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PARADISE CCR MANAGEMENT AND PROCESS WATER BASINS SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

Muhlenberg County, Kentucky

Prepared by:
TENNESSEE VALLEY AUTHORITY
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Symbols, Acronyms, and Abbreviations

APE	Area of Potential Effect
BMP	Best Management Practices
CFR	Code of Federal Regulations
CCR	Coal Combustion Residuals
CWA	Clean Water Act
DEM	Digital Elevation Model
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FGD	Flue Gas Desulfurization
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
IPaC	USFWS Information for Planning and Conservation
KPDES	Kentucky Pollutant Discharge Elimination System
KDOW	Kentucky Department of Water
KGS	Kentucky Geological Survey
KSNPC	Kentucky State Nature Preserves Commission
LOD	Limits of Disturbance
LiDAR	Light Detection and Ranging
LOMR	Letter of Map Revision
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PAF	Paradise Fossil Plant
PEIS	Programmatic Environmental Impact Statement
PWB	Process Water Basin
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
VDGIF	Virginia Department of Game and Inland Fisheries
WMA	Wildlife Management Area
WWC	Wet Weather Conveyances

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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 replaced 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.

With a long-standing commitment to safe and reliable operations and to environmental stewardship, TVA began to modernize its coal ash management in 2009 including converting from wet to dry ash storage. This effort was later endorsed by the TVA Board in 2011. On April 17, 2015, the U.S. Environmental Protection Agency (EPA) published the Final Disposal of Coal Combustion Residuals (CCR) 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 (TVA 2016). A Record of Decision was released in July 2016 that would allow future environmental reviews of CCR impoundment closures to tier from the PEIS. Tiering from this 2016 PEIS, in June of 2017, TVA issued the PAF CCR Management Operations Final Environmental Assessment (FEA) that evaluated closure alternatives for the PAF ash impoundments (TVA 2017b). A Finding of No Significant Impact (FONSI) was issued for this FEA shortly after. The proposed action included the following projects.

- Construct and operate a new fly ash gypsum dewatering facility
- Construct and operate a new dry fly ash conversion system
- Construct and operate a new CCR landfill
- Close the gypsum pond disposal complex
- Close the 2A/2B boiler slag impoundments
- Construct Process Water Basins (PWBs) on top of the closed boiler slag impoundments
- Close the Peabody Ash impoundment

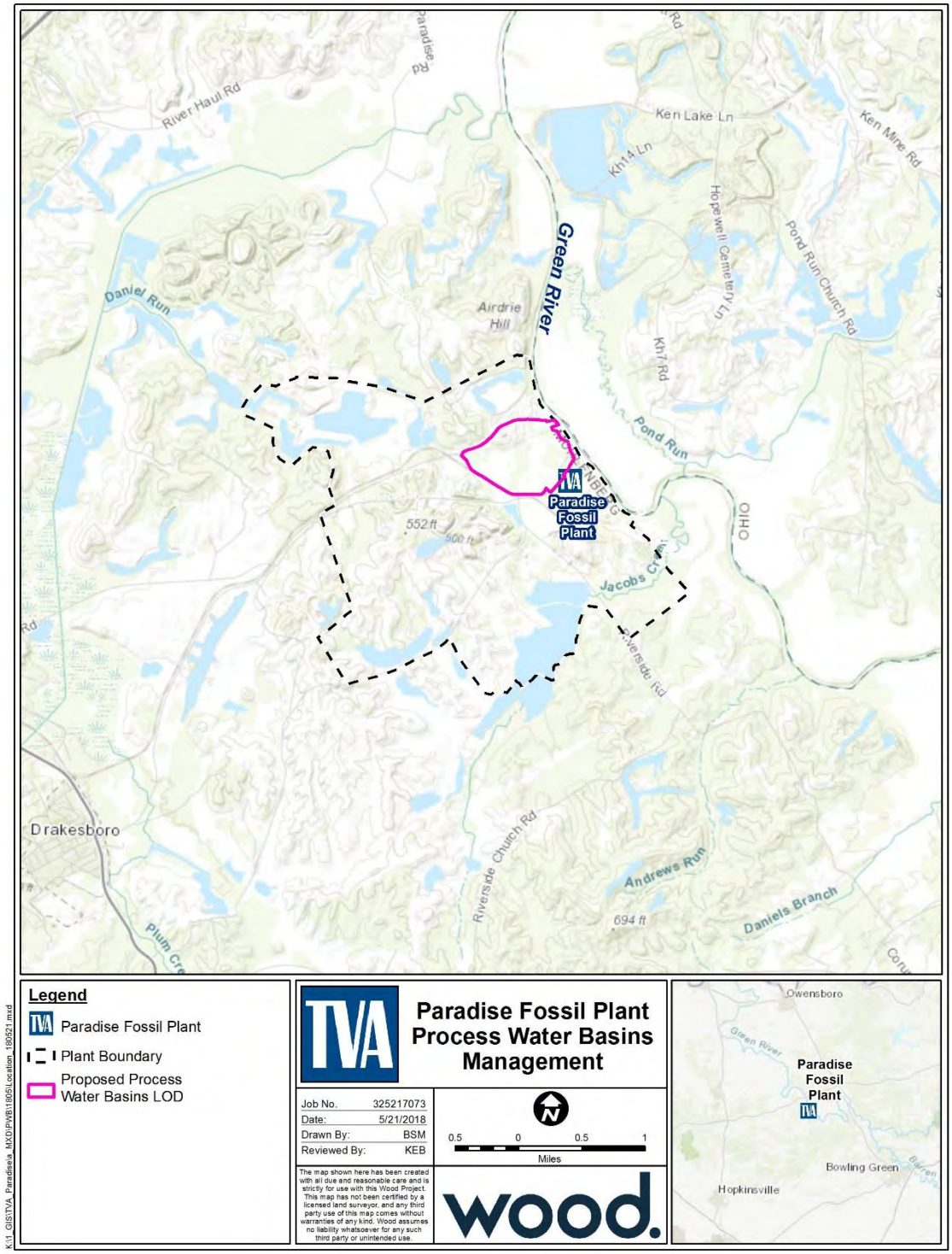

Figure 1-1. PAF Project Location

This document is a supplement to the June 2017 PAF CCR Management Environmental Assessment (TVA 2017b). This new Supplemental EA (SEA) has been prepared to account for changes in the location of PWBs identified in the 2017 EA.

As originally proposed in the 2017 EA (TVA 2017b), the existing slag Impoundment 2A/2B would be closed and converted to lined PWBs and the excavated surface would be covered with a composite geosynthetic liner. The PWBs would treat plant process flows and surrounding storm water flows prior to discharge to the Green River. Subsequent to completion of the 2017 FEA and FONSI, TVA determined that the PWBs should be positioned separately from the closed Slag Impoundment 2A/2B in order to avoid implications associated with potential CCR rule changes regarding building over a former ash facility. Consequently, TVA revised this alternative to develop PWBs 1, 2, and 3, in an area immediately north of the closed Slag Impoundment 2A/2B. As such no PWBs would be developed within the footprint of Slag Impoundment 2A/2B. This SEA evaluates this proposed change to the action proposed in the 2017 EA (TVA 2017b).

1.2 Purpose and Need

The purpose of this site-specific action is to support the implementation of TVA's stated goal of eliminating all wet CCR storage at its coal plants by establishing lined PWBs for treatment of water generated onsite. This proposed action will also assist TVA in complying with state requirements and EPA's CCR Rule. The project is also needed to facilitate on-going plant operations and the proper management and treatment of water in accordance with Kentucky Pollutant Discharge Elimination System (KPDES) permitting requirements.

1.3 Decision to be Made

TVA must decide whether or not to construct three PWBs north of the existing Slag Impoundment 2A/2B and operate these basins to treat water flowing from plant operations with eventual release to the Green River from a separate (new) permitted outfall. TVA's decision considers factors such as potential environmental impacts and TVA's long-term goals. TVA will use this SEA 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.

1.4 Other Environmental Reviews and Documentation

The following environmental reviews are relevant to the proposed action:

Paradise CCR Management Operations Environmental Assessment (TVA 2017b). The EA was prepared to assess the environmental impacts of implementing projects proposed to support dry storage and CCR Rule compliance at PAF.

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

Integrated Resource Plan, 2015 Final Report (TVA 2015b). The plan provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. The

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

The findings in these documents related to this SEA are integrated in the analyses of Chapter 3 for each relevant environmental resource, as appropriate.

1.5 Permits, Licenses and Approvals

TVA had previously identified some permits and approvals required to support the closure alternatives for the PAF ash impoundments. Authorizations required for the proposed action could include the following:

- Actions involving wetlands and/or stream crossings would be subject to federal Clean Water Act (CWA) Section 404 permit requirements as well as state Section 401 water quality certification.
- The proposed outfall 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).
- Project specific BMP plan under the existing Kentucky Pollutant Discharge Elimination System (KPDES) Permit for all stormwater discharges associated with construction activity that disturbs one acre or more.

1.6 Scope of the Supplemental Environmental Assessment

The geographic scope of this supplemental analysis includes the 232-acre area that contains the Slag Pond Impoundment 2A/2B and the Stilling Pond 2C; the proposed new PWBs 1, 2, and 3; the proposed outfall area adjacent to the Green River; Coal Yard Ponds 1 and 2; the bottom ash laydown area and dewatering tanks; and new process water and bottom ash lines (Figure 1-2 and Appendix B). With the exception of the proposed outfall area, all activities associated with the proposed action will be limited to previously disturbed areas. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

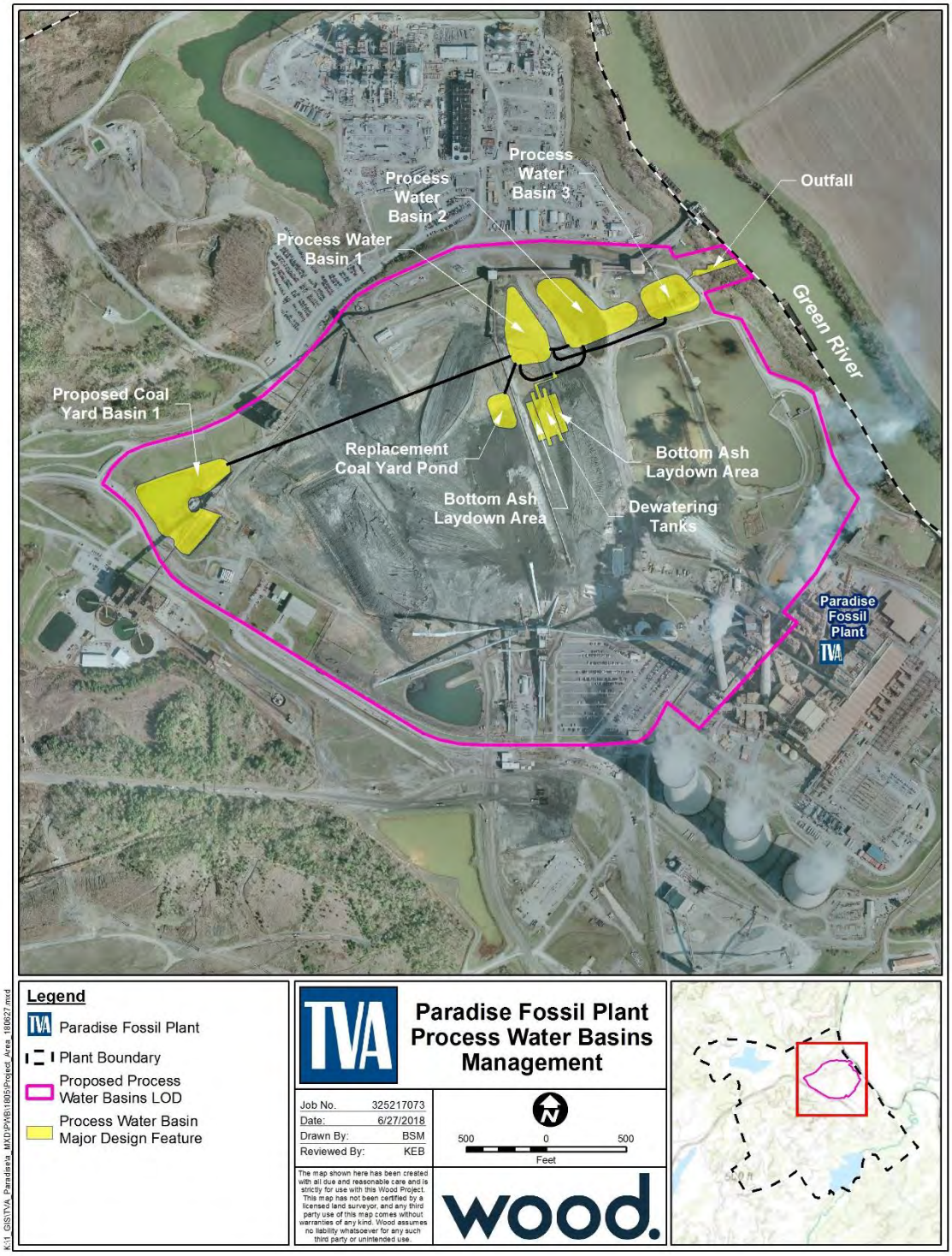

Figure 1-2. PAF Project Area

TVA prepared this SEA to comply with National Environmental Policy Act (NEPA) and regulations promulgated by the Council on Environmental Quality and TVA's procedures for implementing NEPA. Based on the specific activities proposed for this project, TVA focused its environmental review on specific resources and eliminated others from further evaluation. This SEA does not contain detailed discussions of resources not found in the project area or where site-specific conditions would not change the impact analysis presented in the previous EA (TVA 2017b).

In consideration of the nature and scope of the proposed action, TVA determined that the potential impacts of the alternatives under consideration on the following environmental resources are bounded by the analysis contained in the 2017 EA including the site-specific assessment of closure of PAF ash impoundments (Gypsum Stack, Slag Impoundment 2A/2B and Stilling Impoundment 2C, and the Peabody Ash Impoundment), the construction and operation of two dewatering facilities, and the disposal of dry CCR.

- Air Quality
- Climate Change
- Natural Areas, Parks, and Recreation
- Aquatic Ecology
- Visual Resources
- Solid and Hazardous Waste and Hazardous Materials
- Noise
- Transportation
- Socioeconomics

Because the proposed action is primarily associated with the construction and operation of PWBs the only resources not bounded by the previous site-specific analyses and therefore retained for detailed analysis in this SEA are the following.

- Groundwater
- Surface Water
- Soils
- Floodplains
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Wetlands
- Cultural Resources

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

1.7 Public and Agency Involvement

The draft EA was posted on TVA's Web site for a two-week public review period. TVA notified local, state, and federal agencies and federally recognized tribes of its availability through their required consultations. Comments were accepted from July 2, 2018 through July 17, 2018 via e-mail and mail.

CHAPTER 2 – ALTERNATIVES

2.1 Description of Alternatives

This chapter describes the alternatives TVA evaluated in this review. Alternatives evaluated in detail are described below.

2.1.1 Alternative A – The No Action Alternative

Under the No Action Alternative, Alternative B – Construction of an onsite CCR landfill, Implementation of CCR Dewatering and Handling Projects, and Impoundment Closures would be implemented as described in the 2017 EA. As such some CCR in Slag Impoundment 2A/2B would be excavated 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 excavated surface would be covered with a composite geosynthetic liner to meet or exceed applicable permeability requirements, and the impoundment would be converted to lined PWBs. As such, the proposed action as described under the prior EA and related FONSI represents the baseline condition.

2.1.2 Alternative B – Development of PWBs in an Alternate Location

Under this alternative TVA would implement Alternative B as described in the prior EA, but would develop the PWBs in a location immediately north of Slag Impoundment 2A/2B. As such, no PWBs would be developed within the footprint of Slag Impoundment 2A/2B. Under this alternative, Slag Impoundment 2A/2B would be Closed-in-Place as specified in the 2017 PAF CCR Management EA. Impoundment 2A may be used as a “staging area” for interim tanks during construction of the PWBs. However, Impoundment 2C will remain in service and would be cleaned out and lined.

Process water lines and bottom ash lines would also be constructed. Process water lines would convey process water directly to a junction chamber where flow would be diverted to PWB 1 during normal operations. Flow would continue in series from Basin 1 to Basin 2, and then to Basin 3 through connecting pipelines. Flow would be released to the Green River from a newly permitted KPDES outfall after final treatment in Basin 3. Alternate flow routing would be implemented to achieve the same level of treatment if one PWB is taken out of service for routine maintenance. A conceptual design drawing of the proposed PWBs and associated infrastructure is included in Appendix B.

Additional site modifications in conjunction with the proposed action includes the modification of Coal Yard Pond 1 and replacement of Coal Yard Pond 2 which is currently located in the footprint of the proposed PWB 1. Both of these ponds are located within the limits of disturbance (LOD) and include an associated pipeline or ditch to convey runoff to PWB 1. Removal of existing Coal Yard Pond 2 will require removal of coal fines that have accumulated in the area and transfer of any coal fines that can be reclaimed to the Peabody Ash Pond to be used as fill material.

Additionally, bottom ash lines would be developed to convey bottom ash sluice from the plant to dewatering tanks and an associated bottom ash laydown area. Water released from the dewatering tanks would be conveyed via pipeline to the previously described junction chamber where flow would be conveyed to PWB 1.

Laydown areas would be the same as they were originally defined in the CCR Management EA or would be located within the footprint of the LOD identified on the conceptual design drawing in Appendix B. Additional activities that would be undertaken as part of this alternative include the following:

- Use of power sources in the coal conditioner buildings or other suitable location within the LOD and appropriate interconnects.
- Use of potable water for polymer mixing from a location close to the utility/maintenance building and associated piping.
- Installation of appropriate automatic process controls for wastewater treatment connecting to the Unit 3 scrubber building.
- Use of existing gravel roads to support construction, operations, and chemical delivery.

2.2 Summary of Alternative Impacts

This impact summary is limited to those resources reassessed in this SEA as being potentially affected by the proposed action. Table 2-1 provides a summary of environmental impacts associated with the No Action alternative (i.e., the previously considered project action within the preferred alternative as described in the 2017 CCR Management EA) and Alternative B. This impact summary is a relative comparison of those resources reassessed as being potentially affected by the revised action and only those project actions under consideration in this SEA.

2.3 Identification of Mitigation Measures

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

- Fugitive dust emissions from site preparation and construction 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 approved non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs as described in "Kentucky Best Management Practices for Construction Activities" guide (KDOW 2005) would be used during construction activities to minimize impacts and restore areas disturbed during construction.

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

- TVA will submit documentation to update current and future site topography for onsite areas adjacent to the Green River, when appropriate. Changes in topography

will be documented with Federal Emergency Management Agency (FEMA) through completion of a Letter of Map Revision (LOMR).

Table 2-1. Summary and Comparison 2017 EA and Newly Proposed SEA Alternative B (2018) by Resource

Resource	No Action - Conversion of Slag Pond Impoundment 2A/2B to Lined PWBs	Alternative B – Develop PWBs in an Alternate Location
Groundwater	Minimal impacts to groundwater during construction with the use of best management practices (BMPs).	Minimal impacts to groundwater during construction with the use of BMPs. Marginally improved groundwater quality due to construction of PWBs in alternate location.
Surface Water	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.	Minor temporary impacts from construction to surrounding surface waters with implementation of BMPs. Minor impact from disturbance of two wet water conveyance channels. Localized but minor alteration in water quality of Green River in vicinity of new KPDES outfall.
Soils	No impact.	Soil disturbance due to grading and construction of outfall structure. Minor temporary impacts with implementation of BMPs designed to minimize erosion.
Floodplains	No impact.	Minor impact to 5.5 acres of 100-year floodplain. TVA may make request to FEMA to correct incorrectly mapped floodplain.
Vegetation	Minor impact resulting from the disturbance of a predominantly previously disturbed area that lacks notable plant communities.	Minor impact resulting from construction activity in previously disturbed, low quality vegetated community. Localized but minor impact to forested area in the vicinity of proposed outfall. Indirect impacts during construction would be minimized through implementation of BMPs.
Wildlife	Minor impact to predominantly previously disturbed low-quality habitats.	Localized but minor disruption to wildlife and associated habitats in conjunction with alteration of riparian zone forested habitats in vicinity of proposed outfall.
Threatened and Endangered Species	No impact.	No impact.
Wetlands	No impact.	No impact. Delineated wetland in vicinity of outfall structure would be avoided.
Cultural Resources	No impact.	No impact.
Cumulative Effects	No impact.	No impact.

2.4 The Preferred Alternative

TVA's preferred alternative is Alternative B – Development of PWBs in an Alternate Location. Under this alternative TVA would construct three PWBs north of the Slag Impoundment 2A/2B. Among other actions, the preferred alternative from the 2017 EA included closure and re-use of the slag impoundments as PWBs. However, Alternative B proposes to construct PWBs 1, 2, and 3 in an alternate location and reconfigure coal yard runoff ponds to provide enhanced site operations and improved water treatment. Alternative B also provides long-term benefits and meets the purpose and need of the project as it would transition the plant to dry storage of CCRs and allow closure of wet CCR impoundments. Implementation of this alternative 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 would result in minimal impacts to the environment.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Groundwater

3.1.1 Affected Environment

3.1.1.1 Physiographic Setting and Regional Aquifer

The PAF site lies within the Shawnee Hills section of the Interior Low Plateau Physiographic Province in Northwestern Kentucky (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, had underlain most of 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. These spoils are up to 100 feet thick and consist of a heterogeneous mixture of clay, silt, sand, coal, and rock fragments having dimensions of up to several feet in diameter. Quaternary alluvial deposits, averaging 19 feet in thickness and consisting mostly of silt and clay, 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). 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).

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.

Extensive underground and strip mining operations across the area occurred from the 1960s through the 1980s. This past mining extensively 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).

Regional aquifers within 5 miles of PAF are represented by the bedrock carbonate aquifer (the Carbondale aquifer) and the alluvial aquifer associated with the Green River (the Lisman aquifer in the Sturgis formation). 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. Horizontal groundwater gradients in the Lisman

aquifer 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 Lisman aquifer, the groundwater potentiometric surface of the Carbondale averages about 5 feet lower than that of the Lisman aquifer.

The U.S. Geological Survey (USGS) information and geologic studies carried out by TVA indicate that the proposed PAF site may be subject to minor seismic events related to 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.

3.1.1.2 Groundwater Use

Six wells were identified on the PAF plant reservation from KGS records as domestic or "other" use. These wells are located generally west and south of the LOD and none are located within the LOD. 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.

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 2015).

3.1.1.3 Groundwater Quality

Figure 3-1 identifies the network of existing groundwater monitoring wells in the vicinity of Slag Impoundment 2A/2B. This network of monitoring wells was established to conduct baseline groundwater monitoring as required under the CCR rule. In 2017 groundwater monitoring was initiated in the vicinity of Slag Impoundment 2A/2B. Preliminary baseline results have shown statistical exceedances of boron in two of the four downgradient monitoring wells (95-47C, PAF-110), of pH in three of the downgradient monitoring wells (PAF-110, PAF-112, PAF-113), and of pH in two of the three background monitoring wells (PAF-108, PAF-109) (Stantec, 2018). The report notes that additional analysis will be conducted to determine the source of these exceedances. 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.

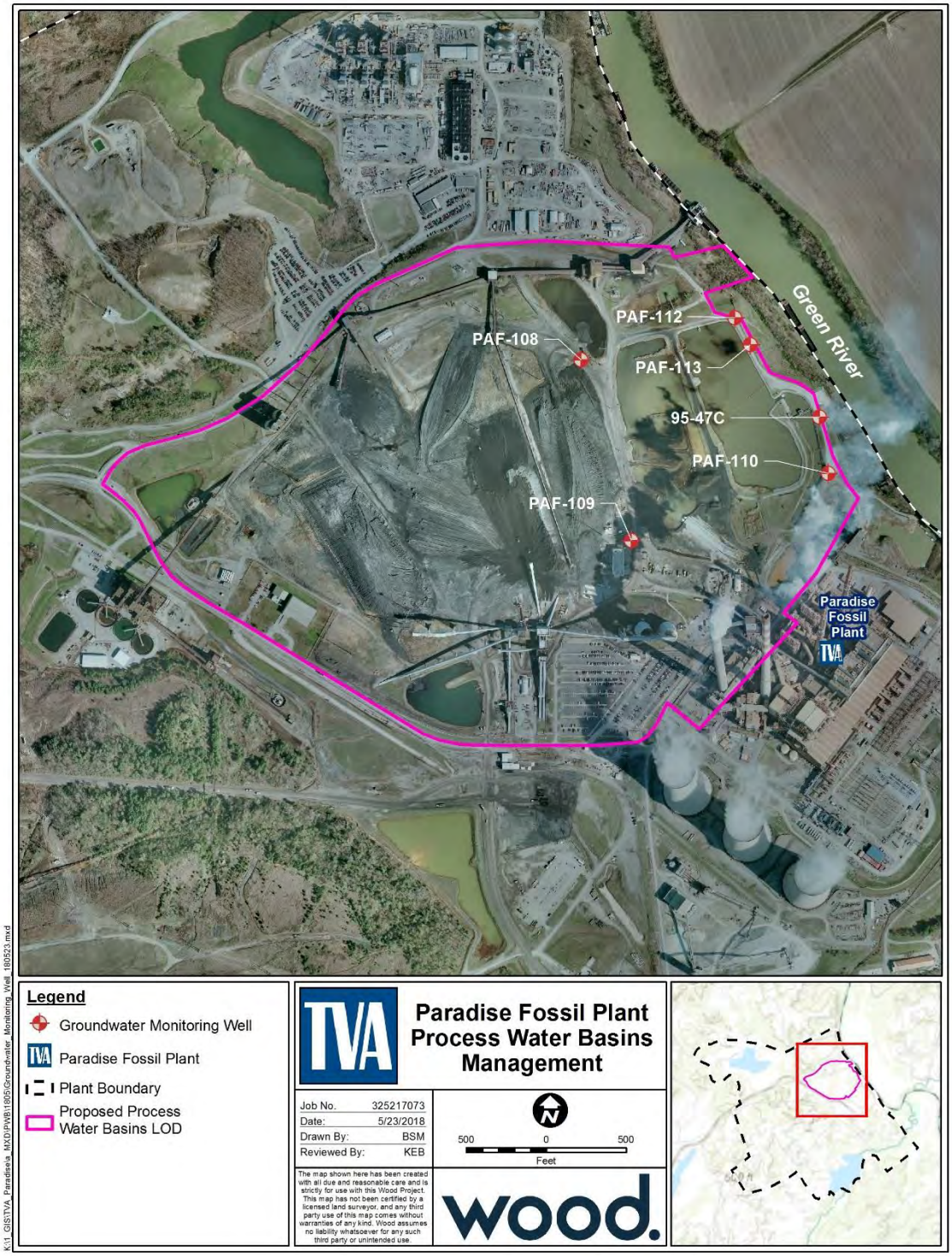

Figure 3-1. Groundwater Monitoring Wells

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue implementation of the preferred alternative in the original EA. As such, Slag Impoundment 2A/2B would be closed and converted to PWBs. The conversion to PWBs would entail dewatering of the CCR and installation of an approved low permeability liner that would isolate surface water above the liner and prevent groundwater contact. Consequently, as previously described in the 2017 EA, potential impacts to groundwater from in-place closure of Slag Impoundment 2A/2B are expected to be beneficial resulting from the removal of the hydraulic head from these impoundments.

As described in the prior PAF CCR Management EA (TVA 2017b) groundwater monitoring of the impoundments will be undertaken in conjunction with the Groundwater Optimization Plan. 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 2016), 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.

Because of such measures, 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.

3.1.2.2 Alternative B – Develop PWBs in an Alternate Location

Under this alternative, Slag Impoundment 2A/2B would be closed as described under the No Action Alternative, but no PWBs would be constructed within that footprint. Excess stormwater from the coal yard ponds would be conveyed to a new PWB 1. The elimination of the hydraulic inputs to the closed impoundment reduces the potential for migration of leachate to groundwater beneath the impoundment and would result in beneficial impacts similar to those described for the No Action Alternative. The proposed PWBs would be constructed in a different location with a geosynthetic liner that complies with applicable permeability requirements to protect groundwater. Therefore, no impacts to groundwater are anticipated during operation of the PWBs.

BMPs as described in *A Guide for Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities Revision 3 2017* (TVA 2017a) would also be used to avoid contamination of groundwater and control sediment infiltration from storm water runoff during construction. Impacts to the existing monitoring well network in the vicinity of Slag Impoundment 2A/2B would also be avoided during construction.

Overall therefore, potential impacts of this alternative to groundwater are expected to be beneficial resulting from the removal of the hydraulic head from Slag Impoundment 2A/2B and because the proposed PWBs would be constructed with a low permeability geosynthetic liner to minimize interaction with groundwater. Because of such measures, 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.

3.2 Surface Water

3.2.1 Affected Environment

3.2.1.1 Regional Surface Water Systems

3.2.1.2 Surface Water of PAF Slag or Bottom Ash Impoundments

As described in the 2017 PAF CCR Management EA (TVA 2017b), PAF has several existing wastewater streams that are permitted under KPDES Permit No. KY0004201 (KDOW 2004). Several of these streams are proposed to be diverted from the current ash pond or slag ponds to the proposed PWBs. The proposed KPDES permit would monitor flow, hardness, mercury, cadmium, thallium and would have limitations on TSS, oil and grease, pH and chronic WET (whole effluent toxicity) (KDOW 2018). The existing Slag/Bottom Ash Impoundment discharge (Figure 3-2) is the primary outfall potentially affected by the proposed project.

3.2.1.3 Onsite Surface Water Features

Surface water features in the immediate proximity of the project area include the Green River and manmade onsite ponds and impoundments used for industrial wastewater processing (see Figure 3-2). Jurisdictional streams and wetlands were delineated within the project area in December 2017 (AECOM 2017). The field survey of the site documented two wet weather conveyances (total linear footage of approximately 92 feet) and one potentially jurisdictional wetland (0.06 acre), adjacent to the Green River within the area where the new process water outfall would be built (see Figure 3-2). Drainage on the property flows generally to the northeast to the Green River.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, the actions and impacts would be the same as in Alternative B of the PAF CCR Management EA (TVA 2017b). No additional impacts to surface waters would occur under this alternative.

3.2.2.2 Alternative B – Development of PWBs in an Alternate Location

Under this alternative, onsite storm water and process wastewater would be directed to the PWBs for treatment prior to release through a new outfall to the Green River. Slag Impoundment 2A/2B would still be closed and the Stilling Impoundment 2C would be refurbished by cleaning it out and lining it. The PWBs would be designed and operated to ensure compliance with all permit limits.

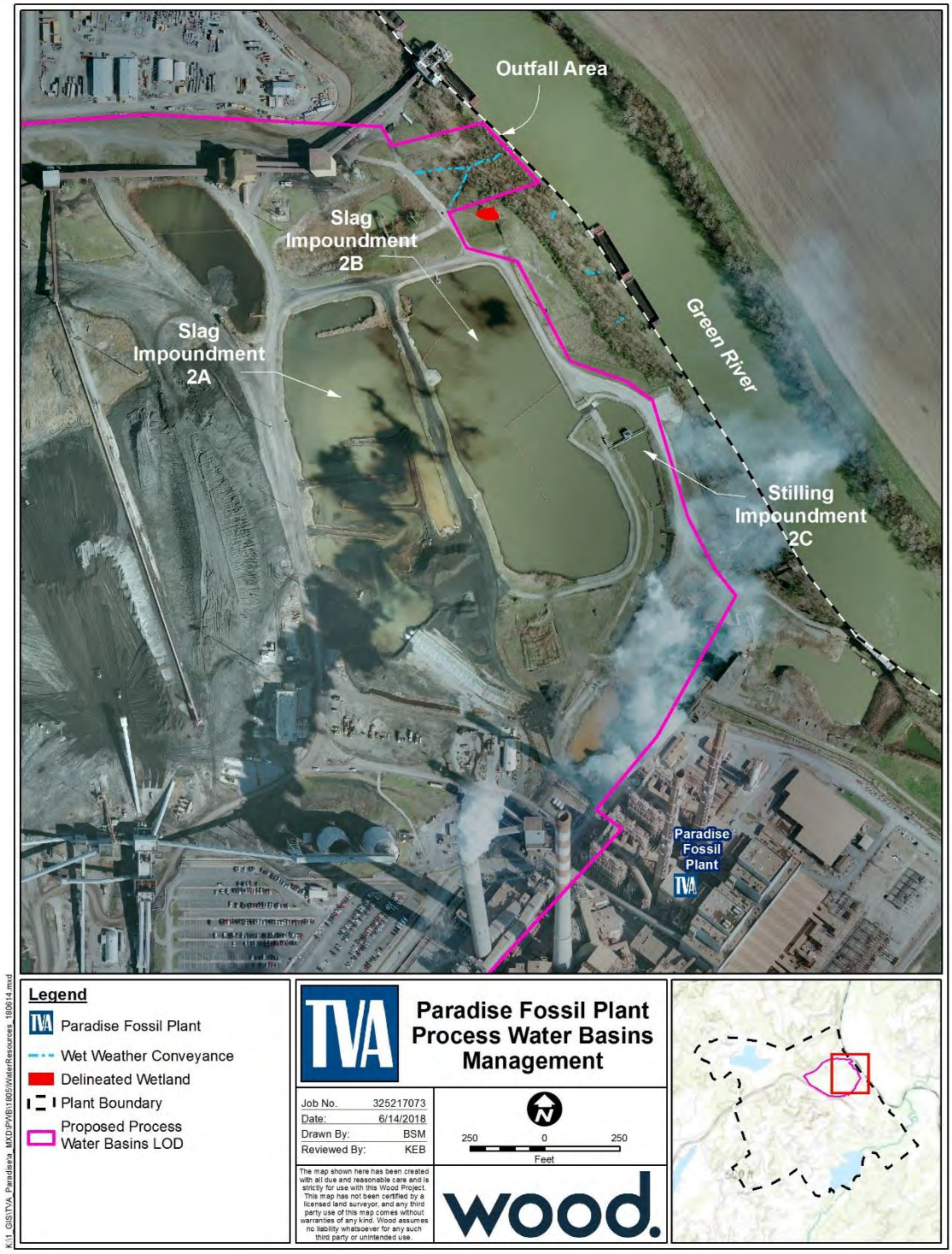

Figure 3-2. Water Resources of the Project Area

The construction of the PWBs would also necessitate the modification of Coal Yard Pond 1 and the removal and replacement of Coal Yard Pond 2, which are described in Chapter 2. Without a coal yard pond in the area of the existing Coal Yard Pond 2, coal fines and other sediment would have the potential to flow directly into PWB 1. This would potentially increase the solids loading of the PWB, increase the frequency of cleanout, and potentially affect the water quality within the PWB. To reduce this impact, a new coal yard pond will be constructed up-gradient of the PWB to intercept the coal yard runoff and drop out any sediment prior to entering the PWB system. Excess storm water flow from both the modified Coal Yard Pond 1 and the new coal yard pond would drain by gravity to the proposed Process Water Basin 1.

During dewatering of the CCR impoundments in preparation for closure, KPDES monitoring and reporting requirements would be met (KDOW 2018).

3.2.2.2.1 Construction Impacts

Wastewater 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. Impacts associated with soil disturbances from construction activities would be identical to those detailed in the 2017 PAF CCR Management EA (TVA 2017b). Only temporary, minor impacts to surrounding surface waters would be expected from construction activities, with implementation of appropriate BMPs.

Two of the five Wet Weather Conveyances (WWCs) identified in the area between the existing slag ponds and the Green River would be impacted (total of 92 linear feet) by the proposed new outfall structure. These WWCs are not considered jurisdictional streams. However, final confirmation of jurisdictional status would be determined by the USACE, Louisville District. If these WWCs are jurisdictional, working in or near them would require a state water quality certification under Section 401 of the Clean Water Act and federal permits under Section 404. The terms and conditions of these permits would likely require mitigation from these proposed activities. The impacts to these onsite streams has the potential to be direct and permanent, however these streams are not expected to be high quality and with the proper controls of both process and storm water, discharges would be expected to have minor impacts to area surface waters.

3.2.2.2.2 Operational Impacts

The site process waters that would be treated by the PWBs would potentially include, but not be limited to: non-chemical metal cleaning wastes, sewage treatment plant discharges, red water ditch discharges, sump discharges, miscellaneous cooling water, floor and roof drains, boiler loss water, coal yard basins discharges, storm water and potentially flue gas desulfurization (FGD) waste water after dewatering. The FGD stream has the potential to be discharged to the proposed PWBs or via the cooling water channel. Final discharge location has not been decided at this time.

Under future operating conditions, it is expected that the level of treatment of the water would be maintained or enhanced as flows would be treated in lined PWBs, thus eliminating any potential seepage. In addition, mitigative measures would be introduced, including wastewater treatment options, to ensure compliance of discharge waters with KPDES permit limits and Kentucky water quality standards. With proper treatment implementation, the water quality of these waste streams would not be expected to negatively impact surface water quality.

Additionally, TVA would conduct characterization/monitoring 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 as needed, which may include passive and/or targeted wastewater treatment to ensure that the discharge KPDES permit requirements for water quality parameters are met.

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

3.3 Soils

3.3.1 Affected Environment

According to the Natural Resources Conservation Service (NRCS 2016) web soil survey, 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 mixture of clay, silt, sand, coal, and rock fragments having dimensions of up to several feet in diameter. Additionally, extensive plant operations in the vicinity of the immediate project area has resulted in extensive disturbance to soils. Alluvial clay and silt deposits characterize the soils within the project boundary immediately adjacent to the Green River. These soils are generally underlain by older terrace alluvium and/or by residual soils derived from weathering of the underlying bedrock (TVA 2003).

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action

Under the No Action Alternative, the slag pond impoundment 2A/2B would be cleaned out and lined and PWBs would be constructed on this site which sits on heavily disturbed soils and fill material. Use of these existing basin structures would result in minor ground excavation in this area. A BMP plan, consistent with the Kentucky Best Management Practices for Construction Activities, would be implemented to minimize erosion during land clearing and site preparation. Therefore, impacts to soils are expected to be minor.

3.3.2.2 Alternative B – Develop PWBS in an Alternate Location

The proposed PWBs would be constructed on a site that is heavily disturbed and comprised of fill material. However, construction of the outfall structure associated with PWB 3 would require minor removal and reinforcement with rip rap of undisturbed soils within a 1.9-acre area of the spillway. 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 and excavation activities are expected to be minor, as BMPs outlined in the Kentucky Best Management Practices for Construction Activities would be implemented to minimize erosion during land clearing and site preparation.

3.4 Floodplains

3.4.1 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.

The PAF property is located adjacent to the Green River from miles 99.3 to 102.5. Slag Impoundment 2A/2B and Stilling Impoundment 2C are located adjacent to the Green River from miles 100.0 to 100.2. The Green River contributing drainage area at this location is indicated by the USGS to be 4,978 square miles.

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) (FEMA 2013). The 100- and 500-year flood elevations of the Green River in proximity to the project site are presented in Table 3-1.

Table 3-1. Green River Flood Elevations

Return period (years)	Elevation at Green River Mile 100.2 (Feet NAVD 88)
10	397.3
50	400.2
100	401.8[1]
500	404.4

[1]Note: for analysis purposes, a 100-year elevation of 402 feet NAVD 88 is assumed

The Green River floodplain based on FIS Flood Insurance Rate Map (FIRM) mapping is presented in Figure 3-3. Also included on Figure 3-3 is the area inundated at elevation 402.0 feet NAVD 88 based on 2012 Light Detection and Ranging (LiDAR) data of the PAF facility. There are notable differences in the mapped area adjacent to the river and below elevation 402.0 feet. Based on the FIRM mapping and the 2012 LiDAR data, a portion of the project would be located in the 100-year floodplain. However, previous construction and development in this area resulted in changes in topography that raised the elevations above the base flood level resulting in changes in the floodplain limits. The two inundated areas within the project area both encompass impoundments formed in part by roadway embankments having low crest elevations higher than 402.0 feet, and neither the FIRM mapping nor the 2012 LiDAR data reflect the area that would actually be inundated in a 100-year flood due to these site features (ponds and raised embankments). The actual extent of the 100-year floodplain is shown in the Revised 1% Annual Chance Flood Limits depicted in Figure 3-3.

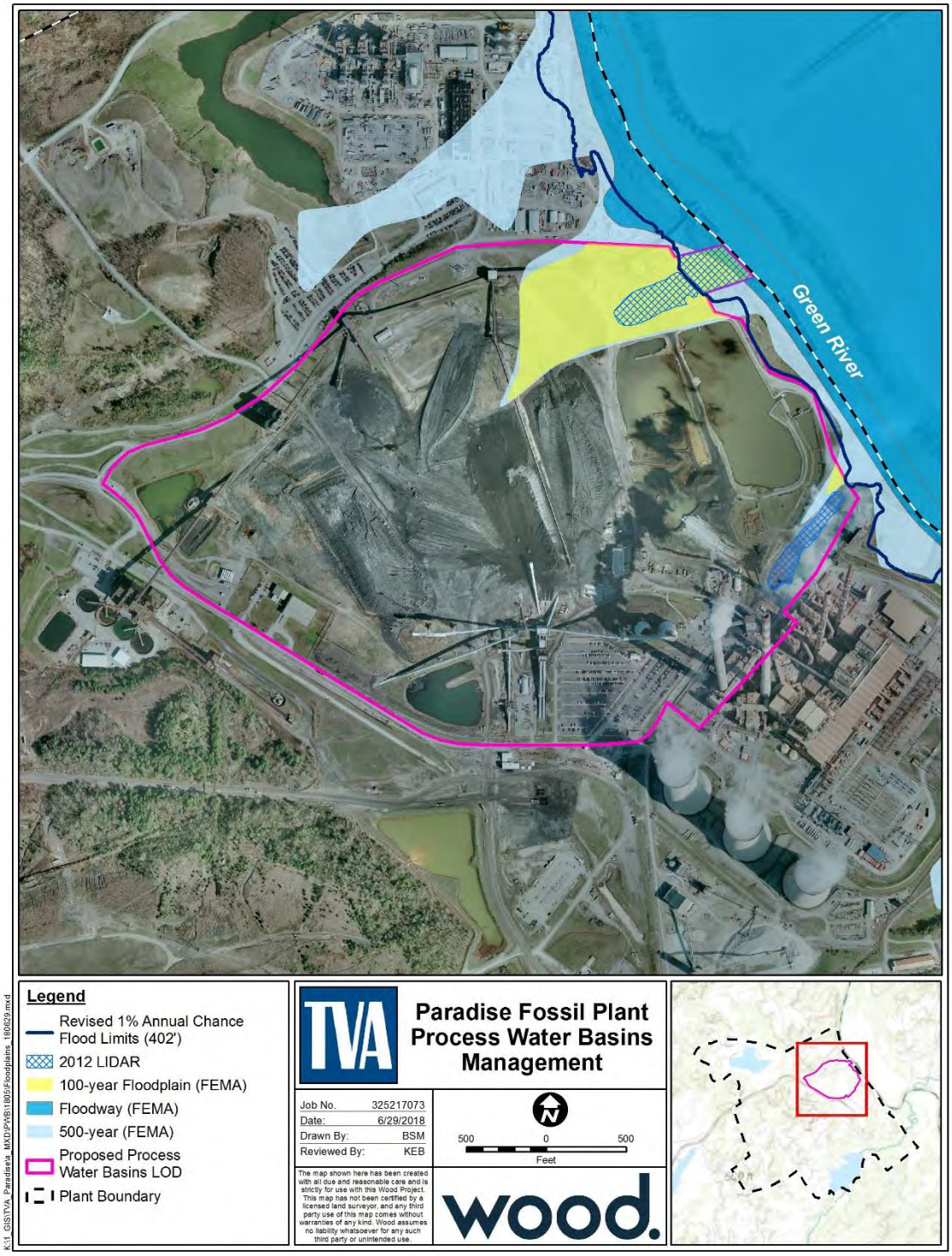

Figure 3-3. Floodplains of the Project Area

The 500-year floodplain is also delineated in the Muhlenberg County FIRMs in the project area. Although the 500-year flood elevation would be 404.4 feet, the inundated area would actually extend only slightly beyond the 100-year floodplain shown on Figure 3-3. A Green River regulatory floodway has been mapped by FEMA and is located along the river-side boundary of the project area.

3.4.2 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 EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances (US Water Resources Council 1978).

For certain "Critical Actions," the minimum floodplain of concern is the 500-year floodplain. "Critical actions" are those actions for which even a slight chance of flooding would be too great (US Water Resources Council 1978), and include, but are not limited to, facilities that, if flooded would create an added dimension to the disaster or would become inoperable. 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, and any development must be consistent with these regulations.

3.4.2.1 Alternative A – No Action

Under the No Action alternative, Alternative A –there would be no impacts to floodplains. Changes to topography at PAF would be documented with FEMA through completion of a Letter of Map Revision (LOMR). As stated in the 2017 PAF CCR Management EA, all of the project areas would be located outside the 100- or 500-year floodplain, which would be consistent with EO 11988.

3.4.2.2 Alternative B – Develop PWBS in an Alternate Location

Under this alternative TVA would develop the PWBs in a location immediately north of Slag Impoundment 2A/2B which has been determined not to be in the floodplain due to topographic changes on the site. Based on current topographic conditions, the PWBs would be located outside the 100- and 500-year floodplain, which would be consistent with EO11988. The outfall would be constructed within the Green River floodplain, and is considered to be a repetitive action in the 100-year floodplain. To minimize adverse impacts, the outfall would be constructed at or below the existing ground elevation, and as such, would not result in the placement of a net increase in fill within the floodplain which would be consistent with the National Flood Insurance Program and EO 11988.

TVA will submit appropriate documentation to the Commonwealth of Kentucky in a LOMR to update the effective FIS and FIRMs. The process consists of two steps: First, because TVA will be proposing future changes related to proposed earthwork as well as correcting existing topographic data, TVA will submit a conditional LOMR which includes conceptual plans to communicate to FEMA what TVA is planning. The second step is to submit a LOMR with as-built drawings once final construction is completed. Alternatively, TVA may

submit an application to remove the mapped floodplain area interior to the roadway embankment dam if FEMA standards for the structures are met.

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

1. BMPs would be used during construction activities.
2. TVA would notify Kentucky Division of Water (KDOW) of the proposed project.
3. TVA would provide KDOW the opportunity to review and comment on the proposed project and this SEA.
4. TVA will submit appropriate documentation to the Commonwealth of Kentucky in a LOMR to update the effective FIS and FIRMs.
5. The outfall would be constructed at or below the existing ground elevation.

With implementation of these measures, Alternative B would result in minor impacts to floodplains and their natural and beneficial values.

3.5 Vegetation

3.5.1 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 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 altered the natural vegetation within the vicinity of the plant. The vegetation within 5 miles surrounding PAF, and within the project area for the PWBs and associated spillway were evaluated with land use/land cover information obtained from the National Land Cover Database (Homer et al. 2015).

Land cover types in the 232-acre project area is quantified by acreage in Table 3-2 and displayed on the Land Cover Map (Figure 3-4). The proposed project area for the PWBs is primarily developed land (96.6 acres), barren land (60.7 acres), and herbaceous areas (44.4 acres).

Land cover within the vicinity (5-mile radius) of PAF is displayed in Table 3-2 and Figure 3-5. Land cover in the vicinity is primarily deciduous forest (36,164.1 acres), herbaceous/grassland (11,750.9 acres), cultivated crops (10,935.6 acres) and pasture/hayfields (8,572.5 acres) (see Table 3-2).

Table 3-2. Land Cover within the Vicinity of PAF

Land Cover Type	PWB Project Area (acres)	5-Mile Radius (acres)
Barren Land	60.7	684.8
Cultivated Crops	0	10,935.6
Deciduous Forest	0.9	36,164.1
Developed, High Intensity	0	159.2
Developed, Low Intensity	78.6	851.8
Developed, Medium Intensity	0	551.7
Developed, Open Space	18.0	3,821.7
Emergent Herbaceous Wetlands	0	2,753.9
Evergreen Forest	0	3,003.5
Hay/Pasture	0	8,572.5
Herbaceous	44.4	11,750.9
Mixed Forest	0	45.6
Open Water	28.1	4,923.1
Shrub/Scrub	1.9	93.4
Woody Wetlands	0	1,810.1
Total	**232.6**	**86,121.9**

Source: Homer et al. 2015.

Most of the project area is disturbed industrial land 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 onsite assessment of vegetation within the project area was conducted in April 2018. No uncommon vegetation or otherwise sensitive plant communities were identified within the proposed project area.

The only woodlot within the PWB project area is located along the Green River and is dominated by silver maple, box elder, and sycamore. Other tree species include hackberry, American elm, black willow, honey locust, and green ash. The maintained/mowed green space within the project area is dominated by fescue and red clover. Immature volunteer trees of eastern red bud and a Callery (Bradford) pear along with common reed and Japanese honeysuckle were observed sporadically within the project area.

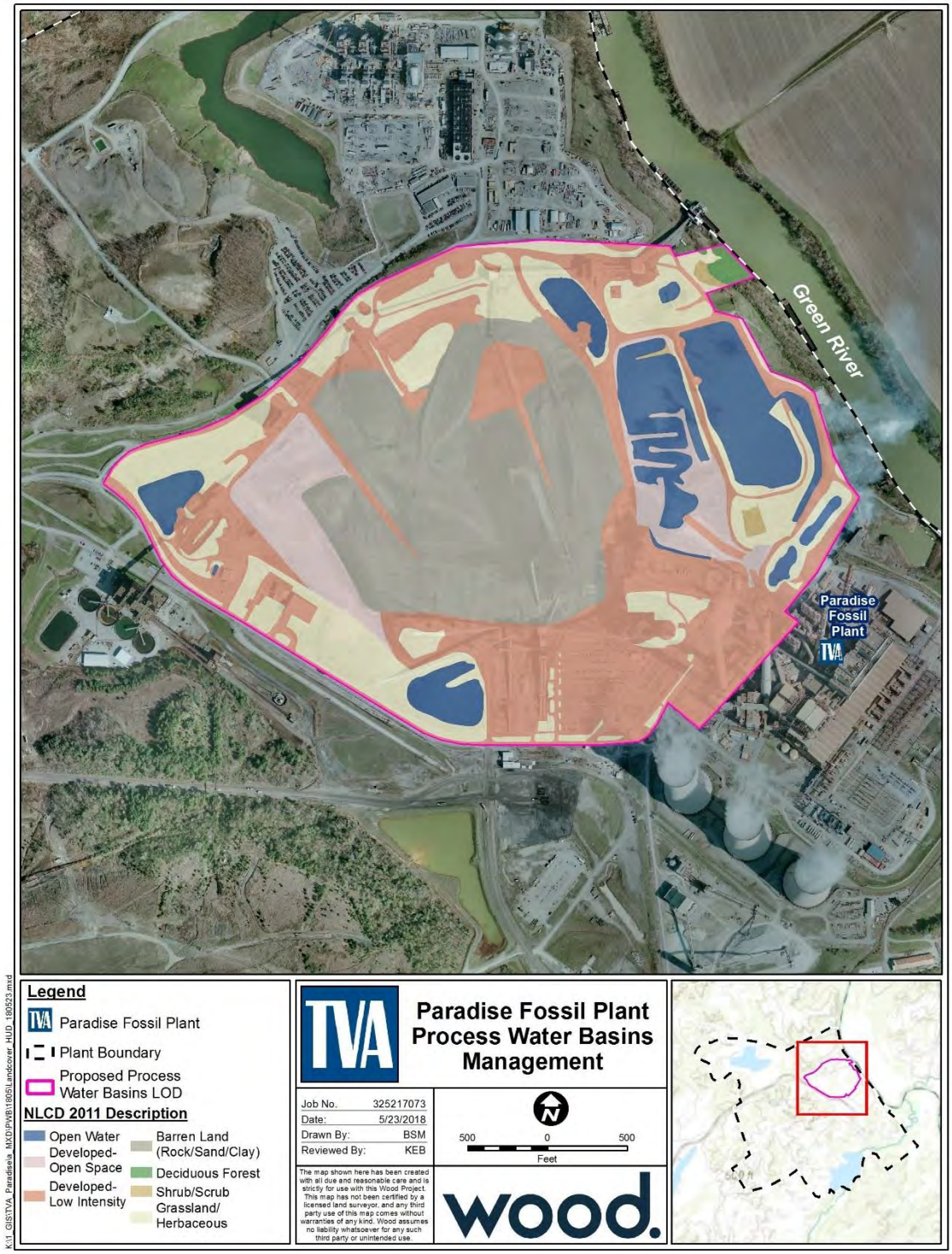

Figure 3-4. Land Cover of PAF PWB Project Area

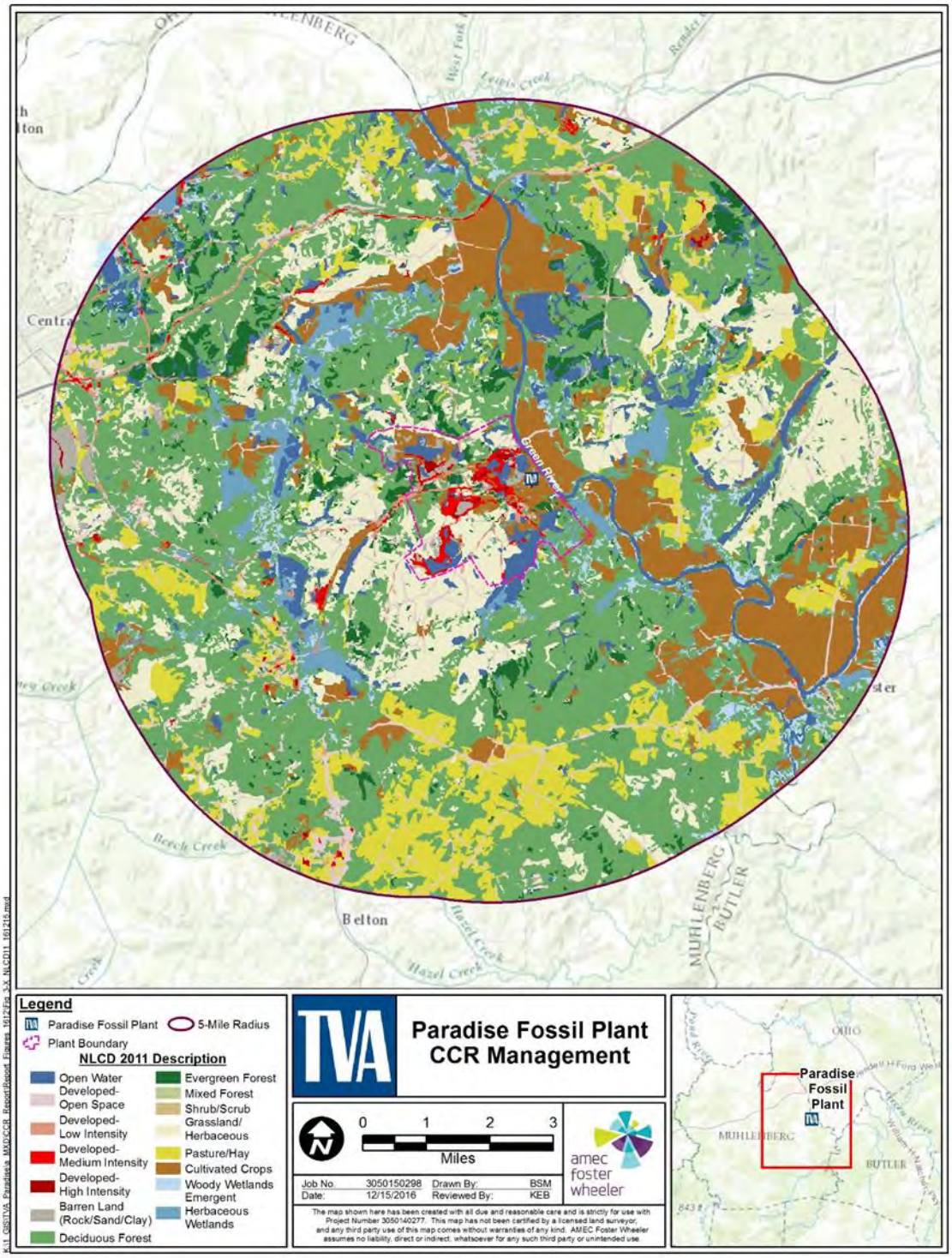

Figure 3-5. Land Cover within the Vicinity of PAF

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. However, based on an onsite field visit, none of these communities are located within the project area.

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would implement the selected alternative identified in the 2017 EA. As such, the proposed action as described under the 2017 EA and related FONSI represents the baseline condition. Therefore, no further project-related environmental impacts with respect to vegetation would occur under this alternative

3.5.2.2 Alternative B – Development of PWBs in an Alternate Location

Impacts to vegetation would generally result from ground disturbance activities related to development of the PWBs and associated infrastructure. However, disturbance would primarily occur to developed open space, barren lands, and the highly disturbed plant communities within the industrialized portion of the site. Impacts to the relatively undeveloped riparian forested area along the Green River would be approximately 0.9 acre and are minor.

Construction activities would use equipment transported to the project area from offsite locations. As such the use of offsite equipment has the potential to contribute to the spread of invasive plant species (e.g., autumn olive, Japanese honeysuckle, sericea lespedeza, common reed and Johnson grass). However, any temporary use areas within the project area would be revegetated 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.

Therefore, because the project area is predominantly a previously disturbed industrial site, impacts to the forested riparian zone along the Green River are limited, and potential expansion of invasive species would be minimized through use of BMPs, impacts to vegetation are minor.

3.6 Wildlife

3.6.1 Affected Environment

Much of the area proposed for development of the PWBs and associated spillway have been disturbed and altered as a result of construction and operation of the existing facility. As described in Section 3.5 Vegetation, plant communities in the project area have been extensively 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 portion of the proposed PWB LOD is comprised of herbaceous grassed area (44 acres) and barren land (61 acres).

Wildlife species present in the more developed portions of the site include those often associated with human presence such as the American robin, northern cardinal, European starling, house sparrow, killdeer, and rock dove. The more heavily vegetated areas support

a community supporting a wider range 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 sparrow, indigo bunting, red-winged blackbird, eastern bluebird, northern mockingbird, 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 and slag ponds offer suitable habitat and foraging opportunities for water birds, amphibians, and mammals. Despite the continual disturbance of the ponds, wildlife occasionally using them include black duck, mallard, great blue heron, and Canada geese (TVA 2003 and 2004). 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 surrounding PAF 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. The forested habitat located within the vicinity of the undeveloped area between the slag impoundment and the Green River could provide potentially suitable habitat for species characteristic of riparian zones. The young age class of the trees within this area, the frequent noise disturbance, and the intensely industrialized and disturbed land uses in the immediate project vicinity, likely limits the suitability of these areas.

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.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would implement the selected alternative identified in the 2017 EA. As such, the proposed action as described in the 2017 EA and related FONSI represents the baseline condition. Therefore, no further project-related environmental impacts with respect to wildlife would occur under this alternative.

3.6.2.2 Alternative B – Development of PWBs in an Alternate Location

Under this alternative TVA would implement Alternative B as described in the previous EA, but would develop the lined PWBs in a location immediately north of Slag Impoundments 2A/2B. Development of the PWBs would largely occur in intensely disturbed areas that offer little habitat for wildlife. Resident wildlife in these areas are likely using the landscape opportunistically, and would continue to do so after construction of the PWBs had been completed. During construction, most wildlife present in the area would disperse to adjacent and/or other similar habitats. Direct temporary effects to some individuals may occur if

those individuals are less mobile during the time of construction, especially if construction occurs during breeding/nesting season. Other individuals that would be considered less mobile may include members of the invertebrate community, in which case a loss of individuals and species diversity due to construction would be minimal given the limited availability of habitat within the proposed PWB project area. Following the construction period, it is probable that the PWBs would be recolonized by aquatic invertebrate taxa suited to inhabit impaired water bodies. Other common terrestrial invertebrates would likely recolonize in all other areas surrounding the PWBs.

Additionally, the implementation of Alternative B requires that flow from the PWBs be released to the Green River from a separate permitted KPDES outfall after final treatment in PWB 3. Construction of this outfall would result in the loss of a very limited amount of low quality, forested riparian habitat. Proposed actions are not expected to substantially impact the local population of any wildlife species. Adjacent areas provide forested habitat that would accommodate displaced biota. 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.

While the proposed project would result in alteration of habitats and possible 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 area and the availability of higher quality habitat in close proximity, potential direct and indirect impacts to associated wildlife are expected to be minor.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

The Endangered Species Act (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 U.S. Fish and Wildlife Service (USFWS).

The Commonwealth 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; additionally, the KSNPC and TVA both maintain databases of aquatic and terrestrial animal species that are considered threatened, endangered, of 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.

3.7.1.1 Wildlife

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

3.7.1.1.1 Terrestrial Animals

Henslow's sparrow utilizes 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). Presence of this species has not been documented at PAF (TVA 2013; TVA 2016b).

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 PAF (TVA 2016).

Short-eared owl inhabits 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 2016b).

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 2016b). As emergent aquatic vegetation is generally not available within the PAF, little habitat for these species exists within PAF.

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

Common Name	Scientific Name	Status		Suitable Habitat Present[4]
		Federal[1]	State[2] (Rank[3])	
Aquatic Snails				
Rugged Hornsnail*	*Pleurocera alveare*	SOMC	S(S3S4)	N
Mollusks				
Catspaw*	*Epioblasma obliquata*	LE	E(S1)	N
Fanshell*	*Cyprogenia stegaria*	LE	E(S1)	N
Little Spectaclecase*	*Villosa lienosa*	--	S(S3S4)	N
Pocketbook*	*Lampsilis ovata*	--	E(S1)	N
Purple Lilliput*	*Toxolasma lividus*	SOMC	E(S1)	N
Pyramid Pigtoe*	*Pleurobema rubrum*	SOMC	E(S1)	N
Rough Pigtoe*	*Pleurobema plenum*	LE	E(S1)	N
Crustaceans				
Mud River Crayfish	*Orconectes ronaldi*	--	T(S2S3)	N
Fish				
Chestnut Lamprey*	*Ichthyomyzon castaneus*	--	S(S2)	N
Lake Chubsucker	*Erimyzon sucetta*	--	T(S2)	
Longhead Darter	*Percina macrocephala*		E(S1)	N
Redspotted Sunfish	*Lepomis miniatus*	--	T(S2)	N
Amphibians				
Bird-voiced Treefrog*	*Hyla avivoca*		S (S3)	N
Eastern Hellbender	*Cryptobranchus alleganiensis*	SOMC	E(S1)	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				
American Bittern	*Botaurus lentiginosus*	--	H(SHB)	N
Bald Eagle*	*Haliaeetus leucocephalus*	DM	T(S2B, S2S3N)	N
Bank Swallow*	*Riparia*	--	S(S3B)	N
Barn Owl	*Tyto alba*	--	S(S3)	N
Bell's Vireo*	*Vireo bellii*	SOMC	S(S2S3B)	Y, P (past record within the South Spoil Area)
Common Gallinule*	*Gallinula galeata*	--	T(S1S2B)	N
Great Egret*	*Ardea alba*	--	T(S2B)	P
Henslow's Sparrow*	*Ammodramus henslowii*	SOMC	S(S3B)	P
Hooded Merganser*	*Lophodytes cucullatus*	--	T(S1S2B, S3S4N)	P (foraging only)
Lark Sparrow	*Chondestes grammacus*	--	T(S2S3B)	P
Least Bittern*	*Ixobrychus exilis*	--	T(S1S2B)	N

Common Name	Scientific Name	Status		Suitable Habitat Present[4]
		Federal[1]	State[2] (Rank[3])	
Long-eared Owl*	*Asio otus*	--	E(S1B, S1S2N)	N
Northern Harrier*	*Circus cyaneus*	--	T(S1S2B, S4N)	P
Osprey*	*Pandion haliaetus*	--	S(S2S3B)	Y
Sedge Wren*	*Cistothorus platensis*	--	S(S3B)	N
Short-eared Owl*	*Asio flammeus*	--	E(S1B, S2N)	N
Mammals				
Evening Bat*	*Nycticeius humeralis*	--	S(S3)	P (foraging only)
Gray Bat	*Myotis grisescens*	LE	T(S2)	P (foraging only)
Indiana bat*	*Myotis sodalis*	LE	E(S1S2)	P (foraging only)
Northern long-eared bat	*Myotis septentrionalis*	LT	E(S3)	P (foraging only)
Southeastern Bat	*Myotis austroriparius*	SOMC	E(S1S2)	P (foraging only)
Plants				
Buffalo Clover	*Trifolium reflexum*	--	E(S1S2)	N
French's Shooting Star	*Dodecatheon frenchii*	--	S(S3)	N
Hair Grass	*Muhlenbergia glabrifloris*	--	S(S2S3)	N
Rose Turtlehead	*Chelone obliqua* var. *speciosa*	--	S(S3)	N
Southern Wild Rice	*Zizaniopsis miliacea*	--	T(S1S2)	N
Trepocarpus	*Trepocarpus aethusae*	--	S(S3)	N
Water Hickory	*Carya aquatica*	--	T(S2S3)	N
Water-purslane	*Didiplis diandra*	--	E(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.

Lark sparrow utilizes 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 harrier 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 harrier 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 PWB limits of disturbance (TVA 2016a).

Sedge wrens nest throughout Kentucky and reside in wet grasslands and savannas 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 exist within a mile of the PWB limits of disturbance in the native grasslands of the Peabody WMA (TVA 2016a).

Bald eagle is 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 miles north of PWB limits of disturbance (TVA 2016b, 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. Only one known record of occurrence exists within 3 miles of the proposed PWB limits of disturbance (TVA 2016b).

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 the PWB limits of disturbance (TVA 2016b). Nesting ospreys on transmission line towers were also observed within the PWB limits of disturbance during a field assessment conducted in 2018.

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 2016b). 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 treefrog is a species that primarily inhabits 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 the Peabody WMA, where occurrences have been recorded. The bird-voiced treefrog has been recorded near the Peabody Ash Impoundment (TVA 2016b); however, suitable habitat does not occur within the project areas as the existing slag impoundments with the PWB limits of disturbance do not provide suitable breeding habitat.

Eastern ribbon snake is a semi-aquatic species that is 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 2016b). The wetland near the PWB limits of disturbance is a relatively small forested wetland and does not meet the habitat requirements of the eastern ribbon snake and no habitat for hibernation exists within the proposed project areas.

Broad-winged skipper is a butterfly 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 boundary, but not within the PWB limits of disturbance. 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 area 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 April 2018, suitable roost habitat for the evening bat does not occur in the project areas on the PAF reservation. The slag ponds may provide some

suitable foraging habitat within the project area. However, no species records occur within 5 miles of PAF.

Southeastern bat is 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 slag ponds 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. This species is 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 area because of a lack of caves, mines, or suitable buildings. Low quality foraging habitat exists over the slag ponds. 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 United States. This species' range extends from New York and New Hampshire in the north to Alabama, Georgia, and Mississippi in the south, and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees, 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 United States from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming, and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) 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 Muhlenberg 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 April 2018, TVA conducted an assessment to determine bat habitat suitability within forested areas of the proposed PWB limit of disturbance. Woodlots within the PWB limits of disturbance were characterized by the information within the USFWS Phase I Summer Habitat Assessment form (USFWS 2018). 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.

Only one small (~0.9 ac) woodlot was identified within the proposed PWB limits of disturbance. This woodlot is adjacent to the Green River and is dominated by silver maple, box elder, and sycamore. Other species included hackberry, American elm, black willow, honey locust, and green ash. Surveys of this woodlot 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. 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. 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.

3.7.1.1.2 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 (Virginia Department of Game and Inland Fisheries [VDGIF] 2015). No suitable habitat for this species is present within the project area. 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 (NatureServe 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. None of these species are known to occur within the project area, and because the PWB project area does not contain perennial aquatic environments, none of the listed mussel species would occur within the project area.

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 area; therefore, this species is not likely to be found within the project area.

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. This species 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). However, no suitable habitat for the chestnut lamprey exists within the PWB project area.

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 lake chubsucker was collected at PAF during 2006-2008 fish impingement studies (TVA 2009), but no suitable habitat exists within the PWB project area.

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.

3.7.1.2 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 2016b). 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 3-3). 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 3-4. 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 study area make it unlikely that any buffalo clover populations persist within PAF.

Table 3-4. 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
Buffalo Clover	Prairies and disturbed openings either associated with forests or opportunistically in fields or well-drained sites.	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
Rose Turtlehead	Floodplain and alluvial forests, swamps and sloughs.	No
Southern Wild Rice	Swamps and stream margins.	No
Trepocarpus	Margins of swamp forests and sandy river bottoms.	No
Water Hickory	Bottomlands and floodplain swamps.	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

Source: KSNPC 2014

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would implement the selected alternative identified in the 2017 EA. As such, the proposed action as described under the prior EA and related FONSI represents the baseline condition. Therefore, no further project-related environmental impacts with respect to threatened and endangered species would occur under this alternative

3.7.2.2 Alternative B – Development of PWBs in an Alternate Location

The proposed PWBs and associated outfall to the Green River would be constructed on a site that is heavily disturbed and largely comprised of fill material from past and present PAF operations and is generally unsuitable for the listed species in Table 3-4. 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. Additionally, water discharges will be routed through a permitted outfall and would meet 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 predominantly 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 PWBs for the listed bats, 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 more extensive and higher quality foraging habitat for these species. A number of activities associated with the proposed action were addressed in TVA's programmatic consultation with the U.S. Fish and Wildlife Service on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. These activities and associated conservation measures are identified on the TVA Bat Strategy Project Screening Form for this action (Appendix C) and would be implemented as part of the proposed action.

TVA's implementation of standard best management practices and other bat strategy conservation measures (Appendix C) would minimize or prevent any impacts to foraging habitat. None of these species has 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 PWBs 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.

3.8 Wetlands

3.8.1 Affected Environment

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).

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 impacts to wetlands and to preserve and enhance their natural and beneficial values.

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) (AECOM 2016). A single jurisdictional wetland (0.06 acre) was identified adjacent to the project area within the riparian zone along the Green River (see Figure 3-2).

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would implement the selected alternative identified in the 2017 EA. As such, the proposed action as described under the prior EA and related FONSI represents the baseline condition. Consequently, there would be no impact to jurisdictional wetlands under this alternative.

3.8.2.2 Alternative B – Development of PWBs in an Alternate Location

A single small wetland was documented at PAF in the vicinity of the project area (see Figure 3-2). However, in development of proposed plans for the spillway from PWB 3 to the Green River, TVA was able to avoid the identified wetland. BMPs as described in the "Kentucky Best Management Practices for Construction Activities" guide (KDOW 2005) would be used during construction activities to minimize indirect impacts to the adjacent wetland from erosion. Therefore, under this alternative there would be no temporary or permanent impacts to wetlands. Consequently, this alternative is consistent with the requirements of EO 11990.

3.9 Cultural Resources and Historic Resources

3.9.1 Affected Environment

3.9.1.1 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.

3.9.1.2 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. The APE for cultural resources for this supplemental analysis includes the 232-acre area that contains the Slag Pond Impoundment 2A/2B and the Stilling Pond 2C, the proposed PWBs 1, 2, and 3, and the spillway area adjacent to the Green River. With the exception of the proposed spillway area, all activities associated with the proposed action will be limited to previously disturbed areas.

3.9.1.3 Previous Archaeological Studies

TVA has conducted records searches at Kentucky Office of State Archaeology, located in Lexington, Kentucky, to identify previously recorded archaeological resources listed on, or eligible for inclusion in the NRHP within the APE. No archaeological sites have been recorded within the project area.

To date, TVA has conducted two Phase I archaeological investigations under Section 106 of the NHPA within the APE. The archaeological survey 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 (Stallings 2015, Hunter 2017).

In May 2015, Amec Foster Wheeler (now Wood) completed a Phase I archaeological survey for 31 acres of proposed gas pipeline easement and unloading facility (Stalling 2015). Approximately 2.4 acres of this survey area is located within the current APE. A majority of the survey area was found to have disturbed soils. However, a small area was found to be undisturbed. A mid-twentieth century concrete building foundation (Non-site Locality 1) was identified, but, in consultation with the Kentucky SHPO, was not considered to be an archaeological site and not eligible for listing on the NRHP. No archaeological resources were recorded and no further work was recommended.

In October 2016, Amec Foster Wheeler (now Wood) completed a Phase I survey of a 358.97-acre area for a proposed Gypsum Disposal Area, Peabody Ash Pond, and Slag Ponds 2A/2B and Stilling Pond 2C (Hunter 2016). The latter is located within the current APE and measures approximately 29.3 acres. A majority of the APE showed varying amounts of disturbance from previous land modifications caused by heavy excavation equipment. The slag pond areas were not able to be accessed; however historic map and aerial photographs depicted the area as also heavily disturbed and not likely to contain intact cultural materials. No archaeological sites were identified and no further work was recommended.

3.9.1.4 Recent Archaeological Study

In April 2018, a 2.92-acre parcel of land between the Green River and Slag Impoundment 2A/2B within the northeast portion of the current APE was surveyed by Wood (Bradley 2018). This survey parcel was located on the same landform as a 6-acre area located immediately to the south that was examined during a 2014 Wood survey (Simpson 2014). The 2014 survey area is located adjacent to, but outside the current APE. The 2018 and 2014 studies produced similar results, with the upper landform consisting of deep disturbed fill layers and the lower landform consisting of recent alluvial deposits. No cultural material was recovered and no archaeological sites were identified during the 2018 survey.

3.9.1.5 Areas Not Subjected to Archaeological Investigation

The majority (197.4 acres) of the APE was not included within previous archaeological investigations. Of this area, approximately 35 acres have no potential for undisturbed archaeological deposits due to ground disturbance from coal mining. According to TVA (1964:19), the presence of coal was a major factor in the selection of this site for the Paradise steam plant:

> As soon as the location of the steam plant at Paradise had been settled, a contract for furnishing coal to the plant was executed with the Peabody Coal Company of St. Louis, Missouri. The contract calls for an unprecedented 65 million tons of coal to be delivered to the tractor hopper over a period of approximately 17 years….. All of the coal was to come from strip mines within a short distance of Paradise…. Sinclair Mine was opened adjacent to the project to supply coal directly from the strip pits…

Figure 3-6 shows areas that were surface mined and sub-surface (auger) mined by the Peabody Coal Company, as well as historical surface mines. With the exception of the PAF footprint, a very extensive portion of the PAF reservation has been affected by surface mining. The remaining areas within the APE that were not surveyed for archaeology and not part of the Sinclair Coal Mine have been affected by the construction of PAF and ancillary facilities, including ash storage areas, coal storage, conveyors, and the switchyard.

3.9.1.6 Historic Architectural Properties

TVA has conducted records searches at Kentucky Heritage Council, located in Frankfort, Kentucky, to identify previously recorded historic architectural properties listed on, or eligible for inclusion in the NRHP within the APE. No historic architectural properties have been previously recorded within the APE.

TVA has complete consultation in the past that has addressed historic architectural properties at PAF. These undertakings include; 1) construction of a pulse jet fabric filter baghouse, two ash storage silos and two hydrated lime storage silos, 2) construction of a combine combustion/combustion turbine plant on the PAF reservation, and 3) various construction activities associated with the Coal Combustion Residuals Operation Project. The result of consultation with the KY-SHPO for all three of these undertaking is consultation consensus that no NRHP-eligible or -listed historic architectural properties would be adversely affected within the APE, which includes a viewshed within one-half mile of the proposed undertakings. The KY-SHPO concurrence letters for these undertakings are provided in Appendix A.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

TVA determined there would be no impacts to cultural resources associated with implementation of the preferred alternative in the 2017 PAF CCR Management EA. Therefore, no direct or indirect impacts to cultural resources would occur under Alternative A.

3.9.2.2 Alternative B – Development of PWBs in an Alternate Location

A significant portion of the above defined APE has been previously surveyed (Hunter 2017; Simpson 2014; Stallings 2015). No archaeological sites were recorded within any of these survey areas and no further work was recommended. All three surveys documented extensive disturbance of the APE. A review of aerial photographs depicts such disturbance readily visible within the current APE related to ponded areas, roads, graded areas, and other structures necessary for plant operations.

Only an approximate 2.35-acre of land along the Green River had not been previously surveyed nor did it appear obviously disturbed on the aerial photographs. It was concluded that the proposed construction will not adversely impact any archaeological resources within the 2.35-acre parcel and no further archaeological investigations were recommended. Therefore, no cultural resources will be impacted in association with Alternative B.

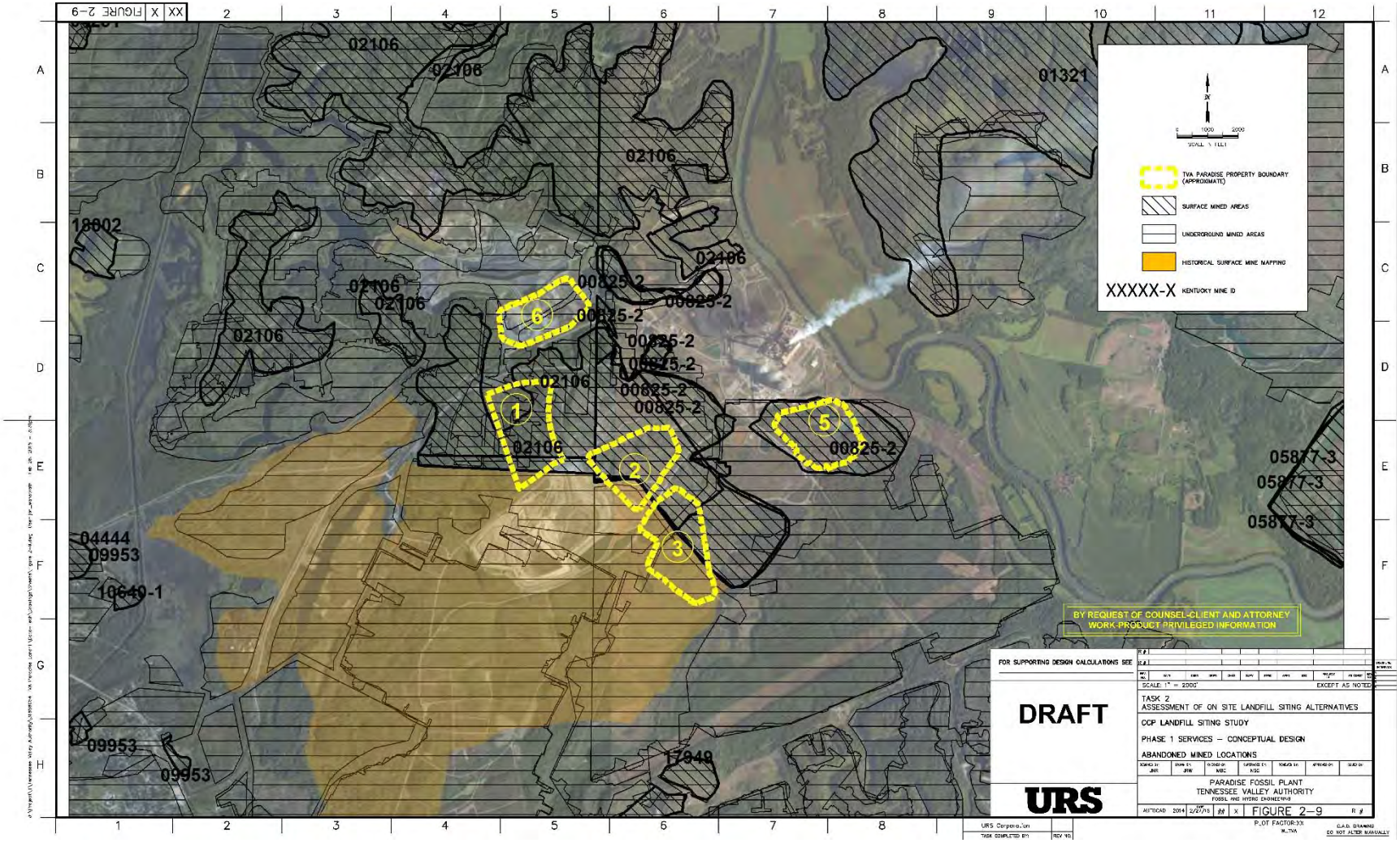

Figure 3-6. PAF Mined-out Areas

3.10 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.

Other impacts associated with Alternative B 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. BMPs to minimize runoff would be implemented, and water released by construction activities would meet established KPDES permit limits.

3.11 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 SEA focuses on the analyses of environmental impacts associated with a project proposed to support management of CCR produced at PAF. For the purposes of this section, the proposed action is considered a short-term use 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 associated with the limited clearing and use of lands within the PWB 3 spillway area. Construction activities such as site preparation and noise may displace some wildlife during the construction period. All other lands are previously disturbed. Most environmental impacts during construction activities would be relatively short term and would be addressed by BMPs and mitigation measures. Construction activities would also have a limited, yet favorable short-term impact to the local economy through the creation of construction and support jobs and revenue.

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.

3.12 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 PWBs. The term irreversible commitments of resources describe environmental resources that are potentially changed by the construction or operation of the proposed project that could not be restored at some later time to the resource’s state prior to construction or operation

Resources required by construction activities, including labor, fossil fuels and construction materials, would be committed for the life of the project. 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 land used for the PWBs is not irreversibly committed because once operations at PAF cease, the land supporting the facilities could be returned to other uses. Therefore, irreversible and irretrievable commitments associated with the implementation of Alternative B are considered minor.

3.13 Cumulative Effects

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 Coal Conditioner Plant

Past, present and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-5. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger and potentially significant adverse impacts to the resources of concern.

Table 3-5. Summary of Other Reasonably Foreseeable Future Actions in the Vicinity of the Proposed Project

Identified Actions	Description	Timing and Reasonable Foreseeability
Closure of Units 1 and 2	TVA closed Units 1 and 2 in April 2017.	Past
Onsite Landfill	As described in PAF CCR Management EA[1]	Present
CCR Dewatering and Handling Projects	As described in PAF CCR Management EA[1]	Present
CCR Impoundment Closures	As described in PAF CCR Management EA[1]	Present
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

[1]TVA 2017a

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 section. 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.

No other foreseeable future actions are known within the project vicinity.

The proposed action considered in this SEA would result in environmental disturbances to lands that are primarily previously used for industrial purposes. The limited clearing and use of lands within the PWB 3 spillway area would result in only minor effects to the riparian zone forested area and minor effects on surface waters resulting from a new KPDES discharge. No impacts would occur to sensitive species or cultural resources with the proposed action. Because these identified impacts are minor and in conjunction with other identified impacts from actions listed in Table 3-5, no additional cumulative effects are expected with the proposed action.

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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:	**Bill Elzinga (Wood)**
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:	**Benny Foshee**
Education:	B.S. Mechanical Engineering
Project Role:	Project Manager
Experience:	11 years as Project Manager for TVA Projects

Name	**A. Chevales Williams (TVA)**
Education:	B.S. Environmental Engineering
Project Role:	Surface Water
Experience:	13 years of experience in water quality monitoring and compliance; 12 years in NEPA planning and environmental services.

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

WOOD

Name:	**Jonathan Allen**
Education:	M.S. Biosystems Engineering Technology, B.S. Natural Resources Management
Project Role:	Wetlands
Experience:	12 years of experience in environmental permitting and stream/wetland delineations
Name:	**Matt Basler**
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**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	NEPA Lead (Project Coordination, NEPA Review)
Experience:	25 years of professional experience in NEPA.
Name:	**Geoff Gadd**
Education:	M.S., Geology
Project Role:	Groundwater
Experience:	2 years of professional experience environmental consulting.
Name:	**Linda Hart**
Education:	B.S., Business/Biology
Project Role	Technical Editing
Experience:	35 years of experience in production of large environmental documents including technical editing, formatting, and assembling.
Name:	**Connie Heitz**
Education:	M.P.A. Environmental Studies, B.S. Public Affairs
Project Role:	Project Coordination, NEPA Review
Experience:	25 years of experience in coordinating and managing NEPA and environmental planning studies
Name	**Wayne Ingram P.E.**
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:	**Kevin Miller**
Education:	B.S., Wildlife Biology
Project Role:	Wildlife, Vegetation
Experience:	8 years of experience

Name:	**Brian Mueller**
Education:	B.S. Limnology/Fisheries-1996, University of Wisconsin-Stevens Point ESRI Certified (ArcInfo), January 26, 1996 GIS
Project Role:	GIS
Experience:	Conducted and managed GIS applications over the past 31 years for large NEPA studies, major groundwater remediation projects, and DOD projects.

Name:	**Marc Wampler**
Education:	M.A., Anthropology; B.A., Physics
Project Role:	Cultural Resource Specialist and Archaeologist
Experience:	Over 20 years of experience implementing and managing cultural resource investigations for electric utility industry, and state/federal agencies.

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CHAPTER 5 – ENVIRONMENTAL ASSESSMENT RECIPIENTS

5.1 Federal Agencies

U.S. Army Corps of Engineers, Louisville District
U.S. Fish and Wildlife Service

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

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Appendix A – Coordination

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STEVEN L. BESHEAR
GOVERNOR

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
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PHONE (502) 564-7005
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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

STEVEN L. BESHEAR
GOVERNOR

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CRAIG A. POTTS
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

February 18, 2014

Clinton E. Jones
Environmental Permits and Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: Proposed TVA Paradise CC/CT Plant
Muhlenberg County

Dear Mr. Jones,

Thank you for your letter and documentation submitted to our office in relation to the above-listed proposed TVA undertaking. From your letter, we understand that TVA is using a phased identification and evaluation process as part of the Section 106 compliance measures for the proposal to replace Paradise Fossil Plant (PAF) Units 1 and 2 with a combined combustion/combustion turbine plant (CC/CT plant). This undertaking will involve three principal elements: 1) construction of the CC/CT plant; 2) a transmission line to connect the proposed CC/CT plant to the PAF switchyard; and 3) one or more gas pipelines to bring natural gas to the plant. The current submission is related to the CC/CT plant only. TVA expects to submit additional detailed plans and documentation regarding the two remaining elements with future correspondence.

Direct Area of Potential Effects

From the information submitted, we understand that the proposed project area has been heavily impacted by previous mining activity and that no previously identified archaeological resources are within the direct APE. As such, TVA recommends that the potential for intact archaeological deposits within the APE is "essentially nil" and that the project has no potential to affect archaeological resources.

We agree that the potential to encounter intact archaeological resources that are eligible for the NRHP within the direct APE is quite low given the previous impacts to the project area from mining activities. However, there are several prehistoric sites and historic cemeteries in the vicinity that contain human remains and we would advise TVA to ensure that those implementing this project be made aware of TVA's responsibilities should there be an inadvertent discovery—both in compliance with relevant state and federal regulations.

Indirect Area of Potential Effects

TVA identified the indirect APE based on 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. According to your letter, a preliminary site check with our office resulted in the identification of a single resource—a historic cemetery that is within the PAF property and is maintained by TVA. Your letter also references previous consultation with our office concerning the eligibility status of the PAF itself, which concluded that the resource is not currently eligible for listing on the National Register of Historic Places. You further indicate that no additional extant structures that are 50 years or older than the PAF are located within the indirect APE.

As a result of these findings and those discussed above concerning archaeology, TVA recommends a determination that no historic properties would be affected by the proposed undertaking. We do not currently have sufficient information to concur with this determination, and we have several questions concerning the assessments made by TVA regarding this project.

First, what was the basis for establishing the indirect APE at one-half mile? Your submission does not include elevations or other basic information on the proposed structure, so it is difficult for us to independently evaluate the appropriateness of this APE. This is a point of concern in part because a NRHP-listed resource, MU1 (Airdrie Ironworks Furnace), lies just beyond the half-mile radius. We feel that the potential impacts to this Historic Property should be taken into consideration, including cumulative impacts. We request your recommendation of potential impacts to MU1 and sufficient documentation so that we may make our own determination.

Second, it is our understanding that the report of previously-identified sites you obtained from the Site Identification program of our office included another NRHP-listed and National Historic Landmark property, OH2 (Indian Knoll), within the indirect APE. While this site was not referenced in your Section 106 submission, it is a resource that is worth further consideration for potential impacts—as may be expressed by our office or by any Tribes or others who may be participating in the consultation process for this undertaking. The fact that it is located on the opposite side of the Green River from the project area may mean that it will not suffer direct impacts, but that does not preclude consideration of other potential impacts to this significant resource. What does TVA recommend regarding potential impacts to this site? We direct TVA to 36 CFR Sections 800.6 and 800.10, and the appropriate steps regarding the Section 106 process and National Historic Landmarks.

Lastly, we request documentation of TVA's compliance with the Consulting Parties process for this undertaking and efforts to engage the Public. We are interested to know if other parties, including the Tribes, have expressed concerns over potential impacts to cultural resources from this project.

We look forward to receiving the additional information requested and to continuing consultation on the remaining elements of the proposed undertaking. Should you have any questions, feel free to contact Kary Stackelbeck of my staff at 502.564.7005, extension 115.

Sincerely,

Craig A. Potts
Executive Director and
State Historic Preservation Officer

CP:ks

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

March 25, 2014

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 (PAF) COMBINED COMBUSTION/COMBUSTION TURBINE (CC/CT) PLANT, MUHLENBERG COUNTY, KENTUCKY

We recently received your letter (dated February 18 and received March 4, 2014) regarding the above-listed proposed TVA undertaking. From the letter, we understand that you have concerns about TVA's responsibilities in the event of inadvertent discoveries, and that you are requesting additional information concerning TVA's findings and determinations. Given that we initiated consultation under Section 106 of the National Historic Preservation Act with your office in our letter of October 11, 2013, and that your comments were not received within the time prescribed in the Advisory Council's regulations implementing Section 106, we consider TVA's obligations under Section 106 for this undertaking to have been completed. However, TVA appreciates the concerns that you have, and is providing the requested information as a professional courtesy.

Direct Area of Potential Effects

From your letter, we understand that our agencies agree that the undertaking will have no direct effects to any archaeological resources eligible for listing in the National Register of Historic Places (NRHP). You are advising TVA to ensure that those implementing the project be made aware of TVA's responsibilities should there be an inadvertent discovery. TVA is in the process of drafting an inadvertent discovery plan (Plan) for the construction of the PAF CC/CT plant, and will implement the Plan during construction. The Plan will contain a description of the types of resources that could be inadvertently discovered, a detailed set of procedures to be followed in the event of an inadvertent discovery, and the names and contact information of local authorities and TVA personnel who should be contacted in such an event. Work crews will be instructed that, in the event of an inadvertent discovery, work within a 50-foot radius of the discovery will cease immediately and the TVA archaeologist will be contacted. Work will not resume until TVA has complied with all relevant state and federal laws and regulations pertaining to the discovery. Copies of this plan will be distributed to project managers and supervisors prior to construction.

Indirect Area of Potential Effects
Your letter asks for the basis of establishing an indirect APE of one-half mile (shown below in Map 1) for potential impacts to architectural resources surrounding the CC/CT plant. We defined the APE in a way that we believe satisfies TVA's responsibility under 36 CFR Part 800.4 to make a "reasonable and good faith effort to carry out appropriate identification efforts." In defining this APE, we took the following factors into consideration: local topography; local vegetation and land use; known historic structures in the area; and the presence of contemporary structures including PAF and associated infrastructure, as well as roads, highways, railroads, local utility lines, etc. Based on these considerations, the architectural APE was determined to be a 0.5 mile radius surrounding the proposed CC/CT plant footprint.

You asked TVA to consider the potential indirect effects to MU1, the Airdrie Iron Furnace, when defining the APE. From the descriptions and current photographs that we examined, it is clear that this resource was constructed adjacent to the Green River at an elevation of approximately 410 feet above mean sea level (amsl), at the foot of a steep hill. The extant structures include a foundry that rises approximately three stories and a smoke stack that rises several feet higher. However, the upper elevations of these structures are lower than the adjacent hill side, which rises to over 510 ft. amsl, is thickly wooded, and lies immediately west and south of the structures. Recent photographs of the Airdrie Iron Furnace show it is surrounded by thick vegetation including trees that tower above it. There would be no direct line of sight from this resource to the proposed new PAF CC/CT plant due to the combined effects of topography and vegetation. For this reason, TVA does not consider the Airdrie Iron Furnace to be within the undertaking's indirect APE.

In addition, the integrity of setting of the Airdrie Iron Furnace appears to have been compromised by past mining activity and the construction of PAF in the 1960s. Photo 1 (below), from TVA's Historic Photograph Collection, was taken in 1969 when construction of PAF was nearing completion. It is an oblique aerial view looking to the north/northwest across the plant, with the ash/slag pond in the middle distance. Airdrie Hill is visible in the upper center of the photograph. Photo 1-detail (below) is an enlarged detail showing Airdrie Hill. At that time the hill had been completely stripped of vegetation; the southern end of the hill had been cut away, and northeast trending gullies had been cut into the hill, leaving a series of artificial ridges aligned on a southwest/northeast axis. All of this left a landform bearing little resemblance to that shown on the 1963 USGS Paradise, KY 7.5-minute quadrangle (Map 1). The Airdrie Iron Furnace does not appear to be visible in the photograph, but would be located within the narrow strip of woods along the bank of the Green River. This logging and mining activity clearly affected the historic setting of Airdrie Iron Furnace. While the existing smokestacks and cooling towers may be visible from this resource, the proposed CC/CT plant would not be visible. Thus, both the past mining activity in the vicinity and the changes in the visual setting due to the construction of PAF and associated infrastructure have already altered the integrity of setting of the Airdrie Iron Furnace. Therefore, even though the Airdrie Iron Furnace is not within TVA's APE, it is worth noting that its integrity of setting has been compromised previously.

Your letter asks for TVA's recommendation regarding potential impacts to archaeological site 15OH2, the Indian Knoll Site. This site is located on the opposite side of the Green River,

outside the archaeological APE. TVA's undertaking does not include any plans for ground disturbing work in that vicinity. Therefore, TVA found that the current undertaking would not affect this archaeological site.

You also asked for documentation of TVA's Section 106 consultation with other consulting parties. We have enclosed copies of the relevant correspondence.

We hope this responds to your request for additional information. As indicated in our October 11, 2013 letter, we will consult further with your office when detailed plans are available for any future TVA actions related to this undertaking.

Sincerely,

Clinton E. Jones, Manager
Biological and Cultural Compliance, Environment
WT11B-K

SCC:CSD

Enclosures

INTERNAL COPIES ONLY, NOT TO BE INCLUDED WITH OUTGOING LETTER:

Brenda Brickhouse, BR 4A-C
Khurshid Mehta, WT 6A-K
Chuck Nicholson, WT11D-K
Richard Yarnell, WT11D-K
EDMS, WT CA-K

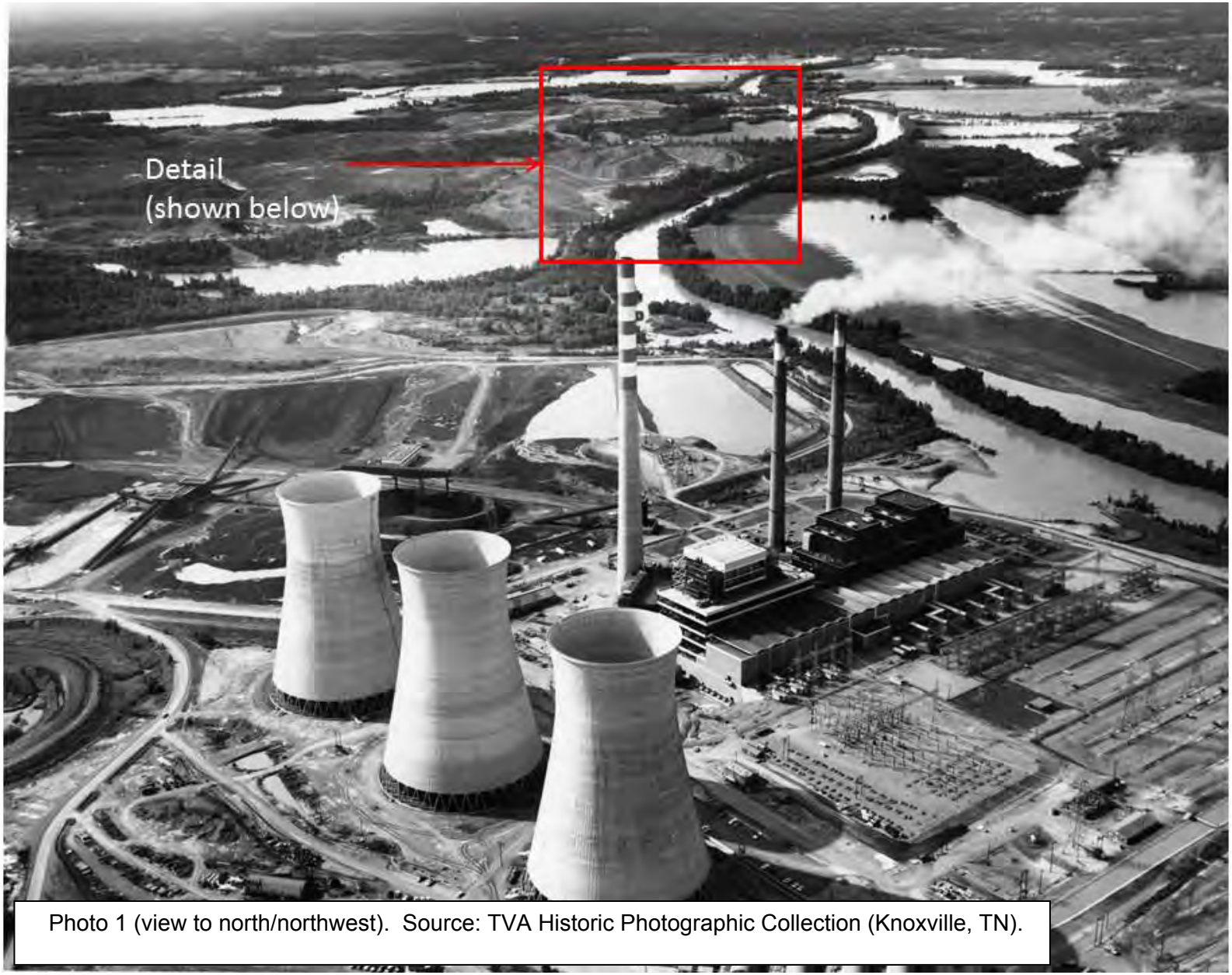

Photo 1 (view to north/northwest). Source: TVA Historic Photographic Collection (Knoxville, TN).

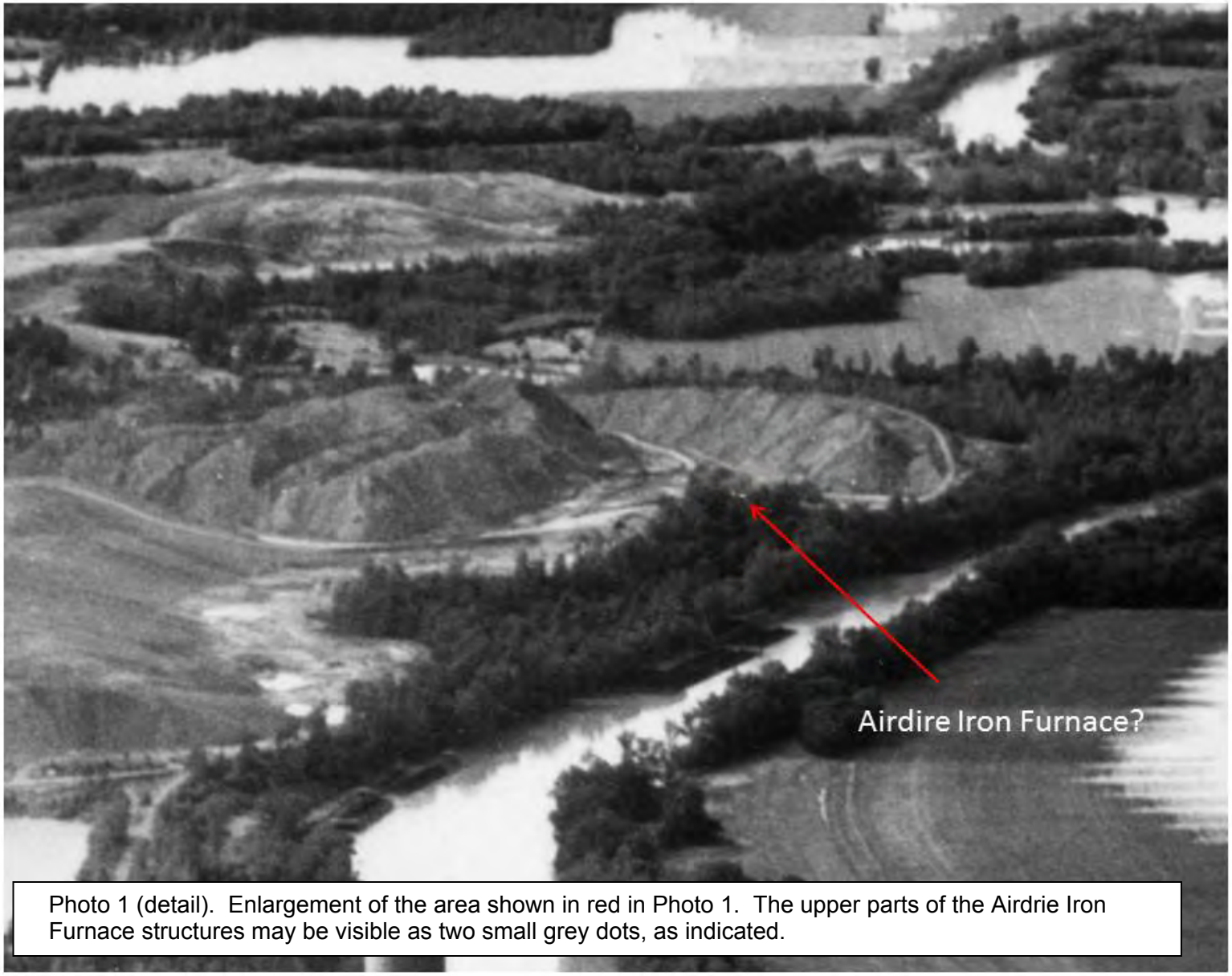

Photo 1 (detail). Enlargement of the area shown in red in Photo 1. The upper parts of the Airdrie Iron Furnace structures may be visible as two small grey dots, as indicated.

STEVEN L. BESHEAR
GOVERNOR

BOB STEWART
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
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www.heritage.ky.gov

CRAIG A. POTTS
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

April 29, 2014

Clinton E. Jones
Environmental Permits and Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: Proposed TVA Paradise CC/CT Plant
Additional Information
Muhlenberg County

Dear Mr. Jones,

Thank you for your letter and additional documentation submitted to our office per an earlier request in relation to the above-listed proposed TVA undertaking (received March 26, 2014). We appreciate your consideration of our earlier comments (dated February 18, 2014).

Direct Area of Potential Effects

Thank you for the additional information concerning the development of an inadvertent discovery plan in the area of direct potential effects.

Indirect Area of Potential Effects

TVA identified the indirect APE based on 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. From your letter, we understand that TVA established this indirect APE based on viewshed and what you know to be the maximum height of new construction. You have confirmed that Site MU-1/Airdrie Furnace has no direct line of sight to new construction. Since we did not participate in the development of the APE and don't have all the details you considered, we strongly encourage you to document the specific information you used in your files for this undertaking.

We appreciate the information you provided on changes in setting for MU1/Airdrie Furnace. Many of the changes you highlight appear to have already taken place by the time the resource was determined eligible for the National Register, so it does not appear eligibility status needs to be reconsidered. Where these changes would seem to become important is in considering whether future projects at the plant contribute to any cumulative effect when taken with the historic changes noted.

We understand that TVA considers the Indian Knoll site (15Oh2), which is a contributing site to the Green River Shell Midden Archaic National Historic Landmark, to be outside of the project APE.

Should the project plans change, or should additional information become available regarding cultural resources or citizens' concerns regarding impacts to cultural resources, please submit that information to our office as additional consultation may be warranted. We look forward to future consultations on remaining elements of this project as plans are developed. Should you have any questions, feel free to contact Kary Stackelbeck of my staff at 502.564.7005, extension 115.

Sincerely,

Craig A. Potts
Executive Director and
State Historic Preservation Officer

CP:kls

Received 5/5/14 (CS)

MATTHEW G. BEVIN
GOVERNOR

DON PARKINSON
SECRETARY

TOURISM, ARTS AND HERITAGE CABINET
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REGINA STIVERS
DEPUTY SECRETARY

CRAIG A. POTTS
EXECUTIVE DIRECTOR
& STATE HISTORIC
PRESERVATION OFFICER

September 5, 2017

Mr. Clinton E. Jones
Biological and Cultural Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

Re: Phase I Architectural Survey of Proposed Improvements at TVA's Paradise Fossil Plant (PAF), Muhlenberg County, Kentucky
KHC Project Registration # FY 17 - 2505

Dear Mr. Jones,

Thank you for the above referenced report referenced in your March 2, 2017 letter to our office. We were not able to review the above-ground component of this submission within the period allowed for our comment. However, in order to complete the recording of these historic properties in our databases we need to comment on the eligibility of each property. Upon review we concur with all of the eligibility recommendations listed in the above referenced report.

We apologize for the delay in our reply and look forward to working with you on future projects. If there are specific issues regarding the above referenced report that you still wish our office to comment or should additional information become available regarding cultural resources or citizens' concerns regarding impacts to cultural resources, please contact our Site Protection Program Administrator, Nick Laracuente at nicolas.laracuente@ky.gov.

Sincerely,

Craig A. Potts,
Executive Director and
State Historic Preservation Officer

CP: nrl, cs
KHC # 48665

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

June 29, 2018

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, PROCESS WATER BASIN, MUHLENBERG COUNTY, KENTUCKY

TVA proposes to construct and operate three process water basins (PWB) at Paradise Fossil Plant (PAF) in Muhlenberg County, Kentucky (see Figure 1 below). The PWBs would be part of a system for treating wastewater runoff from the coal yard drainage basin and other process water plant flows. Piping would connect the PWBs to a new proposed coal yard basin, to one another, and to the outfall (Figure 2). Construction of the PWBs would support TVA's goals to eliminate all wet storage of coal combustion residuals (CCR) at PAF and meet new CCR regulations. TVA's current plans include construction of three adjacent basins north of the existing Slag Impoundment 2A/2B.

This proposed action would be part of the CCR Management project, for which we initiated consultation with your office in February 2017. At that time, the project consisted of constructing and operating fly ash conversion and gypsum dewatering facilities, constructing and operating a new CCR "special waste" landfill, and closing existing impoundments. Our consultation also included proposed bottom ash dewatering and waste water treatment facilities. Our offices agreed that the undertaking would not result in effects on any historic properties (please refer to your letter to Clint Jones dated May 23, 2017). Recently, TVA modified these plans to include the construction and operation of the three PWBs. Hence, by this letter we are continuing our consultation pursuant to Section 106 of the National Historic Preservation Act.

The footprints of the PWBs and associated piping have potential for direct effects on historic properties resulting from ground disturbance. These areas coincide only partially with the previously-determined APE for the CCR management project (see Figure 3, below). The PWB footprint lies mostly outside of the previously-determined APE (please compare Figures 2 and 3). In addition, based on the newly proposed actions and construction engineering changes, TVA has identified a larger area (approximately 232 acres) where ground disturbance could occur resulting from PWB construction and related actions ("limits of disturbance", or LOD). We consider the PWB LOD as an expansion of the CCR Management project APE. The PWB LOD is shown in figures 1 and 2. TVA determined the APE for indirect (visual) effects, for the PWBs, to be the viewshed within a half-mile radius of the proposed PWB and pipeline.

TVA has conducted records searches at Kentucky Office of State Archaeology in Lexington to identify previously recorded archaeological resources listed in or eligible for inclusion in the NRHP within the APE. No archaeological sites or NRHP-eligible structures have been recorded within the project area.

The PWB LOD area can be subdivided into different zones based on their potential to contain archaeological sites. Approximately 35 acres were included in two previous archaeological surveys (Hunter 2016, Stalling 2015). No archaeological sites were identified in the PWB LOD in either survey and TVA completed section 106 consultation for both. Of the remaining areas in the PWB LOD, approximately 35 acres were affected by severe ground disturbance from historic coal mining. Figure 4 shows areas that were surface mined and sub-surface (auger) mined by the Peabody Coal Company, as well as historical surface mines. In addition, approximately 159 acres were affected by the construction of PAF and ancillary facilities, including ash storage areas, coal storage, slag ponds, conveyors, roads, and a parking lot, as shown in Figure 2. TVA finds that there is no potential for intact archaeological sites in any of the areas affected by past coal mining and/or PAF construction. In sum, approximately 229 acres of the PWB LOD have either been investigated archaeologically and contain no sites, or have no potential for archaeological sites due to past disturbance (Table 1).

Table 1. Zones within the Process Water Basin LOD area

Zone	***Approximate acreage***
Previously surveyed areas	35
Affected by past coal mining	35
Affected by PAF construction	159
Subtotal	229

The remaining area consists of a 2.92-acre parcel of land between the Green River and Slag Impoundment 2A/2B where the PWB outfall would be constructed. In order to identify any archaeological sites in this area TVA contracted with Wood to perform a Phase I archaeological survey. An electronic copy of the draft archaeological survey report titled, *Phase I Archaeological Survey, TVA Paradise CCR Basins Outfall Pipeline Survey, Muhlenberg County, Kentucky—Abbreviated No Find Report*, is attached.

This survey parcel is located on the same landform as a 6-acre area located immediately to the south (outside the current LOD) that was examined during a previous archaeological survey (Simpson 2014) for a proposed barge roll-off improvement project. No cultural material was recovered and no archaeological sites were identified during the current survey. The 2018 and 2014 studies produced similar results; both documented an upper landform consisting of deep disturbed fill layers and a lower landform consisting of recent alluvial deposits with little or no potential for buried archaeological sites.

TVA has read the enclosed report and agrees with the findings and recommendations of the authors. Based on this survey, previous surveys in the PWB LOD area, and the documented

historic disturbance from coal mining and plant construction, TVA finds that no archaeological sites are located in the expanded APE (LOD Area).

We previously have completed consultation addressing historic architectural properties at PAF. These undertakings include: 1) construction of a pulse jet fabric filter baghouse, two ash storage silos and two hydrated lime storage silos, 2) construction of a combined cycle/combustion turbine plant on the PAF reservation, and 3) various construction activities associated with the Coal Combustion Residuals Operation Project. The current APE for indirect effects is entirely within the combined indirect effects APEs of these previous undertakings. Historic architectural surveys that we conducted in association with those previous undertakings did not identify any NRHP-eligible or -listed historic architectural properties. Based on this previous consultation, and on the fact that the current undertaking does not include any areas outside those previous APEs, TVA finds that the proposed PWB would result in no effects on any above-ground historic properties.

Pursuant to 36 CFR Part 800.5(d)(2), we are seeking your concurrence with our finding that the addition of the PWBs to the CCR Management project is an action that would result in no effects on historic properties.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the APE that may be of religious and cultural significance and are eligible for the NRHP.

If you have any questions or comments, please contact Steve Cole by telephone, (865) 632-2551 or by email, sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures

REFERENCES CITED

Hunter, John A. 2016. TVA Paradise Fossil Plant CCR Management, Muhlenberg County, Kentucky - Abbreviated- Negative Find Report. KY OSA Registration No. FY17-8984.

Simpson, Duane. 2014. Phase I Archaeological Survey of TVA's Upgrade of the Paradise Plant's Slag and Flyash Ponds, Emergency Spillways, and Additional Rip-Rap for Dike Stability, Muhlenberg County, Kentucky. Amec Report of Investigations # 2014-011

Stallings, Richard J. 2015. Phase I Archaeological Survey, Paradise Fossil Plant Gas Pipeline Easement and Unloading Facility, Muhlenberg County, Kentucky. Amec Foster Wheeler Project # 73611581062.

INTERNAL COPIES ONLY, NOT TO BE INCLUDED WITH OUTGOING LETTER:

U. Matthew Clemmer, LP 3P-C
Stephen C. Cole, WT 11D-K
Hallie A. Hearnes, WT 11D-K
Susan R. Jacks, WT 11C-K
Ashley A. Pilakowski, WT 11D-K
M. Susan Smelley, BR 4A-C
Edward W. Wells, WT 11D-K
ECM, WT CA-K

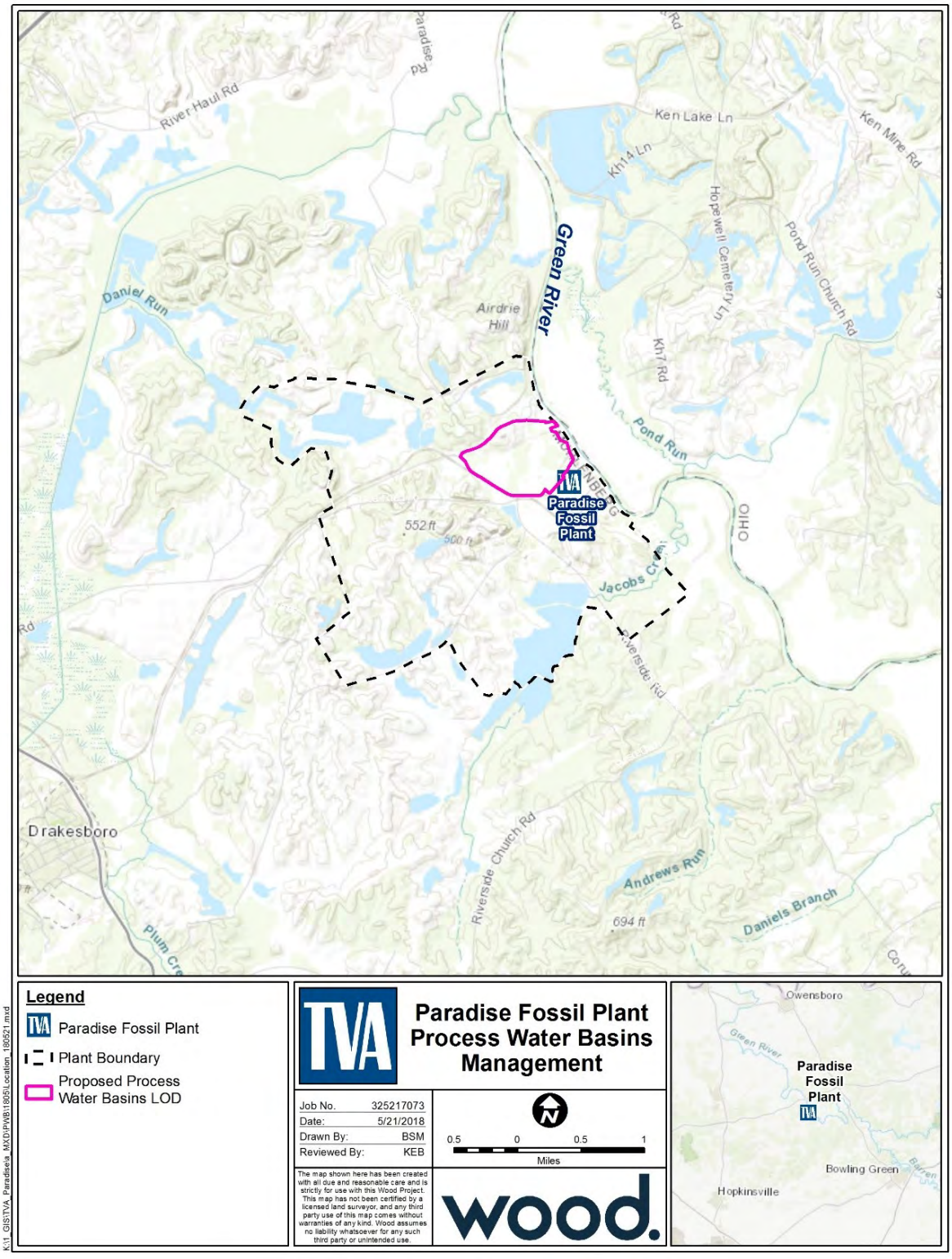

Figure 1. Project location and PAF reservation boundary.

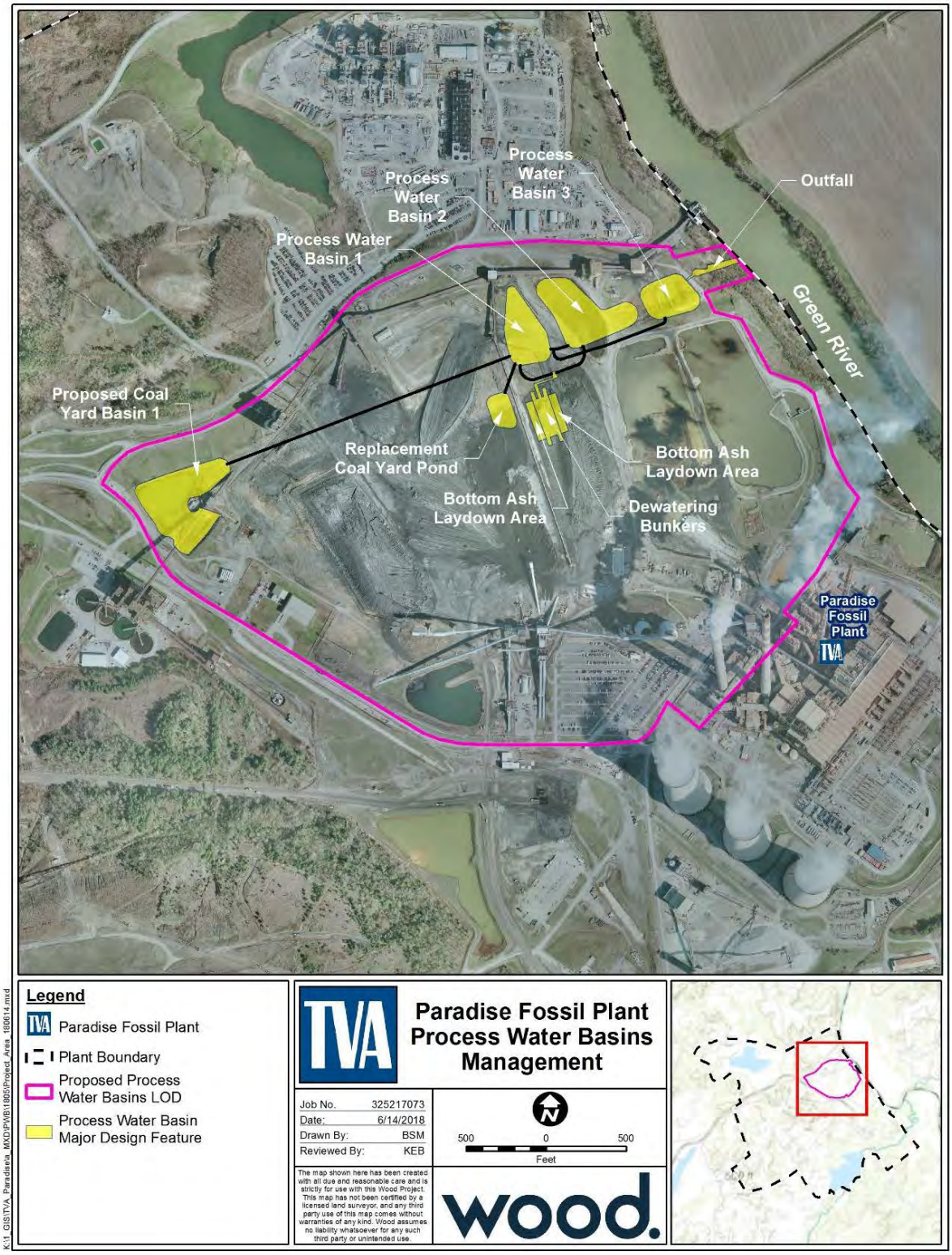

Figure 2. Proposed Process Water Basin (PWB), piping, and associated structures, and limits of disturbance (LOD).

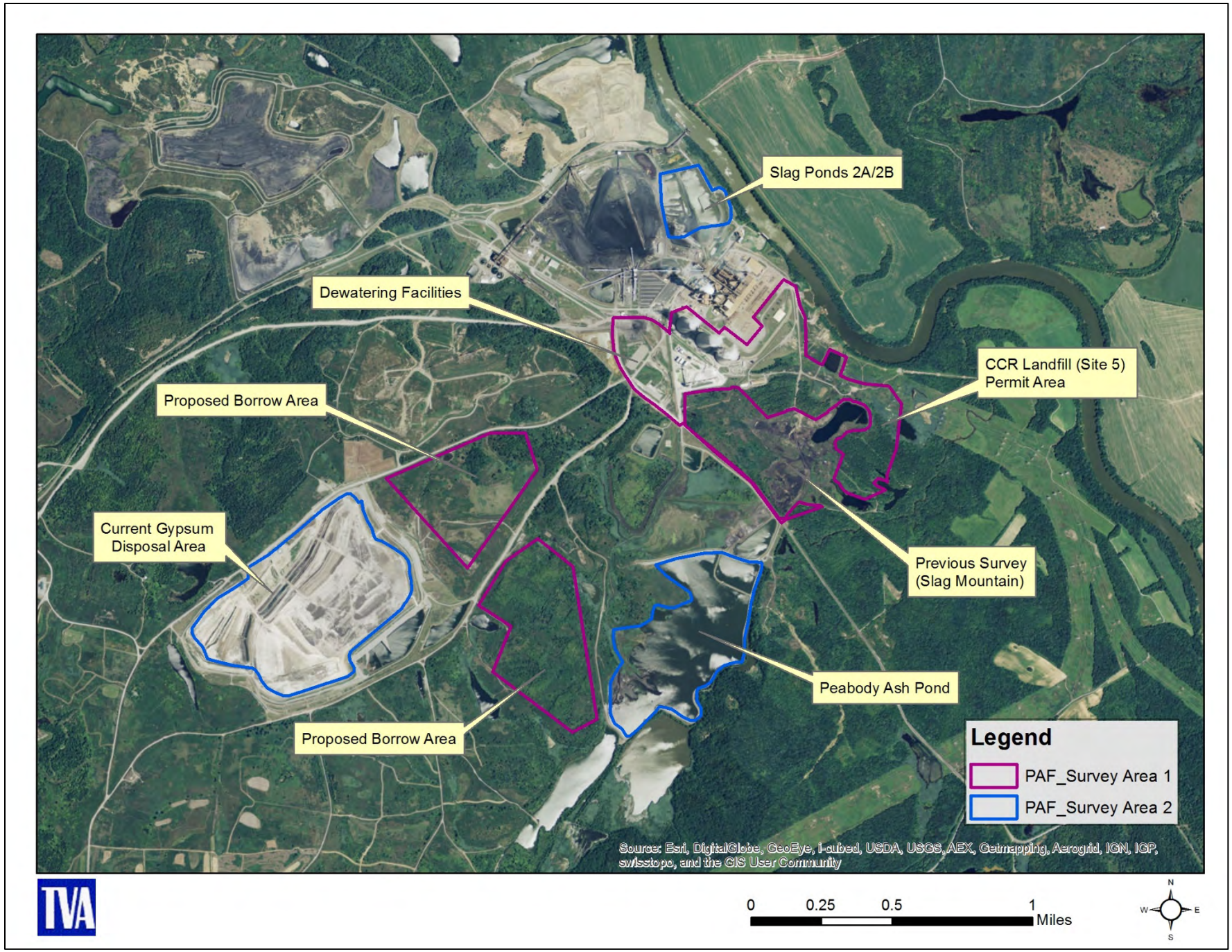

Figure 3. Previously-determined APE for the PAF CCR Management project (survey area 1 and survey area 2).

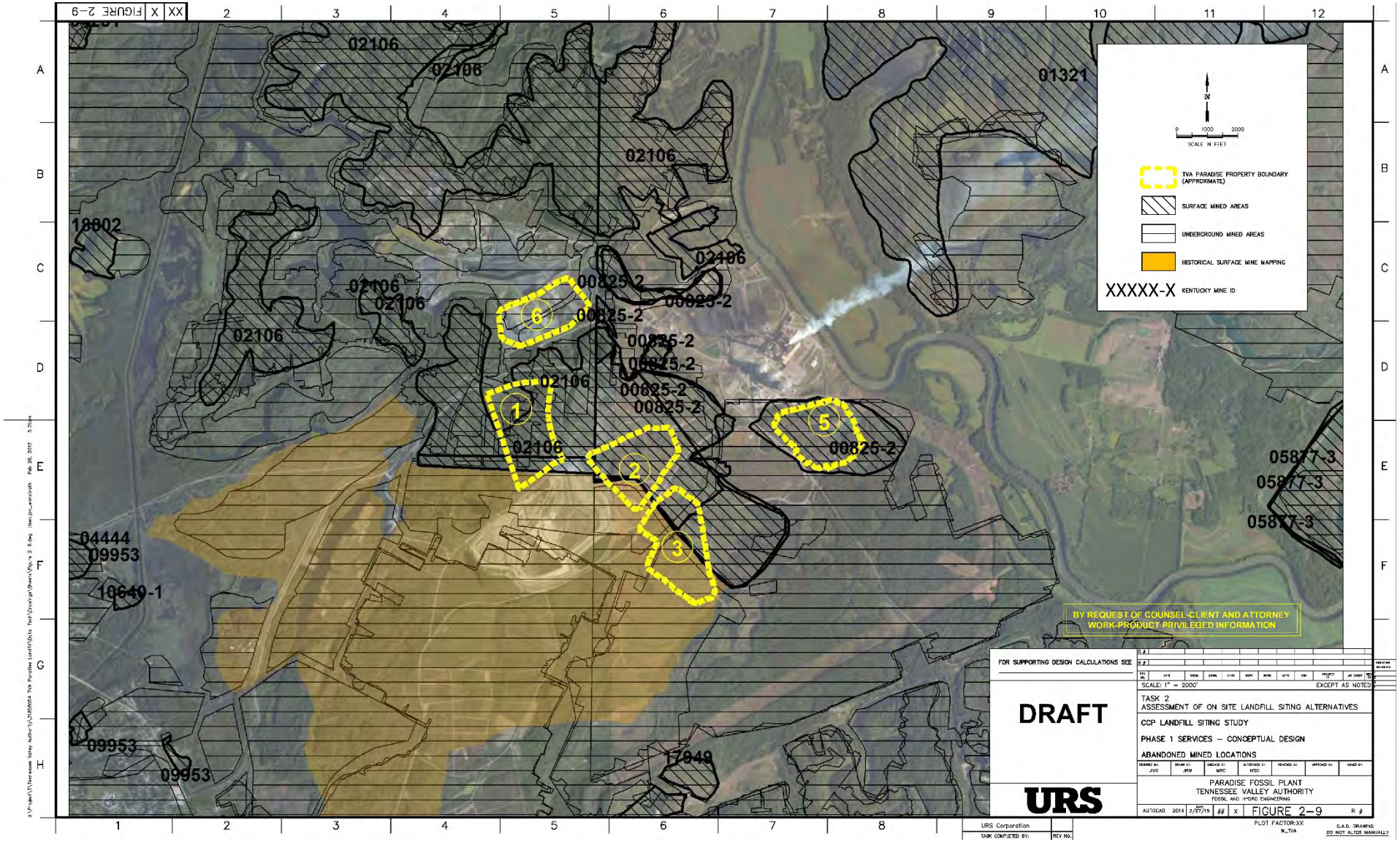

Figure 4. Mined out areas in and around the PAF reservation.

Appendix B – Conceptual Design Drawing

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64 | C | FIGURE 2

PROCESS WATER BASIN 2
WSE 410
(3.4 ACRES)

PROCESS WATER BASIN 1
WSE 412
(2.4 ACRES)

PROCESS WATER BASIN 3
WSE 408
(1.7 ACRES)

GREEN RIVER

SLAG POND 2A

SLAG POND 2B

REPLACEMENT RED WATER POND DISCHARGE TO PWB-1

CONVEYING BUNKERS

BOTTOM ASH LAYDOWN AREA

PROPOSED COAL YARD BASIN 1 GRADING

PROPOSED RED WATER POND 1 GRADING

LEGEND

- 500 - EXISTING MAJOR CONTOURS
- 502 - EXISTING MINOR CONTOURS
- 500 PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- EXISTING UTILITIES
- EXISTING ROAD
- EDGE OF WATER
- OE EXISTING OVERHEAD POWER LINES
- EXISTING TREE LINE
- PROPOSED TYPICAL FLOW PATH

N

0 60 120
SCALE IN FEET

FOR SUPPORTING DESIGN CALCULATIONS SEE

R #
R #

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

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

DRAFT

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

PROCESS WATER BASIN LIMIT OF DISTURBANCE

PROCESS WATER BASINS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
XXX	XXX	BME	NSG	RSH	MST	JCK

PARADISE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AECOM

AUTOCAD	2017	DATE 5/22/18	64	C	FIGURE 2	R A

AECOM	A
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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Appendix C – Bat Strategy Assessment

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Project Screening Form - TVA Bat Strategy *(04/19/2018)*

This form is to assist in determining alignment of proposed projects and any required measures to comply with TVA's ESA Section 7 programmatic consultation for routine actions and federally-listed bats[1]

Project Name: Paradise Fossil Plant Process Water Basins Supplemental EA **Date**: 05/16/2018

Contact(s): Ashley Pilakowski **CEC#**: _____ **RLR#**: _____ **Project ID**: 421419

Project Description: Construction and operation of new process water basins on existing disturbed ai

_____

_____

STEP 1) Select Appropriate TVA Action (or check here □ if none of the Actions below are applicable):

☐	**1**	Manage Biological Resources for Biodiversity and Public Use on TVA Reservoir Lands	☐	**6**	Maintain Existing Electric Transmission Assets
☐	**2**	Protect Cultural Resources on TVA-Retained Land	☐	**7**	Convey Property associated with Electric Transmission
☐	**3**	Manage Land Use and Disposal of TVA-Retained Land	☐	**8**	Expand or Construct New Electric Transmission Assets
☐	**4**	Manage Permitting under Section 26a of the TVA Act	☐	**9**	Promote Economic Development
☑	**5**	Operate, Maintain, Retire, Expand, Construct Power Plants	☐	**10**	Promote Mid-Scale Solar Generation

STEP 2) Select **all** activities from **Tables 1 and 2** (Column 1 only) included in proposed project. If you have an activity that is not listed below, describe here): _____

Table 1. Activities (CHECK ALL THAT APPLY) with No Effect on Federally Listed Bats. If none, check here: □

	#	ACTIVITY		#	ACTIVITY
□	**1**	Loans and/or grant awards	□	**12**	Sufferance agreement
□	**2**	Purchase of property	□	**13**	Engineering or environmental planning or studies
□	**3**	Purchase of equipment for industrial facilities	□	**14**	Harbor limits
□	**4**	Environmental education	□	**19**	Site-specific enhancements in streams and reservoirs for aquatic animals
□	**5**	Transfer of ROW easement or ROW equipment	□	**20**	Nesting platforms
□	**6**	Property and/or equipment transfer	□	**41**	Minor water-based structures
□	**7**	Easement on TVA property	□	**42**	Internal renovation or internal expansion of existing facility
□	**8**	Sale of TVA property	□	**43**	Replacement or removal of TL poles, or cutting of poles to 4-6 ft above ground
□	**9**	Lease of TVA property	□	**44**	Conductor and OHGW installation and replacement
□	**10**	Deed modification of TVA rights or TVA property	□	**49**	Non-navigable houseboats
□	**11**	Abandonment of TVA retained rights			

Table 2. Activities (CHECK ALL THAT APPLY) and Associated Conservation Measures. If none, check here: □

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
□	**15**	Windshield or ground surveys for archaeological resources	□ a. NV1 □ b. HP2	□ b. HP1
■	**16**	Drilling	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3 ■ g. L1, L2	□ a NV3, NV4 / □ a1. NV2
□	**17**	Mechanical vegetation removal; does not include removal of trees or tree branches ≥ 3" in diameter.	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC4, SSPC7
■	**18**	Erosion control – minor	■ a. NV1 ■ f. SPCC1, SSPC2, SSPC3, SSPC5	None
□	**21**	Herbicide use	□ d. SSPC1, SSPC2, SSPC3, SSPC5	□ d. SSPC6, SSPC7
■	**22**	Grubbing	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC4
□	**23**	Prescribed burns, burn piles, or	□ c. SHF1, SHF4, SHF5	□ c. SHF2, SHF3, SHF6, SHF7,

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
		brush piles		SHF8, SHF9
□	**24**	Tree planting	□ a. NV1 □ f. SSCP1, SSPC2, SSPC3, SSPC5	None
□	**25**	Maintenance, improvement or construction of pedestrian or vehicular access corridors	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ a1. NV2 □ f. SSPC7
□	**26**	Maintenance or construction of access control measures	■ a. NV1 □ b. HP2 ■ f. SSPC1, SSPC2, SSPC3,SSPC5 ■ g. L1, L2	□ a NV3, NV4 / □ a1. NV2 □ b. HP1 ■ f. SSPC7
■	**27**	Restoration of sites following human use and abuse	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3	■ f. SSPC7
□	**28**	Removal of debris (e.g., dump sites, hazardous material, unauthorized structures)	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC7
□	**29**	Acquisition and use of fill/borrow material	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC7
□	**30**	Dredging and excavation; recessed harbor areas	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	**31**	Stream/wetland crossings	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ f. SSPC7
□	**32**	Clean-up following storm damage	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ f. SSPC4, SSPC7
□	**33**	Removal of hazardous trees or tree branches	□ a. NV1 □ d. TR7, TR8 □ f. SSPC1, SSPC2, SSPC3, SSPC5	□ d. TR1, TR2, TR3, TR4, TR5, TR6, TR9, □ f. SSPC4, SSPC7
■	**34**	Mechanical vegetation removal, includes trees or tree branches three inches or greater in diameter	■ a. NV1 □ d. TR7, TR8 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	□ d. TR1, TR2, TR3, TR4, TR5, TR6, TR9, ■ f. SSPC4, SSPC7
■	**35**	Stabilization (major erosion control)	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5	■ f. SSPC4, SSPC7
■	**36**	Grading	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, SSPC5 ■ g. L1, L2	■ f. SSPC4, SSPC7
□	**37**	Installation of soil improvements	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3 □ g. L1, L2	□ a1. NV2 □ f. SSPC7
■	**38**	Drainage installations (including for ponds)	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3 ■ g. L1, L2	■ f. SSPC7
□	**39**	Berm development	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, □ g. L1, L2	None
□	**40**	Closed loop heat exchangers (heat pumps)	□ f. SSPC5	None
□	**45**	Stream monitoring equipment-placement, use	□ a. NV1	None
□	**46**	Floating boat slips within approved harbor limits	□ f. SSPC5	None
□	**47**	Conduit installation	□ a. NV1	□ a1. NV2
■	**48**	Laydown areas	■ a. NV1 ■ f. SSPC1, SSPC2, SSPC3, ■ g. L1, L2	None
□	**50**	Minor land-based structures	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	**51**	Signage installation	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	None
□	**52**	Floating buildings	□ a. NV1 □ f. SSPC2, SSPC3,SSPC5 □ g. L1, L2	□ a1. NV2
□	**53**	Mooring buoys or posts	□ a. NV1	

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
			□ f. SSPC2, SSPC3, SSPC5	None
■	54	Maintenance of water control structures (dewatering units, spillways, levees)	■ a. NV1 ■ f. SSPC2, SSPC3, SSPC5	■ f. SSPC6, SSPC7
□	55	Solar panels	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ f. SSPC7
□	56	Culverts	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5	None
□	57	Water intake - non-industrial	□ a. NV1 □ f. SSPC3, SSPC5	None
■	58	Wastewater outfalls	■ a. NV1 ■ f. SSPC2, SSPC3, SSPC5	None
□	59	Marine fueling facilities	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	60	Commercial water-use facilities (e.g., marinas)	□ a. NV1 □ f. SSPC2, SSPC5 □ g. L1, L2	None
□	61	Septic fields	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5	None
□	62	Blasting	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, □ g. L1, L2	□ a NV3, NV4 / □ a1. NV2
□	63	Foundation installation	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	64	Installation of steel structure, overhead bus, equipment, etc.	□ a. NV1 □ g. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	65	Pole and/or tower installation and/or extension	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3	□ a1. NV2
□	66	Private, residential docks, piers, boathouses	□ a. NV1 □ f. SPCC5 □ g. L1, L2	None
□	67	Siting of temporary office trailers	□ a. NV1 □ f. SSPC1, SSPC2, SSPC3, SSPC5 □ g. L1, L2	None
□	68	Financing for speculative building construction	□ a. NV1 □ f. SSPC5	None
□	69	Renovation of existing structures	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5 □ g. L1, L2	□ e. AR1, AR2, AR4, AR5
□	70	Lock maintenance and construction	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	71	Concrete dam modification	□ a. NV1 □ f. SSPC2, SSPC3	□ a1. NV2
□	72	Ferry landings/service operations	□ a. NV1 □ f. SSPC5 □ g. L1, L2	None
□	73	Boat launching ramps	□ a. NV1 □ f. SSPC2, SSPC5	□ a1. NV2
□	74	Recreational vehicle campsites	□ a. NV1 □ g. SPCC5	None
■	75	Utility lines/light poles	■ a. NV1 ■ f. SPCC5 ■ g. L1, L2	None
□	76	Concrete sidewalk	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	77	Construction or expansion of land-based buildings	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5 □ g. L1, L2	□ e. AR1, AR2, AR5
□	78	Wastewater treatment plants	□ a. NV1 □ f. SSPC2, SSPC5 □ g. L1, L2	□ a1. NV2
□	79	Swimming pools and associated	□ a. NV1	

	#	ACTIVITY	CONSERVATION MEASURES	TZ SME Review Needed
		equipment	□ f. SSPC5 □ g. L1, L2	None
□	80	Barge fleeting areas	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	81	Water intakes - Industrial	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	None
□	82	Construction of dam/weirs/ Levees	□ a. NV1 □ f. SPCC2, SPCC3, SPCC5	□ a1. NV2
□	83	Submarine pipeline, directional boring operations	□ a. NV1 □ f. SSPC2, SSPC3, SSPC5	□ a1. NV2
□	84	On-site/off-site public utility relocation or construction or extension	□ a. NV1 □ f. SSPC1, SSPC3, SSPC5	None
□	85	Playground equipment - land-based	□ a. NV1 □ f. SSPC5	None
□	86	Landfill construction	□ a. NV1 □ f. SSPC2, SSPC3 □ g. L1, L2	□ a1. NV2
□	87	Aboveground storage tanks	□ a. NNV1 □ f. SSPC2, SSPC3, SSPC5	None
□	88	Underground storage tanks (USTs)	□ a. NV1 □ g. SSPC2, SSPC3, SSPC5	None
□	89	Structure demolition	□ f. SSPC1, SSPC2, SSPC3	□ e. AR1, AR2, AR4, AR5
■	90	Pond closure	■ a. NV1 ■ f. SSPC2, SSPC3	None
□	91	Bridge replacement	□ a. NV1 □ f. SSPC3, SSPC5	□ a1. NV2 □ e. AR1, AR2, AR3, AR5,
□	92	Return of remains to former burial sites	□ a. NV1 □ b. HP2	□ b. HP1
□	93	Standard license	□ a. NV1 □ f. SSPC5	None
□	94	Special use license	□ a. NV1	None
□	95	Recreation license	□ a. NV1 □ f. SSPC5	None
□	96	Land use permit	□ a. NV1 □ f. SSPC5	None

STEP 3) Are all project activities limited to Table 1? If **YES**, **STOP HERE**. No Bat Strategy Conservation Measures required. Include this form in environmental documentation (e.g., attach to CEC) and send to batstrategy@tva.gov. If **NO**, proceed to Step 4.....□ **YES** ■ **NO**

STEP 4) Check ALL relevant characteristics below. If **none** apply, **STOP HERE** and check ☐. No Bat Strategy Conservation Measures required. Include form in environmental documentation and send to batstrategy@tva.gov

■ **a**. Project may occur outside, involves human presence, or use of equipment that **generates noise or vibration** (e.g., drilling, blasting, loud machinery).
□ **a1.** Project involves continuous noise (i.e., ≥ 24 hrs) that is >75 decibels measured on A scale (e.g., loud machinery).

□ **b**. Project may involve **human entry into/survey of a potential bat roost** (cave, bridge, other structure).

□ **c**. Project may involve **fire (e.g., prescribed fire, burn piles) or preparation of fire breaks** within 0.25 mi of trees, caves, or water sources. **If prescribed burn**, estimated acreage: _____

■ **d**. Project may involve **tree removal**. Tree removal may need to occur **outside of winter:**.....□ **YES** ■ **NO**
Estimated number of trees or acres to be removed: 0.9 ■ acres □ trees
If warranted, project has flexibility for bat surveys (May 15-Aug 15):.....■ **MAYBE** □ **YES** □ **NO**

□ **e**. Project may involve **alteration or removal of bridges or other human structures**.

■ **f**. Project may involve land use activities involving **ground disturbance or use of chemicals or fuels** near water sources, wetlands, sinkholes, caves, or exposed limestone/karst.

■ **g**. Project may involve use of **artificial lighting** at night.

STEP 5) *Please contact Holly LeGrand or other Bat Strategy support staff for assistance if needed*. For those Activities selected in Table 2: select all Conservation Measures with letters (e.g., a-g) that correspond to characteristics selected in Step 4. If this results in selection of Conservation Measures in the last column of Table 2, a review by a terrestrial zoologist is required.

Based on selection of Conservation Measures, does project require review by a terrestrial zoologist? If **YES**, **STOP HERE** and submit form as part of environmental review request; if **NO**, skip to STEP 16.....■ **YES** □ **NO**

Terrestrial Zoologist SME Verification (Steps 6-11 will be completed by a terrestrial zoologist if warranted):

STEP 6) Project includes the following:

- □ Removal/burning of suitable trees within 0.5 mile (0.8 km) of P1-P2 Indiana bat hibernacula or 0.25 mile (0.4 km) of P3-P4 Indiana bat hibernacula or any northern long-eared bat hibernacula.
- □ Removal/burning of suitable trees within 10 miles of documented Indiana bat hibernacula or within 5 miles of northern long-eared bat hibernacula.
- □ Removal/burning of suitable trees greater than 10 miles from documented Indiana bat hibernacula or greater than 5 miles from documented northern long-eared bat hibernacula.
- □ Removal/burning of trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity roost tree.
- □ Removal/burning of suitable trees within 2.5 miles of Indiana bat roost trees or within 5 miles of Indiana bat capture sites.
- □ Removal/burning of suitable trees greater than 2.5 miles from Indiana bat roost trees or greater than 5 miles from Indiana bat capture sites.
- □ Removal/burning of documented Indiana bat or northern long-eared bat roost tree, if still suitable.

STEP 7) Amount of SUITABLE tree/acreage removal or burned (may be different than total amount of removal): 0 ■ acres ■ trees

STEP 8) Select anticipated date range of burning/tree removal in table below:

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	□ Oct 15 - Nov 14	□ Nov 15 - Mar 31	□ Apr 1 - May 31, Aug 1- Oct 14	□ Jun 1 - Jul 31
VA	□ Sep 16 - Nov 15	□ Nov 16 - Apr 14	□ Apr 15 - Sep 15	□ Jun 1 - Jul 31
AL	□ Oct 15 - Nov 14	□ Nov 15 - Mar 15	□ Mar 16 - May 31, Aug 1 - Oct 14	□ Jun 1 - Jul 31
NC	□ Oct 15 - Nov 14	□ Nov 15 - Apr 15	□ Apr 16 - May 31, Aug 1 - Oct 14	□ Jun 1 - Jul 31
MS	□ Oct 1 - Nov 14	□ Nov 15 - Apr 14	□ Apr 15 - Sep 30	□ Jun 1 - Jul 31

STEP 9) Presence/absence surveys (visual, mist net, acoustic) were/will be conducted: ■ **YES** □ **NO** □ **TBD**

STEP 10) Result of presence/absence surveys (if conducted), on 04/19/2018 (date): ■ **NEGATIVE** □ **POSITIVE** □ **N/A** *NOTES*: Habitat surveys were completed by Amec Foster Wheeler (Wood, Inc) on April 19, 2018 and no suitable bat habitat was found.

STEP 11) ■ Conservation measures have been verified (and modified, if necessary) in Table 2. *NOTES*:

Bat Strategy Compliance Verification (Steps 12-15 will be completed by SME/Bat Strategy Support staff):

STEP 12) Project □ **WILL** ■ **WILL NOT** require use of Incidental Take in the amount of _____ □ acres or □ trees, proposed to be used during the □ **VOLANT** □ **NON-VOLANT** bat season (or ■ **N/A**).

STEP 13) Available Incidental Take as of N/A for N/A (Action):

TVA Action	Total 20-year acreage	Winter Burning/Removal	Volant Season Burning/Removal	Non-Volant Season Burning/Removal

STEP 14) Amount contributed to TVA's Bat Conservation Fund upon activity completion: _____or ■ **N/A**

STEP 15) Project Effects Determinations: ***Gray Bat***:□ NE □ NLAA □ N/A;***Virginia Big-eared Bat***:□ NE □ NLAA □ N/A ***Northern Long-eared Bat***: □ NE □ NLAA □ LAA □ N/A; ***Indiana Bat***: □ NE □ NLAA □ LAA □ N/A

NOTES: STEP 15 - Effects determinations - Gray bat - NE; VBEB- NA; NLEB - NLAA; Indiana bat - NLAA

TVA's ESA Section 7 Bat Strategy Conservation Measures Required for:

STEP 16) Based on completion of Step 5, select the appropriate Conservation Measures listed in the table below (this will be completed/verified by a Terrestrial Zoologist if a Terrestrial Zoologist review is required) and review the following bullets. Save this form in project environmental documentation AND send a copy of form to batstrategy@tva.gov. Submission of this form is an indication that the Project Lead Ashley Pilakowski (name) is (or will be made) aware of the requirements below.

- Implementation of conservation measures identified below is required to comply with TVA's programmatic Endangered Species Act bat consultation.
- Confirmation of completion (e.g., report from contractor, time stamped photos pre and post completion) for Conservation Measures below with an * (as well as any additional confirmation noted here by Terrestrial Zoologist:_____) will be provided to TVA's Bat Strategy Compliance Officer (batstrategy@tva.gov) following completion of activit (ies).
- TVA may conduct post-project monitoring to determine if conservation measures were effective in minimizing or avoiding impacts to federally listed bats.

STEP 17) For projects that require use of Take and/or contribution to TVA's Bat Conservation Fund, please acknowledge the following statement:

□ Project Lead/Contact acknowledges that proposed project will result in use of N/A □ acres/□ trees in Incidental Take and will require N/A contribution to TVA's Conservation Fund upon completion of activity.

	Conservation Measure Acronym	Conservation Measure Description
☑	NV1	Noise will be short-term, transient, and not significantly different from urban interface or natural events (i.e., thunderstorms) that bats are frequently exposed to when present on the landscape.
☐	NV2	Drilling, blasting, or any other activity that involves continuous noise (i.e., longer than 24 hours) disturbances greater than 75 decibels measured on the A scale (e.g., loud machinery) within a 0.5 mile radius of documented winter and/or summer roosts (caves, trees, unconventional roosts) will be conducted when bats are absent from roost sites.
☐	NV3	Drilling or blasting within a 0.5 mile radius of documented cave (or unconventional) roosts will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of the roost site.
☐	NV4	Drilling or blasting within 0.5 miles of a documented roost site (cave, tree, unconventional roost) that needs to occur when bats are present will first involve development of project-specific avoidance or minimization measures in coordination with the USFWS.
☐	HP1	Site-specific cases in which potential impact of human presence is heightened (e.g., conducting environmental or cultural surveys within a roost site) will be closely coordinated with staff bat biologists to avoid or minimize impacts below any potential adverse effect. Any take from these activities would be covered by TVA's Section 10 permit.
☐	HP2	Entry into roosts known to be occupied by federally listed bats will be communicated to the USFWS when impacts to bats may occur if not otherwise communicated (i.e., via annual monitoring reports per TVA's Section 10 permit). Any take from these activities would be covered by TVA's section 10 permit.
☐	SHF1	Fire breaks will be used to define and limit burn scope.
☐	SHF2	Site-specific conditions (e.g., acres burned, transport wind speed, mixing heights) will be considered to ensure smoke is limited and adequately dispersed away from caves so that smoke does not enter cave or cave-like structures.
☐	SHF3	Acreage will be divided into smaller units to keep amount of smoke at any one

		time or location to a minimum and reduce risk for smoke to enter caves.
☐	SHF4	If burns need to be conducted during April and May, when there is some potential for bats to present on the landscape and more likely to enter torpor due to colder temperatures, burns will only be conducted if the air temperature is 55° or greater, and preferably 60° or greater.
☐	SHF5	Fire breaks will be plowed immediately prior to burning, will be plowed as shallow as possible, and will be kept to minimum to minimize sediment.
☐	SHF6	Tractor-constructed fire lines will be established greater than 200 feet from cave entrances. Existing logging roads and skid trails will be used where feasible to minimize ground disturbance and generation of loose sediment.
☐	SHF7	Burning will only occur if site specific conditions (e.g. acres burned, transport wind speed, mixing heights) can be modified to ensure that smoke is adequately dispersed away from caves or cave-like structures. This applies to prescribed burns and burn piles of woody vegetation.
☐	SHF8	Brush piles will be burned a minimum of 0.25 mile from documented, known, or obvious caves or cave entrances and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.
☐	SHF9	A 0.25 mile buffer of undisturbed forest will be maintained around documented or known gray bat maternity and hibernation colony sites, documented or known Virginia big-eared bat maternity, bachelor, or winter colony sites, Indiana bat hibernation sites, and northern long-eared bat hibernation sites. Prohibited activities within this buffer include cutting of overstory vegetation, construction of roads, trails or wildlife openings, and prescribed burning. Exceptions may be made for maintenance of existing roads and existing ROW, or where it is determined that the activity is compatible with species conservation and recovery (e.g., removal of invasive species).
☐	TR1*	Removal of potentially suitable summer roosting habitat during time of potential occupancy has been quantified and minimized programmatically. TVA will track and document alignment of activities that include tree removal (i.e., hazard trees, mechanical vegetation removal) with the programmatic quantitative cumulative estimate of seasonal removal of potential summer roost trees for Indiana bat and northern long-eared bat. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☐	TR2	Removal of suitable summer roosting habitat within 0.5 mile of Priority 1/Priority 2 Indiana bat hibernacula, or 0.25 mile of Priority 3/Priority 4 Indiana bat hibernacula or any northern long-eared bat hibernacula will be prohibited, regardless of season, with very few exceptions (e.g., vegetation maintenance of TL ROW immediately adjacent to a known cave).
☐	TR3*	Removal of suitable summer roosting habitat within documented bat habitat (i.e., within 10 miles of documented Indiana bat hibernacula, within five miles of documented northern long-eared bat hibernacula, within 2.5 miles of documented Indiana bat summer roost trees, within five miles of Indiana bat capture sites, within one mile of documented northern long-eared bat summer roost trees, within three miles of northern long-eared bat capture sites) will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☐	TR4*	Removal of suitable summer roosting habitat within potential habitat for Indiana bat or northern long-eared bat will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
☐	TR5	Removal of any trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity summer roost tree during non-winter season, range-wide pup season or swarming season (if site is within known swarming habitat), will first require a site-specific review and assessment. If pups are present in trees to be removed (determined either by mist netting and assessment of adult females, or by visual assessment of trees following evening emergence counts),

		TVA will coordinate with the USFWS to determine how to minimize impacts to pups to the extent possible. May include establishment of artificial roosts before removal of roost tree(s).
☐	TR6	Removal of a documented Indiana bat or northern long-eared bat roost tree that is still suitable and that needs to occur during non-winter season, range-wide pup season, or swarming season (if site is within known swarming habitat) will first require a site-specific review and assessment. If pups are present in trees to be removed (determined either by mist netting and assessment of adult females, or by visual assessment of trees following evening emergence counts), TVA will coordinate with USFWS to determine how to minimize impacts to pups to the extent possible. This may include establishment of artificial roosts before removal of roost tree(s).
☐	TR7	Tree removal within 100 feet of **existing transmission ROWs** will be limited to hazard trees. On or adjacent to TLs, a hazard tree is a tree that is tall enough to fall within an unsafe distance of TLs under maximum sag and blowout conditions and/or are also dead, diseased, dying, and/or leaning. Hazard tree removal includes removal of trees that 1) currently are tall enough to threaten the integrity of operation and maintenance of a TL or 2) have the ability in the future to threaten the integrity of operation and maintenance of a TL.
☐	TR8	Requests for removal of hazard trees on or adjacent to **TVA reservoir land** will be inspected by staff knowledgeable in identifying hazard trees per International Society of Arboriculture and TVA's checklist for hazard trees. Approval will be limited to trees with a defined target.
☐	TR9	If removal of suitable summer roosting habitat occurs when bats are present on the landscape, a funding contribution (based on amount of habitat removed) towards future conservation and recovery efforts for federally listed bats would be carried out. Project can consider seasonal bat presence/absence surveys (mist netting or emergence counts) that allow for positive detections without resulting in increased constraints in cost and project schedule. This will enable TVA to contribute to increased knowledge of bat presence on the landscape while continuing to carry out TVA's broad mission and responsibilities.
☐	AR1	Projects that involve structural modification or demolition of buildings, bridges, and potentially suitable box culverts, will require assessment to determine if structure has characteristics that make it a potentially suitable unconventional bat roost. If so a survey to determine if bats may be present will be conducted. Structural assessment will include: o Visual check that includes an exhaustive internal/external inspection of building to look for evidence of bats (e.g., bat droppings, roost entrance/exit holes); this can be done at any time of year, preferably when bats are active. o Where accessible and health and safety considerations allow, a survey of roof space for evidence of bats (e.g., droppings, scratch marks, staining, sightings), noting relevant characteristics of internal features that provide potential access points and roosting opportunities. Suitable characteristic may include: gaps between tiles and roof lining, access points via eaves, gaps between timbers or around mortise joints, gaps around top and gable end walls, gaps within roof walling or around tops of chimney breasts, and clean ridge beams. o Features with high-medium likelihood of harboring bats but cannot be checked visually include soffits, cavity walls, space between roof covering and roof lining. o Applies to box culverts that are at least 5 feet (1.5 meters) tall and with one or more of the following characteristics. Suitable culverts for bat day roosts have the following characteristics: ▪ Location in relatively warm areas

		▪ Between 5-10 feet (1.5-3 meters) tall and 300 ft (100 m) or more long ▪ Openings protected from high winds ▪ Not susceptible to flooding ▪ Inner areas relatively dark with roughened walls or ceilings ▪ Crevices, imperfections, or swallow nests o Bridge survey protocols will be adapted from the Programmatic Biological Opinion for the Federal Highway Administration (Appendix D of USFWS 2016c, which includes a Bridge Structure Assessment Guidance and a Bridge Structure Assessment Form). o Bat surveys usually are NOT needed in the following circumstances: ▪ Domestic garages /sheds with no enclosed roof space (with no ceiling) ▪ Modern flat-roofed buildings ▪ Metal framed and roofed buildings ▪ Buildings where roof space is regularly used (e.g., attic space converted to living space, living space open to rafters) or where all roof space is lit from skylights or windows. Large/tall roof spaces may be dark enough at apex to provide roost space.
☐	AR2	Additional bat P/A surveys (e.g., emergence counts) conducted if warranted (i.e., when AR1 indicates that bats may be present).
☐	AR3	Bridge survey protocols will be implemented, either by permittee (e.g., state DOT biologists) or qualified personnel. If a bridge is determined to be in use as an unconventional roost, subsequent protocols will be implemented.
☐	AR4	Removal of buildings with suitable roost characteristics within six miles of known or presumed occupied roosts for Virginia big-eared bat would occur between Nov 16 and Mar 31. Buildings may be removed other times of the year once a bat biologist evaluates a buildings' potential to serve as roosting habitat and determines that this species is not present and/or is not using structure(s).
☐	AR5	If evidence of bat use warrants seasonal modification or removal, TVA will carry out or recommend (i.e., to applicants) seasonal modification or removal. Risk to human safety, however, should take priority. For project-specific cases in which project is unable to accommodate seasonal modification or removal, and federally listed bat species are present, TVA will carry out or recommend consultation with the USFWS to determine the best approach in the context of the project-specific circumstance. This may include establishment of artificial roosts before demolition of structures with bats present.
☐	SSPC1	**Transmission actions and activities** will continue to Implement A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities. This focuses on control of sediment and pollutants, including herbicides. Following are key measures: o BMPs to minimize erosion and prevent/control water pollution in accordance with state-specific construction storm water permits. BMPS are designed to keep soil in place and aid in reducing risk of other pollutants reaching surface waters, wetlands and ground water. BMPs will undertake the following principles: ▪ Plan clearing, grading, and construction to minimize area and duration of soil exposure. ▪ Maintain existing vegetation wherever and whenever possible. ▪ Minimize disturbance of natural contours and drains. ▪ As much as practicable, operate on dry soils when they are least susceptible to structural damage and erosion. ▪ Limit vehicular and equipment traffic in disturbed areas. ▪ Keep equipment paths dispersed or designate single traffic flow

		paths with appropriate road BMPs to manage runoff. ▪ Divert runoff away from disturbed areas. ▪ Provide for dispersal of surface flow that carries sediment into undisturbed surface zones with high infiltration capacity and ground cover conditions. ▪ Prepare drainage ways and outlets to handle concentrated/increased runoff. ▪ Minimize length and steepness of slopes. Interrupt long slopes frequently. ▪ Keep runoff velocities low and/or check flows. ▪ Trap sediment on-site. ▪ Inspect/maintain control measures regularly and after significant rain. ▪ Re-vegetate and mulch disturbed areas as soon as practical. o Application of herbicide is in compliance with USEPA, state water quality standards, and state permits. Areas in which covered species are known to occur on existing transmission line ROW are depicted on referenced, applicable spreadsheets and include guidelines to follow for impact minimization or avoidance. During pre-job briefings, the ROW Forester will review location of resources with contractors and provide guidelines and expectations from TVA's BMP Manual (Appendix O). Herbicides labeled for aquatic use are utilized in and around wetlands, streams, and SMZs. Unless specifically labeled for aquatic use, measures are taken to keep herbicides from reaching streams whether by direct application or through runoff or flooding by surface water. Hand application of certain herbicides labeled for use within SMZs is used only selectively. o Specific guidelines regarding sensitive resources and buffer zones: ▪ Extra precaution (wider buffers) within SMZs is taken to protect stream banks and water quality for streams, springs, sinkholes, and surrounding habitat. ▪ BMPs are implemented to protect and enhance wetlands. Select use of equipment and seasonal clearing is conducted when needed for rare plants; construction activities are restricted in areas with identified rare plants. ▪ Standard requirements exist to avoid adverse impacts to caves, protected animals, and unique and important habitat (e.g., protective buffers around caves, restricted herbicide use, seasonal clearing of suitable habitat).
☑	SSPC2	Operations involving chemical/fuel storage or resupply and vehicle servicing will be handled outside of riparian zones (streamside management zones) in a manner to prevent these items from reaching a watercourse. Earthen berms or other effective means are installed to protect stream channel from direct surface runoff. Servicing will be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter will be collected and disposed of properly. Equipment servicing and chemical/fuel storage will be limited to locations greater than 300-ft from sinkholes, fissures, or areas draining into known sinkholes, fissures, or other karst features.
☑	SSPC3	**Power Plant actions and activities** will continue to implement standard environmental practices. These include: o Best Management Practices (BMPs) in accordance with regulations:

		▪ Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy ▪ Maintain every site with well-equipped spill response kits, included in some heavy equipment ▪ Conduct Quarterly Internal Environmental Field Assessments at each sight ▪ Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. ▪ When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods ▪ Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites ▪ Storm drain protection device ▪ Check dam to help slow down silt flow ▪ Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies ▪ Minimize storm water contact with disturbed soils at the construction site ▪ Protect disturbed soil areas from erosion ▪ Minimize sediment in storm water before discharge ▪ Prevent storm water contact with other pollutants ▪ Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1 acre) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to minimize fuel and chemical use
☐	SSPC4	Woody vegetation burn piles associated with **transmission construction** will be placed in the center of newly established ROWs to minimize wash into any nearby undocumented caves that might be on adjacent private property and thus outside the scope of field survey for confirmation. Brush piles will be burned a minimum of 0.25 miles from documented caves and otherwise in the center of newly established ROW when proximity to caves on private land is unknown.
☐	SSPC5	**Section** 26a permits and contracts associated with **solar projects**, **economic development projects** or land use projects include standards and conditions that include standard BMPs for sediment and contaminants as well as measures to avoid or minimize impacts to sensitive species or other resources consistent with applicable laws and Executive Orders.
☐	SSPC6	Herbicide use will be avoided within 200 ft of portals associated with caves, cave collapse areas, mines and sinkholes that are capable of supporting cave-associated species. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements.
☐	SSPC7	Clearing of vegetation within a 200-ft radius of documented caves will be limited to that conducted by hand or small machinery clearing only (e.g., chainsaws, bush-hog, mowers). This will protect potential recharge areas of cave streams and other karst features that are connected hydrologically to caves.
☑	L1	Direct temporary lighting away from suitable habitat during the active season.
☑	L2	Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution when installing new or replacing existing permanent lights by angling lights downward or via other light minimization measures (e.g., dimming, directed lighting, motion-sensitive lighting).

[1]Bats addressed in consultation (02/2018), which includes gray bat (listed in 1976), Indiana bat (listed in 1967), northern long-eared bat (listed in 2015), and Virginia big-eared bat (listed in 1979).