proposed CCR handling projects.

To minimize adverse impacts to floodplains, the following measures would be implemented:

1. BMPs would be used during construction activities.

2. The CCR landfill would be designed to withstand flooding up to a minimum elevation of the 500-year flood on the Green River, which is 405 feet (NAVD 88).

3. TVA would notify KDOW of the proposed project.

4. TVA would provide KDOW the opportunity to review and comment on the proposed project and this EA.

5. TVA would adhere to design, construction and maintenance requirements appropriate for stormwater ponds associated with CCR landfills.

6. TVA would submit documentation to update current and future site topography for both the CCR landfill and the Peabody Ash Impoundment, when appropriate.

3.7.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Floodplain impacts for Alternative C are the same as for Alternative B with the exception that the CCR landfill would not be constructed, which would be consistent with EO 11988.

By adhering to the mitigation measures listed above, the proposed construction of dewatering facilities, closure of three ash impoundments, and long-term management of CCRs under either Alternative B or Alternative C would be consistent with EO 11988; and would have no significant impact on floodplains

3.8 Vegetation

3.8.1 Affected Environment

PAF and surrounding areas are located within the Green River–Southern Wabash Lowland, a subregion of the Interior River Valleys and Hills Ecoregion (Woods et al. 2002), and the Shawnee Hills section of the Western Mixed Mesophytic Forest Region (TVA 2003). Bottomland forests and oak-hickory forests were once common in these regions. These communities are presently dominated by agriculture and have been affected by previous coal mining. Though limited, areas of old-growth forest as well as secondary forests remain in the region, but vary in composition in relation to topography and soil moisture conditions. These forests include representatives of oak-hickory, beech-dominated, and mixed mesophytic communities (TVA 2003).

The area in and around PAF has been heavily impacted and altered as a result of prior coal mining activities and the construction and operation of the facility. Extensive strip mining operations between 1960 and 1970 have significantly altered the natural vegetation within the vicinity of the plant. The vegetation within 5 miles surrounding PAF, and within the project areas for the dewatering facilities, ash impoundment closure areas and proposed landfill were evaluated with land use/land cover information obtained from the National Land Cover Database (Homer et al. 2015).

Land cover on each of the proposed project areas is shown on Table 3-10 and the Environmental Features Map of each project site (Figures 3-4 through 3-8). The proposed project area for the dewatering facilities is primarily developed land (18.1 acres) and herbaceous areas (7.3 acres). The ash impoundment closure areas are predominantly previously developed land (246.3 acres) and open water (141.5 acres). In December 2016, TVA conducted a slope stabilization project which encompassed approximately 82 acres, much of which is included within the boundary of the proposed landfill site. Following the completion of this project, land cover on this site would consist primarily of herbaceous grassed area (71.7 acres), barren land (22.3 acres) and early successional deciduous forest (21.8 acres).

Table 3-10. Land Cover within the Vicinity of PAF

Land Cover Type	CCR Dewatering and Handling Facilities Impact Area[1] (acres)	Ash Impoundment Closure Impact Areas[2] (acres)	Landfill Impact Area[3] (acres)	5-Mile Radius (acres)
Barren Land	0	0	22.3	684.8
Cultivated Crops	0	0	0	10,935.6
Deciduous Forest	0	45.5	21.8	36,164.1
Developed, High Intensity	0	0	0	159.2
Developed, Low Intensity	15.5	22.2	0	851.8
Developed, Medium Intensity	1.1	0.0	0	551.7
Developed, Open Space	1.5	222.6	0.7	3,821.7
Emergent Herbaceous Wetlands	0.4	14.1	0.7	2,753.9
Evergreen Forest	0	0	1.4	3,003.5
Hay/Pasture	0	0	0	8,572.5
Herbaceous	7.3	45.6	71.7	11,750.9
Mixed Forest	0.2	0	0	45.6
Open Water	2.0	141.5	2.1	4,923.1
Shrub/Scrub	1.1	59.0	2.4	93.4
Woody Wetlands	0	0	0.7	1,810.1
Total	**29.1**	**552.0**	**123.8**	**86,121.9**

Source: Homer et al. 2015.

[1] Includes dewatering facilities project area

[2] Includes ash impoundment areas, proposed borrow and South Spoil Areas, and associated temporary equipment laydown and mobilization area.

[3] Includes the landfill limits of disturbance.

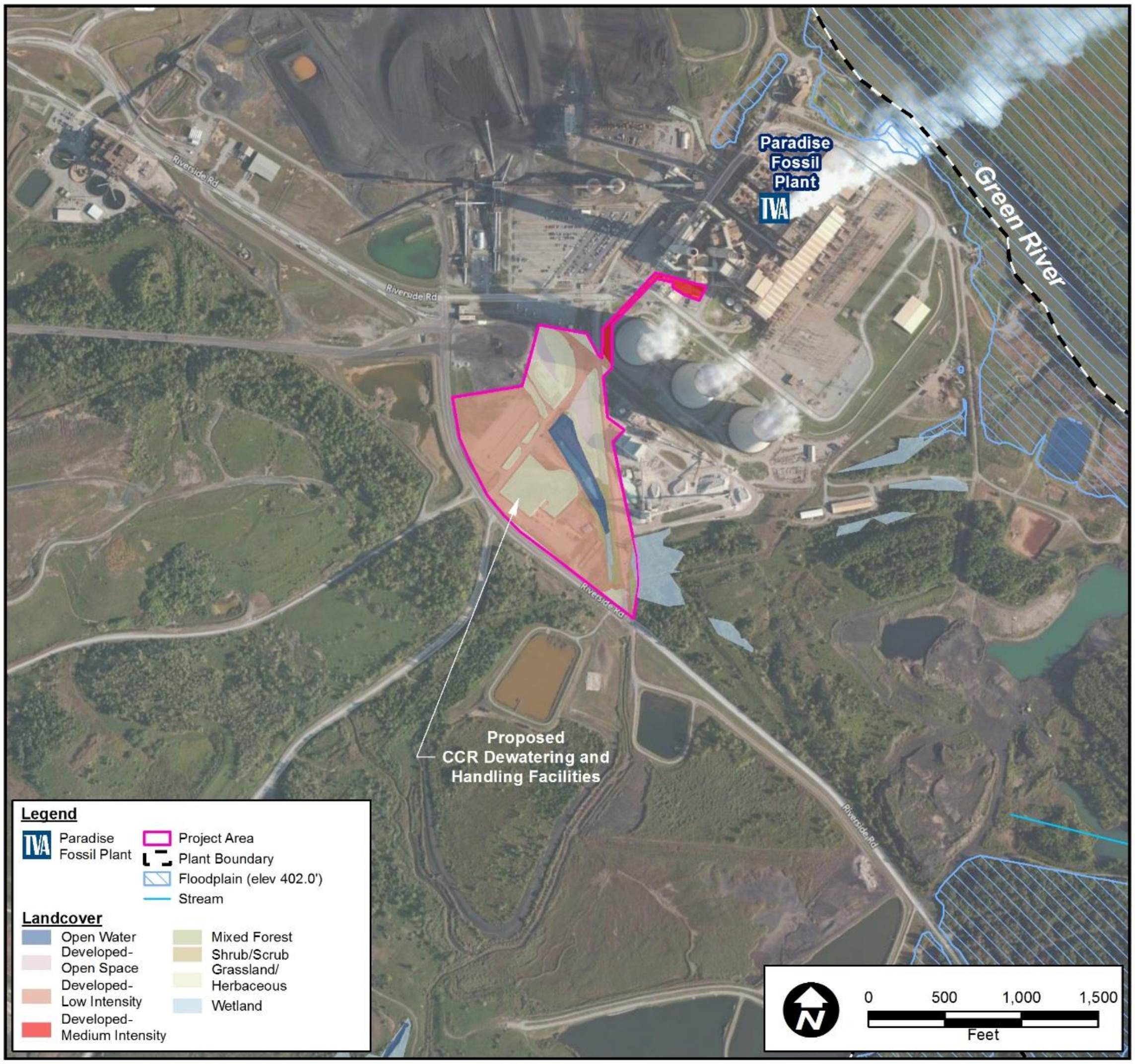

Figure 3-4. Environmental Features CCR Dewatering and Handling Facilities Project Area

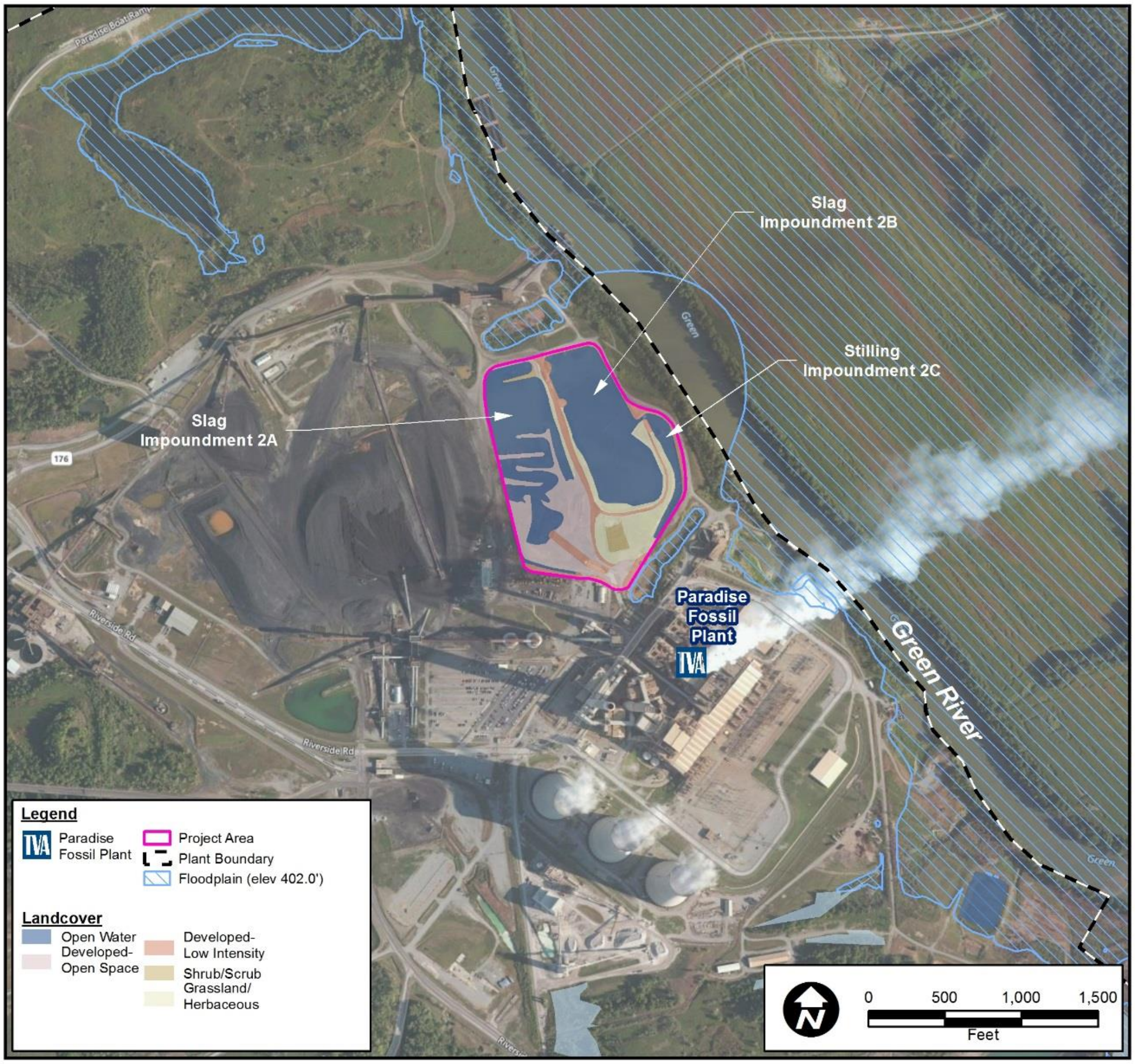

Figure 3-5. Environmental Features Slag Impoundment 2A/2B and Stilling Impoundment 2C

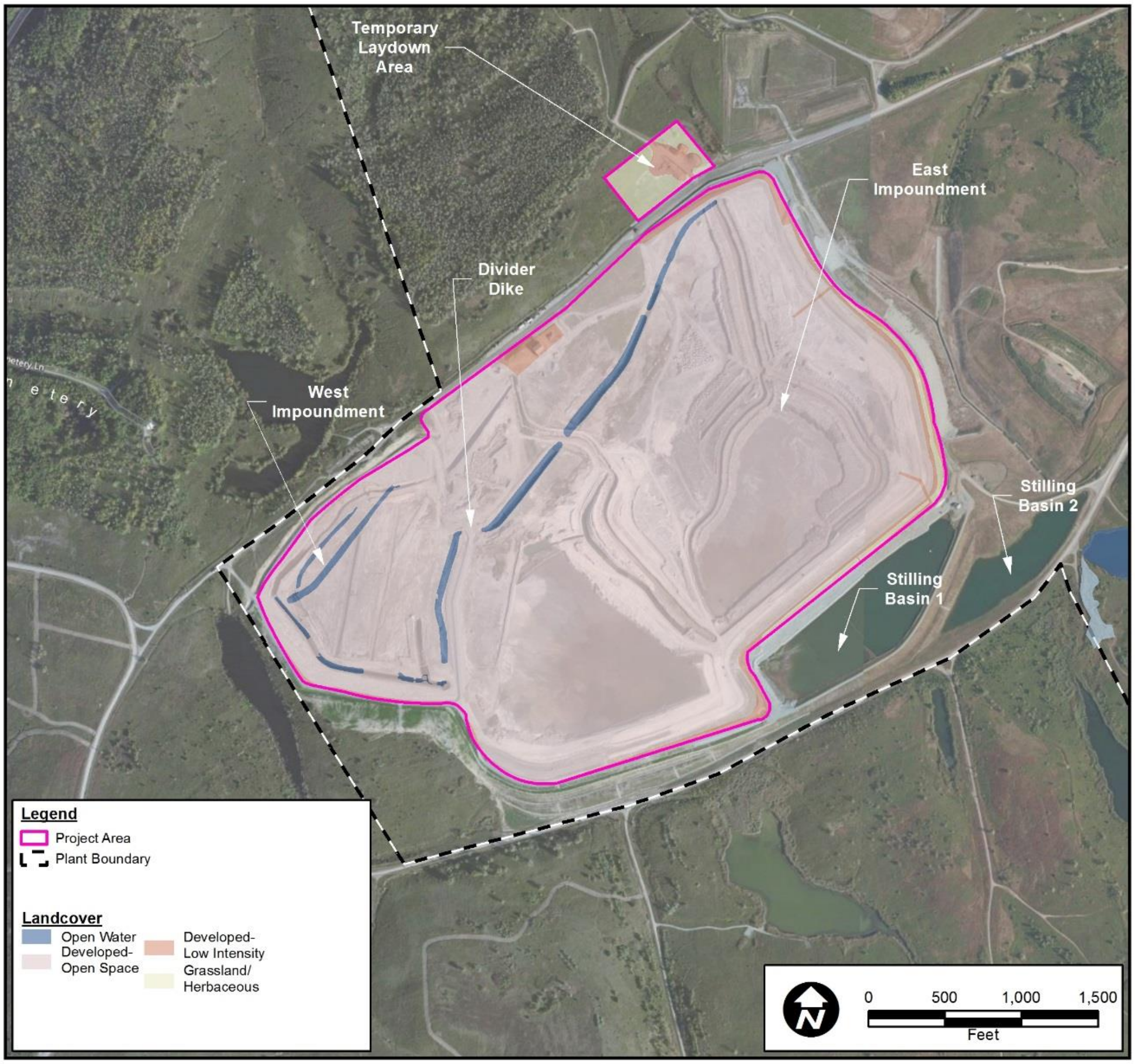

Figure 3-6. Environmental Features Gypsum Disposal Area

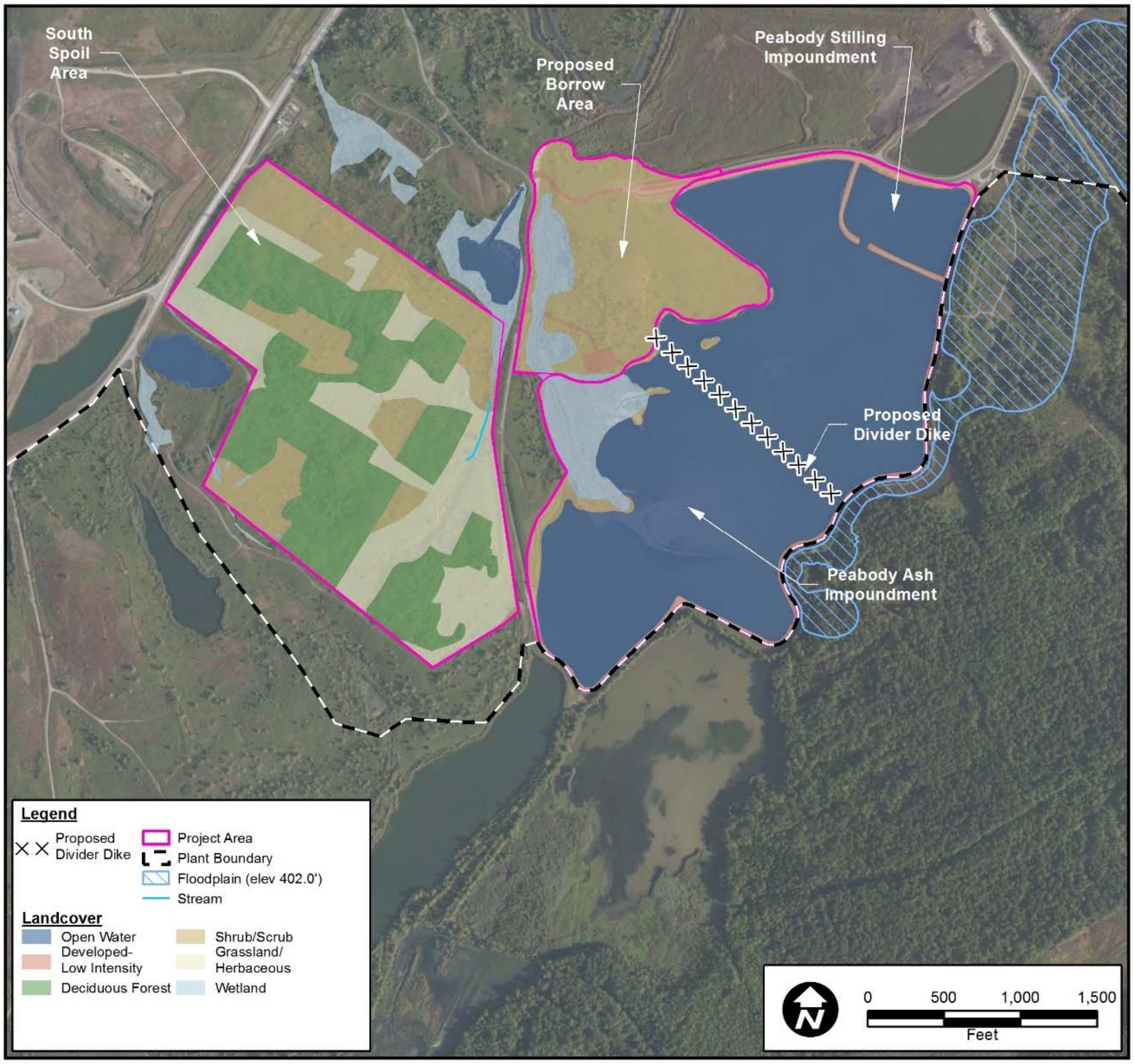

Figure 3-7. Environmental Features Peabody Ash Impoundment, Proposed Borrow Area and South Spoil Area

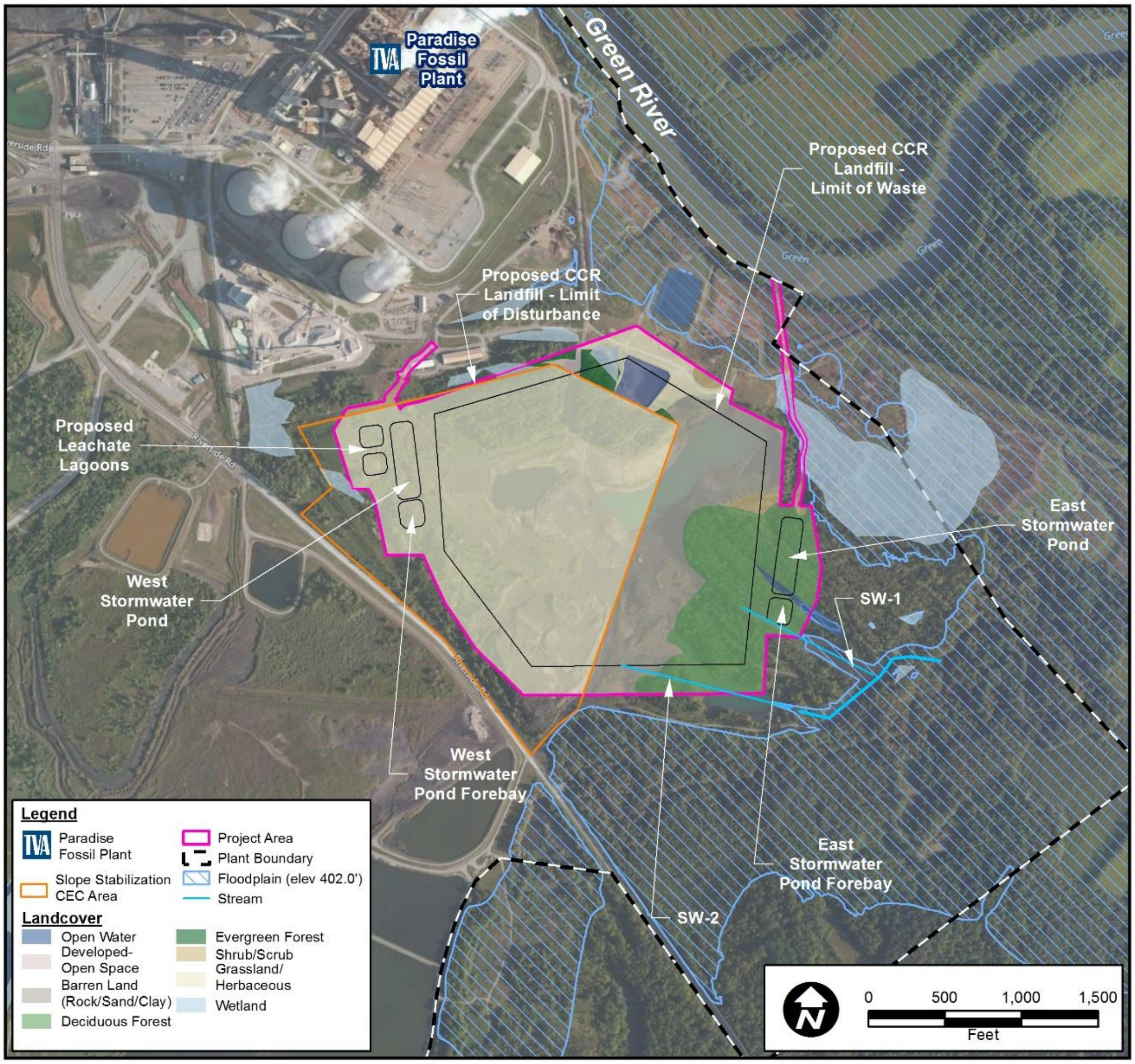

Figure 3-8. Environmental Features Proposed Landfill

Land cover within the vicinity (5-mile radius) of PAF is shown on Table 3-10 and Figure 3-9. Land cover in the vicinity is primarily deciduous forest (36,164 acres), herbaceous/ grassland (11,751 acres), cultivated crops (10,935.6 acres) and pasture/hayfields (8,573 acres) (see Table 3-10). The approximately 700 acres that comprise the proposed project areas are all located within PAF property and together consist primarily of previously developed land (265.1 acres), open water (145.6 acres), herbaceous/grassland areas (124.6 acres), and forested areas (68.9 acres).

Most of the PAF reservation is highly disturbed and is either devoid of native vegetation or consists of early successional habitats dominated by grasses and non-native herbaceous plant communities, shrublands and early successional woodlands. An assessment of vegetation within the proposed project footprints was conducted in November 2016. No uncommon vegetation or otherwise sensitive plant communities have been identified within the proposed project footprints at PAF.

The south spoil area is approximately 104 acres in size. The trees in the south spoil area consist largely of sycamore trees previously planted in rows. Volunteer tree species included eastern red cedar, hackberry, honey locust, sweet gum, and cottonwood.

The temporary laydown area is approximately 5 acres in size and largely composed of open areas dominated by the invasive species sericea lespedeza and buckbrush. These areas contained no woodlots or mature trees. The only tree species observed during the 2016 field survey were saplings of hackberry, eastern red cedar, and smooth sumac.

The northern and eastern portions of the landfill project site contain shrub/scrub areas and early successional woodlots consisting of species including loblolly pine, autumn olive, smooth sumac, hackberry, black cherry, winged elm, eastern red cedar, sycamore, honey locust, box elder, sweet gum, and northern red oak.

According to the Kentucky State Nature Preserves Commission (KSNPC), there are four uncommon to rare plant communities listed as occurring in Muhlenberg County. While none of these communities is ranked as Globally Rare, they are considered to be of conservation concern in Kentucky. They include bottomland hardwood forest (Special concern, S3), bottomland marsh (Threatened, S1S2), cypress tupelo swamp (Endangered, S1), and riparian forest (no status, S5). These communities cannot be distinguished by using the land use/land cover data. General surveys to determine their presence in the project area have been conducted and none of these communities is present.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations, and no work would be conducted that would result in ground disturbance or removal of vegetation. Therefore, no project-related environmental impacts with respect to vegetation would occur under this alternative.

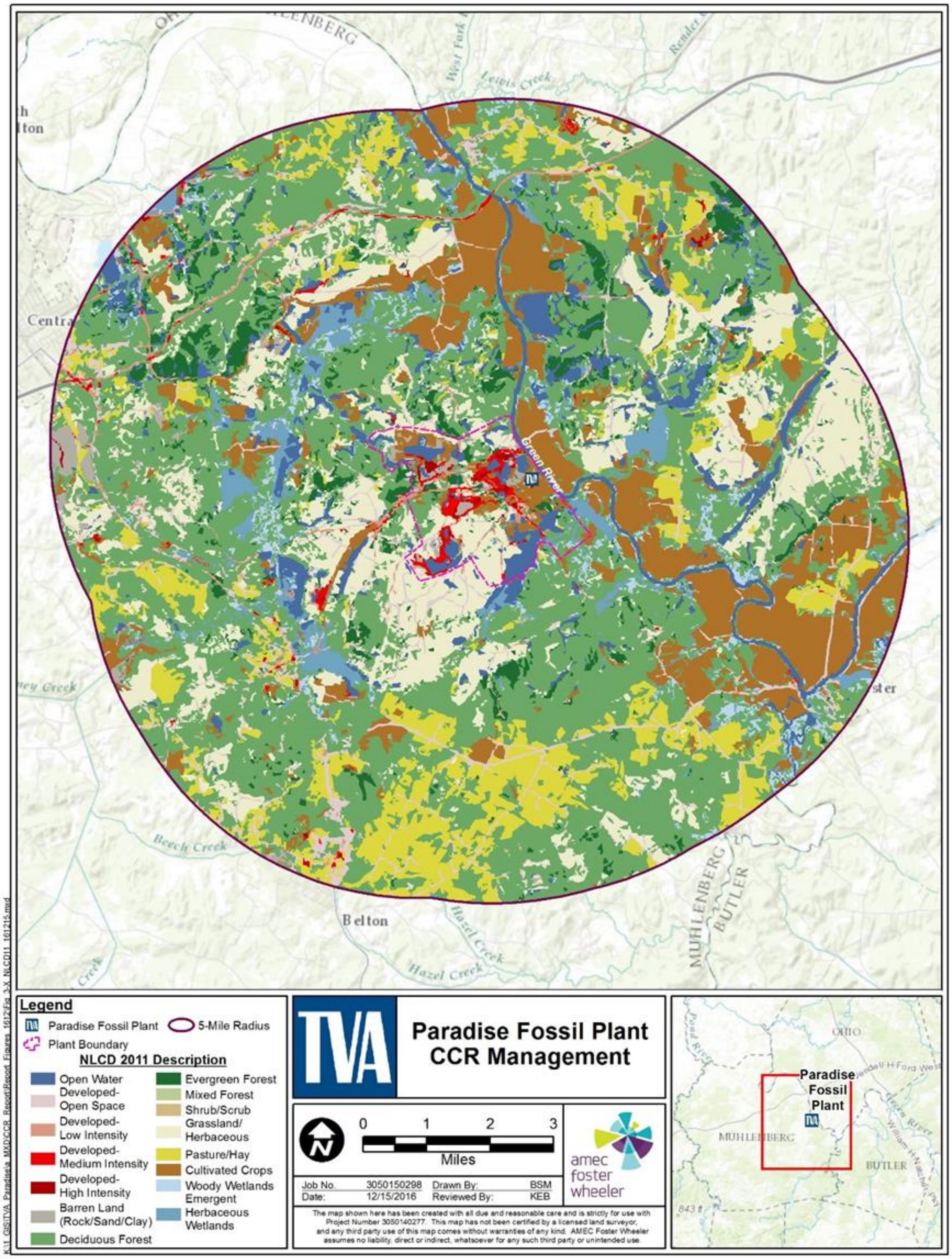

Figure 3-9. Land Cover within the Vicinity of PAF

3.8.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

Impacts to vegetation would generally result from earthmoving activities related to development of the projects including that associated with the dewatering facilities, impoundments, borrow areas, laydown area, and landfill. Relative impacts to each land cover type with each proposed CCR management project are summarized in Table 3-10.

Construction activities associated with all of the proposed projects would result in the disturbance of plant communities from heavy equipment use and the potential introduction and/or spread of invasive plant species from borrow material invasive plants that pose a threat in the region include but are not limited to autumn olive, Japanese honeysuckle, Chinese lespedeza, and Johnson grass. However, the transformation of existing ash impoundments from highly disturbed or open water environments to a stable vegetated landscape would not likely result in a net increase in invasive plants, but would also not benefit native plant habitats on any meaningful scale. The temporary use area would be revegetated to the current land cover type or replanted with herbaceous vegetation. BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate the potential spread of invasive species.

3.8.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering and handling facilities would be constructed on a site that is heavily disturbed and comprised of fill material. The 29.1-acre project site is highly disturbed and supports primarily early successional herbaceous communities. This area does not contain unique vegetation with conservation value. Therefore, there would be a minor impact to vegetation as a result of construction and operation of the dewatering facilities.

3.8.2.2.2 Ash Impoundment Closure

The existing ash impoundments are primarily non-vegetated open water areas or previously disturbed barren lands. Closure of the impoundments would include placement of a cover system over the approximately 233-acre Gypsum Disposal Area and 64-acre Peabody Ash Impoundment. The cover system would include 6 inches of topsoil that would be capable of sustaining herbaceous native plant growth. This would create an additional 297 acres of vegetated area in the long term. 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. However, disturbance to the borrow sites used to provide fill and soil materials for the impoundments would result in some loss of vegetation in those areas in the short term until those areas can be replanted. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be converted to a lined equalization basin and there would be no change in vegetation.

Therefore, impacts to vegetation as a result of impoundment closure would be minor and adverse in the short term, but would have a long term minor beneficial impact as a result of installation of a cover system that would support herbaceous vegetation.

Potential indirect impacts of the transport of borrow material are associated with the deposition of fugitive dust on adjacent vegetation. However, this potential impact would be localized and would be minimized by the use of BMPs that include covering loads during transport.

3.8.2.2.3 Landfill Construction and Operation

Construction of the proposed landfill would involve ground disturbing activities that would include grubbing, grading, and excavation. These activities would result in the removal of existing vegetation within the landfill area resulting in long-term adverse impacts. However, because the existing vegetation in this area has been previously disturbed and is of low quality, the overall impact is considered minor.

Soil excavations, removal of vegetation, grading, and construction activities have the potential to disturb soil stability and increase erosion. However, these indirect impacts would be minimized through the use of BMPs consisting of erosion control measures. CCR handling, transport and placement activities during operation of the new landfill would utilize methods similar to other TVA landfill operations and have no impact on vegetation.

3.8.2.3 Summary of Environmental Consequences of Alternative B

Impacts to vegetation associated with this alternative would be short term and minor with the potential for some long-term beneficial impacts. Impacts to vegetation with the implementation of Alternative B are summarized in Table 3-11.

Table 3-11. Summary of Impacts to Vegetation – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Removal of vegetation to support construction and operation.	Minor, this area consists of disturbed herbaceous vegetation.
Ash Impoundment Closure	Temporary loss of vegetation in borrow areas. Potential spread of invasive species. Installation of a cover system over the Gypsum Disposal Area and a portion of the Peabody Ash Impoundment that would be capable of supporting herbaceous vegetation.	Minor short-term adverse impact due to loss of vegetation. Use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate the potential spread of invasive species. Long-term minor beneficial impact due to change of approximately 297 acres from open water to vegetated cover.
Landfill	Construction related impacts associated with ground disturbing activities and removal of vegetation to support landfill operations.	Minimal impact. Mitigated through the use of BMPs to control erosion. Long-term loss of vegetation in landfill area, but existing vegetation is of low quality and contains numerous invasive species.

3.8.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the CCR dewatering and handling projects and ash impoundment closure would be the same as those identified under Alternative B; however, there would be no construction-related impacts or loss of vegetation associated with landfill construction.

Potential indirect impacts to vegetation could result from the transportation of CCR material to the receiving landfill. The haul route to the Hopkins County Regional Landfill would primarily utilize previously constructed roads, which currently support landfill traffic. Additional trucks hauling CCR materials along this route would potentially result in minor increases of fugitive dust and exhaust emissions that could indirectly impact vegetation resources along the route due to deposition. However, BMPs such as covered loads and responsible equipment maintenance, would be implemented as appropriate to minimize impacts. Therefore, no notable indirect impacts to vegetation are expected to occur from the transport of CCR to the Hopkins County Regional Landfill.

3.9 Wildlife

3.9.1 Affected Environment

Much of the area proposed for development of the various projects to manage CCR at PAF have been heavily impacted and altered as a result of construction and operation of the existing facility. As described in Section 3.8, plant communities in the project area have been heavily disturbed; consequently, the wildlife communities associated with these habitats are relatively common and are not expected to support unique or rare wildlife species. Additionally, a large portion of the proposed landfill is dominated by herbaceous grassed area (71.7 acres) and barren land (22.3 acres).

Wildlife species present in the more developed portions of the site include those often associated with human presence such as the European starling, house sparrow, killdeer, and rock dove. The more heavily vegetated areas support a more diverse community of wildlife adapted to early successional habitats. Wildlife species present in the successional habitats likely include American crow, eastern mole, red fox, raccoon, Virginia opossum, eastern box turtle and northern ringneck snake.

The more open shrub-scrub and herbaceous habitats located on PAF typically support common species such as field sparrows, indigo buntings, red-winged blackbirds, eastern bluebirds, northern mockingbirds, and wild turkey. Common mammal species found in early successional habitats on PAF include the eastern cottontail, white-tailed deer, coyote, striped skunk, white-footed mouse, and other rodents. Some of the common reptiles include black rat snake and northern black racer.

The ash impoundments offer suitable habitat and foraging opportunities for water birds, amphibians, and mammals. Despite the continual disturbance of the ponds, wildlife using them include black ducks, mallards, great blue herons, Canada geese, and beavers (TVA 2003 and 2004a). A great blue heron colony has been reported along the Green River a short distance upstream of PAF, but no colonies have been recorded on the PAF reservation (TVA 2003).

Several migratory bird species of concern are listed in the region surrounding PAF. These include bald eagle, Bell's vireo, blue-winged warbler, cerulean warbler, chuck-will's-widow, dickcissel, fox sparrow, Henslow's sparrow, Kentucky warbler, least bittern, loggerhead shrike, prairie warbler, prothonotary warbler, red-headed woodpecker, rusty blackbird, sedge wren, short-eared owl, willow flycatcher, wood thrush, and worm eating warbler (USFWS 2016b). The early successional habitats, primarily those within the South Spoil Area, could provide a limited amount of potentially suitable habitat for a few of these species including Bell's vireo, dickcissel, Henslow's sparrow, and blue-winged warblers. However, the heavy industrialized and disturbed land uses in the immediate project vicinity likely limit the use of these areas by these species.

No caves have been documented at PAF and none are known to occur within 3 miles of the project area. Should caves be identified during the project construction, they would be examined for use by wildlife, including threatened and endangered species.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations, and no work would be conducted that would result in loss or disturbance of wildlife habitat beyond existing conditions. Therefore, no project-related environmental impacts with respect to wildlife would occur under this alternative.

3.9.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.9.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering facilities would be constructed on disturbed sites that offer relatively low quality wildlife habitat. Under this alternative, the resident, common and habituated wildlife found in the area proposed for the dewatering facilities would continue to opportunistically use other available habitats within the PAF property. During construction and operation, most wildlife present within the project site would likely disperse to adjacent and/or similar habitats. Direct temporary effects to some individuals may occur if those individuals are immobile during the time of construction, especially if construction would occur during breeding/nesting seasons as the species are less mobile during those times. However, given the disturbed nature of the project area, any impacts during construction and operation would be minor.

3.9.2.2.2 Ash Impoundment Closure

In-place closure of ash impoundments would entail the beneficial re-use of some CCR materials coupled with the use of borrow from two onsite borrow areas. Closure activities at PAF would occur within a highly disturbed and fragmented industrial landscape that offers minimal habitat for wildlife. Under this alternative, resident wildlife found in the project area would continue to opportunistically use available habitats within the project area. No tree clearing would occur in conjunction with closure activities within the CCR impoundment area or associated laydown areas. As a result, no direct impacts would occur to tree roosting/nesting bird or mammal species. Use of the borrow sites to provide fill and soil materials for the impoundments would result in some loss of wildlife habitat in those areas, including several areas dominated by small trees and herbaceous vegetation.

Following the construction period, wildlife use of the closed impoundments may be limited, as the geosynthetic and protective soil cover system may be expected to provide limited foraging and nesting habitat for grassland species. The resulting habitat would be of marginal quality and is not anticipated to support large populations of these species.

In the long term, both revegetated borrow areas and vegetated herbaceous cover systems of closed impoundments would provide habitat for a range of common wildlife species typical of grassland and early successional habitats. In consideration of the highly disturbed habitats present within the project area and associated temporary laydown area, and the ample availability of higher quality wildlife in close proximity, potential direct and indirect impacts to associated wildlife are expected to be minor and potentially slightly beneficial following ash impoundment closure.

3.9.2.2.3 Landfill Construction and Operation

Impacts to wildlife would generally result from loss of early successional shrub-scrub and forest habitats due to clearing activities related to development of the proposed landfill. This work would occur within areas that were previously disturbed due to former and current operations at PAF and offer relatively low quality habitat for wildlife. During construction, most mobile wildlife present within the project site would likely disperse to adjacent and/or similar habitat, whereas direct mortality may result to less mobile species. Proposed actions are not expected to substantially impact the local population of any wildlife species. Although small forested areas within the project area would be removed, adjacent areas provide forested areas that would accommodate displaced biota.

Following the construction phase and during operation of the landfill, wildlife use of the proposed landfill would be limited; however, some scattered herbaceous areas could develop and could be used by grassland species or species adapted to disturbed areas. While the proposed project would result in alteration of habitats and displacement of resident wildlife species, these effects are not expected to result in any substantial impacts to populations of wildlife species.

3.9.2.3 Summary of Environmental Consequences to Alternative B

Impacts to wildlife associated with the implementation of Alternative B are summarized in Table 3-12. While the proposed project would result in alteration of habitats and displacement of resident wildlife species, these effects are not expected to result in notable alteration or destabilization of any species. In consideration of the highly disturbed habitats present within the project areas and associated temporary laydown area, and the availability of higher quality wildlife in close proximity, potential direct and indirect impacts to associated wildlife are expected to be minor with the potential for some long-term beneficial impacts.

Table 3-12. Summary of Impacts to Wildlife Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Loss of habitat due to construction and operation.	Minor – Existing habitats are of low quality and existing wildlife species are adapted to disturbance.
Ash Impoundment Closure	Removal of wildlife terrestrial habitat during construction, especially in borrow areas and laydown area. Temporary loss of vegetation in borrow and laydown area, but would be revegetated with native species after construction period. Loss of low quality open water habitats.	Minor. Temporary loss of habitat in borrow and laydown areas. These areas would be revegetated with native vegetation following construction. Existing open water and terrestrial habitats are disturbed and/or of low quality. Most wildlife can relocate to adjacent habitats of similar or better quality. Long-term minor beneficial impacts as revegetated borrow areas and vegetated herbaceous cover systems would provide habitat for a range of common wildlife species typical of grassland and early successional habitats.
Landfill	Removal of vegetation, especially early successional shrub-scrub and forests that may provide some wildlife habitat.	Minor – Existing habitat is of low quality. Most wildlife can relocate to adjacent habitats of similar or better quality.

3.9.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. However, there would be no loss of habitat associated with removal of early successional shrub-scrub and forest habitat for landfill construction. Because the Hopkins County Regional Landfill is an existing permitted landfill, there would be no additional direct impacts to land cover types and their associated wildlife populations that have not already been considered in the issuance of the permit for that existing landfill.

Potential indirect impacts of the transport of CCRs to an offsite landfill could include increased noise disturbance and increased chance for wildlife/vehicle collisions from large trucks and equipment. The increased noise could alter habitat use by some more sensitive species that could be present along the haul route. Direct wildlife mortality caused by trucks transporting CCR materials would not be anticipated to cause measurable impacts to any species populations as it is expected that most truck traffic would operate on the route during daylight hours when wildlife is more visible and many species are less active. Since the route that would be used to transport the CCR materials already contains vehicular traffic the project would not substantially change impacts from baseline conditions.

Therefore, direct impacts to wildlife under Alternative C would be minor with the potential for some long-term beneficial impacts associated with transformation of existing ash impoundments from highly disturbed environments to stable, controlled and vegetated landscapes. Direct and indirect impacts to wildlife associated with the transport of CCR to the landfill are expected to be minor.

3.10 Aquatic Ecology

3.10.1 Affected Environment

The primary aquatic environments related to the PAF CCR actions include Jacobs Creek and the Green River (see Figures 1-1 and 3-1). The Green River is a tributary to the Ohio River, and PAF is located along the left descending bank at GRM 100.5. The Green River adjacent to PAF is characterized as having steep banks with limited suitable spawning habitat for fishes. The river is fairly turbid due to runoff from coalfields and frequent barge traffic. Water level on the Green River near PAF is susceptible to drastic fluctuations from storm events (TVA 2003). The fish community is dominated by warmwater species with the exception of two coolwater species, sauger and walleye (TVA 1999).

TVA collected fish from the PAF intake structure as part of their CWA Section 316(b) impingement compliance program from 2006-2008. During March 2006-March 2007 (Year-1) and March 2007-February 2008 (Year-2), a total of 18,180 fish representing 44 species and 25,693 fish representing 28 species were collected from intake screen wash samples. Samples in both years were dominated by gizzard shad (82 percent), and secondarily by threadfin shad and freshwater drum (<15 percent) (TVA 2009).

TVA sampled fish (electrofishing and gillnetting) upstream and downstream of the PAF between GRM 98.4 and 105 in 2011. Downstream of PAF, 1,272 fish (42 species) were collected. The most abundant species downstream of PAF were emerald shiner (20 percent), bullhead minnow (18 percent), spotfin shiner (15 percent), and bluegill (15 percent). Upstream of PAF, 887 fish (37 species) were collected. The most abundant species upstream of PAF were Mississippi silvery minnow (32 percent), emerald shiner (17 percent), and gizzard shad (11 percent) (TVA 2012a). As part of this same 2011 study on the Green River in the vicinity of the PAF, benthic invertebrates were also collected (standard ponar dredge). Oligochaetes, chironomids, and Asiatic clams were the dominant taxa both upstream and downstream of PAF.

A 2008 mussel survey (TVA 2008) on the Green River near the PAF coal unloading facility found very low densities of a small number of common mussel species. Another mussel study on the Green River, 7 river miles upstream of PAF documented the presence of 23 mussel species (Miller et al., as cited in TVA 2004).

Jacobs Creek is a small tributary of the Green River that flows within the eastern portion of the PAF site. Nonpoint source pollution from strip mining in past years has resulted in the degradation of water quality in Jacobs Creek. Additionally, it has been observed that periodic drought conditions result in intermittent flow and isolated pools, whereas extensive flooding and sedimentation result from periods of prolonged rainfall (TVA 2003).

As part of an effort to document the overall impaired condition of Jacobs Creek for the previously issued PAF KPDES permit, TVA conducted a bioassessment of benthic macroinvertebrate and fish communities at five sampling stations in Jacobs Creek in 1997. During this study, 59 species of benthic macroinvertebrates were collected. The KDOW

Macroinvertebrate Bioassessment Index (MBI) is based on six calculated metrics that weigh various aspects of species diversity, abundance of various taxa groups indicative of good water quality and habitat conditions, and numbers of organisms collected. Results of the MBI are used as a comparison of what would be expected to be found in a similar-size stream in the same ecoregion. MBI scores from the three sites below the Peabody Ash Impoundment indicated a “poor” to “fair” benthic assemblage for both individual sites and combined analyses. The two sampling sites upstream of the Peabody Ash Impoundment rated “poor” (TVA 1998). The results of this survey which yielded similar ratings both upstream and downstream of the Peabody Ash Impoundment indicate that the impoundment is not having a negative effect on Jacobs Creek.

A total of 27 species of fish were also collected at the sampling stations within Jacobs Creek as part of the 1998 bioassessment (TVA 1998). Twelve metrics were calculated to determine an Index of Biotic Integrity (IBI) to address species richness and composition, trophic structure, abundance, and condition. Scores of the 12 metrics were summed to produce the IBI for the site. The IBI is then classified using the system developed by Karr et al. (1986), rating a site from “very poor” to “excellent.” IBI metrics for each station rated all sampling sites either as “poor or fair,” based on KDOW scoring criteria for Interior Plateau ecoregion streams.

During the wetland delineation site visit, an ephemeral stream (SF-1) was also identified along the eastern side of the south spoil area (AECOM 2016). While this stream is considered to be a jurisdictional water due to its direct connection to W20 (see Wetlands section), it only flows ephemerally and, therefore, is not expected to support a high quality aquatic community.

The PAF site is also characterized as having numerous ponds resulting from prior surface mining. These likely provide some habitat for aquatic species. Aquatic communities in ponds on the PAF site likely vary in abundance and diversity depending on the morphology of a given pond, water depth and permanence, and water quality. Because these ponds are the result of previous surface mining activities, habitat quality and species diversity of aquatic biota is expected to be low. Notably several of the ponds that appear on historical aerial imagery within the proposed landfill area, no longer exist or appear to hold water.

The Peabody Ash Impoundment has open water zones and is expected to be represented by common aquatic species and relatively poor community composition.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations and no work would be conducted that would result in loss or disturbance of aquatic resources beyond existing conditions. Therefore, no project-related environmental impacts with respect to aquatic ecosystems would occur under this alternative.

3.10.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.10.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering facilities would be constructed on a site that is already disturbed from former and current operations at PAF. Invertebrates, fish, and mussel fauna of the Green River or Jacobs Creek would not be affected by the dewatering projects as there would be no direct impact to the river/creek or shorelines. A small process water pond is located within the proposed dewatering facility footprint and would be impacted by the project. Little to no aquatic biota is expected within this small 2-acre open water zone are expected to consist of relatively common species with an overall community of low quality.

Discharges to aquatic resources would take place through the permitted existing outfall and would meet existing KPDES permit requirements. Because KPDES requirements are designed to be protective of aquatic life in receiving waters, impacts to aquatic fish and shellfish species near PAF are not anticipated.

Potential indirect impacts to aquatic resources resulting from surface water runoff during construction activities would be mitigated through the implementation of storm water erosion controls in accordance with a SWPPP which would be prepared for this project. Therefore, there would be no impacts to aquatic ecosystems with regard to dewatering projects.

Bottom ash would be managed on an interim basis by reclaiming the material from the bottom slag pumps and stacking in piles to dry near the location of the slag impoundments. Runoff from this area would be managed onsite and there would be no direct or indirect impact to aquatic resources.

3.10.2.2.2 Ash Impoundment Closure

Under Alternative B, the ash impoundments would be closed along with the installation of an approved cover system. Slag Impoundment 2A/2B and Stilling Impoundment 2C would be converted to lined process water basin(s). Primary construction activities would be located within the footprint of the existing impoundments and proposed borrow areas. The wastewater discharges during dewatering would meet existing permit limits, and sampling would continue to be performed at the approved outfall structure in accordance with the KPDES permit.

Because ash impoundments are considered treatment systems and not aquatic habitat, direct impacts to aquatic habitat would primarily be avoided with closure activities. There are no aquatic habitats within the proposed borrow areas, thus direct impacts to aquatic biota from the removal of material from these areas are not anticipated. Should minor alterations of surface waters be required to support construction activities (e.g., culverted crossing of drainage that leads to Jacobs Creek for construction access), any activities within areas containing aquatic resources would be appropriately permitted and would utilize approved BMPs.

Indirect impacts to aquatic resources of adjacent water bodies (i.e., Jacobs Creek and the Green River) may be associated with storm water runoff due to temporary construction activities associated with site preparation and closure activities and dewatering of the ash impoundments. Ash impoundment dewatering activities would temporarily increase flow to

Jacobs Creek and the Green River. Aquatic biota would be displaced temporarily due to increased flows, but would quickly re-establish following dewatering activities. Any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources during the construction phase. Following the construction phase, care and maintenance of the approved closure system and site-wide management of storm water using appropriate BMPs would minimize indirect impacts to the aquatic community in the receiving waters.

Indirect impacts may also occur to the downstream reach of Jacobs Creek due to reduced flow from the closure of the Gypsum Disposal Area and Peabody Ash Impoundment. The reduction of flow from the outfall to Jacobs Creek would decrease the available habitat and overall aquatic biomass. Flow in Jacobs Creek downstream of the existing ash impoundment outfall would be similar to the flow and available habitat upstream of the ash impoundment and aquatic communities would be expected to adjust to reflect the abundance and composition of those in upstream areas.

Based on the use of an approved outfall structure in accordance with the KPDES permit for wastewater discharge and the use of appropriate BMPs to control storm water runoff, impacts to aquatic resources as a result of the ash impoundment closure are expected to be minor.

3.10.2.2.3 Landfill Construction and Operation

Construction of the landfill involves ground disturbing activities that would include grubbing, grading, and excavation. Stormwater would be managed in two onsite ponds, one of which would discharge to an existing KPDES permitted outfall and the other would discharge through a new permitted outfall.

There are no existing aquatic resources within the proposed landfill footprint. As such, no direct impacts to aquatic ecosystems as a result of the construction of the landfill are expected.

Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources. Following the construction phase, site-wide management of storm water using appropriate BMPs would minimize indirect impacts to the aquatic community of the receiving water (Green River).

Construction of the outfall on the shoreline of the Green River may have some minor temporary direct impacts on aquatic biota. Impacts would be minor for mobile aquatic resources, such as fish, that would likely avoid the immediate construction area. Less mobile aquatic organisms (aquatic macroinvertebrates) would be directly impacted by placement of rock at the outfall during construction; however, the area of impact would be very small and many macroinvertebrate species would repopulate quickly. Additionally, the effects are expected to be extremely localized and mitigated by use of proper BMPs. The storm water discharges from this outfall during operation of the landfill would meet permit limits, and compliance sampling will be performed at the approved outfall structure in accordance with the KPDES permit.

3.10.2.3 Summary of Environmental Consequences of Alternative B

Impacts associated with aquatic resources from the implementation of Alternative B are summarized in Table 3-13. Based on the analysis summarized below, impacts associated to aquatic resources would be minor and temporary.

Table 3-13. Summary of Impacts of Aquatic Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Loss of 2-acre open water process water pond.	Minor – Impoundment small and of low quality. Discharges would take place through the existing permitted outfall.
Ash Impoundment Closure	Wastewater discharge during decanting and stormwater discharges during construction.	Minor – Use of permitted outfall structure in accordance with KPDES permit. Use of appropriate BMPs would minimize indirect impacts to the aquatic community of receiving waters.
	Increased flow to receiving waters during ash pond dewatering. Temporary displacement of aquatic biota during ash impoundment dewatering as a result of increased flow to Jacobs Creek and the Green River.	Minor – KPDES permit requirements would be protective of aquatic resources. Aquatic biota would quickly repopulate following dewatering of the ash impoundment.
	Indirect impacts to aquatic biota from reduced flow to Jacobs Creek as a result of Peabody Ash Impoundment and Gypsum Disposal Area closure.	Minor – Expected flow downstream of the Peabody Ash Impoundment would return to that present upstream of the impoundment.
Landfill	Indirect impacts to the Green River associated with storm water runoff during construction.	Minor – Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects.
	Direct impacts associated with the construction of the outfall structure on the shoreline of the Green River. No operational impacts anticipated.	Minor – Avoidance by mobile organisms (fish). Minor direct impacts to less mobile organisms (invertebrates). Aquatic biota would quickly repopulate after construction.

3.10.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B. However, the minor, temporary impacts to aquatic life associated with landfill construction would not occur. Because Hopkins County Regional Landfill is an existing permitted landfill, there would be no additional direct impacts to aquatic resources.

3.11 Threatened and Endangered Species

3.11.1 Affected Environment

The ESA (16 United States Code [USC] §§ 1531-1543) was passed to conserve the ecosystems upon which endangered and threatened species depend, and to conserve and recover those species. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is likely to become endangered within the foreseeable future throughout all or a significant part of its range. Critical habitats, essential to the conservation of listed species, also can be designated under the ESA. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for federal agencies. Under Section 7 of the ESA, federal agencies are required to consider the potential effects of their proposed action on endangered and threatened species and critical habitats. If the proposed action has the potential to affect these resources, the federal agency is required to consult with the USFWS.

The state of Kentucky provides protection for species considered threatened, endangered, or deemed in need of management within the state in addition to those also federally listed under the ESA. The listing of species is managed by the state wildlife agency, Kentucky Department of Fish and Wildlife Resources (KDFWR); additionally, the state nature preserves commission (KSNPC) and TVA both maintain databases of aquatic and terrestrial animal species that are considered threatened, endangered, special concern, or are otherwise tracked in Kentucky because the species is rare and/or vulnerable within the state. Plant species are protected in Kentucky through the Kentucky Rare Plant Recognition Act of 1994.

3.11.1.1 Wildlife

According to the KSNPC, 45 species of conservation concern occur in Muhlenberg County (Table 3-14) (KSNPC 2015). A review of the TVA Regional Natural Heritage database in November 2016 indicated that of those species listed by USFWS and KYNPC, 21 species are currently known or have been known to occur within a 5-mile radius of PAF (as indicated by asterisks in Table 3-14). Review of the USFWS Information for Planning and Conservation (IPaC) website identified one additional federally listed species, the northern long-eared bat (*Myotis septentrionalis*), that has the potential to occur in the project area.

3.11.1.1.1 Terrestrial Animals

Henslow’s sparrows utilize pastures and native grasslands with a preference for areas with tall grass species with a residual layer of dead vegetation (Reinking et al. 2000). This bird species is a very locally distributed summer resident across Kentucky and is known to occupy the Peabody Wildlife Management area (WMA). Sightings have occurred within 1 mile of the Gypsum Disposal Area but have not documented the presence of this species at PAF (TVA 2013; TVA 2016d).

The great egret is a wading bird that inhabits marshland, swampy woody areas, tidal estuaries and other locations with shallow waters. Other habitats include grasslands, fields, and meadow like areas. The great egret nests in tall trees within wooded areas that are in close proximity to water (NatureServe 2016). One record of the great egret exists within the Peabody WMA approximately 2 miles from the PAF Gypsum Disposal Area (TVA 2016a).

Table 3-14. Species of Conservation Concern within Muhlenberg County and Within 5 Miles of PAF

Common Name	Scientific Name	Status: Federal[1]	Status: State[2] (Rank[3])	Suitable Habitat Present[4]
Aquatic Snails				
Rugged Hornsnail*	*Pleurocera alveare*	SOMC	S(S3S4)	N
Mollusks				
Fanshell*	*Cyprogenia stegaria*	LE	E(S1)	N
Catspaw*	*Epioblasma obliquata*	LE	E(S1)	N
Pocketbook*	*Lampsilis ovata*	--	E(S1)	N
Rough Pigtoe*	*Pleurobema plenum*	LE	E(S1)	N
Pyramid Pigtoe*	*Pleurobema rubrum*	SOMC	E(S1)	N
Purple Lilliput*	*Toxolasma lividus*	SOMC	E(S1)	N
Little Spectaclecase*	*Villosa lienosa*	--	S(S3S4)	N
Crustaceans				
Mud River Crayfish	*Orconectes ronaldi*	--	T(S2S3)	N
Fish				
Lake Chubsucker	*Erimyzon sucetta*	--	T(S2)	
Chestnut Lamprey*	*Ichthyomyzon castaneus*	--	S(S2)	N
Redspotted Sunfish	*Lepomis miniatus*	--	T(S2)	N
Longhead Darter	*Percina macrocephala*		E(S1)	N
Amphibians				
Eastern Hellbender	*Cryptobranchus alleganiensis*	SOMC	E(S1)	N
Bird-voiced Treefrog*	*Hyla avivoca*		S (S3)	N
Reptiles				
Eastern Ribbon Snake	*Thamnophis sauritus*	--	S(S3)	P
Insects				
Broad-winged Skipper	*Poanes viator*	--	T(S1)	P
Elusive Clubtail	*Stylurus notatus*	SOMC	E(S1)	N
Birds				
Henslow's Sparrow*	*Ammodramus henslowii*	SOMC	S(S3B)	P
Great Egret*	*Ardea alba*	--	T(S2B)	P
Short-eared Owl*	*Asio flammeus*	--	E(S1B,S2N)	N
Long-eared Owl*	*Asio otus*	--	E(S1B,S1S2N)	N
American Bittern	*Botaurus lentiginosus*	--	H(SHB)	N
Lark Sparrow	*Chondestes grammacus*	--	T(S2S3B)	P
Northern Harrier*	*Circus cyaneus*	--	T(S1S2B,S4N)	P
Sedge Wren*	*Cistothorus platensis*	--	S(S3B)	N
Common Gallinule*	*Gallinula galeata*	--	T(S1S2B)	N
Bald Eagle*	*Haliaeetus leucocephalus*	DM	T(S2B,S2S3N)	N
Least Bittern*	*Ixobrychus exilis*	--	T(S1S2B)	N
Hooded Merganser*	*Lophodytes cucullatus*	--	T(S1S2B,S3S4N)	P (foraging only)
Osprey*	*Pandion haliaetus*	--	S(S2S3B)	Y

Common Name	Scientific Name	Status: Federal[1]	Status: State[2] (Rank[3])	Suitable Habitat Present[4]
Bank Swallow*	*Riparia*	--	S(S3B)	N
Bell's Vireo*	*Vireo bellii*	SOMC	S(S2S3B)	Y, P (past record within the South Spoil Area)
Barn Owl	*Tyto alba*	--	S(S3)	N
Mammals				
Indiana bat*	*Myotis sodalis*	LE	E(S1S2)	P (foraging only)
Northern long-eared bat	*Myotis septentrionalis*	LT	E(S3)	P (foraging only)
Evening Bat*	*Nycticeius humeralis*	--	S(S3)	P (foraging only)
Southeastern Bat	*Myotis austroriparius*	SOMC	E(S1S2)	P (foraging only)
Gray Bat	*Myotis grisescens*	LE	T(S2)	P (foraging only)
Plants				
Water Hickory	*Carya aquatica*	--	T(S2S3)	N
Rose Turtlehead	*Chelone obliqua* var. *speciosa*	--	S(S3)	N
Water-purslane	*Didiplis diandra*	--	E(S1S2)	N
French's Shooting Star	*Dodecatheon frenchii*	--	S(S3)	N
Hair Grass	*Muhlenbergia glabrifloris*	--	S(S2S3)	N
Trepocarpus	*Trepocarpus aethusae*	--	S(S3)	N
Buffalo Clover	*Trifolium reflexum*	--	E(S1S2)	N
Southern Wild Rice	*Zizaniopsis miliacea*	--	T(S1S2)	N

Sources: KSNPC 2015 and USFWS IPaC 2016b

[1] Federal Status Codes:
DM = Delisted, Recovered, and Being Monitored
LE = Listed Endangered
LT = Listed Threatened;
-- = Not Listed by USFWS
SOMC = Species of Management Concern

[2] State Status Codes:
E = listed endangered
S = species of special concern
T = listed threatened

[3] State Rank:
S1 = critically imperiled
S2 = imperiled
S3 = vulnerable
S4 = apparently secure
S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
Migratory Species may have separate ranks for different population segments (e.g., S1B, S2N, S4M);
S#B = rank of breeding population
S#N = rank of non-breeding population

[4] Habitat Codes:
Y = Yes, species has been documented in existing habitats in study area and suitable habitat is present
N = No, no records of species within study area and no suitable habitat is present
P = Potentially suitable habitat is present, but no records of species in study area

* Species documented within 5 miles of PAF by the TVA Natural Heritage Database.

Short-eared owls will inhabit a wide variety of areas including both fresh and saltwater marshes, grasslands, meadows, and open woodlands. The short-eared owl requires vast expanses of open fields with low vegetation and dry upland habitat near water for nesting (NatureServe 2016). The short-eared owl has been recorded 2 miles north-northeast of Drakesboro at the Peabody WMA (TVA 2016d).

The long-eared owl can be found in riparian habitats including deciduous and evergreen forests, scrubland, and orchards. While they require wooded areas for nesting they frequently hunt in open grasslands (NatureServe 2016). The species has been reported in the Peabody WMA, which is considered to contain key habitat for the species. Long-eared owls are very rare imperiled breeders and winter residents in Kentucky (TVA 2013).

American and least bitterns and the common gallinule reside in wetland or riparian habitats including both freshwater and brackish marshes as well as the edges of lakes or ponds. They typically require areas with emergent aquatic vegetation and scattered shrubs present. Generally, larger areas of wetland (2.5 hectares [6.28 acres] or more) are required for nesting, while smaller wetlands can be utilized for foraging for the American Bittern (NatureServe 2016). The least bittern and the common gallinule have been recorded within the Peabody WMA. No records of the American bittern exist within 5 miles of PAF (TVA 2016d. As emergent aquatic vegetation is generally not available within the PAF ash impoundments, little habitat for these species exist within PAF.

Lark sparrows utilize a wide variety of open habitats such as prairies, parkland, shrub thickets, pastures, riparian areas, as well as the edges of woodland. Areas selected by the lark sparrow typically have scattered bushes and trees as woody vegetation is a necessity for nesting (NatureServe 2016). The Peabody WMA likely contains suitable habitat for the lark sparrow; however, no known records occur within 5 miles of PAF.

Northern harriers generally inhabit open herbaceous wetland and grassland area and will typically nest in or near dry vegetation that is near water (NatureServe 2016). The species has been documented nesting on surface mines reclaimed to grasslands and lacking trees. Large numbers of northern harriers winter in fields surrounding PAF (TVA 2013). Although little to no suitable habitat is available for the species on PAF, there are two known records on the adjacent Peabody WMA within 1 mile of the Gypsum Disposal Area (TVA 2016a).

Sedge wrens nest throughout Kentucky and reside in wet grasslands and savanna as well as moist areas where scattered bushes and shrubs are present. This species is highly sensitive to habitat conditions and will leave a potential breeding site if the site is too dry, wet, or overgrown (NatureServe 2016). Habitat for the sedge wren is not likely to occur on PAF. Four records of occurrence are present within a half mile of the Gypsum Disposal Area in the native grasslands of the Peabody WMA (TVA 2016a).

Bald eagles are typically found in close proximity to large, open bodies of water such as rivers, lakes, and reservoirs. Bald eagles will nest on cliffs or large trees near water. Suitable nesting and foraging habitat exists along the Green River and the Peabody WMA adjacent to the PAF. A bald eagle nest was recorded in 2010 along the west bank of the Green River, approximately 1.4 mile north of Slag Impoundment 2A/2B and Slag Stilling Impoundment 2C (TVA 2016d, NatureServe 2016).

The hooded merganser, a species of waterfowl, requires bodies of water such as streams, rivers, and lakes, and typically utilizes both deep and shallow water habitats. Tree cavities within forested areas are required for nesting and are often in close proximity to water (NatureServe 2016). Suitable nesting habitat for this species does not occur within PAF; however ample habitat is available along the Green River and within the waterfowl refuge portion of the Peabody WMA. The ash impoundments may offer suitable foraging opportunities; however only one known record of occurrence exists within 3 miles of the proposed CCR projects (TVA 2016d).

Osprey occupy riparian habitats alongside bodies of water such as rivers, lakes and reservoirs, and may nest in trees and on a variety of man-made structures (e.g., power line towers) near water (NatureServe 2016). Suitable habitat occurs within PAF, along the Green River, and within the adjacent Peabody WMA. Nesting ospreys have been documented at PAF northwest of Slag Pond 2A/2B and Stilling Impoundment 2C and on a portion of area proposed for the dewatering facilities (TVA 2016d). However, no evidence of nesting ospreys was observed during a field assessment conducted in 2016.

Bank swallows nest in colonies where the birds burrow into steep sand and gravel banks creating cavity nests during the breeding season. The species utilizes open and partially open areas near flowing bodies of water (NatureServe 2016). A colony exceeding 100 nest burrows has existed for multiple years in a coal refuse pile in the southeast portion of the PAF reservation; however, based on aerial imagery the area looks to be unsuitable habitat as it is now an area of secondary forest regeneration (TVA 2016d). Suitable nesting habitat occurs along the banks of the Green River.

Bell's vireo requires shrub/scrub, dense brush, willow thickets, or narrow early successional wooded areas with dense understories such as those often found along small stream corridors (NatureServe 2016). Bell's vireos tend to prefer the above-mentioned habitats if they are scattered within more open grassland or agricultural landscapes versus forest dominated areas. Small blocks of grassland/shrub habitats surrounded by mature forests may be avoided by this species. This species has been observed on reclaimed surface mines that lie adjacent to PAF within Muhlenberg County. This species has been recorded within the South Spoil Area. A small amount of suitable habitat for the Bell's vireo may still occur in this area.

The barn owl generally inhabits open habitats such as grasslands, deserts, marshes, and agricultural fields, but the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites. They utilize multiple areas for nesting including hollow trees, nest boxes, barns, and caves (NatureServe, 2016). Because there is limited roosting habitat onsite, it is unlikely the barn owl would be observed within the project areas at PAF.

Bird-voiced treefrogs primarily inhabit swampy areas including large floodplain ponds, manmade ponds, and lakes that are near rivers or streams and in close proximity to forest (NatureServe 2016). Suitable habitat for this species occurs at ponds and wetlands adjacent to the plant including those within of the Peabody WMA, where occurrences have been recorded. The bird-voiced treefrog has been recorded as close as 686 feet from the Peabody Ash Impoundment; however, suitable habitat does not occur within the project areas as the PAF ash impoundments do not provide suitable breeding habitat. Although a forested plant community does lie southeast of the Peabody Ash Impoundment, no impacts to this area are anticipated (TVA 2016d).

Eastern ribbon snakes are semi-aquatic species that are found in close proximity to large wetlands, ponds, and shallow streams with a slow current. They require vegetative cover including shrubs or clumps of grasses and sedges in sun-exposed areas alongside flowing water in order to burrow for hibernation (NatureServe 2016). No records of this species exist within 5 miles of PAF (TVA 2016d). Wetlands identified within PAF may provide suitable habitat for the eastern ribbon snake; however, no habitat for hibernation exists within the proposed project areas.

Broad-winged skippers are found in herbaceous wetlands including, sedge meadows, bogs, ditches, and sedge wetlands with larger shrubs. The species has also been observed using *Phragmites* spp. wetlands (NatureServe 2016). Suitable wetland habitats for the species are present within the PAF reservation. No known records for the species exist on or within 5 miles of PAF.

The elusive clubtail is a moderately sized dragonfly found near shallow and clear waters of big rivers with a steady flow and a sandy gravel substrate. The species requires water for reproduction as its eggs are dropped in the water off of the abdomen, and the larvae burrow into the substrate. They mostly feed above trees but have also been known to forage among grassy non-forested areas (NatureServe 2016). No suitable habitat for the elusive clubtail is present within the proposed project areas or on the PAF reservation. Habitat is likely available along the Green River and its larger tributaries.

The evening bat is found throughout most of the eastern United States in most forest types along waterways. They are known to roost in snags or dead trees with cavities as well as Spanish moss, leaf litter, crevices in rocks, burrows in the ground that have been abandoned, and small spaces or crevices in various types of man-made structures (NatureServe 2016). The wintering habitat for the evening bat is unknown. Based on a field assessment of existing habitats in November 2016, suitable roost habitat for the evening bat does not occur in the project areas on the PAF reservation. The ash impoundments may provide some suitable foraging habitat within the project area. However, no species records occur within 5 miles of PAF.

Southeastern bats are found throughout the southeastern portion of the United States, but the majority of the population occurs in northern Florida. They roost mostly in caves or snags and hollow trees, and sometimes buildings and shelter structures. Their foraging habitat includes areas over water bodies, riparian floodplain forests, flatwoods, or wooded wetlands with permanent bodies of water nearby (NatureServe 2016). As no suitable bat roost trees or caves were identified within the project areas, this species is not likely to occur at PAF. The ash impoundments may provide some suitable foraging habitat within the project area. However, no species records occur within 5 miles of PAF.

Gray bats almost exclusively roost in large caves found in Alabama, Arkansas, Kentucky, Missouri, and Tennessee with some smaller populations found in nearby states. They are sometimes found roosting in mines or buildings. Adults and their young require forested areas along banks, streams, or lakes near the entrance to their cave roosts. They typically do not feed in areas along rivers or reservoirs where the forest has been cleared away (NatureServe 2016). Suitable roosting habitat for gray bats is not present within the proposed project areas because of a lack caves, mines, or suitable buildings. Low quality foraging habitat exists over the Peabody Ash Impoundment. No species records occur within 5 miles of PAF.

The Indiana bat is listed as federally endangered by the USFWS (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 U.S. This species' range extends from New York and New Hampshire in the north to Alabama, Georgia, and Mississippi in the south, and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees, especially species such as shagbark hickory, mature white oaks, and other 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). The project area may provide some suitable foraging habitats for this species. A search of the TVA Natural Heritage Database in November 2016 indicated that an Indiana bat was recorded acoustically 4.7 miles from the Gypsum Disposal Area at PAF.

The northern long-eared bat is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and with high humidity and minimal air currents. During summer, this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter greater than or equal to 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. The project area may provide some suitable foraging habitats for this species. 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 2016a). Summer habitat for northern long-eared bats does exist within Muhlenburg County, but not within 5 miles of the project action area (USFWS 2015). A search of the TVA Natural Heritage Database in November 2016 indicated that no northern long-eared bats have been recorded within 5 miles of PAF.

In November 2016, TVA conducted an assessment to determine bat habitat suitability within forested areas of the proposed CCR landfill limit of disturbance, the south spoil area, and the temporary laydown area. Woodlots within each of the above-mentioned areas were characterized by the information within the USFWS Phase I Summer Habitat Assessment form (USFWS 2016d). In addition to characterizing the representative forest communities, any potentially suitable bat roost trees were recorded. Potentially suitable bat roost trees were identified as live, dead, or declining trees of appropriate size (greater than or equal to 3 inches) that have exfoliating bark, cracks, crevices, and/or hollows. Of the woodlots identified within the study areas, none was designated as potentially suitable bat habitat due to a lack of potentially suitable roost trees and unfavorable forest community composition. There were two relatively larger woodlots within the proposed landfill site, one on the northern portion and the other on the eastern edge. The forested area on the north portion of the proposed landfill was dominated by loblolly pine and autumn olive with no potentially suitable bat roost trees. The forested area on the eastern edge of the proposed landfill was dominated by sweet gum, eastern red cedar, and northern red oak with no potentially suitable bat roost trees. Surveys of the woodlots within the landfill limit of disturbance the south spoil area, and the temporary laydown area indicated there were no potentially suitable bat roost trees present and the forest community composition did not have suitable tree species and age structure to support suitable summer bat roosting habitat. It was evident that all of the forested areas surveyed had been previously disturbed at some point over the past few decades, which resulted in an age structure, tree characteristics, and community structure that did not provide suitable bat habitat. As such, PAF lands potentially disturbed by project activities were not determined to be suitable summer roosting habitat for any of the bat species listed above. In addition, no suitable winter roosting or hibernacula sites are present within the project area. Low quality foraging habitats may be present within the project area for several of the listed bats. However, larger, higher quality foraging habitats are available in surrounding areas that would provide adequate foraging areas for bats that may utilize these areas.

3.11.1.1.2 Aquatic Animals

The rugged hornsnail is commonly found in the Ohio River system and in some rivers of the Ozark region. It requires moderate to rapid flowing water in small to large river systems with a gravel or cobble substrate (NatureServe 2016). No suitable habitat for this species is present within the project areas.

The eastern hellbender is state-listed endangered and federally listed as a species of management concern. There are no known records of occurrence of this species in the vicinity of the plant. Hellbenders are completely aquatic salamanders and prefer fast-flowing, clear, well-oxygenated streams and rivers with substrate consisting of large flat boulders and logs. In Virginia, hellbenders have been observed in streams as small as 5 meters (5.5 yards) and rivers over 100 meters (109 yards) wide (VDGIF 2015). No suitable habitat for this species is present within any of the project areas. Jacobs Creek, which lies within the PAF reservation, does not provide adequate substrate or water quality for the hellbender, therefore this species is not likely to be found within PAF.

Each of the seven state and/or federally listed freshwater mussel species is known to occur within Muhlenberg County and has been recorded within a 5-mile radius of PAF.

The purple lilliput, and pyramid pigtoe have all been historically reported in the Green River at the Rochester Dam approximately 8 miles upstream of PAF or further upstream (TVA 2013). The purple lilliput is found in riffles in creeks and the headwaters of small to medium sized rivers with variable substrate while the pyramid pigtoe is found in shallow waters with riffles or large rivers with a swift current and grainy substrate (Nature Serve 2016).

Typical fanshell habitat is deep or shallow waters in medium to larger rivers with a rapid current and a gravel substrate (NatureServe 2016). The fanshell was once widely distributed but reproducing populations are only presently known in the Clinch River in Tennessee and Virginia and the Green and Licking rivers in Kentucky (USFWS 1991). The species has been reported near Rochester Dam approximately 8 miles upstream of PAF (TVA 2013).

The catspaw currently resides in only two river reaches as non-reproducing populations in the Cumberland River in Tennessee and the Green River in Kentucky. The surviving populations in the Green River are threatened from degradation of water quality resulting from inadequate environmental controls at oil and gas exploration and production facilities, and from altered stream flows from upstream reservoirs (USFWS 1990). The catspaw can be found in large rivers with substantial flow and a sandy gravel substrate particularly with runs and riffles (NatureServe 2016). It has historically been observed in the Green River upstream of PAF near the Rochester Dam; however, there are no recent records from the PAF area (TVA 2013).

The little spectaclecase typically inhabits smaller creeks to medium sized rivers with a slow current and a muddy substrate. In Kentucky, the species occurs throughout the Ohio River Valley, but is locally uncommon (Parmalee and Bogan 1998).

The rough pigtoe prefers medium to large river systems with sandy and gravel substrate (NatureServe 2016). The species originally occurred in the Ohio, Cumberland, and Tennessee rivers drainages (Parmalee and Bogan 1998). Historically, it occurred sporadically in the upper Green River system below Locks 4 and 5, but may be extirpated from this area (TVA 2013).

The pocketbook has generalized habitat preference and can adapt well to deep or shallow river systems of various sizes with a swift current as well as standing water of reservoirs. It requires a sandy gravel substrate that is also somewhat muddy or silty (NatureServe 2016).

Each of the above aquatic mussel species require perennial freshwater riverine and/or reservoir systems. As none of the CCR management project areas contain a riverine system, none of the listed mussel species are expected to occur within the project areas. The pocketbook, although a generalist species, is unlikely to inhabit any of the ash impoundments at PAF due to the poor water quality and frequent disturbance.

Mud River crayfish are found in a very small range of the Mud River system to the Muddy Creek in the Green River drainage in west central Kentucky. More recently, the species has been found in some tributaries of the Ohio River in south central Indiana. They prefer gravel and mud substrates of creeks and small rivers with shallow riffles (NatureServe 2016). No tributaries that would provide the Mud River crayfish with suitable habitat are present within the project areas at PAF; therefore, this species is not likely to be found within the project areas.

The chestnut lamprey resides in medium to large rivers and reservoirs that have heavily vegetated areas with softer substrates as adults. The species moves to smaller streams to spawn from April to June. The larvae are found burrowed in the substrate of small tributaries with a moderate flow. It has been reported near the Rochester Dam approximately 8 miles upstream of PAF and was captured at PAF during 2006-2008 fish impingement studies (TVA 2013).

The redspotted sunfish inhabits swamps, sloughs, bottomland lakes, creek pools, and small to medium rivers. It is common in quiet or moderately flowing waters with heavy vegetation or other cover and mud or sand substrate (NatureServe 2016). It has been observed in the Mud River upstream of PAF, and this species is likely to occur within portions of the Green River (TVA 2013).

The lake chubsucker is a state-listed threatened fish species that is typically found in clear pools of creeks and rivers, ponds, lakes, marshes, and swamps with little to no current. A gravel substrate with a fair amount of vegetation is required by this species for spawning purposes and when the eggs are dispersed (Nature Serve 2016).

The longhead darter is a state-listed endangered fish species that is typically found in larger upland creeks and small to medium rivers that include boulder- and cobble-strewn flowing pools, and areas above and below deep, fast riffles underlain with cobble. Spawning presumably occurs in gravel shoals (Nature Serve 2016). This species has been documented within 10 miles of PAF, but no suitable aquatic habitat occurs in the project area.

3.11.1.2 Plants

A review of the TVA Regional Natural Heritage database indicated that no state-listed or federally listed plant species, or associated designated critical habitat are known to occur on or within 5 miles of PAF (TVA 2016d). Eight species of plants listed by the KSNPC as threatened, endangered, or species of special concern in Kentucky are known to occur within Muhlenberg County (see Table 3-14). Of these eight species, none has been observed during field surveys or reported within 5 miles of PAF. Habitat requirements for each of these species are presented in Table 3-15. Based on the preferred habitats, only one of the listed plants is known to exist in disturbed settings: buffalo clover (*Trifolium reflexum*). Although buffalo clover is adapted to disturbed openings associated with forests or opportunistically in fields; repeated disturbance within each of the survey areas make it unlikely that any buffalo clover populations persist within PAF.

Table 3-15. Habitat Requirements for Plant Species of Conservation Concern within Muhlenberg County and Within 5 Miles of PAF

Common Name	Habitat Requirements	Habitat within Project Area
Water Hickory	Bottomlands and floodplain swamps.	No
Rose Turtlehead	Floodplain and alluvial forests, swamps and sloughs.	No
Water-purslane	Shallow waters, margins of sloughs, ponds, and slow streams. Generally, associated with large old mature oxbow lakes and ponds, which may draw down substantially in the summer.	No
French's Shooting Star	Sandstone rockhouses and overhangs.	No
Hair Grass	Dry or baked soils, prairies, gravels, and rocky slopes, generally at the edges of forests; or in wet, bottomland woods and at marsh edges.	No
Trepocarpus	Margins of swamp forests and sandy river bottoms.	No
Buffalo Clover	Prairies and disturbed openings either associated with forests or opportunistically in fields or well-drained sites.	No
Southern Wild Rice	Swamps and stream margins.	No

Source: KYNPC 2014

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct a new CCR disposal site and would continue current plant operations at PAF. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the project area. Therefore, no impacts to threatened or endangered species, or species of conservation concern or any suitable habitat would occur under this alternative.

3.11.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.11.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering facilities would be constructed on a site that is heavily disturbed and largely comprised of fill material from past and present PAF operations that is generally unsuitable for the listed species in Table 3-14. Suitable habitat for federally listed aquatic species does not occur within the project area; therefore, direct impacts to state- or federally listed threatened and endangered aquatic species are not anticipated to occur with implementation of the dewatering projects. Additionally, because water discharges would continue to be routed through the permitted outfall and would meet existing KPDES permit requirements, and because KPDES requirements are designed to be protective of aquatic life in receiving waters, impacts to listed fish and shellfish species near PAF are not anticipated.

The terrestrial habitat onsite has been severely degraded and is currently disturbed land comprised of fill material, which is generally unsuitable habitat for the eight listed plant species identified within the vicinity of PAF. Therefore, impacts to listed plant species or species of conservation concern are not anticipated.

There is no suitable summer roosting habitat or winter habitat for listed forest or cave dwelling bats. There are no records of caves within 5 miles of PAF. Although there may be some very limited foraging habitat within the limits of disturbance for the dewatering projects for the listed bat, these species would not be impacted by the project. No impacts are expected because the resulting habitats could still be used as limited foraging areas, and the adjacent Peabody WMA and other surrounding lands provide higher quality foraging habitat for these species. None of these species have been documented within the project area and only the Indiana bat has been detected within 5 miles of the project area. Therefore, construction and operation of the proposed dewatering projects is not expected to have adverse impacts on populations of any of the listed species. No suitable habitat exists for any of the other federally listed threatened or endangered terrestrial species, and therefore no impacts are anticipated.

3.11.2.2.2 Ash Impoundment Closure

Closure of the impoundments would incorporate a large amount of fill material and soil material. Proposed closure plans entail both re-utilization of CCR as fill material and the use of onsite borrow material to construct design grades prior to the installation of the final cover systems where needed. TVA anticipates obtaining borrow material onsite. No tree clearing would occur in conjunction with ash impoundment closure activities. As a result, no impacts would occur to tree dwelling bats or bird species.

The closure of the Peabody Ash Impoundment and Gypsum Disposal Area would result in the loss of some open water habitat. The water bodies contain little to no emergent aquatic vegetation; therefore, no impacts to aquatic threatened or endangered species are anticipated. The ash ponds do offer foraging opportunities for water birds, such as the hooded merganser; however higher quality nesting and foraging opportunities are available adjacent to the PAF reservation. Since the limits of disturbance for the closure activities are limited to the current impoundment footprints, with the exception of a highly disturbed 5-acre parcel designated as a temporary laydown area, no suitable habitats for plant or terrestrial threatened or endangered species would be impacted.

Ash impoundment dewatering activities would temporarily increase flow to Jacobs Creek and the Green River. However, the temporary increase in flow would adhere to permit requirements and is not expected to impact populations of any listed aquatic species.

3.11.2.2.3 Landfill Construction and Operation

The area within the limits of disturbance for the proposed landfill is generally unsuitable for the species listed in Table 3-14. This work would occur within areas that were previously, or are currently, disturbed for former and current operations at PAF that offer relatively low quality habitat when compared to surrounding areas that have experienced less disturbance. No direct impacts from landfill construction activities would be negligible to threatened or endangered species or species of conservation concern are expected.

3.11.2.3 Summary of Environmental Consequences of Alternative B

Impacts to threatened and endangered species associated with the implementation of Alternative B are summarized in Table 3-16. No adverse impacts to federally and state listed species would be expected.

Table 3-16. Summary of Impacts to Listed Species – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Loss of habitat due to construction and operation.	No impact – Existing habitats are of low quality and do not offer suitable habitat for listed species.
Ash Impoundment Closure	Loss of low-quality open water habitats, wetland habitat in the borrow areas and one highly disturbed laydown area.	No impact – Existing habitats are disturbed and of low quality, which do not offer suitable habitat for listed species.
Landfill	Removal of existing open water, wetland, and vegetation communities.	No impact – None of the early successional shrub-scrub and forested communities in landfill area, provide suitable habitat. These areas contain numerous invasive species and do not support any federally listed threatened or endangered species.

3.11.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, the landfill would not be constructed and CCR from PAF would be transported to an existing offsite permitted landfill. Impacts associated with implementation of the dewatering projects and ash impoundment closures would be the same as identified under Alternative B. Low quality habitat loss associated with landfill construction would not occur.

Because Hopkins County Regional Landfill is an existing permitted landfill, there would be no direct impacts to threatened or endangered species and their associated habitats that have not already been considered in the issuance of the permit to this existing landfill.

Potential indirect impacts of the transport of CCRs to an offsite landfill are associated with the potential for increased noise disturbance and vehicular collisions with threatened and endangered species; however, the proposed haul route to the Hopkins County Regional landfill from PAF is already subjected to vehicular traffic and landfill traffic. Therefore, no impacts to threatened and endangered species are expected when compared to existing conditions along the proposed haul route.

Additional trucks along this route would result in minor increases of fugitive dust and exhaust emissions that could indirectly impact sensitive resources along the route due to deposition. However, BMPs, such as covered loads and equipment maintenance, would be implemented, as appropriate to minimize impacts. Therefore, impacts to threatened or endangered species along the haul road to Hopkins County Regional Landfill are not anticipated.

3.12 Wetlands

3.12.1 Affected Environment

The USACE regulates the discharge of fill material into waters of the United States, including wetlands pursuant to Section 404 of the CWA (33 USC 1344). Additionally, EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse impact to wetlands and to preserve and enhance their natural and beneficial values.

As defined in the Section 404 of the CWA, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas can also be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood storage, erosion control, water quality improvement, wildlife habitat, and recreation opportunities.

PAF is located within the Green River – Southern Wabash Lowlands subdivision of the Interior River Valleys and Hills Ecoregion and the Shawnee Hills section of the Western Mixed Mesophytic Forest Region (TVA 2003) where the land use and land cover is dominated by agriculture and coal mining (Woods et al. 2002). Some natural vegetation including oak-hickory forests and wetlands still remain on PAF, but are not as extensive as they historically were due to the disturbance of the dominant land uses. The KSNPC lists three types of wetland plant communities of conservation concern within Muhlenberg County: bottomland marsh (Threatened, S1S2), cypress–tupelo swamp (Endangered, S1), and bottomland hardwood forest (Special Concern, S3) (KSNPC 2012).

Wetlands identified on National Wetland Inventory (NWI) maps within the project areas include a total of 91.8 acres of freshwater ponds and lakes (including man-made impoundments) and 13.22 acres of forested wetlands. The majority of the acreage is associated with the ash impoundments. A summary of the water features identified within the project areas by NWI is provided in Table 3-17. Land use/land cover data shows that wetlands comprise less than 3 percent of the land use within the PAF reservation and less than 5 percent (4,564 acres of emergent herbaceous and woody wetlands) of the lands within the surrounding 5-mile radius (see Table 3-10). Field delineation efforts to describe the present state of these ponds and wetlands are discussed below.

Table 3-17. Summary of NWI Wetland Features Identified within Project Area

Feature Type	Dewatering and CCR Handling Facilities Impact Area[1]	Ash Impoundment Closure Impact Areas[2]	Landfill Impact Area[3]
Wetlands (acres)	0.0	13.2	0.0
Open Water (acres)	0.0	91.0	0.8
Total (acres)	**0.0**	**104.2**	**0.8**

Source: USFWS 2016c.

[1] Includes dewatering the facilities project area.
[2] Includes ash impoundment areas, proposed borrow and South Spoil Areas, and associated temporary equipment laydown and mobilization area.
[3] Includes the landfill limits of disturbance.

Wetlands were delineated within the project areas in August and October 2016 (AECOM 2016). Potential jurisdictional wetlands were evaluated in accordance with the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0). In total, 19.6 acres within the PAF CCR project areas were identified that exhibit features of wetlands and ponds (Table 3-18). However, most of these areas are considered to be non-jurisdictional. Other non-jurisdictional wetland and open water features are located within the limits of the ash impoundments, and are part of the PAF treatment system and would therefore not be regulated under Section 404 of the CWA.

As shown on Table 3-18, a total of 1.8 acres of jurisdictional wetlands were identified within the proposed project areas. Within the dewatering facilities and ash impoundment closure project areas, 0.4 and 0.7 acres of wetlands respectively were identified as being jurisdictional. Additionally, within the area proposed for the CCR landfill, 0.7 acres of wetlands were determined to be jurisdictional (AECOM 2016). Jurisdictional wetlands are shown on Figures 3-1 and 3-4 through 3-8).

Table 3-18. Summary of Wetland Features Delineated within Project Areas

Feature Type	CCR Dewatering and Handling Facilities (acres)	Ash Impoundment Closures[1] (acres)	Proposed CCR Landfill (acres)
Jurisdictional			
Stream	--	0.02 (438 feet)	--
Wetland	0.4	0.7	0.7
Open Water	--	--	--
Subtotal	**0.4**	**0.7**	**0.7**
Non-Jurisdictional			
Stream	--	--	--
Wetland	--	13.4	0.3
Open Water	2.0	--	2.1
Subtotal	**2.0**	**13.4**	**2.4**

Source: AECOM 2016
[1] Does not include acreage of ash impoundments. Includes wetlands in the ash impoundment project areas, proposed borrow area and South Spoil Area.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct a new CCR disposal site and would continue current plant operations at PAF. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the project area. Therefore, there would be no impacts to wetland resources with this alternative.

3.12.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.12.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering facilities would be constructed within a previously disturbed site. Approximately 2 acres of non-jurisdictional open water (processing pond) and 0.4 acre of jurisdictional wetlands (primarily emergent wetlands) were identified within the project area. Due to the size and location of these wetlands, they do not provide the surrounding watershed with any significant wetland functions such as flood abatement, nutrient or sediment retention, or wildlife habitat. Therefore, impacts to these wetlands would be considered minor and would be mitigated by appropriate compensation in accordance with permit requirements.

3.12.2.2.2 Ash Impoundment Closures

A total of 0.7 acre of jurisdictional wetlands (approximately 0.15 acre of a mix of emergent and shrub wetland and approximately 0.5 acre of forested wetland) were identified within the South Spoil Area. However, impacts to these areas are minor and would be mitigated by appropriate compensation in accordance with permit requirements.

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 impoundments primarily receive their hydrology via diffuse surface flow and direct precipitation. The dewatering and modification of hydrology from the CCR impoundments is expected to have a negligible effect on these wetlands.

Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into offsite 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.

3.12.2.2.3 Landfill Construction and Operation

Construction, operation and maintenance of the proposed landfill would result in a total of approximately 0.7 acre of jurisdictional wetlands (approximately 0.16 acre of emergent/scrub shrub wetland and approximately 0.5 acre of forested wetland). However, effects of impacts to these areas are minor and would be mitigated by appropriate compensation in accordance with permit requirements.

Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into offsite or nearby wetlands but BMPs would be implemented to minimize this potential.

3.12.2.3 Summary of Environmental Consequences of Alternative B

Wetland impacts associated with implementation of Alternative B are summarized in Table 3-19. The proposed projects would impact a total of 1.8 acres of wetland and 438 feet of an ephemeral stream that could be jurisdictional. Wetland impacts would be minimal when viewed in the context of wetland resources within the surrounding 5 miles, impacting less than 0.1 percent of wetlands within the region. In terms of EO 11990, there is no practicable alternative that would avoid impacting such wetlands given the operational constraints associated with the proposed projects. Such unavoidable direct impacts to wetlands would be mitigated as required by both state and federal agencies in accordance with Kentucky Water Quality Certification Program and Section 404 of the CWA.

Table 3-19. Summary of Impacts to Wetlands – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities	Impacts associated with construction including soil/vegetation disturbing activities and the placement of fill.	Minor – Loss of 0.4 acre of wetlands determined to be jurisdictional under Section 404 of the CWA.
Ash Impoundment Closure	Impacts associated with construction including soil/vegetation disturbing activities and the placement of fill.	Minor – Loss of 0.7 acre of wetlands determined to be jurisdictional under Section 404 of the CWA.
Landfill	Impacts associated with construction including soil/vegetation disturbing activities and the placement of fill.	Minor – Loss of 0.7 acre of wetlands determined to be jurisdictional under Section 404 of the CWA

3.12.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, CCR from PAF would be transported to an existing offsite permitted landfill. Impacts associated with implementation of the CCR dewatering and handling projects and ash impoundment closures would be the same as identified under Alternative B. There would be no impact to 0.7 acre of wetland identified in the proposed landfill site as CCR would be transported to the Hopkins County Regional Landfill. Since this is an existing landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative. The haul route to the landfill would utilize existing roads, which currently support landfill traffic. Therefore, any resources along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. Therefore, impacts to wetlands along the haul road to Hopkins County Regional Landfill are not anticipated.

3.13 Solid and Hazardous Waste

3.13.1 Affected Environment

3.13.1.1 Solid Waste

In Kentucky, requirements for management of solid wastes are focused on solid waste processing and disposal under Kentucky Revised Statutes (KRS) 224. Solid wastes are defined in the rule as garbage, trash, refuse, abandoned material, spent material, byproducts, scrap, ash, sludge and all discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial mining and agricultural operations, and from community activities (KRS 224.1-010(31)a). Currently, the solid waste generated at PAF is managed in accordance with federal and State requirements.

Under KRS 224.50-760, special wastes include high volume and low hazard such as mining wastes, utility wastes (fly ash, bottom ash, and scrubber sludge), sludges from water and wastewater treatment facilities, gas and oil drilling muds and other wastes not regulated as hazardous waste.

On April 17, 2015, the Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule) was published in the Federal Register. Under the final rule, CCRs are not regulated as hazardous waste.

The primary solid wastes that result from the operation of PAF are collectively known as CCRs. The primary CCR waste streams are fly and bottom ash, gypsum, and boiler slag. TVA has historically managed storage of CCR materials generated at PAF in a combination of onsite dry stacks, wet stacks and impoundments.

The projected quantities of CCR that are estimated to be generated at PAF daily and annually between 2020 and 2039 are provided below in Table 3-20.

Table 3-20. Summary of Projected Waste Disposal Volumes at PAF

Waste Materials	Tons/Year	Tons/Day
Fly Ash	45,663	126
Gypsum	321,666	882
Boiler Slag	132,370	362
Total	**499,699**	**1,370**

Fly ash and boiler slag are comprised of the noncombustible particles or components in coal. Both fly ash and bottom ash are composed primarily of silica, aluminum oxide and iron oxide. These waste streams also contain a variety of heavy metals at limited concentrations including arsenic, cadmium, chromium, copper, lead, mercury and selenium. Under KRS 224.50-760, CCR are regulated as special wastes that require special waste approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes.

3.13.1.2 Hazardous Waste

Hazardous materials are regulated under a variety of federal laws including RCRA, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act (EPCRA), and the Toxic Substances Control Act.

Regulations implementing the requirements of EPCRA are codified in 40 CFR 355, 40 CFR 370 and 40 CFR 372. Under 40 CFR 355, facilities that have any extremely hazardous substances present in quantities above the threshold planning quantity are required to provide reporting information to the State Emergency Response Commission, Local Emergency Planning Committee and local fire department. Inventory reporting to the indicated emergency response parties is required under 40 CFR 370 for facilities with greater than the threshold planning quantity of any extremely hazardous substances or greater than 10,000 pounds of any OSHA regulated hazardous material. EPCRA also requires inventory reporting for all releases and discharges of certain toxic chemicals under 40 CFR 372. TVA applies these requirements as a matter of policy.

The federal law regulating hazardous wastes is RCRA and its implementing regulations codified in Title 40 CFR Parts 260-280. The regulations define what constitutes a hazardous waste and establishes a “cradle to grave” system for management and disposal of hazardous wastes.

Subtitle C of RCRA also includes separate, less stringent regulations for certain potential hazardous wastes. Used oil, for example, is regulated as hazardous waste if it is disposed of, but is separately regulated if it is recycled. Specific requirements are provided under RCRA for generators, transporters, processors and burners of used oil that are recycled. Universal wastes are a subset of hazardous wastes that are widely generated. Universal wastes include batteries, lamps and high intensity lights and mercury thermostats. Universal wastes may be managed in accordance with the RCRA requirements for hazardous wastes or by special, less stringent provisions.

PAF is considered a small quantity generator of hazardous waste by Kentucky Division of Waste Management. The primary hazardous wastes currently generated include small quantities of waste paint, waste paint solvents, paper insulated lead cable, debris from sandblasting and scraping, paint chips, solvent rags due to cleaning electric generating equipment, and liquid-filled fuses

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, there would be no change to the management of CCRs at PAF for as long as capacity is available. In the long term, however, once capacity to manage CCR is exceeded, plant operations may have to be curtailed as there would be no option for storage of CCR produced at PAF and therefore theoretically, the amount of solid wastes produced would decrease.

3.13.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.13.2.2.1 CCR Dewatering and Handling Projects

3.13.2.2.1.1 Construction

Construction of the dewatering facilities would entail site preparation and construction activities that would generate typical construction debris and would generate small volumes of hazardous waste as summarized below:

- Paper, wood, glass, and plastics would be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers during project construction.
- Scrap metal would result from welding, cutting, framing and finishing operations, electrical wiring, disposal of packing materials and empty nonhazardous chemical containers.
- A limited amount of soils would result from grading and excavation related to foundation construction.

Construction waste and debris would be placed in roll-offs and disposed of at a permitted offsite construction and demolition landfill. TVA would manage all solid wastes generated from construction of the proposed facility in accordance with applicable State regulations following procedures outlined in TVA’s current Environmental Procedures and applicable BMPs. Any soils generated due to grading or excavation would be managed onsite.

A small amount of landscaping wastes would also result from grubbing and land clearing operations. These landscaping wastes may be disposed onsite through open burning or sent offsite for disposal. TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted.

Hazardous waste generated during site preparation and construction may include limited quantities of fuels, lubricating oils, solvents, paints, adhesives, welding material, and other hazardous materials. Appropriate spill prevention, containment, and disposal requirements for hazardous materials would be implemented to protect construction and plant workers, the public, and the environment. A permitted third-party waste disposal facility would be used for ultimate disposal of the wastes.

3.13.2.2.1.2 Operation

CCR generation depends mainly on the amount and type of coal burned rather than the methods for handling these products; therefore, CCR production rates would not change from existing conditions due to implementation of Alternative B. Under Alternative B, CCR generated at PAF would be transported to the onsite CCR Landfill.

Limited quantities of used oils would be generated during operation of the proposed dewatering facilities from vacuum pumps, liquid and slurry transfer pumps, gear boxes, compressors and other machinery. Hydraulic oils may also be generated from components of the dewatering facility and associated equipment. These types of used oil are currently generated by PAF, and the increase in generation rate of these wastes is not expected to be significant. Used oil is recycled in accordance with applicable regulations and TVA's procedures.

Hazardous waste streams that are likely to be generated during the operation of the dewatering facility are maintenance-related and include adhesives, paints, paint chips, degreasing solvents, absorbents, oily and solvent contaminated rags, sandblasting wastes, and abrasive wastes. Only a limited increase in hazardous waste generation is expected to occur from operation of the dewatering facility, and PAF is not expected to change generator status from small quantity generator.

The transport, handling, storage, use, and disposal of hazardous materials would follow federal, state and TVA requirements. Hazardous materials would be handled in limited quantities, and there is very limited potential for significant impacts related to their handling.

Operation of the dewatering facilities would also generate limited quantities of universal wastes (mercury-containing relays and other mercury-containing devices, batteries and lamps). Although a limited increase in the quantities of these wastes that are generated at PAF would occur from operation of the dewatering facilities, PAF is expected to remain a small quantity handler of universal waste. These wastes would continue to be managed in accordance with RCRA requirements and TVA BMPs.

3.13.2.2.2 Ash Impoundment Closure

As identified in the PEIS (TVA 2016a), the primary waste stream resulting from the proposed impoundment closures would be solid nonhazardous waste. The primary solid nonhazardous wastes generated are summarized below.

- Construction debris consisting primarily of liner scraps, piping removed, miscellaneous construction rubble, wastes from packing materials and empty nonhazardous chemical containers during project construction.
- Wastes would result from land clearing, grading and excavation operations.

In addition to these larger nonhazardous waste streams, limited quantities of hazardous solvents, paints and adhesives, spill absorbent, oil and solvent contaminated rags, and empty containers would be generated.

TVA would manage all solid waste and hazardous wastes generated from construction activities in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with pertinent federal, state and local requirements.

3.13.2.2.3 Landfill

3.13.2.2.3.1 Construction

Construction of an onsite landfill would require site preparation which would include vegetation removal over the 123.8-acre site, excavation, re-compaction of subgrade over the 80.2-acre landfill footprint, and installation of an approved liner and cover system.

The primary wastes resulting from these activities are:

- Landscaping/vegetative waste
- Construction waste and debris

Landscaping wastes would result from grubbing and land clearing and grading necessary to construct the landfill and support areas. Some of the wood from the forested areas (approximately 21.8 acres of deciduous forest and 1.3 acres of evergreen forest) is harvestable but a portion of the wood, mainly stumpage, is considered economically unusable due to difficulties and costs associated with grinding. In addition, approximately 2.4 acres are shrub/scrub clearing would generate additional vegetative waste. As discussed previously, these materials may be disposed offsite or onsite through open burning.

Construction waste and debris, such as paper, wood, and plastics would be generated during landfill construction. This construction waste would be placed in roll-offs and disposed of at a permitted offsite construction and demolition landfill.

In addition to these nonhazardous waste streams, limited quantities of hazardous solvents, paints and adhesives, spill absorbent, oil and solvent contaminated rags and empty containers would be generated. Additionally, there is the potential for spills or releases of fuels, coolants, oils and hydraulic fluids from construction machinery. All of these waste streams would be generated in very limited quantities. As described for dewatering facility construction and impoundment closure construction activities, TVA would manage all solid and hazardous wastes generated from construction activities in accordance with federal, state and local requirements.

3.13.2.2.3.2 Operation

Operation of the landfill would not change the quantity of CCR wastes generated at PAF annually. However, implementation of this alternative would result in a long-term change in the management of CCR as all material would be stored in an onsite landfill. This would be a positive impact as CCR management would be in accordance with TVA goals related to long term management of CCR.

Other solid waste streams associated with operation of the proposed landfill would be limited in quantity. Periodic clean-out of the proposed storm water impoundments would result in soil and vegetative wastes. Clean-out of the storm water retention basins is likely to occur only once or twice over the lifespan of the proposed landfill. Each cleanout event would generate a waste volume of approximately 30 to 50 percent of the combined capacities of the impoundments. These wastes would be disposed of on site or offsite at a landfill.

The largest solid waste stream that would be routinely generated from operation of the proposed landfill is leachate sludge from the leachate storage impoundments. The proposed design provides for leachate storage impoundments. Sediment and miscellaneous solids would be periodically removed from the leachate storage impoundments and managed in the onsite landfill.

Other solid wastes that would be generated from operation of the proposed landfill include paper and plastics from packaging of maintenance-related materials, small quantities of oils and fuels from spills, small quantities of paints, adhesives, etc. from maintenance. Pumps, valves and controls associated with the leachate management system would require replacement during operations.

Various hazardous wastes, such as used oils, hydraulic fluids and engine coolants could be produced during landfill operations. These hazardous wastes would be managed similarly to hazardous wastes generated during operations at the dewatering facilities.

At some point in the future, the landfill would implement closure activities following an approved closure plan. Construction type wastes would be generated during preparation and installation of the final cover. These solid and hazardous wastes would be similar to those generated during impoundment closure activities. TVA would manage all waste generated during landfill closure in accordance pertinent federal, state and local requirements.

After the landfill is closed, post-closure care would generate vegetative debris and soils from maintenance of drainage swales and storm water basins and sludge from the leachate storage impoundments. Other small volume solid waste streams could be generated during post-closure care such as lubricating oils and filters from construction equipment and pumps associated with leachate collection system, small quantities of oils and fuels from spills or leaks, and small quantities of paints and other wastes from maintenance. TVA would manage these wastes in accordance with standard procedures for spill prevention and cleanup and waste management protocols.

3.13.2.3 Summary of Environmental Consequences of Alternative B

Wastes generated by construction activities would be managed in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with pertinent federal, state and local requirements. Hazardous waste streams generated from operation of the dewatering facilities would be limited and would not change the status of PAF from small quantity generator. Therefore, impacts associated with generation of solid and hazardous waste would be minor. However, there would be a long-term impact associated with the change in management of solid wastes produced at PAF as all CCR would be disposed in a dry manner in a new CCR landfill. Impacts to solid and hazardous waste associated with implementation of Alternative B are summarized in Table 3-21.

Table 3-21. Summary of Impacts to Solid and Hazardous Wastes – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities Ash Impoundment Closure Landfill	Small volumes of nonhazardous construction waste and hazardous wastes would be generated from site preparation and construction activities.	Minor impact. TVA would manage all waste handled in accordance with TVA's current Environmental Procedures as well as complying with applicable federal and state management requirements.
Dewatering Facilities	Increase in solid and nonhazardous waste streams generated during operation.	Minor. Wastes would be managed in accordance with applicable federal and state requirements. No change in CCR volume.
Landfill	Limited quantities of nonhazardous solid wastes and hazardous wastes generated during operation, closure and post closure care. Change in management of solid wastes produced at PAF as all CCR would be disposed in a dry manner in a new CCR landfill.	Minor impact. Wastes would be managed in accordance with applicable federal and state requirements. Long-term positive impact.

3.13.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, solid and hazardous waste impacts associated with implementation of the CCR dewatering and handling projects and ash impound closures would be the same as identified under Alternative B. For Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill (Hopkins County Regional Landfill) and not be disposed of onsite; therefore, solid and hazardous wastes associated with construction and operation of the landfill would not occur.

The haul route to the Hopkins County Regional Landfill would use roads that are already subjected to vehicular traffic and no new roads would need to be constructed.

Operation of Alternative C would not change the quantity of CCR wastes generated annually by PAF. CCR wastes as described in Table 3-20 would be transported to an existing permitted landfill. Therefore, this alternative would result in solid waste disposal that would have an effect on the lifespan of the Hopkins County Regional Landfill and its long-term ability to meet disposal needs of the region. Based on Kentucky Division of Waste Management survey, the Hopkins County Regional Landfill had approximately 47 years of capacity based on 2011 disposal rates (KDOW 2011). If PAF's CCR was managed at this landfill, the landfill's long-term disposal capacity would be reduced.

3.14 Visual Resources

3.14.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service and integrated with planning methods used by TVA (USFS 1995).

The visual landscape of an area is formed by physical, biological and man-made features that combine to influence both landscape identifiability and uniqueness. Scenic resources within a landscape are evaluated based on a number of factors that include scenic attractiveness, integrity and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures and visual composition of each landscape. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality and sense of place is dependent on where and how it is viewed.

Scenic visibility of a landscape may be described in terms of three distance contexts: (1) foreground, (2) middleground and (3) background. In the foreground, an area within 0.5 mile of the observer, individual details of specific objects are important and easily distinguished. In the middleground, from 0.5 to 4 miles from the observer, object characteristics are distinguishable but their details are weak and tend to merge into larger patterns. In the distant part of the landscape, the background, details and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment, the background is measured as 4 to 10 miles from the observer. Visual and aesthetic impacts associated with a particular action may occur as a result of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the character of an existing site is an important factor in evaluating potential visual impacts.

For this analysis, the affected environment is considered to include the project area within the PAF facility that encompasses both permanent and temporary impact area, as well as the physical and natural features of the landscape. Parts of the PAF property are devoid of vegetation and most of it has been heavily disturbed by previous industrial activities. The most dominant visual components of the PAF facility include two 600-foot high stacks, one 800-foot high stack, three cooling towers over 435 feet high, and connecting transmission lines. Other major visual components of the large-scale industrial site include the powerhouse buildings, emission control buildings and ducts, and the coal pile and coal handling facilities. The existing site features are shown on Figure 1-1.

Although mining operations have substantially altered the topography and appearance of much of the area surrounding the plant, the large-scale industrial PAF facility provides a sharp visual contrast to the surrounding rural landscape (TVA 2003). Views of the project area include broadly horizontal buildings and industrial equipment. Predominant focal points include the existing smokestack and cooling towers and the plumes they emit. Views of the plumes are heavily influenced by seasonal variations in weather and atmospheric conditions and they are typically more visible during the winter. Scenic attractiveness of the area is minimal and scenic integrity ranges from low to very low.

There are no sensitive viewing receptors within the foreground of the project area. The nearest residential areas are located on the west side of the Green River about 2.5 miles from the southern edge of the PAF property. The PAF facility is located approximately 4 miles from the nearest town, and there are no nearby residences or other environmentally sensitive viewing receptors. The nearest church and cemetery are the Drakesboro United Methodist Church and Ennis Cemetery, located approximately 2.5 miles and 1.2 miles to the southwest of PAF, respectively (Figure 3-10). Groups that have direct views of the project area include authorized employees, contractors and visitors to the plant site. Views of the project areas are generally restricted to the foreground (i.e., within 0.5 mile) in all directions, however, that may be buffered by nearby vegetation and the local topography. The proposed projects could also potentially be viewed by recreational boaters and other users along the Green River as well as visitors to the adjacent Peabody WMA.

3.14.2 Environmental Consequences

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value class ratings based upon landscape scenic attractiveness, integrity and visibility. Sensitivity of viewing points available to the general public, their viewing distances and visibility of the proposed action are also considered during the analysis. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The extent and magnitude of visual changes that could result from the proposed facility were evaluated based on the process and criteria outlined in the U.S. Forest Service scenic management system.

3.14.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations, and no work would be conducted that could change the aesthetics of the project area.

3.14.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.14.2.2.1 Construction Impacts

Under Alternative B, during the construction phase of the proposed activities there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already predominately used for industrial activity. This small increase in visual discord would be temporary and only last until all activities have been completed by TVA.

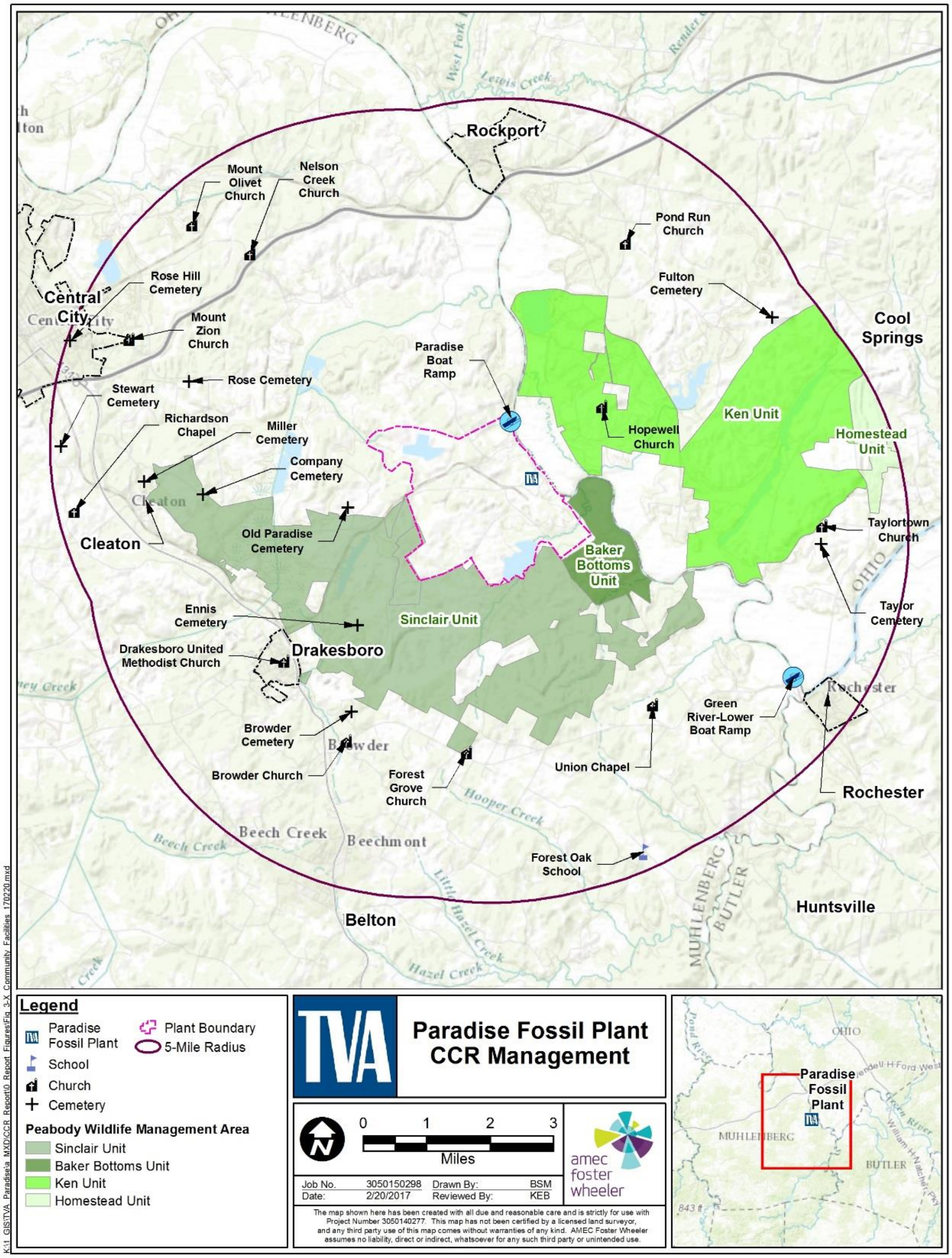

Figure 3-10. Natural Areas, Parks and Community Facilities within the Vicinity of PAF

3.14.2.2.2 CCR Dewatering and Handling Projects

The new facility would primarily be seen by employees and visitors to PAF. The tallest feature of the dewatering facilities (storage silos) would be approximately 97 feet, which would be notably shorter than the existing stacks at PAF (800 feet). The proposed facility components would be visually similar to other industrial elements present in the current landscape. Therefore, the facility would generally be absorbed by existing PAF components and would become visually subordinate to the overall landscape character associated with the plant site.

Views to and from sensitive visual receptors including the Green River, visitors to the Peabody WMA, and residences in the middleground would remain the same. Because the existing PAF facilities are located between the proposed dewatering area and the river and existing topography, the dewatering facilities would not be visible to recreational users along the Green River or the Peabody WMA. Overall, the proposed dewatering facilities would not be discernible from the existing scenery nor would they contrast with the overall landscape due to the distance of the viewing receptors.

3.14.2.2.3 Ash Impoundment Closure

Permanent impacts as a result of the ash impoundment closures would include minor discernible alterations that would be viewed in the foreground of plant operations. In the foreground, the closure of the ash impoundments and cover with natural vegetation and the conversion of the slag impoundments to equalization basins may enhance the landscape character compared to the current condition. In more distant views, the closure of the impoundments would likely merge with the overall industrial components of the facility. The proposed activities would have minimal public visibility and would primarily be seen by employees and visitors to the PAF facility and potentially visitors to the Peabody WMA. Therefore, the closed impoundments would generally be absorbed by existing PAF facility components and would become visually subordinate to the overall landscape character associated with the plant site.

3.14.2.2.4 Landfill Construction and Operation

The construction of the proposed facility would contrast with the color of the landscape during some phases of operation. The current landscape at the proposed site is predominantly green and brown as a result of the existing vegetation on the site. The dominant shapes in the landscape include the vertical lines of existing transmission structures and stacks of existing facilities against the horizon. The color and shape contrast would be greatest in the foreground to employees and visitors to PAF, recreational boaters on the Green River, and visitors to the Peabody WMA, although the contrasts would be less noticeable in the middleground and background. While the CCR in the landfill would contrast with the natural landscape color, it would eventually be covered with an earthen layer and grassy vegetation. Once the landfill is closed, it is expected to reach a maximum height of approximately 210 feet. This is not anticipated to create visual discord with the surrounding environment as the existing PAF facility includes facilities up to 800 feet high, including the existing stacks and cooling towers. In addition, lands expected to be used for construction-related activities and operations for the landfill are already used for heavy industrial use, and due to its location within the PAF facility there are no sensitive visual receptors located near the landfill site.

3.14.2.3 Summary of Environmental Consequences of Alternative B

The scenic attractiveness of the PAF site is already of minimal quality. Therefore, any discord resulting from the construction activity is not anticipated to result in a change in the scenic quality. Additionally, for the ash impoundment closures, the scenic quality of the project area may be expected to improve to some degree relative to the existing conditions based upon the improved visual characteristics of a vegetated closure systems. Therefore, visual impacts resulting from implementation of Alternative B would be negligible. Impacts associated with visual resources with the implementation of Alternative B are summarized in Table 3-22.

Table 3-22. Summary of Impacts to Visual Resources – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Facilities Ash Impoundment Closure Landfill	Visual discord during construction.	Minor and temporary.
Dewatering and Ash Handling Facilities Ash Impoundments Landfill	Long-term change in visual integrity of the landscape.	Negligible – Not discernible from existing scenery. Potential beneficial impact in long term due to re-vegetation of cover systems.

3.14.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering and ash handling projects and ash impoundment closure would be minor and short term as identified under Alternative B. There would be no temporary impact associated with landfill construction because under Alternative C CCR from PAF would be transported to an existing offsite permitted landfill. The Hopkins County Regional Landfill is an existing permitted landfill; therefore, there would be no changes from the existing environment within the landfill boundaries under this alternative. The haul route to the landfill would utilize previously constructed roads which are already subjected to vehicular traffic. Any sensitive visual receptors along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. As such, there would be no impacts to visual resources associated with long term storage of CCR under this alternative.

3.15 Cultural and Historic Resources

3.15.1 Affected Environment

3.15.1.1 Regulatory Framework for Cultural Resources

Cultural resources or historic properties include prehistoric and historic archaeological sites, districts, buildings, structures, and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the National Historic Preservation Act (NHPA) (54 USC 300101 et seq) and by NEPA to consider the possible effects of their undertakings on historic properties. “Undertaking” means any project, activity, or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA at 36 CFR Part 800. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (54 USC 300101 et seq.), Archaeological Resources Protection Act (16 USC 470aa-470mm), and the Native American Graves Protection and Repatriation Act (25 USC 3001-3013).

Section 106 of the NHPA requires that federal agencies consider the potential effects of their actions on historic properties and to allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: (1) initiate the process, (2) identify historic properties, (3) assess adverse effects, and (4) resolve adverse effects. This process is carried out in consultation with the State Historic Preservation Officer (SHPO) and other interested consulting parties, including federally recognized Indian tribes.

Cultural resources are considered historic properties if they are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility of a resource is based on the Secretary of the Interior's criteria for evaluation (36 CFR 60.4), which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling, association and:

a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value; or

d. Have yielded, or may yield, information (data) important in prehistory or history.

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation) that the undertaking's effect on a historic property within the area of potential effect (APE) would diminish any of the qualities that make the property eligible for the NRHP (based on the criteria for evaluation at 36 CFR Part 60.4 above), the effect is said to be adverse. Examples of adverse effects would be ground disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the structure's integrity of feeling or setting.

Agencies are required to consult with SHPOs, tribes, and others throughout the Section 106 process and to document adverse effects to historic properties resulting from agency undertakings.

3.15.1.2 Area of Potential Effect

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

For Alternative B, TVA would construct dewatering and CCR handling facilities; close the ash impoundments, and construct a CCR Landfill. Borrow would be obtained as needed from two sites located on adjacent to the Peabody Ash Impoundment on PAF property (known as the South Spoils Area and the Proposed Borrow Site). The archaeological APE is defined as the project footprint and includes approximately 29.1 acres for the proposed dewatering and CCR handling facilities, a 34.2-acre project area for closing and repurposing Slag Impoundment 2A/2B and Stilling Impoundment 2C, 133.8 acres for the Peabody Ash Impoundment, 237.9 acres for the Gypsum Disposal Complex (232.9 acres for the area to be closed and 5.0 acres for temporary use area), 104 acres for the South Spoil Area, 37 acres for the additional proposed borrow site, and 123.8 acres for the landfill as these are areas where ground disturbance may occur (see Figure 1-1). The APE for architectural resources consists of the half-mile viewshed surrounding the proposed dewatering facilities and landfill as well as the impoundments to be closed where the project could alter the existing viewshed of a historic resource (e.g., constructing a new building or changing topography or vegetation).

For Alternative C – TVA would construct the same dewatering and CCR handling facilities and close the same impoundments as described under Alternative B. No new landfill would be constructed under Alternative C. The archaeological and historic architectural APE for Alternative C would be the same as for Alternative B related to the dewatering and CCR handling facilities and impoundments to be closed. The offsite, permitted Hopkins County Regional Landfill is located on previously developed and disturbed lands. In addition, the landfill would have previously undergone the Section 106 review process to evaluate impacts to historic properties when it was permitted and constructed. CCR material from PAF would be transported to the landfill along existing roadway corridors which had previously been disturbed during their construction.

3.15.1.3 Previous Studies

TVA has conducted records searches at the Kentucky Heritage Council and the Kentucky Office of State Archaeology, located in Lexington, Kentucky, to identify previously recorded archaeological and architectural properties listed on, or eligible for inclusion in the NRHP within the APE. No archaeological sites or historic architectural resources have been recorded within the plant boundary.

To date, TVA has conducted three archaeological investigations under Section 106 of the NHPA within the APE. The archaeological surveys field inspections involved systematic shovel testing at 100-foot intervals and a visual examination of exposed ground surfaces and any terrain with a slope greater than 20 percent. No new archaeological sites were recorded as a result of these investigations (Amec Foster Wheeler 2016a, Amec Foster Wheeler 2016b, and Jordan-Greene et al. 2014).

In March 2013, TVA contracted for an architectural assessment of PAF (Karpynec 2013). The APE for historic architectural resources was defined as the area within a 0.5-mile radius of the proposed pulse jet fabric filter site for Units 1 and 2. Based on the study findings, TVA determined, in consultation with Kentucky SHPO, that the PAF itself is ineligible for inclusion in the NRHP (see Appendix D, SHPO concurrence letters dated April 8, 2013, May 8, 2013 and October 11, 2013). No NRHP-eligible historic structures have been identified within the PAF reservation or within a 0.5-mile viewshed of the proposed pulse jet fabric filter site.

In July 2016, TVA contracted for an architectural assessment of the APE for historic architectural properties. The survey noted that PAF is the only architectural resource within the APE, and based on current information on PAF, TVA has determined that this property remains ineligible for inclusion in the NRHP..

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action Alternative

Implementation of Alternative A would require no new ground disturbance activities or changes to current operations. Therefore, no direct or indirect impacts to cultural resources would occur under Alternative A.

3.15.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.15.2.2.1 CCR Dewatering and Handling Projects

A Phase I archaeological survey did not identify any archaeological sites within the APE and, therefore, the construction of the dewatering facilities would not disrupt archaeological resources (Amec Foster Wheeler 2016b).

A 2016 architectural historic survey (Karpynec and Weaver 2016) determined there are no NRHP-listed or NRHP-eligible historic architectural resources in the APE for indirect effects. For these reasons, TVA determined that no indirect visual impacts would result from the construction of the dewatering facilities.

3.15.2.2.2 Ash Impoundment Closure

The August and October 2016 Phase I archaeological surveys identified that the impoundment areas as well as the proposed laydown area and borrow area had previously been disturbed by heavy excavation equipment (Amec Foster Wheeler 2016a and 2016b). No archaeological resources were located. Based on the absence of findings, TVA determined that no archaeological resources would be impacted by impoundment closure activities.

As discussed above, TVA has found that no historic architectural resources occur on PAF. In addition, based on information from previous architectural surveys, TVA determined that no historic resources occur within the 0.5-mile APE; therefore, no direct or indirect impacts to historic resources are anticipated from the impoundment closures.

3.15.2.2.3 Landfill Construction and Operation

No impacts to cultural resources are anticipated as no archaeological sites or architectural resources eligible for listing in the NRHP were identified within the APE for the proposed landfill site from either a record search, architectural historic survey, or Phase I archaeological survey (Amec Foster Wheeler 2016b). Therefore, TVA determined that no historic resources occur within a 0.5-mile APE and therefore, no direct or indirect impacts to historic resources are anticipated from the construction of the landfill. Summary of Environmental Consequences of Alternative B

In summary, TVA has determined that there are no archaeological or architectural resources within the APE for Alternative B and no impacts associated with cultural resources would occur. The Kentucky SHPO concurred with this determination in letters dated and March 30, 2017 and May 23, 2017 (Appendix D).

TVA sought concurrence from the SHPO with its determination that there are no NRHP-listed or NRHP-eligible historic architectural resources in the APE in a letter dated March 2, 2017 (Appendix D). The SHPO did not respond to TVA's letter within 30 days; therefore, in accordance with applicable regulations, TVA's responsibilities under the Act are fulfilled and no future coordination is required..

If an unidentified archaeological site is discovered during construction, TVA would cease all construction activities in the immediate area where archaeological material is discovered. TVA would contact the SHPO to determine what further action, if any, would be necessary to comply with Section 106 of the NHPA.

3.15.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

As with Alternative B, TVA determined there would be no impacts to cultural resources associated with implementation of the dewatering and CCR handling projects, and ash impoundment closure SHPO concurrence with this determination is pending. Under Alternative C, no direct impacts to historic properties related to long-term storage of CCR would be expected as the Hopkins County Regional Landfill is a permitted landfill. As part of the landfill permitting process (KRS Chapter 224), the owner of the landfill was required to submit a Notice of Intent Application which includes a review of potential historic or archeological sites. The presence of historic properties would have been addressed during the permitting process. Therefore, the addition of CCR material from PAF to this landfill would not result in any direct impacts to historic resources.

Indirect impacts from transporting CCR to the Hopkins County Regional Landfill could include an increase in vibrations and noise that may affect historic resources located adjacent to the haul route to the Hopkins County Regional Landfill. Based on a record search, no historic resources listed on the NRHP were identified along the proposed CCR haul route. In addition, this route would utilize existing roadways and as such if any unrecorded cultural resources are present along the haul route they are already subjected to vehicular traffic. Moreover, if any unrecorded cultural resources are present along the haul route, any increase in noise and vibration due to increased truck traffic would be intermittent and not expected to impair or adversely affect them. Therefore, Alternative C would have no direct or indirect impacts on historic resources.

3.16 Natural Areas, Parks and Recreation

3.16.1 Affected Environment

Natural areas include managed areas, ecologically significant sites, and Nationwide Rivers Inventory streams. This section addresses natural areas, parks, and recreation facilities that are on, immediately adjacent to (within 0.5 mile), or within the region of the proposed project sites (5-mile radius) and near the haul road to the Hopkins County Regional Landfill.

A review of the TVA Regional Natural Heritage database in November 2016 indicated that Peabody WMA is located immediately adjacent to the PAF reservation. The WMA is broken up into eight individual units – three of which lie adjacent to the PAF reservation. The Sinclair Unit of the Peabody WMA adjoins the PAF reservation to the southwest and west and the main PAF access road, State Route (SR) 176, passes through the Sinclair Unit. The Baker Bottoms Unit of the WMA lies adjacent to PAF to the south and southeast. The Ken Unit and Homestead Unit of the WMA is across the Green River from PAF, approximately 0.5 mile and 4.2 miles northeast of the plant, respectively (TVA 2013). Two western units of the Peabody WMA, the Vogue and River Queen Units can both be accessed from the portion of the Western Kentucky Parkway that would be used as the route to haul CCR from PAF to the Hopkins County Regional Landfill. Peabody WMA has rough terrain primarily comprised of reclaimed coal-mined land with swampland, numerous excavated ridges, and water-filled strip mine pits. Lands within the WMA are owned by both private landowners and the KDFWR. Private lands within the WMA are managed by KDFWR under lease agreements with the private landowners. The main public uses are fishing and hunting for deer, turkey, waterfowl, and small game (KDFWR 2016).

A public boat ramp is located near the northern boundary of the PAF reservation approximately 0.5 mile from Slag Impoundment 2A/2B and the Stilling Impoundment 2C. This boat ramp is accessible from SR 176 on the PAF reservation and from Rockport-Paradise road north of PAF (TVA 2013).

As illustrated on Figure 3-10, the Peabody WMA and public boat ramp are located within 5 miles of the proposed project areas on the PAF reservation. No other recreational areas were identified within the 5-mile radius around PAF.

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action Alternative

Under this alternative, there would be no change to CCR management operations at PAF. Therefore, there would be no impact to natural areas, parks or recreation.

3.16.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.16.2.2.1 CCR Dewatering and Handling Projects

There are no natural areas, parks, or recreational areas located on or adjacent to (within 0.5 mile) the proposed dewatering and CCR handling facilities as they lie near the center of the PAF reservation. Therefore, no direct impacts to natural areas, parks or recreational facilities, as a result of construction or operation of the proposed dewatering facilities are anticipated. Increased traffic during the construction period may have an indirect effect on users of the Peabody WMA and the boat ramp, both of which are accessed off of SR 176. This traffic increase would be short term and is unlikely to interfere with use or enjoyment of these facilities. As such, impacts would be minor.

3.16.2.2.2 Ash Impoundment Closure

Project areas for the proposed ash impoundment closures are located within the boundary of PAF. The Peabody WMA lies directly adjacent to the PAF reservation near the Peabody Ash Impoundment. Although this resource would not be directly impacted by ash impoundment closure, indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff and increased fugitive dust during construction. This impact would be minor and would not impair use or enjoyment of this resource given implementation of BMPs designed to minimize fugitive dust and the temporary and intermittent nature of construction. Users of the Peabody WMA and boat ramp may be indirectly impacted due to increased traffic on SR 176 during the construction period. However, as described above, this impact would be minor and temporary.

3.16.2.2.3 Landfill Construction

Under Alternative B, TVA would construct the CCR landfill in an area that is adjacent to an existing industrial use. Due to the distance between the Peabody WMA and the public boat ramp and landfill site, construction and operation of the landfill and associated facilities would have no direct impacts on these facilities. Therefore, no direct impact to natural areas, parks or recreational facilities, as a result of construction or operation of the proposed landfill is anticipated.

However, during construction, there would be an indirect impact on users of the boat ramp and Peabody WMA due to increased traffic. This impact would be minor as described above. Once constructed, CCRs generated at PAF would be transported onsite and there would be no impact to users of these facilities.

3.16.2.3 Summary of Environmental Consequences of Alternative B

Impacts associated with natural areas, parks, and recreation with the implementation of Alternative B are summarized in Table 3-22.

Table 3-23. Summary of Impacts to Natural Areas, Parks, and Recreation – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Projects Ash Impoundment Closure Landfill	Increased traffic, fugitive dust, erosion and sedimentation and noise during the construction period effect on use and enjoyment of natural areas, parks and recreational facilities.	Minor. Short-term indirect impacts due to the increased traffic along SR 176. Other offsite impacts minimized through the use of BMPs in accordance with site-specific erosion control plans.

3.16.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

As with Alternative B, there would be no direct impact to natural areas, parks or recreational areas associated with implementation of the dewatering projects and ash impoundment closure.

There is a potential for indirect impacts to natural areas, parks and recreational areas associated with hauling CCR to the Hopkins County Regional Landfill. The haul route to the Hopkins County Regional Landfill would utilize Western Kentucky Parkway and SR 176 both of which can be used to access the Sinclair, Vogue and River Queen Units of the Peabody WMA. In addition, SR 176, which provides access to the boat ramp, would also be part of the proposed haul route to the Hopkins County Regional Landfill. It is possible that there would be a long-term indirect impact to users of these areas due to the additional truck traffic, noise and dust from the trucks transporting CCR to the landfill. The impact to the use or enjoyment of these resources would be minor given the capacity of the haul route.

3.17 Transportation

3.17.1 Affected Environment

The transportation network surrounding PAF contains roads and bridges, a railroad, and barge transport on the Green River. Rail and barge access are not addressed further as the proposed action does not include any changes to these systems or their use.

Nearby, major highways include: the Wendell H. Ford Western Kentucky Parkway and US 62 (to the north); US 431 (to the west); and the William H. Natcher Parkway (to the east). The Western Kentucky Parkway is a four-lane divided highway approximately 5.5 miles north of PAF. Traffic generated by operations at PAF is expected to be composed of a mix of cars and light duty trucks (two-axle delivery trucks), medium duty trucks (larger two-axle and three-axle trucks) and heavy duty trucks (three- to five-axle trucks and tractor trailers).

The primary roadway providing access to PAF is SR 176 which extends from US 431 in Drakesboro approximately 6 miles east to PAF. SR 70 (Rochester Road) is located approximately 4.5 miles south of PAF. All of these routes are two-lane highways.

The proposed landfill site, the CCR dewatering and handling facilities, and the impoundment proposed for closure are all within the PAF site boundary. The proposed landfill site is located just southeast of the plant and is bordered by Riverside Road to the west and the Green River to the east; the dewatering area is just southwest of the cooling towers; the Gypsum Disposal Complex and the Peabody Ash Impoundment are southwest of the plant across Riverside Road; and Slag Impoundment 2A/2B are just north of the plant along the Green River. Public road access is available through the PAF boundary via SR 176, County Road (CR) 1066, CR 1008 and Riverside Road. The Rockport Paradise Road (CR 1011) runs north along the Green River from its connection point with SR 176 northwest of the plant at PAF to the Western Kentucky Parkway. Hopkins County Regional Landfill is an existing landfill located approximately 32 miles west of PAF. The landfill lies approximately 2.5 miles south of the town of White Plains off of KY 813 (Mt. Carmel Road). SR 813 is a two-lane highway.

The Annual Average Daily Traffic (AADT) on the roadways proximate to PAF are indicated in Table 3-24.

Table 3-24. Average Daily Traffic Volume on Roadways in Proximity to PAF

Roadway	Year	AADT (in year indicated)
SR 176 b/w PAF and P and M Haul Road	2011	1,770
SR 176 b/w US 431 and P and M Haul Road	2013	2,616
US 431 b/w KY 176 and Western Kentucky Parkway	2011	8,290
Western Kentucky Parkway b/w SR 181 and US 431	2014	10,175
Western Kentucky Parkway b/w SR 175 and SR 181	2013	9,989
US 62 b/w SR 813 and SR 175	2015	1,067
SR 813 south of US 62	2013	1,526

Source: Kentucky Transportation Cabinet (KYTC) 2015

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action Alternative

Under this alternative, CCR generated at PAF would continue to be managed in the current impoundments for as long as storage capacity is available. There would be no change in workforce traffic or in existing CCR management operations; therefore, no impacts to transportation and local roads would occur under this alternative.

3.17.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

Traffic impacts associated with the actions included in Alternative B would primarily be associated the following:

- Equipment/materials mobilization and construction workforce.
- Operation of dewatering facilities and transport of CCR to the onsite landfill.

3.17.2.2.1 Equipment/Materials Mobilization and Construction Workforce

The daily workforce traffic generated by the construction of the dewatering projects, the impoundment closures, and the construction workforce for the landfill is expected to range from 20 to 50. This would vary depending on the timing of the construction of the various components of this alternative; however, the worst-case value of 50 workers per day is used to bound the analysis of construction-related traffic impacts. The construction workforce traveling to and from the plant site would contribute to the traffic on the local transportation network. A construction workforce of 50 workers per day would be added to the traffic volumes on SR 176 and US 431 north of SR 176. It is assumed that this workforce traffic volume distributes into the wider roadway network beyond US 431 and becomes negligible. This workforce volume would occur at the beginning and ending of the work day. Assuming no carpooling, these 50 workers equates to 50 morning commutes and 50 afternoon commutes for a total of 100 trips per day.

The effects of these trips on roads along SR 176 and US 431 are shown in Table 3-25.

Table 3-25. Traffic Impacts Associated with Workforce Traffic to and from PAF

Roadway	Year	AADT (in year indicated)	Exist. AADT (incl. CCR Hauling Traffic) (AADT)	Traffic Increase (%)
SR 176 between PAF and P and M Haul Road	2011	1,770	1,870	5.6
SR 176 between US 431 and P and M Haul Road	2013	2,616	2,716	3.8
US 431 between KY 176 and Western Kentucky Parkway	2011	8,290	8,390	1.2

Source: KYTC 2015

The existing traffic volumes on SR 176 are relatively low for a two-lane road. Existing levels of service (LOS) on SR 176 are good. LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions and comfort and convenience. LOS is described accordingly:

- LOS A: free flow traffic conditions;
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable;
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist;
- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced;
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected; and
- LOS F: designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill.

On SR 176 and US 431, which have relatively low traffic volumes, the percentage increases in traffic resulting from the workforce to and from PAF are low and would only occur during the construction period. Additional construction-related vehicles (dozers, backhoes, graders, loaders, etc.) would be delivered on flatbed trailers under both the mobilization and demobilization stages of the projects. Given the temporary and intermittent nature of this action, the impact on the local transportation system would be minor.

Onsite transportation related impacts associated with construction activities related to the closure of the impoundments, construction of the dewatering facilities, and the landfill would result in an increase in onsite traffic. None of this traffic would represent an appreciable increase; therefore, it would not have an impact on the public transportation network or any public roads except to cross Riverside Road in some cases. This crossing of Riverside Road would result in negligible impacts to the road because the existing traffic volume on Riverside Road is relatively low and the amount and frequency of the crossings (to and from the Gypsum Disposal Area and the Peabody Ash Impoundment) would be very minor.

3.17.2.2.2 Operational Impacts

3.17.2.2.2.1 CCR Dewatering and Handling Projects

The proposed dewatering and CCR handling facilities would be constructed on a site between PAF and Riverside Road, within the PAF overall site boundary. Once constructed, operation of these facilities would not require an appreciable increase in workforce and, therefore, would not have an impact on the public transportation network.

3.17.2.2.2.2 Ash Impoundment Closure

Transportation related impacts associated with the closure of the ash impoundments would be associated with construction related impacts as described above. Once closed, operations associated with the use of Slag Impoundments 2A/2B and Stilling Impoundment 2C as equalization basins would not require an appreciable increase in workforce and therefore would not have an impact on the public transportation network. Therefore, there would be no operational impacts on the public transportation network or any public roads.

3.17.2.2.2.3 Landfill

Under this component of the alternative, CCR from the dewatering facilities would be transported to the proposed landfill via an existing access road on TVA property. Once constructed, operation of the landfill would not require an appreciable increase in workforce and, therefore, would not have an impact on the public transportation network.

Based solely on the estimate of CCR produced daily (2,268 tons of conditioned ash per day), and the capacity of an articulated dump truck (approximately 21.1 tons per truck), approximately 108 truckloads of CCR per day would be needed to transport CCR to the proposed landfill. Transport of CCR would occur daily (for a typical five-day work week) over the life of the landfill (estimated to be approximately 32 years). This would result in a traffic count of 216 trips per day between the dewatering site and the proposed landfill site, or approximately 24 truck trips per hour over a typical nine-hour workday. The transport of CCR from PAF to the proposed landfill would not use public roadways, which has a benefit to the safety of traveling public.

3.17.2.3 Summary of Environmental Consequences of Alternative B

Environmental consequences of Alternative B are summarized in Table 3-26. Under this alternative, CCR would be managed in an onsite landfill and would not be transported offsite using public roadways and would not have an impact on traffic and levels of service on local roads. Increased traffic resulting from construction activities would be localized, temporary, and intermittent and are therefore considered to be minor.

Table 3-26. Summary of Impacts to Transportation – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Projects Ash Impoundment Closure Landfill Construction	Minor increase in construction related traffic.	Minor – Short-term impact.
Dewatering and CCR Handling Facilities Landfill Operation	Increased traffic associated with operations.	No impact. No use of public roadways.

3.17.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with construction and operation of the dewatering projects and ash impoundment closure would be the same as identified under Alternative B and would be minor and short term. However, under Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill, the Hopkins County Regional Landfill. The haul route to the Hopkins County Regional Landfill would primarily utilize the following roads (see Figure 2-9):

- SR 176 between PAF and US 431 at Drakesboro
- US 431 from Drakesboro to the Western Kentucky Parkway
- Western Kentucky Parkway from US 431 to SR 175
- SR 175 from the Western Kentucky Parkway to US 62
- US 62 from SR 175 to SR 813 at White Plains
- SR 813 in White Plains from US 62 to Red Hill Road
- Red Hill Road from SR 813 to Orton Bridge Road
- Orton Bridge Road to Hopkins County Regional Landfill

Therefore, for this alternative any resources along the haul route are already subjected to vehicular traffic destined for the landfill. No new roads would need to be constructed.

Over-the-road tandem dump trucks would be used to haul CCR between PAF and the Hopkins County Regional Landfill along the haul route described above. Based on the estimate of CCR produced daily (2,268 tons of conditioned ash per day) and the capacity of an over-the-road tandem dump truck (approximately 13.8 tons per truck), 165 truckloads of CCR would be needed to transport CCR generated at PAF to the Hopkins County Regional Landfill. Transport of CCR would occur daily (during a typical five-day work week) over a period of approximately 32 years to accommodate long-term disposal of CCR generated at this facility). This would result in a traffic count of 330 trips per day along the haul route or approximately 37 truck trips per hour over a typical nine-hour workday. The number of trips per day is higher for Alternative C than it is for Alternative B because Alternative B would use larger articulated dump trucks to haul CCR within TVA-managed property to the onsite landfill. With Alternative C, hauling of CCR is over public roadways; therefore, smaller tandem dump trucks must be used instead of the larger articulated dump trucks. The effects of these trips on roads along the haul route are shown in Table 3-27.

Table 3-27. Traffic Impacts Associated with Hauling CCR to Hopkins County Regional Landfill from PAF and Workforce Traffic to and from PAF

Roadway	Year	AADT (in year indicated)	Exist. AADT (incl. CCR Hauling Traffic) (AADT)	Traffic Increase (%)
SR 176 b/w PAF and P and M Haul Road	2011	1,770	2,100	18.6
SR 176 b/w US 431 and P and M Haul Road	2013	2,616	2,946	12.6
US 431 b/w KY 176 and Western Kentucky Parkway	2011	8,290	8,620	4.0
Western Kentucky Parkway b/w SR 181 and US 431	2014	10,175	10,505	3.2
Western Kentucky Parkway b/w SR 175 and SR 181	2013	9,989	10,319	3.3
US 62 b/w SR 813 and SR 175	2015	1,067	1,397	30.9
SR 813 south of US 62	2013	1,526	1,856	21.6

Source: KYTC 2015

Under Alternative C, hauling of CCR generated at PAF would add 330 trips per day (37 trips per hour over a typical nine-hour workday) along the haul route. This results in an increase of as much as 18.6 percent on SR 176 and 4.0 percent on US 431. The percentage increase on SR 176 appears to be a moderate impact; however, there is sufficient capacity remaining on this road to handle the additional volume and it would have a low impact on its level of service. The 4.0 percent increase on US 431 results in a low impact to its level of service. On SR 813 in White Plains, this represents an increase of 21.6 percent; however, this increase results in a minor impact on traffic flow as there is sufficient capacity for SR 813 (a two-lane roadway) to handle the increase in truck traffic. On US 62, this represents an increase of 30.9 percent and again, there is sufficient capacity for US 62 (a two-lane roadway) to handle the increase in truck traffic. The increase on

Western Kentucky Parkway (a four-lane highway) is essentially negligible as there is more than adequate capacity to absorb this truck traffic increase on Western Kentucky Parkway.

The proposed hauling of CCR over public roadways would contribute to an increased risk of traffic crashes involving trucks on local roadways. As the number of truck vehicle-miles traveled increases, the risk of traffic crashes, including injury and fatal crashes, increases. A September 2013 investigation of heavy truck crashes in Kentucky by the University of Kentucky analyzed crash data for 2008-2012. Annually, crashes involving trucks ranged from 7,442 to 9,092 with annual fatalities of 85 to 102. For the five-year period studied, truck crashes represented 6.4 percent of all crashes, 5.5 percent of injury crashes and 12.2 percent of fatal crashes. Therefore, there is a potential for increased crash rates involving fatalities on roadways being used by heavy trucks. The number of truck-related crashes associated with the hauling of CCR from PAF would increase and could compromise driver safety. Therefore, while the impacts of the additional CCR haul traffic along the haul route may be absorbed, localized effects on traffic flow and safety may be evident and this could result in minor impacts to traffic safety along the haul route.

3.18 Noise

3.18.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs (i.e., higher sensitivities would be expected during the quieter overnight periods).

Sound is measured in units of decibels (dB) on a logarithmic scale. The “pitch” (high or low) of the sound is a description of frequency, which is measured in Hertz (Hz). Most common environmental sounds are a composite of sound energy at various frequencies. A normal human ear can usually detect sounds that fall within the frequencies from 20 Hz to 20,000 Hz. However, humans are most sensitive to frequencies between 500 Hz to 4,000 Hz.

Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes with distance. In addition to distance attenuation, the air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over large distances from the source. An individual’s sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval. A continuous source of noise is rare for long periods and is typically not a characteristic of community noise. Community noise refers to outdoor noise near a community. Typical background day/night noise levels for rural areas range between 35 and 50 dB whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Background noise levels greater than 65 A-weighted decibels (dBA) can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping.

Certain frequencies are given more “weight” during noise assessments because human hearing is not equally sensitive to all frequencies of sound. This adjusted unit of measure is known as the A-weighted decibel, or the dBA. The dBA scale corresponds to the sensitivity range for human hearing. A scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands heard more efficiently by the ear and discounts the lower frequency bands. A noise level change of 3 dBA or less is barely perceptible to average human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change is perceived as a doubling or halving of noise loudness; whereas a 20 dBA change is considered a “dramatic change” in loudness. Common indoor and outdoor noise levels are listed in Table 3-28.

Table 3-28. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 meters (16.4 feet)
Jet Flyover at 300 meters (984.3 feet)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 meter (3.3 feet)		
	90	
		Food Blender at 1 meter (3.3 feet)
Diesel Truck at 15 meters (49.2 feet)		Garbage Disposal at 1 meter (3.3 feet)
	80	
		Shouting at 1 meter (3.3 feet)
Gas Lawn Mower at 30 meters (98.4 feet)	70	Vacuum Cleaner at 3 meters (9.8 feet)
Commercial Area		Normal Speech at 1 meter (3.3 feet)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: Arizona DOT 2008.

3.18.1.1 Sources of Noise

PAF is bordered by wooded ridges on the north and south, a partially wooded valley to the west, and the Green River on the east. There are no noise sensitive land uses (residential areas) located near the plant site. The Sinclair Unit of the Peabody WMA is situated to the south partially to the west of PAF along wooded hills and is used for recreational purposes.

There are numerous existing sources of noise at PAF. Operations at the existing coal plant generate varying amounts of environmental noise. Noise generating activities associated with the existing plant include coal unloading activities, periodic dozer operations associated with coal pile management and truck operations. Existing noise emission levels associated with these activities typically range from 59 to 87 dBA (TVA 2014).

Noise sources common to activities evaluated in this EA include noise from industrial activities, transportation noise, and construction noise. The main sources that can be heard outdoors at PAF are coal delivery and unloading and ash-handling activities. Coal is unloaded from railcars with an unenclosed bottom dumper, which generates considerable noise. Additional noise sources include the shaker, dozers, and other heavy equipment onsite. The existing SCR systems include an alarm, which is tested periodically resulting in an increase in background noise (TVA 2013). Transportation noise primarily includes noise from highway traffic; however, there would also be some noise related to rail traffic at PAF. Three primary factors influence highway noise generation: traffic volume, traffic speed, and vehicle type. Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the loudness of highway traffic noise. Other factors that affect the loudness of traffic noise include a change in engine speed and power, such as at traffic lights, hills, and intersecting roads and pavement type. Highway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (Federal Highway Administration [FHWA] 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic would result in a 3 dBA increase in noise levels, which in and of itself would not normally be a perceivable noise increase. Railway noise depends primarily on the speed of the train but variations are present depending upon the type of engine, wagons, and rails (Berglund and Lindvall 1995).

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment onsite and the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature as it generally only occurs on weekdays during daylight hours which minimizes the impact to sensitive receptors.

3.18.1.2 Sensitive Receptors

A noise sensitive receptor includes residences or other developed sites where frequent human use occurs such as churches and schools. The PAF facility is located approximately 4 miles from the nearest town and there are no nearby sensitive receptors. The nearest church and cemetery are the Drakesboro United Methodist Church and Ennis Cemetery, located approximately 2.5 miles and 1.2 mile to the southwest of PAF respectively and Old Paradise Cemetery located approximately 1 mile west of PAF (see Figure 3-10).

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action Alternative

Under this alternative, there would be no change in management of CCR produced at PAF. Therefore, no noise impacts would occur under this alternative.

3.18.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

Noise impacts associated with the actions included in Alternative B would primarily be associated the following:

- Equipment/materials mobilization and construction workforce; and
- Operation of dewatering facilities and transport of CCR to the proposed onsite landfill.

3.18.2.2.1 Construction Noise

Most construction activities would occur during the day on weekdays; however, construction activities could occur at night or on weekends, if necessary. Construction-related noise would result from implementation of dewatering projects, closing existing impoundments and landfill construction activities. Due to the small workforce, commuting of the construction workforce (via personal vehicles) results in negligible impacts to noise at PAF. All of the construction activities occur within the PAF site boundary.

Noise generated by construction of the dewatering projects is expected to be minor with a relatively minor amount of heavy machinery needed to carry out those projects. The closure of the existing impoundments and the construction of the landfill would generate higher amounts of noise due to the use of more heavy equipment such as compactors, front loaders, backhoes, graders, trucks and earth moving equipment. As illustrated in Table 3-29, typical nose levels from construction equipment are expected to be 84 dBA or less at a distance of 50 feet from the construction site.

Table 3-29. Typical Construction Equipment Noise Levels

Equipment	Noise Level (dBA) at 50 feet
Dump Truck	84
Bulldozer	85
Scraper	85
Grader	85
Excavator	85
Compactor	80
Concrete Truck	85
Boring-Jack Power Unit	80
Backhoe (trench)	80
Flatbed Truck	84
Crane (mobile)	85
Generator	82
Air Compressor	80
Pneumatic Tools	85
Welder/Torch	73

These types of noise levels would diminish with distance from each project site at a rate of approximately 6 dBA per each doubling of distance. Therefore, noise would be expected to attenuate to the recommended U.S. Department of Housing and Urban Development (HUD) noise guideline of 65 dBA at approximately 500 feet (HUD 1985). However, this distance would be shorter in the field as objects and topography would cause further noise attenuation. Construction noise would be intermittent and temporary and would attenuate to ambient levels at the nearest residential areas (approximately 2.5 miles from the southern edge of the PAF property) or the cemetery (approximately 1.2 mile from the southwest edge of PAF property). Therefore, no sensitive receptors would be adversely impacted by construction activities.

3.18.2.2.2 Operation Noise

Primarily, operation of the dewatering and CCR handling facilities and the proposed landfill would occur during the day on weekdays. The transition from construction-period noise to operation-period noise at the proposed landfill site would be relatively indistinct since the same type of equipment would be used to operate the landfill as would be used during construction of the landfill. Noise related to the movement of dump trucks carrying CCR to the proposed landfill would fall into operation of the landfill and would not be temporary. As mentioned in the previous section, there are no receptors within 500 feet of any of the operations at PAF. Consequently, no sensitive receptors would be adversely impacted by operation of the activities dewatering projects and the proposed landfill site.

3.18.2.3 Summary of Environmental Consequences of Alternative B

Under this alternative, CCR would be managed in an onsite landfill and would not be transported offsite using public roadways. There are no receptors within 500 feet of PAF and therefore, there would be no noise impact.

3.18.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

3.18.2.4.1 Construction Noise

As there are no sensitive receptors within 500 feet of PAF, there would be no impacts associated with construction.

3.18.2.4.2 Operation Noise

Noise impacts due to operation of the CCR dewatering and handling facilities would be the same as those discussed under Alternative B. Potential noise impacts associated with this alternative are related to the transport of CCR to Hopkins County Regional Landfill approximately 33 miles west of PAF (see Figure 2-9). The probable haul route uses SR 176, US 431, Western Kentucky Parkway, SR 175, US 62, SR 813, Red Hill Road and Orton Bridge Road. Current traffic on these roadways are characterized by an existing traffic volume that includes truck use. Sensitive receptors (such as churches and residences) located along the haul route proximate to these roadways would be impacted by the noise generated by the transport of CCR.

There are approximately 431 noise sensitive receptors within 500 feet of the haul route to the Hopkins County Regional Landfill. To determine potential impacts of traffic-related noise, FHWA's Traffic Noise Model was used to predict noise impacts to selected receptors located closest to the haul road. These impacts are used to represent the bounding condition. Based on anticipated generating rates, it is estimated that 165 truckloads of CCR would be used to transport CCR to Hopkins County Regional Landfill per day for a typical five-day work week. This would result in approximately 330 trips per day along the haul route or approximately 37 trips per hour over a typical nine-hour workday.

Predicted noise levels along the haul route to Hopkins County Regional Landfill are identified in Table 3-30.

Table 3-30. Predicted Noise Levels Along the Haul Route from PAF to Hopkins County Regional Landfill

Roadway Noise Analysis	Estimated Modeled Noise Level (dBA)
Along SR 176	
No receptors	
Along US 431 – north of SR 176	
Existing Peak	55.9
Peak during hauling	59.4
Along West. Kentucky Pkwy. – west of US 431	
Existing Peak	58.3
Peak during hauling	61.8
Along US 62 – east of SR 813	
Existing Peak	64.2
Peak during hauling	64.8
Along SR 813 – south of US 62	
Existing Peak	65.0
Peak during hauling	65.8

Existing peak traffic noise levels along the haul route range from a low of 55.9 dBA to 65.0 dBA. Predicted noise emissions from the transport of CCR from PAF increased from 0.6 to 3.5 dBA at the receptors modelled. Based on FHWA thresholds for noise impacts, there are no impacted receptors along the haul route. FHWA has determined that if the predicted noise level at a receptor is 67 dBA or greater, then it would be considered an impacted receptor. Also, FHWA has determined that if a receptor experiences a substantial noise increase (10 dBA or more), it is considered to be an impacted receptor (KYTC 2015).

The estimated modeled noise from hauling operations along the haul route (which also includes the existing local traffic) do not exceed the FHWA criterion of 67 dBA, and predicted noise levels do not demonstrate a substantial noise increase. With the exception of US 431, all of the increases in noise due to the hauling of CCR are below 3 dBA; therefore, the noise changes would be inaudible to the human ear. On US 431, the increase would be 3.5 dBA, which would be slightly audible but would still be minor.

Predicted noise levels would exceed the EPA guideline of 55 dBA in all locations. However, given the minor change from existing noise levels (3.5 dBA on US 431), the intermittent nature of noise from increased traffic, and the fact that the noise would occur during regular working hours, the noise impact associated with the hauling of CCR from PAF to the Hopkins County Regional Landfill is expected to be minor.

3.19 Socioeconomics and Environmental Justice

3.19.1 Affected Environment

Socioeconomic characteristics of resident populations are assessed using the 2010 Census, 2015 United State Census Bureau (USCB) estimates and 2011-2015 American Community Survey (ACS) 5-year estimates. Employment and housing information is provided by the 2011-2015 ACS.

The appropriate geographic scale for the analysis of socioeconomic impacts is a 5-mile radius buffer around PAF, which would house the dewatering facilities, ash impoundment closure projects, and the proposed landfill. Similarly, the 5-mile radius around the Hopkins County Regional Landfill defines the scale for impacts associated with transport of CCR from PAF to the landfill. These geographic areas provide an appropriate context for analysis of the socioeconomic conditions in the vicinity of the proposed actions. The geography included in the 5-mile radius for these areas extends into Christian, Hopkins, Muhlenberg, and Ohio counties. Therefore, the four listed counties and the state of Kentucky are included as appropriate secondary geographic areas of reference. Comparison at multiple scales provides a more effective definition for socioeconomic factors that may be affected by the proposed action including minority and low income populations.

3.19.1.1 Demographics

Demographic characteristics of the study area are summarized in Table 3-31. The communities surrounding PAF and the Hopkins County Regional Landfill are primarily rural with most of the population located within the municipalities of Drakesboro, Cleaton, Nortonville, and White Plains (USCB 2016a). This is reflected in the population of the community around PAF and the Hopkins County Regional Landfill, which encompass areas that are proximate to these municipalities. Since 2010, the population around PAF and the Hopkins County Regional Landfill has decreased by approximately 4 and 9 percent, respectively. During this same period, population decreased in Christian, Hopkins, and Muhlenberg counties by 0.8 to 1.5 percent and increased by1.2 and 2.0 percent in Ohio County and the state of Kentucky, respectively.

3.19.1.2 Economic Conditions

Employment characteristics for the communities surrounding PAF and the Hopkins County Regional Landfill are shown on Table 3-32. The total employed civilian population (greater than 16 years old) within the communities surrounding PAF and the Hopkins County Regional Landfill is 4,749 and 6,666, respectively. Approximately 14.5 percent of the civilian labor force in the community surrounding PAF is unemployed, which is nearly double the rate of the community surrounding the Hopkins County Regional Landfill (7.8 percent). The unemployment rates in these communities is generally comparable to the unemployment rates in the reference areas and the State of Kentucky. Median household income for the subject communities was $33,429 for the community surrounding PAF and $41,611 for the community surrounding the Hopkins County Regional Landfill. The incomes surrounding PAF are much lower than those reported for each of the reference counties and the State of Kentucky (see Table 3-32).

The largest percentage of civilian employees in Christian, Hopkins, and Muhlenberg counties are employed in the educational services, health care and social services industries, followed by manufacturing and retail trade. In Ohio County, the three business sectors providing the greatest employment are same; however, unlike the other counties manufacturing supports a larger percentage of employment than education services, health care and social services. Based on current commuting patterns and on proximity, the labor market area is defined to include all adjacent counties (USCB 2016a).

Table 3-31. Demographic Characteristics

	TVA Paradise Fossil Plant 5-mile Radius	Hopkins County Regional Landfill 5-mile Radius	Christian County	Hopkins County	Muhlenberg County	Ohio County	State of Kentucky[2]
Population[2]							
Population, 2015 estimate	5,905	8,284	73,309	46,222	31,183	24,216	4,425,092
Population, 2010	6,165	9,117	73,955	46,920	31,499	23,842	4,339,367
Percent Change 2010-2015	-4.2%	-9.1%	-0.8%	-1.5%	-1.0%	1.2%	2.0%
Persons under 18 years, 2015	22.5%	23.0%	27.3%	22.7%	20.9%	24.5%	22.9%
Persons 65 years and over, 2015	17.4%	16.4%	11.5%	17.4%	18.1%	17.1%	15.2%
Racial Characteristics[2]							
White alone, 2015 (a)	97.8%	96.8%	72.6%	90.4%	93.4%	96.7%	88.1%
Black or African American, 2015 (a)	1.2%	1.8%	21.3%	6.7%	4.9%	1.7%	8.3%
American Indian and Alaska Native, 2015 (a)	0.0%	0.3%	0.7%	0.2%	0.2%	0.3%	0.3%
Asian, 2015 (a)	0.2%	0.4%	1.8%	0.6%	0.3%	0.2%	1.4%
Native Hawaiian and Other Pacific Islander, 2015 (a)	0.0%	0.0%	0.5%	0.1%	0.0%	0.1%	0.1%
Two or More Races, 2015	0.7%	0.6%	3.2%	2.0%	1.2%	0.9%	1.8%
Hispanic or Latino, 2015d (b)	0.0%	0.1%	7.5%	1.9%	1.5%	3.9%	3.4%
Housing[1]							
Housing units, 2015	2,641	3,832	29,763	21,294	13,640	10,252	1,957,037
Median household income, 2011-2015	$33,429	$41,611	$39,521	$42,346	$38,961	$40,189	$43,740
Persons below poverty level, 2011-2015	21.1%	17.2%	20.3%	18.4%	19.4%	19.9%	18.5%

(a) Includes persons reporting only one race.

(b) Hispanics may be of any race, so also are included in applicable race categories.

Sources: [1]USCB 2016a; [2]USCB 2016b

Table 3-32. Employment Characteristics

	TVA Paradise Fossil Plant 5-mi Radius	Hopkins County Regional Landfill 5-mile Radius	Christian County	Hopkins County	Muhlenberg County	Ohio County	State of Kentucky[2]
Population >16 years	4,749	6,666	54,889	37,056	25,480	18,765	3,493,098
Civilian Labor Force							
Employed	1,874	3,432	23,856	19,388	11,534	8,906	1,891,381
Unemployed	318	291	3,485	1,387	1,330	944	174,308
Subtotal	2,192	3,723	27,341	20,775	12,864	9,850	2,065,689
Unemployment							
% of Total Population	6.7%	4.4%	6.3%	3.7%	5.2%	5.0%	5.0%
% of Civilian Labor Force	14.5%	7.8%	12.7%	6.7%	10.3%	9.6%	8.4%

Source: USCB 2016a

3.19.1.3 Community Facilities and Services

Community facilities and services are public or publicly-funded facilities such as police protection, fire protection, schools, hospitals and other health care facilities, libraries, day-care centers, churches, and community centers. Community facilities within a 5-mile radius of PAF are shown on Figure 3-10. Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and affect the delivery of such services. When applicable, the study area for the evaluation of impacts to community services is the service area of various providers, otherwise a secondary study area defined for the purposes of a socioeconomic analysis may be defined. In this case, the study area for community impacts is defined as those areas proximate (within 0.5 mile) of PAF and around the existing Hopkins County Regional Landfill.

There are no community facilities within 0.5 mile of the Hopkins County Regional Landfill or PAF. Five churches, two cemeteries, one post office, and one fire department are located adjacent to the route that would be used to haul CCR to the Hopkins County Regional Landfill.

3.19.1.4 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations. EO 12898 mandates some federal-executive agencies to consider Environmental Justice (EJ) as part of the NEPA. EJ has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income (USEPA 2016c) and ensures that minority and low income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities. Although TVA is not one of the agencies subject to this order, TVA routinely considers environmental justice impacts as part of the project decision-making process.

Guidance for addressing EJ is provided by the CEQ's Environmental Justice Guidance under NEPA (CEQ 1997). The CEQ defines minority as any race and ethnicity, as classified by the USCB, as: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997). Low income populations are based on annual-statistical poverty thresholds also defined by the USCB.

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

Low-income populations are those with incomes that are less than the poverty level (CEQ 1997). The 2015 Health and Human Services Poverty Guidelines states that, an annual household income of $24,250 for a family of four is the poverty threshold. For an individual, an annual income of $11,770 or less is below the poverty threshold. A low-income population is identified if either of the following two conditions are met:

- The low income population exceeds 50 percent of the total number of households.
- The ratio of low income population significantly exceeds (i.e., greater than or equal to 20 percent) the appropriate geographic area of analysis.

For this assessment, two geographic areas of analysis (i.e., census block group and county) were used to determine potential EJ populations. Potentially affected communities were defined as any census block group that contained the project areas at PAF, Hopkins County Regional Landfill or along the haul route used to transport waste to the Hopkins County Regional Landfill. Demographic data by block group were then compared to county-wide data specifically, Muhlenberg County and Hopkins County. Total minority populations (i.e., all non-white racial groups combined and Hispanic or Latino) comprise between 0.29 to 28.0 percent of the population of the block groups studied. Two minority populations which meet the criteria for EJ consideration were identified adjacent to the haul route to the Hopkins County Regional Landfill.

The percentages of households within each block group living below the poverty threshold in the potentially affected communities ranged from 2.6 to 57.9 percent. The percentage of households with income below the poverty level in one block group exceeded 50 percent of the total number of households in that block group and therefore meets the criteria for EJ consideration. This block group is located along the haul route to the Hopkins County Regional Landfill. The location of potential block groups subject to EJ consideration is shown on Figure 3-11.

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations and no work would be conducted that could result in a change or impact to local demographics, economic conditions, community services or EJ populations.

3.19.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

Demographic characteristics of the project area are expected to change temporarily in response to an increased construction workforce, but this change would not be significant. The onsite construction workforce is estimated to be 20 to 50 workers for all phases of the project (i.e., construction of dewatering facilities and the proposed landfill, and ash impoundment closures). No additional permanent workers would be employed during operation of the landfill or dewatering facilities. No long-term impacts to local demographics are expected.

Potential economic impacts associated with the proposed projects relate to direct and indirect effects of the construction activities associated with the dewatering facilities, closure of the ash impoundments, and proposed landfill as well as the long-term operation of the facilities. Construction activities would entail a temporary increase in employment and associated payrolls, the purchases of materials and supplies, and procurement of additional services. Capital costs associated with the proposed action would, therefore, have direct economic benefits to the local area and surrounding community. Revenue generated by income tax and sales tax from new workers would benefit the local economy. Additionally, some beneficial secondary impacts to the economy are also expected in conjunction with the multiplier effects of construction activities. For example, the hospitality and service industries would benefit from the demands brought by the increased construction workforce. However, given the relatively small magnitude of the anticipated workforce, this impact is considered to be negligible.

Construction and operation of a landfill, dewatering facilities and impoundment closures would not have a direct impact on community facilities as the proposed actions would not require any displacements and workers needed to construct and operate these facilities would likely be residents of the region and therefore local fire, police, medical or educational services would not be affected.

There would be no impact to EJ communities under this alternative as EJ populations or other sensitive low income populations were not identified near PAF.

3.19.2.3 Summary of Environmental Consequences of Alternative B

Environmental consequences of Alternative B are summarized in Table 3-33.

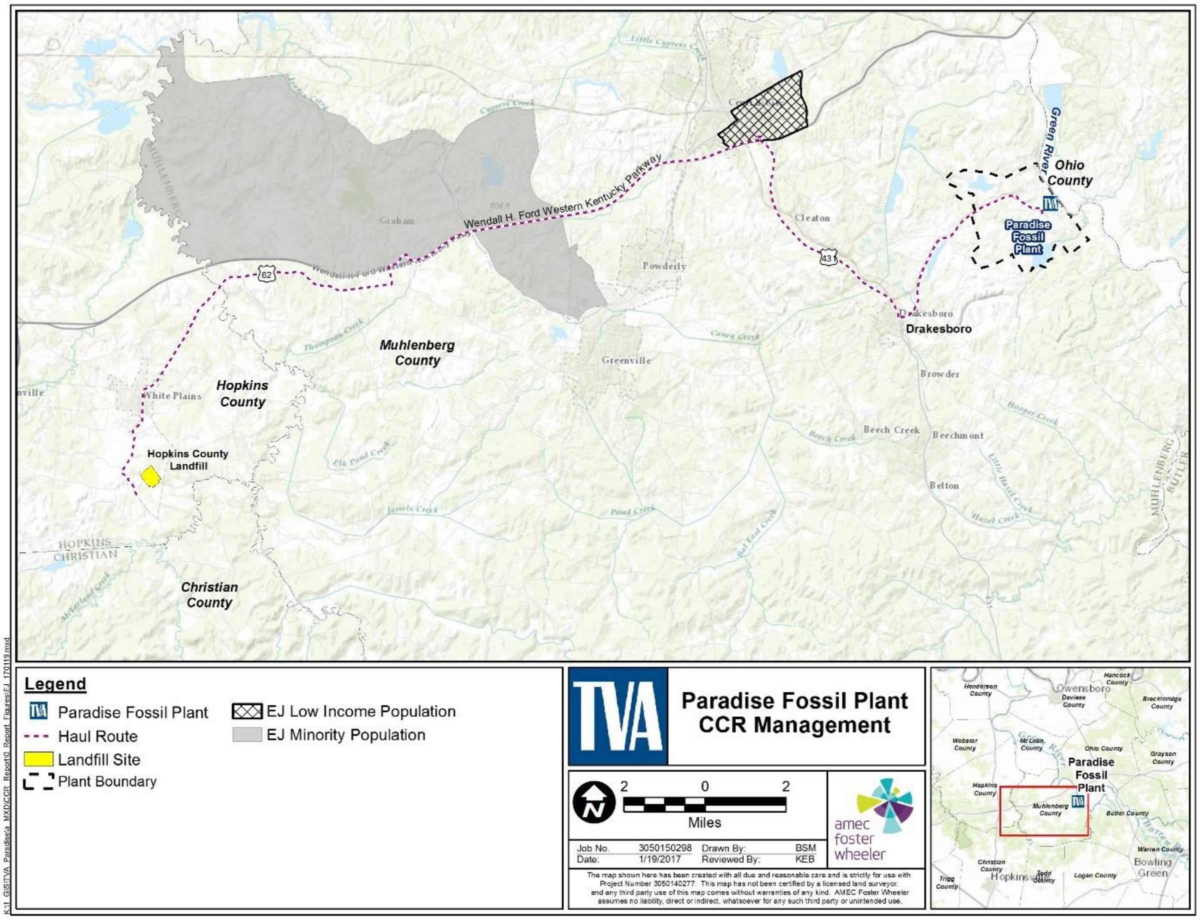

Figure 3-11. Communities Subject to EJ Considerations in the Impacted Areas of Alternative B and C

Table 3-33. Summary of Socioeconomic Impacts – Alternative B

Project	Impact	Severity
CCR Dewatering and Handling Projects Ash Impoundment Closure Landfill	Effect to community from additional construction workforce and primary and secondary economic impacts due to the multiplier effect related to employment.	Negligible impact. Temporary minor increase in the localized workforce.
	Disproportionate negative impact to environmental justice communities.	No impact.

3.19.2.4 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

Under this alternative, impacts associated with implementation of the CCR dewatering and handling projects and ash impoundment closures would be the same as identified under Alternative B except the onsite landfill would not be constructed. Therefore, positive economic impacts would be slightly reduced with the exclusion of landfill construction while negative impacts would remain negligible.

There would be no change in demographic characteristics of the study area under this alternative. The Hopkins County Regional Landfill is already constructed and therefore no temporary workforce would be needed. Although unanticipated, additional workers needed for the operation of the landfill could be drawn from the labor force that currently resides in the study area and therefore no long-term impacts to local demographics are expected.

No displacements would occur under this alternative and there are no community facilities proximate to the Hopkins County Regional Landfill. There would be no change in travel patterns or access to the facilities that are located adjacent to the haul route to the Hopkins County Regional Landfill. However, there may be some impact to ease of movement to facilities along the proposed haul route due to the additional trucks on the roadway transporting CCR to the landfill. As noted in Section 3.17, these potential localized impacts are anticipated to be minor. Transport of CCRs generated at PAF to the Hopkins County Regional Landfill is expected to be carried out by local contractors, and no significant relocations to the area are anticipated. Therefore, local fire, police, medical or educational services would not be affected.

Three communities that met the criteria for EJ consideration were identified along the Western Kentucky Parkway, the haul route to the Hopkins County Regional Landfill. It is possible that there would be a long-term indirect impact to these communities due to the additional traffic, noise, and dust from the trucks transporting CCR to the landfill. Although this impact would be minor from a transportation perspective, the addition of 165 trucks (330 truck trips per day or 37 trucks passing by this communities every hour) could have an impact on the individuals living in the community. The Western Kentucky Parkway is a four-lane divided highway, and truck trips would be dispersed throughout the day and would fit in with familiar traffic patterns along this roadway. In addition, populations along the route are generally set back from the road which minimizes exposure to traffic noise and fugitive dust. Further, the impact would be minimized through the use of BMPs designed to minimize fugitive dust emissions during transport. Therefore, this impact is considered to be moderate but would not be disproportionate as it would be consistent across all communities (EJ and non-EJ) along the haul route.

3.20 Public Health and Safety

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws are defined in both federal and state statutes. OSHA is the main statute protecting the health and safety of workers in the workplaces. OSHA regulations are presented in Title 29 CFR Part 1910 (29 CFR 1919), Occupational Safety and Health Standards. A related statute, 29 CFR 1926, contains health and safety regulations specific to the construction industry. The Kentucky-specific regulations adopted by the Kentucky Occupational Safety and Health (OSH) Standards Board or the Kentucky Labor Cabinet supersede federal OSHA standards. The Kentucky OSH Program, under the statutory authority of KRS Chapter 338 (338.011 to 338.991) and through a state plan approved by the U.S. Department of Labor, OSHA, maintains authority for enforcement, standards promulgation, onsite consultation, and training services related to job safety and health. The official regulations (803 KAR 2:015 through 2:505 (containing both general industry and construction industry) are maintained by the Legislative Research Commission.

TVA's Safety Standard Programs and Processes would be strictly adhered to during the proposed actions. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations and programs. It also establishes responsibilities for implementing OSHA and state requirements.

3.20.1 Affected Environment

The routine operations and maintenance activities at PAF reflect a safety-conscious culture, and activities are performed consistent with OSHA and KRS standards and requirements and specific TVA guidance. Personnel at PAF are conscientious about health and safety, having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training and control measures.

PAF has safety programs and BMPs in place to minimize the potential of safety incidences. These would include but are not limited to such programs as the following:

- Operations and Maintenance Plans
- Hazard Communication
- Housekeeping
- Emergency Spill / Release Plans
- Contractor Evaluation and Acceptance
- Competent Person
- Standard Operating Procedures
- Emergency Response Plan
- Project Safety Plans
- Ground Disturbance
- Lifting Operations
- Hazard Analysis
- Energy Isolation (Lockout/Tag out)
- Cutting, Burning, Welding and other "Hot Work"
- Incident Reporting and Investigations
- Management of Change
- Personal Protective Equipment
- Hearing Conservation
- Health and Safety Training
- Safety Reviews and Compliance Audits

It is TVA's policy that contractors have a site-specific health and safety plan in place prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operations after construction is complete.

The potential offsite consequences and emergency response plan are discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically.

Health hazards are also associated with emissions and discharges from the facility as well as accidental spills/releases at the plant and/or along the pipelines. Mitigative measures are used to ensure protection of human health which includes the workplace, public and the environment. Applicable regulations and attending administrative codes that prescribe monitoring requirements may include those associated with emergency management, environmental health, drinking water, water and sewage, pollution discharge, air pollution, hazardous waste management and remedial action.

Additionally, wastes generated by operation of the plant can pose a health hazard. Wastes including solid wastes, hazardous waste, liquid wastes, discharges and air emissions are managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements (see Section 3.13). Furthermore, waste reduction practices are employed including recycling and waste minimization. TVA is committed to complying with all applicable regulations, permitting and monitoring requirements.

3.20.2 Environmental Consequences

3.20.2.1 Alternative A – No Action Alternative

The operations and maintenance activities at PAF would continue within the safety-conscious culture and activities currently performed in accordance with applicable standards or specific TVA guidance. TVA would continue to address and manage reduction or elimination of occupational hazards through implementation of safety practices, training and control measures. TVA's safety conscious efforts would continue such that impacts on worker and public health and safety at PAF would be maintained. Therefore, Alternative A would not have an impact on public health and safety.

3.20.2.2 Alternative B – Construction of an Onsite CCR Landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures

3.20.2.2.1 Construction Impacts

During construction of all CCR management projects, customary industrial safety standards as well as the establishment of applicable BMPs and job site safety plans would describe how job safety would be maintained. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping, and personal protective equipment are in place; the establishment of programs and procedures for lockout, right-to-know, hearing conservation, equipment operations, excavations, grading, and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazardous. Construction debris and wastes would be managed in accordance with federal, state, and local requirements.

Construction activities in support of the proposed dewatering and CCR handling facilities onsite and offsite, impoundment closure activities including material transport, and landfill construction would be performed consistent with standards established by OSHA and KRS. Worker and public health and safety during construction and material transportation would be maintained.

3.20.2.2.2 Operation Impacts

Operation of the CCR dewatering and handling facilities, equalization basin and landfill would adhere to TVA guidance and be consistent with standards established by OSHA. Operation activities would adhere to established health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards.

All facility wastes would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. No hazardous materials that might affect human safety are expected to be utilized. Implementation of operational safety measures would manage and address monitoring and control; maintenance and integrity programs; performance of field surveys and inspections; right-of-way maintenance; and public awareness. Therefore, worker and public health and safety during operation including material transportation would be maintained.

3.20.2.3 Alternative C – Offsite Disposal of CCR in an Existing Permitted Landfill, Implementation of Dewatering and CCR Handling Projects, and Impoundment Closures

As with Alternative B, worker and public health and safety during construction and operation of CCR dewatering and handling facilities and ash impoundment closures would be maintained. However, under Alternative C, a landfill would not be constructed onsite, and CCR generated at PAF would be transported by truck on existing roadways to the Hopkins County Regional Landfill. As identified in Section 3.17, this increase in traffic on existing roadways would potentially increase the risk of injuries and fatalities associated with traffic incidents.

Implementation of Alternative C may require PAF to use additional trucks to transport CCR. TVA would establish health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards associated with the additional vehicles through implementation of safe operation practices, training and control measures.

All wastes generated by additional trucks would be managed in accordance with applicable federal, state and local laws and regulations, and all applicable permit requirements. TVA may decide to contract transportation services. TVA policy requires that contractors have in place a site-specific health and safety plan prior to operation on TVA properties. The contractor site-specific health and safety plan addresses the hazards and controls; spill and emergency response; as well as contractor coordination for operations.

Therefore, worker and public health and safety regarding offsite disposal of CCR in an existing permitted landfill would be maintained.

3.21 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPS are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the management of CCR from PAF have the potential to cause unavoidable adverse effects to several environmental resources.

The closure of impoundments at PAF has the potential to cause unavoidable adverse effects to existing open water habitats located within the ash impoundments. However, this impact is considered to be minor as these areas are elements of a man-made permitted treatment system which do not provide high quality habitat. In addition, temporary impacts to water quality from runoff at the site and wastewater discharge during decanting could impact nearby receiving water bodies during initial construction activities. BMPs to minimize runoff would be implemented, and water released by construction activities would meet established KPDES permit limits.

Under Alternative B, the construction of a new landfill would be on lands currently undeveloped and either barren or covered with forested or herbaceous vegetation. Clearing and grading of the site would result in long-term impacts to species composition and wildlife habitat. However, the project area is located within the boundaries of an existing industrial use (i.e., PAF) and has been previously disturbed. Adverse impacts would also occur to the ephemeral stream located within the South Spoil Area. This impact would be mitigated through adherence to permit requirements.

Other impacts associated with Alternatives B and C would primarily be related to impacts that occur during construction activities. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, noise and vibration that may potentially impact onsite workers. Potential noise impacts also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles. During operation of the dewatering facility, onsite handling and transportation of CCRs to the CCR Landfill may generate minor amounts of fugitive dust.

Under Alternative C, the transport of CCR material from PAF to the Hopkins County Regional Landfill would increase truck traffic volumes on public roads which could compromise public safety. This additional operations-related traffic would also increase noise and fugitive dust in areas proximate to these roads. Emissions from the haul trucks are minimized through implementation of BMPs including proper vehicle maintenance.

3.22 Relationship of Short-Term Uses to Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EA focuses on the analyses of environmental impacts associated with the various projects proposed to support management of CCR produced at PAF. For the purposes of this section, these activities are considered short-term uses of the environment and the long term is considered to be initiated upon the cessation of management and storage of CCR at PAF. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project site.

Construction activities would have a negative effect on a limited amount of short-term uses of the environment such as air, noise and transportation resources as described above. In addition, construction activities such as site preparation and noise may displace some wildlife during the construction period. Most environmental impacts during construction activities would be relatively short term and would be addressed by BMPs and mitigation measures. Construction activities would have a limited, yet favorable short-term impact to the local economy through the creation of construction and support jobs and revenue.

The proposed dewatering facilities and landfill would be constructed in areas that have been previously disturbed and support industrial uses. Because PAF is dedicated to power production, no loss of productivity of other natural resources is anticipated. In the long term, upon cessation of operations at PAF and after decommissioning, the lands could be reused and made available for other uses. Safety and security requirements as well as post-closure monitoring of the impoundments and landfill could impact future use of these areas. However, since these facilities are located on land presently dedicated for industrial uses, future land use would be limited to those uses that are compatible with industrial uses, until the PAF facilities are decommissioned.

Ash impoundment closure at PAF would have a beneficial effect on long-term productivity through the reduction or elimination of potential subsurface discharges of leachate to groundwater. Additionally, since there is limited capacity for additional CCR disposal onsite, at some point in the future capacity to store CCR onsite will become a limiting factor for PAF operations. Therefore, the development of the CCR Rule compliant landfill would have a favorable short-term impact on the operations at PAF in that the proposed landfill would meet the need for long-term storage of CCR.

If needed, the purchase of borrow material would have a short-term impact on the availability of this resource for other uses, however this impact is minimized as it is anticipated that borrow material would primarily be obtained from the project site.

Use of the Hopkins County Regional Landfill would impact capacity and, therefore, have an impact on the users of the landfill. However, there are other landfills within the region that may be utilized for disposal of waste materials

3.23 Irreversible and Irretrievable Commitments of Resources

This section describes the expected irreversible and irretrievable environmental resource commitments used in the construction and operation of the proposed CCR management activities. The term irreversible commitments of resources describe environmental resources that are potentially changed by the construction or operation of the proposed projects that could not be restored at some later time to the resource’s state prior to construction or operation. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road right of way as long as the road remains. Irretrievable commitments of resources include materials that are used for the new facility in such a way that they could not, by practical means, be recycled or restored for other uses. For example, mining of ore is an irretrievable commitment of a resource; once the ore is removed and used, it cannot be restored.

The land used for the proposed dewatering facility is not irreversibly committed because once operations at PAF cease, the land supporting the facilities could be returned to other industrial uses. Nonrenewable fossil fuels and some process materials such as thickening agents would be irreversibly lost through the construction and operation of the dewatering facility. In addition, the materials used for the construction of the facility would be committed for the life of the facility. While some of these building materials may be irrevocably committed, some metal components and structures could be recycled. The limited use of building materials for use in this project would not adversely affect the future availability of these resources.

Resources required by construction activities, including labor, fossil fuels and construction materials, would be committed for the life of the projects. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. In addition, construction materials (such as liners and cover systems) would be consumed. However, it is unlikely that their limited use in these projects would adversely affect the future availability of these resources.

The transfer of borrow material from the borrow site to the ash impoundment could be both an irreversible and irretrievable commitment of resources. The loss of soil (which requires a very long time to generate) would constitute an irreversible and irretrievable resource commitment; however, revegetating the borrow site and ash impoundment would return both sites to productive status. Thus, the loss of vegetation until the areas are successfully revegetated would be an irretrievable commitment, but not irreversible.

The land used for the ash impoundments would be irreversibly committed as the CCR material would remain in place for the foreseeable future representing a permanent commitment of the land and precluding future use of the land. However, as these areas would be vegetated they would support some natural resources. The land used for the proposed landfill is irreversibly committed because the land would be permanently converted from an undeveloped use to a landfill that would remain for the life of the landfill.

The Hopkins County Regional Landfill is an existing landfill, and there would be no changes to the committed materials and resources associated with landfill construction. However, nonrenewable fossil fuels would be irretrievably lost through the use of fuel by trucks used to transport CCR to this landfill. Due to the higher number of trucks needed and the greater number of miles travelled, this impact would be greater than Alternative B (which would require a lower number of trucks and fewer vehicle miles travelled), but would still be minor relative to existing supplies

3.24 Cumulative Effects

This section supplements preceding analyses that include in some degree the potential for cumulative adverse impacts to the region’s environment that could result from the implementation of the projects proposed to manage CCR at PAF. The CEQ regulations (40 CFR §§ 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 321 et seq.) define cumulative impact as: “…the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR § 1508.7).

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of a project when added to other past, present and reasonably foreseeable future actions (40 CFR § 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions including the following actions which are either explicitly or implicitly considered cumulative impacts:

- Historical underground mining throughout the PAF site
- Desulfurization System on Unit 3
- Operation of Unit 3
- Construction of CC Plant

As such, these actions are considered part of the baseline and are not addressed separately in the cumulative effects analysis.

TVA evaluated a full range of environmental resource issues for inclusion in the cumulative effects analysis. The proposed action and its connected actions identified under Alternative B would occur on land that was previously disturbed and is used for industrial purposes. The surrounding landscape is already subject to environmental stressors associated with continuing industrial operations and previous disturbance from mining. Consequently, as has been described in prior subsections of this EA, the existing quality of environmental resources with the potential to be directly or indirectly affected by project activities is generally low. The proposed action identified under Alternative C would occur on land developed as a landfill and would utilize existing roadways for transport of CCR; accordingly impacts associated with this alternative are confined to those associated with the transport of CCR from PAF to the Hopkins County Regional Landfill.

3.24.1 Geographic Area of Analysis

The appropriate geographic area over which past, present, and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. Based upon the defined list of resources potentially affected by cumulative effects, the lands and water resources within a 5-mile radius of the proposed actions was considered appropriate for consideration in this analysis. This geographic area also encompasses lands on the PAF reservation proposed for use as laydown during construction.

3.24.2 Identification of "Other Actions"

Past, present and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-34. 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.

Table 3-34. Summary of Other Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Project

Actions Description	Description	Timing and Reasonable Foreseeability
Closure of Units 1 and 2	TVA closed Units 1 and 2 in April 2017.	Past
Waste Water Treatment Plant	A waste water treatment plant would be near the site proposed for the dewatering facilities.	Reasonably Foreseeable Future
Bottom Ash Dewatering Facility	Installation of a bottom ash dewatering system within the PAF reservation.	Reasonably Foreseeable Future

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.

3.24.2.1 Closure of Units 1 and 2

TVA retired Units 1 and 2 in April 2017. These units were coal-fired cyclone generating units with a rated capacity of 704 megawatts each. The closure of these coal-fired units will result in a decrease of air pollutants emitted from the facility and reduce the amount of CCR generated and stored at PAF. In addition, closure of the units will result in a reduction of water withdrawals and thermal and wastewater discharges to the Green River.

3.24.2.2 Waste Water Treatment Plant

TVA is planning to construct and operate a new WWT facility/plant to treat wastewater streams from the gypsum FGD dewatering facility. Preliminary planning indicates that this facility would occupy approximately 5 acres and would be located near the proposed dewatering facilities on a previously disturbed site.

3.24.2.3 Bottom Ash Dewatering Facility

TVA is planning to construct and operate a bottom ash dewatering facility within the PAF reservation. The purpose of the new facility is help TVA meet its commitment to convert CCR storage from wet to dry. The facility would be constructed within PAF property on a previously disturbed site, presumably proximate to the plant. As with other dewatering facilities constructed by TVA, construction of the dewatering facility is expected to take place over an 18- to 24-month period. With the conversion to dry handling of fly ash and the future dewatering and possible recirculation of bottom ash sluice, there would likely need to be a future new outfall for cooling tower blowdown water.

3.24.3 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the project area was considered in conjunction with the environmental impacts presented in Chapter 3. These combined impacts are defined by the CEQ as “cumulative” in 40 CFR 1508.7 and may include individually minor, but collectively significant actions taking place over a period of time. As described in the resources analyzed above, the proposed projects would be located on a previously disturbed industrial site and would not substantially impact land use, geology, floodplains, surface water, groundwater, natural communities, cultural resources, visual resources, natural areas, parks or recreational facilities, and socioeconomic resources. The projects would result in some beneficial impacts during operation due to the increase in vegetated land cover at borrow and impoundment areas. However, this benefit is minor and localized and would not be expected to contribute to a more significant cumulative effect. Overall risk related to groundwater and surface water quality would be improved with implementation of impoundment closures. As noted in the PEIS (TVA 2016a), this would contribute to a positive impact on a cumulative basis within the Tennessee Valley region and within river systems supporting multiple coal-fired power plants subject to CCR impoundment closures. However, there are no other TVA facilities within the 5-mile geographic area of analysis.

Primary adverse effects of the proposed action as described in the preceding sections of Chapter 3 are related to temporary and localized effects associated with air and noise emissions from construction vehicles, erosion and runoff from construction sites, and minor generation of solid and hazardous wastes. It is likely that the construction phase of some of the other reasonably foreseeable future actions identified within the region may overlap with the proposed action. However, due to the relatively minor and temporary nature of construction related impacts, and the implementation of BMPs to minimize impacts, cumulative effects of the proposed action are considered to be negligible.

The potential for cumulative effects to the identified environmental resources of concern are analyzed below for Alternatives B and C

3.24.3.1 Air Quality and Climate Change

The reasonably foreseeable future actions identified have the potential to impact air quality. Emissions from the operation of a dewatering facility and WWT are subject to applicable operating permit and fugitive dust regulations. Emissions from these activities are expected to be minor and together with minor emissions associated with operation of the dewatering facilities and onsite landfill would not exceed significance levels. In addition, there would be a beneficial impact to regional air quality associated with the retirement of Units 1 and 2 and operation of the CC plant which together will result in a net reduction in emissions.

Under Alternative C, the transportation of CCR material to the Hopkins County Regional Landfill would extend throughout the operational phase, up to 32 years. This would result in potentially notable and long-term local effects on air quality. However, exceedances of applicable ambient air quality standards are not expected and no cumulative effects to air quality are anticipated as a result of this alternative.

Retirement of Units 1 and 2 and operation of the CC facility will reduce TVA’s fleet-wide GHG emissions. Implementation of Alternative B or C would result in minimal change in GHG emissions and, therefore, there would be no cumulative effect to climate change

3.24.3.2 Wetlands, Floodplains, Surface Water and Aquatic Ecology

The potential for cumulative effects to wetlands, surface water and the aquatic environment are largely driven by the loss of wetland area as a result of implementation of Alternative B. As described in Section 3.12 (Wetlands), impacts associated with obtaining borrow material from the South Spoil Area to support closure of the ash impoundments would result in the permanent loss of 0.7 acre of wetlands and impact 438 feet of a stream. Construction of the dewatering facilities would impact 0.4 acre of wetland. Construction of the proposed landfill would impact 0.7 acre of wetland. Implementation of Alternative C would impact wetlands and the stream within the South Spoil Area and the wetlands located within the dewatering facility project area. There would be no impacts associated with landfill construction. Any permanent impacts would be mitigated in accordance with requirements of Section 404 of the CWA.

Floodplain impacts would be avoided by locating the reasonably foreseeable activities identified in Table 3-34 outside the floodplain of the Green River and/or Jacobs Creek. However, floodplain impacts would be evaluated, and mitigation measures identified as needed, for each of the reasonably foreseeable activities in future environmental reviews. By adhering to the requirements of EO 11988 and the NFIP, impacts of reasonably foreseeable actions on floodplains and floodplain resources would be minimized.

Implementation of the proposed projects would result in unavoidable direct impacts to 437.8 feet of ephemeral streams. Impacts would be mitigated through adherence to the terms and conditions identified in the applicable state water quality certification under Section 401 of the CWA and federal permit under Section 404. Temporary indirect impacts to surface water quality would be minimized through the use of appropriate BMPs during construction. Leachate and storm water flow from the landfill and discharge associated with ash impoundment closure, would comply with applicable KPDES permit requirements.

Closure of the ash impoundments would also temporarily impact aquatic resources in the Green River due to construction of a new outfall on the Green River and a reduction in flow to Jacobs Creek.

Given the local abundance of similar aquatic resources and wetland areas within the region and the implementation of BMPs during construction and adherence to permit requirements for all identified projects, watershed level cumulative impacts to wetlands, floodplains, surface water and aquatic resources are not anticipated under either alternative.

3.24.3.3 Transportation

The potential for cumulative effects to transportation from other identified actions would be related to the construction phase of the other identified actions. Traffic generated by these actions would consist of the construction workforce and the shipments of goods and equipment to the construction site. The construction phase traffic would occur in addition to the existing traffic generated by the operation of PAF. However, once construction is completed, maintenance phase traffic associated with the foreseeable future projects would be negligible.

Under Alternative B, the hauling of CCR generated at PAF would not use public roadways. Since public roadways would not be impacted under this alternative, there would be no cumulative effects.

Under Alternative C, the transportation of CCR material to the Hopkins County Regional Landfill would extend throughout the operational phase, up to 32 years. Most of the road network along this route is anticipated to have sufficient capacity remaining to handle the resulting increase in truck traffic. Therefore, there would be no cumulative effects.

3.24.3.4 Noise

Implementation of the foreseeable future project have the potential to contribute to additional noise impacts. All of the projects would be located on PAF and there are no sensitive receptors within 500 feet of the facility, therefore no cumulative effect would be associated with Alternative B.

Under Alternative C, there would be no cumulative effect resulting from projects proposed on PAF (construction and operation of the dewatering facilities and ash impoundment closure). However, the increase in noise emissions along the haul route to the Hopkins County Regional Landfill are anticipated to result in moderate adverse effects to receptors located along the haul route. The potential for cumulative noise impacts from the foreseeable future actions would be associated with the increase in construction related traffic along the existing roads. This may increase noise levels at residences proximate to the haul route. However, any impacts would be minor and limited to the construction phase of the proposed projects. Therefore, cumulative effects to noise resources from the other identified actions are not anticipated.

3.24.3.5 Landfill Capacity

Under Alternative B, CCR would be disposed in an onsite landfill, and there would be no impact to capacity of other landfills in the region.

Under Alternative C, CCR from PAF would be transported to an existing offsite permitted landfill. Existing Subtitle D landfills that may be considered for receipt of CCR from PAF are typically sited, sized and permitted with expectations regarding total life span and capacity for disposal within their respective service areas. While the Hopkins County Regional Landfill has been considered in this analysis as the nearest receiving landfill with available capacity for the purposes of assessing impacts on environmental resources, TVA has not eliminated the possibility of transporting CCR under this alternative to one or more other offsite landfills if needed. If such a decision were made in the future, it would be the subject of a separate NEPA review. Disposal of CCR from PAF at any offsite landfill may reasonably be expected to consume existing capacity and, therefore, shorten the lifespan of the receiving landfill. The need to expand a given receiving landfill, however, is dependent upon a range of factors that include the existing permitted capacity, volume of CCR material placed within a given landfill and other market factors that would result in the placement of other non-CCR materials within the landfill. Because of these factors and the fact that TVA has not determined with certainty whether CCR materials from PAF would be placed at Hopkins County Regional Landfill, or any other receiving landfill, potential cumulative effects on environmental resources associated with the expansion of landfill capacity are remote and speculative.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Ashley Pilakowski**
Education:	B.S., Environmental Management
Project Role:	TVA Project Manager, TVA NEPA Coordinator, NEPA Compliance
Experience:	6 years in environmental planning and policy and NEPA compliance

Name:	**Anita Masters**
Education:	M.S., Biology/Fisheries; B.S., Wildlife Management
Project Role:	TVA Project Manager, TVA NEPA Coordinator, NEPA Compliance
Experience:	28 years in project management, NEPA and ESA compliance and community/watershed biological assessments.

Name:	**Bill Elzinga (Amec Foster Wheeler)**
Education:	M.S. and B.S., Biology
Project Role:	Project Manager, NEPA Coordinator
Experience:	30 years of experience managing and performing NEPA analyses for electric utility industry, and state/federal agencies; ESA compliance; CWA evaluations.

4.2 Other Contributors

TENNESSEE VALLEY AUTHORITY

Name:	**Elizabeth B. Hamrick (TVA)**
Education:	M.S., Wildlife and B.S. Biology
Project Role:	Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species
Experience:	17 years conducting field biology, 12 years technical writing, 8 years compliance with NEPA and ESA.

Name:	**Adam Dattilo (TVA)**
Education:	M.S., Forestry
Project Role:	Vegetation, Threatened and Endangered Plants
Experience:	10 years botany, restoration ecology, threatened and endangered plant monitoring/surveys, invasive species control, as well as NEPA and Endangered Species Act compliance

Name:	**Robert Marker (TVA)**
Education:	B.S., Outdoor Recreation Resources Management
Project Role:	Parks and Recreation
Experience:	40 years in outdoor recreation resources planning and management.

Name:	**Carrie Williamson, P.E., CFM (TVA)**
Education:	B.S. and M.S., Civil Engineering
Project Role:	Floodplains
Experience:	3 years Floodplains, 3 years River Forecasting, 1 year NEPA Specialist, 7 years compliance monitoring.

Name	**Craig Phillips (TVA)**
Education	M.S. and B.S., Wildlife and Fisheries Science
Project Role:	Aquatic Ecology and Threatened and Endangered Species
Experience:	7 years sampling and hydrologic determination for streams and wet-weather conveyances; 5 years in environmental reviews

Name:	**Kim Pilarski-Hall (TVA)**
Education:	M.S., Geography, Minor Ecology
Project Role:	Wetlands, Natural Areas
Experience:	20 years expertise in wetland assessment, wetland monitoring, watershed assessment, wetland mitigation, restoration as well as NEPA and Clean Water Act compliance

Name	**Tom Waddell (TVA)**
Education:	B.S., Chemical Engineering
Project Role:	Air Quality
Experience:	29 years in air permitting and compliance, regulatory development, and air pollution research

Name	**A. Chevales Williams (TVA)**
Education:	B.S. Environmental Engineering
Project Role:	Surface Water/ Groundwater and Geology
Experience:	12 years of experience in water quality monitoring and compliance; 11 years in NEPA planning and environmental services.

AMEC FOSTER WHEELER

Name:	**Matt Basler (Amec Foster Wheeler)**
Education:	M.S., Fisheries Science/Management and B.S., Wildlife and Fisheries
Project Role:	Aquatic Resources
Experience:	Expertise in fisheries and wildlife science (population studies/surveys, habitat measurements and improvement, stream and wetland delineation, fisheries management, lake renovation, aquatic vegetation sampling and identification).

Name:	**Karen Boulware (Amec Foster Wheeler)**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	NEPA Lead (Socioeconomics and Environmental Justice, Natural Areas, Parks and Recreation)
Experience:	25 years of professional experience in NEPA.

Name:	**Joel Budnik**
Education:	M.S. and B.S., Wildlife and Fisheries Sciences
Project Role:	Threatened and Endangered Species, Wildlife and Vegetation
Experience:	19 years of experience in environmental planning, NEPA analysis and documentation, ecological studies, and preparation of technical documents.

Name:	**Kelvin Campbell**
Education:	B.S., Geology, Geological Science and Hydrogeology
Project Role:	Geology and Geohydrology
Experience:	25 years of experience in geology, geohydrology and seismic assessment.

Name:	**Steve Coates, PE (Amec Foster Wheeler)**
Education:	B.S., Civil Engineering
Project Role:	Transportation
Experience:	25 years of experience in conceptual design of urban and rural highway projects, environmental compliance and stormwater management and civil site design, and NEPA compliance.

Name:	**Linda Hart (Amec Foster Wheeler)**
Education:	B.S., Business/Biology
Project Role	Technical Editing
Experience:	30 years of experience in production of large environmental documents including technical editing, formatting, and assembling.

Name:	**Richard Hart (Amec Foster Wheeler)**
Education:	A.S. of Applied Science
Project Role:	Noise Analysis
Experience:	20 years of experience in Computer-Aided Design Technology, baseline noise measurements and noise modeling using the Traffic Noise Model

Name	**Wayne Ingram P.E. (Amec Foster Wheeler)**
Education	B.S., Civil Engineering and B.S., Physics
Project Role	Surface Water
Experience:	30 years of experience in surface water engineering and analysis including drainage, stormwater management, water quality assessment, erosion and sedimentation, sediment transport, wetlands hydrology, stream restoration, and stormwater detention systems

Name:	**Stephanie Miller (Amec Foster Wheeler)**
Education:	M.S., Biology and B.S., Marine Biology
Project Role:	Land Use and Prime Farmland, Visual Resources
Experience:	8 years of experience in visual assessment, land use, aquatic and terrestrial ecology

Name:	**Chris Musselman**
Education:	M.S., Fisheries and Aquatic Ecology; B.S., Biology
Project Role:	Socioeconomic, EJ, Naturals Areas, Parks and Recreation
Experience:	4 years of experience in NEPA

Name:	**Lana Smith (Amec Foster Wheeler)**
Education:	M.S., Biology; B.S., Environmental Biology
Project Role:	Public Health and Safety
Experience:	21 years in Health and Safety, Hazard Analysis Assessment and Health and Safety Plan development

Name:	**Steve Stumne**
Education:	B.S., Biology
Project Role:	Vegetation, Threatened and Endangered Species, Wildlife
Experience:	Over 20 years of experience providing natural resource investigations, NEPA analysis and documentation, wetland and stream delineation/permitting/mitigation and endangered species investigations

CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

U.S. Army Corps of Engineers, Louisville District
U.S. Fish and Wildlife Service
U.S. Parks Service (attn: Mammoth Cave National Park)

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Cherokee Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Shawnee Tribe
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

Kentucky Department for Environmental Protection
Kentucky Department for Energy Development and Independence
Kentucky Department of Natural Resources
Kentucky Energy and Environment Cabinet
Kentucky Heritage Council
Kentucky Fish and Wildlife
Kentucky State Clearinghouse
Kentucky State Historic Preservation Officer
Land Between the Lakes
Natural Resources Conservation Service

5.4 Individuals and Organizations

Central City Library – Central City, Kentucky

CHAPTER 6 – LITERATURE CITED

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Appendix A – Public Involvement

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Appendix A – Public and Agency Comments Received on the Draft EA and TVA's Response to Comments

A draft of the EA was released for public review and comment on March 28, 2017. State, federal, and local agencies and federally recognized tribes were notified of the availability of the Draft EA. It was also posted on TVA's Web site and was made available at the Central City, Ky., Public Library. A notice of availability including a request for comments on the Draft EA was published in newspapers that serve the Muhlenberg County area *Central City Leader News*, and *Central City Times Argus*. Comments were accepted through April 27, 2017, via TVA's Web site, mail, and e-mail. Responses to comments raised during the comment period are provided below.

Comments were received on TVA's website and through the mail. We received comments from the U.S. Fish and Wildlife Service, Kentucky Ecological Services Field Office, and the Kentucky State e-Clearinghouse, the official designated Single Point of Contact for the Commonwealth. The Kentucky state e-Clearinghouse letter identified statutory and regulatory requirements. Other than the comments provided by Kentucky Department for Environmental Protection, no response to these comments is necessary. The letter from the Kentucky State e-Clearinghouse is included in the end of this section.

Following is a listing of the comments ordered by submitter and TVA's responses. A copy of each of the comments is included at the end of this section.

1. **Comment** General comment regarding permit recommendations and requirements (Ronald Price).

Response: Comment noted. TVA would obtain necessary permits, licenses and required approvals before construction activities begin.

2. **Comment**: The Service recommends including additional details regarding habitat and what aspects of the forest composition and age structure make the site unsuitable for bat roosting habitat. From the aerial maps included in the EA, the preferred area for the CCR landfill contains two forested blocks of significant size in close proximity to the Green River and Jacobs Creek, which facilitate the use of forested habitat within the planned CCR landfill by the Indiana bat and northern long-eared bat. If there are trees, living or dead, greater than three inches in diameter at breast height with exfoliating bark, broken limbs, broken tops, cracks, or crevices, then it is reasonable to think that these species may be using the proposed CCR landfill area for roosting. (USFWS).

Response: Additional detail from the Indiana bat and Northern long-eared bat roost habitat assessment that was conducted for the site in November 2016 was included in Section 3.11.1.1.1 of the Final EA. Specifically, information pertaining to survey methods, dominant species of the forest community for each woodlot, and whether any of the woodlots contained potentially suitable bat roost trees was added to support the conclusion that the project sites do not contain suitable summer roosting habitat or winter habitat for listed bats.

3. **Comment:** The Service agrees with TVA's assessments and discussion on the potential direct and indirect effects to aquatic biota. In addition, the mussel survey TVA performed near Paradise Fossil Plant in 2008 did not reveal federally listed mussel species at the time, a conclusion that is still applicable at this time. (USFWS).

Response: Comment noted.

4. **Comment:** The Division would like to offer the following suggestions on how this project can help them stay in compliance with the National Ambient Air Quality Standards (NAAQS): utilize alternatively fueled equipment, utilize other emission controls that are applicable to your equipment, and reduce idling time on equipment. The Division also suggests an investigation into compliance with applicable local government regulations (KYDEP).

Response: The suggestions will be considered. As noted in the EA, TVA requires all equipment to be properly maintained. TVA will adhere to all applicable local government regulations and obtain necessary permits, licenses and approvals required before beginning construction activities.

Public Meeting Fact Sheet

Paradise Fossil Plant

CCR Management EA

Introduction

The Tennessee Valley Authority (TVA) has prepared an Environmental Assessment (EA) according to federal regulations to evaluate the environmental impacts of implementing projects proposed to support dry storage of coal combustion residuals (CCR) produced at its Paradise Fossil Plant (PAF).

Purpose and Need

The purpose of the proposed action is to convert the management of CCRs produced at Paradise from wet to dry storage. The proposed individual projects are needed to support TVA's stated goal to store CCR on a dry basis and to eliminate all wet CCR storage at its coal plants by closing CCR impoundments. The projects are also needed to comply with present and future state and federal regulatory requirements.

TVA's Preferred Alternative

TVA proposes to implement several projects to address the long-term management of CCR at the plant. These include:

- closure of the ash impoundments (Gypsum Stack, Slag Impoundments 2A/2B, Stilling Impoundment 2C and the Peabody Ash Impoundment),
- construction and operation of two dewatering and CCR handling facilities (gypsum dewatering and dry fly ash conversion), and
- construction of an onsite landfill to accommodate future dry CCR disposal.

Each of these projects are summarized below.

CCR Dewatering and Handling Facilities

TVA proposes to build and operate a gypsum dewatering facility and a dry fly ash disposal system at its coal fired electric generating Unit 3. Units 1 and 2 are in the process of closing and therefore would not produce CCR. All proposed dewatering equipment would be constructed within a 29.1-acre previously disturbed site located south of the current coal units. A separate dewatering facility would be required to address boiler slag produced at the coal plant. Construction and operation of this facility would be evaluated in a separate NEPA document.

Under the proposed action, gypsum slurry would be delivered to one of two gypsum slurry storage tanks and would be pumped from the storage tanks to the gypsum dewatering facility, located within the gypsum dewatering building, where it would be mechanically dewatered using vacuum belt filters. The dewatered gypsum would be conveyed from the facility and stacked in a pile on a concrete storage pad next to the dewatering facility. The gypsum would be reclaimed from the storage pile and trucked to a landfill or offsite for marketing.

The proposed new Dry Fly Ash Handling and Storage System would use air to move the fly ash to a transfer station within the existing power plant and onto storage/disposal silos located next to the future gypsum dewatering facility. The dry fly ash may be mixed with water during loading to facilitate compaction and transported to a landfill for disposal. Provisions would be made for future disposal offsite and for marketing for beneficial reuse.

Ash Impoundment Closures

This EA is intended to draw from the findings of the TVA 2016 Programmatic Environmental Impact Statement (PEIS) to evaluate the closure alternatives for the Paradise ash impoundments. Specific activities associated with each of the impoundments are described below.

Slag Impoundment 2A/2B and Stilling Impoundment 2C – TVA proposes to convert the impoundments to lined process water basins which would treat process water prior to discharge via a permitted outfall. This would entail the excavation of CCR from the impoundments to achieve the final desired grade. This excavated CCR would be consolidated into the Peabody Ash Impoundment or would be recovered for marketing where feasible.

Gypsum Disposal Area – The Gypsum Disposal Area would be closed in place using a reduced footprint option similar to the one studied in TVA’s PEIS. CCR material would be excavated from the Upper Stilling Basin, drained, and re-used as fill material to create design grades for the final cover system. Additional fill material as needed would be obtained from areas next to the Peabody Ash Impoundment. A state-of-the-art cover system, like the one above, will be placed over the entire Gypsum Disposal Area.

Peabody Ash Impoundment – A divider dike would be constructed between the northern and southern portions of the impoundment. The southern portion would be closed in place and the northern portion would be closed by removal. CCR removed from the northern portion of the impoundment, together with additional material from the South Spoil Area and the adjacent borrow area, would be used to grade the southern portion of the site prior to the installation of a state-of-the-art cover system described previously. The closure option identified for this impoundment is similar to the criteria identified for the Reduced Footprint Option in the PEIS. The east dike along the northern portion of the impoundment would be lowered and that area would be used as a storm water basin.

Construction of an Onsite CCR Landfill

TVA would build and operate an onsite landfill for disposal of dry CCR generated at Unit 3, located about 0.5 mile southeast of the plant. Much of the land within the 80-acre landfill footprint includes areas that are substantially disturbed. The estimated capacity of the landfill is 13.8 million yd^3 which would provide up to 32 years of disposal. An existing access road on the PAF property would be used to haul CCR from the dewatering and CCR management systems to the landfill. Landfill construction will comply with all state and federal regulations and requirements.

The landfill design will reduce groundwater impacts by including a storm water management system, a leachate collection system, a state-of-the-art cover system and a groundwater monitoring program. Best Management Practices would be used to control sediment from storm water runoff during all construction phases of the project.

More detailed information about each of the proposed projects can be found online at www.tva.gov/nepa.

Next Steps

TVA is soliciting your comments on this project and will accept comments through April 27, 2017. Written comments can be submitted at this public open house or:

Online at: www.tva.gov/nepa or
Send written comments to:
Ashley Pilakowski
NEPA Compliance Specialist
400 West Summit Hill DR. WT 11D
Knoxville, TN 37902-1499 or
aapilakowski@tva.gov

Appendix B – Conceptual Closure Plans

XXXMXX | X | XX

Slag Pond 2A		Slag Pond 2B		Slag Pond 2C	
115.2	ACRE-FT	114.5	ACRE-FT	9.4	ACRE-FT
10.3	acres	10.3	acres	1.4	acres

FOR SUPPORTING DESIGN CALCULATIONS SEE

DRAFT

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

AECOM

SCALE: NONE EXCEPT AS NOTED

PROPOSED TOP OF LINER

SLAG PONDS 2A, 2B & 2C

FINAL CLOSURE

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
XXX	XXX	XXX	XXX	XXX	XXX	XXX

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

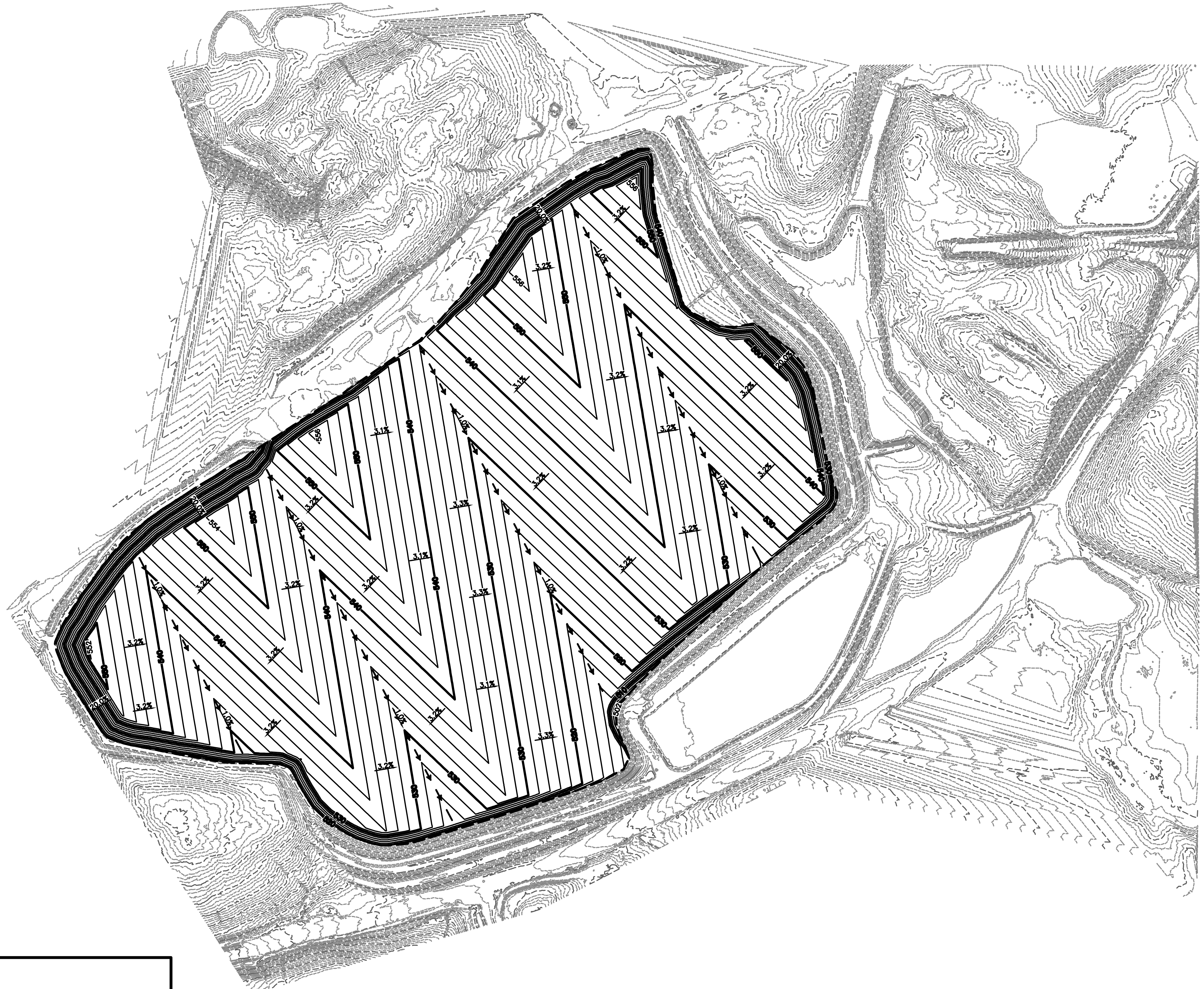
AUTOCAD 2010 XX/XX/XX ## X FIGURE 1 R #

AECOM
TASK COMPLETED BY: REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

I:\Projects\TVA-PAF\60522427_SlagPondsPh2\900-CAD-GIS\910-CAD\20-SHEETS\Figures\FIGURE 1 - 2A-2B-2C PRLG.dwg User:brian.egan Mar 09, 2017 - 2:10pm

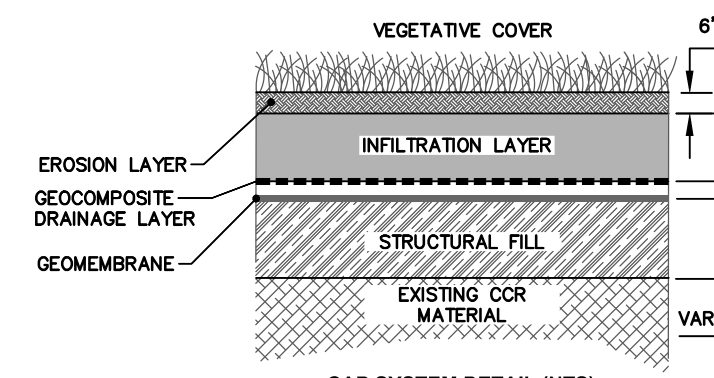


LEGEND

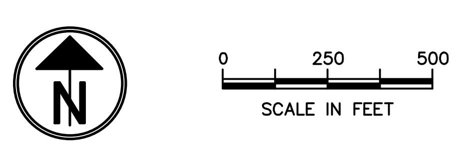
- 500 EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- 500 PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EXISTING VEGETATION
- EXISTING ROAD
- EDGE OF WATER
- DRAINAGE FLOW DIRECTION

NOTES

1. CUT QUANTITY = 1,908,000 C.Y.
   FILL QUANTITY = 1,356,000 C.Y.
   NET CUT/FILL QUANTITY = 552,000 C.Y. CUT



CAP SYSTEM DETAIL (NTS)



DRAFT

PRE-DECISIONAL AND DELIBERATIVE

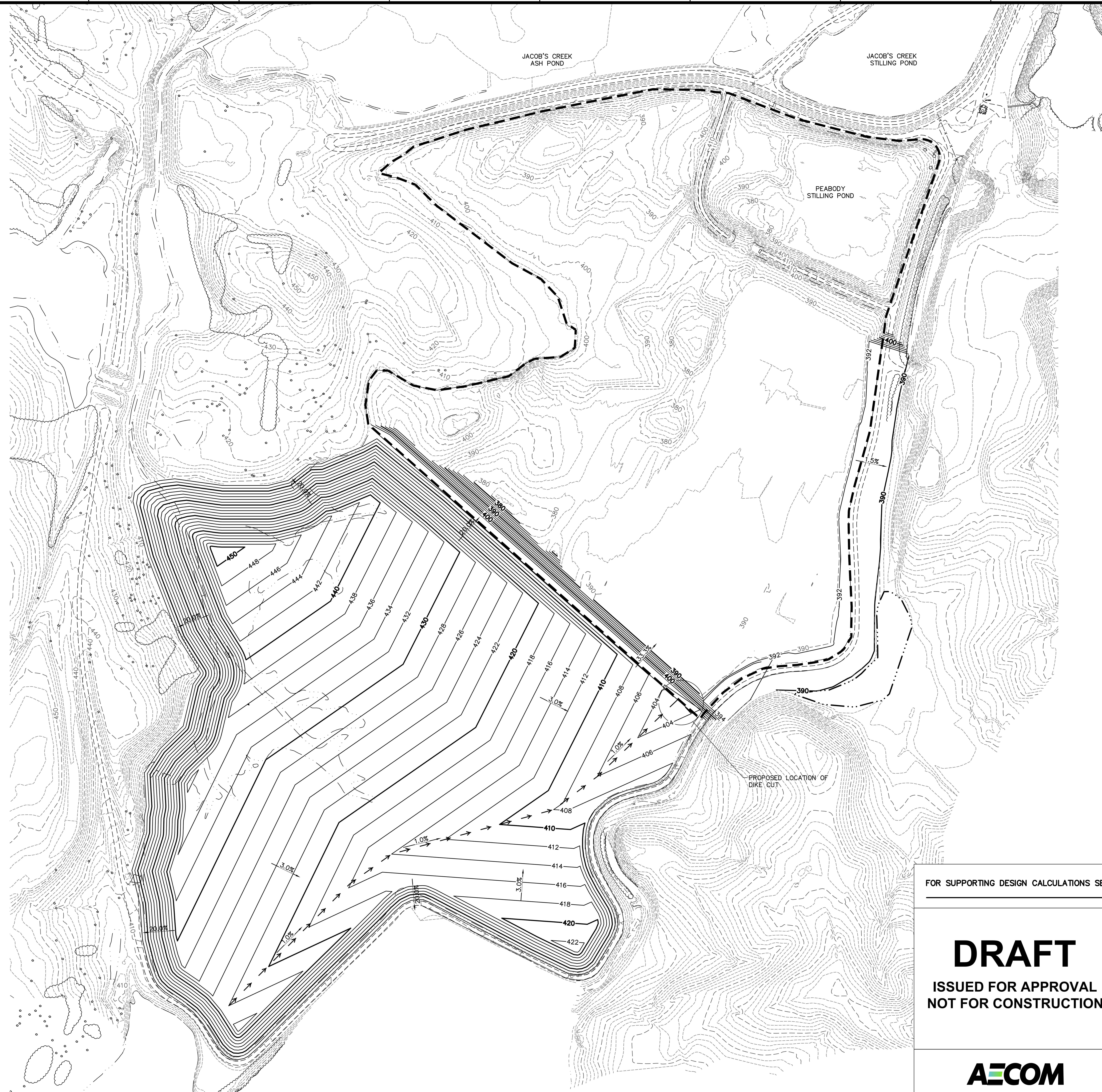
AECOM

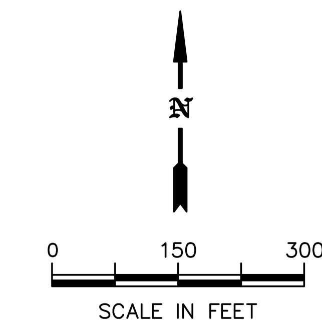
TVA PARADISE FOSSIL PLANT

PARADISE, KENTUCKY

GYPSUM STACK
FINAL CLOSURE GRADES PLAN

DRAWN BY:	CHECKED BY:	PROJECT No:	DATE:	FIGURE No:
JAD	NSG	60444361	08/2016	6





LEGEND

- 500 EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- 500 PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EXISTING VEGETATION
- EXISTING ROAD
- EDGE OF WATER
- DRAINAGE FLOW DIRECTION
- AREA OF SEDIMENT REMOVAL (SEE NOTE 5)

NOTES

1. EARTHWORK QUANTITIES
   - 1.1. FILL QUANTITY = 2,770,000 CY
   - 1.2. CAP SOIL @ 18" THICK = 157,000 CY
   - 1.3. TOPSOIL @ 6" THICK = 52,400 CY
   - 1.4. CUT QUANTITY FROM DIKE = 97,500 CY
2. THE SOUTHERN PORTION OF THE EXISTING PERIMETER DIKE WILL BE LOWERED FROM ORIGINAL 408 ELEVATION TO 405 ELEVATION.
3. THE NORTHERN PORTION OF THE EXISTING PERIMETER DIKE WILL BE LOWERED FROM ORIGINAL 408 ELEVATION TO 392 ELEVATION. THE ROAD WILL NOT BE MAINTAINED.
4. AREA PROPOSED TO BE CLEAN-CLOSED HAS AN AVERAGE APPROXIMATE THICKNESS OF 1-2 FEET ALONG THE BOTTOM OF THE POND.
5. SEDIMENT CONTAINING ASH WITHIN THE AREA TO BE EXCAVATED, DECANTED, AND INCORPORATED AS FILL INTO THE SOUTHERN CLOSURE AREA.

FOR SUPPORTING DESIGN CALCULATIONS SEE

DRAFT

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

AECOM

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

DISCIPLINE INTERFACE
1
2
3
4

SCALE: 1" = 150' EXCEPT AS NOTED

CONCEPTUAL GRADING PLAN
ALTERNATIVE 4

PEABODY ASH POND CLOSURE

REVISED 2/17/17

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

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2015 | DATE 10/30/15 | 64 | C | FIGURE 3 | R #

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PLOT FACTOR:XX
W_TVA

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64 C FIGURE 3

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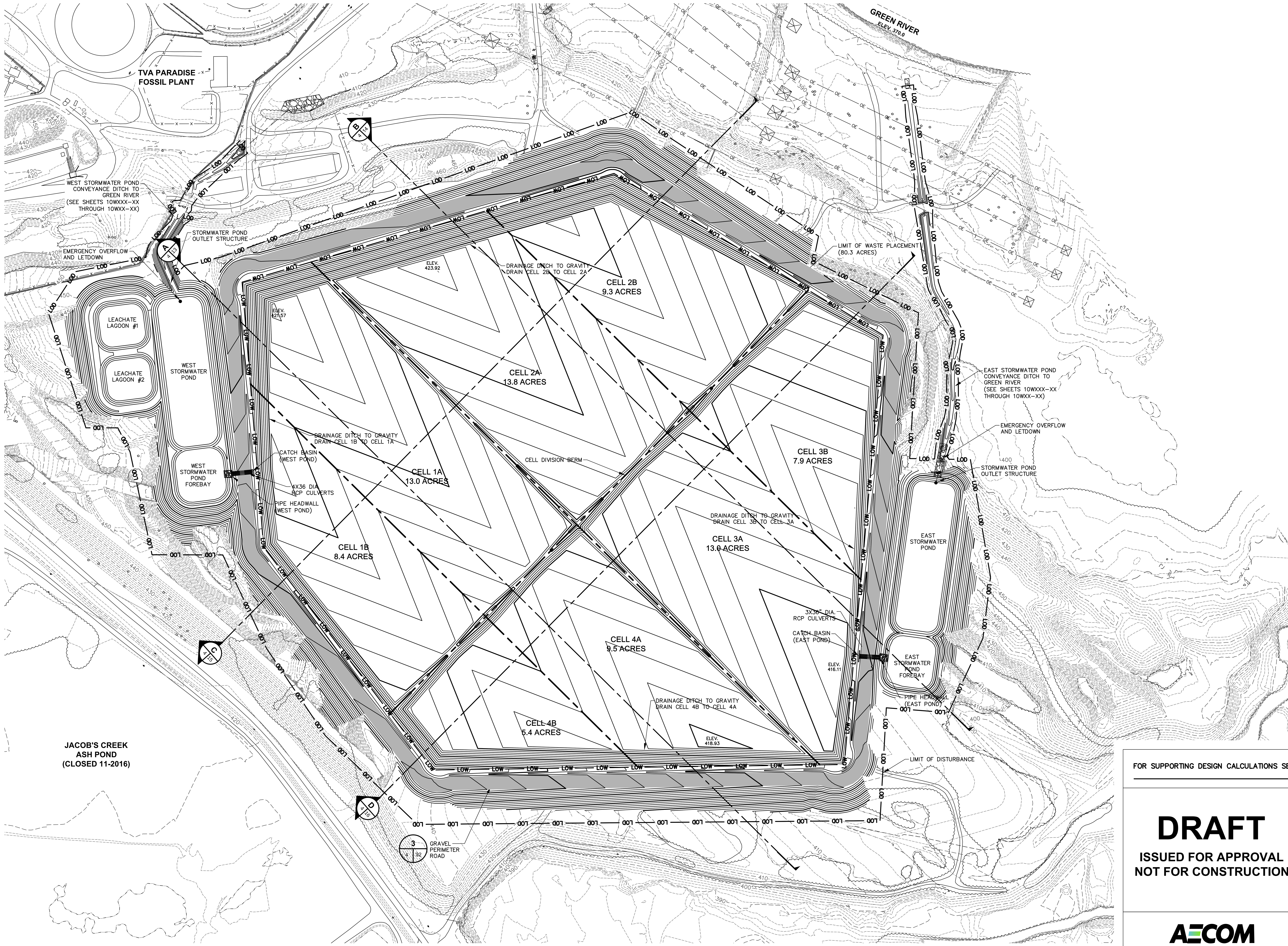
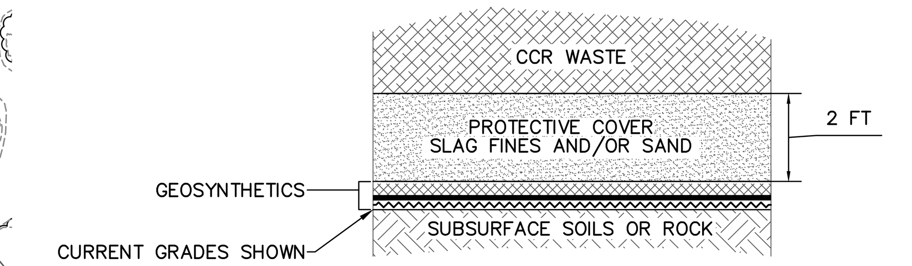


LEGEND

— 500 —	EXISTING MAJOR CONTOURS (10')
- - -	EXISTING MINOR CONTOURS (2')
— 500 —	PROPOSED MAJOR CONTOURS (10')
——	PROPOSED MINOR CONTOURS (2')
(shaded)	PROPOSED PERIMETER ROAD
— —	PROPOSED CELL BOUNDARY
— LOD —	LIMIT OF DISTURBANCE
— LOW —	LIMIT OF WASTE (80.3 ACRES)
~~	TREELINE
☒	TRANSMISSION TOWER
— OE —	OVERHEAD ELECTRIC LINE
=	EXISTING ROAD
- · -	EXISTING EDGE OF WATER
— —	LIMITS OF 100-YR FLOOD PLAIN

NOTES:

1. A FIVE (5) FOOT SEPARATION BETWEEN BETWEEN THE UPPERMOST AQUIFER AND PROPOSED BOTTOM OF EXCAVATION WITHIN THE LIMIT OF WASTE; THEREFORE THE BOTTOM OF EXCAVATION GRADES WILL ALSO SERVE AS THE BOTTOM OF LINER GRADES.
2. TEMPORARY DIVERSION BERMS/ RAIN FLAPS SHALL BE CONSTRUCTED BETWEEN CELLS DURING EACH PHASE.
3. LARGE OBJECTS AND DELETERIOUS MATERIAL WITHIN THE LIMIT OF WASTE TO BE REMOVED PRIOR TO GEOSYNTHETICS PLACEMENT.



COMPOSITE LINER SYSTEM

FOR SUPPORTING DESIGN CALCULATIONS SEE

DRAFT

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

AECOM

SCALE: 1" = 125' EXCEPT AS NOTED

BOTTOM OF EXCAVATION/ BOTTOM OF LINER

COAL COMBUSTION RESIDUALS (CCR) LANDFILL

OVERALL LANDFILL SITE PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
CLF	CLF	MBC	NSG	XXX	XXX	XXX

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2015 DATE 11/23/16 64 C 10WXXX-04 R A

PLOT FACTOR:XX
W_TVA

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TASK COMPLETED BY:	REV NO.

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Appendix C – TVA Technical Memorandum, Surface Water

TVA Project Technical Memorandum

Project Name:	**Paradise CCR Impoundment Closure EA**
Project Number:	
Date:	**January 19, 2017**
To:	**Ashley Pilakowski**
Subject:	NEPA Surface Water
Prepared by:	A.C. Williams and C.L. McEntyre

1.0 Introduction/Project Description

TVA is proposing to change the way that coal combustion residuals (CCR) are managed at the Paradise Fossil Plant (PAF) located in Muhlenberg County, Kentucky. CCRs are byproducts produced from burning coal and include fly ash, bottom ash, boiler slag and flue gas desulfurization materials. Currently, CCR generated by the operating units at PAF are managed by sluicing it to the existing gypsum stack, Peabody Pond, and boiler slag impoundments. TVA intends to transition from a wet sluiced ash disposal system to a dry ash disposal system as part of a new agency-wide directive. Therefore, TVA has proposed the following projects at PAF:

- construct and operate a Gypsum Dewatering Facility
- construct and operate a Dry Fly Ash Handling System
- construct and operate an onsite CCR landfill
- closure of the Gypsum Disposal Area
- closure of Slag Impoundment 2A/2B and Stilling Impoundment 2C
- closure of the Peabody Ash Impoundment

On April 17, 2015, the EPA established national criteria and schedules for the management and closure of CCR facilities (80 Federal Register 21302) (herein referred to as the CCR Rule).

This Surface Water Technical Memorandum is in support of the preparation of an Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA), to analyze the potential environmental impacts associated with the implementation of these new CCR management operations at PAF.

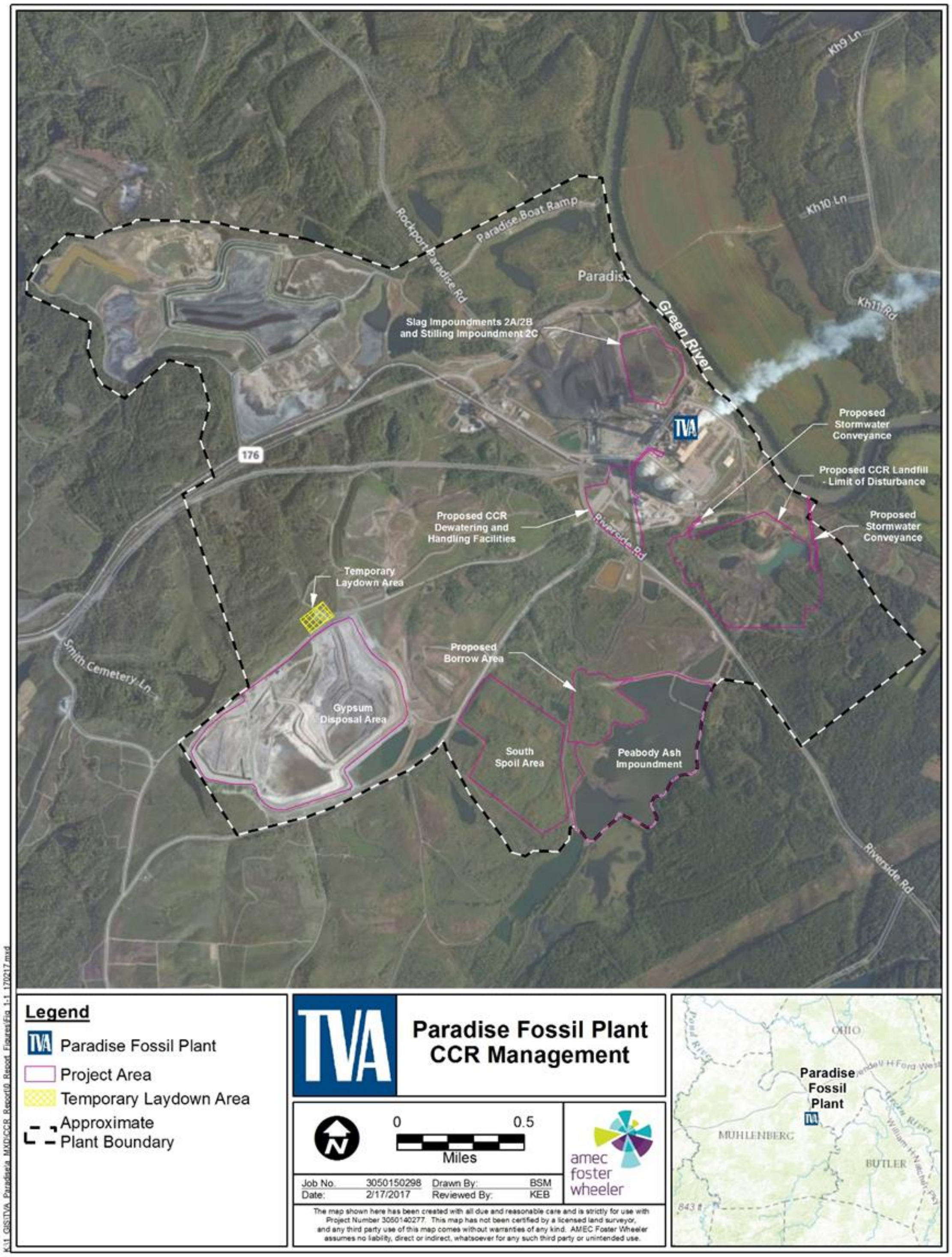

Figure 1. **Proposed Location of Projects**

2.0 Methods and Assumptions

2.1 Methods

Surface water NEPA evaluations follow the NEPA methodology of: (a) describing and assessing the existing environment, (b) evaluating the potential changes which could occur from the proposed actions or projects, and (c) estimating the potential impacts those changes could have on the existing environment.

For surface water quality this process normally consists of first describing the existing surface waters adjacent to the proposed actions/projects including any existing wastewater streams that currently discharge into those surface waters. The second step is to estimate any new or changed wastewater streams that could result from the proposed actions and compare them to any existing wastewater streams. The third and final step is to evaluate the proposed changes and discuss the potential impacts that those changes could have on surface water quality.

2.2 Assumptions

- Analyses presented reflect the retirement of PAF Units 1 and 2.
- This NEPA review of CCR impoundment closures and new dewatering facilities at PAF is based on and tiers off the Final Ash Impoundment Closure Environmental Impact Statement, Part 1 - Programmatic NEPA Review, prepared by TVA in June 2016. It is available at the following website: https://www.tva.gov/Environment/Environmental-Stewardship/Environmental-Reviews/Closure-of-Coal-Combustion-Residual-Impoundments.
- Current operations at PAF are in compliance with all applicable regulations and permits.
- In general, a balanced indigenous aquatic population exists in the Green River adjacent to PAF concurrent with existing plant operations and wastewater discharges to surface waters. Therefore, current operations do not appear to have had major negative impacts on surface water quality.
- Reductions in wastewater loadings discharged to surface waters resulting from the proposed actions should have beneficial impacts on surface water quality.

2.3 Governing Regulations

- Federal Clean Water Act (40 CFR 401 and 401)
- Federal Safe Drinking Water Act (40 CFR 141-143)
- Kentucky KPDES Regulations – 401 KAR Chapter 5 (http://water.ky.gov/Pages/KPDESDWRegs.aspx)
- Kentucky Drinking Water Regulations – 401 KAR Chapter 8 (http://water.ky.gov/Pages/KPDESDWRegs.aspx)

3.0 Affected Environment - Surface Water

3.1 Surface Water - Green River

PAF is drained by permitted storm water outfalls, wet weather conveyances, red water ditches (which ultimately flow to either the slag impoundment or the Peabody Ash Impoundment), the condenser cooling water discharge (Outfall 005), and process and storm water discharges from the Peabody Ash Impoundment (Outfall 001) and slag impoundment system (Outfall 002). The plant intake for Units 1 and 2 is located approximately at Green River Mile (GRM) 100.6 and the intake for Unit 3 is located at GRM100.3. The plant intakes water for cooling and process purposes (USACE 2011a).

The Green River basin contains approximately one-fourth of Kentucky's land area and is the largest drainage basin in the state with a total of 18,858 acres. (KDEP 2014) Reservoirs have been constructed by the USACE on the Rough, Nolin, and Barren Rivers, as well as on the main stem of the Green River in the upper basin. Major sources of stream contamination in the upper basin are agriculture (sediment, nutrients, and pesticides); mining or drilling (chloride); on-site and municipal wastewater-treatment systems (decomposable organic matter, nutrients, and bacteria); and urban storm water runoff (metals, nutrients, and sediment). Concentrations of chloride in the upper basin of the Green River are higher than those recorded at other locations in the basin and have been associated with brines from oil production. Concentrations of dissolved solids in the upper basin; however, were not high relative to those in other Kentucky streams. The relatively high median concentrations of nitrite (0.87 milligrams per liter) and suspended sediment (27 milligrams per liter) were among the highest for Kentucky's monitoring locations. The high values possibly were due to agricultural and urban runoff and municipal wastewater discharges. (TVA 1995)

Overall, water quality is good in the Green River Basin. However, two segments of the Green River and the entire 8210-acre Green River Reservoir are listed on the state 303(d) report as impaired, only partially support their designated uses. The Green River sites are upstream of the project site. One impaired segment from GRM 210.4 to GRM 250.2 is designated for primary contact recreation water and fish consumption uses. The listed pollutants of concern include E coli and mercury in fish tissue from an unknown source. The other impaired segment is from GRM 283.10 to GRM 309.0 and is also designated for primary contact recreation water. The listed pollutant is fecal coliform from a package plant or other permitted small flow discharges. The Green Reservoir is designated for fish consumption. The listed pollutants of concern are mercury and PCB in fish tissue. (KDEP 2014). Additionally, the Green River at GRM 189-290, approximately 90 miles upstream, is on the Nationwide Rivers Inventory. (KDEP 2016). However, no Nationwide Rivers Inventory streams or Wild and Scenic Rivers are near the proposed action. Jacobs Creek and the portion of the Green River adjacent to PAF are currently not assessed.

3.2 Onsite Surface Water Features

Jurisdictional streams and wetlands were delineated within the project area in August and October 2016 (AECOM 2016). The field survey of the site documented one ephemeral stream (total linear footage of 437.8) within the South Spoil Area and two storm water ditches (total linear footage of 3,095) on the proposed landfill site (Figure 2). Stream flow data was not available for the unnamed stream. All of the proposed landfill area has been previously disturbed originally by mining of coal and later by disposal impoundments or plant site activities. Drainage on the property flows generally to the east and south to Jacobs Creek.

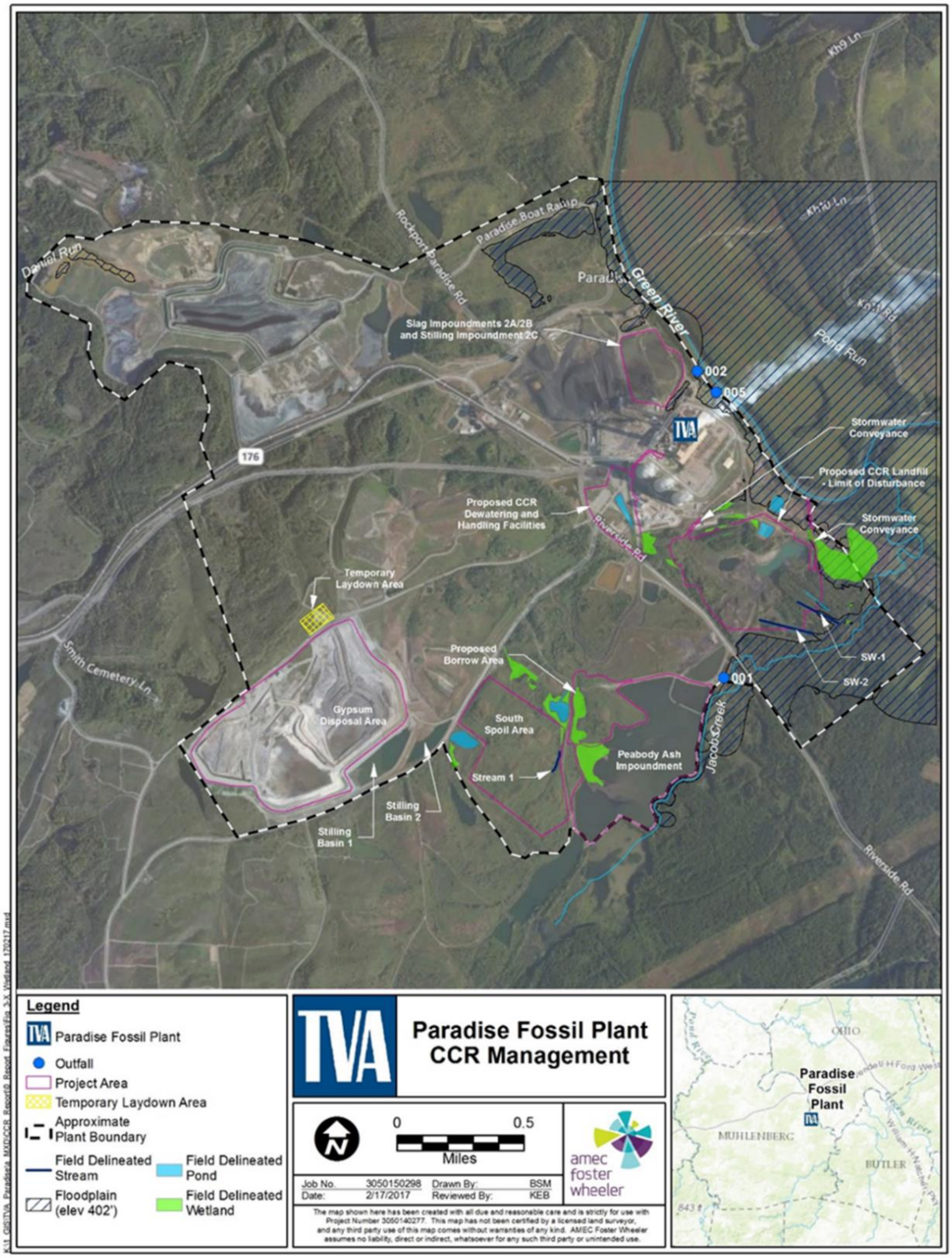

Figure 2. Surface Water Features of the PAF Project Areas

3.3 Existing PAF Wastewater Streams

3.3.1 Condenser Cooling Water (CCW)

The largest wastewater discharge at PAF is the CCW whose average daily annual flow is approximately 306 MGD through Outfall 005. Because Unit 3 operates in closed cycle utilizing cooling towers, essentially all of the flow from Outfall 005 is condenser cooling water and miscellaneous equipment cooling water from Unit 1 and 2. Unit 1 and Unit 2 actually generate an average daily flow of 337 MGD but part of that flow is recycled and used for ash sluice water and other processes and currently discharged through Outfall 001 or Outfall 002.

3.3.2 Coal Combustion Residue

The existing systems for handling CCR include several areas that receive and treat CCR wastewater streams, including Slag Impoundment 2A/2B, and Stilling Impoundment 2C the Peabody Ash Impoundment; and the Gypsum Disposal Area (see Figure 2).

3.3.2.1 Slag or Bottom Ash

Slag or bottom ash collects in the bottom of the boiler. It is washed from the boiler bottoms with jets of water and sluiced to Slag Impoundment 2A where suspended solids are settled. As shown in Table 1 below, boiler ash sluice flow at PAF averages 29.64 million gallons per day (MGD). Much of the settled ash or slag is reclaimed by Harsco Mineral and beneficially reused in the production of roof singles. Precipitation runoff from the coal storage area drains to three separate impoundments. Impoundment 2A discharge flows through a culvert to impoundment 2B for further settling. Impoundment 2B discharges into a stilling impoundment and the stilling impoundment discharges into the Green River through Outfall 002 (see Figure 2). A pump platform is located at the head of the stilling impoundment where an annual average of 16.85 MGD is pumped from the slag impoundments to the Peabody Ash Impoundment (Outfall 001) to aid in regulating total dissolved solids (TDS) in Outfall 001 discharge. The Outfall 002 discharge to the Green River has an average flow of 27.58 MGD. TVA is required under KPDES Permit No. KY0004201 to meet pH, total suspended solids, oil and grease, and acute toxicity limits on this discharge (TVA 2003).

Table 1. Inflow Average Annual Daily Flow Sources to Slag Impoundments Prior to Retirement of Units 1 and 2 and Dewatering Projects.

Source	Inflow to BAP (MGD)	Percent of Total Inflow (%)
Bottom ash sluice, Unit 1 2 and 3	29.638	66.71
Station Sumps, Unit 1 2 and 3	5.088	11.45
Unit 1 and 2 Unwatering Sumps	4.421	9.95
Red Water Ditch 1 and 2	1.951	4.39
Ash Slurry Sump, Unit 3	1.162	2.62
Coal Yard Drainage	0.539	1.21

Source	Inflow to BAP (MGD)	Percent of Total Inflow (%)
Unit 3 Ext. Area Sump	0.201	0.45
Miscellaneous Minor Streams	1.430	3.22
Total	44.430	100

Source: Flow schematic in 2016 for KPDES Permit KY0004201

The sluice from all three units at PAF makes up about 67 percent of the inflow to the slag impoundments system. It is estimated that approximately half of that flow or 15 MGD is from Unit 3. Station sumps for all 3 units plus Unit 1 and 2 unwatering sumps make up approximately 21 percent of the inflow. Approximately 16.85 MGD (38 percent) of the total flow is pumped to the Peabody Ash Impoundment. This leaves approximately 27.58 MGD to be discharged to the Green River through Outfall 002. These values are based on information gathered for the current KPDES permit application and represent average daily flows on an annual basis. With the retirements of Units 1 and 2 in April,

3.3.2.2 Fly Ash

About 8 percent of coal burned at PAF remains as ash, of which approximately 70 percent is slag/bottom ash and 30 percent is fly ash, but varies slightly. Approximately 436,377 dry tons of ash is wet-sluiced to either the slag or fly ash Impoundments each year. Most of the fly ash from Units 1 and 2 (approximately 70,148 tons per year) is captured by the existing FGD system and is sluiced with the scrubber gypsum to the Gypsum Disposal Area. All of the fly ash from Unit 3 (approximately 38,947 tons per year) is sluiced to the Peabody Ash Impoundment at an average annual flow of 10.944 MGD. Economizer fly ash is incorporated into the molten slag tank. Air preheater ash is sluiced to the Peabody Ash Impoundment. Some ash is collected at the Selective Catalytic Reduction System (SCR) in ash hoppers and then sluiced to the Peabody Ash Impoundment (TVA 2003).

TVA is required under Kentucky Pollutant Discharge Elimination System (KPDES) Permit No. KY0004201 to meet pH, total suspended solids, oil and grease, and chronic whole effluent toxicity (WET) limits on the Peabody Ash Impoundment discharge. The KPDES permit also requires that Outfall 001 (and Outfall 002) be monitored for a series of total recoverable metals, but there are no current limitations for these metals. Total recoverable metals means antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc—results for these metals are totaled and the aggregate value is reported (KPDES 2004).

Three sources (fly ash sluice, bottom ash sluice, and FGD sluice) comprise almost 98 percent of the total in-flow to the Peabody Ash Impoundment, as shown in Table 2 below. The Slag Impoundment flow averages almost 17 MGD which is approximately 50 percent of the total inflow to the Peabody Ash Impoundment. Fly Ash Sluice Water from Unit 3 and Air Preheater Hopper Wastewater from Units 1and 2 average almost 11 MGD (33 percent) and FGD flows average approximately 5 MGD (15 percent).The chemical metal cleaning waste is 0.11 percent and then precipitation/evaporation is approximately 1.6 percent of the total flow and all other sources make up only

0.038 percent. These values are based on information gathered for the current KPDES permit application and represent average daily flows on an annual basis.

Table 2. Average Annual Daily Process Flow Sources to the Peabody Ash Impoundment Prior to Retirement of Units 1 and 2 and Dewatering Projects.

Source	Inflow to Ash Impoundment (MGD)	Percent of Total Inflow (%)
Bottom Ash Impoundment Outfall 002	16.85	50.5
Fly Ash Sluice Water Unit 3 and Air Preheater Hopper Wastewater Unit 1 and Unit 2	10.944	32.8
FGD Impoundments	4.9776	14.9
Chemical Metal Cleaning Waste	0.0366	0.11
Precipitation-Evaporation	0.5262	1.6
Miscellaneous Minor streams	0.0128	0.038
Total	**33.3**	**100**

Source: Flow schematic in 2016 for KPDES Permit KY0004201

Please note all streams that are storm water driven are denoted in average annual daily flows; however a storm event can produce flows greater than these amounts in a 24-hour period.

Ancillary streams flow into these major streams, but are not mentioned in this table.

The Peabody Ash Impoundment provides settling of suspended solids, ammonia uptake/removal, and limited metals precipitation before treated water overflows to a stilling impoundment. Effluent (about 33 MGD) from the stilling impoundment is discharged into Jacobs Creek through KPDES Outfall 001 (Figure 2). Normal operating conditions can result in lower discharge flows in the range of 17 to 20 MGD. The influent flows to the Peabody Ash Impoundment shown in Table 2 may or may not vary accordingly. The pH of effluent discharged from the Peabody Ash Impoundment generally ranges from 6.0 to 9.0, however a CO_2 system is in place to provide pH control when needed to meet discharge limits. On occasions when the effluent pH approaches the upper pH limit of 9.0, a carbon dioxide injection system is used to add acidity. A numerical model, FLOWPATH, for determining subsurface discharges at the impoundment boundaries indicated that impoundment seepage entering Jacobs Creek is minute compared to the surface discharge to the creek (TVA 2003).

3.3.2.3 FGD Scrubber Gypsum Byproduct

PAF has installed selective catalytic reduction (SCRs) on all three units and most fly ash removal for these units is performed by the FGD system of Units 1 and 2. FGD makeup water and the lime feed slurry are approximately 3.15 MGD of the FGD impoundment discharge of 4.9776 MGD (see Table 2).

When the gypsum concentration reaches about 15 percent, solution blow-down is initiated to maintain equilibrium. This blow-down stream is pumped to the Gypsum Disposal Area. The Gypsum Disposal Areas consists of the main disposal unit which wet stacks CCR materials, and two treatment settling impoundments identified as Stilling Basin 1 and Stilling Basin 2 (Figure 2). The stilling impoundments discharge to the Peabody Ash Impoundment through the FGD channel. Other operations and runoff from other areas contribute an additional 0.46 MGD to the FGD scrubber gypsum byproduct impoundments system flow. Stilling Basin 2 currently discharges to the Peabody Ash Impoundment.

Some ammonia may slip through the SCRs. Most of the ammonia slip would be removed from the stack gases in the FGD scrubber for that unit and become part of the FGD scrubber gypsum/fly ash byproduct impoundment wastewater (TVA 2003). PAF performs monthly monitoring of the intake, slag impoundment discharge, and Peabody Ash Impoundment discharge for ammonia per an ammonia monitoring plan required by KPDES Permit KY0004201. The ammonia monitoring concentrations for the calendar years 2015 - 2016 varied based on the ammonia slip, the water temperature and various water quality parameters like ammonia uptake in the pond. The ammonia as nitrogen levels ranged from below detection (<0.25 mg/L) to 3.05 mg/L for Outfall 001 and ranged from <0.25 mg/L to 1.21 mg/L for the Outfall 002. Intake data, which would be assumed to be representative of the Green River, was generally below detection at < 0.25 mg/L with one concentration above detection of 0.7 mg/L.

3.3.2.4 Other Surface Runoff

The existing plant site runoff is regulated under the KPDES Permit KY0004201. Existing facilities and BMPs are used to ensure compliance with the permit conditions. Some plant runoff is directed through the Peabody Ash Impoundment and slag impoundment systems discussed above, whereas other runoff goes directly to the Green River or Jacobs Creek through permitted discharge points.

Potential adverse impacts to surface water quality are normally related to those resulting from construction activities and the maintenance of the new facilities. Potential construction-related impacts in waterways include increased turbidity and sedimentation. Proper standard erosion-control measures would be followed to minimize the potential for adverse impacts on water quality and aquatic organisms and habitats.

3.3.2.5 Sanitary Wastewater Treatment

Most sanitary wastewater at PAF is treated on-site in a small, extended aeration package plant that discharges as Outfall 004 to Red Water Ditch #1. Red Water Ditch #1 then discharges to the slag impoundment system. Outfall 004 has limitations on CBOD5 (carbonaceous biochemical oxygen demand) and fecal coliform bacteria. The average annual flow from Outfall 004 is 0.02 MGD. During outages, an additional 100 workers may be on site and portable toilets are provided because of the distance to the permanent sanitary facilities. The wastewater from the portable toilets is pumped and hauled to a nearby municipal wastewater treatment facility.

3.3.2.6 Paradise Combined Cycle Plant

The combined cycle (CC) plant was added to the grid for a test run in late 2016. The KPDES permit #KY011902 for this facility was effective on September 1, 2016 (KY DEP 2016) and includes discharges to the Green River of storm water and Internal

Outfall 002 (cooling tower blowdown) from Outfall 001 located at approximately GRM 99.4 and Raw Water Intake for cooling water from Outfall 003. The parameters monitored and or limited from Outfall 001 are flow, temperature, TSS, pH and acute whole effluent toxicity. Outfall 002 requires monitoring of flow, pH, free available chlorine, total residual oxidants oxidant discharge time, total chromium, total zinc, and priority pollutants. Outfall 003, the facility intake, monitoring requirements includes flow, intake velocity and intake inspection.

4.0 Results of Impact Evaluation – Environmental Consequences to Surface Water Quality

4.1 No Action Alternative

Under the No Action Alternative, TVA would not construct the proposed new facilities and so no construction impacts would occur. TVA would continue to operate the existing gravity dewatering system for both gypsum and fly ash described in the affected environment. All CCR material would continue to be stored on-site. The existing wastewater streams would continue to be authorized under KPDES Permit KY0004201. Discharges would continue to comply with all applicable permit limits and therefore, surface water quality adjacent to PAF should remain approximately the same or improve with the exception of reduced loadings due to the Unit 1 and 2 shutdown.

Thus, continued operations at PAF under the No Action Alternative would not be expected to cause any additional direct or indirect effects to local surface water resources, and therefore, would not change existing conditions except for the effect of Unit 1 and 2 shutdown.

4.2 Alternative B – Construction of an Onsite Special Waste Landfill and Implementation of Dewatering Projects and Impoundment Closures

4.2.1 Construction Impacts

Wastewaters generated during construction of the proposed projects may include construction-related storm water runoff, drainage of work areas, non-detergent equipment washings and dust control, hydrostatic test discharges and domestic sewage.

Soil disturbances associated with construction activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and impact aquatic life. TVA would comply with all appropriate state and federal permit requirements. Construction activities would be located on the plant property that already supports heavy industrial uses. Appropriate BMPs would be followed, all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized. The Site Best Management Practices Plan, required by the KPDES permit, would be updated to include project-specific BMPs or a stand-alone project BMP plan would be prepared. This plan would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts.

These proposed projects would require filling of the ephemeral stream in the South Spoil Area. As this stream has been determined to be jurisdictional, Kentucky Division of Water 401 Water Quality Criteria and USACE 404 permits would be required which would require mitigation, such as on-site stream restoration or contributing to a stream mitigation bank, per permit requirements. Additionally, impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. The existing infrastructure would be removed from the project site; however, they would be replaced with the dewatering facilities, a new landfill, and capped impoundments thus altering the current storm water flows. Because the project site is an industrial site and was partially covered with impervious structures or ground covers that decreases percolation construction would not significantly impact impervious surface area, but it would increase. Concentrated storm water flow from the project areas would come primarily from either the roof drains from the dewatering facilities or from concentrated flows not able to infiltrate through the impoundment caps. These flows would need to be properly treated with either implementation of proper BMPs or by diverting the storm water discharges to an appropriate storm water outfall or impoundment for co-treatment.

Equipment washing and dust control discharges would be handled in accordance with BMPs described in the BMP Plan required by the site's KPDES Permit KY0004201 to minimize construction impacts to surface waters.

Onsite hydrostatic testing will have the option to use potable or surface waters and would be covered under the current KPDES Permit KY0004201.

Sanitary wastes generated during construction activities would be collected by the existing sewage treatment system, on-site septic system(s) or by means of portable toilets (i.e., porta lets). These portable toilets would be located throughout construction areas and would be pumped out regularly, and the sewage would be transported by a vacuum truck to a publicly-owned wastewater treatment works that accepts pump out.

Potential on-site borrow areas have been identified and evaluated to ensure the material is suitable for construction and capping activities for the proposed projects. The borrow material has been evaluated to ensure that it can met the required compaction requirements of the proposed designs and other specifications. The on-site KPDES BMP Plan would cover any needed best management practices that would be required to ensure that no adverse impacts to surface water would be expected from the use of these borrow areas.

With the implementation of appropriate BMPs only temporary minor, impacts to surrounding surface waters would be expected from construction activities associated with dewatering facilities and impoundment closure.

Landfill construction activities could include, but are not limited to, the clearing and grading of the project site and grading of new separate storm water and leachate impoundments; the installation of the landfill facility (including liner and leachate collection fields) and the installation of a forced main to pump leachate to its discharge outfall. This proposed project would have similar impacts to the construction, as those noted above.

The landfill project area has one ephemeral stream, 1.2 acres of jurisdictional wetland areas and two storm water ditches that could be impacted by the proposed project. (AECOM, 2016a) This would require a state 401 water quality certification and federal

404 permits to be obtained for any stream/wetland alteration and the terms and conditions of these permits would likely require mitigation from these proposed activities.

4.2.2 Operational Impacts

4.2.2.1 PAF Surface Water Withdrawal and Discharge Rates

With the retirement of Units 1 and 2 intake withdrawals and waste water discharges would change significantly. PAF Unit 3 operates in closed cycle cooling mode only. Therefore, the discharge of once-through CCW would be eliminated once Units 1 and 2 are retired. This would greatly decrease any thermal loading of approximately 306 MGD that is added by these discharge flows. There would need to be a discharge of cooling tower blowdown, which may require a new outfall, thus requiring a modification of the site's KPDES permit. Currently, the only provision for cooling tower blowdown is that it is used for ash sluicing. With the conversion to dry handling of fly ash and the future dewatering and possible recirculation of bottom ash sluice, there would likely need to be a future new outfall for cooling tower blowdown.

At PAF, withdrawals and discharges from the miscellaneous equipment cooling water and other plant waste water should be reduced by approximately half. The projects detailed, with the implementation of Alternative B, would yield positive surface water impacts with the reduction of both intake demand for surface withdrawals and the reduction in loading to surface water discharged from the facility.

4.2.2.2 Dewatering and Dry Handling Projects

4.2.2.2.1 *Gypsum Dewatering Facility Operational Impacts*

The gypsum dewatering system is designed to process a total gypsum slurry flow rate of 80 tons per hour (tph) from the FGD system. The resulting annual throughput would be approximately 166,400 tons per year (tpy). Gypsum blowdown slurry would be routed from the absorber to the new dewatering facility. The maximum flowrate from the Unit 3 FGD absorber would be approximately 1,166 gpm at approximately 25 percent solids by weight. This slurry would be conveyed via pipelines from the absorber bleed pumps and would be routed to the dewatering facility.

Discharge waste water from the gypsum dewatering system would initially be routed to clarifiers for further treatment before being discharged to the equalization basin and would ultimately be discharged through Outfall 002. The normal discharge rate from the dewatering facility would average approximately 1,000 gpm for 24 hours a day, seven days a week (approximately 1.44 MGD). This flow rate could possibly range up to 1,400 gpm. The facility would run 24 hours a day and seven days a week under normal operation. This would be a reduction of approximately 3.07 MGD from the current flow from all three units.

The process wastewater or blowdown from the proposed gypsum dewatering system would be treated in clarifiers, thickeners and a filter press and routed to the equalization basin prior to discharge to the Green River via Outfall 002. The equalization basin would be designed and operated to ensure compliance with all KPDES regulations and permit limits and Kentucky Water Quality Standards. In addition, there would be no discharge of any visible scum, floating materials, or objectionable color contrast, nor a significant discharge of total suspended solids.

There would be outage washes associated with the gypsum dewatering facility. These washes would include the discharge of the absorber(s) of the FGD, which could generate flows of 2400 gpm for a short duration, but generally the washes would generate flows of approximately 200 gpm which would be sump discharge flows for a short period. These washes and discharges would be treated and then discharged to the equalization basin and ultimately out Outfall 002 until the full spectrum of waste water treatment is in place.

Between 3 and 20 gpm of potable water would be used for safety showers, eye washes and restrooms. Service water for both the gypsum dewatering facility and the dry fly ash conversion would be required for hose stations and for wetting the ash prior to loading into trucks. The flow is anticipated to be approximately 150 to 200 gpm (average). It is assumed that this water need would only be required during the hours that hauling operations were taking place. The majority of the storm water flows would be managed through the implementation of BMPs and cleaning and maintenance plans and would be released through either existing or new storm water outfalls. All other flows would be co-treated as process wastewater in the current impoundment systems.

4.2.2.2.2 *Dry Fly Ash Conversion Operational Impacts*

Conversion to a dry fly ash handling system would reduce existing water needs for PAF by approximately 11 MGD. Changing the volumes of ash impoundment sources could affect the assimilative capacity currently used for treating storm water, air pre-heater washes (APHW), low volume waste streams, and station sump discharges.

Removing approximately 11 MGD of fly ash sluice waters from Outfall 001 would reduce the average daily flow through Outfall 001 from approximately 33 MGD to approximately 22 MGD. This Outfall 001 discharge flow would be ultimately reduced even further with the retirement of Units 1 and 2, resulting in an estimated discharge of approximately 19 MGD. In general, reducing the flow through the existing ash impoundment system would provide additional time for mixing and settling of these wastewaters and would provide enhanced treatment, especially for neutral wastewaters such as general area storm water and station sump discharge. However, removing the fly ash sluice water does have the potential to reduce the alkalinity in the system and thereby reduce its effectiveness in treating acidic wastewaters, such as FGD waste water or APHW. However this 19 MGD would essentially be rerouted to the equalization basin prior to the closure of the ash impoundment.

No discharge flows would be expected from this system except for contact and non-contact storm water. Metals and other constituents that are currently leached from the fly ash during the wet sluicing process would no longer be leached from this waste stream, except for a low level leachate waste stream that is described in the gypsum dewatering facility and on-site landfill operational impacts. These impacts would be representative for all CCR waste streams stored in this on-site facility. As reported in the EA prepared for Dry Fly Ash conversion at Kingston Fossil Plant (TVA 2010a), literature (Ainsworth and Rai 1987) suggests that arsenic, boron, chloride, fluoride, sulfur, and selenium are concentrated on the surface of fly ash at higher levels than in bottom ash. Therefore loadings of these constituents would be reduced, when ash is not sluiced, beyond that expected, based only on the reduction in flow to Outfall 001. As reported by TVA in the

EA for Dry Fly Ash conversion at Kingston Fossil Plant, Bohac, (1990) concluded that removal of fly ash from the wet ash handling system could reduce the mass loading to the ash impoundment by as much as 80 percent. Under current operations the change to dry ash handling would therefore substantially reduce the mass of metals presently discharged to the Jacob's Creek and ultimately the Green River. Please see Table 2 for details.

There are no actual outage washes associated with the pneumatic handling system, however air preheater and precipitator outage washes would still take place as needed. The purpose of the air pre-heater is to recover the heat from the boiler flue gas, which increases the thermal efficiency of the boiler by reducing heat loss. Consequently, the flue gases are also sent to the stack at a lower temperature; this lower temperature allows for sulfur compound deposition that can trap fly ash, causing clogging. APHWs occur at infrequent intervals based on the amount of clogging from fly ash in the air pre-heater baskets. Typically, baskets are washed at two- to three-year intervals depending on outage scheduling, or as needed. TVA would collect data from these washes; if potential impacts on Outfall 001 were indicated, TVA would take appropriate actions to avoid impacts to the discharge. In the future these washes would be discharged to the equalization basin or a treatment system as needed prior to discharge to the Green River. These actions could include capturing the first flush of the wash in holding tanks and neutralizing any acidity before discharge.

Reductions in Metals Loadings from Proposed Dewatering Projects

Currently, any discharges from the Peabody Ash Impoundment and the Gypsum Disposal Area leave the facility through Outfall 001 to Jacob's Creek and ultimately are discharged to the Green River. The dewatering projects would change the dynamics of the ash impoundment by eliminating the ash transport water and decreasing FGD discharges that would be treated by the ash impoundment. Conversion of the Slag Impoundment 2A/2B to an equalization basin would be used to handle future process water flow. The proposed schedules would be aligned so that the dewatering/dry processes projects would be completed at the same time as the completion and diversion of flows to the equalization basin. Therefore, it would be necessary to evaluate the functionality of the equalization basin prior to the dry ash and gypsum dewatering installation to ensure that all permit limits would be met. The equalization basin would be designed and operated to ensure compliance with all KPDES regulations and limits and KY Water Quality Standards design process. However, as design is still preliminary, discharges from the equalization basin will be further evaluated in the subsequent NEPA evaluation for WWT.

The Peabody Ash Impoundment discharge flow is currently approximately 33.36 MGD and the Slag Impoundments discharge is approximately 44.43 MGD (see Tables 1 and 2 for specific flow details). Once the ash and gypsum dewatering/pneumatic implementation takes place these flows would be routed to the new equalization basin. Additionally, a proposed bottom ash dewatering project with a potential recirculation component of the ash transport water would be evaluated in a subsequent NEPA evaluation. This project would have the potential to dewater the bottom ash slag and discharge the water or to recirculate the bottom ash slag with only a small blow down stream and outage wash discharge stream. Since this bottom ash slag dewatering will be detailed in a subsequent evaluation, the flows that are directly associate with the ash impoundment will be evaluated here. The estimated flows from Outfall 001 that would remain after the above evaluated dewatering/dry handling project would be approximately 18.59 MGD. The post-conversion flows sources are displayed below in Table 3. In order to evaluate and characterize the changes that would take place once this reduction in specific waste streams takes place, each waste water stream flow and chemical composition must be considered.

Table 3. Inflow Average Annual Daily Flows Sources – Post Dry Ash Conversion and Gypsum Dewatering

Source	Inflow to Ash Impoundment (MGD)
Bottom Ash Impoundment Outfall 002	16.85
Fly Ash Sluice Water Unit 3 and Air Preheater Hopper Wastewater Unit 1 and Unit 2	0
FGD Impoundments	1.906
Chemical Metal Cleaning Waste	0.0183
Precipitation-Evaporation	0.5262
Miscellaneous Minor streams	0.0128
Total	**19.31**

Please note all streams that are storm water driven are denoted in average annual daily flows; however a storm event can produce flows greater than these amounts in a 24-hour period.

Fly Ash sluice metals data for the contributing streams were collected during a special TVA study, while the plant intake, Outfall 001 and Unit 3 FGD stream data was collected during a 2016 permit renewal sample event. These samples were collected from the fly ash sluice and gypsum absorber prior to mixing and treatment in the gypsum and/or ash impoundments. Please note that these loading reductions do not reflect the concentrations being discharged from an outfall or to a receiving stream, but the reduction in the loadings that were originally routed to the ash impoundment. The ash impoundment currently effectively treats and decreases these concentrations. It is assumed that the discharges from the equalization basin and Outfall 002 to the Green River would have the potential to also be reduced and would meet KPDES permit limits and thereby comply with Kentucky water quality standards.

As illustrated in Table 4, the reduction evaluation displayed a reduction in loading for future operations, (i.e., following the gypsum dewatering and fly ash dry handling). Although the majority of concentrations would be expected to decrease with the removal of the fly ash sluice and the reduction of the gypsum waste streams, this project is not expected to remove all concentrations of the constituents evaluated. The analysis indicates that the future dewatering and dry handling operations would have a long-term positive impact to surface water quality due to reduction in mass loading of constituents.

Table 4. PAF Reduction of Loadings with Implementation of Dewatering Projects

Element	MDL (mg/L)	Background River Conc. (mg/L)	Current Ash Pond Conc. (mg/L)	Current Ash Pond Loading (lbs/day)	FGD Conc. (mg/L)	FGD Loading (lbs/day)	Fly Ash Conc. (mg/L)	Fly Ash Loading (lbs/day)	Projected Reduction in Loading at Ash Impoundment by Proposed Projects (lbs/day)	KDEP* Water Quality Based Effluent Standard Conc. (mg/L)
Antimony	0.002	<0.002	0.010	2.90	0.0079	0.202	<0.002	0.091	0.29314	0.64000
Arsenic	0.002	0.000947	0.00431	1.20	0.0047	0.120	<0.002	0.091	0.21167	0.15000
Barium	0.002	0.029	0.0635	17.69	0.1600	4.099	0.034	3.085	7.18377	NL
Beryllium	0.002	<0.002	<0.002	0.28	0.0016	0.040	<0.002	0.091	0.13124	0.00400
Cadmium	0.001	<0.001	0.00168	0.07	0.0391	1.002	<0.002	0.091	1.09290	0.00030
Chromium	0.002	0.000627	0.00398	1.11	0.0075	0.191	<0.002	0.091	0.28263	NL
Copper	0.002	0.00906	0.00277	0.77	0.0178	0.456	0.006	0.535	0.99084	0.01036
Lead	0.002	0.000732	0.000431	0.12	0.0030	0.078	<0.002	0.091	0.16915	0.00372
Mercury	0.0002	0.00000857	0.0000114	0.003176	0.0037	0.095	0.00001	0.001	0.09550	0.00077
Nickel	0.002	0.00109	0.0114	3.18	0.1920	4.918	0.003	0.272	5.19049	0.05785
Selenium	0.002	0.00109	0.0201	5.60	0.3020	7.736	<0.002	0.091	7.82765	0.00500
Silver	0.002	<0.002	<0.002	0.28	<0.002	0.026	<0.002	0.091	0.11689	0.00467
Thallium	0.002	<0.002	0.0155	0.14	0.0078	0.200	<0.002	0.091	0.29109	NL
Zinc	0.025	<0.025	<0.025	3.48	1.4300	36.633	<0.025	1.141	37.77343	0.13289

lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.

Intake Flow	337.26	River flow and data from PAF 2016 NPDES Permit renewal application for Intake
Current Ash Impoundment Flow	33.36	MGD, Ash Pond flow from PAF 2016 NPDES Permit renewal
Post Dewatering/Dry handling	19.31	MGD Projected Future MGD Flow
Current FGD Flow	5.0	MGD
Future FGD Flow	1.906	MGD Projected Future Flows
Current FAS Flow	10.944	Flow to evaluate Human Health GAF Permit 2012
7Q10 River Flow	210.699	MGD, USGS
	113	
ln of hardness	4.727387819	

Mass Discharge and Loadings were calculated using 0.5 the Minimum Detection Limit

*KY Surface Water Standards, 401 KAR 10:31

KY WQS - There is not a WQS for Total Chromium, however there are standards for Chromium III and VI. However there was no SGLP data for either the speciation forms of Chromium

River concentrations are a combination of intake NPDES sampling data taken in 2016 and on-site characterization samples taken in 2012. Maximum values were used when representative of the stream, except for hardness, in which the lowest Green River concentration was used.

Background Intake data for Copper represents an average of data from KPDES and plant characterization sources

Ash pond concentrations are maximum pond NPDES sampling data taken in 2016.

If maximum sample results show less than detect (all samples that have "less than sign"), 1/2 of the detection level was used in the loading and concentration calculations for that constituent sample where non-detection occurred.

4.2.2.3 Ash Impoundment Closures

As identified in the Programmatic EIS (TVA 2016), closure in place of the ash impoundments would minimize surface water flow to the impoundment which would enhance stability of the berms due to a reduction of hydraulic inputs. As all work would be done in compliance with applicable regulations, permits and BMPs potential impacts of this alternate to surface water would be negligible.

The Kentucky Division of Water (KDOW) has stated that requirements for dewatering CCR impoundments will be included in KPDES permits to ensure these actions are performed in a manner protective of water quality. These requirement will likely include accelerated monitoring for solids, metals, and whole effluent toxicity. In addition, permittees, including TVA, have been asked to submit updated applications with discussions of planned CCR impoundment removal activities and updated BMP plans related to CCR impoundment dewatering. KDOW plans to reissue the KPDES permit for PAF no later than July 2018. For any dewatering performed during the interim, KDOW will issue a supplemental letter.

The main operational change that would take place with the closure of the impoundments at PAF is the change in management of the on-site storm water and process waste water that is currently treated. Slag Impoundment 2A/2B would be closed and a portion converted to an equalization basin to treat flows before discharge to the Green River via Outfall 002. The equalization basin would be designed and operated to ensure compliance with all KPDES regulations and limits and KY Water Quality Standards ;In the future WWT would be installed to treat the gypsum dewatering effluent as part of meeting ELG required limits for mercury, arsenic, selenium, nitrate/nitrite, in addition to pH and TSS control. As planning for this facility has not been completed, the WWT facility will be evaluated in a separate NEPA document.

Existing outfall structures associated with the Peabody Ash Pond and Gypsum Disposal Area would be removed and replaced with new ditches and/or outfall structures as needed to manage the runoff from the closed impoundments. Precipitation driven runoff should have much lower loadings of suspended solids, metals, and other constituents than current process wastewaters. Final drainage would be routed to existing or new discharge points and comply with the KPDES permit to permit to ensure that no adverse impacts to surface waters would occur. Mitigation measures would be identified, as needed, to ensure the discharges meet permit limits. This may or may not require a permit modification.

Additionally, all post construction contact storm water would be routed to the future equalization basin or WWT facility.

4.2.2.4 CCR Landfill Operational Impacts

The CCR by-products that would be included in the storage of the landfill are expected to include fly ash, bottom ash rejects and dry scrubber waste (gypsum). By-product generation and characterization would be dependent on the coal source. Therefore, a maximum design coal blend for design, construction, and environmental evaluation has been determined. The design coal for the CCR landfill considerations would be based on the current 100 percent Illinois basin blend (ILB).

The wastewater streams, which could change substantively under this alternative are:

- The addition of the landfill leachate stream and storm water run-off.
- Non-contact surface runoff from the proposed landfill drainage area.

Each of the three by-products were evaluated using the synthetic groundwater leaching procedure (SGLP) water extraction to evaluate the metals that would potentially leach from the proposed new landfill's leachate collection system. This information was utilized to predict waste water impacts from the landfill operation.

The Hydrologic Evaluation of Landfill Performance (HELP) Model was utilized to evaluate the proposed leachate collection system disposal facility. Based on this HELP model, the estimated average daily leachate flow from the proposed landfill could be approximately 50,838 gallons per day (gpd), (0.051 mpd day) with a maximum peak flow of 0.186 mpg. (AECOM, 2016b) The non-contact storm water run-off, based on the design storm of 24-hour and 25 year event, could be expected to have peak flows of 14.72 cubic feet per second (cfs) for the East Impoundment and 13.19 cfs for the West Impoundment and an estimated daily flow of 0.0412 MGD from both storm water impoundments. Since storm water flows from the site would be discharged from storm water outfalls 013, 014, and 015, the flow volumes would potentially be equivalent; however, the leachate and landfill contact run-off streams could have the potential to be a higher concentration, low flow stream, alkaline in nature with a higher metals and ammonia levels.

On Site Landfill Leachate and Run-off

The gypsum and fly ash solids not beneficially reused would be trucked and placed in the proposed on-site landfill. This proposed landfill system would have a liner system that consists of a 2 ft compacted clay layer with hydraulic conductivity of less than $1x10^{-7}$ cm/sec with a 60 mil flexible membrane layer above the clay. The leachate collection system would be comprised of a drainage blanket which drains to sumps. The leachate would be collected and pumped into two lined leachate impoundments and discharged via an existing modified outfall or a new outfall to the Green River. This leachate waste stream is expected to be a low flow waste stream with relatively low levels of solids and metals and would be precipitation driven. Reactions of the acidic solids with storm water in the landfill would be buffered by the unreacted lime in the gypsum and the medium in the leachate collection system, thus reducing the potential of a concentrated acidic leachate stream. A more neutral leachate stream would prohibit metal accumulation issues in this waste stream. Consequently, the leachate would be treated as required to meet all applicable KPDES permit requirements and in-stream water quality standards, therefore potential impacts to surface water under would be expected to be minor. Should the option be chosen to transport this by-product to an off-site landfill, this waste stream would be blended with leachate from other materials landfilled at that site and treated as necessary to comply with that facility's permits.

The landfill leachate and contact run-off stream would be an intermittent precipitation-driven stream. Metals and ammonia in the dry fly ash could have the potential to enter the wastewater stream during a rainfall event as runoff and leachate from the dry by-product landfill area. This runoff and leachate would be mixed in a ditchline with the storm water pond discharges and would ultimately be discharged to the Green River from an existing modified KPDES storm water outfall or a new KPDES outfall. The data available on the projected concentration of ammonia in fly ash ranges dramatically based on several factors, including SCR tuning, catalyst pluggage, ammonia injection grid pluggage, catalysis age, and fuel burning. Much of this data would be dependent on SCR process and plant specifics. To limit ammonia loads from the dry fly ash stack, the amount of CCR exposed would be restricted to10 acres or less. The greater the surface area of exposed CCR, the more ammonia is available to runoff or leach during a rain event. The by-product disposal landfill was evaluated for potential impacts associated metals in-stream loading.

Ammonia Criteria

Ammonia slip, the emission of unreacted ammonia (NH_3), is caused by the incomplete reaction of the ammonia with NOx present in the flue gas. The unreacted NH_3 could react with available gaseous sulfuric acid to form ammonium bisulfate (NH_4HSO_4), a very sticky substance. Ammonia slip tends to adhere to or commingle with the fly ash, and/or build up on the APH interior surfaces. Formation of NH_4HSO_4 could accelerate the buildup inside the APHs, and make the periodic cleaning of the APHs more difficult.

$$NH_3 + H_2O + SO_3 \Leftrightarrow NH_4HSO_4$$

Approximately 20 percent of the NH_3 slip is expected to adhere to the heating surfaces in the APH, and about 80 percent adhered to the fly ash. The partitioning of ammonia slip between fly ash and APH heating surfaces will be determined by the specific equipment installed, actual fuel blends, and their operating characteristics.

The discharge concentrations to the receiving stream or the concentration at the edge of an approved mixing zone in the receiving streams should meet applicable water quality standards. The USEPA acute aquatic life criterion (ALC) for ammonia in fresh water is termed the criterion maximum concentration, or CMC, and the USEPA chronic ALC for ammonia in fresh water is the criterion continuous concentration, or CCC. The CMC is the one-hour average concentration of total NH3-N (in mg of nitrogen per liter [N/L]) which is not to be exceeded at the discharge more than once every three years on average. The CMC is pH dependent: as the pH increases, the ammonia CMC decreases to remain protective of aquatic organisms. The CCC is the 30-day average concentration of total NH3-N/L, which is not to be exceeded more than once every three years on average. The CCC is pH and temperature dependent: as pH and/or temperature increase, the ammonia CCC decreases to remain protective of aquatic organisms. (TVA 2008)

As mentioned previously, PAF currently burns 100 percent ILB coal. Due to the presence of acid species in ILB coal ash and flue gas relative to PRB coal ash and flue gas, it is likely that the ammonia slip could react with gaseous acids or acids in the fly ash, causing an increase of ammonia on the ash and potentially forming ammonium fluoride, ammonium chloride, and/or ammonia-sulfur salts (ammonium bisulfate likely predominating) among other species. This acid-base neutralization reaction would likely keep the ammonia more stable in solid salt form or combined with fly ash and less susceptible to off-gassing as it would be in a more alkaline environment. If dissociated in water, the soluble ammonium would likely pair with soluble acids from the now more acidic fly ash and result in a more neutral pH, to the extent that such a small amount of gaseous ammonia slip can influence the pH of a much larger volume of water.

Nutrient Criteria

Because addition and conversion of ammonia increases the nutrient enrichment potential of impoundment aquatic discharges (total nitrogen, NO2+NO3-N, organic nitrogen), nutrient water quality criteria for the receiving water bodies are important considerations. States' water quality standards contain criteria to protect surface waters from the adverse effects of nutrient enrichment. These criteria have historically been in the narrative form (prohibit the formation of objectionable accumulations of floating materials), but more recently, a major emphasis by USEPA and the states is to develop numeric, "not to exceed," concentrations of the nutrients nitrogen and phosphorous or o of biological (i.e., algal biomass) or other (i.e., water transparency) values that protect against use impairment. USEPA is encouraging states to promulgate numeric nutrient criteria that will be protective of downstream, even far-field, uses such as in the Gulf of Mexico hypoxic zone. Should any receiving stream segment become listed as "impaired" on a state's 303(d) list due to exceedance of either existing or future ammonia and/or nutrient criteria, TVA would reduce or treat the amount of ammonia and/or nutrient discharged as required to comply with water quality standards and KPDES permit limits. (TVA 2008)

Metals Loading

To estimate the concentration of metals in the Green River after receiving discharges from the proposed by-product landfill, the maximum synthetic groundwater leaching procedure data was used and was added to the storm water pond discharges. The SGLP data was used instead of the toxicity characteristic leaching procedure (TCLP) data because the SGLP data was deemed more appropriate to model leachate discharges because of the use of non-acidified water in the method. Additionally, this method allows for analysis of more parameters than the TCLP method.

The HELP Model was utilized to evaluate the proposed leachate collection system disposal facility. The drainage layers for the cap and liner systems as well as the leachate drainage pipe system would be designed to maintain less than 1 foot of leachate head above the liner system (AECOM 2016b). Per the Final CCR Rule, the design of the leachate collection system would account for anticipated differential settlement of the liner. Leachate generation volumes would be used to size leachate storage pond(s). The design of the leachate storage pond(s) would also involve design of the following items:

- Compacted clay and geosynthetic membrane liner system
- Pump station and force main to convey leachate to Peabody Pond
- Groundwater monitoring plan to detect potential leaks through the liner system

The added loadings from the by-product leachate collection system and storm water pond discharge would be unlikely to increase the metals concentrations at the Green River where this stream would discharge. Additionally, the concentrations would not exceed KPDES water quality standards, with the exception of cadmium (Table 5). This analysis represents the estimated maximum discharges from this site, since the leachate flow used would be the peak flow during Phase III of the landfill operation. In addition, water quality standards are typically applied as an in-stream concentration after mixing.

Table 5. Cumulative Impact of By-Product Storage Leachate Total Mixed Concentration Estimate

Element	MDL (mg/L)	Background River Conc. (mg/L)	River Loading (lbs/day)	Gypsum SGLP Concentration (mg/L)	BAS SGLP Conc. (mg/L)	Fly Ash SGLP Conc. (mg/L)	Landfill Leachate Conc. Estimates (mg/L)	Landfill Leachate Loading Estimates (lb/day)	Rain Water Conc - Assume De Minimis (mg/L)	Rain Water Loading (lbs/day)	Projected Mixing Conc. Rain Water with Landfill SGLP (mg/L)	Instream Conc. Including PAF loading in Green River 7Q10 (mg/L)	Instream Most Stringent Water Quality Criteria Conc., (mg/L)
Antimony	0.002	<0.002	1.757	0.2382	0.0009	0.0006	0.240	0.72278	0.00100	0.00069	0.19537	0.00141	0.64000
Arsenic	0.00001	0.000947	1.664	0.0002	0.0017	0.0020	0.004	0.01190	0.00100	0.00069	0.00340	0.00095	0.15000
Beryllium	0.002	<0.002	1.759	0.0001	0.0000	0.00001	0.00015	0.00045	0.00100	0.00069	0.00031	0.00100	0.00400
Cadmium	0.001	<0.001	0.880	0.0002	0.0002	0.00002	0.00038	0.00116	0.00050	0.00034	0.00041	0.00050	0.00030
Chromium	0.002	0.000627	0.880	0.0006	0.0010	0.0025	0.004	0.01220	0.00100	0.00069	0.00348	0.00063	NL
Copper	0.002	0.00906	15.940	0.0054	0.0003	0.0006	0.006	0.01920	0.00100	0.00069	0.00537	0.00905	0.01036
Lead	0.002	0.000732	1.288	0.0027	0.0007	0.0004	0.004	0.01139	0.00100	0.00069	0.00326	0.00074	0.00372
Mercury	0.000002	0.00000857	0.01508	0.0000	0.0000	0.0000	0.000	0.00020	0.00000100	0.00000	0.00005	0.00001	0.00077
Nickel	0.002	0.00109	1.918	0.0035	0.0002	0.0002	0.004	0.01175	0.00100	0.00069	0.00336	0.00109	0.05785
Selenium	0.002	0.00109	0.880	0.0071	0.0007	0.0448	0.053	0.15842	0.00100	0.00069	0.04297	0.00118	0.00500
Silver	0.002	<0.002	1.759	0.0004	0.0002	0.0001	0.001	0.00208	0.00100	0.00069	0.00075	0.00100	0.00467
Thallium	0.002	<0.002	0.880	0.0009	0.0004	0.0010	0.002	0.00687	0.00100	0.00069	0.00204	0.00100	NL
Zinc	0.025	<0.025	8.797	0.0024	0.0013	0.0003	0.004	0.01209	0.01250	0.00859	0.00558	0.01249	0.13289

lbs/day = conc. in mg/L X flow in MGD X 8.34 lbs/gal.

Intake Flow	337.26	MGD	
Leachate worse case Phase 3 Flow	0.4	MGD	
SW flows from both ponds	0.1	MGD	
1Q10 River Flow	210.699	MGD	from 326 cfs from USGS
	113		
ln of hardness	4.727387819		

***KY Surface Water Standards, 401 KAR 10:31

Results of the mass balance analysis showed that the concentrations of the constituents of concern after mixing with the Green River would be at or below the Kentucky's lowest water quality standards, except for cadmium, which is attributable to the elevated background concentration. Even after accounting for the impacts of the by-product storage leachate, the impacts after mixing with the Green River would be minor. Additionally, TVA would conduct a characterization of the leachate and run-off streams to confirm no significant impacts to the Green River. The waters would be analyzed for metals and other parameters. If determined to be necessary, appropriate mitigating measures would be evaluated and implemented to ensure that the discharge KPDES permit requirements for the water quality parameters are met.

5.0 Summary

5.1 Environmental Consequences of Alternative B

Impacts to surface water associated with the implementation of Alternative B are summarized in Table 6.

Table 6. Summary of Impacts to Surface Water – Alternative B

Project	Impact	Severity
Dewatering Facilities	Construction Impacts	With the implementation of appropriate BMPs only temporary minor, impacts to surrounding surface waters would be expected.
	Operation Impacts	Long-term beneficial impact due to reduction of mass loading of constituents and reduced water usage.
Ash Impoundment Closure	Closure activities.	With the implementation of appropriate BMPs only temporary minor, impacts to surrounding surface waters would be expected. Impacts to surface water features on site would be mitigated as a result of adherence to permit requirements.
	Operation Impacts	The equalization basin would be used to manage onsite storm water and process water flows. All discharges would comply with current or potential KPDES permit measures and other state and federal regulations. TVA plans to build a WWT facility which would further treat process water flows. Therefore, no impact to surrounding surface waters would be expected.
Landfill	Construction Impacts	Minor temporary impacts due to runoff would be minimized through BMPS.
	Operational Impacts	Minor impact to Green river. Mitigated would be implemented to meet permit requirements.

5.2 Environmental Consequences of Alternative C Offsite Disposal of CCR in an Existing Permitted Landfill (Hopkins County Regional Landfill) and Implementation of Dewatering Projects and Impoundment Closures

Under this alternative, impacts associated with implementation of the dewatering projects and ash impoundment closures would be the same as identified under Alternative B. Minor impacts associated with construction and operation of the onsite landfill would not occur as CCR produced by PAF would be transported to an existing offsite permitted landfill. It is assumed the pre-existing landfill would have necessary permits that would be protective of water quality. Because this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative.

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Appendix D – Coordination

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

April 8, 2013

Mr. Lindy Casebier
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Casebier:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE FOSSIL PLANT BAGHOUSE, MUHLENBERG COUNTY, KENTUCKY

TVA plans to install additional emission controls at Paradise Fossil Plant (PAF). This project will meet the U.S. Environmental Protection Agency's (EPA) new Mercury and Air Toxics Standards (MATS) rule, which requires the application of maximum achievable control technology (MACT) to reduce hazardous air pollutants (HAPs) from coal-fired electrical generating units. The proposed actions include construction of two pulse jet fabric filters (PFJJ), or baghouses, for fly ash control and associated equipment (fly ash handling, storage silos, and transmission facilities). TVA has determined that this action qualifies as an undertaking as defined at 36 CFR Part 800.16 due to the potential for effects to architectural properties listed on, or eligible for listing on, the National Register of Historic Places (NRHP).

TVA has determined that the project will not affect archaeological resources because the construction footprint is limited to areas that have been previously disturbed by the construction of PAF in the 1960s and 1970s, and which have no potential for buried cultural resources.

TVA identified the area of potential effects (APE) for architectural resources as a one-half mile radius surrounding the project area, as well as any areas where the project would alter existing topography or vegetation in view of historic resources.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to carry out an architectural assessment within the APE.

Enclosed are two hard copies of the report titled, *Architectural Assessment of the Proposed Improvements to the TVA Paradise Fossil Plant*, along with two electronic copies on CD.

A check of the GIS database of architectural resources at the Kentucky Heritage Council in Frankfort, conducted prior to the survey, indicated that there are no previously unrecorded historic architectural properties within the APE. The survey resulted in the identification of one previously unrecorded architectural resource, PAF (HS-1). TVAR recommends PAF ineligible

Mr. Lindy Casebier
Page Two
April 8, 2013

for listing on the NRHP due to its lack of architectural distinction and to a loss of integrity of design, materials, and feeling.

TVA has reviewed the enclosed report and agrees with the recommendations of the authors. Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's findings and determination that no historic properties would be affected by the proposed undertaking.

If you have any questions or comments, please contact Richard Yarnell by telephone at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Clinton E. Jones
Senior Manager, Biological and Cultural Compliance
Environmental Permits and Compliance
WT 11B-K

Enclosures

STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

LINDY CASEBIER
ACTING EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

May 8, 2013

Clinton E. Jones, Senior Manager
Biological and Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Dr.
Knoxville, TN 37902-1499

Re: Architectural Assessment of the Proposed Improvements to the TVA Paradise Fossil Plant in Muhlenberg County, Kentucky

Dear Mr. Jones,

On April 9, the State Historic Preservation Office received for review and comment the above referenced report. The undertaking involves construction a pulse jet fabric filter baghouse, two ash storage silos and two hydrated lime storage silos. TVA's Paradise Fossil Plant (MU-146) was the only historic resource located in the area of potential effect. It is your recommendation that the site is ineligible for listing in the National Register of Historic Places.

Based on the information available at this time, we concur with this recommendation. There have been numerous alterations to the original buildings that support a finding of ineligibility for the relatively small portion of the plant that is now 50 years of age. While we do not believe the site is presently eligible for listing, we recommend that TVA reevaluate it again in 2020. Many of the major changes to the plant took place between its opening and 1970, and they may be considered to have gained their own significance at such time as they reach 50 years of age. While there would still be significant changes to the site that could not yet be considered for eligibility in 2020, like the barge loading facility constructed in the 1980's, we do not see these as changes that would preclude the main facility from being looked at again.

Sections 106 and 110 of the National Historic Preservation Act would not compel anything at this time, but we respectfully encourage you to continue in your work of maintaining the character of some of those facilities original to the plant that are still in use today. If you have questions regarding these comments, please contact Jill Howe of my staff at (502) 564-7005, extension 121.

Sincerely,

Lindy Casebier
Acting Executive Director and
State Historic Preservation Officer

LC:jh

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

October 11, 2013

Mr. Craig Potts
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE FOSSIL PLANT COMBINED COMBUSTION-COMBUSTION TURBINE PLANT, MUHLENBERG COUNTY, KENTUCKY

Earlier this year, we consulted with your office concerning TVA's plans to install additional emission controls at Paradise Fossil Plant (PAF). At that time, the proposed actions included construction of a pulse jet fabric filter baghouse for fly ash control and associated equipment. Subsequently, TVA began considering a second alternative action, replacing PAF Units 1 and 2 with a combined combustion/combustion turbine plant ("CC/CT plant"), to be constructed within the PAF reservation (see Map 1). TVA has determined that the proposed CC/CT plant qualifies as an undertaking (as defined at 36 CFR § 800.16(y)) that has the potential to cause effects on historic properties. We are initiating consultation under Section 106 of the National Historic Preservation Act for this undertaking.

The current undertaking would be associated with two related undertakings: a transmission line to connect the proposed CC/CT plant to the PAF switchyard; and one or more gas pipelines to bring natural gas to the plant. However, TVA does not yet have detailed plans for these related undertakings. Pursuant to 36 CFR Part 800.4(b)(2) TVA will use a phased identification and evaluation process for the identification of historic properties, evaluations of effect, and resolution of adverse effects associated with these related undertakings. At the current time, TVA has put forward detailed plans for the CC/CT plant only. TVA will consult further with your office when detailed plans for the related undertakings are available.

TVA has determined that the current APE consists of the proposed CC/CT plant location and six associated laydown areas, shown in Map 2. The APE for historic architectural resources is a half-mile radius surrounding the proposed CC/CT plant. TVA contracted with AMEC Environment and Infrastructure (AMEC) for a preliminary site check of the current APE as well as three possible gas pipeline corridors. The results of the preliminary site check at the Office of State Archaeology (OSA) showed there are no archaeological sites recorded within the current APE. The archaeological APE is located in an area affected by past coal mining. Part of the APE overlies the location of the former community of Paradise, which was removed by Peabody Coal Company in the 1950s. Surface mining for coal has removed soil and sediments to a depth greatly exceeding the depth of Holocene deposits, and reclamation has refilled the depressions created by the mining, resulting in a landscape that does not resemble the original landscape. The extent of the changes can be seen by

Mr. Craig Potts
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October 11, 2013

comparing the 1909 USGS 15-minute Hartford, KY topographic quadrangle (Map 1), the 1954 USGS 7.5-minute Paradise, KY topographic quadrangle (Map 3), and aerial photographs taken recently and available from www.bing.com (Map 2, Photos 1 and 2). Map 4 shows the current topography of the proposed CC/CT plant footprint area, based on a civil survey completed earlier this year by TVA, overlaid on the most current USGS 7.5-minute topographic quadrangle. This map documents extensive ground disturbance. Laydown area 1 is within the area affected by the use of the Peabody shovel, the world's largest steam shovel at the time of its use. Laydown areas 2, 3, and 5 are within or partially within areas shown as former strip mines on the USGS 7.5-minute Paradise, KY topographic quadrangle. Laydown area 4 is within the area affected by grading associated with the construction of PAF. Therefore, the potential for intact archaeological deposits within the APE is essentially nil. TVA has determined that the project has no potential to affect archaeological resources.

TVA identified the area of potential effects (APE) for architectural resources as a one-half mile radius surrounding the CC/CT plant footprint, as well as any areas where the project would alter existing topography or vegetation in view of historic resources. Based on the preliminary site check at the Kentucky Heritage Council (KHC), one cemetery has been recorded within the architectural APE and no historic architectural resources are within the APE. The cemetery is within the PAF property boundary and is protected and maintained by TVA. In our consultation related to the proposed pulse jet fabric filter baghouse at PAF (letters dated April 8 and May 8, 2013), our offices agreed that PAF is ineligible for listing in the NRHP. We have examined current maps and aerial photographs of the APE, but have not identified any extant structures that would be 50 years or older other than PAF. Therefore, TVA finds that no historic architectural resources listed in or eligible for listing in the National Register of Historic Places (NRHP) are located within the current architectural APE.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's findings and determination that no historic properties would be affected by the proposed undertaking.

If you have any questions or comments, please contact Richard Yarnell by telephone at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

JOHN T BAXTER for

Clinton E. Jones
Senior Manager, Biological and Cultural Compliance
Environmental Permits and Compliance
WT 11A-K

Enclosures

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

March 2, 2017

Mr. Craig Potts
State Historic Preservation Officer and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), PARADISE FOSSIL PLANT, COAL COMBUSTION RESIDUALS MANAGEMENT PROJECT, MCCRACKEN COUNTY, KENTUCKY

TVA proposes to change the way that coal combustion residuals (CCR) are managed at Paradise Fossil Plant (PAF) in McCracken County, Kentucky. Currently, TVA manages CCR at PAF by sluicing it to the Gypsum Stack, Peabody impoundment, and boiler slag impoundments ("wet stacking"). TVA is planning to convert CCR storage from wet to dry stacking. This undertaking would consist of the following actions:

- Construction and operation of new dewatering facilities for CCR (specifically, fly ash conversion and gypsum dewatering).
- Construction and operation of a new CCR (or "special waste") landfill. The landfill would have a footprint of 80 acres and a landfill capacity of approximately 16,000,000 cubic yards of waste. It would provide ash storage for 32 years.
- Closure of existing ash impoundments (gypsum disposal complex, the 2A/2B Impoundment, and the Peabody Ash Impoundment).

TVA is also currently considering a future bottom ash dewatering facility and potential waste water treatment facility. As planning for these projects have just begun, there is little information available regarding specific impacts to historic properties. However, it is anticipated that the proposed facilities would be constructed within the same footprint as the fly ash conversion and gypsum dewatering facility. In addition to these actions, large quantities of soil would be required, necessitating a soil borrow operation. Three potential borrow areas have been identified, all located within the PAF reservation. TVA has determined that the PAF CCR Management Project constitutes an undertaking (as defined at 36 CFR § 800.16(y)) that has the potential to cause effects on historic properties. We are initiating consultation under Section 106 of the National Historic Preservation Act for this undertaking.

All of the above actions would take place within the existing PAF reservation (Figure 1, below). The preferred location for the CCR landfill, referred to as Site 5, is located on the PAF reservation south of the plant switchyard. The area labelled "CCR Landfill Permit Area (Site 5)" in Figure 1 encompasses the landfill footprint as well as areas that would be disturbed during landfill construction, including haul roads. The completed landfill would occupy approximately 80 acres, would rise approximately 210 feet higher than the surrounding ground, and would be seeded with grass for erosion control.

TVA has determined that the area of potential effects (APE) for above-ground (historic architectural) resources consists of the areas where the new facilities would be constructed (fly ash conversion and gypsum dewatering, bottom ash dewatering, waste water treatment, and CCR landfill), as well as areas within a one-half mile radius that would have unobstructed views to the these facilities. We are consulting with your office regarding the undertaking's potential effects on archaeological sites under separate cover.

TVA contracted with Tennessee Valley Archaeological Research (TVAR) to perform a Phase I architectural survey of the above-ground APE. Enclosed are two copies of the draft survey report titled, *Phase I Architectural Survey of a Proposed Dry Ash Landfill and Dewatering Facility at TVA's Paradise Fossil Plant (PAF), Muhlenberg County, Kentucky*, along with two CDs containing electronic copies.

TVAR's background study, conducted prior to the field study, indicated that no National Register listings are located within the survey area. One previously recorded historic architectural property is located within the APE: MU-146 (PAF). In 2013, our offices agreed that PAF is ineligible for the NRHP due to a lack of architectural distinction and to a loss of integrity of design, materials, and feeling. Based on the current investigation, TVAR recommends that PAF remains ineligible. The current study identified no additional historic properties in the APE. TVAR recommends no additional historic architectural studies in connection with the undertaking.

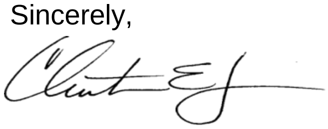
TVA has read the report and agrees with the findings and recommendations of the authors. TVA finds that there are no National Register-listed or –eligible above-ground (historic architectural) resources in the APE.

Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your comment on our finding that no NRHP-listed or –eligible above-ground historic properties would be affected by the undertaking.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

If you have any questions or comments, please contact Ted Wells by telephone at (865) 632-2259 or by email at ewwells@tva.gov.

Sincerely,



Clinton E. Jones
Manager
Biological and Cultural Compliance

SCC:ABM
Enclosures

MATTHEW G. BEVIN
GOVERNOR

DON PARKINSON
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE

410 HIGH STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

REGINA STIVERS
DEPUTY SECRETARY

CRAIG A. POTTS
EXECUTIVE DIRECTOR
& STATE HISTORIC
PRESERVATION OFFICER

March 30, 2017

Mr. Clinton E. Jones
Manager, Biological and Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Re: **Phase I Archaeological Survey, TVA Paradise Fossil Plant CCR Management, Muhlenberg County, Kentucky, Abbreviated – Negative Finding Report** prepared by John Hunter of AMEC Foster Wheeler. Report dated January 2017.

Dear Mr. Jones:

Thank you for the letter concerning the above referenced revised report, received February 23, 2017. This reports discuss the archaeological assessment of several plots that are intended for development of revised coal ash handling processes at the Paradise Fossil Plant (PAF). All parcels are situated within the existing PAF boundaries.

This report describes pedestrian survey of the current Gypsum Disposal Area and the Peabody Ash Impoundment. The proposed closures also include Slag Impoundments 2A/2B, but the investigators were denied access to this area. All three areas have been subjected to ground disturbance in the past from mining and plant operation facilities. The investigators recommended that these areas had low potential to contain intact archaeological deposits, and recommended no additional archaeological work. We ***concur*** with the investigator's findings and recommendations. We accept this report as final and acknowledge receipt of two copies.

Your letter also included a second report related to proposed borrow areas and new landfill (Sites 2, 3, and 5). We will provide commentary on this report in a separate letter. At this point, we are withholding comment on your finding of no effect for the proposed undertaking. We still need additional information concerning the scope of the proposed undertaking. We provide further comment on our request in our letter concerning the archaeological assessment of Sites 2, 3, and 5.

If the project design or boundaries change, this office should be consulted to determine the nature and extent of additional documentation that may be needed. In the event of the unanticipated discovery of an archaeological site or object of antiquity, the discovery should be reported to the Kentucky Heritage Council and to the Kentucky Office of State Archaeology in the Anthropology Department at the University of Kentucky in accordance with KRS 164.730. In the event that human remains are encountered during project activities, all work should be immediately stopped in the area and the area cordoned off, and in accordance with KRS 72.020 the county coroner and local law enforcement must be contacted immediately. Upon confirmation that the human remains are not of forensic interest, the unanticipated discovery must be reported to the Kentucky Heritage Council.

Should you have any questions, feel free to contact Chris Gunn of my staff at (502) 564-7005, extension 4450.

Sincerely,

Craig A. Potts,
Executive Director and
State Historic Preservation Officer

CP: KHC # 48604
Cc: George Crothers (OSA); John Hunter (AMEC)

MATTHEW G. BEVIN
GOVERNOR

DON PARKINSON
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL
THE STATE HISTORIC PRESERVATION OFFICE

410 HIGH STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

REGINA STIVERS
DEPUTY SECRETARY

CRAIG A. POTTS
EXECUTIVE DIRECTOR
& STATE HISTORIC
PRESERVATION OFFICER

May 23, 2017

Mr. Clinton E. Jones
Manager, Biological and Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Re: **REVISED: Phase I Archaeological Survey, Paradise Fossil Plant, Sites 2, 3, and 5, Muhlenberg County, Kentucky, Abbreviated – Negative Finding Report** prepared by John Hunter of AMEC Foster Wheeler. Report dated May 2017.

Dear Mr. Jones:

Thank you for the letter concerning the above referenced revised report, received May 16, 2017. This report describes the intensive pedestrian reconnaissance, supplemented by screened shovel tests, of three proposed borrow areas (Site 2, Site 3, and a third proposed borrow pit adjacent to the Peabody Ash Impoundment), and one proposed coal combustion residuals landfill (Site 5). Site 5 was previously surveyed in part, and the present survey effort completes the archaeological reconnaissance of unsurveyed portions of Site 5. Field investigation included pedestrian survey supplemented by opportunistic screened shovel testing. Much of the proposed project area had been disturbed previously by mining activities. The investigators encountered no artifacts, and no evidence of cultural features. Based on these results, the investigators recommended no additional work within the project area.

After review of the revised report, your letter indicates that TVA staff recommended that the proposed project would not affect any sites included in or eligible for the National Register of Historic Places. We have reviewed the report and concur with the reports findings and recommendations. We recommend that the proposed project should result in **No Effect to Historic Resources**. We accept this report as final and acknowledge receipt of two archival copies.

If the project design or boundaries change, this office should be consulted to determine the nature and extent of additional documentation that may be needed. In the event of the unanticipated discovery of an archaeological site or object of antiquity, the discovery should be reported to the Kentucky Heritage Council and to the Kentucky Office of State Archaeology in the Anthropology Department at the University of Kentucky in accordance with KRS 164.730. In the event that human remains are encountered during project activities, all work should be immediately stopped in the area and the area cordoned off, and in accordance with KRS 72.020 the county coroner and local law enforcement must be contacted immediately. Upon confirmation that the human remains are not of forensic interest, the unanticipated discovery must be reported to the Kentucky Heritage Council.

Should you have any questions, feel free to contact Chris Gunn of my staff at (502) 564-7005, extension 4450.

Sincerely,

Craig A. Potts,
Executive Director and
State Historic Preservation Officer

CP: KHC # 49164
Cc: George Crothers (OSA); John Hunter (AMEC)