FINAL ENVIRONMENTAL ASSESSMENT

# INSTALLATION OF EMISSION CONTROL EQUIPMENT AND ASSOCIATED FACILITIES AT GALLATIN FOSSIL PLANT

**Sumner County, Tennessee**

**PREPARED BY:**
TENNESSEE VALLEY AUTHORITY

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# Symbol, Acronyms, and Abbreviations

| | |
|---|---|
| **µm** | micrometer |
| **ACI** | activated carbon injection |
| **AMSL** | above mean sea level |
| **APE** | area of potential effect |
| **ARAP** | Aquatic Resource Alteration Permit |
| **ADT** | Average Daily Trips |
| **avdp** | avoirdupois |
| **BIP** | balanced indigenous populations |
| **BMP** | best management practice |
| **Btu** | British thermal unit |
| **°C** | degrees Celsius |
| **C&D** | construction and demolition |
| **CAA** | Clean Air Act |
| **CaO** | calcium oxide (pebble lime) |
| **$Ca(OH)_2$** | calcium hydroxide (hydrated lime) |
| **$Ca(SO)_3$** | calcium sulfite |
| **CCC** | criterion continuous concentration |
| **CCR** | coal combustion residue |
| **CCW** | condenser cooling water |
| **CDS** | circulating dry scrubber |
| **CEQ** | Council on Environmental Quality |
| **CERCLA** | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| **CFR** | Code of Federal Regulations |
| **cfs** | cubic feet per second |
| **$CH_4$** | methane |
| **CO** | carbon monoxide |
| **$CO_2$** | carbon dioxide |
| **$CO_2e$** | carbon dioxide equivalent |
| **CRAC** | Cumberland River Aquatic Center |
| **CRM** | Cumberland River Mile |
| **CT** | combustion-turbine |
| **CY** | calendar year |
| **CWA** | Clean Water Act of 1972 |
| **dB** | decibels |
| **dBA** | A-weighted decibels |
| **DNL** | day/night average sound level |
| **EA** | environmental assessment |
| **EHS** | extremely hazardous substance |
| **EIS** | environmental impact statement |

| | |
|---|---|
| **EO** | Executive Order |
| **EPA** | U.S. Environmental Protection Agency |
| **EPCRA** | Emergency Planning and Community Right-to-Know Act of 1986 |
| **ERP** | Emergency Response Plan |
| **ESA** | Endangered Species Act of 1973 |
| **ESP** | electrostatic precipitator |
| **ETSZ** | East Tennessee Seismic Zone |
| **°F** | degrees Fahrenheit |
| **FAA** | Federal Aviation Administration |
| **FF** | fabric filter |
| **FFCA** | Federal Facilities Compliance Agreement |
| **FGD** | flue gas desulfurization |
| **FICON** | Federal Interagency Committee on Noise |
| **FICUN** | Federal Interagency Committee on Urban Noise |
| **FR** | *Federal Register* |
| **ft** | feet |
| **$ft^2$** | square feet |
| **GAF** | Gallatin Fossil Plant |
| **GHG** | greenhouse gas |
| **GPD** | gallons per day |
| **GPS** | Global Positioning System |
| **GWh** | gigawatt-hour |
| **HELP** | Hydrologic Evaluation of Landfill Performance |
| **HEPA** | high-efficiency particulate air |
| **HFCs** | hydrofluorocarbons |
| **Hz** | hertz |
| **IB** | industrial boiler |
| **ID** | induced draft |
| **ILB** | Illinois Basin |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **IPPP** | Integrated Pollution Prevention Plan |
| **IRP** | Integrated Resource Plan |
| **Jh** | hydraulic gradient |
| **kg** | kilograms |
| **kg/L** | kilograms per liter |
| **km** | kilometers |
| **kWh** | kilowatt-hour |
| **lb** | pound |
| **lbm** | pound-mass |
| **LBP** | lead-based paint |
| **LCS** | leachate collection system |
| **$L_{eq(8)}$** | continuous equivalent sound level over 8-hour period |
| **LOD** | limit of disturbance |

| | |
|---|---|
| **LOS** | level of service |
| **MACT** | maximum achievable control technology |
| **MATS** | Mercury and Air Toxics Standards |
| **MCL** | maximum contaminant level |
| **MGD** | million gallons per day |
| **mg/kg** | milligrams per kilogram |
| **mg/L** | milligrams per liter |
| **$mi^2$** | square miles |
| **mmBtu** | million British thermal units |
| **MSDS** | Material Safety Data Sheet |
| **MW** | megawatt |
| **MWhr** | megawatt-hour |
| **$N_2O$** | nitrous oxide |
| **NAAQS** | National Ambient Air Quality Standards |
| **NEPA** | National Environmental Policy Act of 1969 |
| **$NH_3$-N/L** | ammonia nitrogen |
| **NHPA** | National Historic Preservation Act of 1966 |
| **NID** | novel integrated desulfurization |
| **NIOSH** | National Institute for Occupational Safety and Health |
| **NM** | noise measurement |
| **$NO_X$** | nitrogen oxides |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NPS** | National Park Service |
| **NRC** | Nuclear Regulatory Commission |
| **NRHP** | National Register of Historic Places |
| **NRI** | Nationwide Rivers Inventory |
| **NRL** | North Rail Loop |
| **NSR** | New Source Review |
| **O&M** | operations and maintenance |
| **$O_3$** | ozone |
| **OSHA** | Occupational Safety and Health Administration/Act |
| **OWS** | oil/water separator |
| **PA** | Programmatic Agreement |
| **Pb** | lead |
| **PFCs** | perfluorocarbons |
| **PJFF** | pulse jet fabric filter |
| **$PM_{2.5}$** | particulate matter whose particles are less than or equal to 2.5 micrometers |
| **$PM_{10}$** | particulate matter whose particles are less than or equal to 10 micrometers |
| **ppb** | parts per billion |
| **PPE** | personal protective equipment |
| **ppm** | parts per million |
| **PRB** | Powder River Basin |
| **PSI** | pounds per square inch |

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|---|---|
| **RCNM** | Roadway Construction Noise Model |
| **RCRA** | Resource Conservation and Recovery Act of 1976 |
| **RFAI** | Reservoir Fish Assemblage Index |
| **RM** | river mile |
| **RMP** | Risk Management Plan |
| **ROW** | right-of-way |
| **s.u.** | standard unit |
| **SAMI** | Southern Appalachian Mountains Initiative |
| **SCR** | selective catalytic reduction |
| **SDA** | spray drying absorber |
| **$SF_6$** | sulfur hexafluoride |
| **SGLP** | Synthetic Groundwater Leaching Procedure |
| **SHPO** | State Historic Preservation Officer |
| **$SO_2$** | sulfur dioxide |
| **SPCC** | spill prevention control and countermeasures |
| **SR** | State Route |
| **SRA** | sensitive receptor area |
| **SRL** | South Rail Loop |
| **SWPPP** | Storm Water Pollution Prevention Plan |
| **TBtu** | trillion British thermal units |
| **TCA** | Tennessee Code Annotated |
| **TCLP** | Toxicity Characteristic Leaching Procedure |
| **TDEC** | Tennessee Department of Environment and Conservation |
| **TDOT** | Tennessee Department of Transportation |
| **TL** | transmission line |
| **TPY** | tons per year |
| **TRC** | TRC Environmental Corporation |
| **TRI** | Toxic Release Inventory |
| **TRV** | toxicity reference value |
| **TSP** | total suspended particulate |
| **TVA** | Tennessee Valley Authority |
| **TVARAM** | TVA Rapid Assessment Method |
| **TWRA** | Tennessee Wildlife Resources Agency |
| **U.S.** | United States |
| **US** | U.S. Highway |
| **USACE** | U.S. Army Corps of Engineers |
| **USDA** | U.S. Department of Agriculture |
| **USDOT** | U.S. Department of Transportation |
| **USEPA** | U.S. Environmental Protection Agency |
| **USFWS** | U.S. Fish and Wildlife Service |
| **USGS** | U.S. Geological Survey |
| **VOC** | volatile organic compound |
| **WMA** | wildlife management area |

| | |
|---|---|
| **wt%** | weight percent |
| **WWC** | wet weather conveyance |

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# Chapter 1 – PURPOSE, NEED, AND BACKGROUND FOR THE PROPOSED ACTION

## 1.1 Purpose and Need for the Proposed Action

TVA proposes to install additional air emission controls and to take other actions, including constructing a dry coal combustion residue (CCR) landfill, at its Gallatin Fossil Plant (GAF). This plant is located near the city of Gallatin in Sumner County, Tennessee (Figure 1-1). The purpose and need for the proposed actions are:

- Complying with U.S. Environmental Protection Agency's (USEPA or EPA) new Utility Mercury and Air Toxics Standards (MATS) and other anticipated regulations including requirements affecting the management of coal ash and other residues from the combustion of coal,
- Complying with a Federal Facilities Compliance Agreement (FFCA or "Compliance Agreement"), and
- Achieving and maintaining a more balanced portfolio of energy resources on the TVA power system.

The need to move to a more balanced portfolio was identified by TVA after completion of its most recent Integrated Resource Plan (IRP) in 2011 and associated Environmental Impact Statement.

USEPA's MATS requires the application of maximum achievable control technology (MACT) to reduce emissions of hazardous air pollutants (HAPS) from coal- and oil-fired electric generating units. Utilities have until April 16, 2015, to comply with the rule (USEPA 2012) with the possibility of a one-year extension to April 16, 2016. The USEPA has also tightened the National Ambient Air Quality Standards (NAAQS), and this is expected to result in additional emissions reductions at coal-fired power plants through 2020.

USEPA and the Tennessee Valley Authority (TVA) agreed to the FFCA on April 14, 2011 (USEPA 2011a). TVA also entered into a judicial consent decree with the States of Alabama, Kentucky, Tennessee, and North Carolina and three environmental advocacy groups: the Sierra Club, the National Parks Conservation Association, and Our Children's Earth Foundation (USEPA 2011b). The FFCA and the consent decree are substantively identical and were negotiated together. References to the FFCA in this document include the consent decree and its parties.

The FFCA resolved disputes over how the Clean Air Act's (CAA's) New Source Review (NSR) program applied to TVA's power plant maintenance and repair activities. As part of this resolution, the FFCA requires TVA to reduce emissions at GAF through one of the three specified methods—installing additional emissions controls (i.e., flue gas desulfurization [FGD] and selective catalytic reduction [SCR] technology), repowering the units to use renewable biomass, or retiring them—no later than December 31, 2017. As part of the FFCA, TVA agreed to retire 18 of its 59 coal-fired generating units. Under the FFCA, TVA has the discretion to decide how to reduce emissions at its other units. The parties to the consent decree, including the Sierra Club and other environmental advocacy groups, expressly recognized and stated that the agreement provided TVA a great deal of flexibility to control its facilities to a greater or lesser decree, including closing them, and that this approach was “adequate and reasonable.” EPA expressly observed that the compliance agreement allows TVA to make decisions regarding the best options for reducing emissions at its plants as TVA’s business plan evolves in the future. As stated, one purpose of this environmental assessment (EA) is to help TVA decide how to exercise this discretion respecting reducing emissions at GAF in order to comply with the FFCA.

Specifically, TVA proposes to install and operate the following at GAF:

- Dry flue gas desulfurization (dry FGD) systems, or “dry scrubbers,” to reduce sulfur dioxide ($SO_2$) emissions,
- SCR technology to reduce nitrogen oxide ($NO_X$) emissions, and
- Pulse jet fabric filters (PJFFs, or baghouses) to control particulate matter (PM) emissions.

In addition, activated carbon injection (ACI) systems would be integrated with the dry FGD and operated, as needed, to reduce mercury emissions.

Additional facilities required to support TVA’s proposed action include a new onsite dry CCR (in this case, primarily fly ash and scrubber residue), landfill, electrical transmission lines (TLs), transformer yard, and switchyard upgrades; and ancillary facilities such as onsite haul roads. The dry CCR landfill would position TVA to better respond to future regulation of ash management activities.

TVA has previously announced a broad plan or goal to convert all of its coal plants to dry CCR management. Future developments, including evolving regulatory requirements, are expected to affect this plan. Although the TVA Board endorsed this plan, each dry conversion project has to be individually assessed and justified when it is proposed for approval in the future. Part of this assessement would include a National Environmental Policy Act (NEPA) review. The proposed dry CCR landfill would initially manage dry fly ash and dry FGD byproduct with the expectation that some time in the future the plant’s bottom ash also would be dewatered and managed in the landfill. Activities to support bottom ash dewatering to complete the wet to dry conversion at GAF have not yet been proposed and are not included in the scope of this EA. Bottom ash will continue to be wet-sluiced for the time being.

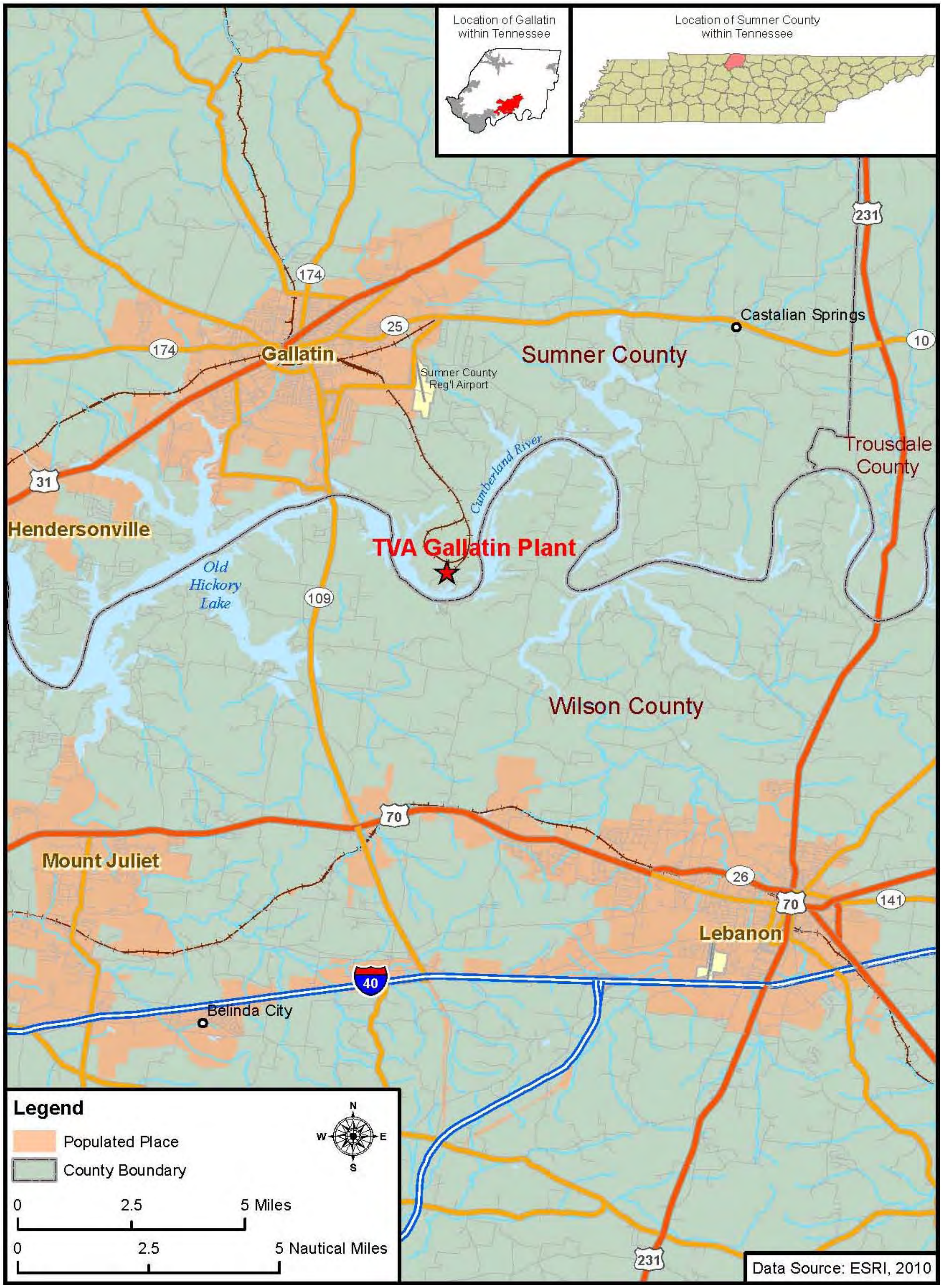


**Figure 1-1. Location of Gallatin Fossil Plant**

## 1.2 Background

TVA began construction of GAF in 1953, and began operating Unit 1 in 1956; all units were operating in 1959. GAF's powerhouse, coal yard, CCR surface impoundments, and additional facilities are located along the north bank of the Cumberland River (see Figure 1-2). GAF operates four coal-fired, steam-generating units and combusts an average of 12,350 tons of coal per day. Units 1 and 2 each have generator nameplate ratings of 300 megawatts (MW), and Units 3 and 4 each have generator nameplate ratings of 327.6 MW. In a typical year, GAF generates about seven billion kilowatt-hours (kWh) of electricity, enough to supply about 480,000 homes. Four combustion-turbine (CT) units were added to GAF in the early 1970s, and another four were added in 2000. They are primarily fueled with natural gas but have the capability to use fuel oil. The CT units support the TVA system's peak energy demand.

TVA has installed electrostatic precipitators (ESPs) at GAF to reduce particulate matter (PM) emissions and low-$NO_X$ burners to reduce nitrogen oxide ($NO_X$) emissions. TVA also burns low-sulfur blend coal, primarily coal from the Powder River Basin (PRB), at GAF to reduce emissions of $SO_2$. Currently, approximately 185,000 dry tons of fly ash and approximately 46,500 dry tons of bottom ash are wet-sluiced to GAF's surface impoundments each year. Figure 1-2 shows the GAF powerhouse, the Cumberland River Aquatic Center (CRAC) facility, combustion turbines, current coal pile area, and current CCR (fly ash and bottom ash) management area at GAF.

The GAF reservation also supports non-power-related land uses, including a Tennessee Wildlife Resources Agency (TWRA) wildlife management area (WMA) designated for recreational/hunting uses and the CRAC. The CRAC is an aquatic species hatchery facility. TVA constructed and operated this hatchery initially, but it is now operated by the TWRA. The hatchery is located on the north side of GAF's discharge channel on Cumberland River Mile (RM) 242.4. TWRA operates the CRAC under a short-term (30-day) License Agreement from TVA. TVA supplies electricity and water to the facility. TWRA is responsible for CRAC facility operations, which include freshwater mussel holding and propagation.

## 1.3 Decisions to be Made

The decision before TVA is whether to install additional pollution control equipment and take other associated actions at GAF to meet the requirements of the FFCA, MATS, and other applicable regulatory requirements and to maintain GAF as part of TVA's more balanced portfolio of energy resources. Specifically, TVA must decide whether to undertake the following actions:

- Construct and operate a dry FGD system for each coal-fired unit at GAF (units 1-4) and associated calcium oxide (CaO, also referred to as quicklime and pebble lime) storage facilities.
- Construct ACI and PJFF systems for each unit and tie-in with dry FGD system.
- Construct and operate a SCR system for each individual coal-fired unit.
- Construct and operate ammonia storage facility to support SCR operations.

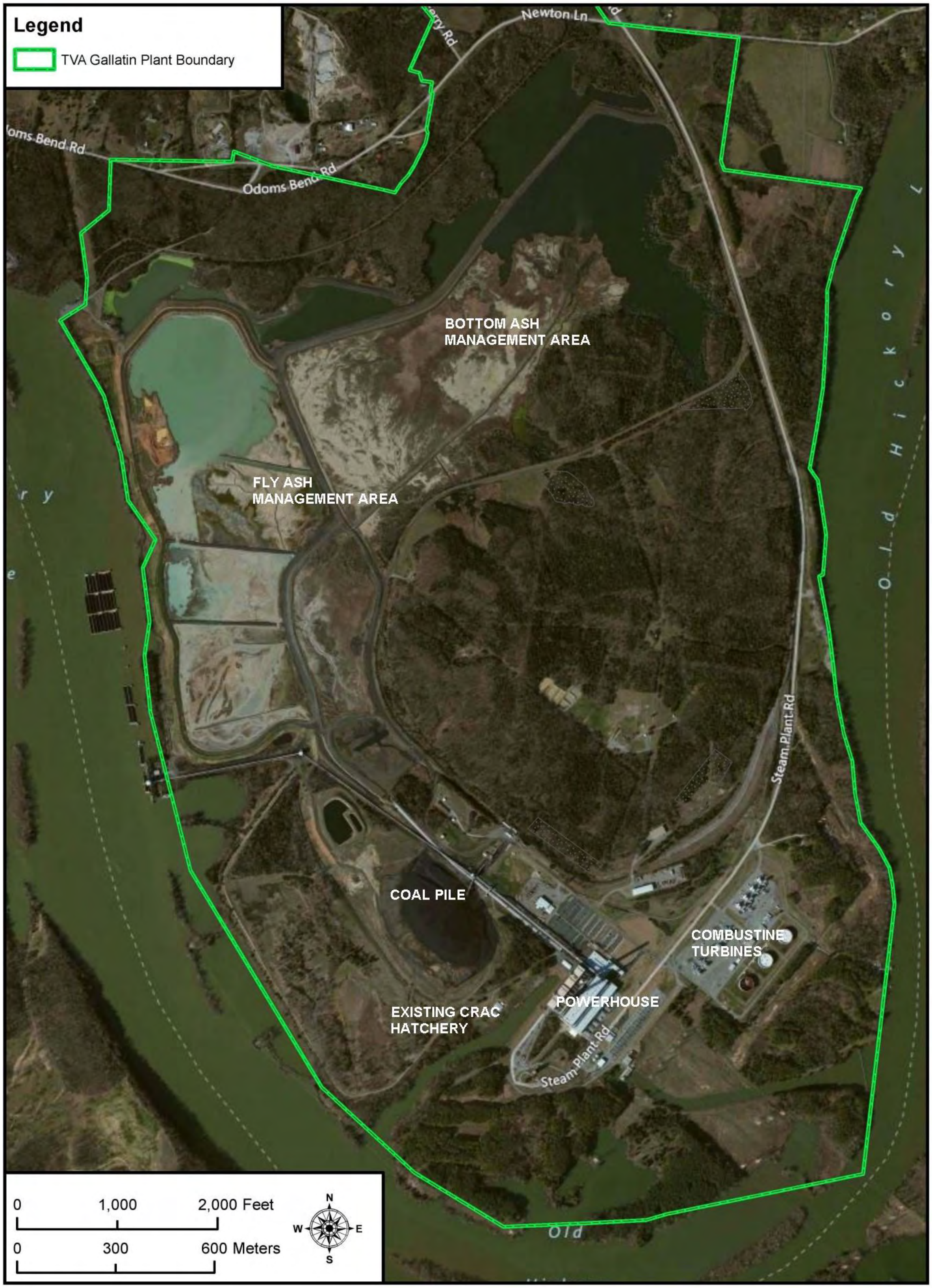


**Figure 1-2**. Gallatin Fossil Plant Existing Facilities

- Construct and operate a dry CCR handling, transport, and disposal facilities for fly ash and scrubber waste, to support pollution control equipment operations
- Construct and operate ancillary facilities, such as the electrical feeds, transmission lines (TLs), and transformer yard to support clean air equipment operations.

TVA also has two feasible locations for the proposed dry FGDs and it must decide which of these two locations to use if it proceeds with the proposed actions:

1. Across Discharge Channel Configuration (install and operate dry FGD across the discharge channel, SCR adjacent to the GAF powerhouse, and CCR disposal) (Alternative 2), or
2. Close Coupled Configuration (install and operate dry FGD and SCR adjacent to the GAF powerhouse, and CCR disposal) (Alternative 3).

If selected, the across discharge channel configuration (Alternative 2) would require relocation of the TWRA CRAC facility because it would interfere with the construction and operation of the proposed scrubbers. If TVA decides to do this, it would rebuild the CRAC on the GAF plant site away from the footprint of the proposed project components. TVA is coordinating plans to relocate and rebuild the hatchery with TWRA if Alternative 2 is selected. TVA anticipates entering into a Memorandum of Agreement with TWRA and the U.S. Fish and Wildlife Service (USFWS) to address the specifics of rebuilding the hatchery and its future operation if TVA decides to proceed with Alternative 2.

The proposed emissions control projects do not depend on closing the plant's existing future wet ash impoundment closures. Operation and closure of wet CCR impoundments typically are regulated under Clean Water Act permits in Tennessee and this is the regulatory situation at GAF. GAF holds National Pollutant Discharge Elimination System (NPDES) Permit TN0005428 (TDEC 2012b). When these impoundments are proposed for closure, TVA anticipates working closely with the Tennessee Department of Environment and Conservation (TDEC) to establish appropriate closure designs. Any proposed closure activities would be supported by an appropriate NEPA review.

## 1.4 Related Environmental Reviews

In 2011, TVA completed the IRP to describe how it would meet the electric power demands in its service area for the next 20 years while fulfilling its mission of providing low-cost, reliable power; environmental stewardship; and economic development *(*TVA 2011a). TVA released the accompanying environmental impact statement (EIS) for the IRP in March 2011 (TVA 2011b). This EA tiers from the 2011 IRP EIS providing a site-specific analysis of the potential impacts of installing air pollution control equipment and associated actions at GAF. In addition, the environmental reviews below are relevant to this EA and are hereby incorporated by reference:

- *Paradise Fossil Plant Units 1, 2, and 3, Selective Catalytic Reduction Systems for Nitrogen Oxide Control Final Environmental Assessment and Finding of No Significant Impact* (TVA 1999)
- *Bull Run Fossil Plant Unit 1, Selective Catalytic Reduction Systems for Nitrogen Oxide Control Final Environmental Assessment and Finding of No Significant Impact* (TVA 2002a)

- *Installation of Flue Gas Desulfurization System on Paradise Fossil Plant Unit 3, Muhlenberg County, Kentucky, Final Environmental Assessment and Finding of No Significant Impact,* March 2003 (TVA 2003b)
- *Replacement or Rejuvenation of Catalyst for Selective Catalytic Reduction for Nitrogen Oxides at Seven TVA Fossil Plants in the Tennessee Valley, Final Environmental Assessment and Finding of No Significant Impact,* January 2005 (TVA 2005a)
- *Installation of Flue Gas Desulfurization System on Bull Run Fossil Plant, Anderson County, Tennessee, Final Environmental Assessment and Finding of No Significant Impact,* March 2005 (TVA 2005b)
- *Installation of Flue Gas Desulfurization System on Kingston Fossil Plant, Roane County, Tennessee, Final Environmental Assessment,* April 2006 (TVA 2006a)
- *Operational Improvements to Optimize Selective Catalytic Reduction Systems at Five Fossil Plants Tennessee, Alabama, and Kentucky, Environmental Assessment and Finding of No Significant Impact,* April 2008 (TVA 2008)

## 1.5 Scope of the Environmental Assessment

NEPA requires federal agencies, including the TVA, to consider the potential environmental impacts of actions they propose to take that will impact the physical environment before making a final decision to proceed. See Appendix A for more information on the NEPA compliance process for this proposed action.

TVA has prepared this EA to evaluate the environmental effects of the proposed actions and determined that potential effects to the environmental resouces listed below are relevant to the decision to be made:

- Air quality and climate change
- Water resources (surface water, groundwater, floodplains)
- Biological resources (aquatics, vegetation, natural areas, terrestrial animals, and wetlands)
- Cultural and historic resources
- Geology, soils, and prime farmland
- Solid waste and utilities
- Socioeconomics and environmental justice
- Land use and recreation
- Aesthetics and visual resources
- Hazardous materials and waste
- Noise

- Public health and safety
- Transportation

## 1.6 Public and Agency Involvement

TVA issued a draft of this EA for public review and provided a 30-day comment period that was to end on November 17, 2012. Thirty days is TVA's standard comment period when it releases draft EAs for public review. At the request of a number of individuals and organizations, the comment period was extended until November 30 for a total period of 44 days. Subsequently, TVA agreed to accept late comments from the Sierra Club and other environmental advocacy groups until December 18, 2012. The notice of availability of the draft EA was published in two newspapers that serve the Sumner County area: *The Tennessean* and the *Gallatin News Examiner*. In addition, the draft EA was placed on TVA's public NEPA website. TVA also sent copies of the draft EA to the Gallatin Public Library, TDEC, the USFWS, the State Historic Preservation Officer (SHPO), the National Park Service (NPS), and TWRA for review and comment. Individuals and organizations who had previously expressed an interest in the proposed action were notified of the availability of the draft EA (refer to Chapter 6 for the list of recipients). A response to public and agency comments in provided in Appendix E.

## 1.7 Environmental Permits Required

Activities at coal-fired power plants are heavily regulated and require a number of different kinds of environmental permits. This regulation helps ensure that potential impacts from plant activities are kept to levels protective of human health and the environment. TVA already holds the permits necessary for the operation of GAF. Depending on the decisions made respecting the proposed actions, however, TVA may have to obtain or seek amendments to the following permits:

- New Solid Waste Class II Disposal Permit for the disposal of CCR from operating additional pollution control equipment and the four generating units. This permit would contain applicable groundwater protection measures.
- TDEC Aquatic Resource Alteration Permit (ARAP) for physical alteration of surface waters of the state (streams, wetlands, reservoirs, etc.).
- Air construction permit for new emissions sources.
- Modification of GAF's existing air operating permit to reflect the new plant configuration and associated emissions.
- NPDES Construction Storm Water Permit for storm water runoff from construction activities.
- Modification of GAF's existing NPDES permit to reflect the new plant configuration and any discharges associated with industrial activities.
- United States Army Corps of Engineers (USACE) Section 404 and Section 10 permit.
- Modifications to the Integrated Pollution Prevention Plan (IPPP) would be made for

the addition of new surface ponds, switchyards, and fuel tanks.

- A Risk Management Plan (RMP) would be developed for the addition of new ammonia handling facilities required for SCR operations.
- Modification to the Tennessee Multi-sector Permit for Industrial Storm Water discharges would be made for the addition of new storm water outfalls.
- Hydrostatic testing permit application would be submitted, if necessary, for pipe system integrity testing.
- The GAF site Storm Water Pollution Prevention Plan (SWPPP) would be revised to include management of precipitation into secondary containment for ammonia tanks.

## 1.8 Project-Specific Design Measures and Environmental Commitments

To help to further safeguard the environment and to better safeguard against potential environmental impacts, TVA would implement the environmental commitments summarized below, as necessary, if it proceeds with the proposed actions. The commitments include project specific design measures and best management practices (BMPs). Refer to Chapter 4 for additional information regarding environmental commitments.

### 1.8.1 Proposed Construction BMPs

- Appropriate BMPs for erosion control and stabilization of disturbed areas, including dust suppression, would be utilized, and all construction activities would be conducted in a manner to ensure that waste materials are contained and that introduction of polluting materials into receiving waters is minimized.
- All applicable permits, as described in Section 1.7, would be acquired. Consequently, associated permit-related mitigations and BMPs, determined at the time of the permitting process, would be implemented to further minimize impacts to water quality and wetlands.
- In addition to the proper operation of pollution control devices and dust suppression methods for controlling fugitive emissions as required by the GAF air operating permit, the following mitigation measures are being considered for maintaining air quality:
    - If necessary, potential emissions from construction areas, paved, and unpaved roads would be mitigated using wet suppression. From roadways and unpaved areas, wet suppression can reduce fugitive dust emissions by as much as 95 percent.
    - Specific haul roads would be paved, as required, to ensure no particulate emissions associated with industrial activity go beyond the GAF property boundary.
- Mitigations and BMPs for soil erosion would be developed as part of the legally required SWPPP Erosion Control Plan. All erosion and sediment controls would be installed, placed, implemented, or constructed in accordance with the

provisions of the Tennessee Erosion and Sediment Control Handbook.

- Proper management of hazardous materials/wastes would be conducted in accordance with established TVA procedures. TVA would comply with all TDEC regulations regarding disposal of waste materials, including asbestos and lead based paint (LBP) management activities prior to demolition.

### 1.8.2 Proposed Construction Design Measures

- TVA would ensure construction activities for areas that support Indiana bat habitat are performed in a manner to avoid conflicts and protect breeding habitat. TVA would notify USFWS prior to clearing/construction of proposed project areas supporting Indiana bat habitat, and remove trees that support Indiana bats during winter months only (outside of the maternity period).
- Protective buffers around historic cemeteries and archeological sites potentially eligible for listing on the National Register of Historic Places (NRHP) have been identified, flagged, and noted on project plans to ensure such sites are avoided during all phases of TVA's proposed action.
- In consultation with the SHPO and interested federally recognized Indian tribes, TVA has entered into a Programmatic Agreement (PA) with the SHPO. The PA specifies stipulations for the avoidance, minimization, and mitigation of adverse effects to NRHP-eligible properties resulting from the construction, operation, and maintenance of emissions control equipment and CCR disposal facilities and associated infrastructure. If, after avoidance measures for a historic cemetery have been considered in consultation with the SHPO and found not to be technically feasible or economically prudent, TVA would follow procedures outlined in Tennessee Code Title 46 Chapter 4 – Termination of Use of Land as Cemetery.
- Appropriate management of construction and land-clearing debris, including recycling and reuse when possible, would limit solid waste generation and disposal needs.
- TVA would develop a detailed blasting plan to protect workers and nearby neighbors. The plan would document the specifications or rules that clearly define the performance and safety requirements of the work. The plan would also delineate proper hearing protection for workers in the vicinity of the blast and would ensure that the use, transportation, and storage of explosives is being conducted in accordance with all applicable or relevant regulations, including 29 Code of Federal Regulations (*CFR)* 1926.900, *Blasting and the Use of Explosives*; 49 *CFR* Parts 171-179, *Highways and Railways*, and 49 *CFR* Parts 390-397, *Motor Carriers* (transportation); and 27 *CFR* Part 55, *Commerce in Explosives* (storage).
- The need to implement mitigation to alleviate traffic impacts would be identified through coordination with the Tennessee Department of Transportation (TDOT), the Sumner County Highway Department, and the City of Gallatin.

### 1.8.3 Proposed Operational BMPs

**Clean Air Equipment**

- TVA's recommended coal quality and specification testing would be performed, as required.
- Appropriate quality assurance activities related to continuous stack monitoring would be performed, as required, for the continuous emission monitoring (CEMs) equipment per CAA regulations.
- Stack paint and lighting patterns and requirements would be consistent with Federal Aviation Administration (FAA) regulation AC 70/7460 (FAA 2007).

**Ammonia Facilities**

- The spill retention basin would be sized to retain the contents of an entire tank, deluge water and storm water. The spill retention basin at a minimum would be lined with compacted in situ earth or low-permeability clay liner.
- TVA would monitor impacts on effluent pH; outfall parameters would be evaluated and adjusted as necessary to meet NPDES permit requirements.
- TVA would develop an RMP describing the overall management structure, all risks, and all physical and operational methods designed to minimize the likelihood of an accidental ammonia release.

### 1.8.4 Proposed Operational Design Measures

- TVA would characterize impacts from ammonia addition on dry CCR and associated runoff during rain events; CCR would be evaluated to determine optimum means of ensuring that adequate mixing and assimilation of ammonia compounds occur within the landfill. This will be performed by characterizing the anticipated ammonia-on-ash concentration based on actual coal blends and ammonia slip conditions during operations to ensure that it does not exceed the calculated threshold TVA would implement to meet the requirements of TDEC and the USFWS.
- TVA would ensure the maximum area of exposed ash at any particular time during the stacking period does not exceed 10 acres.

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# Chapter 2 – ALTERNATIVES

## 2.1 Description of Alternatives

This chapter describes the alternatives TVA evaluated in this review. These include alternatives addressed in more detail here in the EA and other alternatives that were considered but addressed in less detail:

- Alternative 1 – Continue Operation of GAF Units 1-4 With No Additional Controls (*No Action Alternative*)
- Alternative 2 – Install and Operate Emission Control Equipment and CCR Disposal - Across Discharge Channel Configuration (*TVA's Preferred Alternative*)
- Alternative 3 – Install and Operate Emission Control Equipment and CCR Disposal - Close Coupled Configuration

Under both Alternatives 2 and 3, TVA would install and operate the same emission control equipment and CCR landfill. The difference in these two alternatives is the location of the dry FGD equipment. Under Alternative 2, TVA would install and operate the dry FGD equipment across the discharge channel from the powerhouse (Across Discharge Channel Configuration). Alternative 3 would construct the dry FGD equipment adjacent to the powerhouse (Close Coupled Configuration). The following descriptions of Alternatives 2 and 3 focus on the differences in these alternatives; their common components are described below in Section 2.2.

This chapter also discusses the alternatives that TVA considered but rejected from detailed analysis because they did not meet the purpose and need of TVA's proposed action or were otherwise unreasonable.

### 2.1.1 Alternative 1, No Action Alternative: Continue Operation of GAF Units 1-4 with No Additional Controls

Applicable NEPA regulations require federal agencies to consider a No Action Alternative. Under the No Action Alternative, TVA would continue current operation of GAF Units 1-4 and would not implement activities to further reduce emissions or comply with applicable environmental requirements such as MATS and the FFCA. It is possible that these requirements could be changed and TVA would not have to reduce emissions at GAF. However that is not likely and not reducing emissions would be inconsistent with TVA's goals to provide cleaner, reliable, and affordable energy to support sustainable economic growth in the Tennessee Valley. Therefore, this alternative is not considered viable or reasonable. It does provide, however, an appropriate benchmark or baseline from which to consider the environmental improvements TVA is proposing to make to future operation of GAF.

### 2.1.2 Alternative 2, Across Discharge Channel Configuration: Install and Operate Emission Control Equipment and CCR Facilities (*TVA's Preferred Alternative*)

For Alternative 2, a dry FGD (scrubber) would be installed for each individual unit on the west side of GAF's discharge channel, resulting in reductions in $SO_2$, acid gases, and mercury; and SCR systems would be installed adjacent to the GAF powerhouse to further reduce $NO_X$. In addition, TVA would install an ACI system integrated with the dry FGD to further reduce mercury emissions, as necessary, and PJFF, or baghouse, for each unit to reduce PM emissions. Additional facilities required to support TVA's proposed action include a new onsite dry CCR landfill constructed to accept dry fly ash, dewatered bottom ash (possible future project), and dry FGD byproduct; extensions of on-site electrical transmission lines; and ancillary facilities such as haul roads, stock piles, and laydown areas. The layouts of major components associated with Alternative 2 are provided in Figure 2-1. The total land disturbance anticipated under Alternative 2 to support operations would be approximately 140 acres (approximately 96 acres for North Rail Loop [NRL], 20 acres for haul roads, 12 acres for dry FGD, 4.5 acres for SCR, and 6.5 acres for transmission components). An additional 80 acres would eventually be developed for the South Rail Loop (SRL) landfill.

One individual SCR would be installed for each generating unit, including inlet and outlet ductwork, supporting structures, and all required accessories. TVA would design, install, and operate all equipment in a manner that complies with applicable environmental requirements.

TVA currently burns low-sulfur PRB coal at GAF. TVA would conservatively design the dry FGD system to accommodate a blend of approximately equal parts PRB and higher-sulfur Illinois Basin (ILB) coal. Table 2-1 provides design fuel specifications for the dry FGD systems, though these are not a component of TVA's proposed action. Designing the FGD system to burn higher-sulfur coal gives TVA the flexibility to switch coals in the future to take advantage of changing market conditions while maintaining compliance with applicable regulations.

**Table 2-1. Coal Blend Assumptions for Proposed Action**

| Coal Blend With ILB and PRB[1] | | Coal Analysis | | Final Blend | Design Coal Specifications |
|---|---|---|---|---|---|
| **Fuel** | | **ILB As-Rec'd** | **PRB As-Rec'd** | **50% PRB/ 50% ILB As-Rec'd** | |
| Sulfur | wt% | 2.94 | 0.284 | 1.61 | 1.61 |
| Moisture[2] | wt% | 9.89 | 27.5 | 18.7 | 30.0 |
| Ash[3] | wt% | 8.76 | 5.03 | 6.90 | 10.00 dry |
| Total | wt% | 100 | 100 | 100 | -- |
| HHV | Btu/lb | 11,500 | 8,720 | 10,324 | 10,324 |
| Fuel Sulfur | lb $SO_2$/mmBtu | 5.00 | 0.636 | 3.05 | 3.05 |

Btu = British thermal unit; ILB = Illinois Basin; lb =pound; mmBtu = million British thermal units; ppm = parts per million; PRB = Powder River Basin; $SO_2$ = sulfur dioxide; wt% = weight percent

(1) The scrubber design coal would not be limited to only PRB and ILB coals (other coal combinations could be acceptable provided permit conditions and compliance requirements are met.

(2) Although the table reads that the final blend moisture is 18.7%, the scrubbers would be designed for a maximum of 30% coal moisture to increase operational flexibility.

(3) Although the table reads that the final blend ash is 6.90%, the scrubbers would be designed for a maximum of 15% coal ash (% dry basis) to increase operational flexibility.

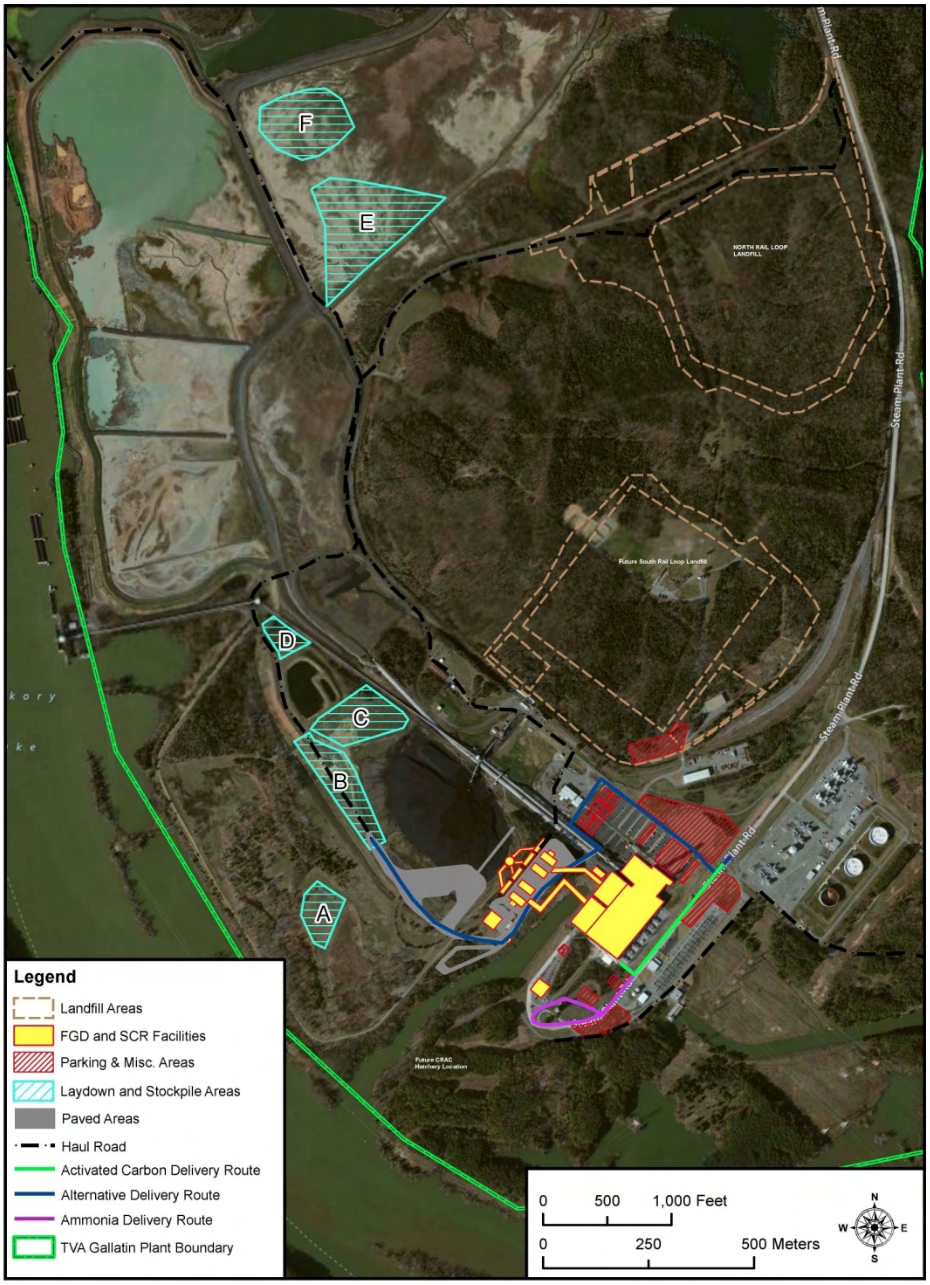


**Figure 2-1. Alternative 2, Across Discharge Channel Configuration Site Plan (TVA's Preferred Alternative)**

The additional actions proposed by TVA and specific to Alternative 2 would entail the following:

**New Stack.** A new air emission stack with four new flue liners (one for each unit) would be constructed. The stack would include CEMs equipment certified to monitor stack emissions. The existing stacks at GAF would remain in place and associated emission monitoring equipment would be removed from service. Stack height will be between 300 and 500 feet, with final stack height determined in the final engineering and design process.

**CRAC Facility Relocation.** The CRAC facility would have to be relocated under Alternative 2 to provide room for the FGD equipment and related components. TVA would provide TWRA with long-term land use rights to a site on the south side of the discharge channel and closer to the canal's mouth (see Figure 2-1). TVA is working with TWRA on the design and construction of a replacement hatchery that would not only allow hatchery activities to continue at GAF, but would enhance those activities. The existing facility would be dismantled. All debris from demolition activities would be disposed of in an off-site landfill approved to accept such wastes. TVA assumes all applicable requirements would be adhered to by the TWRA, assuring species are protected, and impacts are avoided. TVA, TWRA, and USFWS would develop a joint memorandum of agreement (MOA) outlining each agencies' roles and responsibilities regarding future operations at this new facility.

**Discharge Channel Ductwork**. Alternative 2 would require the construction/installation of a conveyance bridge across the discharge channel to support pipes, ducts, and other components.

### 2.1.3 Alternative 3, Close Coupled Configuration: Install and Operate Emission Control Equipment and CCR Facilities

Alternative 3 would install and operate a dry FGD system adjacent to GAF's powerhouse (see Figure 2-2). This alternative would provide a dry FGD and a connected SCR for each unit. This equipment would be installed between the powerhouse and the northern end of the discharge channel, in an area partly occupied by the existing ESPs. The ESPs would be replaced by the proposed baghouses (i.e., ESPs would no longer be required); therefore ESPs would be dismantled and disposed of at an off-site landfill. As the ESPs are anticipated to contain asbestos containing materials (ACMs), TVA would select a landfill accepting such regulated waste for demolition debris. The existing induced draft (ID) fans would be replaced at GAF during this phase of construction. This alternative would potentially require additional modifications to the GAF powerhouse structures not required by Alternative 2, allowing the equipment to be directly coupled with GAF's powerhouse operations. A new air emission stack would not be required, as the existing stacks could be used. Under this alternative, the hatchery would not be relocated. Under Alternative 3, the anticipated total land disturbance to support operations would be approximately 1323 acres (96 acres for the NRL landfill, 20 acres for haul roads, 5 acres for dry FGD, 4.5 acres for SCR, and 6.5 acres for transmission components). An additional 80 acres would likely be developed in the future for the SRL landfill.

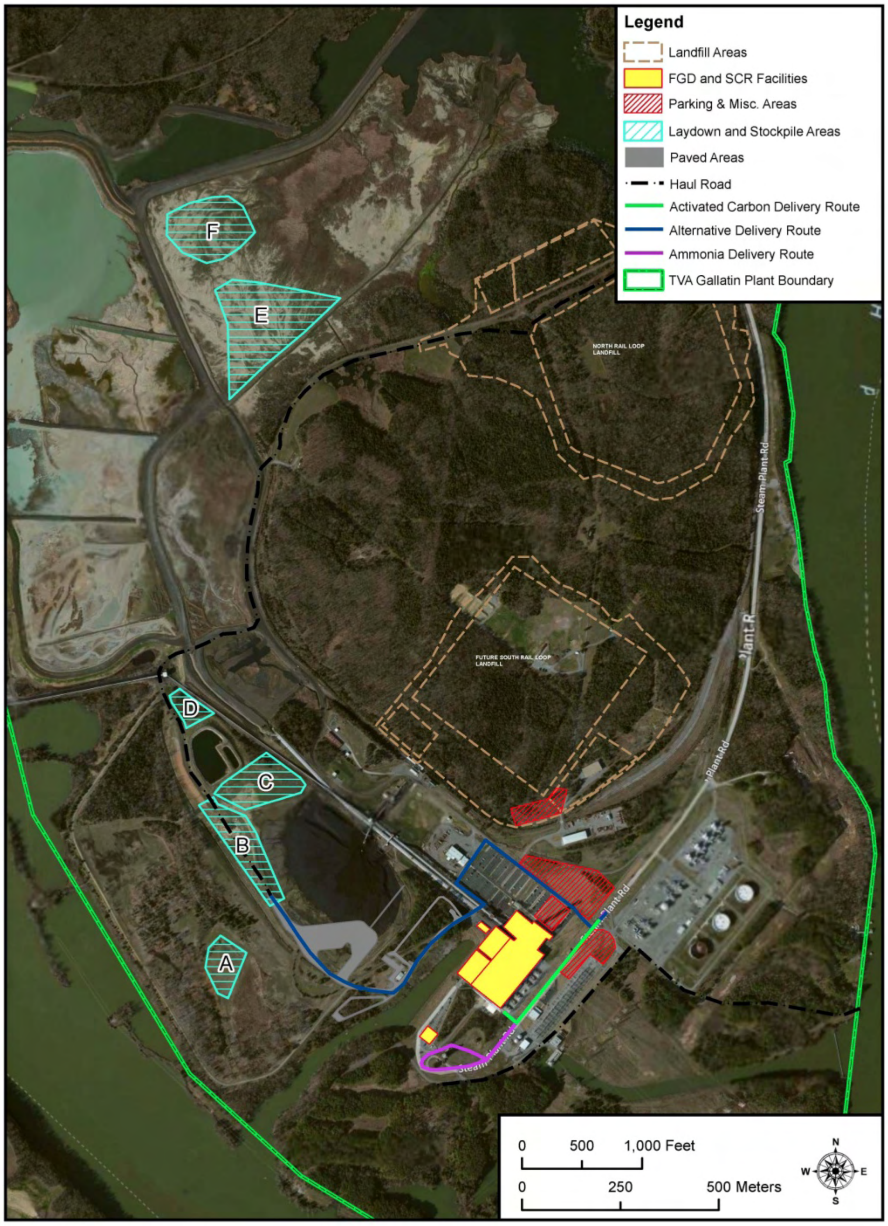


**Figure 2-2. Alternative 3, Close Coupled Configuration**

## 2.2 Summary of Common Components (Alternatives 2 and 3)

The equipment proposed for the Action Alternatives (2 and 3) is primarily the same, with the proposed location of dry FGD equipment, the continued use of the existing stack, and the retention of the current hatchery location being the major differences. The total cost of TVA's proposed action, inclusive of the dry FGD, SCR, CCR landfill, transmission upgrades, and new haul roads, is estimated to be $1.2 billion. The components common to Alternatives 2 and 3 include the following:

- Dry FGD systems for GAF Units 1-4 designed to remove up to 96 percent of $SO_2$ emissions on a continuous basis and associated pebble lime and byproduct storage facilities;
- SCR for GAF Units 1-4 designed to reduce $NO_X$ emissions by approximately 90 percent, given an inlet $NO_X$ of 0.4 pounds (lbs) per million British thermal units (mmBtu), and associated ammonia storage facility;
- ACI and PJFF systems integrated with the dry FGD for GAF Units 1-4;
- Dry CCR handling and disposal, i.e. NRL and SRL landfill areas (SRL for potential future action);
- Ancillary facilities (haul and access roads, parking areas, stockpiles, laydown areas, and transmission/utility upgrades), and
- Design coal specifications.

The common equipment summarized below for Alternatives 2 and 3 would achieve similar reductions of $SO_2$, $SO_3$, NOx, mercury, and PM emissions.

### 2.2.1 Dry FGD System

#### *2.2.1.1 Dry FGD Equipment*

A dry FGD system, utilizing pebble lime, would be installed to control $SO_2$ and acid gases and to enhance mercury capture by the fabric filter PM control device. Dry scrubber costs have continued to decrease, largely because of technical innovations and are increasingly being recognized as an important part of a comprehensive air control program. The following dry FGD systems were evaluated:

- Spray drying absorber (SDA)
- Circulating dry scrubber (CDS)
- Novel integrated desulfurization (NID)

TVA identified the NID dry scrubber technology for GAF. Compared to the other scrubber technologies evaluated such as SDA and CDS, the NID scrubber has low capital and maintenance costs as well as low operating energy requirements. The NID system would utilize calcium oxide (CaO), also referred to as pebble lime, as the base reactant to remove $SO_2$. Pebble lime is mixed with raw water to produce calcium hydroxide [$Ca(OH)_2$], or hydrated lime, which is injected into the flue gas stream. Upon injection, hydrated lime captures $SO_2$ in the flue gas resulting in conversion to calcium sulfite ($CaSO_3$). The fundamental scrubbing reaction for the NID is as follows:

$$CaO + H_2O \text{ ---> } Ca(OH)_2 \; Ca(OH)_2 + SO_2 \text{ ---> } CaSO_3 + H_2O$$

.

The basic schematic for the NID is represented in Figure 2-3 and a process diagram is provided in Figure 2-4. As shown in Figure 2-3, the NID system includes a mixer and lime hydrator, a reactor and fabric filter.

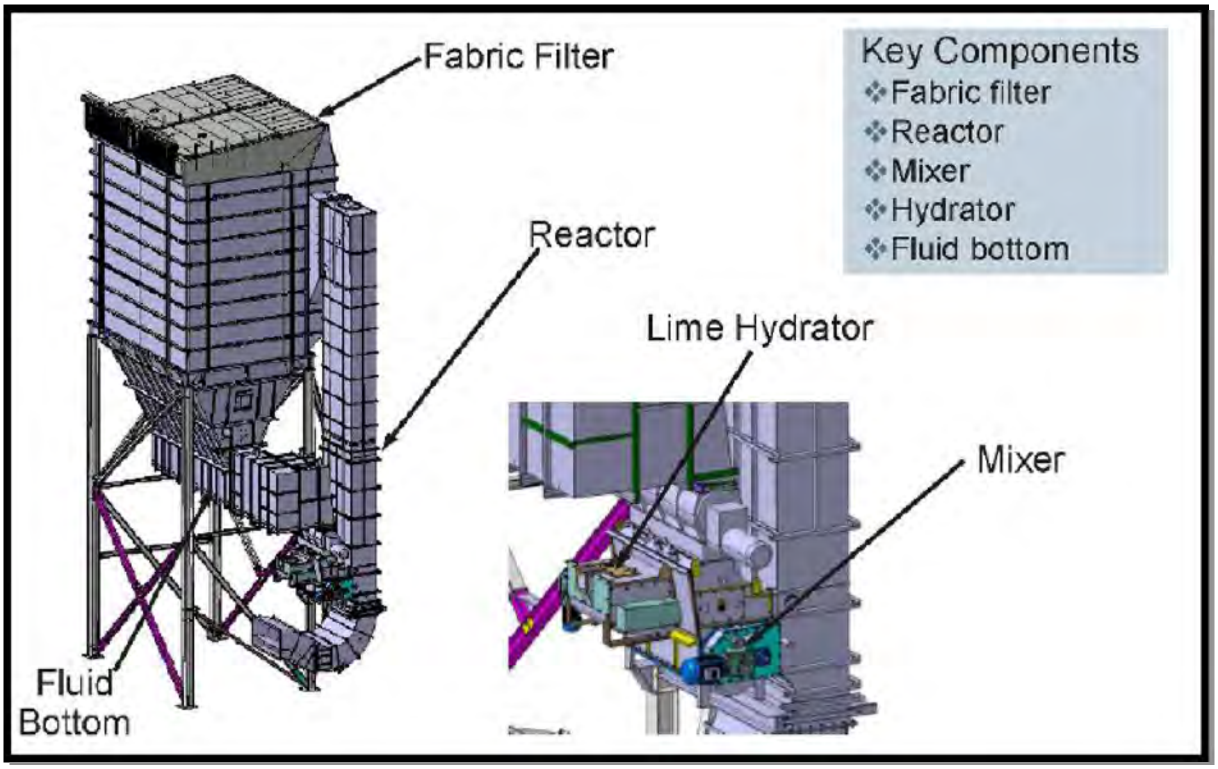


**Figure 2-3. Schematic of Proposed Dry FGD NID System**

As shown in Figure 2-4 pebble lime would be mixed with raw water in the hydrator/mixer. The hydrated lime is injected into the flue gas stream to a react with the $SO_2$. The NID system includes a fabric filter that separates the gas from the solid material. The process includes a disposal bin for small quantity, short-term storage of CCR. The amount of water added to NID is minimal, which means the recycled solids remain in the range of moisture to be considered dry. Raw water would be used from a process water supply line for each unit. Information on the expected coal blend is provided in Appendix B.

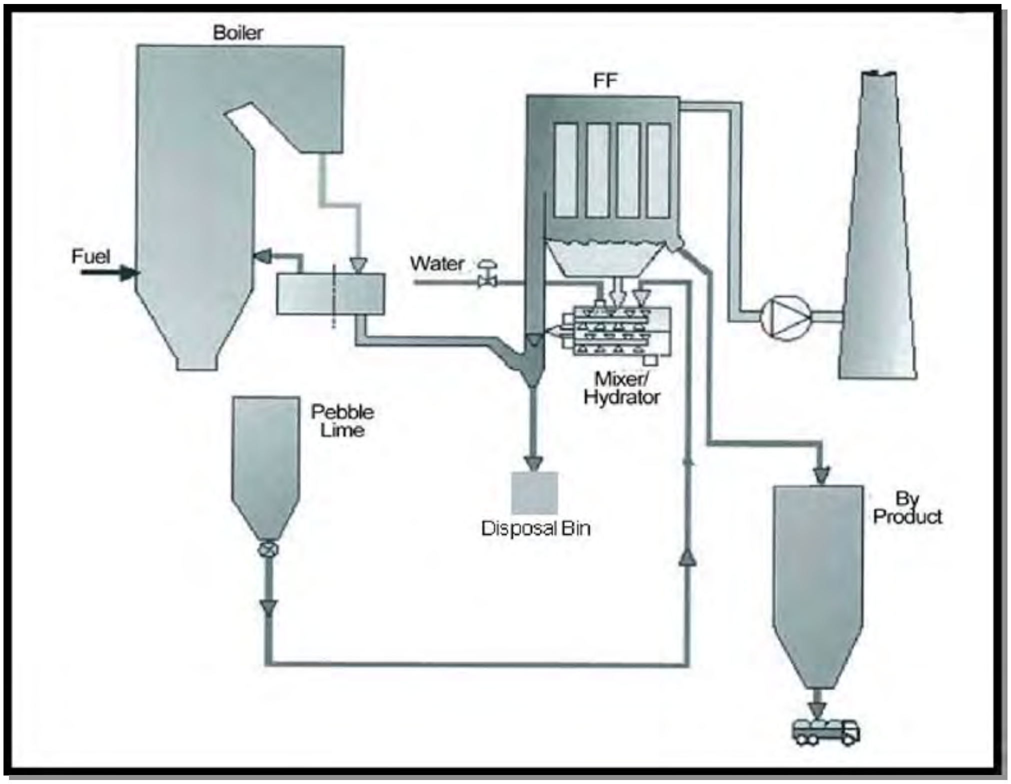


**Figure 2-4. Typical NID Process Diagram**

#### *2.2.1.2 Dry FGD Reagent Delivery and Storage*

Pebble lime would be delivered to GAF by trucks equipped with a pneumatic unloading blower. The pebble lime would be unloaded and conveyed to pebble lime storage silos (one silo per unit). There would be two truck lanes for each silo, allowing the lime silos to be filled simultaneously. A self-contained vent filter mounted on each silo roof would control fugitive dust during receiving operations. Section 2.2.6 provides additional information regarding materials delivery and hauling.

#### *2.2.1.3 Dry FGD Reagent Preparation and Feed*

The pebble lime would be conveyed from the silos to the dry FGD bins using a positive-pressure pneumatic conveying system. Pebble lime from the bins would then be gravity fed to a hydrator where raw water is added to form the $Ca(OH)_2$.

### 2.2.2 SCR System

#### *2.2.2.1 SCR Equipment*

The SCR (Figure 2-5) is designed to convert $NO_X$ in the boiler flue gas to nitrogen gas and water vapor. The reduction is accomplished by a chemical reaction, using ammonia facilitated by a catalyst. The SCR systems inject ammonia into boiler flue gas and pass it through a catalyst bed where the ammonia and nitrogen oxide gas react to form nitrogen and water vapor. The emission of unreacted ammonia is caused by the incomplete reaction of injected ammonia with $NO_X$ present in the flue gas. Units 1-4 would be retrofitted with an SCR system to reduce

$NO_X$ emissions by approximately 90 percent, given an inlet $NO_X$ of 0.4 lbs/mmBtu (see Figure 2-1 for location of SCR systems and ammonia storage as applicable to Alternative 2 and 3). The new SCR systems would be placed where the ESPs are currently located. When the dry FGD system is built, the new duct system would direct the flue gas directly from the SCR reactors across the discharge channel (for Alternative 2) and into the dry FGD system. For Alternative 3, the new duct system would direct the flue gas directly from the SCR reactors and into the dry FGD system.

During operation of the SCR, catalysts slowly deactivate over time in service, so they are replaced or rejuvenated during scheduled unit outages to maintain the needed $NO_x$ reduction. To retain optimal $NO_x$ removal between scheduled outages, the ammonia injection rate may need to be gradually increased to make up for catalyst deactivation. Increasing the amount of ammonia injected can increase the amount of unreacted ammonia that slips through the system, which could increase the ammonia-on-ash concentration and the ammonia concentration in the receiving ponds. SCR optimization programs at Colbert, Cumberland, Kingston, Paradise, and Widows Creek Fossil Plants have enabled TVA to sustain high $NO_x$ removal rates while extending the SCR catalyst life until the next scheduled outage. This is accomplished by increasing slip up to values that do not cause violations of applicable opacity standards, NPDES action levels, or toxicity reference values based on constraints at the individual plants. TVA will employ a comparable process for SCR optimization at GAF.

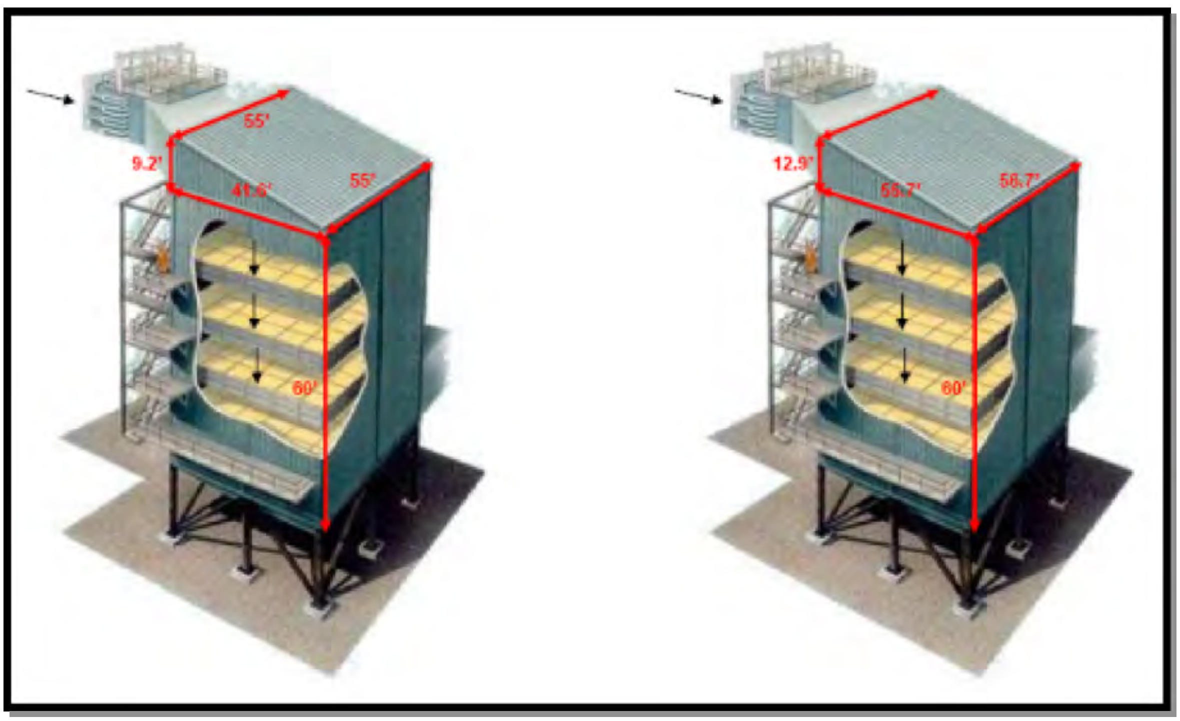


**Figure 2-5. Typical SCR Equipment** (dimensions shown are approximate)

### *2.2.2.2 Anhydrous Ammonia Delivery and Storage*

To support SCR system operations, a new anhydrous ammonia tank farm and vaporizer system would be constructed. The new tank farm and vaporizer system would consist of four 18,000-gallon tanks, ammonia liquid forwarding pumps and vaporizers mounted on skids, and miscellaneous truck unloading equipment, piping, valves, and instrumentation. Delivery of the anhydrous ammonia to the tank farm is planned by truck. Section 2.2.6 provides additional information regarding materials delivery and hauling. Any liquid including runoff from the unloading operations area would be contained in the compacted-earth catch basin surrounding the storage tank and unloading area. The containment would be sized for storm water runoff from a 10-year, 24-hour event, one tank's contents and deluge system associated with catastrophic release. Following testing, any spilled material would be handled and disposed of as required by applicable regulations.

#### *2.2.2.3 Anhydrous Ammonia Preparation and Feed*

Anhydrous ammonia vapor from the tank farm vaporizers would be piped to an ammonia injection grid where the vapor and dilution air would be injected into the SCR reactor inlet duct. A device to control ammonia flow would be provided for each unit’s SCR to control the vaporized ammonia flow.

### 2.2.3 Activated Carbon Injection

TVA would construct an ACI system for each dry FGD system and operate it when needed to reduce mercury emissions from GAF Units 1-4. The ACI injection point is anticipated to be after the dry FGD and before the PJFF. Activated carbon would be delivered by truck and stored onsite in storage silos. Each truck would also be equipped with a pneumatic unloading blower and there would be one truck unloading facility for each silo. From the silos, activated carbon would be conveyed by pneumatic blowers for injection.

### 2.2.4 CCR Landfill Storage and Disposal

TVA would construct a dry CCR facility to store the waste from GAF’s proposed clean air equipment components. GAF’s four coal-fired, electric generating units currently produce approximately 185,000 dry tons of fly ash and bottom ash annually, which are wet-sluiced to onsite fly ash and bottom ash ponds. TVA estimates that dry fly ash and scrubber residue production from the proposed new equipment, plus future dewatered bottom ash, could range from approximately 411,000 to 877,000 dry tons per year (TPY). This range is conservatively based upon a variety of proposed coal and coal blends, increased dry additives (lime and activated carbon), and resulting variation of annual CCR production.

As shown on Figure 2-6, two separate landfills, the NRL and SRL, have been sited and would be constructed as needed. Initially, the NRL landfill would be constructed to support GAF’s operations. TVA anticipates that the NRL landfill complex could disturb about 96 acres of land for the lined landfill, laydown areas, storm water pond and perimeter roads. Approximately 50 acres would be developed per TDEC Industrial Landfill requirements and Federal Subtitle D requirements for dry CCR disposal. Disposal areas located within the landfill footprint, also referred to as ‘cells,’ would be operated; current design provides three cells for NRL, or approximately 6.7 million cubic yards of disposal capacity. The maximum height of the CCR facility would be approximately 190 feet from the perimeter haul road elevation, which results in an active stack elevation of 695 feet above mean sea level (AMSL). The primary goal for CCR disposal is to support GAF’s dry FGD and SCR operations by providing approximately 20 years of storage capacity. The initial estimate of the NRL landfill life is between seven and fifteen years, dependent on factors previously discussed.

In the event the NRL begins to approach full capacity, TVA would take necessary actions to construct the SRL landfill. This would include conducting hydrogeologic studies, landfill design,

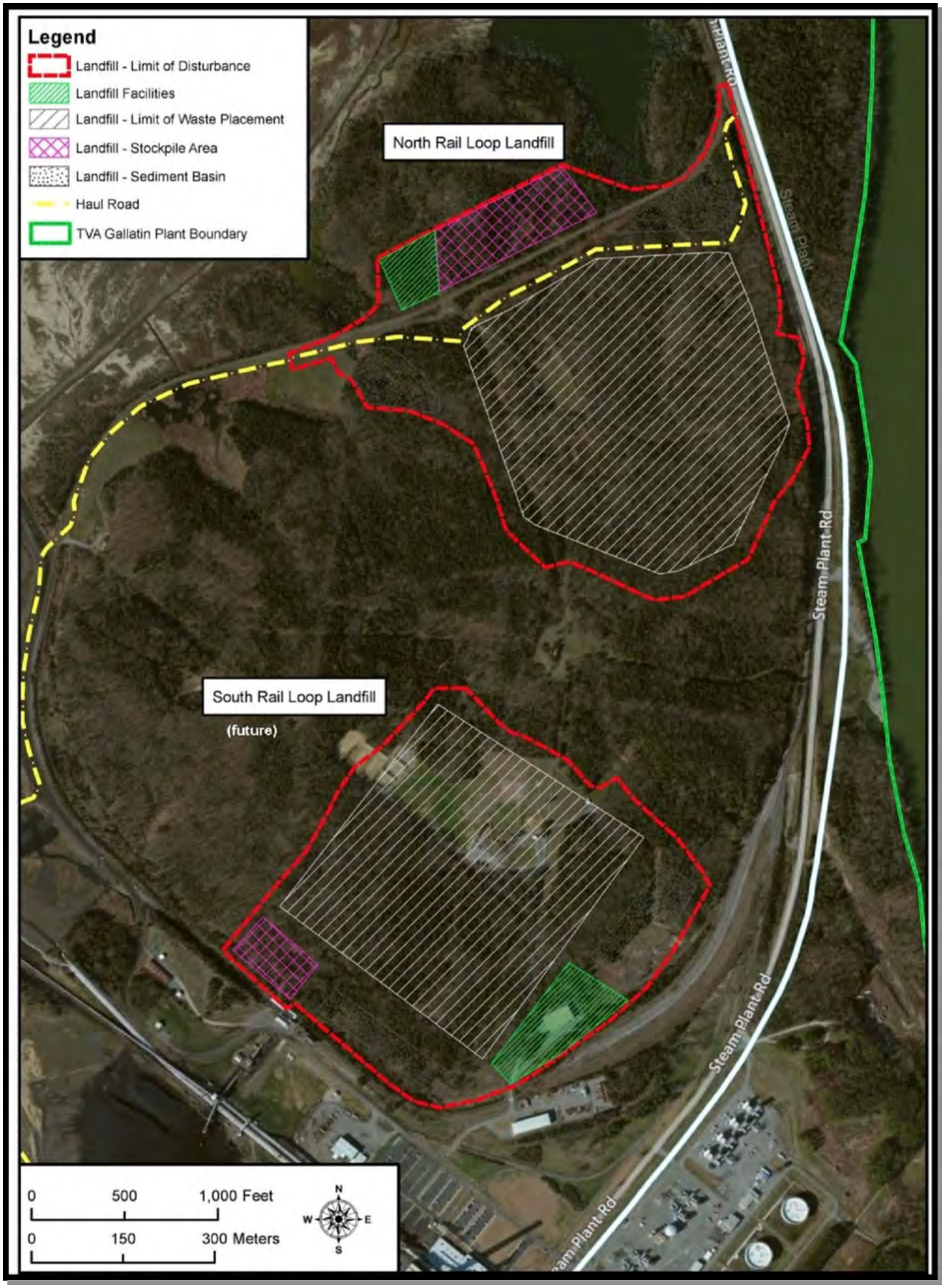


**Figure 2-6. Proposed CCR Landfill Locations**

obtaining a solid waste disposal permit, and constructing the SRL landfill. TVA also would conduct additional environmental reviews as appropriate if TVA proposes to do this. The timing of the development of the SRL landfill would vary, depending on factors such as energy demand, quantity of coal burned in units 1-4 at GAF, and dry CCR production. The SRL landfill area would be available as a construction laydown area or for other project-related uses until future CCR disposal needs are determined.

CCR byproduct (fly ash and scrubber residue) would be removed in the fabric filters and collected in the hopper/trough beneath each unit. The byproduct would gravity flow into a conveying system. The collected byproduct would be conveyed utilizing a new pneumatic conveying system to byproduct storage silos. The final byproduct would be stored in the silos until it is loaded into trucks and transported to the landfill for disposal.

A Phase I hydrogeologic evaluation determined that there is potential for karst features to occur around the NRL and SRL areas where the Carters Limestone is exposed to the surface. TVA's Phase 2 studies for landfill design have now been completed. CCR landfill design would include a seep collection system, karst remediation, liner system, leachate management system, and geosynthetic cap system. In addition to the 40-foot-wide haul road from the dry CCR landfill to Steam Plant Road, a 30-foot-wide access road would be constructed around the landfill perimeter. Storm water management facilities would consist of terraces and rock-lined discharge channels to direct water off the landfill to perimeter channels. Water in these channels would flow to two sediment basins, which would discharge to the existing ash pond. TVA would implement operational mitigations to reduce potential surface water impacts from CCR operations, such as requiring no more than 10 acres of ash be exposed at any one time during CCR landfill operations. Additional details of the proposed CCR landfill design specifications are discussed in Section 3.6.

### 2.2.5 Transmission and Electrical System Components (Tentative Design)

In order to provide adequate electrical power to operate the new dry FGD systems and PJFFs, TVA would construct and operate new 161-kilovolt (kV) TLs and the new FGD power supply transformer. A combination of entirely new right-of-way (ROW) and existing ROW would be utilized. The potential transmission routes are entirely on the GAF reservation and in locations previously disturbed by plant construction and operations (Figure 2-7). For the most part, the 161-kV TLs are constructed with single-circuit, steel-pole structures between 60 and 140 feet tall, depending on the terrain. TVA considered various power supply and routing options for GAF (Figure 2-7):

**West Side Bus (Feed 1)**

Option 1: This option is located to the south side of the plant and consists of approximately 650 feet of rework of an existing TL and 2,800 feet of new TL. This option would require the relocation of the connection of the existing GAF 161-kV TL currently within the GAF switchyard from Bay 39 to Bay 37. The dry scrubber power source would then be supplied out of existing Bay 39. Total line length is 0.65 mile and construction would take approximately six weeks.

Option 2: This option is located to the south side of the plant and consists of approximately 5,700 feet of new TLs. This option would require spanning an existing TL and connecting into the GAF switchyard at Bay 37 from the east side. Construction would take approximately seven weeks.

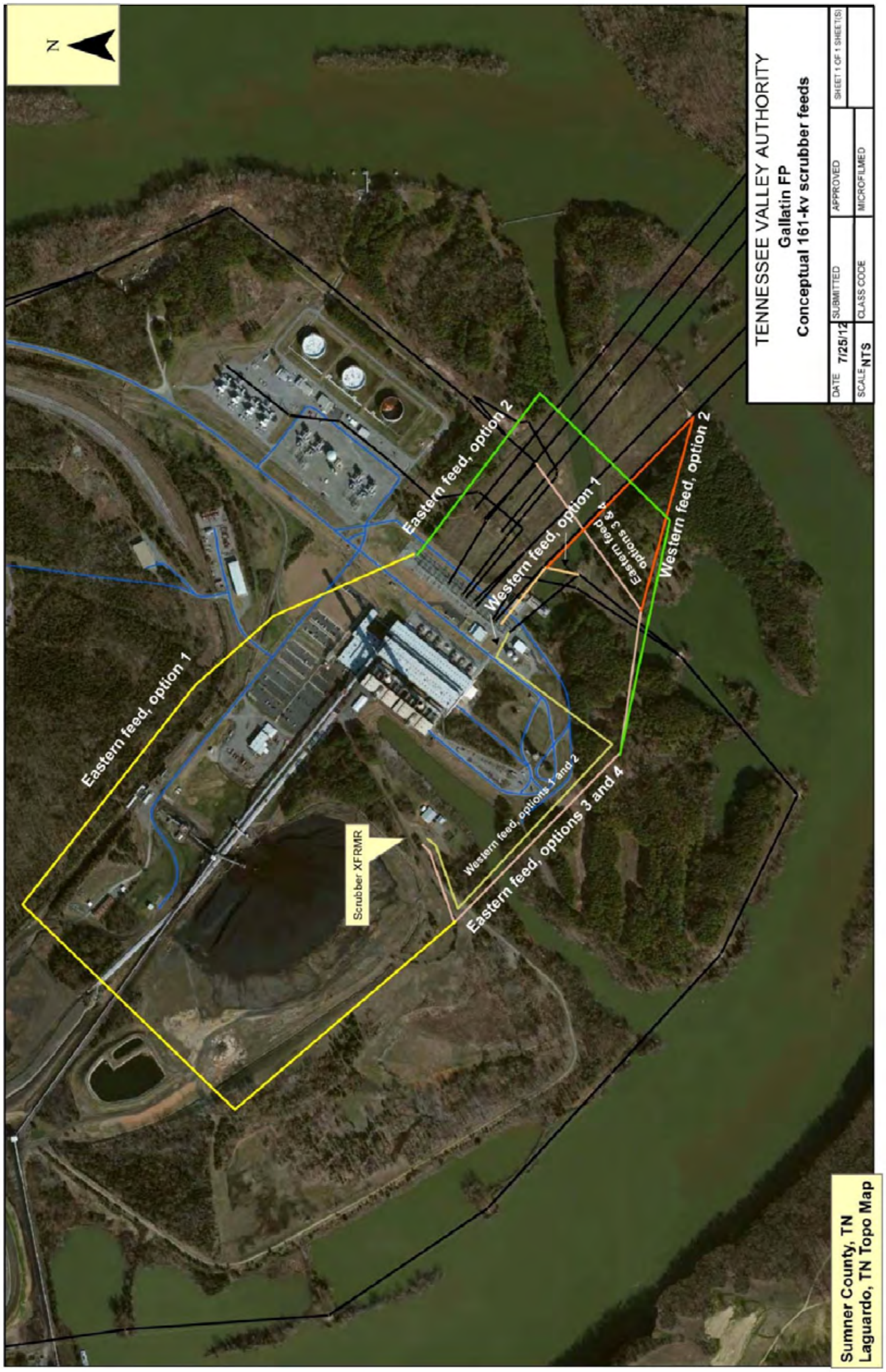


**Figure 2-7. Tentative Transmission Line Route Options for Proposed Action (Represents Alternative 2)**

**East Side Bus (Feed 2)**

Option 1: The northern route option is the longest, both in physical line length and construction duration. It represents approximately 7,300 feet of new electrical feed. This option extends the existing buswork at GAF for the construction of Bay 20 and routes the new TL around the perimeter of much of the northern section of the GAF reservation. Construction would take approximately nine weeks.

Option 2: This option represents approximately 5,800 feet of new TL and extends the existing buswork at GAF for the construction of Bay 20 and routes the new TL south then west of the plant. Construction would take approximately eight weeks.

Option 3: This option is located on the south side of the plant and represents approximately 4,000 feet of new electrical feed. This option would tap the existing Gallatin-Angeltown line, require the installation of two 2,000-amp switches at the tap point, and require the installation of breakers in the scrubber yard. Construction would take approximately four weeks.

Option 4: This option is located on the south side of the plant and represents approximately 4,000 feet of new 161-kV TL. This option would tap the existing Gallatin-Angeltown line, require the installation of one 40-foot-by-40-foot switch structure and two associated 2,000-amp switches at the new tap point, and require the installation of breakers in the scrubber yard. Construction would take approximately four weeks.

### 2.2.6 Ancillary Facilities (Access/Haul Roads and Utilities)

New access and hauling routes would be constructed to deliver pebble lime, activated carbon, ammonia, and CCR; all new roads or upgrades required for access, hauling, and other purposes are on-site at GAF (Figure 2-8). Additional upgrades required for Alternatives 2 and 3 are summarized in Table 2-2.

**Table 2-2. Ancillary Facility Upgrades (Alternatives 2 and 3)**

| Terminal Point | Project Scope/Location |
| --- | --- |
| ***Water Supply:***<br>Service Water<br>Fire Water<br>Cooling Water<br>Potable Water | • The project would utilize the existing raw water system for service water, cooling water, and fire protection.<br>• Existing plant potable water mains would supply the potable water.<br>• Potable (city) water would be supplied from the existing site potable water mains. Backflow preventer(s) would be provided where required by code. Potable water service would be provided to each area equipped with potable water uses such as safety shower/eye wash stations. |
| Septic | • Septic and sewage system would be linked to existing system (unless a portable sewage unit would meet utility needs). For portable, a pump and haul permit would not be obtained. |
| ***Access and Haul Roads*** | • The project would use existing roads on-site and off-site to the extent possible.<br>• The new CCR landfill haul road would provide a route from the byproduct storage to landfill operations; the entrance road to CCR area would be expanded.<br>• Repair to roads would be performed, as required, after construction is completed. |
| **Drainage System** | • Storm water drainage around equipment would be directed to new sump areas that would pump to existing ash ponds.<br>• Storm water would go to the dry FGD area drainage basin permitted outfall.<br>• Any oily waste would be collected in new oil/water separators. |
| **Parking** | Construction parking would require approximately 900 temporary spaces for GAF during construction activities.<br>No significant increase in permanent parking spaces would be required from the proposed action. |

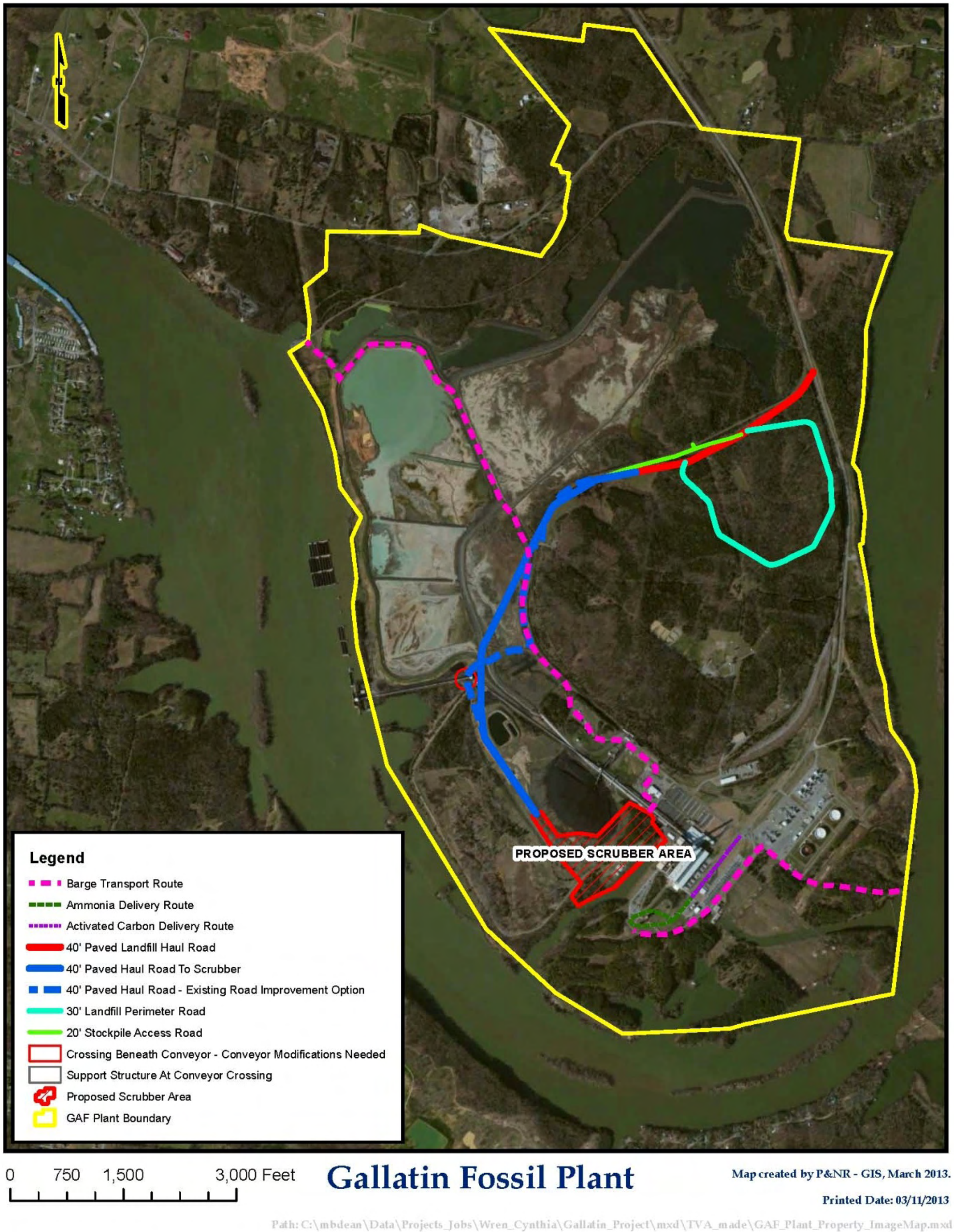


**Figure 2-8. Proposed Haul Routes/Road Improvements**

## 2.3 Construction Activities

The construction process for Alternatives 2 and 3 would be similar and this description applies to both alternatives. The construction assembly area (laydown area) would be required for equipment assembly, vehicle parking, and material storage. This area would be located on the GAF reservation, possibly utilizing the area already intended as laydown for the scrubber project (see Figure 2-1 and Figure 2-2)

Selection criteria used for locating potential laydown areas include the following:

- Typically 5 acres in size
- Relatively flat and well-drained
- Previously cleared
- Preferably graveled and fenced
- Preferably wide access points with appropriate culverts
- Sufficiently distant from streams, wetlands, or other sensitive environmental features
- Located adjacent to an existing paved road near the dry FGD components

***Site Preparation.*** TVA initially attempts to utilize property that requires no site preparation. However, at times, the property may require some minor grading and installation of drainage structures such as culverts. Likewise, the area may require graveling and fencing. Trailers used for material storage and office space would be parked on the site. Following completion of construction activities, unused materials, trailers, and construction debris would be removed from the site. Removal of fencing installed by TVA and site restoration would be at the discretion of GAF personnel. In general, preparing the site for construction includes rough grading, excavation and fill, and installation/relocation of underground utility lines. The rough grading work includes subgrade preparation, the installation of drainage features for all areas required for construction activities, and final grading. Marketable timber removed for components would be salvaged, where feasible; otherwise, wood debris and other vegetation would be stored on-site or transported off-site to an approved facility. Construction laydown areas are also illustrated in Figure 2-1 and Figure 2-2.

New access roads would be required for the construction and maintenance of the proposed equipment and facilities. Prior to construction, TVA would remove trees and other vegetation as necessary. Additionally, for Alternative 2, the CRAC facility operated by TWRA would be relocated on-site at GAF in a manner that minimizes the potential for future land use conflicts. Equipment used during the construction phase would include trucks, truck-mounted augers, and drills, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (e.g., areas with soft ground) to reduce the potential for environmental impacts. Construction laydown areas are also illustrated in Figure 2-1 and Figure 2-2.

***Stockpile Areas/ Surface Impoundments.*** An estimated 313,000 cubic yards of topsoil, soil, and rock would be excavated during construction of the proposed scrubber system. Of this total, a proposed 61,000 cubic yards of excavated material would be temporarily stockpiled as fill during scrubber construction while the remaining 252,000 cubic yards of material would be stockpiled onsite for future use (see Figure 2-1).

- Potential stockpile A –within the non-registered site inactive ash pond area west of the proposed dry FGD system, directly adjacent to the closed asbestos disposal area.
- Potential stockpile B –west of the current coal pile between the existing access road and the coal pile runoff ditch. This area would be filled and leveled to provide a laydown area during the proposed scrubber system construction.
- Potential stockpile C –between the existing coal pile and chemical pond and used to temporarily stockpile fill material used in the proposed scrubber system project.
- Potential stockpile D –north of the existing chemical pond and would be used to stockpile excavated material for the future closure of the chemical pond.
- Potential stockpile E –at the southern portion of ash pond A, between the bottom ash and fly ash rim ditches, and would be used to stockpile excavated material for future use in CCR dry conversion projects at GAF.
- Potential stockpile area F –at the southern end of ash pond A, west of the bottom ash and fly ash rim ditches. This area would also be used to stockpile excavated material for future use in CCR dry conversion projects at GAF.

These activities would be consistent with completing the conversion from wet CCR management to dry management and closure of the wet ponds in the future. Future developments and expected regulations would dictate if, when, and how these other actions are undertaken. Appropriate environmental review of these future actions would be conducted if they are proposed.

***Construction.*** Equipment used during construction of Alternatives 2 and 3 would include front-end loaders, power saws, skidders, bulldozers, tractors, and low-ground-pressure feller-bunchers. Plant roads would be maintained during the construction process. Any new construction access roads would be designed in accordance with U.S. Department of Transportation (USDOT) and relevant local requirements. Excavation required beyond the initial rough grading primarily includes excavation for foundations, below-grade utilities, pebble lime storage silo areas, oil/water separator (OWS) gravity line, access roads, and transformer pads. Below grade, pipes would have adequate bedding and backfilling materials consisting of lean concrete or compacted, clean, granular borrow material (i.e., gravel or sand). It is expected that the granular material would be brought in from off-site. During excavation for CCR construction, some blasting of rock is anticipated. At the peak of construction, approximately 920 people would be employed to work on the projects.

***Site Finalization.*** In general, site finalization includes the following: finish grading, paving of parking areas, completion of yard lighting, removal of temporary construction facilities, final adjustments to plant drainage features, and general site cleanup. Plant roads that are damaged during the construction process would be repaired at the end of the project. Peripheral equipment and systems design, installation, and start-up procedures would be in strict accordance with the manufacturer's written requirements and procedures. Plant layout and design would be such that commonly operated, viewed, and/or maintained components (including but not limited to valves, controls, gauges, panels, and similar) are either operable/maintainable at grade (preferable) or via elevated platform meeting all relevant

Occupational Safety and Health Administration (OSHA) regulations. Adequate room for equipment maintenance would be considered for dismantling any surrounding systems and structures, whether located in a building, enclosure, or freestanding to the greatest extent possible. Adequate laydown room (indoor versus outdoor) would be considered for major equipment components during maintenance.

Start and end dates of construction for each component are provided in Table 2-3.

**Table 2-3. Anticipated Construction Dates**

| Component | Construction Start | Construction End |
|---|---|---|
| Dry scrubber/mercury controls | Spring 2013 | Winter 2015 |
| SCR | Spring 2014 | Winter 2017 |
| CCR landfill and haul roads (initial phase, NRL only) | Spring 2013 | Winter 2015 |
| Transmission upgrades | Spring 2013 | Summer 2014 |

CCR = coal combustion residue; kV = kilovolt; NRL = North Rail Loop; SCR = selective catalytic reduction; SRL = South Rail Loop

## 2.4 Summary of Alternatives Considered but Eliminated From Further Discussion

This section discusses alternatives to the proposed action that TVA considered, but determined did not require further discussion in detail. The need to which TVA is responding is complying with EPA's MATS and the FFCA in the context of achieving a more balanced portfolio of energy resources on the TVA system. TVA's IRP and accompanying EIS assessed a range of strategies for meeting future demand for electricity from the TVA power system. This included consideration and analyses of different kinds of energy resources such as generation from nuclear, coal, and natural gas fuels, renewable resources (solar and wind), and energy efficiency. TVA also considered in the IRP and associated EIS retiring various amounts of TVA's coal-fired generation. TVA determined that strategies using more balanced portfolios performed better over time and handled uncertainties better. Among other things, TVA relies on those analyses in this EA to help focus alternatives for more detailed treatment.

### 2.4.1 Alternative Landfill Sites

Site selection criteria for the proposed new CCR landfill included the following:

- Sufficient area to provide 20 years of capacity at a rate of 230,000 tons per year of CCR
- Abillity to comply with TDEC regulatory requirements and potential restrictions for siting on existing or former ponds
- Avoidance of extensive karstic features throughout the facility
- Avoidance of impacts to the floodplain and/or wetlands
- Avoidance of impacts to historic properties and threatened and endangered species
- Stability of existing pond dikes in candidate areas
- Public perception

- Geotechnical considerations for construction on alluvial soils

Because sufficient land was available on the GAF reservation which appeared to meet at least some of the above requirements, no off-site locations were evaluated. This also minimized the distance CCRs would be hauled to the landfill as well as off-site land disturbance and other off-site impacts. TVA evaluated four areas on the GAF reservation. The proposed rail loop area, containing the NRL and SRL sites, best met the above criteria.

### 2.4.2 Repower to Renewable Biomass

The FFCA provides TVA the option of repowering the GAF facility to utilize renewable biomass in lieu of installing emission control equipment (FGD and SCR) or retirement. TVA has examined the biomass option and determined that it is not a feasible option at this time. Since biomass has a lower heating value (Btu/lb) than coal, replacing the current energy generation potential of coal at GAF would require about six million tons of biomass per year. Further, this biomass must be of a particular quality (clean biomass in a pelletized form) that is suitable for combustion in the GAF boilers. This amount of biomass is not currently readily available within an economically feasible distance from GAF. Conversion of the GAF boilers to burn 100 percent biomass was comparatively evaluated based on engineering studies TVA performed at other coal-fired units located at Colbert, Shawnee, and Widows Creek Fossil Plants. The estimated cost for biomass conversion ranged from $500 to $3,000/kW of energy produced. As a point of comparison, the 2012 cost of a combined-cycle gas plant is around $1,000/kW. In addition, the U.S. average estimated cost for new generation from biomass is approximately 18 percent higher than for conventional coal sources (EIA 2011). TVA's preferred action (Alternative 2) is anticipated to cost around $1,000/ kW, which includes the dry FGD, SCR, CCR landfill and related facilities.

Converting the GAF boilers to biomass could also result in a reclassification of the boilers to new industrial boilers (IBs), with different associated MACT requirements. IBs burning biomass are subject to emission limitations for PM, mercury, and carbon monoxide (CO). It is likely that TVA would have to obtain a new major source construction permits to support converting GAF's boilers to biomass; a potentially complicated and lengthy process. Accordingly, TVA does not consider repowering the GAF boilers to utilize renewable biomass to be a reasonable alternative at this time, and this option has been eliminated from more detailed analysis in this EA.

### 2.4.3 Unit Retirements and Generation Replacement

TVA considered operating GAF Units 1-4 "as-is" until ceasing operations in April 2015 under the Utility MATS or on December 31, 2017, under the FFCA, if MATS requirements were delayed or vacated. This alternative would not result in the installation of the dry FGD, SCR, or additional controls to reduce stack emissions for GAF Units 1-4 or the construction of the proposed associated facilities. Although this alternative would comply with the FFCA and applicable regulations and would further reduce emissions from the plant, retiring GAF coal-fired boilers would not maintain an existing energy asset available to generate reliable and cost-effective energy for the region. Nor would it help meet TVA's plans and identified need for a more balanced energy resource portfolio.

TVA analyzed a range of coal unit retirements in its IRP and EIS. The top-ranked IRP strategies resulted in a range of coal capacity retirements from 2,400 to 4,700 MW and this range was made part of the TVA Board's IRP decision. In producing this range, TVA ranked each of its coal units based on detailed performance metrics and cost studies into three unit groupings. The factors TVA considered included operating costs (fuel costs, variable operating costs, costs categorized as operations and maintenance, and emission allowance costs), environmental control capital costs, outage rates (equivalent forced outage, maintenance outage, and planned outage rates), coal combustion residue (e.g., ash) management costs, any additional plant capital costs, fuel flexibility and operational flexibility. The GAF Units are high-performing and reliable with relatively low operational costs and provide TVA operational flexibility from a system-perspective with their ability to both serve baseload and load-following roles. All four of the coal-fired units operating at GAF were ranked in the unit grouping that the IRP studies indicated should be considered last for retirement.

Subsequent to these IRP retirement analyses, TVA conducted additional studies focusing on the merits of retiring the units specifically. Given the significant uncertainties in key analytic assumptions such as relative fuel prices (e.g., coal v. natural gas), demand and sales growth rates, and regulatory constraints, TVA employed a robust scenario/sensitivity analytical framework for these studies. The installation of controls at GAF was the preferred alternative in the clear majority of study cases. This confirmed the IRP results. Although these analyses and studies did not directly consider partial retirement of GAF units (fewer than all four units), they were done on a unit basis, and the results and conclusions would apply to individual units and the merits of retiring fewer than all of the units.

Additionally and importantly, GAF is a major source of generation serving the energy needs of Nashville and the surrounding area. The GAF units not only provide the real power required by Nashville area loads (the public), but also serve as major sources of dynamic reactive power for the area needed to maintain adequate voltage. Inadequate voltage can cause damage to equipment, such as motors, and result in potential reliability issues for the area. If the GAF generation were unavailable, there could be transmission line overload, causing damage to equipment and posing risks to safety. In addition, TVA is required by the North American Electric Reliability Corporation (NERC) to comply with reliability standards. These standards help ensure that TVA maintains system reliability and does not exceed specified equipment ratings. Failure to meet these standards can result in penalties. Without GAF generation or an equivalent power source in the locale, TVA could not meet these standards and be able to continue to reliably and safely serve the Nashville area loads.

Retiring and replacing the GAF units with new generation at the plant site or in the locale was encompassed by the studies TVA did of the merits of unit retirement. Replacing the GAF coal units with natural gas combined-cycle units would provide TVA generation that is more equivalent in performance to coal-fired generation than currently available renewable resources. Until very recently, however, natural gas has been subject to wide price swings and supply shocks (e.g., weather events like hurricanes or severe cold snaps often drove prices three to five times higher than normal) that have resulted in greater volatility in the costs of energy generated using natural gas. As the market for gas continues to internationalize, and LNG export capabilities expand, the current dampening effect shale gas supplies have had upon gas prices could disappear or weaken, resulting in return to volatility in the future. Coal, which is purchased on much more local, domestic markets, has been more insulated from global demand. In addition to price uncertainties, it may be difficult to permit and construct a new gas plant.

A number of commenters of the draft of this EA thought renewable energy resources--wind or solar--could be constructed at the GAF plant site and replace the GAF coal units. Even if sized to match the GAF coal unit capacities, such resources would not be equivalent to the GAF generation and could not provide sufficient, assured voltage regulation. Wind and solar generation is intermittent and variable. Wind generation produces energy only when the wind blows. Solar generation can be steadier than wind generation, but only during daylight hours and it also can vary depending on weather conditions (e.g., rain events, overcast days). The utility industry considers these renewable energy resources to be “non-dispatchable,” meaning that system operators cannot count on such generation being available when called upon to meet energy or voltage regulation needs.

TVA also studied upgrading its transmission system in order to address voltage and equipment overloading problems associated with retirement of the GAF units. To compensate for retiring GAF, TVA would have to construct new, large 500 kV transmission lines and install additional substation equipment in the area. Doing this would require the acquisition of new transmission line rights of way from persons and businesses. Such activities have a long lead time, typically six to eight years, to be able to complete necessary environmental studies, acquire sufficient land rights, and complete construction. Until these projects were completed, TVA would have to continue to operate the GAF units beyond the dates allowed by EPA’s MATS and the FFCA. A transmission system upgrade alternative would not meet the need addressed by the proposed action, including helping TVA achieve a more balanced portfolio.

TVA’s IRP and FEIS did recognize the opportunity for increasing energy efficiency on the TVA system and TVA is actively increasing its energy efficiency programs. These programs help reduce demand across the TVA system, but TVA cannot be assured that the energy savings from these programs in the Nashville area would be sufficient to offset the retirement of the GAF units. Relying on energy efficiency program results would put at risk continued reliable service in the Nashville area. The results of such programs are not a resource that is equivalent to GAF generation.

The GAF coal units have been some of TVA’s best performing generation assets from a material condition, reliability, efficiency and fuel cost perspective. Not only does the plant’s reliability (as measured by the traditional metric of forced outage rate) place it in the top quartile of TVA’s fleet, when measured over the past five years, no plant in TVA’s fossil fleet has a better reliability record. Continued operation of the GAF units is important to TVA achieving a balanced portfolio of energy resources. Retiring these units and replacing them with some kind of alternative resource would require TVA to weight more heavily continued operation of one of its other coal-fired power plants to achieve the desired balanced portfolio. Considering GAF’s record, this would not make sense. Accordingly, TVA has decided that retiring the GAF coal units would not achieve all of the identified purposes and need and it is not addressed in further detail.

## 2.5 Comparison of Alternatives

TVA’s preferred alternative is Alternative 2, Across Discharge Channel Configuration Action Alternative, as this option was determined to have a lower overall risk and cost than the Close Coupled Option (Alternative 3). Alternative 3 would require a longer construction outage than Alternative 2, with increased costs for the necessary replacement power.

Construction risks for Alternatives 2 and 3 include the increased possibility for “discovery” issues identified during the outage, given the use of existing plant steel, precipitators, stacks, foundations, and other infrastructure. Crane usage and coordination with the SCR project, all in the congested area, presents significant risk to project schedule and cost. The increased outage duration associated with Alternative 3 would result in a potentially higher cost of labor, in addition to schedule delays and overall capital cost increases. Any risks associated with

Alternative 2 are minimized based on the "green field" nature of the installation and the bulk of the construction work being performed during non-outage periods. Table 2-4 provides a comparison of impacts of each alternative by resource area.

**Table 2-4. Comparison of Impacts for Each Alternative by Resource Area**

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Air Quality and Climate Change | Unless TVA shuts down the four coal units to comply with applicable requirements, emissions would continue at current levels. | Overall, beneficial impacts to air quality identified.<br>• Project operations would result in substantial reductions for $NO_x$, $SO_2$, $SO_3$, HCl, and mercury.<br>• Short-term increases in fugitive dust emissions are expected associated with construction activities. These would cease once construction is completed, and methods for controlling fugitive dust would be implemented to minimize impacts. Short-term increases in greenhouse gases (GHGs) are also anticipated – these would cease upon completion of construction activities.<br>• Fugitive emissions are expected to increase in the future due to the transport of reagents required for pollution control; however, suppression methods for controlling fugitive dust emissions would limit impacts. | Similar beneficial impacts to air quality as identified for Alternative 2. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Water Resources | None | No significant adverse impacts identified.<br>• Increases in short-term runoff associated with construction activities are anticipated.<br>• Operational water quality impacts would be minimal given implementation of design and permit requirements meant to minimize pollutant discharge.<br>• All associated new or existing permit modifications would be obtained for any water body or wetland alteration, and the terms and conditions of these permits would be followed. Adherence to permit requirements would ensure that the potential for adverse impacts is minimal. | Similar impacts identified for Alternative 2; short-term during construction and minimal impacts during operations. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Biological Resources | None | No significant adverse impacts identified.<br>• Minor wildlife displacement associated with construction and new facilities.<br>• Seasonal removal of trees (November 15 – March 31) required to mitigate potential impact to Indiana bat. TVA has consulted with USFWS, and USFWS has concurred with these findings.<br>• Mitigation would be required for the loss of an intermittent stream and wetlands associated with construction activities to meet requirements under the CWA and the Tennessee Water Quality Control Act of 1977, USACE Section 404 permit, and TDEC Aquatic Resource Alteration Permit (ARAP).<br>• Modeling data indicate impacts to aquatic species would remain less than significant.<br>• TVA has consulted with USFWS regarding relocation of the CRAC facility facility. USFWS has concurred with TVA's finding that relocation is not likely to adversely affect any listed species housed by TWRA at the current facility. | Similar impacts as Alternative 2 with the exception of potential impacts associated with the CRAC facility; relocation would not be required. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Cultural and Historic Resources | None | No significant impacts identified.<br>• The potential for adverse impacts to cultural resources has been identified under Alternative 2. However, TVA would avoid such resources or mitigate such impacts if they could not be avoided. This is addressed in a Programmatic Agreement with the SHPO. | Potential for adverse impacts would be similar to Alternative 2. TVA's Programmatic Agreement with the SHPO would stipulate avoidance, minimization, or mitigation of potential adverse impacts. |
| Solid Waste and Utilities | None | No significant impacts identified.<br>• Demolition / Construction activities would generate approximately 1,110 tons of solid waste – this would not create a burden on local landfills.<br>• An estimated increase of 835,000 tons of CCR is anticipated for either management in new landfill or reuse/recycling.<br>• No adverse impacts to utilities identified | No significant impacts identified.<br>• Approximately 202 tons of solid waste estimated for demolition and construction activities under Alternative 3.<br>• All other impacts similar to Alternative 2. |
| Geology, Soils, and Prime Farmland | None | No significant impacts identified.<br>• All of the natural soil types within the project are high risk for erosion. Implementation of regulatory requirements for sediment and erosion control would ensure that the potential for adverse impacts associated with soil disturbance and erosion are minimized to less than significant levels. | No significant impacts identified. Similar to Alternative 2, management of soil disturbance and erosion and implementation of regulatory requirements. would minimize impacts to less than significant levels. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Socioeconomics and Environmental Justice | None | No significant impacts identified.<br>• Small positive impact to the local economy would occur during construction period. This would be temporary, concluding once construction is completed.<br>• TVA will implement measures to minimize traffic impacts, as required, through coordination with TDOT, the Sumner County Highway Department, and the City of Gallatin. | No significant impacts identified.<br><br>Similar to Alternative 2, benefit would be realized to local economy resulting from temporary increase in employment for construction workers. |
| Land Use and Recreation | None | No significant impacts identified.<br>• Short-term impacts include conversion of several undeveloped areas of open space to support various construction-related activities.<br>• Construction of the landfills would result in permanent conversion of open space to landfill use. Future construction of the SRL landfill would require that the shooting range be closed or relocated.<br>• The CRAC facility would be relocated and rebuilt on the plant site farther away from the plant under this alternative. | • No significant impacts identified.<br>• Removal/relocation of the CRAC facility would not be required for dry FGD equipment placement.<br>• Land use designation would remain industrial. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Visual Resources | None | No significant impacts identified.<br>• Proposed development and bridge intersecting across discharge channel would change the character of that area. Even so, the overall industrial nature of the area would be similar to existing conditions Proposed developments are visually similar to the current landscape with minor reductions expected to scenic beauty. Landfills would be bound by trees and other vegetation along the sides facing the GAF boundary therefore creating a visual barrier and minimizing the visual impact to residents and other members of the public. | Slight benefit as compared to Alternative 2 as the bridge across discharge channel would not be required and less change to character of the waterway would be realized. |
| Hazardous Materials and Waste | None | No significant impacts identified. Alternative 2 would result in the use of hazardous materials and generation of hazardous wastes. However, regulatory requirements for management and disposal of such items would be followed and internal TVA procedures have been developed and implemented to ensure compliance with regulatory requirements. | Impacts would be similar to Alternative 2. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Noise | None | No significant impacts identified.<br>• Noise impacts are not expected off-site from typical construction activities.<br>• Blasting activities may cause some annoyance due to unexpected impulse noises and residual vibrations. Appropriate planning and adherence to noise standards associated with blasting activities would be implemented.<br>• Operational noise under either Action Alternative would cause little change to current baseline noise levels. An increase in truck noise from waste hauling would not cause impacts to sensitive receptors. Trucks hauling materials to GAF would cause slight increase in road noise but would not cause adverse impacts to sensitive receptors. | Impacts from construction /operational noise would be greater with the implementation of Alternative 3 as the CRAC facility would remain near the plant and could require mitigation to avoid adverse impacts. |
| Public Health and Safety | None | No significant impacts identified.<br>• Implementation of regulatory safety requirements and adherence to TVA procedures would minimize potential adverse impacts.<br>• Potential for natural disasters is minimal.<br>• Implementation of regulatory safety requirements for handling of explosives for blasting would serve to minimize potential adverse impacts from blasting activities. | Impacts would be similar to Alternative 2. |

| Resource Area | Alternative 1 (No Action) | Alternative 2 (Across Discharge Channel Configuration) | Alternative 3 (Close Coupled Configuration) |
|---|---|---|---|
| Transportation | None | No significant impacts identified.<br>• The potential for short-term adverse impacts to local roadways associated with construction employee trips during peak construction period has been identified. TVA would monitor conditions as well as install a traffic light at this location to assure Intersection of Airport Road and Steam Plant Road is not adversely affected.<br>• Operational activities would result in an increase of about 41 trucks per day, which is less than a 1% increase in daily traffic along local roadways.<br>TVA has coordinated with TDOT to ensure proper engineering and design are implemented to minimize potential impacts. . | Impacts would be the same as Alternative 2. |

# Chapter 3 – AFFECTED ENVIRONMENT

## 3.1 Air Quality and Climate Change

### 3.1.1 Air Quality

Air quality is an environmental resource value that is considered important to most people. Through its passage of the CAA, Congress has mandated the protection and enhancement of our nation's air quality resources through various programs including the promulgation and attainment of National Ambient Air Quality Standards (NAAQS) (40 *CFR* Part 50). EPA has established NAAQS to protect the public health and welfare for the following "criteria" pollutants:

- $SO_2$
- Ozone ($O_3$)
- Nitrogen dioxide ($NO_2$)
- Particulate matter less than or equal to 10 micrometers [µm] ($PM_{10}$)
- Particulate matter less than or equal to 2.5 µm ($PM_{2.5}$)
- CO
- Lead (Pb)

There are two types of NAAQS: *primary standards* (set to protect public health) and *secondary standards* (set to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings). Primary and secondary standards are listed in Table 3-1.

Air quality in the Tennessee Valley and the Nation has steadily improved following the enactment of the Clean Air Act, subsequent amendments to that Act, and the promulgation of increasingly severe regulations by USEPA and the States. This has resulted in significant emission reductions from industrial and other categories of sources such as motor vehicles. Air quality levels of all criteria pollutants have significantly decreased. For example, from 1980 to 2010, ozone levels (8-hour) have decreased 28 percent. NOx levels (annual) and $SO_2$ levels (24 hour) have decreased 52 percent and 76 percent, respectively. There has been a 29 percent and 27 percent reduction in 24-hour and annual levels of fine particulates, respectively, from 2000 to 2010. These air quality improvements have resulted from the significant reductions in relevant emissions. For example, NOx and $SO_2$ emissions have decreased by 52 percent and 69 percent, respectively from 1980 to 2010. Direct emissions of fine particles have decreased by 55 percent from 2000 to 2010. In the aggregate, common pollutant emissions have decreased by 63 percent from 1980 to 2011. See http://www.epa.gov/airtrends/aqtrends.html. Air quality is better today than it has been for decades and it will continue to get better as emission sources continue to make reductions.

The air quality in Sumner County, Tennessee, in which the GAF is located meets applicable federal and state air quality standards. Sumner County and the surrounding counties (Wilson, Davidson, Robertson, and Trousdale) are all in attainment with applicable NAAQS. Table 3-2 lists the pollutant concentration values from monitors in Sumner County and Nashville, Tennessee. These concentrations, which represent air quality near the GAF, are in the form used to determine attainment with NAAQS. Aside from the 8-hour ozone standard, the monitored pollutant concentrations are well below the standards.

All areas in Tennessee have attained the old 1-hour ozone standard. Subsequently, on March 27, 2008, the USEPA revised the primary and secondary NAAQS for ozone (73 *Federal Register* [*FR*] 60). The level of the 8-hour primary standard was revised to 75 ppb, and the secondary standard was revised, making it identical to the revised primary standard.

Attainment of NAAQS is addressed by States through regulations and specific limits in permits issued to sources of emissions for the relevant pollutant. TDEC has issued TVA a permit to operate the GAF coal-fired units and associated material handling operations and TVA has put in place equipment and practices at GAF to meet permit requirements.

### 3.1.2 Climate Change

Global climate change comprises the changes in the global environment (including alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems) that may alter the capacity of Earth to sustain life (U.S. Global Change Research Act 1990). Studies indicate that global surface temperatures have risen by nearly 1.33 degrees Fahrenheit (°F) over the last 100 years (1906 to 2005) and the rate of warming over the last 50 years has been reported to be almost double that over the last 100 years (Intergovernmental Panel on Climate Change [IPCC] 2007).

The GAF region transitions between a humid yet cooler climate during winter months and a humid subtropical warmer climate during summer months. This provides the region with generally mild temperatures on average (i.e., a limited number of days with temperature extremes), ample rainfall for agriculture and water resources, vegetation-killing freezes from mid-autumn through early spring, occasional severe thunderstorms, infrequent snow, and infrequent impacts – primarily in the form of heavy rainfall – from tropical storms. The seasonal climate variation induces a dual-peak in annual power demand, one for winter heating and a second for summer cooling. Rainfall does not fall evenly throughout the year, but tends to peak in late winter/early spring and again in mid-summer. Winds over the region are generally strongest during winter and early spring and lightest in late summer and early autumn. Solar radiation varies seasonally with the maximum sun elevation above the horizon and longest day length in summer. However, solar radiation is moderated by frequent periods of cloud cover typical of a humid climate.

**Table 3-1. National Ambient Air Quality Standards (NAAQS)**

| Pollutant | | Primary/ Secondary | Averaging Time | Level | Form | Final rule |
|---|---|---|---|---|---|---|
| Carbon Monoxide | | Primary | 8-hour | 9 ppm | Not to be exceeded more than once per year | 76 FR 54294, (Aug. 31, 2011) |
| | | | 1-hour | 35 ppm | | |
| Lead | | Primary and secondary | Rolling 3 month average | 0.15 $\mu g/m^3$ (1) | Not to be exceeded | 73 FR 66964, (Nov. 12, 2008) |
| Nitrogen Dioxide | | Primary | 1-hour | 100 ppb | 98th Percentile, averaged over 3 years | 75 FR 6474, (Feb. 9, 2010) |
| | | Primary and secondary | Annual | 53 ppb (2) | Annual mean | 61 FR 52852, (Oct. 8, 1996) |
| Ozone | | Primary and secondary | 8-hour | 75 ppb (3) | Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years | 73 FR 16436, (Mar. 27, 2008) |
| Particle Pollution | $PM_{2.5}$ | Primary and secondary | Annual | 15 $\mu g/m^3$ | Annual mean, averaged over 3 years | 71 FR 61144, (Oct. 17, 2006) |
| | | | 24-hour | 35 $\mu g/m^3$ | 98th Percentile, averaged over 3 years | |
| | $PM_{10}$ | Primary and secondary | 24-hour | 150 $\mu g/m^3$ | Not to be exceeded more than once per year on average over 3 years | |
| Sulfur Dioxide ($SO_2$) | | Primary | 1-hour | 75 ppb (4) | 99th Percentile of 1-hour daily maximum concentrations, averaged over 3 years | 75 FR 35520, (Jun. 22, 2010) |
| | | Secondary | 3-hour | 0.5 ppm | Not to be exceeded more than once per year on average over 3 years | 38 FR 25678, (Sept. 14, 1973) |

FR = Federal Register; $\mu g/m^3$ = micrograms per cubic meter; PM = particulate matter; ppb = parts per billion; ppm = parts per million.

(1) Final rule signed on October 15, 2008. The 1978 lead standard (1.5 micrograms per cubic meter [$\mu g/m^3$] as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual $NO_2$ standard is 0.053 parts per million (ppm), equal to 53 parts per billion (ppb), which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed on March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, the United States Environmental Protection Agency revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed on June 2, 2010. The 1971 annual and 24-hour $SO_2$ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

**Table 3-2. Air Quality in the Vicinity of GAF**

| Monitor Location | Pollutant and Form | Concentration | Years |
|---|---|---|---|
| Nashville[(1)] | 8-hour carbon monoxide | 1.6 ppm | 2011 |
| Nashville | 1-hour carbon monoxide | 2.1 ppm | 2011 |
| Rockland Recreation Area[(2)] | 8-hour ozone 4th highest | 0.075 ppm | 2009-2011 |
| Cottontown Wright's Farm[(3)] | 8-hour ozone 4th highest | 0.071 ppm | 2009-2011 |
| Rockland Recreation Area | 24-hour $PM_{2.5}$ 98th percentile | 20.0 µg/$m^3$ | 2010 |
| Rockland Recreation Area | 24-hour $PM_{2.5}$ 98th percentile | 21.9 µg/$m^3$ | 2011 |
| Nashville | 1-hour $SO_2$ 99th percentile | 14 ppb | 2011 |
| Gallatin Fossil Plant[(4)] | 1-hour $SO_2$ 99th percentile | 40 ppb | 2007 |

United States Environmental Protection Agency Ambient Monitoring Data, Web site available: http://www.epa.gov/airquality/airdata/ad_maps.html.
µg/$m^3$ = micrograms per cubic meter; PM = particulate matter; ppb = parts per billion; ppm = parts per million; $SO_2$ = sulfur dioxide.
(1) Nashville, Tennessee, is approximately 20 miles southwest of the GAF powerhouse.
(2) Rockland Recreation Area is 14 miles west of the GAF powerhouse.
(3) Cottontown Wright's Farm is 11 miles northwest of the GAF powerhouse.
(4) Gallatin Fossil Plant monitor is located 1.8 miles north of the GAF powerhouse.

### 3.1.3 Greenhouse Gases

Human activities, such as fossil fuel combustion and land use changes, and natural processes release $CO_2$ and other compounds, cumulatively considered greenhouse gases (GHGs). GHGs are effective in trapping infrared radiation that otherwise would have escaped the atmosphere, thereby warming the atmosphere, the oceans, and Earth's surface (USEPA 2010a). GHGs include $CO_2$, methane ($CH_4$), nitrous oxide ($N_2O$), perfluorocarbons (PFCs), sulfur hexafluoride ($SF_6$), and hydrofluorocarbons (HFCs). The most abundant man-made GHG is $CO_2$; its major U.S. emission sources include combustion of fossil fuels; noncombustion uses of fossil fuels in producing chemical feedstocks, solvents, lubricants, waxes, asphalt, and other materials; iron and steel production; cement production; and natural gas systems. The major U.S. emission sources of $CH_4$ are ruminant animals (cows and sheep), landfills, natural gas systems, and coal mining. HFCs, PFCs, and $SF_6$ are all industrial chemicals with no natural sources and emitted by various industrial activities (USCCSP 2007). GHGs are present in the atmosphere naturally, released by natural sources, or formed from secondary reactions taking place in the atmosphere. In the last 200 years, substantial quantities of GHGs have been released into the atmosphere by human activities. These extra emissions are increasing GHG concentrations in the atmosphere, potentially enhancing the natural greenhouse effect, which is thought to be causing or contributing to global warming (EIA 2011).

The primary GHG emitted by human activity is $CO_2$ produced by the combustion of coal and other fossil fuels. Coal- and gas-fired electric power plants and automobiles are major sources of $CO_2$ in the United States (EIA 2011). Forests and other vegetated landforms represent sinks of $CO_2$. GHG emissions are also affected by development activities associated with land or forest clearing and land use changes, as well as construction activities involving use of fossil - fuel-powered equipment (e.g., bulldozers, loaders, haulers, trucks, generators).

In 2007, worldwide man-made annual $CO_2$ emissions were estimated at 29.7 billion tons, with the United States responsible for about 20 percent (EIA 2007). In 2009, U.S. electric utilities emitted 2.4 billion tons, roughly 40 percent of the U.S. total (EIA 2009). Figure 3-1 shows how TVA's approximately 76 million tons of annual $CO_2$ emissions in 2009 contributed to worldwide, national, and industry emissions. This amount is down from 105 million tons produced by TVA in 2008 and a little less than the 80 million tons emitted in 2011. With plans for replacing coal generation with gas and nuclear generation, TVA's $CO_2$ emissions should continue to decline (TVA 2011b).

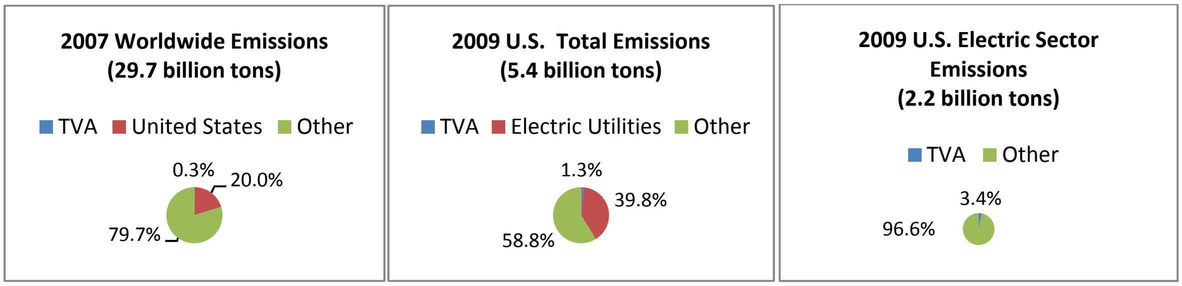


**Figure 3-1. 2007 and 2009 Man-Made Carbon Dioxide Emission Percentages**

The current $CO_2$ emission rate at GAF is approximately 1.150 tons per MWhr of electricity delivered to the TVA electrical grid. Direct emissions of CO2 averaged 7.58 millions tons per year from 2006 through 2011.

## 3.2 Water Resources

### 3.2.1 Surface Water

GAF is located on the northern side of a bend in the Cumberland River between RMs 240 and 246. The main plant area is drained by permitted storm water outfalls, wet weather conveyances (WWCs), intermittent streams, the condenser cooling water (CCW) discharge (Outfall 002), the intake screen backwash (Outfall 004), and process and storm water discharges from the ash pond system (Outfall 001). This portion of the Cumberland River is impounded by Old Hickory Dam (under the control of and operated by the USACE) at about RM 216.2. Stream flow varies with rainfall and averages about 21 inches of runoff per year. This equates to approximately 1.5 cubic feet per second (cfs) per square mile of drainage area.

Old Hickory Lake is a mainstream storage impoundment on the Cumberland River operated by the USACE. The reservoir contains 22,500 surface acres at an elevation of 445 feet AMSL and extends 97.3 miles. Water level fluctuations are minimal with minimum pool elevation at 442 feet (USACE 2012). The surface area and volume of the reservoir at normal minimum and high pool elevations are 19,550 and 22,500 acres, respectively, and 357,000 and 420,000 acre-feet, respectively.

The USACE maintains water quality monitoring locations above and below GAF at RMs 245 and 241, respectively. Parameters monitored are mostly related to eutrophic conditions (dissolved oxygen, temperature, pH, and nutrients), but some data are available for a comprehensive list of parameters including major and minor ions and trace metals. The Cumberland River and its tributaries generally exhibit moderate to high concentrations of calcium and magnesium and a slightly alkaline pH because much of the basin is comprised of limestone and dolomitic bedrock. Total dissolved solids concentrations, a measure of all salts in solution, range from 100 to 300 milligrams per liter (mg/L) in the lower Cumberland watershed, in particular the mainstream river downstream of Nashville (TVA 1995).

Generally, the mainstream Cumberland River exhibits lower concentrations of suspended solids than its tributaries. The lower Cumberland watershed tributaries, west of Nashville, are characterized by higher suspended solids concentrations. Topography and land usage also influence the erodibility of the lower Cumberland tributary valleys (TVA 1995).

The Cumberland River from RM 216.2 to 309.2 (Caney Fork River), including the stretch adjacent to GAF, is classified by TDEC for the following uses:

- Domestic water supply
- Industrial water supply
- Fish and aquatic life
- Recreation
- Irrigation livestock watering and wildlife
- Navigation

This segment of the river is not classified as a Section 303d impaired waters by the State or considered exceptional Tennessee waters or outstanding national resource waters. Specific standards are established for each of these uses, with the most stringent associated with domestic water supply and fish and aquatic life. The project area drains to the Cumberland River (at Old Hickory Lake) and has the potential to impact downstream tributaries, including Bledsoe Creek and its tributaries. Old Hickory Lake is considered to be fully supporting its designated uses.

GAF withdraws approximately 316,000 million gallons per year (MGY) for use as condenser cooling water and plant process water (i.e., sluice water, fire protection, boiler feed water, safety eye wash and showers, miscellaneous wash water). Approximately 97 percent of the water withdrawal is used for cooling, while approximately 3 percent is used for process water and is returned to the river.

### 3.2.2 Onsite Streams

The NRL and SRL areas were both surveyed to determine the location of all jurisdictional streams within each site's limit of disturbance (LOD). The field survey of the 94-acre NRL site was conducted on May 22, 2012, using TDEC criteria, and documented two intermittent streams and 12 WWCs. Stream details are noted below:

- ***Stream NRL001*.** The stream width and depth varied along the reach, with a maximum observed width of approximately 5 feet and depth of 4 feet. Average substrate observed was bedrock with clay and some cobble/gravel. The upper reach of the stream had some small pockets of pools with standing water and observable flow.
- ***Stream NRL013.*** The stream width and channel depth were approximately 4 feet by 4 feet with bedrock/cobble substrate and terminating at a pond/wetland area. The stream was dry at the time of the survey.

Stream flow data were not available for unnamed streams; these streams are not connected to each other or to any other stream, and would terminate on-site into the ash pond. See Figure 3-2 for stream location details (TVA 2012b).

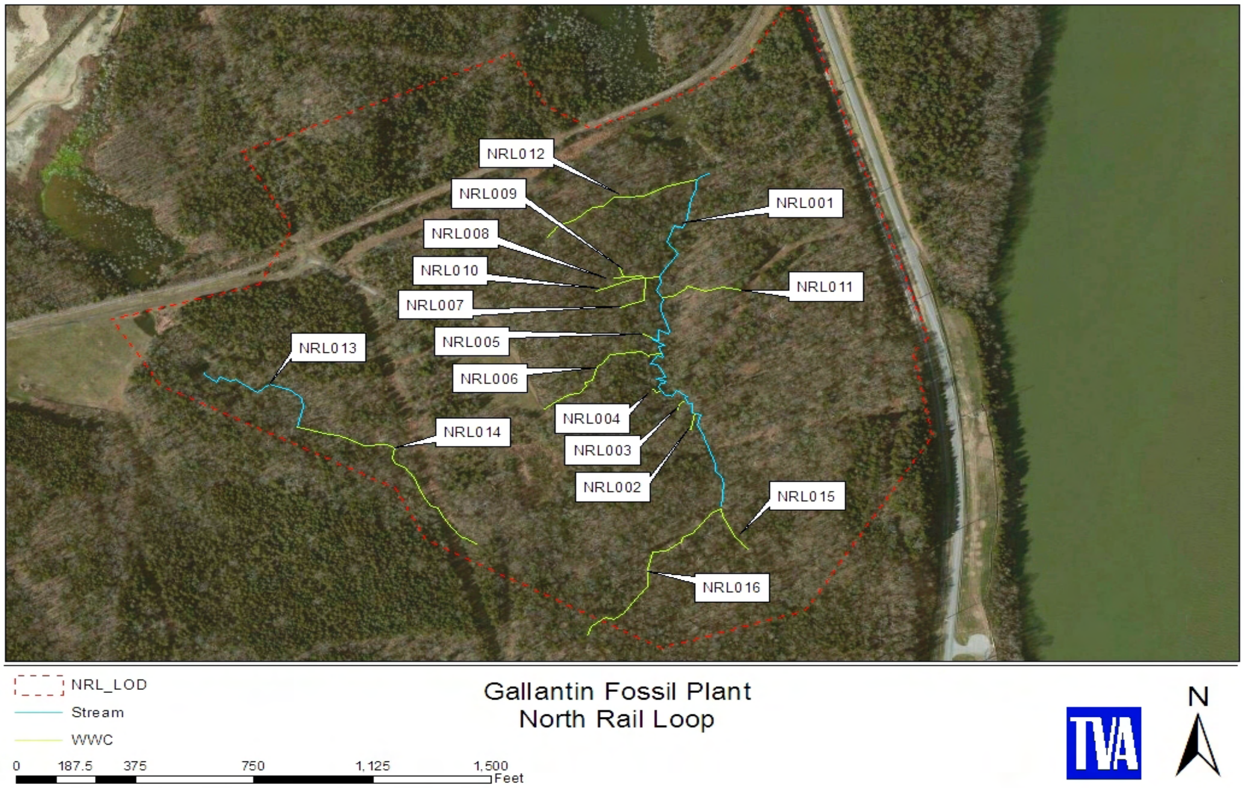


**Figure 3-2. NRL Streams and Wet Weather Conveyances**

The survey of the 80-acre SRL site was conducted on June 6, 2012. The field survey of the SRL documented two intermittent streams, two ponds, and 10 WWCs. Stream details are noted below:

- ***SRL003.*** The stream width and channel depth were approximately 3 feet wide by 1 foot deep with moderate substrate sorting. The stream was dry at the time of the survey.
- ***SRL009.*** The stream width and depth were approximately 6 feet wide by a 1- to 2-foot deep channel that forms at the confluence of SRL007 and SRL008. It is comprised of mostly bedrock and slab rock substrate that cuts through old road bed/ limestone wall. Some flow and pools were observed at the time of the survey.

Stream flow data were not available for these unnamed streams. Stream SRL003 is part of a wetland complex and terminates onsite into a wetland area. Stream SRL009 flows southwest off of the Rail Loop site and terminates into an established storm water drainage ditch that eventually is released from the site at a permitted storm water outfall (TVA 2012b).

### 3.2.3 Existing Wastewaters

There are several existing wastewater streams at GAF permitted under NPDES Permit Number TN0005428 (TDEC 2012b). Potentially impacted wastewater streams include the Coal Yard drainage ditch, CCW discharge channel, dewatering sump, and ash pond discharge.

Because the ash pond discharge (Outfall 001) and the CCW discharge channel (Outfall 002) are the primary off-site discharge points potentially affected by the proposed project, they are the main focus of discussion. About 27.9 million gallons per day (MGD) average are discharged from the ash pond through NPDES Outfall 001. Outfall 001 discharges to Cumberland River Mile (CRM) 240.5. The pH of the ash pond discharge generally ranges from 6.9 to 9.0. The current NPDES permit contains limitations on the ash pond discharge for pH, oil and grease, total suspended solids, and toxicity. This permit also requires monitoring and reporting of cyanide and 16 metals, including aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, selenium, iron, mercury, manganese, nickel, silver, and thallium. The ash pond currently receives wastewater from a number of sources, as listed in Table 3-3.

Approximately 923 MGD is discharged from the CCW discharge channel through NPDES Outfall 002. Outfall 002 discharges to CRM 242.5. The plant's permitted discharges from Outfall 002 are once-through cooling water, auxiliary cooling water, and storm water runoff. The current NPDES permit contains limitations on the CCW discharge for temperature, total residual oxidants (no oxidants are added as part of normal operations), and toxicity. This permit also requires reporting of flow, intake temperature, and duration of chlorination when biocides are added.

**Table 3-3. Major Inflow Sources to the Ash Pond**

| Source | Average Daily Inflow to Ash Pond (MGD) |
|---|---|
| Fly Ash Sluice Water | 8.35 |
| Bottom Ash Sluice Water | 13.20 |
| Low-point Sump | 0.13 |
| Station Sumps | 3.40 |
| Powerhouse Dewatering Sump | 0.80 |
| Coal Yard Unloading and Drainage Ditch | 0.12 |
| Environmental Sump | 0.06 |
| Boiler Bottom Overflow Sumps | 0.74 |
| Precipitation Onto Ash Pond | 1.40 |
| Evaporation From Ash Pond | -0.35 |
| **Total** | **27.85** |

Source: Flow schematic in 2009 for National Pollutant Discharge Elimination System Permit TN0005428.
MGD = million gallons per day.
Note: All streams that are storm water driven are denoted in average annual daily flows; however, a storm event can produce flows greater than these amounts in a 24-hour period. Ancillary streams flow into these major streams but are not mentioned in this table.

### 3.2.4 Existing Coal Combustion Residue Wastewater

As described below, the existing CCR handling system is a wet system that receives and transports wastewater effluents, including fly ash and bottom ash sluice waters to the ash ponds for treatment. GAF currently burns between 3.5 and 4.4 million tons annually of 100 percent PRB coal. This coal averages 5.5 percent ash; therefore, total ash production ranges from approximately 192,500 to 242,000 tons of ash per year. The ash is collected as both fly ash and bottom ash. The fly ash/bottom ash split is approximately 80 percent fly ash and 20 percent bottom ash by weight. Fly ash production ranges from approximately 154,000 to 193,600 tons per year. Bottom ash production currently ranges from 38,500 to 48,400 tons per year. Bottom ash would continue to be collected in the bottom of the boiler (by post washing with jets of water) and sluiced to a bottom ash pond complex.

### 3.2.5 Groundwater

The project area is underlain by Ordovician-, Silurian-, and Devonian-aged rocks of the Interior Low Plateaus Physiographic Province. These carbonate rocks, which are primarily limestone with some dolostone, are the principal aquifers in large areas of central Tennessee and are part of the Central Basin aquifer system. The carbonate rock aquifers consist of limestone and minor dolostone, interlayered with confining units of shale and shaley limestone. The middle Ordovician Stones River Group contains the most important carbonate-rock aquifers in the project area. The calcareous siltstones of the middle Ordovician Nashville Group yield small volumes of water but are not considered principal aquifers. The lower Ordovician Knox Group is a major aquifer where dolostone contains freshwater. In a large area in central Tennessee, the upper parts of these aquifers contain fresh water and underlie a thin layer of Mississippian limestone and the Chattanooga Shale of Mississippian and Devonian age (Lloyd and Lyke 1995). Site-specific geology is described in Section 3.4.

The carbonate rocks that underlie the project area are typical of karst systems. The term “karst” refers to carbonate rocks (limestone and dolostone) in which groundwater flows through solution-enlarged channels and bedding planes within the rock. Karst topography is characterized by sinkholes, springs, disappearing streams, and caves, as well as by rapid, highly directional groundwater flow in discrete channels or conduits. Because of the connections between surface and underground features, water in karst areas is not distinctly surface water or groundwater.

Precipitation is the primary source of recharge for the Central Basin aquifer system. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs is common throughout the Interior Low Plateaus Province (Lloyd and Lyke 1995). The Carters Limestone has been defined as a local aquifer due to large solution openings that occur, especially at weathered portions of the T-3 bentonite layer (Hanchar 1988). Bentonite zones in the Carters Limestone play a significant role in the hydrology of the Central Basin aquifer system. In areas where the bentonite layers are unbreached, the downward movement of groundwater is restricted. Where the bentonite zones are breached by open joints or intersecting stream valleys, solution openings can form in the underlying limestone. In contrast, shale units within the formations typically act as local confining units for groundwater (Brahana and Bradley 1986).

Groundwater at the site was encountered within rock of the Hermitage Formation and Carters Limestone. Although the Bigby-Cannon Limestone is potentially a regional aquifer, due to its occurrence only near the tops of hills in the study area, it is unlikely to be a water-bearing unit locally (URS 2011b).

**<u>Groundwater Quality</u>**

The quality of the water in the carbonate aquifers in the Ordovician rocks is considered hard and contains high concentrations of dissolved solids, chlorine, and iron. However, these concentrations are equal to or less than USEPA’s secondary maximum contaminant levels (MCLs) for drinking water. The quality of the water generally is adequate for domestic use, or it can be treated and made adequate for most uses. Naturally occurring contaminants and turbid waters are common problems for the users of water from the carbonate aquifers in Ordovician rocks. The thin soil and residuum and the presence of solution features, such as sinkholes, swallow holes, and solution-enlarged fractures, allow water from the land surface to recharge the aquifer directly and rapidly. The naturally occurring contaminants and sediment-laden waters can then spread through a system of interconnected solution openings, which can eventually reach wells and springs (Lloyd and Lyke 1995).

Karst systems are readily susceptible to contaminant transport as the waters can travel long distances through conduits with no probability for natural filtering processes of soil or bacterial action to diminish the level of contamination. In unconfined conditions, karst aquifers have very high flow and contaminant transport rates under rapid recharge conditions, such as storm events (TDEC 2002). Consequently, the groundwater sources in karst aquifers considered most vulnerable to contamination are those under the direct influence of surface water.

TVA has been working with TDEC on the inactive ash pond since it became a Non-Registered Site (# 83-1324) and initiated groundwater monitoring in 1997. TVA has been performing groundwater monitoring at GAF in accordance with Rule 0400-11-7-.04(7) since 2000 and reports this data to TDEC quarterly. Monitoring locations are primarily for characterizing GAF's non-registered site, the inactive ash pond. The latest report submitted in October 2012 is representative of past trends for GAF, as October data show MCL exceedances for beryllium, cadmium and nickel at compliance well GAF-19R. Turbidity levels were generally very low in samples from compliance wells GAF-19R and GAF-20, and slightly elevated in the remaining samples. Beryllium concentrations at GAF-19R (and predecessor well GAF-19) have been elevated since monitoring began in October 2000, with no consistent trend upward or downward during the period of record. Elevated levels of beryllium, cadmium and nickel at GAF-19R are associated with unusually low pH, i.e., median pH is 4.1 at this location. By comparison, median pH values for compliance well GAF-20 and background well GAF-22 are 5.6 and 7.1, respectively. The unusually low pH is possibly the result of pyrites associated with the historical coal burned at the time ash was sluiced into the non-registered site. TVA continues to work with TDEC at the site on a Groundwater Assessment Program, which includes an ongoing risk assessment. TVA will continue to follow the regulatory requirements for groundwater assessment and has established a voluntary groundwater monitoring program for the active ash ponds through installation of a groundwater monitoring well network in 2010 and the initial sampling event in July 2011. Results of the semi-annual monitoring show no MCL exceedances of TDEC Appendix I parameters for the wells monitored.

### Groundwater Use and Trends

The Central Basin aquifer system is an important source of drinking water for central Tennessee, as it supplies most of the rural domestic wells and many public drinking wells in the Central Basin and surrounding region. Private residential wells occur near the project area. However, public water for Sumner County is supplied by surface water sources (USEPA 2012). The project area is not within a state-designated Source Water Protection Area. TVA's groundwater monitoring program for GAF shows shallow groundwater movement beneath the non-registered site located in Quaternary age alluvial deposits. Monitoring wells range from approximately 49 to 52 feet in depth and all are completed in the alluvium. The average horizontal hydraulic gradient (Jh) in the disposal site vicinity is approximately 0.0178, based on July 24, 2012, groundwater level measurements made in monitoring wells. Former monitoring well GAF-21 is included in the groundwater level measurements, though it is no longer sampled. Groundwater level data from this well, along with data for GAF-19R and GAF-20, provide sufficient information for determination of the local groundwater potentiometric surface in the Non-Registered Site #83-1324 (inactive ash pond) locality. The direction of the horizontal gradient is southwesterly toward the Cumberland River.

### 3.2.6 Floodplains

A floodplain is the relatively level land area along a stream or river subjected to periodic flooding. The area subject to a 1 percent annual probability of flooding (100-year flood) in any given year is normally called the 100-year floodplain. It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of Presidential Executive Order (EO) 11988. For certain “critical actions,” the minimum floodplain of concern is the area subject to inundation from a 500-year (0.2 percent annual probability) flood. “Critical actions” are those for which even a slight probability of flooding would be too great.

GAF is located at CRM 244.4 in Sumner County, Tennessee. Information provided by the USACE indicates that the 100-year floodplain at this location is the area located below elevation 453.3. The Standard Project Flood elevation is 457.0. The Standard Project Flood is defined as a flood with a frequency range between once in 200 years and once in 1,000 years. Sumner County participates in the National Flood Insurance Program, and any development must be consistent with these regulations.

As a federal agency, TVA is subject to the requirements of EO 11988, Floodplain Management. The objective of EO 11988 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” (United States Water Resources Council 1978). 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. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For certain “critical actions,” the minimum floodplain of concern is the area subject to inundation from a 500-year (0.2 percent annual probability) flood.

## 3.3 Biological Resources

### 3.3.1 Aquatic Ecology

GAF and the planned CCR landfill area are adjacent to Old Hickory Lake at CRM 243. The Cumberland River was altered from a free-flowing river to a reservoir due to impoundment by Old Hickory Dam, located 27 river miles downstream. Upstream of GAF, Old Hickory LAke extends 70 river miles to Cordell Hull Dam.

Section 316(a) of the Clean Water Act authorizes alternate thermal limits for the control of the thermal component of a discharge from a point source, so long as the limits will assure the protection of a Balanced Indigenous Population (BIP) of aquatic life. The term “balanced indigenous population,” as defined by USEPA regulations, means a biotic community that is typically characterized by diversity appropriate to the ecoregion, the capacity to sustain itself through cyclic seasonal changes, the presence of necessary food chain species, and lack of domination by pollution-tolerant species. Beginning in 2001, TVA began a fish community monitoring program downstream (CRM 239 to CRM 240.6) and upstream (CRM 248.4 to CRM 249.9) of the GAF discharge in order to verify that a BIP was being maintained.

TVA uses the Reservoir Fish Assemblage Index (RFAI), which incorporates 12 fish community metrics, as an effort to provide a balanced evaluation of fish community integrity. The RFAI has been thoroughly tested on TVA reservoirs, as well as other reservoirs, and published in peerreviewed literature (Hickman and McDonough 1996; McDonough and Hickman 1999). The twelve RFAI metrics are grouped into four general categories: species richness and composition, trophic composition, abundance, and fish health. The ratings for the twelve metrics are summed to produce a RFAI score for each sample site. RFAI scores range from 12 to 60. Ecological health ratings (12-21 “Very Poor”, 22-31 “Poor”, 32-40 “Fair”, 41-50 “Good”, or 51-60 “Excellent”) are then applied to scores. A difference in RFAI scores attained at the downstream area compared to the upstream (control) area is used as the basis for determining presence or absence of impacts on the resident fish community from GAF’s operations. The definition of “similar” is integral to accepting the validity of these interpretations. RFAI scores have an intrinsic variability of ±3 points. This variability comes from various sources, including annual variations in air temperature and stream flow; variations in pollutant loadings from nonpoint sources; changes in habitat, such as extent and density of aquatic vegetation; natural population cycles; and movements of the species being measured. Another source of variability arises from the fact that nearly any practical measurement, lethal or non-lethal, of a biological community is a sample rather than a measurement of the entire population. As long as the score is within the six-point range, there is no certainty that any real change has taken place beyond method variability. Therefore, a difference of six points or less between the overall RFAI scores is used to define “similar” scores between upstream and downstream fish communities.

Beginning in 2010, TVA also incorporated an assessment of the benthic macroinvertebrate community to provide additional information on the overall biotic integrity of the reservoir in the vicinity of GAF. Benthic community results were evaluated using seven community characteristics or metrics. The ratings for the seven metrics were summed to produce a benthic score for each sample site. Potential scores ranged from 7 to 35. Ecological health ratings (7-12 “Very Poor”, 13-18 “Poor”, 19-23 “Fair”, 24-29 “Good”, or 30-35 “Excellent”) were then applied to scores.

Fish community monitoring was conducted during 2001, 2002, 2003, 2005, 2007, 2008, 2010, and 2011 (TVA 2011c). Benthic macroinvertebrate monitoring was conducted during 2010 and 2011. Over the eight sample years, average RFAI scores at the site just downstream of the GAF discharge and at the reference site upstream of GAF were identical and each site was within the six point range of variability each sample year (Table 3-4). Recent benthic macroinvertebrate data indicated healthy benthic communities downstream and upstream of GAF (Table 3-5). Both fish and benthic macroinvertebrate data do not indicate adverse impacts from GAF to the aquatic community downstream of the GAF discharge.

**Table 3-4. GAF Reservoir Fisheries Assemblage Index Scores***

| Station | 2001 | 2002 | 2003 | 2005 | 2007 | 2008 | 2010 | 2011 | AVG. |
|---|---|---|---|---|---|---|---|---|---|
| Downstream of GAF CRM 240* | 39 | 37 | 41 | 43 | 40 | 40 | 43 | 41 | 41 |
| Upstream of GAF CRM 249* | 37 | 33 | 44 | 38 | 46 | 41 | 47 | 42 | 41 |

*Sampling reaches extended more than a river mile. The river mile listed is the nominal river mile for the sampling site. RFAI Score Range: 12-21 (Very Poor), 22-31 (Poor), 32-40 (Fair), 41-50 (Good), or 51-60 (Excellent).

**Table 3-5. GAF Reservoir Benthic Macroinvertebrate Community Scores**

| Station | 2010 | 2011 |
|---|---|---|
| Downstream of GAF | | |
| CRM 239.3 | 27 | 29 |
| CRM 242.0 | --- | 31 |
| Upstream of GAF | | |
| CRM 248.7 | --- | 27 |
| CRM 250.2 | 23 | 27 |

Reservoir Benthic Index Scores: 7-12 (“Very Poor”), 13-18 (“Poor”), 19-23 (“Fair”), 24-29 (“Good”), 30-35 (“Excellent”).

In addition to the Cumberland River, other potential aquatic resources were evaluated on the GAF property. Streams, ponds, and WWCs within the proposed CCR landfill areas are described above in Section 3.2.2. The intermittent streams could support aquatic life (insects) during periods of flow but did not support a fish community.

No streams, ponds, or other aquatic resources were identified during a survey of the proposed CRAC relocation property. No important aquatic resources were indentified.

### 3.3.2 Aquatic Threatened and Endangered Species

Data from the TVA Natural Heritage database indicated that one federally listed endangered species (pink mucket) and nine state-listed aquatic species (eight fish and one snail) are known to occur within a 10-mile radius and/or within Sumner County (Table 3-6). No federally designated critical habitat segments are present within the project area. Of the species listed in Table 3-6, only the pink mucket and lake sturgeon are likely to occur in the Cumberland River adjacent to GAF. None are known to occur or are likely to occur in intermittent streams or ponds within the project area. TWRA has been propagating pink muckets and other endangered and threatened species in the CRAC facility located on the GAF plant site.

### 3.3.3 Vegetation

GAF lies completely within the Outer Nashville Basin of the Interior Plateau Ecoregion. According to Griffith et al. (2001), the Interior Plateau is a diverse ecoregion extending from southern Indiana and Ohio to northern Alabama. Rock types are distinctly different from the coastal plain sands of western Tennessee, and elevations are lower than the Appalachian region to the east.

The natural vegetation is primarily oak-hickory forest, with some areas of bluestem prairie and cedar glades. The Outer Nashville Basin is composed of a rolling and hilly topography with slightly higher elevations than the surrounding terrain. The region encompasses most all of the outer areas of the generally noncherty Ordovician limestone bedrock. The higher hills and knobs are capped by the more cherty Mississippian-age formations, and some Devonian-age Chattanooga shale, remnants of the Highland Rim. Deciduous forest with pasture and cropland are the dominant land covers (Griffith et al. 2001).

**Table 3-6. Federally and State-listed Aquatic Animal Species Reported Within 10 Miles and/or Within Sumner County, Tennessee[1]**

| Common Name | Scientific Name | Element Rank[2] | Federal Status[3] | State Status[3] | State Rank[4] |
|---|---|---|---|---|---|
| **Fishes** | | | | | |
| Bedrock Shiner | *Notropis rupestris* | E | | NMGT | S2 |
| Flame Chub | *Hemitremia flammea* | H | | NMGT | S3 |
| Frecklebelly Darter | *Percina stictogaster* | E | | NMGT | S1 |
| Lake Sturgeon | *Acipenser fulvescens* | E | | END | S1 |
| Orangefin Darter | *Etheostoma bellum* | E | | NMGT | S3 |
| Slenderhead Darter | *Percina phoxocephala* | E | | NMGT | S3 |
| Splendid Darter | *Etheostoma barrenense* | E | | NMGT | S3 |
| Teardrop Darter | *Etheostoma barbouri* | E | | NMGT | S2 |
| Mussels | | | | | |
| Pink Mucket | *Lampsilis abrupta* | E | END | END | S2 |
| Snails | | | | | |
| Ornate Rocksnail | *Lithasia geniculata* | H | | TRKD | S3 |

(1) Source: TVA Natural Heritage database, queried by C. Howard on 12/19/2012.
(2) Heritage Element Occurrence Rank: E = extant record ≤ 25 years old; H = historical record > 25 years old.
(3) Status codes: END = endangered; NMGT = in need of management; TRKD = tracked by state natural heritage program (no legal status).
(4) State ranks: S1 = critically imperiled; S2 = imperiled; S3 = vulnerable.

Field inspections conducted in February 2010 and April 2012 within the project footprint reveal that the vegetation is a mixture of common native and nonnative herbaceous and woody species. Approximately 45 percent of the GAF reservation can be classified based on plant community vegetation types; the remaining 55 percent is being used for plant operation activities and not considered in the vegetation discussion. The existing plant communities observed within the proposed project area include herbaceous vegetation, evergreen forests, mixed evergreen-deciduous forest, and scrub-shrub areas associated with wetlands.

Evergreen forest, in the form of planted loblolly pines, accounts for approximately four percent of the area and is found near the tip of the peninsula south of the steam plant. These trees appear to be about 50 to 60 years of age. The subcanopy vegetation is sparse with scattered individuals of aromatic sumac, bush honeysuckle, flowering dogwood, hackberry, and wild black cherry. The herbaceous layer is dominated by the invasive Japanese stiltgrass. Vines, such as poison ivy and Virginia creeper, were abundant, and a few ferns (adder's tongue, ebony speenwort, and rattlesnake fern) were encountered. Several species of deciduous trees are found along the edges of the pine plantation, including American sycamore, box elder, sweetgum, and white ash.

Thirty-four percent of the project area occurs as evergreen-deciduous forest dominated by eastern red cedar and several oak and hickory species (black oak, chestnut oak, northern red oak, pignut hickory, shagbark hickory, southern red oak, and white oak). In addition, coral berry, flowering dogwood, hackberry, red maple, sugar maple, white ash, and winged elm are common understory species. The shrub layer contained the invasive species autumn olive, bush honeysuckle, Chinese privet, Japanese honeysuckle, along with stiff dogwood and various species of blueberries. Areas not dominated by invasive shrubs and poison ivy contained a number of native herbaceous flowering plants and ferns. Examples of these include aborted buttercup, adder's tongue fern, baby blue-eyes, blunt-lobe woodsia, ebony spleenwort, green dragon, hound tongue, Jack-in-the-pulpit, and lyre-leaf sage.

The remaining one percent of the project area can be classified as scrub-shrub communities commonly associated with pre-emergent wetlands. Black willow, button-bush, silky and stiff dogwood, and tag alder occur in these areas along with cattails, rushes, sedges, and various grass species. There are no uncommon terrestrial plant communities, designated critical plant habitat, or otherwise noteworthy botanical areas occurring on or adjacent to the GAF.

## Invasive Plants

Most lands in and around the TVA power service area have been affected by introduced nonnative plant species. Nonnative plants are known to occur across southern Appalachian forests, accounting for 15 to 20 percent of the documented flora (USFS 2008). According to NatureServe (2012), invasive nonnative species are the second leading threat to imperiled native species. Not all nonnative species pose threats to our native ecosystems. Many species introduced by European settlers are naturalized additions to our flora and considered to be nonnative noninvasive species. These "weeds" have very little negative impacts to native vegetation. Examples of these are Queen Anne's lace and dandelion. However, other nonnative species are considered to be invasive species and do pose threats to the natural environment. EO 13112 defines an invasive species as any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (U.S. Department of Agriculture 2007).

Invasive plants infest under and beside forest canopies and occupy small forest openings, increasingly eroding forest productivity, hindering forest use and management activities, and degrading diversity and wildlife habitat. They occur as trees, shrubs, vines, grasses, ferns, and forbs. Some have been introduced into this country accidentally, but most were brought here as ornamentals or for livestock forage. These exotic plants arrived without their natural predators of insects and diseases that tend to keep native plants in natural balance and are able to outcompete native vegetation for available resources such as nutrients, space, and water (Miller 2003). Much of the native vegetation within and surrounding GAF has been altered by previous land use history, and invasive species are abundant throughout the area. Commonly encountered invasive species include, but are not limited to, autumn olive, Bermuda grass, bush honeysuckle, Chinese privet, crown vetch, Japanese honeysuckle, Japanese stilt grass, Johnson grass, mimosa, multiflora rose, and sericea lespedeza.

## Endangered and Threatened Plants

A review of the TVA heritage database indicates that one federally listed plant (Spring Creek bladderpod) and three state-listed plants are known to occur within 5 miles of GAF (Table 3-7). In addition, a record of leafy prairie clover, a federally listed endangered species is reported from Sumner County. All species found within 5 miles of the project area occur across the Cumberland River in Wilson County. TVA biologists conducted field surveys in February 2010 and April 2012. No endangered, threatened or rare plants or habitats to support them were observed.

**Table 3-7. Plant Species of Conservation Concern Within Five Miles of GAF and Federally Listed Species from Sumner County, Tennessee**

| Common Name | Scientific Name | F-status | S-rank/Status |
|---|---|---|---|
| Beak Grass | *Diarrhena obovata* | -- | S1/SPCO |
| *Leafy Prairie Clover | *Dalea foliosa* | LE | S1S2/END |
| Spring Creek Bladderpod | *Lesquerella perforata* | LE | S2/END |
| Water Stitchwort | *Arenaria fontinalis* | -- | S3/THR |

*Federally listed species known for Sumner County but not within five miles of the project.
Federal status abbreviations: LE = endangered.
State status abbreviations: END = endangered; SPCO = special concern.
State rank abbreviations: S1 = extremely rare and critically imperiled in the state with five or fewer occurrences, or very few remaining individuals, or because of some special condition where the species is particularly vulnerable to extirpation; S2 = imperiled with 6 to 20 occurrences; S3 = rare or uncommon with 21 to 100 occurrences; S#S# = denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).

### 3.3.4 Natural Areas

Natural areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; WMAs; recreational areas; greenways; trails; Nationwide Rivers Inventory (NRI) streams; and wild and scenic rivers. Managed areas include lands held in public ownership that are managed by an entity (e.g., TVA, U.S. Department of Agriculture [USDA], United States Forest Service, State of Tennessee, and Sumner County) to protect and maintain certain ecological and/or recreational features. Ecologically significant sites are either tracts of privately owned land that are recognized by resource biologists as having significant environmental resources or identified tracts on TVA lands that are ecologically significant but not specifically managed by TVA's Natural Areas program. NRI streams are free-flowing segments of rivers recognized by the NPS as possessing remarkable natural or cultural values. Seven natural areas occur in the vicinity of GAF (Figure 3-3).

Following are descriptions of the natural areas in the vicinity of GAF. The numbering aligns with the numbered labels in Figure 3-3.

1. GAF Plant Property. Most of this area is designated as the Gallatin Steam Plant Wildlife Management Area.

2. Gallatin Steam Plant Heronry (located 0.14 mile west of GAF's proposed barge offload) is an ecologically significant site located on a small island in the reservoir. This site has historically been utilized by Great Blue Herons for nesting activities, but activity is not current at this time.

3. Old Hickory State WMA (located approximately 0.2 mile east of GAF) managed by TWRA for small and large game, including waterfowl, is located along the shoreline of the reservoir. Old Hickory State Wildlife Management Area is adjacent to the proposed CCR Landfill.

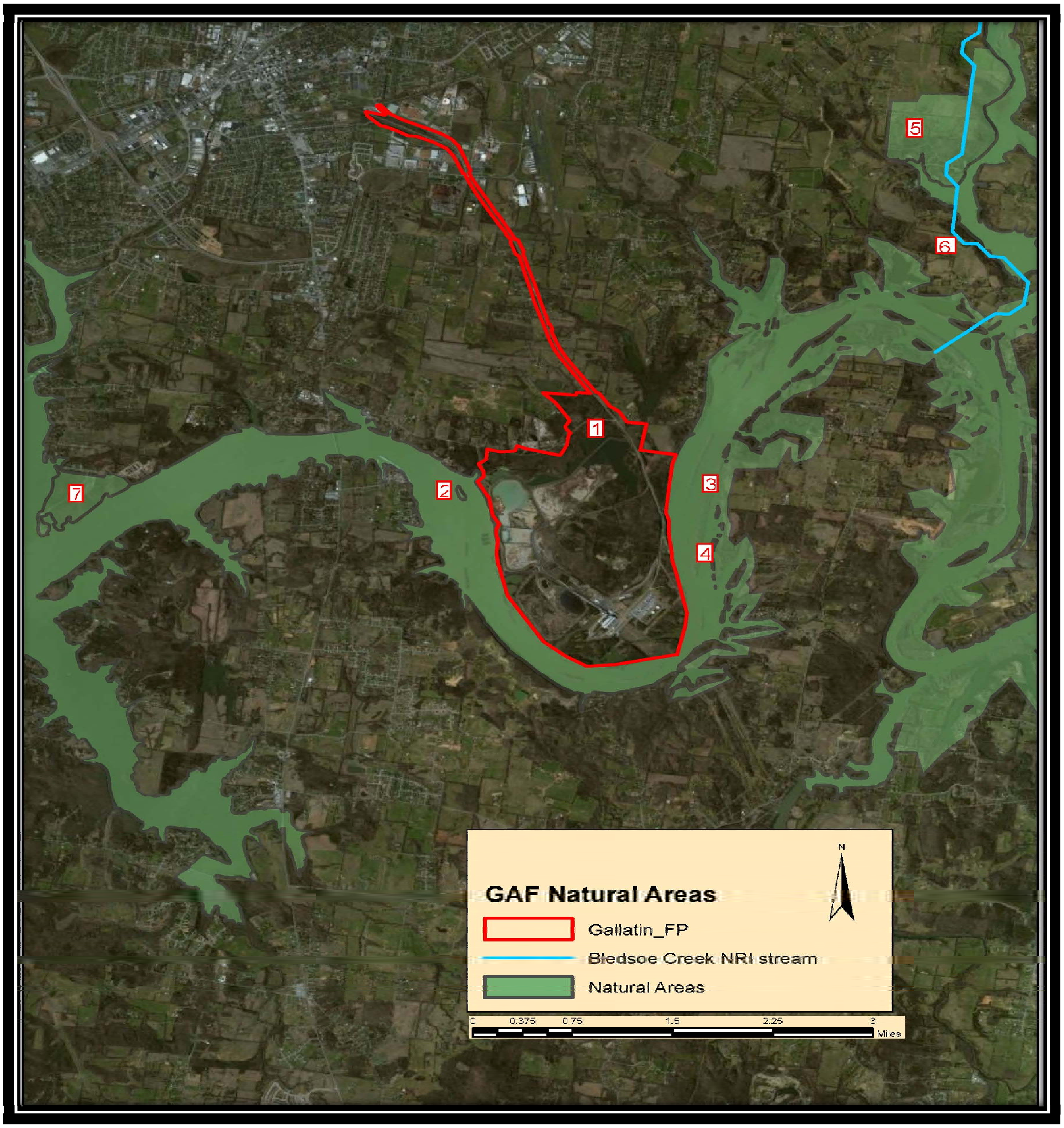


**Figure 3-3. Natural Areas in the Vicinity of GAF. See the text for descriptions of the numbered areas.**

4. Old Hickory Lake Reservation (located adjacent to GAF property) is managed by USACE, extends from the dam at Cumberland River RM 100 upstream to Cordell Hull Lock and Dam. This reservoir is adjacent to the GAF property.

5. Bledsoe Creek State Park (located 2.9 miles east of the GAF property) is a 164-acre site managed by the State of Tennessee Division of State Parks, is located on the Bledsoe Creek embayment of the Old Hickory Lake, and offers several public recreation opportunities such as boating, camping, fishing and hiking.

6. Bledsoe Creek NRI stream (located 2.0 miles northeast from GAF) in Sumner County is designated by the U.S. National Park Service as an NRI stream from RM zero (0) at Old Hickory Lake to RM 14 at Bethpage and is noted for its scenic, recreational, geological, fisheries, wildlife, historical, and cultural values. The mouth of this stream empties into the Cumberland River approximately 2.0 miles northeast of the GAF property.

7. Sumner County Park (located 2.6 miles west of the GAF reservation) is located along the shoreline of the reservoir. This park, managed by Sumner County, is open to the public for recreation.

Most of the GAF plant reservation is designated as the Gallatin Steam Plant WMA by TWRA under terms of a 60-day revocable lease from TVA. The Gallatin WMA (Figure 3-4) is managed by TWRA for hunting within specified hunting zones; only deer and turkey can be hunted and only with archery equipment. A special permit issued by TWRA is required to hunt on the WMA and 639 permits were issued for the 2012-2013 hunting season (TWRA 2013). TWRA maintains boundary markers for the WMA. Other than boundary maintenance and a prescribed burn several years ago, there are no active management activities on the WMA.

From at least the 1970s into the 1990s, the WMA was also regularly utilized for wildlife observation, particularly birdwatching, with public access granted by permission from GAF Plant personnel. The ash ponds, and to a lesser extent the stilling ponds, are used by shorebirds during migration and by waterfowl throughout much of the year, but especially during the winter. Public access for wildlife observation has been restricted since 2008 due to security and safety concerns. Approximately 21 parties have requested access to the WMA for wildlife observation since 2008 (Gray 2012).

About 229 acres of the plant site and WMA are open to hunting (Figure 3-4). The area open to hunting was reduced from over 900 acres to the current 229 acres when the WMA lease was renewed effective December 31, 2011 (TWRA 2012). Before 2012, the area within the Rail Loop and some adjacent areas were open for hunting. These areas were closed for hunting during 2012 to minimize potential conflicts and safety concerns due to the frequent presence of personnel in the area conducting sampling and surveys necessary to evaluate the feasibility of the area for the proposed landfills.

Most of the WMA, including the area of the proposed landfills, is second growth mixed evergreen-deciduous forest with interspersed stands of planted loblolly pine. Ash and stilling ponds also make up a significant portion (325 acres) of the WMA. The ash ponds generally contain shallow water, large areas of exposed, unvegetated ash, and smaller areas of emergent herbaceous vegetation including cattail, cut-grass, and bulrush. The stilling ponds tend to contain deeper water and little vegetation.

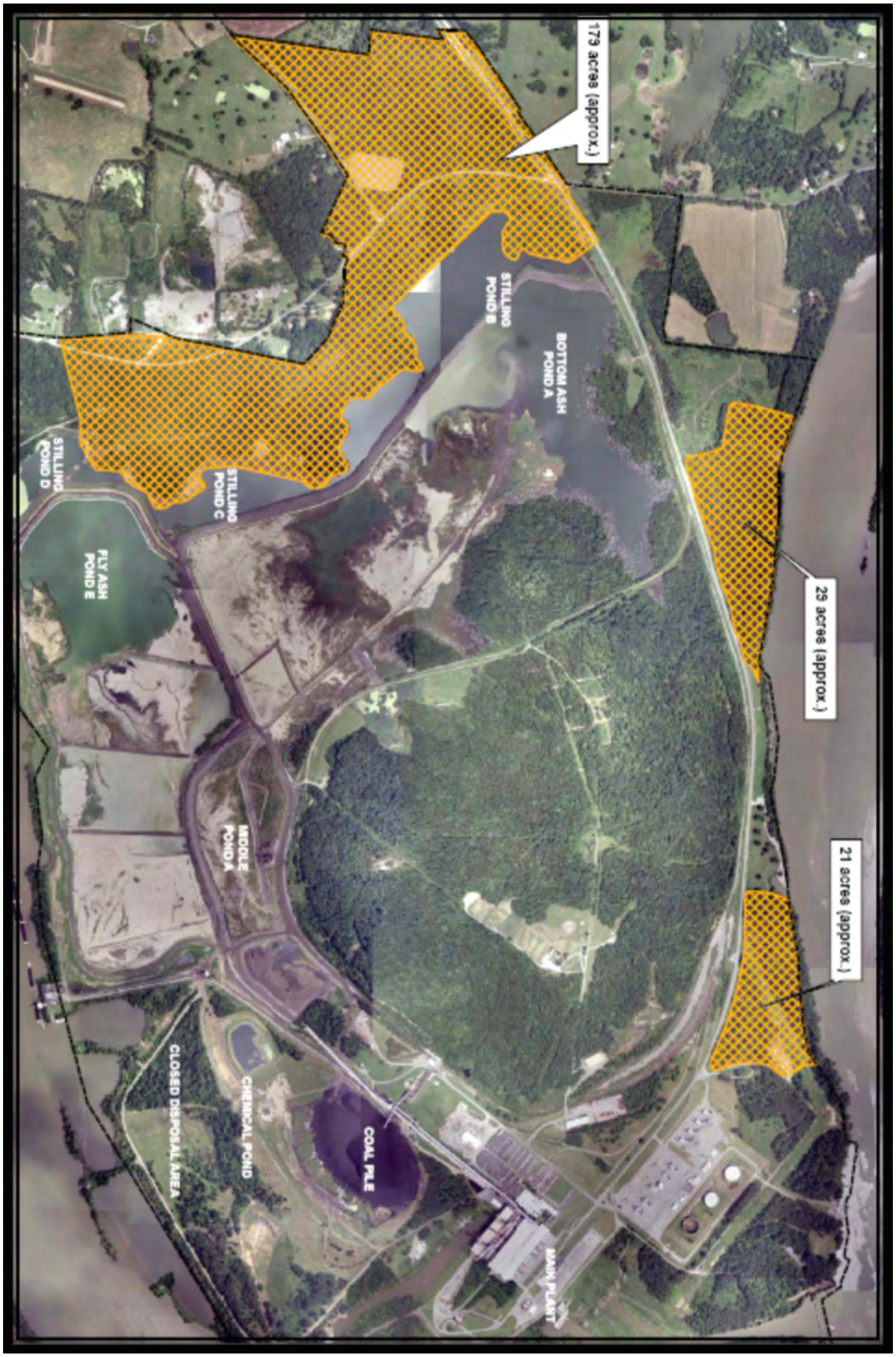


**Figure 3-4. Areas on the GAF Plant Site Open to Hunting in 2012**

### 3.3.5 Terrestrial Animals

Habitats within the project footprint and the surrounding areas of the GAF have been heavily impacted by previous residential and industrial practices. Much of the project area is either already devoid of natural vegetation (office areas, laydown and steel yards, stockpile locations, FGD and SCR sites) or consists of early successional habitats dominated by herbaceous vegetation (construction parking, transport routes, portions of landfill area, stockpile locations). Forested habitats (landfill, the proposed CRAC facility relocation site) include both mixed evergreen-deciduous forest and evergreen forest. See Section 3.3.3 for a more detailed description of the various plant communities.

Early successional habitats consist of maintained lawns, fields, TL ROWs, and areas on either side of existing roadways. These habitats are capable of supporting many common bird species, such as common yellowthroat, field sparrow, song sparrow, indigo bunting, eastern meadowlark, wild turkey, red-winged blackbird, Carolina wren, mourning dove, and white-eyed vireo. White-tailed deer, eastern cottontail, striped skunk, and rodents such as white-footed mouse are also frequently associated with early successional habitats. Reptiles found in this habitat include northern black racer, black rat snake, and pine snake.

Habitat on the southern end of the GAF reservation is evergreen forest in the form of planted loblolly pine. Mixed evergreen-deciduous forest in the proposed landfill area is dominated by osage orange, eastern red-cedar, hackberry, and black locust. Both forests types are fragmented and provide poor quality overall habitat for terrestrial animals. Several common birds were observed in each forest type and included tufted titmouse, eastern towhee, northern cardinal, blue jay, American crow, American goldfinch, eastern phoebe, downy woodpecker, blue-gray gnatcatcher, and Carolina chickadee. Mammals such as eastern chipmunk and eastern gray squirrel are also observed in these forest types. Common amphibians and reptiles in this habitat include slimy salamander, eastern box turtle, copperhead, eastern fence lizard, and eastern garter snake. Low-gradient streams and wetlands in these forested habitats provide minimal habitat for amphibians such as northern cricket frog, upland chorus frog, dusky salamander, and southern two-lined salamander. The proposed relocation site for the CRAC facility (Alternative 2) is within the planted loblolly pine forest on the southern end of the GAF reservation.

Four caves have been recorded within three miles of the proposed project area. The closest cave, Gallatin Fossil Plant Cave, occurs approximately 1,300 feet from the southern end of GAF and is located on the opposite side of the Cumberland River. The other three caves are also located on the Cumberland River and are approximately two miles from the project site. Two wading bird colonies have been documented within three miles of the project area. Both are located along the Cumberland River on the west side of the reservation. Neither has been documented as active since before 2000. One of the colonies was located on an island approximately 800 feet from the hatchery site. The other was located approximately 800 feet from the barge offload location for the FGD. No additional caves, heron colonies, or other unique habitats were observed during field investigations conducted in 2011 and 2012. The project area does not contain any designated critical habitat for federally protected species.

### 3.3.6 Endangered and Threatened Terrestrial Animals

Review of terrestrial animals in the TVA Natural Heritage database in April 2012 found records of one federally listed, one federally protected, and one Tennessee state-listed terrestrial animal species within a 3-mile radius of the project area (Table 3-8). In addition, the endangered

Indiana bat has been included due to the USFWS decision in 2012 to list it as potentially occurring in every county in Tennessee that does not otherwise have a documented occurrence. The review found no additional records of federally listed terrestrial animal species occurring in Sumner County. The only threatened or endangered species observed during field investigations in 2011 and 2012 is the Indiana bat, described in more detail below.

**Table 3-8. Federally Listed Terrestrial Animal Species Reported from Sumner County, Tennessee, and State-listed Terrestrial Animal Species Reported from Within Three Miles of GAF[1]**

| Common Name | Scientific Name | Federal Status | Tennessee State Status[2] (Rank)[3] |
|---|---|---|---|
| **Birds** | | | |
| Bald eagle | *Haliaeetus leucocephalus* | DM | NMGT (S3) |
| **Mammals** | | | |
| Gray bat | *Myotis grisescens* | END | END (S2) |
| Indiana bat[4] | *Myotis sodalis* | END | END (S1) |
| Allegheny woodrat | *Neotoma magister* | -- | NMGT (S3) |

(1) Source: TVA Natural Heritage database, extracted March 2012.
(2) Status abbreviations: DM = delisted, recovered, and being monitored; END = endangered; NMGT = in need of management.
(3) State rank: S1 = critically imperiled; S2 = very rare or imperiled; S3 = rare or uncommon.
(4) No records were present in database for this species during desktop review, but species is included due to 2012 statewide listing in Tennessee by the USFWS.

Two bald eagle nests have been documented within three miles of the project area. The nearest recorded bald eagle nest is located at GAF along a discharge channel on the eastern side of the reservation, greater than 500 feet from the proposed transport route that would run between the SCR duct yard and the barge offload site. Vegetation visibly separates this nest from the transport route. The second nest is located approximately two miles from the proposed SCR site (Alternative 2). This species is associated with larger mature trees capable of supporting its massive nests. These nests are usually found near larger waterways over which bald eagles forage. The Cumberland River provides suitable foraging habitat. Suitable nesting habitat may be available along the edge of the intake channel. The nearest gray bat recorded is associated with Gallatin Fossil Plant Cave, located approximately 1,300 feet across the Cumberland River from the southern portion of GAF's reservation. This cave has been monitored since 1976, with estimated bat numbers ranging from 0 to 16,954 per survey. The most recent survey was conducted in the summer of 2009 and found an estimated of 16,954 bats (Lamb and Wyckoff 2010). Gallatin Fossil Plant Cave is the only documented occurrence of gray bat within three miles of the project area. The gray bat has been documented in Sumner County. This species is associated with caves year-round, while foraging over waterways during the summer months (Tuttle 1976). No caves have been documented on the project area and none were encountered during field investigations. Foraging habitat is available in the stilling ponds and drainage canals in and adjacent to the project area, as well as along the Cumberland River, which surrounds the Reservation.

Prior to this environmental assessment, the Indiana bat had not been documented in Sumner County, Tennessee. The closest documented occurrence of Indiana bat was approximately 27 miles to the northeast, in Allen County, Kentucky. The record is associated with collection of an Indiana bat at a creek crossing in July 1956. However, the Tennessee Ecological Services office of the USFWS recently listed Indiana bat for every county in Tennessee, regardless of whether the species has been documented in the county. The state-wide listing is based on the continued decline of Indiana bat, the determination by the USFWS that past survey efforts have been limited and not comprehensive for the state, and the recent and continued impact of white-nose syndrome on cave-dwelling bat species. Since 2006, when white-nose syndrome was first observed in a cave in New York, the associated fungus, *Geomyces destructancs*, has wreaked havoc on cave-dwelling bat species up and down the eastern seaboard and impacts are spreading further south and west, with close to 100 percent mortality in affected caves after two to three years (USFWS 2012a). Indiana bat hibernates in caves during winter and is one of the species that has succumbed to mortality due to white-nose syndrome. During summer months, this species migrates to roost in trees under exfoliating bark, cracks or crevices (Kurta and Kennedy 2002). Draft range-wide survey guidance for identifying summer roosting Indiana bat habitat was released in February 2012. This guidance instructs project proponents to assess trees within a project area to determine if the trees provide potentially suitable summer roosting habitat for the Indiana bat (USFWS 2012b). At the time of review, the Tennessee office of the USFWS did not have a state-specific framework for guidance related to conducting summer surveys with respect to the Indiana bat, and concurred with implementing components of the draft guidance to assess the site for the presence of potentially suitable summer roosting habitat.

Habitat assessments were conducted concurrently by TVA and USFWS biologists on April 17, 2012, in the forested area on the southern tip of GAF and at five predetermined sample points in the NRL.

The forested area on the southern tip of GAF is bordered on the south by the Cumberland River, on the northeast by existing TL ROW that serves the GAF, and the Plant facility. The forest is planted with loblolly pine. Bark on living loblolly pine is not exfoliating in nature and does not provide suitable habitat under which Indiana bats typically roost. Snags or other potentially suitable trees were not observed during surveys of this area. TVA and USFWS biologists agreed onsite that suitable habitat for summer roosting by Indiana bat is not present in this southern section of GAF, which includes the proposed CRAC facility relocation site.

The NRL footprint contains patches of open, early successional habitat interspersed with forest. Sample point sites at the NRL were selected from an aerial photo both to distribute sampling across the NRL and to choose sample sites that represented different forest cover types based on aerial signature. Sample sites were limited to areas in the NRL with tree cover (open, early successional areas were not included in placement of these sample sites due to lack of trees). This approach to selecting sample sites was discussed with, and agreed to by, USFWS prior to conducting habitat assessments.

Habitat within a 150-foot radius of each sample point within the NRL was characterized with respect to proximity to water resources and type of forest resources present. Dominant tree species and size composition were noted; and closure and density of the canopy, midstory and understory were recorded. Percent of trees with exfoliating bark was estimated and number of snags was enumerated. Water resources were in proximity of three of the five sites. Dominant tree species included black and red oaks, eastern red cedar, sugar maple, hackberry, black locust, box elder and Osage orange. Canopy closure ranged from 20 to 95 percent. Percentage of trees with exfoliating bark ranged from 0 to 1 percent in the canopy layer, 0 to 5 percent in the midstory layer, and 0 to 5 percent in the understory layer. A single snag was observed at two of the five sample points. Cursory observations made of the habitat outside of these sample sites and while traveling between sample point locations were similar in nature. Based on these observations, overall habitat suitability at the landfill site is considered to be low. There are, however, a few potentially suitable trees (based on presence of exfoliating bark, cracks and/or crevices) at NRL. Habitat assessments were conducted along the proposed TL ROW on May 9, 2012. Much of the habitat within the proposed ROW is either early successional herbaceous or already in use as storage for ash. The areas with tree presence are limited to the northernmost arm of the line, a small circular patch of forest southwest of this arm, and a couple of fragmented patches of vegetative cover just west of the southernmost terminus. In general, forested habitat in the section along the northern elbow of the TL ROW is similar in character to the areas assessed within the NRL. Trees with exfoliating bark were limited to the northwestern half of the northernmost arm of the proposed TL ROW and included eight snags and fourteen live trees (shagbark hickory and white oak). This area eastern feed, Option 1, was later eliminated as a potential location for siting of the TL ROW.

Due to similarity of habitat to NRL, based on comparison of aerial footage, two other sections of the proposed project footprint were considered to have potentially marginally suitable summer roosting habitat. These included the stockpile yard north of the railroad and associated with the NRL and sections of the SRL. Clearing within these sections of the SRL was later eliminated from the project footprint.

Based on the presence of some trees with suitable roost characteristics, TVA conducted acoustic surveys. Acoustic equipment was set up at seven locations across the project area. Surveys were conducted by a third-party consulting firm May 15-17, 2012, and June 26-28, 2012.

Current acoustic detection of Indiana bat is based on running all files collected during acoustic surveys through a software filter that is built based on graphic parameters of an ultrasonic call (kilohertz range, slope, height of pulse, frequency) that are specific to Indiana bat. Analysis of data collected during acoustic surveys resulted in isolation of two calls identified by the software filter as matching the parameters of an Indiana bat call. These two calls were collected at an acoustic survey station adjacent to Bottom Ash Pond A (refer to Figure 3-3) located a short distance north of the NRL stockpile area. The detector was aimed towards the pond and towards several standing snags within the pond. Neither the pond nor the snags would be impacted by TVA's proposed action. Current plans for the stockpile area include utilizing only the southernmost eight acres. Based on review of this data and of photos of the acoustic survey location, it is likely that the Indiana bat or bats detected were flying over the ash pond.

### 3.3.7 Wetlands

Wetlands are those areas inundated by surface or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas also are found along the edges of most watercourses and impounded waters (both natural and man-made).

GAF is located in the Old Hickory Lake watershed of the Cumberland River basin. This area lies within the Outer Nashville Basin ecoregion, a subdivision of the Interior Plateau ecoregion, which occurs west of the Cumberland Plateau (Griffith et al. 2001). The hilly and rolling topography of the region affects the type, location, and extent of wetlands. In general, low-lying, poorly drained areas are confined to floodplains and large (greater than ten acres) wetlands are uncommon. Land use/land cover data generated by USEPA in 1999 indicated wetlands comprise less than one percent of overall land use types in the Cumberland River watershed (TDEC 2006).

Identification of wetlands within the GAF project area used NWI maps, aerial photography, and field surveys (Figure 3-5). The GAF site lies on a large peninsula of the Cumberland River. Wetlands on the site are associated with ash disposal ponds, intermittent/ephemeral streams, reservoir/riverine shoreline, and topographical depressions (vernal pools). Human-induced excavations and land movement actions have also created wetlands over time as drainage patterns were altered, creating low-lying areas where water remains over time and wetland vegetation develops.

Wetland determinations were performed according to USACE standards (USACE 2008), which require documentation of hydrophytic vegetation (USFWS 1996), hydric soil, and wetland hydrology. Broader definitions of wetlands were also considered in this review. They include the definition provided in EO 11990 (Protection of Wetlands), the USFWS definition (Cowardin et al. 1979), and the TVA Environmental Review Procedures definition.

The TVA Rapid Assessment Method (TVARAM) was used to assess wetland condition and identify wetlands with potential ecological significance (Mack 2001). Using TVARAM, wetlands may be classified into three categories. Category 1 wetlands are considered “limited quality waters” and represent degraded aquatic resources that have limited potential for restoration and such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and wetlands that are degraded but could be restored. Avoidance and minimization are the first lines of mitigation for Category 2 wetlands. Category 3 generally includes wetlands of very high quality or of regional/statewide concern, such as wetlands that provide habitat for threatened or endangered species. TVARAM scores and categories are summarized in Table 3-9.

**Table 3-9. Summary of Wetlands Identified at GAF**

| Wetland ID | Wetland Type[1] | TVARAM Category (Score) | Total Wetland Acreage |
|---|---|---|---|
| **PAW001** | POW/PEM1A | 2 | 5.62 |
| **PAW002** | POW/PEM1A | 1 | 0.18 |
| **W003** | PFO1E | 2 | 0.47 |
| **W004** | PSS1E | 1 | 0.03 |
| **PAW005** | PEM1E | 2 | 0.30 |
| **PAW006** | PEM1E/PFO1E | 2 | 0.67 |
| **W007** | PFO1E | 2 | 1.60 |
| **W008** | PFO1E | 2 | 0.58 |
| **W009** | PEM1A | 2 | 0.06 |
| **W010** | PFO1/PSS/PEM1E | 3 | 2.30 |
| | | ***Total*** | **11.81** |

(1) Cowardin Classification: PEM1A = palustrine, persistent emergent, temporarily flooded; PFO1E = palustrine, forested, broad leaf deciduous, seasonally flooded/saturated; PSS1E = palustrine, scrub-shrub, broad leaf deciduous, seasonally flooded/saturated; POW = palustrine open water; ID = identification; TVARAM = Tennessee Valley Authority Rapid Assessment Method.

**<u>Description of Wetlands</u>**

Potential Area Wetland 001 (PA-W001) was identified due to human-induced hydrology present on site, but then reconsidered due to the lack of wetland soils. This area had previously been graded/filled, and soils morphology exhibited fill material with an impervious layer at six inches deep. PA-W001 receives hydrology from the surrounding localized watershed and retains water due to the controlled and elevated water tables of connected/active ash ponds at GAF. PA-W001 totaled 5.6 acres, and was entirely located within the proposed project footprint. PA-W001 contains open water areas interspersed with native emergent vegetation. Water depth was estimated at greater than four feet; however, soils along the periphery of the wetland area were saturated at the surface. Dominant hydrophytic vegetation consisted of giant reed and cattail. PA-W001 scored in TVARAM Category 2, which indicates moderate condition and good provision of wetland functions.

Similar to PA-W001, Potential Area Wetland 002 (PA-W002) was identified due to human-induced hydrology present on site, but then reconsidered due to the lack of wetland soils. This area had previously been graded/filled, and soils morphology exhibited fill material with an impervious layer at six inches deep. This potential wetland totaled 0.18 acre, and was entirely located within the proposed project footprint. PA-W002 receives hydrology from the surrounding localized watershed and retains water due to the controlled and elevated water tables of connected/active ash ponds at GAF. PA-W002 contains an open water area surrounded by native emergent vegetation. Water depth was estimated at greater than four feet; however, soils along the periphery of the wetland area were saturated at the surface. Dominant hydrophytic vegetation consisted of cattail, Virginia cut-grass, and bulrush. PA-W002 scored in TVARAM Category 1, which indicates poor condition and low provision of wetland functions.

Wetland 3 (W003) is a 0.47-acre forested headwater wetland, containing vernal pools and braided channels, entirely located within the project larger project boundary. A small, 0.02-acre portion of this wetland extends into an existing TL ROW with only emergent wetland vegetation. W003 exhibits hydric soils and hydrologic connectivity via an intermittent stream to PA-W002, which drains to GAF ash ponds that discharge to the Cumberland River. Dominant hydrophytic vegetation included green ash, sugarberry, and red maple. W003 scored in TVARAM Category 2, which indicates good condition and provision of wetland functions.

Wetland 4 (W004) is a 0.03-acre scrub-shrub wetland that has formed on the downslope side of a dirt access road. W004 exhibits hydric soils and hydrologic connectivity via a culvert to GAF ash ponds that discharge to the Cumberland River. Dominant hydrophytic vegetation included red maple, sugarberry, and sweetgum saplings. W004 scored in TVARAM Category 1, which indicates poor condition and low provision of wetland functions.

Potential Area Wetland 005 (PA-W005) was identified as a potential wetland area due to human-induced hydrology present on site, but then reconsidered due to lack of wetland soils. This area had previously been graded/filled, and soils appear to be derived from coal ash. PA-W005 receives hydrology from a WWC that drains the surrounding localized watershed and retains water due to an old access road within the Rail Loop that parallels a concrete drainage ditch within the loop. PA-W005 totaled 0.30 acre. Soils were saturated at the surface. Dominant hydrophytic vegetation consisted of invasive, exotic plants: giant reed and Nepal grass. PA-W005 scored in TVARAM Category 2, which indicates moderate condition and good provision of wetland functions.

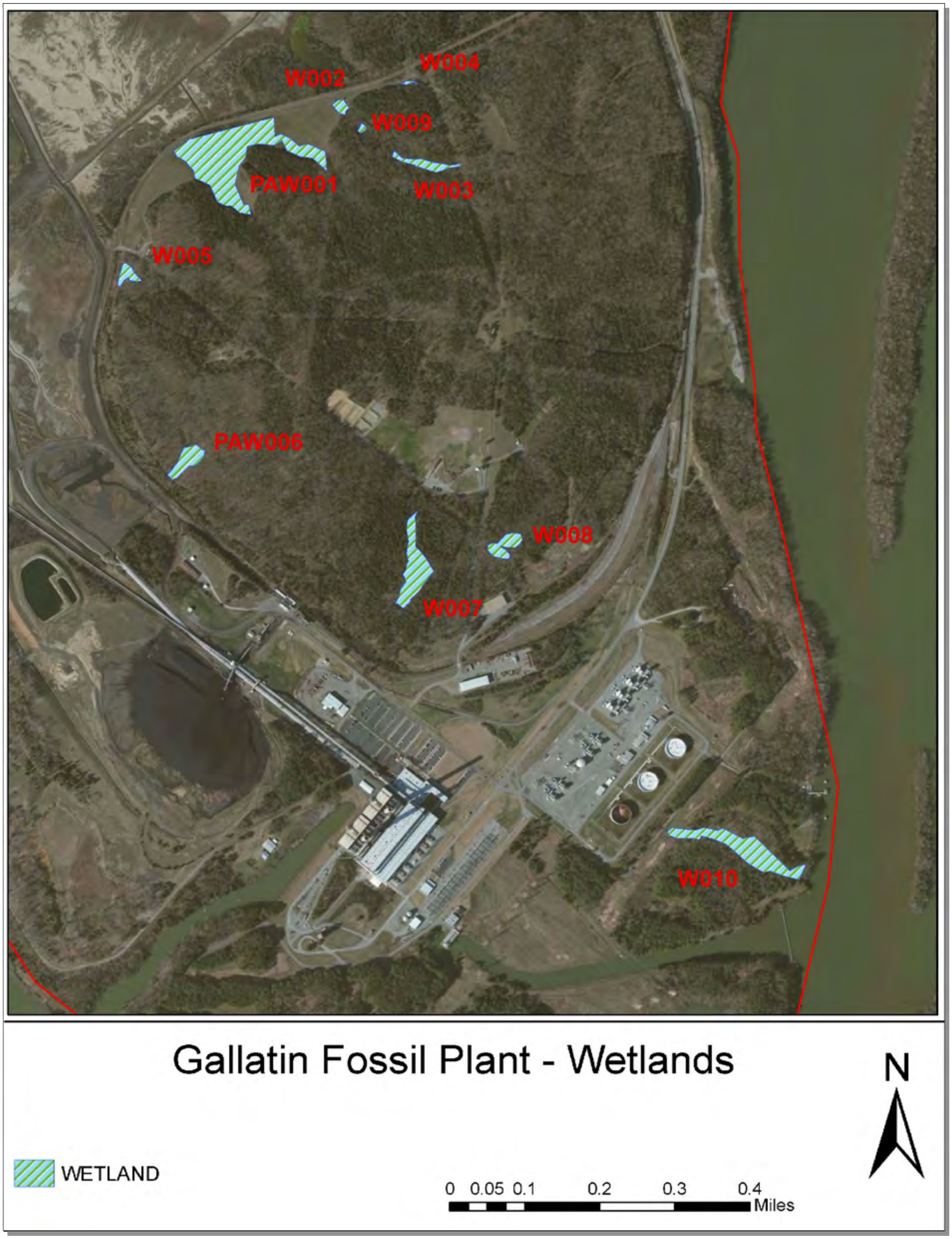


**Figure 3-5. Wetlands on the Gallatin Fossil Plant Site**

Potential Area Wetland 006 (PA-W006) was identified as a potential wetland area due to human-induced hydrology present on site, but then reconsidered due to lack of wetland soils. This area had previously been graded/filled, and soils are very disturbed. PA-W006 receives hydrology from two WWCs that drain two small surrounding local watersheds and retains water due to an old access road within the Rail Loop that parallels a concrete drainage ditch within the loop. There are two moderately large vernal pools in the northeastern end of the wetland. PA-W006 totaled 0.67 acre (approximately 0.47-acre emergent and 0.20-acre forested). Soils appear to derive from a mixture of coal ash, crushed rock, and excavated soil and were saturated at the surface. Dominant hydrophytic vegetation consisted of a mix of native forest plants and exotic emergent vegetation. Dominant forest vegetation included black willow and sugarberry; emergent vegetation consisted of giant reed. There were large areas within the wetland with bare soil exposed and no vegetation present. PA-W006 scored in TVARAM Category 2, which indicates moderate condition and good provision of wetland functions.

Wetland 7 (W007) is a 1.60-acre forested wetland that has formed in a small alluvial valley downstream from the shooting range at GAF. The wetland is associated with one intermittent stream, two WWCs, and an old pond. W007 exhibits hydric soils and hydrologic connectivity via an intermittent connection to the Cumberland River. Dominant hydrophytic vegetation included green ash. W007 scored in TVARAM Category 2, which indicates moderate condition and good provision of wetland functions.

Wetland 8 (W008) is a 0.57-acre forested wetland that has formed in the headwater of a WWC that drains into W007. W008 exhibits hydric soils and hydrologic connectivity to waters that discharge into to the Cumberland River. Two vernal pools make up the largest part of the wetland. Dominant hydrophytic vegetation included sugarberry and slippery elm. W008 scored in TVARAM Category 2, which indicates moderate condition and good provision of wetland functions.

Wetland 9 (W009) is a 0.06-acre emergent wetland associated with a wet weather conveyance draining from a pond at the northern boundary of the Rail Loop road. Dominant vegetation is American water plantain and soft rush.

Wetland 10 (W010) is a 2.30-acre wetland associated with a low-lying area along the shoreline of the reservoir. The site is shown on NWI maps, and is a mix of forested/scrub-shrub, and emergent habitat. Hydrology is the result of overflow from the Cumberland River and runoff from upland areas surrounding the wetland. There may also be some groundwater influence as well. Dominant vegetation includes water oak, sweet gum, willow oak, sycamore soft rush, Nepal grass, black willow, cattails, bulrush, and sugarberry. Habitat diversity and landscape position of this wetland are unique, and as a result, W010 scored in TVARAM Category 3, indicating good condition and high provision of wetland functions. W009 scored in TVARAM Category 2, which indicates morderate conditions and good provision of wetlands functions.

**Regulatory Status**

The regulatory status of the wetlands that have developed in PA-W001, PA-W002, PA-W005, and PA-W006 is uncertain for several reasons. Normally, the ash ponds would be excluded from USACE jurisdiction based on the definition of Waters of the United States regulated under the CWA [33 *CFR* 328.3(a) (8)]. This area was flooded as a result of elevating the water levels in adjacent, designated ash ponds, and has since developed wetland characteristics. A jurisdictional determination by USACE and TDEC would not be required to resolve the regulatory status of PA-W001, PA-W002, PA-W005, and PA-W006. Because W003, W004, W007, W008, W009, and W010 exhibit all three required parameters for wetland determination and maintain connectivity to a navigable waterway, these wetlands are assumed regulated as jurisdictional wetlands.

## 3.4 Cultural and Historic Resources

Cultural resources include prehistoric and historic archaeological sites, districts, buildings, structures, and objects; and locations of important historic events that lack material evidence of those events. Cultural resources that are listed, or considered eligible for listing, on the NRHP maintained by the NPS are called *historic properties*. Historic properties are identified based on whether they meet the Secretary of the Interior's criteria for evaluation (36 *CFR* Part 60.4), which states that historic properties possess integrity of location, design, setting, materials, workmanship, feeling, and association; and are associated with important historical events; or are associated with the lives of significant historic persons; or embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or have high artistic value; or have yielded or may yield information important in history or prehistory.

Federal agencies are required by the NHPA and by NEPA to consider the possible effects of their undertakings on historic properties. *Undertaking* means any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency. Considering an undertaking's possible effects on historic properties is accomplished through a four-step review process outlined in section 106 of the NHPA (36 *CFR* Part 800). These steps are:

1. Initiation (defining the undertaking and the area of potential effect [APE] and identifying the parties to be consulted in the process);

2. Identification (studies to determine whether cultural resources are present in the APE and whether they qualify as historic properties);

3. Assessment of adverse effects, if any (determining whether the undertaking would damage the qualities that make the property eligible for the NRHP); and

4. Resolution of adverse effects (by avoidance, minimization, or mitigation).

Throughout the process the agency must consult with the appropriate SHPO and federally recognized Indian tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking. Refer to Appendix C for additional information.

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 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), the effect is agreed 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 building's historic setting. Adverse effects must be resolved. Resolution may consist of avoidance (such as redesigning a project to avoid impacts), minimization (such as planting visual screenings), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site.

Adverse effects to a historic building are sometimes mitigated through documentation of the building by compiling historic records, studies, and photographs.

### 3.4.1 Area of Potential Effects

For the proposed undertaking, TVA, in consultation with the Tennessee SHPO, determined the APE for archaeology to be any area within the GAF reservation that would be affected by land-disturbing activities associated with the construction, operation, and maintenance of emissions control equipment and CCR disposal facilities, and their infrastructure. They also determined the architectural APE to be the 0.5-mile viewshed surrounding the GAF powerhouse, as well as any areas where the proposed projects may alter existing topography or vegetation in view of a historic resource. This APE takes into account potential direct, indirect, and cumulative effects on cultural resources due to the construction and use of the emissions control equipment, CCR disposal facilities, and their accessory structures. The accessory structures include access roads, transport routes, three construction staging and stockpile areas, construction parking, plant parking, an office/hiring complex, a byproduct storage area, a steel yard, a pebble lime preparation area, an SCR duct yard, a dry FGD area, barge offload areas (large construction components), and the CRAC facility that is currently located approximately 285 yards to the west-southwest of the GAF powerhouse. All of these areas are included within the APE.

### 3.4.2 Historic Properties in the APE

In 2005, TRC Environmental Corporation (TRC) conducted a Phase I archaeological survey, totaling 1.5 square kilometers (km) (0.59 square mile), and historic architecture survey, totaling 12.7 square km (4.9 square miles), within the APE for proposed improvements to ash disposal areas situated in the northern portion of the GAF reservation (Wampler and Karpynec 2005). No archaeological sites were identified in this survey. The historic architecture survey resulted in the identification of no previously unrecorded historic structures. Two previously surveyed architectural properties (SU-664 and SU-665) were shielded by mature tree growth, which completely obstructed the viewshed to the project area, and thus were not re-evaluated for the proposed undertaking. Therefore, no historic properties were identified as a result of these surveys. SHPO agreed by letters dated April 28 and May 10 of 2005 (see Appendix C).

In 2005, TRC conducted a Phase I archaeological survey of approximately 0.48 km of proposed improvements to the railroad spur servicing the GAF plant operations (Deter-Wolf and Wampler 2005). No historic properties were identified during this survey. The SHPO agreed by letter dated July 13, 2005 (see Appendix C).

In 2010, TRC conducted a Phase I cultural resources survey within the APE for proposed upgrades to approximately 6.3 km (3.9 miles) of an existing 161-kV TL extending from the GAF to a TL structure located near the junction of Newton Lane and Steam Plant Road (Barrett and Karpynec 2010). The archaeological survey re-evaluated one previously recorded site (40SU192) within the GAF reservation. Site 40SU192 consists of a complex of stone wall features associated with nineteenth-century agricultural/light industrial activities involving water impoundment and possibly water-powered machinery or milling equipment (McKee 2000). Shovel-testing at the site revealed no subsurface artifacts. The historic architecture survey of the APE identified the Harper Cemetery (HS-9) on the west side of Steam Plant Road on the GAF Reservation. Two previously recorded architectural properties (SU-664 and SU-665) were located outside the visual line-of-sight to the project corridor. TVA determined that no historic properties would be adversely affected by the proposed TL upgrade. The SHPO agreed by letter dated February 16, 2010 (see Appendix C).

In 2010, TRC conducted a Phase I archaeological survey of 285 acres under consideration for the CCR disposal facilities associated with the current proposed action (McKee 2010). The surveyed area included a 52-acre ash pond in the northeastern corner of the GAF reservation, a 49-acre fly ash pond and 43-acre closed ash disposal area (both on the western side of the GAF reservation), and a 141-acre parcel within the northern portion of the Railroad Loop parcel. Four archaeological sites (40SU257, 40SU258, 40SU259, and 40SU260) were identified. Site 40SU260 is the remnant of a historic-period domestic site dating to the nineteenth century, which was partially destroyed during the construction of GAF. TVA determined, in consultation with the SHPO and federally recognized Indian tribes, that site 40SU260 is ineligible for listing on the NRHP, while sites 40SU257, 40SU258, and 40SU259 are potentially eligible. The SHPO agreed by letter dated May 28, 2010 (see Appendix C).

In 2011, TRC conducted a Phase I archaeological survey of an approximately 200-acre area in the southern portion of the GAF Railroad Loop also under consideration for the CCR disposal facilities associated with the proposed action (McKee 2011). This survey identified seven archaeological sites (40SU263, 40SU264, 40SU265, 40SU266, 40SU267, 40SU268, and 40SU269). Four of the sites are the remnants of domestic sites dating to the early twentieth century with associated features and artifact scatters. One of these historic sites (40SU266) may be associated with a cemetery that was noted on the 1952 TVA land acquisition map, but was not identified in the field. Two of the sites (40SU265 and 40SU267) are historic-period cemeteries. TVA determined all of these historic sites to be ineligible for listing on the NRHP. TVA determined site 40SU268 to be eligible for the NRHP. The SHPO agreed that the historic sites are ineligible, but expressed their opinion that site 40SU268 is potentially eligible for the NRHP by letter dated April 28, 2011 (see Appendix C).

In 2012 TRC conducted a Phase I archaeological survey of approximately 43 acres north of the Railroad Loop parcel that TVA proposed to use as a stockpile area for the staging and storage of materials for the construction of the proposed CCR disposal facility (Barrett and Holland 2012). Five previously unrecorded archaeological sites were identified: 40SU271, 40SU272, 40SU273, 40SU274, and 40SU275. Sites 40SU272, 40SU273, and 40SU274 are historic-period farmsteads dating to the twentieth century. All of the sites are defined by the presence of small, stone building foundations in various states of disrepair, with varied associated subsidiary house lot features (road beds, outbuilding foundations, etc.), surface artifact scatters, and subsurface artifact deposits. Each of these sites is shown on the 1952 TVA land acquisition map. Sites 40SU271 and 40SU275 are historic-period cemeteries. Both are identified on the 1952 TVA acquisition map. 40SU275 is labeled as the “Hutson Cemetery,” with an additional notation of there being “50+” graves at the site. 40SU271 is labeled as “single grave.” TRC identified a possible grave depression in the general area of where 40SU271 is located on the TVA land acquisition map. TVA determined all of these historic sites to be ineligible for listing on the NRHP. The cemeteries are protected from disturbance by Tennessee state law; thus, TVA will take measures to avoid any ground-disturbing activities at these locations. The SHPO agreed with TVA’s findings by letter dated February 28, 2012 (see Appendix C).

TRC completed an additional Phase I cultural resources survey in 2012 of approximately 41.5 acres south of the Railroad Loop, which covers all areas associated with the proposed new emissions control equipment and infrastructure at GAF (i.e., dry FGD and SCR facilties and their accessociated structures) (Hockersmith, Karpynec, and Holland 2012). No archaeological sites were identified during the survey. The historic architectural survey included a 0.8-km (0.5-mile) radius centered on the GAF powerhouse. The powerhouse (HS-1) was the only historic architectural property identified and recorded and was assessed for NRHP eligibility. Based on the results of this assessment, TVA has determined that the GAF powerhouse is ineligible for the NRHP based on a loss of integrity of feeling and association due to the previous addition of emissions control technology and other architectural changes that have occurred after the plant's construction in the 1950s. The SHPO agreed with TVA's findings by letter dated June 20, 2012 (see Appendix C).

## 3.5 Geology, Soils, and Prime Farmland

### 3.5.1 Geology/Geologic Hazards

The project area is located within the Central Basin physiographic region. The Central Basin and southern segment of Sumner County are underlain by Ordovician geologic period deposits consisting of limestones, shales, dolomite, siltstones, sandstones, and claystones (Newcome 1958). Specific geologic formations underlying GAF include bedrock of the Bigby-Cannon Limestone, Hermitage Formation, Carters Limestone, and Lebanon Limestone (Table 3-10). These formations generally consist of limestones ranging from massively bedded, densely crystalline limestone to thin-bedded, silty and nodular, fossiliferous limestone containing calcareous shale partings. Bedding in these formations is generally horizontal, with primary fractures typically following bedding. A bentonite clay layer, designated the T-3 unit, occurs within the Carters Limestone and has been estimated to range from 3 to 6 inches in thickness at GAF (URS 2012).

**Table 3-10. Bedrock Stratigraphy of GAF**

| | |
|---|---|
| **Nashville Group** | Bigby-Cannon Limestone – comprises the Bigby facies (0 to 10 ft thick), the Cannon facies (40 to 80 ft thick), and the dove-colored facies (10 to 20 ft thick) |
| | Hermitage Formation – comprises the *silty nodular* facies (0 to 5 ft thick), the granular phosphatic facies (10 to 20 ft thick), and the laminated argillaceous facies (40 to 60 ft thick) |
| **Stones River Group** | Carters Limestone – comprises the Upper Carters (10 to 20 ft thick), the T-3 bentonite deposit (6 to 12 in.), and the Lower Carters (60 to 70 ft thick) |
| | Lebanon Limestone – consists of a single facies approximately 75 ft thick beneath the study area |

Geologic mapping shows alluvial deposits consisting of clay, silt, and very fine sand across much of the site. The mapping indicates the thickness of the alluvium is variable, but may reach 70 feet in depth. The remaining areas are underlain by residual clays resulting from weathering of the parent Ordovician-age formations (TDG 2012; Stantec 2009).

The potential for seismic events exists in central Tennessee. Two zones of earthquake activity influence the area: the New Madrid Seismic Zone and the Southern Appalachia Seismic Zone. The East Tennessee Seismic Zone portion of the Southern Appalachia Seismic Zone extends from northwestern Georgia through eastern Tennessee. Earthquakes within this zone are relatively more frequent but historically low in magnitude. Earthquakes emanating from the New Madrid zone, historically, have been more severe, and have the potential to cause damage to central Tennessee (Stantec 2009).

Karst topography exists in the region and is present in areas where groundwater erodes subsurface limestone or other carbonate rock below ground surface. Acidity in the soils can mix with the groundwater and intensify the corrosive nature of the water moving through rock formations. This action can lead to the formation of sinkholes, which may pose a danger to development and construction activities. In addition, the collapse of sinkhole formations underneath the surface can lead to soil subsidence, which may damage surface structures. Topographic maps and historical investigations indicate that karst conditions, such as enclosed drainage basins and sinkholes, are present at the GAF.

A Phase I hydrogeologic evaluation determined that there is potential for karst features to occur around the NRL and SRL areas where the Carters Limestone is exposed to the surface. Cover over the unexposed portions of Carters Limestone (i.e., Hermitage Formation and Bigby-Cannon Limestone) averages approximately 35 feet in the NRL site and 20 feet in the SRL site. Several sinkholes have been recorded within the footprint of the SRL site, whereas no sinkholes have been reported within 200 feet of the NRL site footprint. Two significant karst features, a 5-inch-thick void and a 1.6-foot-thick void, were encountered in borings in the SRL within the Carters Limestone (URS 2011b).

Information gathered during the Phase I evaluation indicated approximately five percent of the NRL area is underlain by the Carters Limestone or its residuum , whereas approximately 83 percent of the area is underlain by the Hermitage Formation. Conclusions contained in the Phase I report are based on approximately 49,380 linear feet of electrical resistivity (ERI) geophysical data and approximately 900 feet of rock coring performed in the Rail Loop area. According to the Phase I report, no surface depressions were noted within 200 feet of the NRL site. Samples and data collected during the geotechnical borings advanced showed no development of karst features within the Hermitage Formation. There were no geotechnical or hydrogeologic fatal flaws identified during the Phase I Hydrogeologic Evaluation of the NRL area, which would preclude the development of a CCR disposal area at that location.

Information gathered from the Phase I Hydrogeologic Evaluation was used to guide the engineering design of the proposed landfill and the development of an investigation plan for Phase II Evaluation of the NRL area. The Phase II Evaluation investigation was subsequently performed to determine additional information for the proposed NRL disposal area. This investigation will be submitted to TDEC in the Part II Solid Waste Landfill Permit Application. The Phase II Evaluation report addresses concerns relating to karst morphology in the proposed NRL area by utilizing geophysical and geotechnical methods to evaluate the geology in the proposed disposal area and help identify potential structural anomalies, which could pose issues relating to the structural stability of the proposed landfill site. The final hydrogeological investigation, which was conducted by a third party expert, states in the section describing Karst Evaluation, “In summary, data indicate no karst activity within the proposed NRL landfill limit.”

While the initial Phase I Evaluation determined that 47 percent of the SRL is underlain by Carter Limestone, more in-depth investigation is needed in this proposed disposal area. A separate hydrogeologic investigation and design would be completed prior to a proposed decision to expand landfill operations to the SRL.

### 3.5.2 Soil

Soil is produced by forces of weathering and other soil formation processes acting on parent material. The main processes of soil formation are accumulation of organic matter, leaching of calcium carbonate, reduction of iron, and the reduction of silicate clay minerals. If all of these processes do not occur, the resulting matrix is then referred to as sediment.

Under certain conditions, interaction between storm water runoff and the soil surface, in association with land disturbances, can create conditions prone to exacerbate erosion. This may result in adverse effects to land and water resources. In the absence of intervention, the loss of soil through human-induced activity can lead to erosion and permanent loss of soil. Soil erosion is a process of displacement and deposition of surface materials by either wind or water. Erosion can reduce land productivity, pollute waters, and degrade habitats.

Soils in the project area were evaluated to identify soil types, define prominent soil properties, and describe relevance to possible soil erosion. Soil types and properties are critical when determining the level of soil erosion that can occur. If activities were to occur in an area where soil loss or erosion is high, the potential effects can damage waterways, cause ground instability, and impact animal and human habitats. Soil attributes were examined to determine soil suitability for the proposed activities. Soil is defined in terms of permeability, erodibility, composition, and the topography (slope) at proposed project locations. Soil drainage, texture, and strength combine to determine erosion, thus determining the suitability of the ground to support structures and facilities, as well as other activities. Adverse impacts to soils and associated potential indirect impacts to water resources can be minimized through the implementation of BMPs.

Soil types at GAF and their characteristics are identified in Figure 3-6, while Appendix D provides additional details of soil types within the project area.

### 3.5.3 Prime Farmland

Prime farmland soils, defined by the USDA (1997), are soils best suited to a variety of crops. Such soils have properties that favor the economic production of sustained high yields of crops owing to adequate moisture supply and a sufficiently long growing season. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Prime farmland soils may be used as cropland, pasture, woodland, or for other purposes. Soils considered prime farmland must also have acceptable acidity or alkalinity levels and have few or no rocks. The slope ranges mainly from 0 to 5 percent (USDA 1997). Within the project area only 12 acres (0.68 percent of total land) are designated as prime farmland. Both areas are small and located outside of proposed activity areas at the northern end of the site.

## 3.6 Solid Waste and Utilities

### 3.6.1 Solid Waste – CCR Generation

Ash is the non-combustible mineral matter left behind from the burning of coal and is the most prevalent of CCRs. It takes the form of fly ash (fine, smaller particles) or bottom ash (coarse, larger particles). Fly ash is carried with the flue gas stream exiting the boiler, while bottom ash falls to the bottom of the boiler. By weight, approximately 80 percent of the total ash is fly ash and 20 percent is bottom ash. Depending on the coal type, the amount of ash that remains is generally about 10 percent of the coal that is burned as fuel.

Currently, GAF produces approximately 185,000 tons (197,000 cubic yards) of fly ash and 46,500 tons (38,000 cubic yards) of bottom ash annually, for a total of 232,500 lb of combined CCR waste. CCR is disposed of onsite in one of two ash ponds. The fly ash and bottom ash are wet-sluiced the ash pond. There are no dry stacking operations currently at GAF.

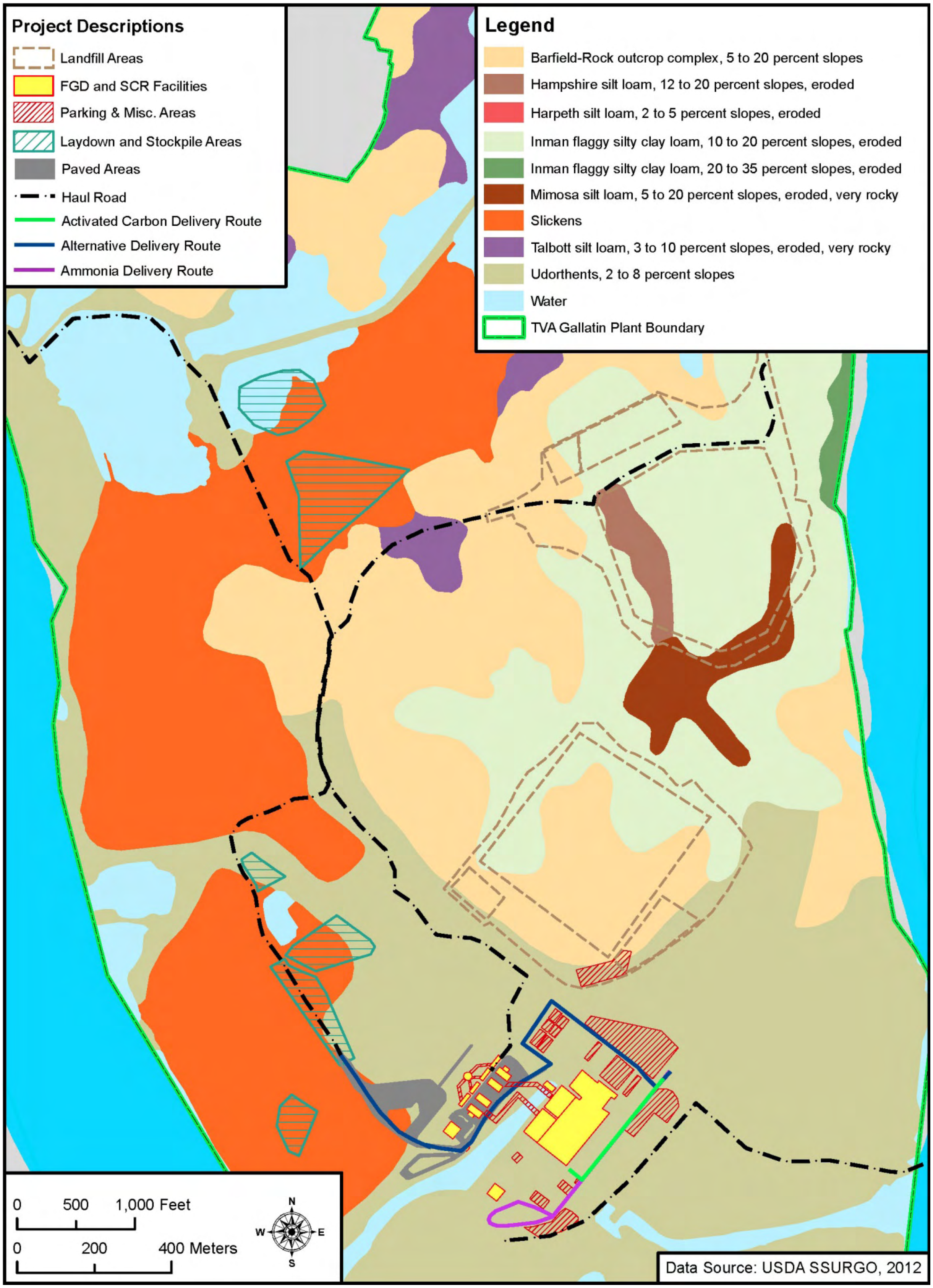


**Figure 3-6. Soil Types Associated Located Within Proposed Alternative Footprints**

### 3.6.1 Solid Waste – Municipal Solid Waste

Most nonhazardous materials not disposed on-site are taken to the Sumner County solid waste transfer station and then shipped for disposal to the Republic Waste Services in Murfreesboro, Tennessee. This landfill, a Subtitle D landfill with two clay liners and two synthetic liners, opened in September 1997. There are no construction and demolition (C&D) [Class IV] landfills within Sumner County; however, four such landfills are located in nearby counties, including the Southern Services and Central Pike landfills in Davidson County, the Wilson County Landfill, and the Rutherford County Demolition Landfill.

### 3.6.2 Utilities

Existing utilities at GAF include electricity, potable water, sanitary wastewater, and natural gas. Electricity to the powerhouse and supporting facilities comes from the switchyard via various transformers and distribution lines. Potable water is supplied from the city of Gallatin via a water line that runs along Steam Plant Road to the plant. Sanitary wastewater is discharged into a septic field located east of the combustion turbine plant. The septic field has a Class V Underground Injection Control (UIC) Permit through the state of Tennessee (SUM 0000018). (Note that Tennessee has applied for primacy over the UIC program). Natural gas is supplied via a 12-inch line that runs underneath the Cumberland River bed from Wilson County into the combustion turbine plant for for this facility.

## 3.7 Socioeconomics and Environmental Justice

### 3.7.1 Socioeconomics

GAF is located in Sumner County, approximately seven miles south of the city of Gallatin on the Cumberland River. In 2010, the population of Sumner County was 160,645, according to U.S. Census Bureau estimates (U.S. Census Bureau 2010). Wilson County, across the Cumberland River from GAF, had a population of 113,993. Both counties are part of the Nashville Metropolitan Statistical Area, which includes all counties linked to the Nashville economy. In 2009, total employment in Sumner County was 54,472, and in Wilson County it was 50,533 (Bureau of Economic Analysis 2012). No single industry dominates employment in either county. In 2009, government and government enterprises accounted for 15.1 percent of employment in Sumner County, followed by 10.9 percent in retail trade. In Wilson County, government and government enterprises accounted for 9.5 percent of total employment, and retail trade accounted for 13.2 percent. In comparison, statewide, 12.8 percent of jobs were in government and 10.8 percent were in retail trade, while nationally, 14.2 percent of jobs were in government and 10.2 were in retail trade. Per capita income in 2009 was $33,557 in Sumner County, or 85 percent of the national average of $39,635. In Wilson County, average income was slightly higher at $35,612, or 90 percent of the national average. Statewide, per capita income was 86 percent of the national average, at $34,277.

### 3.7.2 Environmental Justice

GAF is located in Census tract 209.01, in all or portions of Blocks 1015, 1016, 1018, 1019, 1020, 1021, 1025, 1027, 1032, 1034, 1036, 1042, 1043, 1045, 1046, and 1055 (Figure 3-7).

Of these, only Blocks 1015 and 1021 are inhabited and none of the population resides within the GAF boundaries. The nearest residence in this tract is in Block 1021, near the northern boundary, and about half a mile north of the Rail Loop. As of the 2010 Census, 25 people live

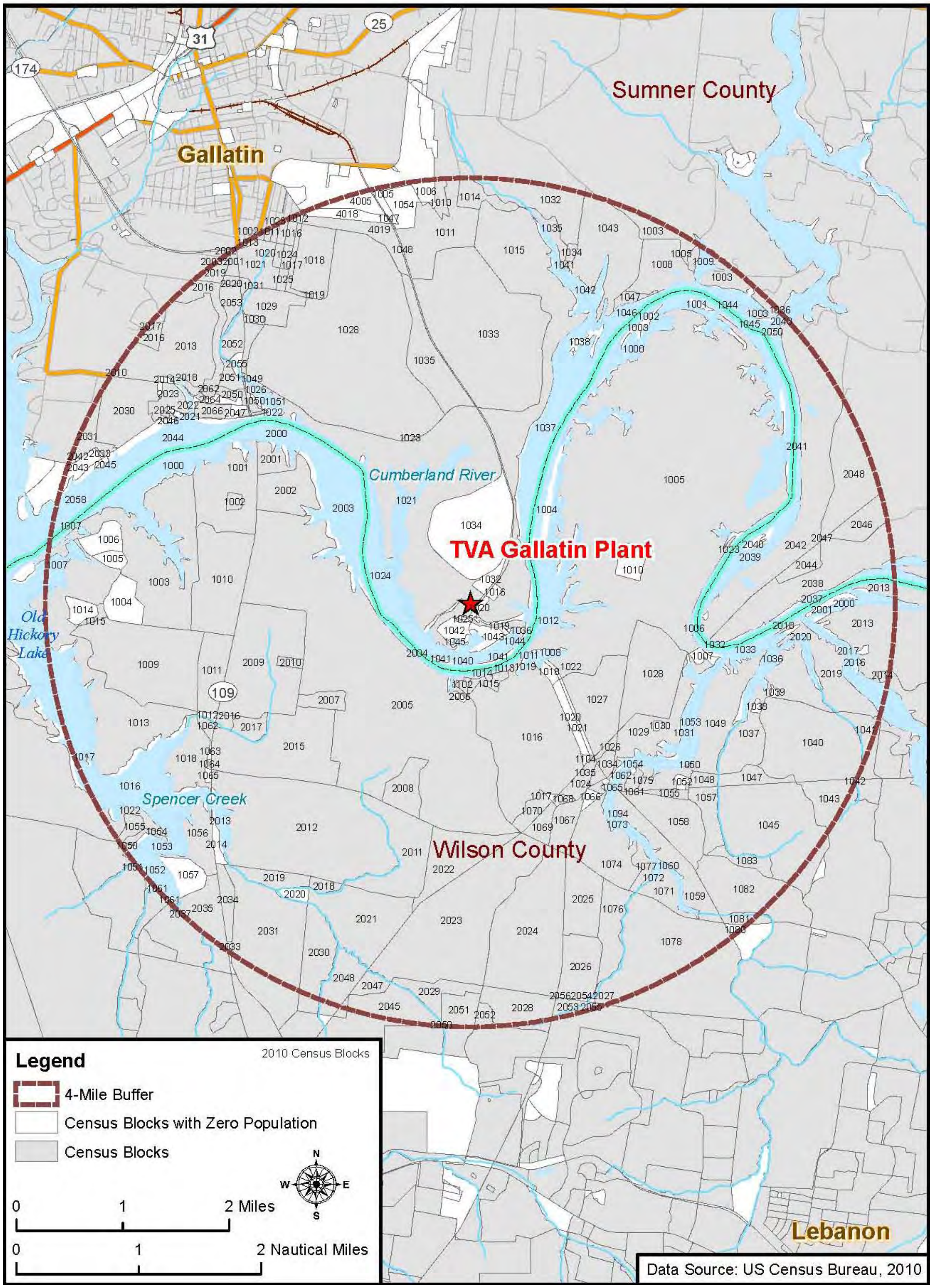


**Figure 3-7. Census Blocks Associated With GAF**

in Block 1021, of which nine (36 percent) are minorities, which is slightly above the national and state averages (U.S. Census Bureau 2010). Block 1015 includes 345 people, of which 15 (4.3 percent) are minorities. Census tracts 302.04 and 301.01 in Wilson County are directly south across the Cumberland River. Minority populations in the nearest blocks are below both the national and state averages, ranging from 0 to 20.7 percent of the total. Figure 3-8 shows minority populations near GAF.

The Census Bureau did not collect information on poverty in the 2010 Census, but the American Community Survey provides five-year average poverty estimates for counties and census tracts (http://factfinder2.census.gov).

The minority population within a 4-mile radius of the plant is approximately 12.9 percent of the total in Sumner County, and 12.4 percent in Wilson County, according to the 2010 Census (U.S. Census Bureau 2010). The 4-mile radius was used as a representative characterization for the project area. The percentage is well below the national average of 34.1 percent and the Tennessee average of 24.2 percent. The poverty level in Sumner County for the years 2006 to 2010 was 10.1 percent, and in Wilson County it was 7.6 percent. Both are lower than the national average of 13.8 percent and the Tennessee average of 16.5 percent. However, the poverty rate in Census Tract 209.01 was 26.8 percent, which is well above the national and state averages. The poverty rate was 6.5 percent in tract 301.01 and 6.0 percent in tract 302.04.

## 3.8 Land Use and Recreation

Current land use at GAF is heavy industrial—coal- and gas-fired power production. Major facilities and features associated with coal-fired generation include the powerhouse, coal handling system, switchyard, transmission corridors, coal pile, ash disposal areas, access roads, railroad tracks, barge unloading facility, wellness center, and parking areas (see Figure 1-2). TVA also operates a combustion turbine facility adjacent to the powerhouse site. TVA and TWRA have a license agreement for the operation of the CRAC facility located on the north side of the powerhouse discharge channel. Within the SRL area the Gallatin Gun Club operates an outdoor shooting range. Surrounding these areas is a mix of forested tracts and open fields.

WMAs are located on GAF property north of the plant and along the shoreline of Old Hickory Lake (Figure 3-9). The GAF Steam Plant WMA managed by TWRA includes about 230 acres for deer and turkey hunting (archery only). Portions of the Old Hickory WMA (Unit 1) are located within the GAF property boundary primarily along the shoreline. A boat ramp for lake access is located on the eastern side of the property off Steam Plant Road. In addition to hunting and fishing, these areas also provide limited public opportunities for watching wildlife, especially shorebirds, waterfowl, and wading birds.

The majority of the GAF property is surrounded by Old Hickory Lake. Land use adjacent to the northern property boundary is primarily undeveloped agricultural land with some residential. The closest residences to the northern property boundary are located along Odoms Bend Road and Newton Lane. Additional residential areas are located across the reservoir to the south and east.

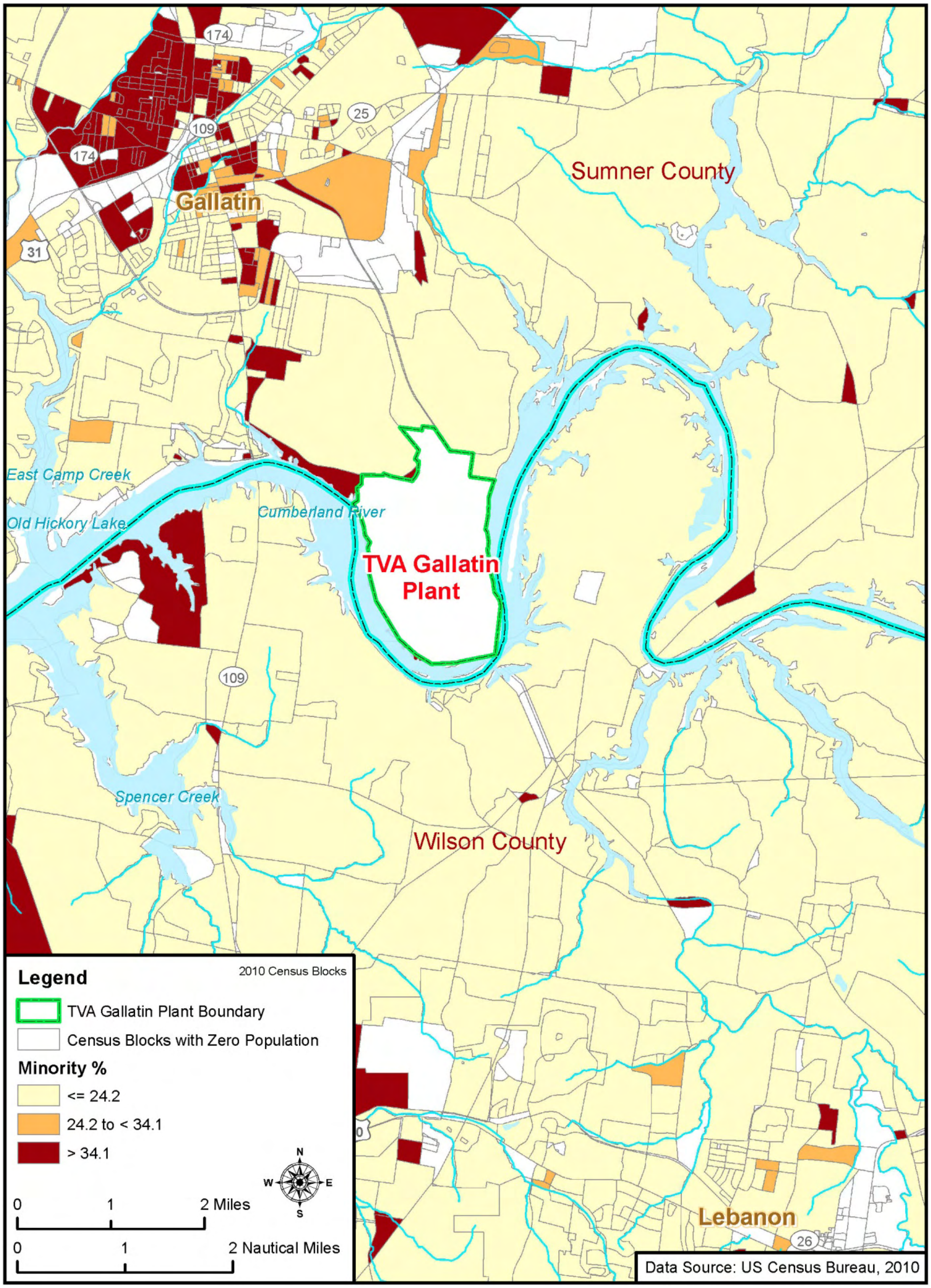


**Figure 3-8. Minority Populations in the Vicinity of GAF**

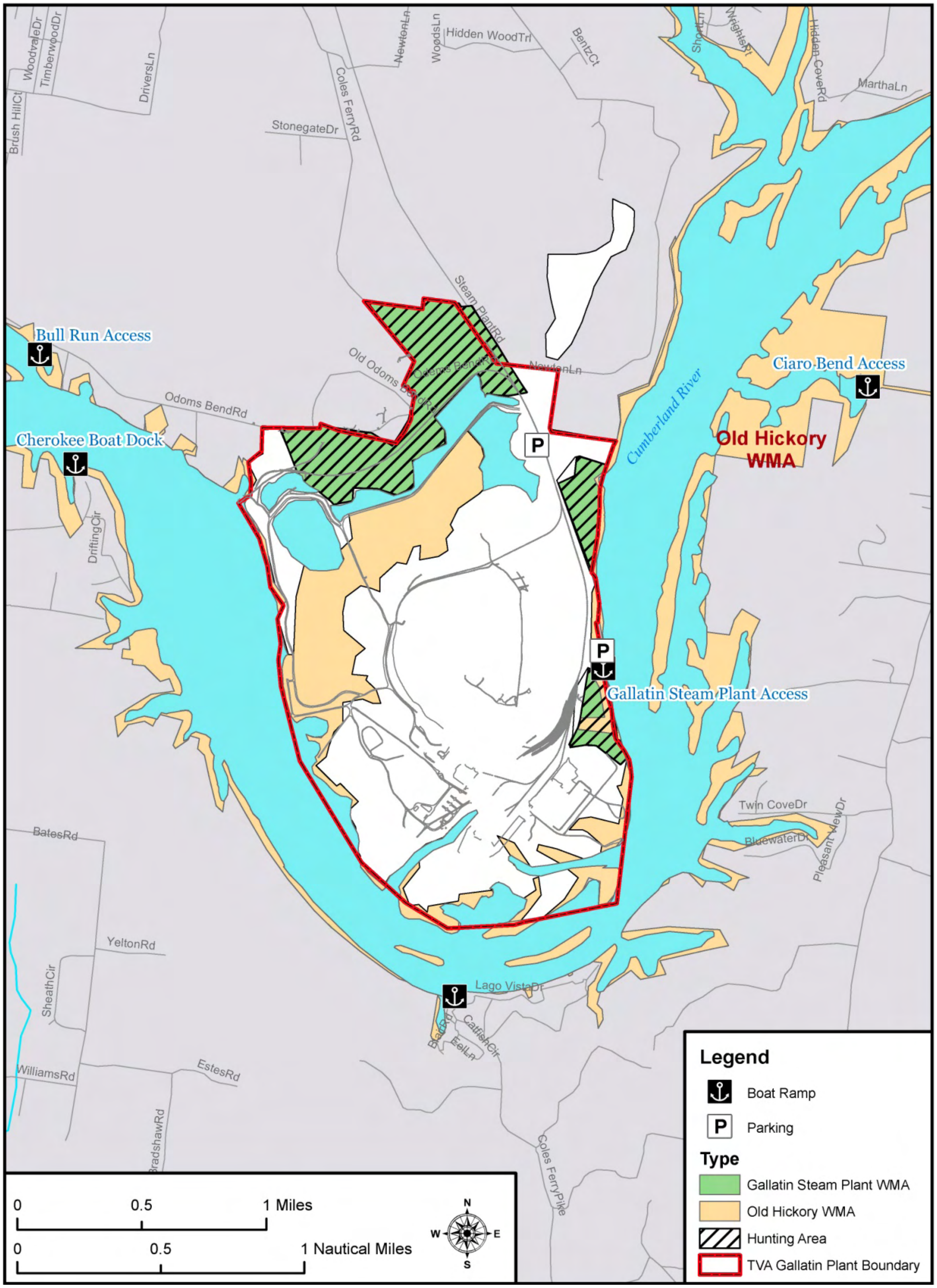


**Figure 3-9. Recreational Areas in the Vicinity of GAF**

## 3.9 Visual Resources

Visual resources are the natural and manmade features of a landscape that can be seen and contribute to the public's appreciation and enjoyment of the general environment. Visual resource impacts are generally identified by contrasts between the characteristics of the existing landscape character and the characteristics of the TVA's proposed action. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within 0.5-mile radius of the observer, details of objects are easily distinguished in the landscape. In the middleground, between 0.5 and 4 miles from the observer, objects may be distinguishable, but they tend to merge into larger patterns. Details of the distant part of the landscape are not normally discernible unless they are especially large and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used.

All of the proposed actions would occur on the GAF reservation. GAF is a relatively large coal-fired plant site with extensive ash ponds and wooded, rolling hills. The existing stacks at the facility stand at about 600 feet above ground level. Electric power infrastructures are well-established components of the landscape in the area (TVA 2010). Five 161-kV transmission lines originate in the GAF switchyard and cross the Cumberland River to the southeast. Other transmission lines run from the GAF switchyard to the northwest along the west side of the GAF reservation, and to the north parallel to Steam Plant Road. A short on-site transmission line connects the combustion turbines to the main switchyard.

The Sandy Chapel Access Area is immediately east of the project site across the Cumberland River. The park contains physical, cultural, and historic features and is within a forested and riverine environment. There are fishing accesses within the area but no state parks in the vicinity or the viewshed of the project. Few homes are close to the plant site.

## 3.10 Hazardous Materials and Waste

This section describes the affected environment associated with hazardous materials, hazardous and solid wastes, and asbestos in structures at GAF.

The terms *hazardous materials* and *hazardous waste* refer to substances defined as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Solid Waste Disposal Act of 1976, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA). In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Hazardous wastes that are regulated under RCRA are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that either exhibits one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or are listed as a hazardous waste under 40 *CFR* Part 261.

At GAF, a variety of hazardous materials are used as part of daily operations. A byproduct of the use of hazardous materials is the generation of hazardous wastes. GAF is typically classified as a small quantity generator of hazardous waste, generating between 100 and 1,000 kg of hazardous waste per month. The proper management of these materials/wastes is performed in accordance with established procedures. Information about the presence of hazardous chemicals that exceed specified thresholds is reported to the state of Tennessee and local emergency and planning agencies under procedures established by section 312 of

Emergency Planning and Community Right-to-Know Act (EPCRA). Onsite storage is reported on a "Tier II" inventory form. During calendar years (CYs) 2010-2011, GAF reported numerous chemicals, including $CO_2$, fuel oil, gasoline, lubricating oil, propylene glycol, lead (in batteries), asbestos, sodium hypochlorite, aqueous ammonia, and polychlorinated biphenyls (PCBs) (Weidner 2012).

When coal is burned to make the steam that drives electrical generators, ash is the noncombustible mineral matter left behind. Some hazardous materials (metals) that occur naturally in the coal in trace amounts, such as mercury, barium, manganese, chromium, lead, and copper, remain in the ash. Coal ash itself is not, however, regulated as or deemed to be a hazardous waste. At GAF, these metals are currently handled within the on-site ash ponds (TVA 2012c).

Releases of toxic chemicals to the environment associated with power generation are estimated and reported to USEPA under the EPCRA Toxic Release Inventory (TRI) program (section 313). 'Form R' reports are submitted annually. These thresholds relate to amounts of toxic chemicals used, manufactured, or processed during the calendar year. The regulations include lower reporting thresholds for some chemicals, such as lead and lead compounds and mercury and mercury compounds. TVA's 2011 TRI report for GAF can be found at http://www.tva.com/environment/air/gallatin.htm#tri.

Some of the potentially affected equipment and buildings at GAF may contain asbestos. Asbestos is a naturally occurring mineral that is a very effective heat and sound insulator. Consequently, it has been used in many buildings as a fire and noise retardant. However, asbestos has been linked to several diseases, including lung cancer, and has not been used in construction materials since 1987. Friable (brittle) asbestos becomes hazardous when fibers become airborne and are inhaled. Asbestos is regulated by the USEPA, as well as under OSHA. Emissions of asbestos fibers to ambient air are regulated under Section 112 of the CAA. TVA manages asbestos in-place except when it poses a health hazard or it is in the way of a construction project, in which case TVA has established procedures for removing and properly disposing of asbestos. All asbestos removal is done by certified asbestos contractors in accordance with OSHA asbestos regulations (29 *CFR* 1926.1101). All parts of NESHAPs, 40 *CFR* Part 61 Subpart M – National Emission Standard for Asbestos, are followed during any abatement activities. Procedures for mitigating the release of asbestos fiber include the use of curtains, shrouds, wet suppression, high-efficiency particulate air (HEPA) filters, and transport of asbestos in sealed containers. The transfer of asbestos for ultimate disposal is done in accordance with USDOT regulation 49 *CFR* Parts 171-173.

## 3.11 Noise

Noise is defined as any unwanted sound. Defining characteristics of noise include sound level (amplitude), frequency (pitch), and duration. Each of these characteristics plays a role in determining a noise's intrusiveness and level of impact on a noise receptor. The term "noise receptor" is used in this document to mean any person, animal, or object that hears or is affected by noise. Sound levels are described on a logarithmic decibel scale, reflecting the relative way in which the ear perceives differences in sound energy levels. A sound level that is 10 decibels (dB) higher than another would normally be perceived as twice as loud while a sound level that is 20 dB higher than another would be perceived as four times as loud. Under laboratory conditions, the healthy human ear can detect a change in sound level as small as 1 dB. Under most nonlaboratory conditions, the typical human ear can detect changes of about 3 dB.

Sound measurement may be further refined through the use of frequency “weighting.” The normal human ear can detect sounds that range in frequency from about 20 hertz (Hz) to 20,000 Hz (Federal Interagency Committee on Noise [FICON] 1992). However, all sounds throughout this range are not heard equally well. In “A-weighted” measurements, the frequencies in the 1,000 to 4,000 Hz range are emphasized because these are the frequencies heard best by the human ear. Sound level measurements weighted in this way are termed “A-weighted decibels” (dBA). Unless otherwise noted, all sound levels referenced in this EA can be assumed to be A-weighted.

Based on numerous sociological surveys and recommendations of federal interagency councils, the most common noise benchmark is the Day/Night Average Sound Level (DNL) of 65 dBA (Table 3-11). The DNL is a measure of the cumulative noise exposure in a community, with a 10 dB addition to nighttime (10:00 p.m. to 7:00 a.m.) noise levels. This annual average threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors.

**Table 3-11. Percentage of Population Highly Annoyed by Elevated Noise Levels**

| Noise Exposure (DNL in dBA) | Percent Highly Annoyed |
|---|---|
| < 65 | < 12 |
| 65-75 | 12-21 |
| 70-75 | 22-36 |
| 75-80 | 37-53 |
| 80-85 | 54-70 |
| > 85 | > 71 |

Source: Finegold et al. 1994
< = less than; > = greater than; dBA = A-weighted decibels; DNL = Day/Night Average Sound Level.

USEPA recommends that, to protect public health with an adequate margin of safety, exterior noise levels should not exceed 55 dB DNL, interior noise levels should not exceed 45 dB DNL, and sleeping areas should be less than 45 dB DNL in noise-sensitive locations (USEPA 1974). The Federal Interagency Committee on Urban Noise (FICUN) took these recommendations into consideration when developing its recommendations on compatibility of land uses with noise impacts (FICUN 1980). TVA generally uses the USEPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. Additionally, TVA considers an increase of 3 dB (FICON 1992) an indication of potential impact that would require further analysis in areas with an existing DNL of 65 dBA or less).

Typical background day/night levels for rural areas range between 35 and 50 dB whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (USEPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping. Studies indicate a tendency for humans to habituate to regularly occurring noise over time, eventually reducing susceptibility to annoyance and noise-induced sleep disturbance (Fidell et al. 1995; Pearsons et al. 1995; Kryter 1984).

The plant is bordered by the Cumberland River to the east, west, and south. The land surrounding the plant is primarily rural residential: a mixture of residences and farms. Small hills and dense woods act as a buffer between plant operations and homes. Residents are located approximately one mile from the plant and proposed landfill locations to the north, east, south, west, and northwest. The primary noises heard in these areas would be natural sounds (wind, birds, etc.) and some traffic noise from nearby roads. Other sources of periodic noise include boats on the river and gunfire from a nearby shooting range. On-site, the CRAC facility is located north of the electric generation power plant discharge channel, which enters the Cumberland River. One building is an open-air facility while the rest of the buildings are enclosed in warehouse-type construction. CRAC personnel are currently not exposed to harmful noise levels from plant operations.

An ambient noise survey, completed in 2005, at three residential locations surrounding the plant, found noise levels to be typical of a rural setting and found slightly higher noise levels at the residential area to the north, located at the intersection of Steam Plant Road and Newton Lane, where traffic on Steam Plant Road is somewhat higher and contributes to the ambient noise levels (Table 3-12).

**Table 3-12. 2005 Noise Survey Measurements Surrounding Gallatin**

| Measurement Location | Distance from Plant (miles) | Average $L_{eq}$(dBA)[1] | Maximum Peak Sound Level (dBA)[2] |
|---|---|---|---|
| North: Intersection of Steam Plant Road and Newton Lane | 1.71 | 47.4 | 89.0 |
| East: Intersection of Twin Cove Drive and Cherry Point Road | 0.73 | 38.9 | 77.5 |
| South: Cole's Ferry Boat Ramp | 0.80 | 42.9 | 77.2 |

Source: TVA 2005.
dBA = A-weighted decibel.
(1) $L_{eq}$ is the continuous equivalent sound level or the "average" noise level during the measurement period. Discreet high-level events, such as a passing truck, are smoothed to the point of eliminating the annoyance factor of the events.
(2) Maximum Peak Sound Level is the maximum sound level recorded during the measurement period and describes the intermittent noises.
Note: Noise levels were measured three times at each location with each measurement lasting five minutes.

## 3.12 Public Health and Safety

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. OSHA is the main statute protecting the health and safety of workers in the workplaces. OSHA regulations are codified in Title 29 *CFR* Part 1910 (29 *CFR* 1919), *Occupational Safety and Health Standards*. A related statute, 29 *CFR* 1926, contains health and safety regulations specific to the construction industry. The Tennessee Department of Labor and Workforce Development has adopted federal OSHA standards contained in 29 *CFR* Parts 1910 and 1926 pursuant to Tennessee Code Annotated (TCA) Section 50-3-201. Day-to-day operations and maintenance activities at GAF are performed in accordance with applicable standards as prescribed by OSHA requirements or specific TVA guidance. Additionally, construction-related activities require the establishment of appropriate job site safety plans explaining how job safety would be ensured throughout the life of the project. Procedures are in place to ensure that contractors are properly informed of known potential hazards related to the contractors' work and the process involved, including the emergency response procedures in the event of an accidental release of a regulated substance (TVA 2009a). TVA's Hazardous Communications Program requires personnel training regarding potential chemical-related exposures and hazards and also requires that a chemical inventory and a Material Safety Data Sheet (MSDS) are made available for each chemical utilized (TVA 2009a).

## 3.13 Transportation

GAF is accessible by highway, railway, and water through the use of barge transportation. The nearest interstate highways are I-65 and I-24 toward the west, and I-40 south of GAF. Local roads leading to GAF are U.S. Highway (US) 31E (Nashville Pike), Tennessee State Route (SR) 25 (Hartsville Pike), and SR 109. US 31E is located southeast of Gallatin and generally runs northeast from Nashville, SR 25 runs east to west through Gallatin, and SR 109 runs north to south and intersects with I-40 to the south. SR 109 includes a bypass that goes around the western side of Gallatin. US 31E intersects with the SR 109 Bypass, while SR 109 and SR 25 both connect to Airport Road located north of GAF and south of Gallatin.

Road access to GAF is by Steam Plant Road, which runs north to south from Gallatin. Steam Plant Road intersects Odoms Bend Road, Airport Road, and SR 25. Odoms Bend Road runs east to west and leads to SR 109, approximately 2.5 miles from the Odoms Bend and Steam Plant Road intersection. Airport Road connects to both SR 109 and SR 25 and is approximately 2.5 miles north from the Odoms Bend and Steam Plant Road intersection. Coles Ferry Road also provides access to Odoms Bend Road from Airport Road; it runs north to south for approximately 3 miles.

All roads leading to GAF are two-lane roads with the exception of US 31E and the SR 109 Bypass, which are multilane highways. Airport Road currently provides access to Sumner County Regional Airport, the intersection of SR 25 and Steam Plant Road and the entrance point to Sumner Regional Hospital. Current 2011 traffic estimates of average daily traffic volume are summarized in Table 3-13. Figure 3-10 shows the location of TDOT traffic count locations.

**Table 3-13. Daily Traffic Volume for Roads Leading to GAF**

| Road Name | Average Daily Traffic Volume |
|---|---|
| SR 109 (Wilson County location south of river) | 17,337 |
| Odoms Bend Road | 995 |
| Coles Ferry Road | 3,031 |
| Airport Road | 8,762 |
| Steam Plant Road (North of Airport Road) | 1,440 |
| Steam Plant Road (South of Airport Road) | 667 |

Source: Tennessee Department of Transportation (TDOT) 2011.
GAF = Gallatin Fossil Plant.

CSX operates the main rail lines leading into Gallatin and GAF. A north-to-south rail line runs parallel to Steam Plant Road from Gallatin into the GAF plant. GAF currently has a 3-mile loop track at the plant. The CSX line at GAF has not been operated for several years and would need repair for future use.

Waterway access to GAF is made along the Cumberland River through the use of barges. Offloads are made at a landing along the western side of the GAF site. The USACE operates a lock at Old Hickory Dam leading to the GAF site.

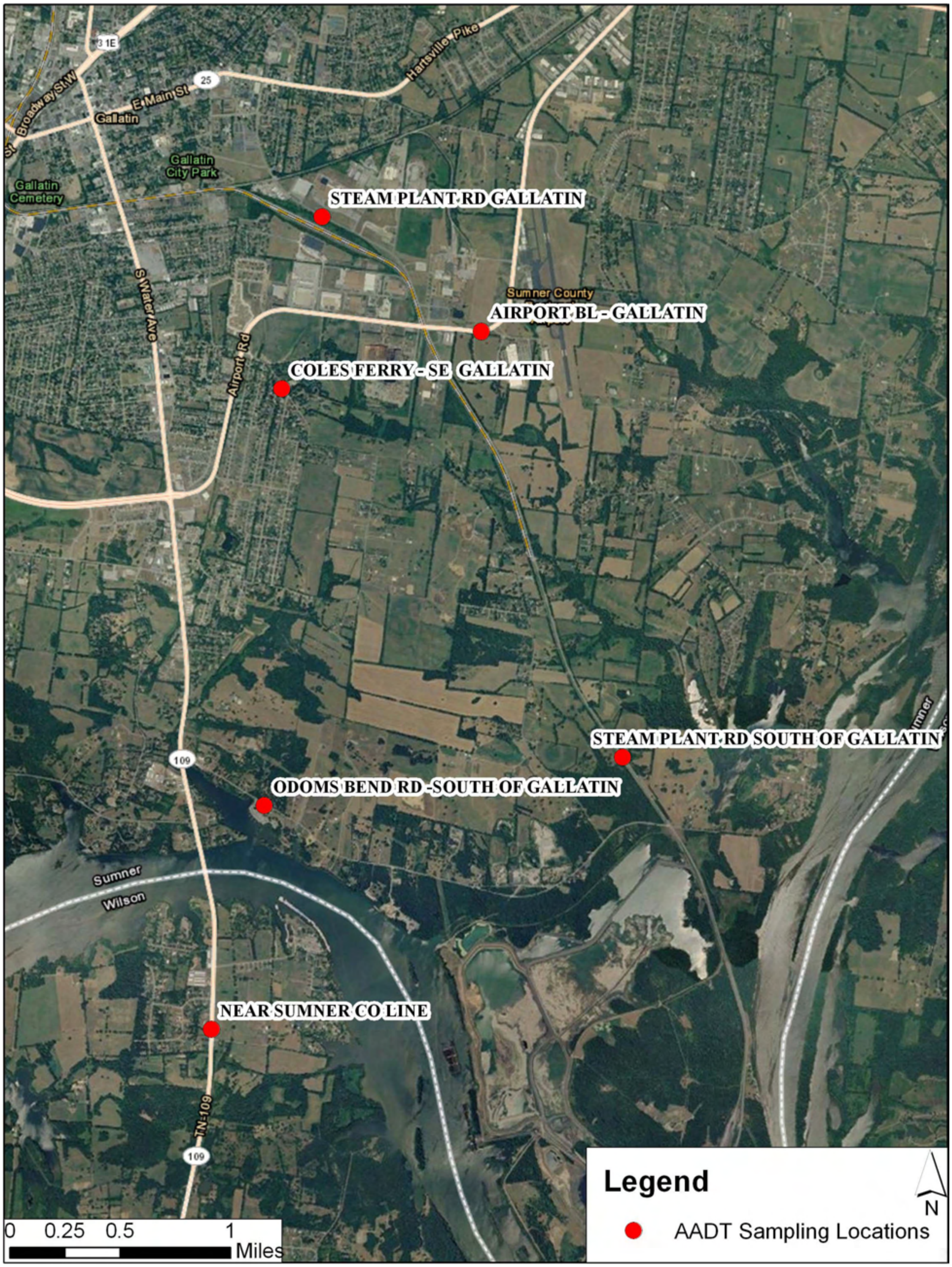


**Figure 3-10. TDOT Traffic Count Locations**

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# Chapter 4 – ENVIRONMENTAL CONSEQUENCES

## 4.1 Air Quality and Climate Change

### 4.1.1 Alternative 1, No Action

Under the No Action Alternative, TVA would continue current operations without implementing the proposed action to further reduce emissions at GAF. Because no foreseeable changes to operations or emissions would occur at GAF, air pollutant emissions would be unchanged. Consequently, air quality improvements resulting from GAF emission reductions would not occur.

Emissions at GAF vary and depend on the level of operation of the plant, which is subject to electrical demand and the relative cost to operate GAF versus other plants. Since GAF has recently been operating at a fairly high capacity, it is unlikely that the plant would operate at a much higher capacity in the future. GAF's contributions to pollutant levels in the ambient air would likely not change under the No Action Alternative.

### 4.1.2 Alternative 2, Across Discharge Channel Configuration

**Construction Impacts – Priority Pollutants**

The construction activity associated with Alternative 2 would result in transient air pollutant emissions. Land clearing, site preparation, and vehicular traffic over unpaved roads and the construction site result in the emission of fugitive dust PM during site preparation and active construction periods. The largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the construction site boundaries. The remaining fraction of the dust, such as fugitive dust from constructing 161 kV TLs, land clearing for constructing CCR landfill and storm water impoundment areas, would be subject to transport beyond the property boundary.

There would be fugitive emissions from the excavation and transport of soil associated with the construction of the landfill. There would also be fugitive emissions from the transport of equipment and supplies on paved and unpaved roads. Currently, TVA's Title V permit allows no more than five minutes per hour or twenty minutes per day of visible fugitive emissions (dust) beyond the GAF property line. Fugitive emissions from demolition and construction activities would produce particles that would primarily be deposited near the site of the activity. Ninety-five percent (by weight) of fugitive emissions from vehicular traffic over paved roads would also be deposited near the roadways (AP-42 Paved Road emission factors). The remaining fraction of the dust would be subject to transport beyond the property boundaries or roadway ROWs. A large fraction of fugitive emissions from vehicle traffic in unpaved areas would also be deposited near the unpaved areas.

Finally, there would be pollutant emissions from the exhaust of internal combustion engines powering the machinery used for removal of existing structures and construction of new equipment, concrete, and earthen structures. Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of PM, $NO_X$, CO, volatile organic compounds (VOCs), and $SO_2$ during the site preparation and construction period. The total amount of these emissions would be small and would result in minimal off-site impacts.

The project would comply with Tennessee regulations for fugitive emissions and GAF'sair operating permit conditions. Air quality impacts from demolition and construction would be temporary and dependent on both manmade factors (e.g., intensity of activity, control measures) and natural factors (e.g., wind speed, wind direction, soil moisture). However, even under unusually adverse conditions, these emissions would have, at most, a minor, transient impact on off-site air quality and be well below the applicable ambient air quality standard. Overall, the impact to air quality of the construction resulting under Alternative 2 would not be significant.

**Construction Impacts – Greenhouse Gases/Climate Change**

GHG emissions from demolition and construction would be short-term and dependent on manmade factors (e.g., intensity of activity, control measures). Assuming that construction would involve diesel engines with a total output of 3,000 horsepower, operating 40 hours per week for three years, the GHG emissions would be approximately 11,000 tons total over a three-year period. Removal of forest and other vegetation cover for construction of the various project components would reduce the $CO_2$ sink provided by the vegetation and would contribute an imperceptible amount globally to higher $CO_2$ levels in the atmosphere. The 2009 estimate of $CO_2$ emissions in the world was almost 30 billion tons. By comparison, the GHG emissions from construction-related activities for the proposed actions would not be significant and would have negligible effects on climate change.

**Operation Impacts – Priority Pollutants**

Alternative 2 would result in substantial reductions in emissions of $SO_2$, acid gases, mercury, and $NO_X$ currently emitted from GAF and contribute to the significant improvement in air quality that has been occurring since at least 1980. SCR systems would be designed and installed to reduce $NO_x$ emissions by approximately 90 percent given an inlet $NO_x$ of 0.4 lb/mmBtu. Dry FGD systems utilizing hydrated lime would be installed to reduce up to 96 percent of $SO_2$ emissions. These systems will also control acid gases and enhance mercury capture by the PJFF. If necessary to meet the MATS, ACI would be deployed to capture mercury. The combination of SCR, dry FGD, and PJFF would remove at least 86 percent of mercury emissions. Tests would be conducted to determine if ACI would be needed to attain the required mercury emission limit of 1.2 lb per trillion British thermal units (TBtu) based on heat input or 0.013 lb per gigawatt-hour (GWh) based on power output.

Fugitive emissions are expected to increase in the future due to the transport of reagents required for pollution control and the transport and disposal of CCR. Under the proposed action, the volume of CCR would increase because it would contain the dry fly ash and the reaction products of flue gas desulfurization (calcium sulfate and calcium sulfite) as well as residual lime and activated carbon. If TVA proceeds with dewatering plant bottom ash in the future, it also would be managed in the proposed dry CCR landfill. The hauling of this material to the proposed dry CCR landfill and the operation of the landfill would generate fugitive emissions that are not generated by the current wet-sluicing and disposal of CCR.

All reagents would be conveyed to storage bins pneumatically and to pollution control systems either pneumatically or mechanically. Emissions from all air exhaust points would be controlled with HEPA filters that have a penetration rate of no more than 0.004 grains per standard cubic foot (scf) of air flow. The CCR would be collected from the bag filter hoppers using vacuum pumps and conveyed to silos that have filtered vents. All vents would have filters with particulate penetrations rates no greater than 0.004 grains per scf of air flow. Before being dumped into trucks for hauling to the landfill for disposal, the CCR would be conditioned by adding raw water to achieve a moisture content of 20 percent by weight.

Fugitive emissions from the hauling of reagent and CCR would be minimized by paving the roads and using wet dust suppression. Wind erosion from the active part of the landfill would be controlled by keeping the disturbed area as small as possible and using wet suppression. Fugitive emissions must be controlled under the plant's CAA operating permit. Among other things, visible fugitive emissions cannot cross plant boundaries for more than 20 minutes per day under the permit.

The additional fugitive emissions from all the material handling operations would be less than PSD significant levels of 25 TPY for total suspended particulate (TSP), 15 TPY for $PM_{10}$ and 10 TPY for $PM_{2.5}$.

**<u>Operation Impacts – Greenhouse Gases/Climate Change</u>**

The Council on Environmental Quality (CEQ) has issued draft guidance intended to assist federal agencies in analyzing environmental effects of GHG emissions and climate change in a NEPA document (CEQ 2010). CEQ recommends that agencies assess the impacts on GHG emissions and climate change from proposed actions that would directly emit 25,000 metric tons or more of $CO_2$- equivalent ($CO_2$e) GHGs per year. CEQ also recommends that agencies consider opportunities to reduce GHG emissions caused by their proposed actions and adapt their actions to future changes in climate.

Table 4-1 compares the recent baseline emissions of GHGs from coal combustion at GAF and the anticipated GHG emissions resulting from the proposed action. The baseline emissions represent the highest annual emissions during the years 2006 through 2011. The largest component of these emissions is $CO_2$, and direct $CO_2$ emissions averaged 7.58 millions tons per year from 2006 through 2011. Future emissions are estimated based on the assumption that GAF will burn the FGD design coal, which is a 50/50 blend of sub-bituminous PRB coal and ILB coal. Sub-bituminous coal has a default $CO_2$ emission factor of 97.02 kilograms (kg) per mmBtu. ILB coal has a default emission factor of 93.4 kg/mmBtu (USEPA 2011). Because of the lower $CO_2$ emission factor of ILB coal, the proposed change from burning PRB coal to the blend of PRB and IL coal would reduce direct GHG emissions by about 6 percent. The future GHG emissions rate would be slightly greater if a higher proportion of sub-bituminous coal is burned and slight lower if a higher proportion of ILB coal is burned.

**Table 4-1. Current and Future GHG Emissions from Coal Combustion under Alternative 2**

| Emission Source | Baseline Emissions 2006-2011 (Tons/Year) | Future Emissions (Tons/Year)[2] | Difference (Tons/Year) |
|---|---|---|---|
| GAF Coal Combustion – Greenhouse Gas (GHG) $CO_2$ equivalent[1] | 8,192,972 | 7,794,161 | (398,811) |

[1] Includes carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$).

The operation of the dry scrubber would not change the direct $CO_2$ emissions because the reagent being used, hydrated lime, $Ca(OH)_2$, contains no carbon to be oxidized during the flue gas desulfurization process. Indirect $CO_2$ emissions would increase from the production of hydrated lime. $CO_2$ is emitted from the fuel used to heat the limestone and during the conversion of limestone ($CaCO_3$) to pebble lime (CaO). Indirect $CO_2$ emissions from the transport of coal would decrease.

The implementation of Alternative 2 would result in a slight decrease in GHG emissions based on the assumed future use of the PRB/ILB coal blend. As described in the 2011 IRP and EIS, TVA's overall GHG emissions are projected to substantially decrease in the future. This projection assumes that TVA will retire between 2,400 and 4,700 MW of coal-fired generating capacity. As described elsewhere in this EA, GAF is not among the coal plants being considered for retirement and the projected future decrease in overall GHG emissions would occur under Alternative 2. The small incremental change in GHG emissions resulting from the proposed action is not expected to have any noticeable effect on climate change. Future climate change is also expected to have little or no effect on the operation of the various facilities proposed under Alternative 2.

**Mitigation Measures/BMPs**

In addition to the proper operation of pollution control devices and dust suppression methods for controlling fugitive emissions as required by the GAF air operating permit, the following mitigation measures are being considered for maintaining air quality:

- Specific haul roads will be paved, as required, to ensure no visible fugitive emissions are transferred past the GAF property boundary.
- If necessary, emissions from construction areas, paved, and unpaved roads would be mitigated using wet suppression. From roadways and unpaved areas, wet suppression can reduce fugitive dust emissions by as much as 95 percent.

### 4.1.3 Alternative 3, Close Coupled Configuration

**Construction Impacts**

Pollutant emissions from construction activities related to Alternative 3 would be similar to those from Alternative 2. Since the emissions control equipment would be installed at the powerhouse, less land should need to be cleared, which would slightly reduce the amount of fugitive emissions. The landfill construction would be the same and the transport of materials and operation of internal combustion engines would be similar. Similar fugitive emission controls would be employed to minimize dust evolution.

**Operation Impacts**

The impacts to air quality from operations under Alternative 3 would be the same as those described for Alternative 2.

**Greenhouse Gases/Climate Change**

No difference in GHG emissions and/or climate change would be realized between Alternatives 2 and 3.

**Mitigation Measures/BMPs**

Mitigation measures/BMPs for Alternative 3 are the same as those described previously for Alternative 2.

### 4.1.4 Summary of Impacts

Significant adverse impacts associated with air quality and GHG emissions have not been identified under either Action Alternative. Implementation of either of the action alternatives would result in substantial emission reductions at GAF and help continue air quality improvements in the region. Under the No Action Alternative, emissions would not be reduced, and any associated air quality improvements would not result.

### 4.1.5 Cumulative Impacts

Nationally and regionally, the trend in air quality has been very positive. Pollution levels have significantly declined and are expected to continue to do so as emissions from plants, industrial processes, and vehicles continue to decrease. TVA has reduced its system-wide $SO_2$ emissions by 95 percent since 1977 and system-wide NOx emissions by 88 percent since 1995. TVA's proposed actions would contribute to this positive trend and to the positive benefits to human health and environment associated with cleaner air.

## 4.2 Water Resources

### 4.2.1 Alternative 1, No Action

**Surface Water**

Under the No Action Alternative, it is assumed that the plant would continue to operate and there would be no changes to surface water impacts. A number of different environmental regulatory programs keep potential surface water impacts to acceptable levels. This includes restrictions and limits in the plant's NPDES permit. If the plant is retired eventually, residual impacts after compliance with regulatory requirements would be reduced.

**Groundwater**

Under the No Action Alternative, there would be no additional direct effects to groundwater or geological resources. The current use of BMPs and adherence to site spill prevention control and countermeasures (SPCC) programs for the management and cleanup of oils limits the likelihood that oil or chemicals would reach groundwater. There would be no additional effects to groundwater or geological resources under the No Action Alternative.

**Floodplains**

Under the No Action Alternative, there would be no direct, indirect, or cumulative impacts to floodplains because there would be no physical changes to the current conditions found within the local floodplains.

### 4.2.2 Alternative 2, Across Discharge Channel Configuration

**Surface Water**

**Construction Impacts**

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

***Surface Runoff* -** Soil disturbances associated with construction and demolition (C&D) activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. TVA would comply with all appropriate state and federal permit requirements. C&D activities would be located on the plant property that already sees heavy industrial uses. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollution materials to the receiving waters would be minimized. A Construction Storm Water Permit would be in effect that would require development of a project-specific SWPPP. This plan would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts.

Where soil disturbance could occur, the area would be stabilized and vegetated with native or non-native, noninvasive grasses and mulched, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (Muncy 2012) or equivalent measures.

Additionally, impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing of vegetation and ground cover and the addition of impervious buildings and pavement would alter the current storm water flows. Impervious cover would increase with the implementation of these projects, thus altering and possibly increasing the concentrated storm water flow off of the project sites. This flow would need to be properly treated with either implementation of the proper BMPs or by diverting the storm water discharges to the ash pond for co-treatment or an on-site treatment facility. With proper implementation of these controls, only minor, temporary impacts to local surface waters are expected.

***Equipment Washing and Dust Control*** - Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning, and/or NPDES Permit TN0005428.

***Hydrostatic Testing* -** These discharges would be handled in accordance with NPDES Permit TN0005428 or the TDEC General NPDES Permit for Discharges of Hydrostatic Test Water (TN670000).

***Sewage*** - A permanent sewage system and leachfield would be installed at the new FGD facilities. If a sewage leachfield is not feasible at the FGD facilities, other options will be evaluated and pursued with state approval for proper disposal of sewage. Sanitary wastes generated during construction activities would be collected by means of portable toilets (i.e., portalets). These portable toilets would be located throughout construction areas and would have wastes removed as required by an approved contractor.

**Dry FGD Construction**

The drainage area associated with this site would be approximately 13 acres. As mentioned above, appropriate BMPs would be implemented in accordance with the project's SWPPP to minimize construction storm water impacts. The duct work for the flue gas/fly ash streams could span the discharge channel. In addition to a project NPDES construction storm water permit, installation of the new storm water outfall would be required to have an ARAP/USACE permit. During this phase of construction, floating turbidity screens and/or coffer dams may be necessary to minimize construction impacts to the discharge channel stream. With proper implementation and maintenance of BMPs, only minor, temporary impacts to local surface waters are expected.

**SCR Unit Construction**

The proposed installation of the SCR would take place within the current plant footprint and little to no additional new soil disturbance would be associated with this task. The areas that could potentially have soil disturbances are the clearing and grading of the project and laydown areas; creation of personnel offices and parking space; and the construction of the ammonia tank farm, containment pond, and drainage from the pond to the main plant. The drainage area associated with the ammonia tank farm site would be approximately 0.3 acre. The SCR containment pond site would be approximately 0.1 acre. As mentioned above, appropriate BMPs would be implemented in accordance with the project's SWPPP to minimize construction storm water impacts. With proper implementation and maintenance of BMPs, only minor, temporary impacts to local surface waters are expected.

**Landfill Construction**

Construction of the NRL and SRL landfill facilities would disturb about 96 and 80 acres, respectively. A leachate collection system would be utilized to collect leachate from the active landfill area. This leachate would be pumped to the ash pond, where it would be co-treated with other process waters and discharged through the ash pond discharge (Outfall 001). Storm water from the new CCR landfill site would flow to two onsite storm water ponds. These ponds would drain to the ash pond. All new process discharges from the scrubber facility would need to be characterized and an NPDES permit modification completed to include new process waste streams.

As mentioned above, appropriate BMPs would be implemented in accordance with the project's SWPPP to minimize construction storm water impacts. This NRL project area has two intermittent streams and four wetland areas that could be impacted by the proposed project, and TVA has proposed mitigation for these areas. In addition to a project NPDES construction storm water permit, applicable ARAP and USACE 404 permits would be obtained for any stream/wetland alteration, and the terms and conditions of these permits could likely require mitigation for these proposed activities.

**Transmission Line Construction**

TVA's proposed 161-kV TLs and the new FGD power supply transformer would be constructed entirely on the GAF reservation and in locations previously disturbed by plant construction and operations (Figure 2-7). A combination of entirely new ROW and existing ROW would be utilized. TVA performed an evaluation of water resources for the proposed TL laydown and placement areas. No permanent stream alterations or crossings that cannot be avoided are anticipated. Because potential impacts are minor, no cumulative impacts are anticipated

**Operational Impacts**

**Surface Water Withdrawal and Discharge**

Both withdrawal and discharge rates would be reduced under Alternative 2. Additional wastewater streams would be added to the total discharge from GAF, however net discharges should decrease. The conversion of wet fly ash handling to dry handling would eliminate 8.35 MGD of fly ash sluice wastewater from the total GAF discharge. The installation of the SCR and dry FGD would require raw water for quick lime mixing, nozzle cleaning, fogging system, wash-down activities and by-product conditioning along with minimal amounts of potable water (safety showers, eye washes and restroom facilities) to operate. Estimated water usage for the dry FGD would be approximately 4.03 to 4.18 MGD of raw water and 3 to 20 gallons per minute of potable water for safety showers, eye washes and restrooms (while in use). This withdrawal represents less than one percent (0.76) of the total volume of water in the Cumberland River moving past the plant at 1Q10 flow (552 MGD) and would not be significant. The SCR has no continuous use water streams other than potable water for eyewash and safety shower facilities and intermittent raw water needs (filling of two vaporizer tanks every 1–2 years and the use of the fogging system at the ammonia tanks). The current surface water withdrawal would also be reduced by approximately 4 MGD.

The raw water utilized in the dry FGD would mostly be absorbed by the process and discharges from this system would consist of consist of small volumes of nozzle cleaning wastes (described in more detail below). Up to 90% of this water would be consumed (evaporation and conditioning) in the process.

The net process wastewater discharge from the ash pond would be reduced by approximately 7.95 MGD due to the removal of the fly ash sluice water and the introduction of approximately 0.4 MGD of process water from the dry FGD at a maximum. This would result in a 28.5% reduction in total discharge from GAF Outfall 001. Additionally, because the LSC stream is a low intermittent flow instead of a large continuous flow the pollutant loading in Outfall 001 would potentially decrease.

The remainder of the discharges from the site would be leachate, minimal low volume wastewater flows, and storm water driven flows. The majority of the storm water flows would be managed through the implementation of BMPs and cleaning and maintenance plans. All other flows would be co-treated as process wastewater in the current pond system before discharge.

The main withdrawal usage plant wide (96 percent) is for the condenser cooling water (CCW) which carries the majority (99.9%) of the thermal loading from GAF discharges out Outfall 002. The discharge characteristics (including thermal loading) at Outfall 002 would not be changed by the current project. Thermal discharges from Outfall 001 would also not change. Raw and potable waters utilized in the SCR and DFGD processes, leachate, and storm water flows associated with this project would remain at ambient temperatures; therefore, no additional thermal impacts would be anticipated. Additionally, the discharge rate from this outfall would remain unchanged.

The U.S. Army Corps of Engineers has notified TVA that water levels behind Wolf Creek Dam, which is up-stream from Gallatin, probably would be increased during the spring of 2013 and beyond, due to continued successful remediation efforts on the dam. This will result in additional river flow past the plant and help to further mitigate the thermal loading on the river from GAF operations.

TVA would maintain wet surface impoundments on-site as required to support GAF's operations and continued wastewater streams. When surface impoundments are closed, the closure would be regulated by the NPDES permit. Dry FGD Operational Impacts

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

- Surface runoff from the proposed hydrated lime and byproduct silo areas
- Surface runoff from the dry FGD system, baghouse, and duct bridges
- Surface runoff from the new CCR disposal area
- Addition of the dry FGD scrubber system nozzle wash stream
- Outage washes associated with dry FGD process equipment

***Dry FGD Nozzle Wash Stream***

The dry FGD system would be a primarily dry system; however, injection nozzles could require manual cleaning several times daily. The nozzle washout could contain ash, hydrated lime, calcium sulfite, and calcium sulfate. This stream would be relatively low-flow. This stream would be routed from the dry FGD to the coal yard drainage ditch to Ash Pond E. The flow would then be discharged from the ash pond discharge (Outfall 001). This stream has the potential to impact ash pond pH and metals concentrations. Hydrated lime is an acid neutralizer due to its basic nature. Currently, the GAF ash pond tends to have a neutral to slightly basic pH. A carbon dioxide diffuser is installed to help maintain ash pond pH below 9.0 standard units (s.u.). Addition of the lime in nozzle washout could increase the average alkalinity and pH of the ash pond effluent. This operational discharge would be permitted under the existing NPDES permit, and action and mitigation measures would be implemented as necessary to ensure that there would be no adverse impacts on water quality in the Cumberland River.

***Runoff Streams from the Dry FGD Site***

Various storm water runoff streams would be generated following the construction of the dry FGD and baghouse. These waste streams would include a combination of storm water and process water.

All industrial storm water associated with the dry FGD equipment would be routed to a newly constructed storm water pond that flows to the CCW discharge channel located southwest of the new dry FGD facility. This stream is expected to be a precipitation-driven intermittent storm water stream. An oil/water separator (OWS) would also be constructed for the transformer yard, upstream of the pond to ensure that oil/grease discharges would be minimized. The pond would be equipped with a valve discharge so that if a byproduct or oil release takes place, it could be pumped out of the pond and thus prevent discharges to the condenser cooling water channel. The pond would be equipped with an overflow spillway to allow for quick pond evacuation to the discharge channel in the event of an above-design storm event. This storm water discharge would be permitted under the existing Multi-Sector Permit and is not expected to have any adverse impacts on water quality in the Cumberland River. The construction of the overflow spillway and outfall would require ARAP/USACE approval. Since the FGD drainage areas are adjacent to the CCW discharge, it would be necessary to ensure proper drainage to the FGD sumps is maintained. This may include the need to implement design controls, a cleaning and maintenance plan, and the installation of appropriate BMPs on-site to ensure this process waste stream is not discharged to the discharge channel.

***Outage Wash Waste Streams***

Maintenance during outages would likely require a wash down of the hydrator, mixer, and duct reactor. These wash downs could contain ash, hydrated lime, calcium sulfite, and calcium sulfate. For that reason, the material would be dry collected where possible prior to the wash down.

For the outage cleaning of the duct work that spans the CCW discharge channel, ash removal could be required. The ash removal would be performed in such a way that all vacuum truck hoses would be routed inside the duct from an access door that is not directly over the channel. Additionally, a curtain or other BMPs would be used as needed to ensure that fine ash particles do not become airborne and reach water resources.

These wash waters would be evaluated for permitting under the modified NPDES permit and would either be managed on-site or would be trucked off-site by an approved vendor for proper disposal. If treated on site, these waste streams are not expected to have any adverse effect on water quality in the Cumberland River.

**SCR Operational Impacts**

Operational impacts are primarily dependent on the engineering features and safeguards of the proposed SCR system. A number of assumptions concerning the proposed SCR system and its operation are necessary to establish the basis for the potential environmental impacts. These assumptions are summarized below:

***Design, Construction, and Operational Assumptions***

1. Given an inlet of 0.4 lbs/mmBtu, a 90 percent $NO_X$ removal rate would be achieved under normal operations throughout the life of the system, excepting potential periods near the end of the catalyst life.

2. The SCR systems would operate year-round in order to meet air quality requirements.

3. No ammonia slip limits would be applied. Slip would be allowed to increase to a point that would not violate any water quality criteria for ammonia and/or nutrients, NPDES action levels, pH limits, or toxicity reference values (TRVs). Catalyst disposal would be managed by a catalyst contractor in compliance with applicable regulations.

**Anhydrous Ammonia System**

***Design, Construction and Operational Assumptions***

1. Four 18,000-gal (nominal) storage tanks would be installed.

2. A water fogging system with both automatic and manual activation would protect both the storage tanks and the truck off-loading area by limiting the hazard from large ammonia leaks or catastrophic tank failure.

3. The drainage from the proposed ammonia unloading and storage area would be configured to contain the ammonia generated by operation of the fogging system within the SCR containment pond adjacent to the ammonia unloading and discharge facility.

4. Discharges from the SCR containment pond would be treated prior to release, if an ammonia release occurs, to the plant's unwatering sump and ultimately to the ash pond.

5. The applicable chemical accident prevention measures required under 40 *CFR* 68 would be implemented prior to filling of the anhydrous ammonia storage system or receipt of ammonia in quantities exceeding 10,000 pound-mass (lbm)[1].

6. Appropriate personal protective equipment (PPE) (respirators, self-contained breathing apparatus, and protective clothing) and training would be provided to operating personnel consistent with OSHA regulations.

These features would control the probability and extent of accidental or unintentional releases of anhydrous ammonia to the environment. These potential releases and attendant impacts could be:

- Excessive ammonia passing through the SCR reactors could result in ammonia contamination of the air heater wash causing potential effluent toxicity and/or odor. Additionally, fly ash could become contaminated with ammonia and in turn, ammonia would be released to the ash pond from the landfill leachate, air pre-heater wash, and CCR silo storm water runoff causing potential effluent toxicity.

- Accidental releases of anhydrous ammonia to the air from the storage and unloading system or truck causing a potential hazard to plant operating personnel, the public, and the environment.

- Direct accidental releases of anhydrous ammonia to surface water causing damage to aquatic life.

The parameters of concern with regard to wastewater discharge to surface waters are: 1) the concentration of ammonia that contaminates ash pond effluent (as opposed to the total annual amount discharged), and 2) its potential for toxicity to aquatic organisms.

***Effects on Wastewater and Surface Water***

Permit limits for ammonia are typically net cutoff amounts, such that the difference between the intake ammonia (as N) concentration and the effluent concentration requires notification to the state when it is greater than a certain level. To avoid higher ammonia concentrations at Outfall 001, the five potential sources of ammonia to the ash pond (byproduct leachate, air pre-heater wash water, SCR containment pond purge, byproduct storm water runoff, and CCR silo runoff via the coal yard drainage ditch) would be characterized for operational knowledge. Any

[1] Pound-mass (lbm) is a unit of mass used in the imperial, United States customary and other systems of measurement. A number of different definitions have been used—the most common today being the international avoirdupois (avdp) pound, which is legally defined as exactly 0.45359237 kilograms. The avdp system is a system of weights (or properly "mass") based on a pound of 16 ounces.

non-storm water releases from the SCR containment pond would be monitored and treated prior to discharge to the unwatering sump and ultimately the ash pond. If concentrations from these sources are deemed too high, then the streams would be released to the ash pond complex singularly, sent off-site for proper disposal, or new treatment options and BMPs will be explored within the ash pond complex.

No direct negative (toxic) impacts on water quality of surface waters are anticipated, based on historical and modeled data, and ultimately as a result of the fact that ash pond discharges would be required to meet NPDES limits (see Landfill Runoff and Leachate below for additional details). The engineered features of the SCR systems, including a containment pond for spills and emergency water fogging to minimize risk of direct releases of ammonia, are adequate to meet regulatory requirements and designed to ensure safe handling of ammonia. Therefore, direct impacts from accidental releases of ammonia to surface waters are not expected.

**CCR Landfill Operational Waste Streams**

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

- The addition of the landfill leachate stream and storm water runoff
- Surface runoff from the proposed landfill drainage area

Byproduct samples from a FGD process were obtained from a system that was deemed comparable to the proposed FGD technologies byproducts. Raw dry FGD byproduct, byproduct mixed with 52/48 (PRB/ILB) blend, and dry FGD mixed with 100 percent PRB ash were evaluated for Toxicity Characteristic Leaching Procedure (TCLP), metals, synthetic groundwater leaching procedure (SGLP) water extraction, sieve analysis, and other physical properties. This information was utilized to predict wastewater impacts from the landfill operation.

The Hydrologic Evaluation of Landfill Performance (HELP) Model Version 3.07 was utilized to evaluate the proposed leachate collection system disposal facility. Based on this HELP model, the estimated average daily leachate flow from the proposed landfill would be approximately 26,000 GPD (0.026 MGD) with a maximum peak flow of 0.30 MGD (URS 2012). The storm water runoff is expected to have peak flows of 123 cfs for Pond 1 and 80 cfs for Pond 2 and an estimated daily flow of 0.34 MGD from both ponds. Since storm water flows from the site are currently entering the ash pond complex, the flow volumes would potentially be equivalent; however, the leachate and landfill contact runoff streams could have the potential to be a higher concentration, low-flow stream that is very alkaline in nature with higher metals and ammonia levels. The assumptions utilized to produce this model are listed below:

***<u>Landfill Design Material Textures:</u>***

- The 200-mil geocomposite drainage layer used in both the liner system and the cap system of the landfill was modeled as HELP default texture 20 (Lateral Drainage Layer) with a default permeability of 10.00 cm/sec.
- The 40-mil Linear Low Density Polyethylene (LLDPE) geomembrane used as part of the landfill cap system was modeled as HELP default texture 36 (Flexible membrane liner) with a default permeability of $3.9 \times 10^{-13}$ cm/sec.
- The intermediate cover soils used in the initial and intermediate conditions (Scenarios 1 and 2) and the protective and vegetative cover layer of the final closure

cap system during closed conditions (Scenario 3) was modeled as HELP default texture 9 (USCS Classification ML) with a default permeability of 1.9 x $10^{-4}$ cm/sec.

- The waste layer was modeled as HELP default texture 30 (Fly Ash) with a default permeability of 5.5 x $10^{-5}$ cm/sec. It is anticipated that fly ash will be the primary material placed in the landfill.
- The 60-mil High Density Polyethylene (HDPE) geomembrane used as part of the landfill liner system was modeled as HELP default texture 35 (Flexible membrane liner) with a default permeability of 1.9 x $10^{-13}$ cm/sec, in accordance with project requirements.
- The geosynthetic clay liner (GCL) used as part of the landfill liner system was modeled as HELP default texture 17 (Bentonite) with a default permeability of 1 x $10^{-9}$ cm/sec.
- The 5-foot geological buffer layer used as part of the landfill liner system was modeled as HELP default texture 16 (Barrier soil) with a modified permeability of 1 x $10^{-6}$ cm/sec.

***General Assumptions***

- The initial water contents of all layers were manually set equal to the default HELP specified field capacity of the material, which represents the water content of the material after a prolonged period of gravity drainage. However, for the purpose of calculating hydraulic flow through the landfill system, the HELP Model automatically assumes that all barrier layers (the compacted soil liner and final cover barrier layer) are saturated.
- The HELP Model was utilized to synthetically generate temperature, precipitation, evapotranspiration, and solar radiation data based on the location of Nashville, Tennessee.

The HELP Model results are independent of the landfill area. A one acre area was considered for the analysis. Therefore, leachate generation results are presented as cubic feet per acre per time period (annual or daily). Results were converted to gallons per acre per time period. Results of this model are represented in Table 4-2. These results were utilized to complete a mass balance and determine impacts of the LSC waste stream.

**Table 4-2. HELP Modeling Results**

| Stage of Facility Development | Area in Initial Condition (acres) | Area in Intermediate Condition (acres) | Average Annual Leachate Generation Rate (gal/year) | Average Daily Leachate Generation Rate (gal/year) | Peak Daily Leachate Generation Rage (gal/day) |
|---|---|---|---|---|---|
| Cell | 10 | 10.8 | 6,171,628 | 16,909 | 214,470 |
| Cell 2 | 10 | 29.6 | 8,513,721 | 23,325 | 246,532 |
| Cell 3 | 10 | 40 | 9,809,347 | 26,875 | 264,268 |
| Before Closure | 0 | 50 | 6,228,970 | 17,066 | 85,272 |

**Landfill Leachate and Runoff**

The landfill leachate and storm water runoff would be an intermittent, precipitation-driven stream. Metals and ammonia in the dry fly ash have the potential to enter the wastewater stream during a rainfall event as runoff and leachate from the dry byproduct landfill area. This runoff and leachate would be directed to the ash pond and ultimately discharged from the site at DSN 001. In the event of wet pond closure, on-site water treatment or off site disposal would be implemented. Minimal data is available on the projected concentration of ammonia in fly ash. Much of this data would be dependent on SCR process and plant specifics. To limit ammonia loads from the dry fly ash stack, it would be important to restrict the amount of dry fly ash exposed to 10 acres or less. The greater the surface area of exposed dry fly ash, the more ammonia there is available to run off or leach during a rain event. The byproduct disposal landfill was evaluated for potential impacts associated with both ammonia and metals in-stream loading.

***<u>Ammonia Model</u>***

An ammonia model was used to evaluate the maximum ammonia releases from the landfill leachate and runoff. The model was based on extremely conservative assumptions regarding the amount of ammonia entering the river, the volume of ammoniated water released, and the flow of the river at the time of release.

If the plant changes from PRB coal to a blend of PRB and ILB coals, there would be no anticipated change in flue gas ammonia slip over PRB. Due to the increased presence of acid species in ILB coal ash and flue gas relative to PRB coal ash and flue gas, it is likely that the ammonia slip would react with gaseous acids or acids in the fly ash causing an increase of ammonia on the ash, likely forming ammonium fluoride, ammonium chloride, and/or ammonia-sulfur salts (ammonium bisulfate likely predominating) among other species. This acid-base neutralization reaction would likely keep the ammonia more stable in solid salt form or combined with fly ash and less susceptible to off-gassing as it would be in a more alkaline environment. If dissociated in water, the soluble ammonium would likely pair with soluble acids from the now more acidic fly ash and result in a more neutral pH, to the extent that such a small amount of gaseous ammonia slip can influence the pH of a much larger volume of water.

***<u>Ammonia Criteria</u>***

The discharges to the receiving streams must meet water quality criteria, NPDES action levels, and/or TRVs for ammonia to be in compliance. The USEPA action level for ammonia in fresh water is the criterion continuous concentration (CCC). The CCC is the 30-day average concentration of total ammonia nitrogen ($NH_3$-N/L), which is not to be exceeded more than once every three years on average. The CCC is pH and temperature dependent: as pH and/or temperature increase, the ammonia CCC decreases to remain protective of aquatic organisms (TVA 2008).

***<u>Nutrient Criteria</u>***

Because addition and conversion of ammonia increases the nutrient enrichment potential of pond discharges (total nitrogen, $NO_2$ + $NO_3$-N, and organic nitrogen), nutrient water quality criteria for the receiving water bodies are important considerations. State water quality standards contain criteria to protect surface waters from the adverse effects of nutrient enrichment. These criteria have historically been in the narrative form (prohibit the formation of objectionable accumulations of floating materials), but more recently, a major emphasis by USEPA and the states is to develop numeric, “not to exceed,” concentration standards for the nutrients nitrogen and phosphorous or of biological (i.e., algal biomass) or other (i.e., water transparency) values that protect against use impairment. USEPA is encouraging states to promulgate numeric nutrient criteria that would be protective of downstream, even far-field, uses such as in the Gulf of Mexico hypoxic zone. Should any receiving stream segment become listed as “impaired” on a state’s 303(d) list due to exceedance of either existing or future ammonia and/or nutrient criteria, TVA would reduce the amount of ammonia and/or nutrient discharged as required to comply with water quality standards and NPDES permit limits (TVA 2008).

For the estimated maximum byproduct analysis, it was assumed that a rainfall event generated runoff from the landfill area and the leachate collection system (LCS) would be routed to the ash pond. Dry FGD byproduct mixed with 52/48 PRB/ILB fly ash blend was the test basis. Storm water would be routed to two storm water ponds and then gravity-fed to the ash pond. It was assumed that the exposed surface area of the stack had just reached maximum working capacity (10 acres) before having interim cover applied, and all of the ammonia stored in the top 1 centimeter of the exposed area would be released as runoff through the storm water pond then the ash pond.

The leachate infiltration assumptions included:

- Twenty percent moisture content on the byproduct.
- Particle density was assumed at 2.25 kg/L.
- One hundred percent of the ammonia would be released from the byproduct.
- One pour volume of water dissolves all of the $NH_3$ in one unit volume of byproduct.
- The runoff from the entire 54-acre site, which includes the 10-acre exposed area, as well as all of the infiltration collected by the LCS would flow to the ash pond.

Since the average concentration of ammonia in the fly ash is unknown for this process at this time, a concentration limit was back-calculated based on the ammonia action limit and USEPA ammonia criteria at the ash pond discharge and the Cumberland River mixing zone. The initial concentration of ammonia in the Cumberland River was taken from intake background samples. The highest concentration of all the samples (0.29 mg/L $NH_3$-N) was selected as the maximum concentration based on available data, which results in an estimated concentration in the ash pond discharge of 0.91 mg/L. However, for pH greater than 8.2 at 32 degrees Celsius (°C), a concentration of 0.91 mg $NH_3$-N/L would exceed the CCC. If necessary, the ammonia-on-ash concentration would be restricted to ensure that the CCC would not be exceeded for higher pHs.

The average theoretical residence time for GAF’s Ash Pond is approximately 10.3 days. Therefore, based on the findings of the winter ammonia study at Paradise Fossil Plant (TVA 2006), biochemical uptake rates of 50 percent during spring and summer and 20 percent during fall and winter are assumed for all GAF ash pond sections. It was also assumed that because of the size of the ponds, the discharge leachate/runoff would mix with 75 percent of each pond section before discharge.

Under these conditions, the ammonia-on-ash concentration must not exceed 118 mg $NH_3$-N/kg, to ensure that the CCC would not be exceeded for the NPDES permit limits for pH at Outfall DSN 001 (6.0–9.0). At this ammonia ash concentration, the estimated discharge concentration should be approximately 0.159 mg/L of $NH_3$-N. Table 4-3. indicates higher ammonia-on-ash concentrations that could be achievable if either a larger $CO_2$ system were available or sulfuric acid were used to lower the ash pond pH. Sulfuric acid has been approved for the site and can be used as mitigation if the pH of the pond approaches 9.0 s.u. The mixed concentration of the Cumberland River and the DSN 001 discharge at the 118 mg $NH_3$-N/kg ash concentration is estimated to be approximately 0.286 mg/L of $NH_3$-N, which could possibly be above the CCC limit at pH levels higher than 8.62. This is more because of the higher initial Cumberland River $NH_3$-N concentrations than the ash pond discharge concentrations. However, the pH background samples at the intake have indicated that the pH levels of the Cumberland River tend to peak at approximately 8.5 s.u. This would indicate that the CCC limit would not be exceeded at this ammonia ash concentration.

**Table 4-3. Ammonia-on-Ash Concentrations for CCC Concentrations at pHs Greater Than 8.19**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **pH (s.u.)** | 8.25 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 | 9 |
| **CCC (mg/L)** | 0.538 | 0.494 | 0.418 | 0.353 | 0.298 | 0.252 | 0.214 | 0.183 | 0.159 |
| **NH3-N on Ash (mg/kg)** | 400 | 367 | 311 | 262 | 221 | 187 | 159 | 136 | 118 |
| **pH (s.u.)** | 8.25 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 | 9 |
| **CCC (mg/L)** | 0.538 | 0.494 | 0.418 | 0.353 | 0.298 | 0.252 | 0.214 | 0.183 | 0.159 |
| **$NH_3$-N on Ash (mg/kg)** | 400 | 367 | 311 | 262 | 221 | 187 | 159 | 136 | 118 |

CCC = criterion continuous concentration; mg/kg = milligrams per kilogram; mg/L = milligrams per liter.

The ammonia concentration expected to be released from the GAF ash pond from the proposed SCR system was evaluated using the CORMIX model, a model developed by Cornell University. Two winter and two summer scenarios were evaluated. Each scenario was assumed to have the same ammonia concentration in the pond release, but two different river flow rates were looked at for each release scenario. The target pH in the ash pond is 8.5. At this pH, the allowable $NH_3$-N concentration is 0.262 mg/kg. This was the concentration used for the ash pond release in the model for all flow and temperature scenarios. In all cases, the ammonia concentration was below the limit within a very short distance of the discharge and quickly reached levels of less than half of the allowable concentration.

Further characterization of ammonia-on-ash would be performed after start up and operation of the FGD and SCR systems utilizing actual coal blends burned and SCR ammonia slips. An actual NPDES action target would be calculated to ensure that the CCC would not be exceeded at Outfall DSN 001. Mitigation measures would be implemented as needed.

***Metals Loading***

The volume of discharges from Outfall 001 would be reduced due to the conversion from wet to dry fly ash handling and the associated elimination of flows of fly ash sluice water to the ash pond. This reduced volume of fly ash sluice water would also reduce the metal loading (lb./day) entering the ash pond from wet handling of CCR. The use of the dry scrubber eliminates the water discharges from scrubber waste handling typical of wet scrubber systems. Other flows resulting from the implementation of the proposed action include process, potable, and storm water flows from the dry scrubber; potable and storm water flows from the SCR; and storm water and leachate flows from the landfill. The addition of a dry scrubber and conversion from wet to dry fly ash handling would greatly reduce overall wastewater discharges and pollutant loadings from the GAF Plant.

To estimate the concentration of metals in the ash pond discharge after receiving discharges from the proposed by-product landfill, the maximum SGLP data were used from the acquired dry FGD by-product mixed with a 52/48 PRB/ILB ash blend to produce the estimated results in Table 4-4. The SGLP data was used instead of TCLP data because the SGLP data was deemed more appropriate due to the alkaline nature of the by-product. Additionally, this method allows for analysis of more parameters than the TCLP method. The concentrations of metals in storm water were conservatively assumed to be the same as the leachate.

In analyzing the anticipated discharges of pollutants, TVA conservatively assumed that the ash pond concentrations of metals would not change as a result of elimination of fly ash transport water. The HELP Model was utilized to evaluate the proposed landfill's leachate collection system (LCS) . The landfill's proposed LCS consists of a geocomposite drainage layer with 6-inch perforated leachate underdrain connected to 6-inch collection piping to direct leachate to the perimeter of the landfill. The maximum drainage length of any individual leachate underdrain is approximately 200 feet. The liner system is designed to maintain a minimum 1 percent slope to the leachate collection system piping post-settlement (URS 2012).

While the added loadings from the leachate collection system could increase the metals concentrations at the ash pond discharge, total concentrations are not expected to exceed the most stringent TDEC Water Quality Criteria in the Cumberland River as a result of the added loading, conservatively assuming maximum leachate discharges from the site, except for thallium (discussed below).

**Table 4-4. Cumulative Impact of Byproduct Storage Leachate Total Mixed Concentration Estimates**

| Element | MDL (mg/L) | Background River Conc. mg/L | River Loading lbs/day | Ash Pond Conc. mg/L | Ash Pond Loading lbs/day | Landfill Leachate Conc. Estimates mg/L | Landfill Leachate Loading Estimates lbs/day | Projected Loading at DSN 001 lbs/day | Projected Conc. at DSN 001 mg/L | Instream Conc. Including GAF loading in Cumberland River 30Q5 mg/L | Instream Conc. Including GAF loading in Cumberland River 1Q10 mg/L | Instream Most Stringent Water Quality Criteria Conc., mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 0.001 | <0.001 | 2.305 | <0.0010 | 0.08 | <0.0010 | 0.001 | 0.082 | 0.00050 | 0.00050 | 0.00050 | 0.0056 |
| Arsenic | 0.001 | 0.0011 | 5.070 | 0.011 | 1.79 | 0.0021 | 0.005 | 1.796 | 0.01090 | 0.00117 | 0.00143 | 0.01 |
| Barium | 0.001 | 0.029 | 133.667 | 0.45 | 73.27 | 2.400 | 5.210 | 78.482 | 0.47623 | 0.03224 | 0.04426 | 2.0 |
| Beryllium | 0.001 | <0.001 | 2.305 | <0.001 | 0.08 | <0.001 | 0.001 | 0.082 | 0.00050 | 0.00050 | 0.00050 | 0.004 |
| Cadmium | 0.0005 | <0.0005 | 1.152 | <0.0005 | 0.04 | <0.0005 | 0.001 | 0.041 | 0.00025 | 0.00025 | 0.00025 | 0.002 |
| Chromium | 0.001 | <0.001 | 2.305 | 0.01 | 1.63 | 0.15 | 0.326 | 1.954 | 0.01186 | 0.00058 | 0.00089 | 0.1 |
| Copper | 0.001 | 0.0056 | 25.812 | 0.0022 | 0.36 | <0.002 | 0.002 | 0.360 | 0.00219 | 0.00558 | 0.00548 | 0.013 |
| Lead | 0.001 | <0.001 | 2.305 | 0.0067 | 1.09 | <0.001 | 0.001 | 1.092 | 0.00663 | 0.00054 | 0.00071 | 0.005 |
| Mercury | 0.0002 | 0.00000125 | 0.00576 | 0.00000545 | 0.000887 | <0.0002 | 0.00022 | 0.0011 | 0.0000067 | 0.00000129 | 0.00000144 | 0.00005 |
| Nickel | 0.001 | 0.0022 | 10.140 | 0.0028 | 0.46 | 0.0086 | 0.019 | 0.475 | 0.00288 | 0.00220 | 0.00222 | 0.1 |
| Selenium | 0.001 | <0.001 | 2.305 | 0.029 | 4.72 | 0.02 | 0.043 | 4.765 | 0.02892 | 0.00071 | 0.00147 | 0.02 |
| Silver | 0.0005 | <0.0005 | 1.152 | <0.0005 | 0.04 | <0.001 | 0.001 | 0.042 | 0.00025 | 0.00248 | 0.00025 | 0.0032 |
| Thallium | 0.001 | <0.001 | 2.305 | <0.001 | 0.08 | <0.001 | 0.001 | 0.082 | 0.00050 | 0.00050 | 0.00050 | 0.00024 |
| Zinc | 0.001 | <0.01 | 23.046 | 0.026 | 4.23 | <0.010 | 0.001 | 4.235 | 0.02570 | 0.00515 | 0.00571 | 0.13 |

Abbreviations: lb/day = pounds per day; mg/L = milligrams per liter.
Estimated by-product leachate flow = 0.30 million gallons per day (MGD).
Total flow from DSN 001 = 19.5 MGD.
950 MGD = Cumberland River Flow long term average from 2009 NPDES renewal application.
30Q5 Cumberland River Flow = 2,670 MGD; data from 2012 NPDES permit - Human Health Flow.
1Q10 Cumberland River Flow = 552 MGD; data from 2012 NPDES permit - Fish and Aquatic Life.
Most stringent water quality criteria based on effluent concentrations (2012 NPDES permit, page A-13) and TDEC Criteria, Rule 1200-4-3-.03.
River concentrations are a combination of intake NPDES sampling data and on-site characterization samples taken in 2012. Maximum values were used when representative of the stream.
Background Intake data for Copper represents an average of data from NPDES and plant characterization sources.
Ash pond concentrations are maximum pond data points from NPDES sampling data taken in 2012. Using maximum data points is the most conservative approach.
If maximum sample results show less than detect (all samples that have "less than sign"), 1/2 of the detection level was used in the loading and concentration calculations for that constituent sample where non-detection occurred. Using 1/2 detection is a conservative approach for Thallium in particular since thallium results have never been detectable in the ash pond discharge. In such situations, 1/4 of the detection level has been used in prior studies.

A mass balance analysis was performed using metal concentrations from

- background river samples,
- ash pond discharge samples,
- maximum modeled leachate collection system discharges, and
- modeled storm water discharge from the proposed landfill.

The results of the mass balance analysis are shown in Table 4-4. Numbers in columns highlighted in blue represent metal concentrations (mg/l). The numbers in the column highlighted in orange represents the lowest applicable Water Quality Criteria (mg/l). Concentrations highlighted in yellow exceed the most stringent instream Water Quality Criteria (mg/l). All metal concentrations added at DSN 001 would create instream concentrations at or below the TDEC lowest criteria; except for thallium. By this analysis, thallium calculated concentrations are shown to exceed the lowest instream water quality criteria.

Cumberland River background sample concentrations for both copper and thallium were described in the Draft EA as being above the lowest water quality criteria. However, upon further review of NPDES data and on-site characterization samples of intake data, the copper concentration data point of 0.0755 mg/L was found to be more than a degree of magnitude higher than the other analytical results evaluated and was determined to be an outlier. Instead of disregarding this data point, an average of all data was taken. The average copper concentration of 0.0056 was utilized to represent the river concentration in the revised Table 4-4. The amended mass balance currently shows copper discharges are below instream Water Quality Criteria. Furthermore, the current fly ash sluice concentration of copper is approximately 0.78 mg/L, while the ash pond discharge concentration is 0.0022 mg/l. This indicates that treatment for copper is occurring in the pond, since the discharge concentration is lower. The modeled LSC and storm water waste streams showed very low concentrations of copper and predicted a copper loading of approximately 0.003 pounds per day. This extremely low loading would not be significant in the ash pond discharge loading. Therefore, the copper concentrations do not show any appreciable increase in instream concentrations as a result of the added ash pond and leachate pollutant loading. The previously predicted exceedance of lowest copper instream Water Quality criteria was based on the copper concentrations in the Cumberland River upstream of GAF. Therefore the proposed project will not affect existing copper concentrations in the river.

Thallium appears to exceed the lowest instream Water Quality Criteria because the detection level for NPDES approved thallium sampling methods is higher than the criterion. Both the SGLP and ash pond concentrations of thallium were below detection levels. It is common practice when assuming concentrations of samples that are below detection levels to multiply the detection level by half to get an assumed concentration. However, under these circumstances even half of the detection level is still above the Water Quality Criteria. Therefore using this method of analysis is inconclusive. Until detection limit improvements are made to the sampling method, TVA will not be able to conclusively show no impact from thallium. This is a wider issue for the industry and the regulations. To date, thallium has not been detected in any ash pond discharges from GAF.

In the current NPDES permit, TDEC states that based on the reasonable potential analysis (RPA), TDEC has determined that discharges from the ash pond do not cause or contribute to aquatic toxicity. Using actual background concentrations of metals from the GAF plant intake water, a revised RPA has been developed and shows that actual effluent concentrations are substantially lower than the projected concentration which would cause aquatic toxicity.

The conversion to dry fly ash will reduce the metal loading to the ash pond.  This reduction was not included in the conservative mass balance analysis shown in Table 4-4. Even with this conservative analysis the calculated instream concentrations would not exceed the most stringent Water Quality Criteria due to proposed operational activities at GAF.

***Groundwater***

As part of the overall assessment for the on-site CCR landfill, a Phase I hydrogeologic investigation was conducted and found no hydrogeologic fatal flaws at either of the proposed landfill sites.  However, the results indicate that the NRL site is more suitable than the SRL site due to the karst features and greater exposed Carters Limestone in the SRL (URS 2012a).  A Phase II Evaluation was then performed for the NRL site.  The results of these investigations are summarized in Section 3.5.  They indicate there are no geotechnical or hydrogeologic fatal flaws that would preclude the development of a CCR disposal area at the NRL site and that no karst activity is within the proposed NRL landfill limit.

TDEC Rule 0400-11-7-01 covers solid waste processing and disposal and has requirements that reduce groundwater impacts.  These areas include runon and runoff collection and erosion control, leachate migration control standards, and a groundwater monitoring program.  In accordance with these TDEC rules, the proposed landfill design will incorporate a composite liner system satisfying Federal Subtitle D RCRA regulations.  The liner system will utilize a synthetic liner in combination with a compacted clay liner.  The proposed design for the on-site CCR landfill would include other control measures that would reduce or eliminate leachate release to groundwater, including a seepage collection system, karst remediation if necessary, a geosynthetic cap system, a storm water management system, and a leachate management system.  With these measures, the proposed CCR landfill would classified as a Class II Industrial Landfill.

TVA acknowledges that EPA is currently considering the regulation of CCR as a special waste under RCRA Subtitle C regulations.  However, the evaluation for the EA was conducted using the best information currently available.  This information indicates forth coming rules will require disposal of CCR to be in accordance with RCRA Subtitle D standards.  The disposal area would therefore be a Class II Industrial Landfill, which would be constructed and operated in accordance with current rules and regulations governing solid waste disposal in the State of Tennessee.  If EPA elects to regulate CCR as a special waste under RCRA Subtitle C, the landfill design criteria are expected to be very similar to those currently required for Industrial Landfills in Tennessee and Dubtitle D.  Subtitle C regulations would differ in that they would establish controls on the management of the CCR from the point of generation through disposal (cradle to grave).  In addition to regulations for CCR disposal facilities, this would include generator and transporter requirements.  As necessary, TVA would upgrade the proposed landfill design, permitting, and maintenance to meet the finally adopted regulatory standards.

Because the proposed landfill design incorporates a composite liner system, the facility is expected to adequately contain CCR waste.  The composite liner design standards are based on USEPA Subpart D design criteria (40 *CFR* 258.40).  Site development and SWPPP includes BMPs that would help ensure that water sources would not be impacted from all the above construction activities.

TVA may have to expand CCR waste management to the SRL site when the NRL site is approaching capacity. If this occurs, additional geotechnical testing would be performed prior to design and solid waste permit application activities and this environmental review would be supplemented if necessary.

The total project area is located within karst terrain; however, no state designated Source Water Protection Areas were identified along the identified transmission line ROW. BMPs, as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (Muncy 2012), would be used to avoid contamination of groundwater in the project area. BMPs would be used to control sediment infiltration from storm water runoff during all construction phases of the project. With the use of BMPs, and adherence to TDEC Rule 0400-11-7, impacts to groundwater from the proposed action would be insignificant.

**Floodplains**

All equipment and new construction would be located outside of the 100-year floodplain except for the suppor pilings for a bridge that would cross the discharge channel to carry dry scrubber and mercury emission control equipment. Although the TL would cross the 100-year floodplain, the support structures would be located outside of the 100-year floodplain, and the line would be well above the 100-year flood elevation. Consistent with EO 11988, a bridge is considered to be a repetitive action in the 100-year floodplain. To minimize adverse impacts, all of the equipment on the bridge would be located above the 100-year flood elevation. Therefore, the project would be consistent with EO 11988.

**Mitigation Measures/BMPs**

***Dry FGD*** - Alternative 2 would require modification of the Multi-Sector Permit to include the new storm water outfall, modification to the NPDES permit for storm water/process discharges from lime and byproduct areas to the ash pond, an NPDES General Construction Permit, permits for spanning the discharge channel and bridge construction, ARAP and USACE permits and potentially a hydrostatic general permit for pipe system integrity testing. Additionally, operations and maintenance (O&M) and BMPs would need to be incorporated to ensure that minimal discharges from O&M activities are released to storm water discharges—either to the storm water pond or to the FGD sumps. All waste streams from this process would need to be fully characterized to ensure all permit limits would be met. Visual monitoring of the storm water pond would be implemented to avoid accidental discharges.

TVA would conduct an operational characterization of the leachate and runoff streams to confirm no significant impacts to the Cumberland River. The waters would be analyzed for metals and other parameters as required by the NPDES permit modification within two years of changed operations. If determined to be necessary, appropriate mitigating measures would be evaluated and implemented to ensure that the discharge NPDES permit requirements are met.

CRAC Facility Relocation - Alternative 2 would require the relocation of the CRAC facility due to land use conflicts. Applicable ARAP, USACE, and NPDES Construction Storm Water permits would be required for the proposed reconstruction of the facility on GAF property. In addition, a Subsurface Disposal System Construction permit will be obtained from TDEC for sanitary wastes from the facility. TVA anticipates that TWRA, as the facility operator, would apply for a NPDES discharge permit, if necessary, to operate the relocated facility.

***SCR*** - An NPDES permit modification for storm water from the containment pond and ash silos going to the ash pond would be required. Applicable permits would be required for construction. No ammonia slip limit would be implemented on the system; however, the ash pond discharge would need to meet all USEPA and TDEC ammonia, nutrient, and toxicity criteria. An ammonia-on-ash threshold would be implemented to ensure discharges do not exceed discharge limits. Additionally, the waste streams associated with byproducts from this system would need to be characterized and monitored. $CO_2$ or sulfuric acid will be used, as required, to reduce the pH of the pond is it approaches 9.0 s.u.

***Landfill*** - Applicable ARAP and USACE 404 permits would be obtained for any stream alteration and the terms and conditions of these permits would be followed. Modification to the existing NPDES permit, to include leachate and storm water into the ash pond, would be required. An NPDES general/individual construction permit would be required. SCR ammonia, nutrient, and toxicity measures would apply to discharges from this site. Additionally, waste streams associated with byproducts would be characterized and monitored. At any given time, the maximum active area of CCR at the stacking area would be 10 acres of material or less. As stacking areas become inactive, the areas would be stabilized using an interim cover such as grass or bottom ash.

***Transmission Line*** - Applicable ARAP, USACE 404, and NPDES construction permits would be obtained, as required. ROW maintenance would employ manual and low-impact methods wherever possible, and TVA's General Pesticide application permit would be complied with during operations.

### 4.2.3 Alternative 3, Close Coupled Configuration

**Surface Water**

Construction impacts under Alternative 3 would be somewhat less than those under Alternative 2 because of the smaller amount of land disturbed from use of the close-coupled configuration and not relocating the CRAC facility. Operational impacts of Alternative 3 would essentially be the same as those under Alternative 2.

**Dry FGD and Related Components Construction**

In this alternative, the dry FGD system would be constructed and connected to the plant in place of the current ESPs. Construction activities associated with the dry FGD could include, but are not limited to, the clearing and grading of the project site and laydown areas; creation of personnel offices and parking space; creation of a storm water pond; construction of the FGD; construction of TL components, and construction of the byproduct and lime storage areas.

As mentioned above, appropriate BMPs would be implemented in accordance with the project's SWPPP to minimize construction storm water impacts. This project would require a project NPDES construction storm water permit, but because the flue gas ducts would not span the discharge channel, the project would need to be assessed for an ARAP or a USACE and/or 404 permit, but not for a USACE Section 10 permit. With proper implementation and maintenance of BMPs, only minor, temporary impacts to local surface waters are expected.

**Dry FGD Nozzle Wash Stream**

Construction is the same as for Alternative 2; however, the routing to the coal yard ditch would be different. This operational discharge would be permitted under the existing NPDES permit, and action and mitigation measures would be implemented to ensure that this stream would have no adverse effect on water quality in the Cumberland River.

**Runoff Streams from the Dry FGD Site**

Various storm water runoff streams could be generated by the construction of the dry FGD and baghouse. These waste streams could include a combination of storm water and process water.

Construction is the same as for Alternative 2; however, the location of the pond would be south of the current plant site but would still drain to the discharge channel. The drainage details would be different, but the functionality and impacts would be the same as for Alternative 2.

Storm water and combination storm water and process water would be captured into sumps and then routed to the coal yard drainage ditch and ultimately to Ash Pond E. The composition and potential impacts of this stream would be similar to Alternative 2 except for the impacts associated with the cross-channel bridge and duct cleaning. These impacts would not exist in this alternative; however, the need to route the above-mentioned flows to the coal yard ditch could potentially have minor, temporary impacts to surface waters.

This operational discharge would be permitted under the existing NPDES permit, and action and mitigation measures would be implemented to ensure that this stream would have no adverse effect on water quality in the Cumberland River

**Outage Wash Waste Streams**

The composition and potential impacts of this stream could be similar to Alternative 2 except for the impacts associated with the cross-channel bridge and duct cleaning. These impacts would not exist in this alternative; however, the need to route the above-mentioned flows to the coal yard ditch would potentially have minor, temporary impacts to surface waters.

This stream's flow and concentration would need to be characterized to be evaluated for inclusion in the NPDES permit and to accurately assess stream impacts. This operational discharge would be permitted under the existing NPDES permit would either be managed on-site or would be trucked off-site by an approved vendor for proper disposal. These waste streams would have no adverse effect on water quality in the Cumberland River.

**Groundwater**

Similar to Alternative 2, all equipment and new construction would be located outside of the recharge areas for groundwater. Therefore, the project would have the same or similar impacts for groundwater and hydrogeology.

**Floodplains**

For Alternative 3, TVA would install similar emissions reduction technology for $SO_2$, $NO_x$, and mercury as identified in Alternative 2 to comply with applicable environmental regulations. The location of required clean air equipment under this option would be installed near the powerhouse. Similar to Alternative 2, all equipment and new construction would be located outside of the 100-year floodplain.

**Mitigation Measures/BMPs**

Alternative 3 would require all of the same measures except for the bridge construction option and CRAC facility relocation. Additionally, piping for discharges to the low-point sump or coal yard drainage ditch will need to be installed. Should these pipes span the discharge channel, then they would need to be double-walled and have regular inspections and O&M procedures established to ensure no releases to surface waters would take place. If these flows should be directed to the low-point sump and then to the coal yard drainage ditch, then the low-point sump would need appraisal to ensure that it was sized and enclosed properly to handle these additional flows.

### 4.2.4 Summary of Impacts

No significant adverse impacts to water resources have been identified under any of the alternatives. All associated new ARAP, USACE 404, and NPDES permits or existing permit modifications would be obtained for any water body or wetland alteration, and the terms and conditions of these permits would be followed. Adherence to permit requirements would ensure that the potential for adverse impacts is minimal. The management of fly ash and gypsum in dry form in the proposed, Subtitle D compliant CCR landfill should reduce both surface and groundwater impacts that may be resulting from current plant operation.

### 4.2.5 Cumulative Impacts

No cumulative impacts are anticipated; however, TVA would monitor the landfill leachate, FGD operational, and SCR containment pond discharges for constituents of concern in the discharges to ensure the concentrations of metals and other parameters do not adversely impact water quality of surrounding surface waters. Mitigation measures would be identified, as needed, to ensure the discharges from the dry FGD and CCR landfill site and the altered receiving waters into the ash pond have no significant impact on the receiving stream or outfall.

## 4.3 Biological Resources

This section addresses potential impacts to aquatic ecology, botanical resources, natural areas, terrestrial zoology, and wetlands under all alternatives.

### 4.3.1 Alternative 1, No Action

Under the No Action Alternative, TVA would not implement the proposed action or other Action Alternatives. Unless requirements are changed, TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS.

**Aquatic Ecology**

TVA would continue current operations without implementing activities to further reduce emissions at GAF and comply with environmental regulatory requirements. The additional landfill for storage of CCR would not be created, nor would the existing CRAC need to be relocated. Thus, no changes to aquatic resources within these areas would occur. Adoption of the No Action Alternative is not expected to result in any additional effects to local aquatic life or aquatic threatened and endangered species.

**Vegetation (Includes Invasive Plants)**

Since all the plant communities present in and around the GAF are common and representative of the region, no direct, indirect, or cumulative impacts are expected to occur to these botanical resources as a result of adopting the No Action Alternative.

In addition, there would be no vegetation removal or soil disturbance that could impact threatened or endangered plant species, or contribute to the introduction and spread of exotic invasive species. Therefore, by adopting the No Action Alternative, there would no impacts to rare species or plant communities from the encroachment of invasive plants.

**Natural Areas**

Under the No Action Alternative, TVA would continue current operations without implementing activities to reduce emissions at GAF or constructing and operating the new landfills. TVA would consider reopening the proposed landfill area to public hunting as part of the Gallatin Steam Plant Wildlife Management Area. There would be no other direct, indirect, or cumulative impacts on natural areas.

**Terrestrial Animals**

Under the No Action Alternative, the project area would likely remain in its current state. Therefore, terrestrial animals and their habitats would not be affected.

**Wetlands**

Wetlands are protected under Sections 404 and 401 of the Clean Water Act and by EO 11990. In order to conduct specific activities in wetlands, authorization under a Section 404 permit from the USACE may be required depending on the wetland's size and hydrologic connectivity to a navigable waterway. Section 401 gives states the authority to certify whether activities permitted under Section 404 are in accordance with state water quality standards. In Tennessee, the Department of Environment and Conservation is responsible for issuing Section 401 water quality certification. EO 11990 requires all federal agencies to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.

Under the No Action Alternative, TVA would continue current operations of GAF, with no implementation of emissions control activities. Under this scenario there would be no additional construction, and no impacts to wetlands would occur.

**Threatened and Endangered Species (Plants and Animals)**

There would be no vegetation removal or soil disturbance that could impact threatened or endangered plant species, or contribute to the introduction and spread of exotic invasive species. Therefore, by adopting the No Action Alternative, there would no impacts to rare species or plant communities.

### 4.3.2 Alternative 2, Across Discharge Channel Configuration

**Aquatic Ecology**

The proposed CCR disposal areas are primarily forested and adjacent to the existing GAF facility. Alteration of the intermittent streams and two ponds to facilitate CCR disposal would occur. As stated in Section 3.3.2, these streams do not support fish communities or other important aquatic resources. Applicable ARAP and USACE 404 permits would be obtained for any stream alteration and the terms and conditions of these permits would require mitigation from these proposed activities if appropriate. Any impacts to aquatic life from this construction are anticipated to be minor and insignificant. Mitigation activities agreed to during the permitting process would offset any identified impacts to aquatic life.

The six proposed locations for stockpile areas and the areas proposed for TL components are all previously disturbed land with no documented watercourses. Implementation of construction Best Management Practices (erosion control, and storm water containment) would ensure that no discharges to the Cumberland River occur.

No measurable impacts to aquatic life in the Cumberland River (including the federally-listed pink mucket or state-listed lake sturgeon) or nearby tributary streams would occur as a result of construction of the dry scrubber, SCR, or CCR disposal area.

The CRAC facility would be relocated to a parcel adjacent to the Cumberland River within the GAF property (Figure 2-1). No streams, ponds, or other aquatic resources were identified during survey of the proposed CRAC relocation property. Therefore, the proposed facility relocation would not affect sustainable aquatic habitat.

It is presumed that a portable water pump and intake/return system would be required to provide river water to the CRAC facility for aquaculture purposes. The intake line would need to extend to at least the winter pool elevation to ensure river water to the facility year-round. The intake would use a screen to prevent debris, fish, and potentially other relatively large aquatic organisms from entering the system. It is unclear whether the intake would be fixed to the riverbed or float on the water surface, but some aquatic organisms (mostly microscopic in size) could be impinged or entrained by the water intake/return system. Water returned from the aquaculture facility to the river would undergo an intensive filtering process that would reduce the amount of sediments and micro-organisms returned to the river. The facility would develop a water-handling process that follows appropriate guidelines for aquaculture facilities to prevent the escape and/or introduction of captive or exotic species to the receiving waters (Cumberland River).

**Operational Impacts**

Due to the possibility of the release of ammonia to surface waters through the ash pond discharge or through groundwater migration to the Tennessee River, there exists a potential to affect individuals or populations of pink mucket, as well as other species of more common mussels. Recent studies have shown that freshwater mussels are typically more sensitive to ammonia than are many other aquatic species, and can be adversely affected at lower acute and chronic criteria concentrations than currently allowed by USEPA (Bartsch et al. 2003) As the catalyst used in the SCR ages, ammonia loading to ash begins to increase from negligible levels. Maximum ammonia loading to coal ash would be limited to the calculated action level; currently predicted to be 118 mg/kg. An ammonia action level will be recalculated following the beginning of operation of the SCR system and actual ash testing. Ammonia levels on ash would be monitored throughout the operational life of the SCR catalyst. When ammonia loading to ash approaches this level, the catalysts would be replaced, and ammonia-on-ash levels would drop. A consequent drop in ammonia discharge to the ash pond and the Cumberland River would be observed.

As described in Sections 3.2 and 4.2 of this document, modeling results based on conservative estimates show that both the potential ammonia discharge from the ash pond outfall and the potential leachate effects of ammonia at maximum ash loading levels (118 mg/kg) would be well below levels that would result in acute or chronic toxicity to aquatic animals (including freshwater mussels) in the Cumberland River. CORMIX modeling results show that ammonia levels in the Cumberland River where the discharge plume meets the bottom of the river are well below both the current USEPA criteria, and proposed revised ammonia criteria (i.e., USEPA chronic ALC for ammonia in fresh water is the CCC 30-day average concentration of total $NH_3$-N/L, which is not to be exceeded more than once every three years on average, pH and temperature dependent). The proposed criteria consider the greater sensitivity of freshwater mussels to ammonia, and are much lower than the current USEPA criteria. Due to the presence of the endangered pink mucket (and other more common mussel species) in the Cumberland River, TVA has analyzed potential ammonia effects with respect to both the current and proposed USEPA criteria. TVA has determined that discharges from the GAF ash pond would have no effect on the pink mucket or other more common mussel species present in the Cumberland River. Ammonia discharges to the Cumberland River would be monitored under the facility's NPDES permit to ensure discharges are within permitted limits.

Operational discharges from cooling systems and settling ponds associated with this facility would be permitted under the existing NPDES permit and would have no adverse effect on water quality in the Cumberland River. Therefore, TVA's proposed action would have only minor direct or indirect impacts on aquatic life.

**Vegetation**

The construction of the SCR and FGD facilities would have minimal impacts on vegetation as little vegetation occurs on their proposed sites. The construction of the CCR landfills would result in the initial clearing of vegetation from most of the 94-acre NRL site and the eventual clearing of the 80-acre SRL site. These areas are predominantly second growth mixed evergreen-deciduous forest with interspersed stands of planted loblolly pine. Cattail, cut-grass, and bulrush occur in the wetlands on the CCR landfill sites. Because these vegetation types are relatively common in the region, impacts of their clearing would not be significant. Similarly, vegetation types on the site of the proposed CRAC facility relocation are relatively common and the facility relocation would not adversely affect vegetation.

The adoption of Alternative 2 would result in the movement of heavy equipment through the area building roads, hauling rock, and removing trees and brush, which would result in soil disturbance that could potentially be a vector for the introduction of invasive species. In addition, invasive plant propagules (seeds, roots or leaves) could be transported to uninfested areas during disposal of cut vegetation. Consistent with EO 13112, clean rock would be used for road building, equipment would be cleaned before leaving the action areas, and disturbed areas would be revegetated with native or nonnative, noninvasive species. This would help reduce the potential for the proposed actions to contribute to the spread of invasive terrestrial plant species. TVA's best management practices for weed and invasive plant control would be adhered to for TL components.

**Natural Areas**

The North and South Rail Loop sites of the proposed landfills were formerly part of the Gallatin Steam Plant Wildlife Management Area (WMA; see Section 3.3) and open to public hunting. Construction and operation of the landfills would result in the permanent removal of the rail loop area from the WMA and greatly alter the wildlife habitats on up to about 220 acres. Construction and operation of the other components of Alternative 2 would have little impact on the WMA as their affected areas are already used for industrial purposes and therefore provides little habitat for wildlife. The impacts of the habitat alterations in the landfill area are described elsewhere in Section 4.3.2. They would have insignificant direct and indirect effects on the quality of the wildlife habitats on the remainder of the WMA. There would be a long-term loss of public wildlife-oriented recreation opportunities – primarily hunting - in the Rail Loop area. This loss would result in moderate adverse impacts. The remainder of the Gallatin WMA would remain open to hunting, and 639 hunting permits were issued for this area for the 2012-2013 season. Hunting opportunities are available on public lands within the adjacent Old Hickory WMA and these lands would likely absorb hunters displaced from the Gallatin WMA without adverse impacts. The implementation of Alternative 2 is not anticipated to adversely impact other natural areas in the vicinity of the GAF.

TVA would notify the appropriate agencies prior to project construction if TVA makes the decision to proceed. Notifications by TVA would minimize potential conflicts with WMA-related activities and ensure personal safety of TVA's construction workers (i.e., GAF's WMA used for hunting). TVA's mitigations and related BMPs would ensure no significant direct, indirect or cumulative impacts to natural areas or NRI streams would occur.

**Terrestrial Animals**

The proposed project area for the scrubber and SCR is already used for industrial purposes and therefore provides little habitat for terrestrial wildlife. The existing habitats in the project area are common, and some have been heavily impacted by industrial development, and similar to the surrounding landscape. Some of the wildlife using areas to be developed would be displaced to nearby similar habitats unless such habitat is at maximum carrying capacity. If so, some of the displaced wildlife would not survive. Other wildlife less capable of dispersing out of the construction area would be eliminated. The wildlife on the proposed construction sites is relatively common in the surrounding area; although their populations on the GAF reservation would be reduced, regional population impacts would be insignificant. The proposed action would have little impact on shorebird and waterfowl habitat, which is much less common in the area than are the upland wildlife habitats that would be most disturbed.

The four recorded caves in the vicinity are at distances far enough away (all are 1,300 feet or greater) from the project site that they would not be affected under this alternative. This alternative is not expected to directly, indirectly, or cumulatively result in significant impacts to terrestrial wildlife or their habitats.

**Wetlands**

The implementation of Alternative 2 would result in the filling of 2.24 acres of wetlands. Construction of the NRL and SRL landfills would fill five wetlands totaling 0.74 acres and an additional 1.5 acres of wetlands would be impacted by construction of the haul road (Table 4-5, Figure 4-1). These totals represent a 0.64 acre reduction in the area of affected wetlands from the 2.92 acres described in the Draft EA. This reduction resulted from revisions to the


**Figure 4-1. Potential Wetland Impacts (Alternative 2)**

preliminary design of the SRL landfill and avoidance of impacts to wetlands W007 and W008. Based on the desirability of constructing the landfills on the GAF reservation, site topography and existing site constraints (archaeological resources, rail lines, roads, utilities, site geology) of the landfills, TVA has determined there is no practicable alternative to the 2.24 acres of wetland impacts. The other project components, including the construction of the scrubber, SCR system, and transmission line, and relocation of the hatchery would not affect wetlands.

**Table 4-5. Potential Wetland Impacts (Alternative 2)**

| Wetland ID | Wetland Type[1] | TVARAM Category (Score) | Wetland Acreage Impacted |
|---|---|---|---|
| PAW001 | PEM1A | 2 | 1.50 |
| PAW002 | POW/PEM1A | 1 | 0.18 |
| W003 | PFO1E | 2 | 0.47 |
| W004 | PSS1E | 1 | 0.03 |
| W009 | PEM1A | 2 | 0.06 |
| **TOTAL** | | | 2.24 |

(1) Cowardin Classification: PEM1A = palustrine, persistent emergent, temporarily flooded; PFO1E = palustrine, forested, broad leaf deciduous, seasonally flooded/saturated;
PSS1E = palustrine, scrub-shrub, broad leaf deciduous, seasonally flooded/saturated
POW = palustrine open water.
ID = identification; TVARAM = Tennessee Valley Authority Rapid Assessment Method.

TVA would comply with USACE and TDEC regulations regarding wetland permitting and mitigation. Current USACE guidelines recommend mitigation be accomplished through purchase of credits at a mitigation bank. Permitting requirements would, at a minimum, require purchase of wetland credits or creation/restoration/enhancement of approximately 5-acres of wetlands to offset the 2.24 acres of wetland impacts fill. The required mitigation would therefore minimize wetland impacts to an insignificant level.

Potential indirect wetland impacts to adjacent wetlands would be reduced to an insignificant level during construction activities through implementation of BMPs (Muncy 2012). As a result of these measures, the proposed actions would have no significant adverse impacts to wetland areas and the associated wetland functions and values provided within the project area and general watershed.

**Threatened and Endangered Species (Plants and Animals)**

### Plants

Since there are no known endangered or threatened plant species known to occur within or adjacent to the GAF, there is no known potential for the adoption of the No Action or Action Alternatives to have any direct, indirect, or cumulative impacts on rare plant populations.

### Terrestrial Animals

The closest documented bald eagle nest is greater than 500 feet from the transport route and is separated from the transport route by vegetation. Therefore, no impacts to this nest are expected as a result of use of the transport route (USFWS 2007). The Cumberland River surrounding the GAF reservation provides suitable foraging habitat for bald eagle, and suitable nesting habitat may be available along the edge of the intake channel adjacent to the site proposed for the relocation of the mussel hatchery. Given the abundance of both nesting and foraging habitat immediately adjacent to the project area, impacts to bald eagle are not expected as a result of TVA's proposed action.

A bachelor colony of gray bats has been documented since 1976 roosting during the summer in Gallatin Fossil Plant Cave, located approximately 1,300 feet from the southern end of GAF's reservation. Foraging habitat for this colony is available in the stilling ponds and drainage canals in and adjacent to the project area, as well as along the Cumberland River, which surrounds the Reservation. With the implementation of standard BMPs that avoid or minimize the input of sediment and pollutants into any water body within and around the project area, impacts to foraging habitat for gray bat are not expected to occur.

Based on the review of historical records and the results of recent field surveys at GAF, the only species listed as endangered, threatened, or of other conservation concern known to occur or potentially occurring on the GAF site is the Indiana bat.

Acoustic surveys for Indiana bat were conducted at seven locations in relation to the project footprint. Calls identified as Indiana bat were collected at the acoustic station located north of the proposed stockpile yard and adjacent to the Plant's ash pond. The detector was facing towards the ash pond, suggesting that the Indiana bat or bats detected were traveling over the pond. The closest proposed clearing to this acoustic survey location is on the southern end of the area north of the rail road and would total approximately 8 acres. There is approximately 50 acres of wooded vegetation separating this area proposed for clearing from the ash pond. Given the similarity of habitat in the stockpile yard to the NRL, and the subsequent low quality nature of the habitat with respect to providing suitable summer roosting habitat, the likelihood is fairly low that trees in the stockpile yard or elsewhere within the project footprint is used by Indiana bat for summer roosting.

Although the quality of habitat within the project footprint is low, there is some potential for use of trees for roosting by Indiana bat. Per discussion with the USFWS, trees with suitable roost characteristics that occur within the project footprint have been marked in the field such that they can be removed during the time of year when Indiana bat would not be present (November 15–March 31). Removal of these trees during this timeframe would remove the potential for Indiana bats to select trees within the footprint for roosting during the following spring/summer roost season (April 1–November 14). If the mussel hatchery is relocated to the site currently proposed, trees identified as suitable would be marked in the field and removed between November 15 and March 31. With implementation of seasonal clearing of suitable roost trees, TVA has determined that potential impacts associated with the proposed action would not likely adversely affect Indiana bat.

Removal of vegetation for the proposed landfill and, possibly, for stockpile areas also has the potential to effect the endangered gray bat. Gray bats inhabit caves throughout the year, but the nearest cave to the Gallatin plant site is approximately 1,300 feet across the Cumberland River. There are no caves on the plant site. Gray bat foraging habitat is available in the plant still ponds and drainage canals in and adjacent to the project area as well as along the Cumberland River. With the implementation of standard BMPs that reduce the risk of sediment and pollutant releases to surface water, gray bat foraging habitat should not be affected. TVA has determined that there should be no effect on the gray bat.

**Aquatic Species**

As described in the species' accounts in the Affected Environment section above, lake sturgeon (state endangered) and the pink mucket pearlymussel (federally listed as endangered) are the only listed aquatic animal species potentially occurring in the Cumberland River near the proposed project. Suitable habitat for the other listed species (Table 3-6) does not occur near the project; therefore, those species would not be affected by the project.

Lake sturgeon is typical found in depths of 5-10 meters, but can occur in waters over 40 meters. It seems to prefer deep, mid-river areas over deposits of gravel, sand, and silt with continuous flow but can feed in various habitats. Spawning typically occurs in the spring to early summer at depths of 0.3 to nearly 5 meters in substrates of boulders, rocks, and even riprap near the banks. Therefore, lake sturgeon, particularly eggs and small individuals, could potentially be impinged or entrained by the new water intake system if the CRAC facility is rebuilt. This will require further evaluation when design details become available if the hatchery must be relocated. However, the project effect on the lake sturgeon would be similar to those occurring from the water intake system at the existing hatchery.

The pink mucket pearlymussel is typically found in heterogeneous substrate mixtures in the riverbed where continuous flow conditions occur and where the riverbed remains submerged (i.e., below low [winter] pool elevations for the Cumberland River). Typically, most native freshwater mussels, like the pink mucket, occur in big rivers or reservoirs at least 10 meters from the bank where the above conditions persist. Occurrence of the pink mucket in the project reach (ten mile radius) is very uncommon and many miles from the project site. Based on the reservoir conditions near the future CRAC site, which appears to occur in an impounded section with very slow flow conditions, aquatic habitat that may be affected by a new CRAC facility water intake/return system would not be suitable for pink mucket.

The pink mucket, like most native mussels, requires a fish host to complete its reproductive cycle where larvae transform into juveniles while attached to their fish host. Although the fish hosts for pink mucket may occur near the proposed CRAC facility site, it seems extremely unlikely that they would be affected by the facility's water intake system. Moreover, adult fish that may be infected with mussel larvae would almost certainly not be affected by the new water intake. Therefore, the potential for the facility water intake to affect the pink mucket, including viable fish hosts, is effectively non-existent. Consequently, TVA has determined that the new water intake system for the CRAC facility, if it is relocated on site, would not affect the federally endangered pink mucket.

The only potential to affect the pink mucket mussel associated with the proposed control projects and landfill is from the release of ammonia to the Cumberland River. This potential effect was carefully analyzed by TVA by applying both the current and proposed USEPA ammonia criteria. Because TVA is proposing to cease managing fly ash in wet impoundments and to convert fly ash handling to dry with management in a lined landfill the potential for release of ammonia to surface waters is greatly reduced compared to wet ash management. Ammonia levels would be closely monitored under the plant's NPDES permit and ammonia use would be adjusted to ensure that acceptable levels are maintained. TVA has determined that the proposed actions would have no effect on the pink mucket.

If Alternative 2 is selected by TVA and TVA proceeds with the proposed actions, the existing CRAC facility will have to be relocated. In consultation with USFWS, TVA is committing to rebuilding the hatchery at another location on the GAF plant site, farther away from the plant and Alternative 2 project footprints. TVA is working with TWRA on the design of the new hatchery and the two agencies anticipate improvements in the design of the new hatchery. TVA also is committing to providing TWRA longer term tenure over the new hatchery site. TWRA currently operates the existing hatchery under a short-term license from TVA that can be terminated by either agency upon 30-days notice. Longer-term tenure should provide TWRA a better basis to justify additional investments in the new hatchery including possibly expanding hatchery operations. An improved design and longer tenure is expected to enhance TWRA's species propagation activities.

TVA has no control over or responsibility for the species propagated by TWRA at the hatchery. TWRA conducts the propagation of listed species under an agreement with USFWS. Anticipating that TVA will decide to select Alternative 2 and that the existing hatchery will have to be closed, TWRA has been relocating species at the hatchery and plans to complete relocation before project activities impact the existing hatchery. Relocated species would be moved back to the existing hatchery if it is not closed or to the new hatchery after it is built should that occur. TWRA has informed TVA that it is taking care to minimize potential impacts from relocating and housing the species under its control in the interim.

TVA has completed informal consultation with USFWS in accordance with the Endangered Species Act. In a letter dated March 6, 2013, USFWS concurred with TVA's determination that except for the federally-listed mussel species located at the existing hatchery and the Indiana Bat, there will be no effect on listed species from any of the proposed actions. USFWS also concurred with TVA's determination that the proposed projects are not likely to adversely affect either the Indiana Bat or any of the listed mussel species held by TWRA at the hatchery.

## Mitigation Measures/BMPs

### Aquatic Ecology

Applicable ARAP and USACE 404 permits would be obtained for any stream alteration and the terms and conditions of these permits would require mitigation from these proposed activities.

TVA will relocate and rebuild the existing CRAC facility to another location on the Gallatin plant site at its expense if Alternative 2 is selected by TVA. TVA also is committing to provide TWRA longer-term tenure over this location.

### Wetlands

Construction activities resulting in the placement of fill within any jurisdictional wetlands require wetland mitigation to compensate for the loss of wetland functions. This could take place in the form of purchasing credits in a wetland mitigation bank, or on-site creation/restoration/enhancement of wetlands. The use of standard BMPs, as described in Muncy (2012), would further reduce impacts to surrounding wetlands outside the construction footprint.

### Natural Areas

TVA's standard BMPs to prevent storm water runoff from construction activities that may enter the reservoir would be incorporated to ensure protection of natural areas on and adjacent to the GAF reservation.

TVA would notify USACE and TWRA managers of the decision it makes respecting the proposed actions.

**Terrestrial Animals**

In order to minimize the potential for effects on the Indiana bat, TVA would:

- Notify USFWS prior to clearing/construction of proposed project areas supporting potential Indiana bat habitat.
- Remove trees potentially supporting Indiana bats only during winter months (outside of the summer roosting season).

### 4.3.3 Alternative 3, Close Coupled Configuration

Environmental impacts associated with aquatic ecology, botanical resources, natural areas, terrestrial zoology, and wetlands would be similar to those described under Alternative 2 except the existing CRAC facility would not have to be relocated.

**Mitigation Measures/BMPs**

Mitigation measures and BMPs for Alternative 3 would be the same as those described under Alternative 2 except TVA would not have to mitigate closure of the CRAC facility.

### 4.3.4 Summary of Impacts

No significant adverse impacts to biological resources have been identified under any of the alternatives. Clearing activities would occur during winter months to mitigate potential impacts to the Indiana bat, and adherence to all other permit requirements as described under Water Quality and Soils/Geology would ensure that the potential for adverse impacts associated with biological resource habitats are minimal. Construction activities resulting in the placement of fill within any jurisdictional wetlands would require wetland mitigation to compensate for the loss of wetland functions.

### 4.3.5 Cumulative Impacts

Cumulative impact analysis of wetland effects takes into account wetland loss and conversion at a watershed-level scale. However, this project would not result in any significant loss of wetland function. The 2.24 acres of wetlands that could be impacted are all Category 1 and 2 wetlands, providing moderate to limited overall wetland function. The mitigation requirements would offset impacts associated with the loss of these wetlands; therefore, no cumulative wetland impacts are anticipated as a result of the proposed alternative at GAF.

The conversion of about 220 acres of mostly forested habitats to industrial uses would have insignificant cumulative impacts on native plant communities and wildlife populations, given recent trends in the Middle Tennessee area.

As construction and operation of the proposed dry scrubber and SCR would not result in significant water quality impacts to the Cumberland River where pink mucket and lake sturgeon may be present, and no protected aquatic animals are present in the vicinity of the CCR disposal area, no direct, indirect, or cumulative impacts to protected aquatic species or their habitat would occur as a result of implementing this alternative.

Since there are no known endangered or threatened plant species known to occur within or adjacent to the GAF, there is no known potential for the adoption of the No Action or Action Alternatives to have any direct or indirect cumulative impacts on rare plant populations. Benefits of the reduction in emissions would improve the air quality in this region, potentially benefiting regional botanical resources, and related habitat.

No cumulative impacts to natural areas have been identified with the implementation of mitigation measures/BMPs identified previously.

## 4.4 Cultural and Historic Resources

### 4.4.1 Alternative 1, No Action

Under the No Action Alternative there would be no ground disturbing activities. Therefore, there would be no potential for effects to historic properties. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.4.2 Alternative 2, Across Discharge Channel Configuration

**Clean Air Equipment**

Ground-disturbing activities would include grubbing, grading, and excavation during construction and installation of the proposed dry scrubber and emission control equipment andtheir associated facilities. The FGD systems would be installed across the discharge channel from the existing powerhouse and would require the removal of the CRAC facility The SCR systems would be installed near the existing powerhouse. No archaeological sites are identified within the limits of disturbance from construction and installation of the FGD and SCR systems and the associated structuresand the powerhouse is not eligible for the NRHP. Ttherefore this action has no potential to affect cultural resources.

**Onsite CCR Landfill (NRL and SRL)**

TVA is proposing to construct a dry CCR landfill at the NRL location, but plans to expand to the SRL site if the NRL landfill reaches capacity. The construction of an onsite CCR landfill would require disturbing approximately 138 acres within the Railroad Loop parcel and has the potential to affect NRHP-eligible archaeological sites 40SU257, 40SU258, 40SU259, and 40SU268. TVA's BMPs identified below would minimize and mitigate potential effects to these sites and ensure that these resources are protected.

**Materials Transport and Hauling**

TVA would construct new haul routes for CCR, activated carbon, and ammonia, and improve or maintain existing haul routes as required. These actions would occur on the Gallatin plant site, but would involve ground disturbance from grubbing and grading during the construction, improvements, and maintenance of the proposed materials transport routes. No archaeological sites or historic structures are located in the proposed areas of disturbance; therefore, no cultural resources would be affected by these actions.

**Stockpile Areas and Surface Impoundments**

An estimated 312,880 cubic yards of soil and rock would be excavated during construction of the proposed scrubber system. Of this total, a proposed 60,727 cubic yards of excavated material would be temporarily stockpiled as fill during scrubber construction while the remaining 252,153 cubic yards of material would be stockpiled on-site for future use. Some of these materials could support TVA's closure of surface impoundment when required in the future. TVA has considered the potential for impacts on cultural resources at each of the identified stockpile areas (see Section 2.3).

Surface and subsurface archaeological reconnaissance surveys of the potential stockpile locations revealed that the soils in these portions of the GAF reservation have been completely altered by past borrow activities and ash disposal use associated with previous GAF operations, and have no potential for intact archaeological deposits. Therefore, no cultural resources would be affected by these actions.

**161kV Transmission Line**

In order to provide additional power input into GAF for the proposed new FGD system, TVA would construct and operate new 161-kV TLs on the GAF reservation that would utilize both new and existing ROW.

**West Side Bus (Feed 1)**

Option 1: This option is located in an area that where soils have been previously disturbed by plant construction and operations and have no potential for intact archaeological deposits. Therefore this action has no potential to affect cultural resources.

Option 2: This option is located to the south side of the plant where there has been less soil disturbance from plant construction and operation. This option would require a Phase I archaeological survey prior to construction and installation of the TL and ROW clearing.

**East Side Bus (Feed 2)**

Option 1: This option extends around the perimeter of much of the northern section of the GAF reservation and construction and installation of the TL and ROW would encroach within the 100-meter (300 feet) protective buffer of the potentially NRHP-eligible archaeological site 40SU268 (see BMPs below). Therefore this action has the potential to affect an historic property.

Option 2: This option extends south then west of the plant where there has been less soil disturbance from plant construction and operation. This option would require a Phase I archaeological survey prior to construction and installation of the TL and ROW clearing.

Option 3: This option is located on the south side of the plant and a portion of this TL is located in an area where there has been less soil disturbance from plant construction and operation. This option would require a Phase I archaeological survey prior to construction and installation of the TL and ROW clearing.

Option 4: This option is located on the south side of the plant and a portion of this TL is located in an area where there has been less soil disturbance from plant construction and operation.

This option would require a Phase I archaeological survey prior to construction and installation of the TL and ROW clearing.

**Mitigation Measures/BMPs**

In consultation with the SHPO and interested federally recognized Indian tribes, TVA developed a PA that has been signed by TVA and SHPO (see Appendix C). The PA establishes terms and conditions for phased identification and evaluation of historic properties, for evaluating the undertakings' effects on historic properties, for avoiding adverse effects, for resolving adverse effects, and for guiding the undertakings through their development, construction, and operation with the APE. The PA specifies stipulations for the avoidance, minimization, and mitigation of adverse effects to NRHP-eligible historic properties resulting from the construction, operation, and maintenance of the proposed emissions control equipment and CCR disposal facilities, and their infrastructure. As stipulated in the PA, TVA, in consultation with SHPO and federally recognized Indian tribes, has undertaken measures to protect the potentially NRHP-eligible archaeological sites 40SU257, 40SU258, 40SU259, and 40SU268 by avoiding all ground-disturbing activities within a 100-meter (300 feet) buffer of each site.

Tennessee state law, including the Desecration of a Venerated Object statute (TCA 2011a) and the Abuse of Corpse statute (TCA 2011b), provide for protection against intentional disturbance of cemeteries, burial sites, and human remains. In accordance with state laws, TVA will avoid any ground-disturbing activities near the identified historic cemeteries within the project APE. TVA will follow procedures outlined in Tennessee Code Title 46 Chapter 4 – Termination of Use of Land as Cemetery (TCA 2011c) if avoidance measures for a historic cemetery are found not to be technically feasible or economically prudent.

Protective buffers around the historic cemeteries and potentially NRHP-eligible archaeological sites have been identified, flagged, and noted on project plans to be used in construction to ensure that they are avoided during all phases of the proposed undertakings.

### 4.4.3 Alternative 3, Close Coupled Configuration

No archaeological sites are located in the proposed areas of disturbance near the powerhouse, and the powerhouse is not eligible for the NRHP. Therefore, no historic properties would be affected by installation of the clean air equipment under Alternative 3. In all other respects the environmental consequences of Alternative 3 would be the same as for Alternative 2.

**Mitigation Measures/BMPs**

Mitigation measures/BMPs associated with Alternative 3 would be the same as those described under Alternative 2.

### 4.4.4 Summary of Impacts

The potential for adverse impacts to cultural resources has been identified under both Action Alternatives. Option 1 of the proposed East Side Bus TL (Feed 2) has the potential to affect a historic property. The PA, as described previously, which was developed in consultation with SHPO and federally recognized Indian tribes, specifies stipulations for the avoidance, minimization, and mitigation of adverse effects to NRHP-eligible historic properties. As a result, TVA does not anticipate any significant adverse impacts, immediate or cumulative, to cultural or historic resources.

## 4.5 Geology, Soils, and Prime Farmland

### 4.5.1 Alternative 1, No Action

Under the No Action Alternative, there would be no ground-disturbing activities. As a result, no impacts to geology and soils would occur. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.5.2 Alternative 2, Across Discharge Channel Configuration

Under Alternative 2, ground-disturbing activities would include grubbing, grading, and excavation during construction and installation of the dry FGD and SCR systems. The construction of the on-site NRL and SRL landfills would require blasting and disturbance of approximately 138 acres. Stockpile areas A, C, D and E would be used to stockpile soil and fill for future projects while stockpile area B would require grading and leveling. Construction of new haul routes and improvement or maintenance of existing haul routes would involve ground disturbance from grubbing and grading during construction. The installation of the TLs would require vegetation clearing and grading for new access roads to enable the construction and maintenance of the proposed lines. Relocation of the CRAC facility on another parcel of GAF property would also require ground-disturbing activities including grubbing, grading, and excavation during construction.

All of the natural soil types within the project are high risk for erosion. That erosion hazard is exacerbated within high-slope areas. Soil excavations, removal of vegetation, grading, and construction activities all have the potential to disturb soil stability and increase the susceptibility of soil particles to suspension and transport by wind and water. Despite this, impacts to soil resources associated with surface disturbances related to the proposed construction, excavation, blasting, clearing, and grubbing activities are expected to be minor, since land clearing and site preparation would follow BMPs, as discussed below.

No impacts are expected to occur to the small portions of prime farmland that are located outside of the activity areas. There is a moderate risk of sinkhole activity and soil subsidence within the project area, which may potentially pose a long-term risk of damage to completed structures. Sinkhole risks can be ascertained by defining specific areas prone to sinkhole activity through geophysical and hydrogeological investigations targeted to identify high risk areas. Such investigations have been completed for the proposed NRL landfill location and no karst features were identified that would be more susceptible to sinkholes. Sinkholes can be mitigated if necessary by several methods including insertion of rock and soil fill. As a result of proposed mitigations and BMPs, Alternative 2 would not adversely impact soil resources.

**Mitigation Measures/BMPs**

Mitigations and BMPs would be developed as part of the legally required SWPPP Erosion Control Plan. All erosion and sediment controls would be installed, placed, implemented, or constructed in accordance with the provisions of the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2002).

### 4.5.3 Alternative 3, Close Coupled Configuration

Impacts resulting from Alternative 3 would be similar to those discussed under Alternative 2. Although ground disturbance would occur under Alternative 3, it is expected to be smaller in footprint to the alternative. For the TLs, new transport and hauling route, and on-site NRL and SRL landfills, impacts from implementing Alternative 3 would be the same as for Alternative 2.

No appreciable difference in the level of ground disturbance would occur between both the Alternative Actions. As a result, Alternative 3 would not adversely impact geology and soil resources with the implementation of mitigations and BMPs.

**Mitigations/BMPs**

Mitigations and BMPs resulting from Alternative 3 would be the same as those discussed under Alternative 2.

### 4.5.4 Summary of Impacts

No significant adverse impacts to soils and geology have been identified under any of the alternatives. Site assessments and geological studies have shown that the sites chosen for various facilities are suitable for development. While ground disturbance would occur during C&D activities, implementation of regulatory requirements for sediment and erosion control would ensure that the potential for adverse impacts associated with soil disturbance and erosion are minimize to less than significant levels.

### 4.5.5 Cumulative Impacts

Cumulative impacts with regard to soil disturbance and erosion would be minimal. Both the Alternative 2 and 3 actions involve land disturbance, clearing of vegetation, and exposure of soils to increased erosion potential. The potential for soils to be transported off the project site and affect water resources and sensitive species would be minimized by the implementation of BMPs for containing and limiting soil erosion. TVA does not anticipate any significant impacts to soils or geology as a result of implementing Alternative 2 or 3, or reasonably foreseeable future actions and no significant, cumulative impacts.

## 4.6 Solid Waste and Utilities

### 4.6.1 Alternative 1, No Action

Under the No Action Alternative, TVA would continue current operations without implementing activities to further reduce emissions at GAF. Under the No Action Alternative, existing TVA operations at GAF would continue and there would be no changes that would impact existing solid waste generation or utility consumption/generation. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.6.2 Alternative 2, Across Discharge Channel Configuration

**Solid Waste**

**Construction Waste**

Construction activities would be expected to generate nonhazardous solid waste, including concrete, land clearing debris, metals, plastic, and wood. The majority of debris generated would be considered nonhazardous wastes. These wastes would be properly disposed of at approved solid waste facilities or recycled in compliance with TDEC waste regulations. In addition, demolition activities may also generate asbestos wastes (from removal of ESP ductwork) and lead (from structures with LBP). To estimate potential C&D debris generated from proposed activities, the following formula was used (USEPA 2003):

- Nonresidential construction: [(4.34 lb per $ft^2$) x ($ft^2$)] ÷ 2,000 lb = C&D waste (in tons)
- Nonresidential demolition: [(158 lb per $ft^2$) x ($ft^2$)] ÷ 2,000 lb = C&D waste (in tons)

Similar formulas for C&D generation rates from pavement construction are not available; therefore, the analyses assumed that pavement construction would generate 10 percent of C&D debris generated during construction (i.e., 0.434 lb per $ft^2$). Quantities of C&D debris associated with Alternative 2 are shown in Table 4-6.

**Table 4-6. Construction and Demolition Debris from Implementation of Alternative 2**

| Facility | Paved Area Only | Paved Area and Structure | Debris Factor* | Square Footage | C&D Debris (Tons) |
|---|---|---|---|---|---|
| CRAC facility Demolition | - | Yes | 158 | 10,922 | 862.8 |
| FGD | Yes | - | 0.434 | 85,608 | 18.6 |
| New Paved Areas | Yes | - | 0.434 | 409,586 | 88.9 |
| New Plant Parking | Yes | - | 0.434 | 43,294 | 9.4 |
| SCR | Yes | - | 0.434 | 311,767 | 67.7 |
| Ammonia Tank Farm | Yes | - | 0.434 | 12,370 | 2.7 |
| Crew Shacks | - | Yes | 4.34 | 8,361 | 18.1 |
| Local Crews | - | Yes | 4.34 | 4,381 | 9.5 |
| Supt./Field Engineer Office | - | Yes | 4.34 | 1,227 | 2.7 |
| Lime Silos | Yes | - | 0.434 | 12,356 | 2.7 |
| Byproduct Storage | - | Yes | 4.34 | 12,577 | 27.3 |
| | | | **Total** | **912,451** | **1,110.3** |

C&D = construction and demolition; FGD = flue gas desulfurization; SCR = selective catalytic reduction; TWRA = Tennessee Wildlife Resources Agency.
*United States Environmental Protection Agency 2003.

As Table 4-6 shows, implementation of Alternative 2 would generate approximately 1,110 tons of C&D debris. There are no C&D (Class IV) landfills within Sumner County; however, four landfills are located in nearby counties, including the Southern Services and Central Pike landfills in Davidson County, the Wilson County Landfill, and the Rutherford County Demolition Landfill. The nearby Southern Services landfill can accept up to 1,600 TPD of C&D and has a remaining capacity of approximately 1.7 million cubic yards (Cochran 2012). The other landfills have additional capacities with remaining life expectancies of at least 10 years (TDEC 2012).

It is not anticipated that land clearing and grading activities associated with the proposed landfills or CRAC facility relocation would generate a need for disposal of soil and woody waste.

It is assumed that soils generated would be used as fill during construction projects. In accordance with TVASPP05.50, *Solid Waste Compliance – Non-Coal Combustion Products*, if trees of commercial value are in sufficient quantity at the project site to warrant sale, then these would be sold through Investment Recovery. Non-salable timber and smaller trees and brush (if present in sufficient quantities) would be chipped, stockpiled, or composted for future use as a mulch or soil conditioner, or at the responsible manager's discretion, employees and/or the public may be permitted to utilize such for firewood. Such material may also be used to create wildlife habitat. Therefore, these materials would not be expected to impact solid waste resources.

Appropriate management of construction and land clearing debris, including recycling and reuse when possible, would limit any potential adverse impacts. Overall, sufficient landfill capacity exists to accommodate the additional solid waste generated as a result of construction activities.

**CCR Wastes**

Under the Alternative 2, generated CCR would comprise a mix of dry fly ash and dry FGD reaction solids (primarily calcium salts). The collected CCR would be conveyed utilizing a pneumatic conveying system to byproduct storage silos, where it would be stored until it is loaded into trucks and transported to the landfill for disposal. Approximately 46,500 tons and 185,000 tons of bottom ash and fly ash, respectively, are currently generated annually. It is projected that the same amount of bottom ash likely would continue to be generated and be treated in the ash pond system. Approximately 835,000 tons (upper limit) of CCR (dry fly ash and FGD reation solids) would also be generated per year. Future bottom ash dewatering would increase the maximum total to approximately 877,000 tons per year of CCR disposal.

Current plans are for dry CCR byproduct to be disposed in the new Class II landfill. GAF would strive to apply beneficial reuse of the CCR waste to the greatest extent possible. For example, bottom ash that meets industry specifications would be marketed for ready-mix concrete, concrete-block manufacturing, or other products.

TVA has actively promoted the beneficial reuse of coal combustion residuals (CCR) and scrubber waste for many years. During calendar year 2011, TVA successfully recycled 25% of CCR and 27% of scrubber waste generated at its coal plants. The quantities recycled at individual coal plants varies according to the type of materials produced, the demand for the materials in the area, and other factors.

Unlike the synthetic gypsum (CaSO4(OH)) scrubber waste produced at plants with wet scrubbers, which is suitable for use in manufacturing wallboard, the proposed GAF dry scrubber would produce calcium sulfite ($CaSO_3$). In addition to having a different reaction by-product, the waste would also contain fly ash and, therefore, would not be a pure reaction product limiting the marketability of the material.

TVA is currently participating with others in an ongoing Electric Power Research Institute (EPRI) study entitled "Development and Demonstration of High-Volume Uses for Spray Dryer Absorber Solid Products." This collaborative study is developing uses for spray dryer absorber (SDA) byproducts as well as providing engineering and environmental data for SDA byproduct applications. The study is scheduled for completion in 2016 and will guide TVA's future efforts to recycle the mixed flyash and scrubber waste that would be produced at GAF under the proposed action.

The effects of the landfill on specific resource areas (e.g., water quality), required permitting actions, and mitigation commitments for developing the new landfill are discussed under the various, applicable sections of this EA. The primary goal for CCR disposal is to support GAF's dry FGD operations by providing approximately 20 years of storage capacity.

**Utilities**

Construction and operation of the new clean air equipment and on-site CCR landfill would have negligible impacts on existing utilities at GAF. During construction activities it is expected that there would be a temporary increase in the consumption of potable water and in the generation of sanitary wastewater due to the increase in construction workers. The potable water supply is sufficient to support this increase. It is expected that the existing septic system is also sufficient to handle the increase in sanitary waste generation but could require pumping more often than annually. However, other temporary options for on-site sewage management could include portable toilets and temporary sewage tanks. Portable toilets would be pumped out regularly, and the sewage would be transported by tanker truck to a publicly owned wastewater treatment works. Temporary septic tanks would require a pump and haul permit and monthly reporting to TDEC. New water and sewer lines would be extended to temporary construction facilities (e.g., safety shower/eye wash stations) and other structures as needed. To support operation of the new dry FGD system, a new raw water pump would be added to provide service water, cooling water, and water for fire control.

A tie-in with the existing GAF switchyard along with a new 161-kV TL, transformers, and new transformer yard is proposed to provide the required electrical requirements for the new dry FGD system. Additional electricity needed for support facilities/buildings (lighting, receptacles, heating, ventilating, and air-conditioning, etc.) would be powered by tie-ins to the existing common distribution system. Natural gas use is not anticipated under Alternative 2 and the existing natural gas supply would continue to only serve the combustion turbine plant.

**Mitigation Measures/BMPs**

Aside from implementation of waste reduction and minimization techniques during C&D activities, no additional mitigations/BMPs have been identified for Alternative 2.

### 4.6.3 Alternative 3, Close Coupled Configuration

**Solid Waste**

Under Alternative 3, there would be less C&D debris generated from proposed construction activities (Table 4-7). As stated earlier, sufficient capacity exists in nearby landfills to accommodate projected waste levels. Additionally, appropriate management of construction and land clearing debris, including recycling and reuse when possible, would limit any potential adverse impacts.

**Table 4-7. Construction and Demolition Debris from Implementation of Alternative 3**

| Facility | Paved Area Only | Paved Area and Structure | Debris Factor* | Square Footage | C&D Debris (Tons) |
|---|---|---|---|---|---|
| New Paved Areas | Yes | -- | 0.434 | 288,431 | 62.6 |
| New Plant Parking | Yes | -- | 0.434 | 43,294 | 9.4 |
| SCR | Yes | -- | 0.434 | 311,767 | 67.7 |
| Ammonia Tank Farm | Yes | -- | 0.434 | 12,370 | 2.7 |
| Crew Shacks | -- | Yes | 4.34 | 8,361 | 18.1 |
| Local Crews | -- | Yes | 4.34 | 4,381 | 9.5 |
| Supt./Field Engineer Office | -- | Yes | 4.34 | 1,227 | 2.7 |
| Lime Silos | Yes | - | 0.434 | 12,356 | 2.7 |
| Byproduct Storage | -- | Yes | 4.34 | 12,577 | 27.3 |
| | | | **Total** | **694,765** | **202.6** |

*Source: United States Environmental Protection Agency 2003.
C&D = construction and demolition; SCR = selective catalytic reduction.

**Utilities**

Utility impacts under the close coupled alternative would be similar to those described for Alternative 2. During construction of the dry FGD system, there could be a temporary shutdown of two GAF units, but since the other two units would continue to operate, no adverse impacts on regional energy supply would occur. The other difference between the two alternatives is that the close coupled alternative would be slightly more energy efficient and would require approximately 3-5 percent less power to operate than Alternative 2 (across the discharge channel alternative).

**Mitigation Measures/BMPs**

Mitigation measures/BMPs for Alternative 3 are the same as those described previously for Alternative 2.

### 4.6.4 Summary of Impacts

Based on analyses of potential impacts associated with solid waste generation/disposal and utility use presented above, significant impacts would not be expected under either Action Alternative. Waste generation amounts would not significantly affect local landfill capacity or life spans, and the development of an on-site landfill would eliminate the need to dispose of process wastes off-site. Utility use is not expected to increase in any appreciable manner, and no utility interruptions to local customers are anticipated.

### 4.6.5 Cumulative Impacts

In the future, it is projected that the bottom ash would be dewatered at GAF, increasing the annual quantity of total CCR from 835,000 tons (proposed action) to approximately 877,000 tons per year of (anticipated future action). GAF would strive to apply beneficial reuse of the CCR waste to the greatest extent possible. Generation of solid waste over time results in a cumulative impact to landfill facilities to which the solid wastes are transferred and stored. Based on the capacity of surrounding landfills and the expected life span of the proposed onsite landfills, TVA's proposed actions contributions to cumulative impacts to local landfills are expected to be minimal. No cumulative impacts have been identified for utilities.

## 4.7 Socioeconomics and Environmental Justice

### 4.7.1 Alternative 1, No Action

**Socioeconomics**

Under the No Action Alternative, operations at GAF would continue as they are, and no changes in the local economy related to this decision would occur. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.7.2 Alternative 2, Across Discharge Channel Configuration

**Socioeconomics**

**Construction**

Construction activity would occur in stages starting in Spring 2013 and ending in the fall of 2016. At peak, estimated construction employment for all components is estimated to be up to 920 workers, from spring 2014 through the end of the year. The average annual construction wage for Sumner and Wilson Counties was $51,242 in 2009 (Bureau of Economic Analysis 2012) Over the nine-month peak construction period, income in the area would be increased by approximately $35 million. Other construction phases would generate additional income; the exact amount would depend on the number of workers employed at each phase. This would be a positive, but temporary, impact on the local economy. The increase in employment would be less than nine-tenths of 1 percent of employment in Sumner and Wilson counties in 2009. Since both counties are part of the Nashville Metropolitan Statistical Area, many of the construction workers are likely to come from other counties, which would reduce the overall impact on the local economy.

**Operation and Maintenance**

Operation and Maintenance employment at GAF is estimated to increase by an additional thirty personnel. This would have a negligible impact on the local economy of less than one-hundredth of one percent of employment.

**Environmental Justice**

Under Alternative 2, there may be some temporary traffic congestion and delays during peak construction, as discussed in Section 4.13. The largest impacts would likely occur near the intersection of Steam Plant Road and Airport Road, which is in a low income Census tract. Mitigations as discussed in Section 4.13 would be employed to minimize traffic congestion, thus minimizing impacts to local residents to less than significant. No other adverse impacts are expected, and there would be no other disproportionate adverse impacts to minority or low income populations.

**Mitigations/BMPs**

No mitigations or BMPs have been identified for socioeconomics or environmental justice. Traffic impacts would be temporary, and can be substantially reduced with the mitigation measures identified in Section 4.13. These measures would therefore serve to minimize the adverse impact on the local low income population.

### 4.7.3 Alternative 3, Close Coupled Configuration

**Socioeconomics**

Alternative 3 would generate 5 percent less construction and operating employment. As a result, the impact on the local economy would be very similar to the impact under Alternative 2.

**Environmental Justice**

The environmental justice impacts of Alternative 3 would be the same as those of Alternative 2.

**Mitigations/BMPs**

Mitigations and BMPs would be similar to those discussed previously for Alternative 2.

### 4.7.4 Summary of Impacts

Both Action Alternatives would have minimal beneficial socioeconomic impacts through creation of jobs and increased income. No significant adverse socioeconomic impacts were identified. Temporary traffic congestion and delays that may occur during peak construction would affect a low income area adjacent to the plant; however the potential impact would be short-term and cease once construction has been completed. In addition, mitigation strategies have been identified that would substantially reduce the impact.

### 4.7.5 Cumulative Impacts

Since there is little or no long-term socioeconomic impact as a result of any of the alternatives, no significant cumulative impacts are anticipated. Additionally, no adverse impacts to disadvantaged populations are anticipated. The reduction in emissions would improve the air quality in the region, which is likely to benefit disadvantaged as well other populations.

## 4.8 Land Use and Recreation

### 4.8.1 Alternative 1, No Action

Under the No Action Alternative, existing TVA operations at GAF would continue and there would be no changes to existing land uses. There would also not be any adverse impacts to recreation activities within the TVA GAF property boundary (i.e., hunting, fishing, and wildlife observation). TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.8.2 Alternative 2, Across Discharge Channel Configuration

The entire GAF site already has been committed to a heavy industrial use (operation of a coal-fired power plant). However, about 45 percent of the plant site is not being used for plant operations and existing uses at a number of locations would be impacted by the proposed actions. Short-term impacts would include temporary conversion of several undeveloped areas of open space to support various construction-related activities. These would include new construction parking areas, laydown and stockpile areas, steel yard, and areas for temporary crew shacks, trailers, and offices. Once construction activities were complete, it is expected that these areas would be cleaned up and revert to open space, with the exception of the stockpile areas; these would remain and the spoils would be utilized for other projects on GAF as needed. Construction of the new dry FGD system, byproduct storage, lime silos, and ammonia tank farm would permanently convert approximately 10 acres of open space to industrial use. Construction of the dry FGD system and supporting equipment across the discharge channel would also include the permanent relocation of the CRAC facility. The relocation of the CRAC facility could occur on GAF property which would impact current land usage. The dry FGD system would also require the clearing of new ROW for the construction of a 161-kV TL. The exact location of the new corridor has not yet been determined but is not expected to have a significant adverse impact on existing land use.

TVA's proposed action also includes the construction and operation of an on-site CCR landfill, which would also result in a permanent change to the existing land use. The proposed location for the NRL site would disturb approximately 96 acres of presently undeveloped property. Future development of the SRL site would disturb approximately 44 acres. The majority of the property at the SRL site is undeveloped except for the outdoor shooting range operated on a portion of the site by the Gallatin Gun Club.

Construction of the landfill at the SRL site would require that the shooting range be closed or relocated. While closure of the range would inconvenience the members of the Gallatin Gun Club and other users of the range, there are 13 other shooting ranges within 25 miles of the site that could be used. TVA does not consider this potential inconvenience to users of the Gallatin Gun Club to be a significant impact.

Alternative 2 would have no adverse impacts on other recreational activities. The GAF WMA hunting areas, Old Hickory WMA, and GAF boat ramp access would be unaffected. Construction of the dry FGD system would result in temporary closures of the discharge channel for fishing until the installation of the equipment across the discharge channel is complete. Periodic closures of the channel for fishing could occur during routine maintenance operations or emergencies due to potential safety concerns.

**Mitigations/BMPs**

There are no mitigations or BMPs for land use/recreation under Alternative 2.

### 4.8.3 Alternative 3, Close Coupled Configuration

Land use impacts would be similar to those described for Alternative 2. Temporary land use conversions would be essentially identical, but since the dry FGD system would not be constructed across the discharge channel, less permanent conversion would be needed and the CRAC facility would remain at its current location. Land use impacts from the construction of the new CCR landfill would be identical to Alternative 2. Like Alternative 2, there would be no adverse recreation impacts within the Gallatin WMA, Old Hickory WMA, or GAF boat ramp. Temporary closures to fishing within the discharge channel might still occur but would not be as long as would be required under Alternative 2.

**Mitigations/BMPs**

There are no mitigations or BMPs for land use/recreation under Alternative 3.

### 4.8.4 Summary of Impacts

While there would be changes to land use from either of the two Action Alternatives, none of these changes would result in significant adverse impacts since these changes are consistent with existing GAF land uses. While the potential removal of the shooting range would result in long-term displacement of this recreational component, there would be no other long-term adverse impacts to recreation under either Action Alternative.

### 4.8.5 Cumulative Impacts

Under either Action Alternative there would be a loss of use for the shooting range. However, there would be no additional loss of recreational area on GAF. Additionally, future land use changes are not anticipated at the GAF facility. As a result, there would be no further land use impacts at GAF in the future resulting in cumulative effects.

## 4.9 Visual Resources

### 4.9.1 Alternative 1, No Action

Under the No Action Alternative there would be no changes to structures or the current layout of the GAF. No impacts to visual resources would occur as a result of this alternative. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.9.2 Alternative 2, Across Discharge Channel Configuration

Different landscapes have differing intrinsic abilities to absorb human activities without loss of landscape character (USDA 1995). The current GAF facility is on a highly developed parcel of land jutting into a bend on the Cumberland River. The surrounding land use types include a mix of residential, rural, recreational and agricultural uses. The baseline visual setting was compared to the elements of the proposed action to determine potential impacts to the current landscape on and around GAF.

Most elements of the new stack would be seen mainly by plant employees and visitors to the plant. The proposed stack would be 300 to 500 feet AMSL, making it similar in height and scale as the existing stacks at GAF. Under normal operating conditions visible plumes would not be a visual impact from the new stack. Bag filters would be installed and the system is dry, which would result in minimal steam. Similar systems in the United States have not resulted in opacity/steam plumes. The new stack would be lit by medium intensity flashing lights at two levels with a rate of 40 F/Sec. From dusk until dawn these lights would be reduced in intensity. With the reduction of nighttime light exposure no significant visual impacts are expected. Minor short term visual impacts may occur during the construction period due to the presence of additional construction personnel and equipment. The proposed on-site NRL and SRL landfills are expected to reach an elevation of 135 feet above ground level. These landfills would be constructed on the interior of the GAF parcel and would be surrounded on the north, south, and west sides by previously developed elements of the facility. These landfills would be seen mainly by plant employees and visitors to the plant, but also have the potential to be seen by recreation users and residents of houses located to the east of GAF across the Cumberland River. Vegetation on the eastern side of Steam Plant Road and on parcels on the eastern side of the Cumberland River would mitigate some of the minor visual changes created by the landfill construction. Minor long term visual impacts may be anticipated as portions of the landfill facilities would likely be seen off site by local residents after the construction is complete. There may also be some temporary, minor visual impacts during construction due to an increase in personnel and the presence of excavation equipment.

Construction of a new haul route and the improvement of existing haul routes would involve construction activity through the central portion of the GAF starting near the southern side of the existing CRAC facility and winding northward along the SRL and NRL locales, terminating at the northern end of the parcel. These roadways would be seen mainly by plant employees and visitors to the plant. Long-term visual impacts from the construction of the haul route ar expected to be visually insignificant as the vehicle traffic transiting the route would be adjacent to industrial activity areas.

TVA would also install a new 161-kV breaker, relay equipment, a new transformer yard and two auxiliary transformers. A combination of entirely new ROW and existing ROW would be utilized. The potential TL routes are entirely on the GAF reservation and in locations previously disturbed by plant construction and operations. The TLs would be on single-circuit, steel-pole structures between 60 and 140 feet tall, depending on the terrain. It is expected that the installation of the TLs, dependent on location, would create minor short-term visual impacts during the construction period due to the presence of additional construction personnel and equipment. Long term impacts are expected to be minor as both the western and eastern feed options are adjacent to areas where already existing TLs are present.

**Height of Proposed Components**

The new stacks would be approximately 300 to 500 feet in height and lighting patterns and requirements will be designed according to FAA regulation AC 70/7460 (FAA 2007). Daytime and evening lighting requirements for the stack are specified in AC 150/5345-43F (FAA 2006). These requirements would be addressed in the project engineering plans for these structures.

Due to their heights of less than 200 feet, the proposed TL structures would not require lighting. Due to a lack of significant impacts under Alternative 2, no mitigation or best management practices are proposed to address visual resources.

Use of the CCR disposal facilities over time would result in the gradual increase in the height of the CCR landfill, which could have an adverse visual effect to the potentially NRHP-eligible archaeological sites 40SU257, 40SU258, 40SU259, and 40SU268.

### 4.9.3 Alternative 3, Close Coupled Configuration

Impacts on visual resources are expected to be minor to moderate. Vegetation would be maintained or planted along the sides of the landfills facing the plant boundary to further reduce potential impacts.

**Mitigations/Best Management Practices**

Due to a lack of significant impacts under Alternative 3, no mitigation or best management practices are proposed to address visual resources.

### 4.9.4 Summary of Impacts

Overall, the project site has low or moderately altered scenic integrity owing to modifications to the landscape from previous development. The proposed developments are visually similar to the current landscape with minor reductions expected to scenic beauty. Landfills would be bound by trees and other vegetation along the sides facing the GAF boundary therefore creating a visual barrier and minimizing the visual impact to residents and other members of the public. As a result, neither action alternative is expected to result in significant adverse impacts to the visual landscape within or surrounding the GAF.

### 4.9.5 Cumulative Impacts

Cumulative impacts with regard to aesthetic resources would be moderate. Both the Alternative 2 and 3 actions involve construction of landfills, creation of six new stockpile locations, construction of TLs, and clearing of vegetation. Scenic integrity would be modified by the alternatives; however, these actions are in harmony with the current landscape, a mixed-use environment. TVA does not anticipate any significant impacts to visual resources as a result of implementing Alternative 2 or 3 or reasonably foreseeable future actions; therefore, the TVA does not expect any significant cumulative impacts to occur.

## 4.10 Hazardous Materials and Waste

### 4.10.1 Alternative 1, No Action

Under the No Action Alternative, TVA would not implement the proposed emission reduction technologies or construct the new landfills. GAF would continue to use hazardous materials and generate hazardous wastes as part of day-to-day operations. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.10.2 Alternative 2, Across Discharge Channel Configuration

**Hazardous Materials Management**

Construction activities would require the on-site storage and use of hazardous materials such as fuels, paints, and lubricants. The accidental release of hazardous materials during construction activities could adversely affect the environment. Additionally, there is the potential for fire or explosion due to spillage of fuels or other chemicals. Accidental releases could occur as a result of vehicular accidents, equipment malfunction, or improper storage. These are common risks at all large construction projects. Proposed projects would be developed utilizing normal construction methods, which would limit, to the greatest extent possible, the use of hazardous materials. Any petroleum products or other hazardous materials used would be stored in proper containers, employing secondary containment, as necessary, to prevent and limit accidental spills. All spills and accidental discharges of petroleum products, hazardous materials, or waste would be reported and mitigated. The use, storage, transporting, and disposal of any hazardous materials would comply with applicable TVA guidance and all federal, state, and local laws and regulations.

Anhydrous ammonia would be stored on-site as part of Alternative 2. Anhydrous ammonia is classified as an extremely hazardous substance (EHS) with a corresponding threshold planning quantity of 500 lb. Because the proposed on-site storage of ammonia would exceed this quantity, TVA would include ammonia in its annual Tier II inventory report to TDEC and local agencies consistent with EPCRA Section 302 and 312.

Additionally, TVA would include in the Tier II report any other chemical exceeding its applicable EPCRA Section 302/312 threshold planning quantity. For specific measures related to the safe usage or storage of ammonia, please refer to Section 4.12.2.

**Other Process Wastes**

GAF currently generates a small number of regulated waste streams associated with normal plant operations. These wastes are managed according to TVA-SPP-05.64, *Hazardous Waste Management*. Under proposed activities, generation of new waste streams would be avoided to the greatest extent possible; however, new ammonia and mercury-related wastes would be created from proposed technology upgrades.

Anhydrous ammonia would be used to control oxides of NOx emissions through SCR. The $NO_x$ control system would involve injecting anhydrous ammonia directly into the hot flue gases. In an ideal reaction, all of the ammonia would react with the oxides of nitrogen and be consumed. The quantity of ammonia not consumed in the reaction depends on the type of coal burned and on the design of the air pollution control equipment. Some of the ammonia would escape as air emissions; however, for a dry scrubber burning coal with moderate amounts of sulfur, nearly all the ammonia would be captured and disposed with other dry CCR waste in the new landfill (TVA 2012c). The proposed SCR system would be designed to achieve good distribution and mixing of the injected ammonia with the flue gas; this combined with proper catalyst sizing and selection would ensure that ammonia slip is controlled to levels low enough that effects on ash properties would be insignificant. . Additional information regarding TVA's use of anhydrous ammonia to support SCR process, associated risks, and project design measures, are provided in Section 4.12.

Proposed activities also involve installing equipment to reduce mercury, to include activated carbon injection. Mercury occurs naturally in the coal in trace amounts. Injection of activated carbon upstream of particulate control equipment has the potential of providing a low-cost option for control of resulting mercury emissions from the flue gas. The mercury captured by the activated carbon would be contained within the ash and be disposed of on-site in the new landfills. Mercury captured within activated carbon has been shown to be very stable and unlikely to reenter the environment (ADA Environmental Solutions-ES 2006).

TVA would include the "otherwise" use of anhydrous ammonia on its TRI Form R. The onsite disposal of ammonia- and mercury-related wastes would also be reported on the Form R.

**Lead in Shooting Range**

A shooting range is currently located within the proposed SRL location for the landfill. The range, which is open on a daily basis, is operated by the Gallatin Gun Club and open only to its members. The range allows the use of non-magnum pistol and .22 caliber rifle ammunition. Bullets are captured in earthen berms located at distances of 25, 50 100, 200, and 300 yards (Gallatin Gun Club 2012).

If the SRL landfill is constructed, the shooting range would be characterized by TVA for lead contamination prior to cleanup. Any required cleanup would be conducted in accordance with federal or TDEC requirements, and any lead-contaminated waste removed from the range would be properly manifested and shipped to a permitted hazardous waste disposal facility. Cleanup of the range and the subsequent appropriate management of lead-contaminated wastes would not create any significant impacts.

**Regulated Construction Waste**

C&D activities would generate regulated hazardous materials used, anticipated to include petroleum products, compressed gases, paints, coatings, and adhesives. No acutely toxic hazardous materials would be used on site during construction. These wastes would be properly disposed of at approved solid waste facilities or recycled in compliance with TDEC waste regulations. In addition, demolition activities may also generate asbestos wastes (from removal of ESP ductwork) and lead (from structures with LBPs). Asbestos would be abated and properly disposed of prior to the demolition of the structures according to applicable requirements. Any asbestos removals would comply with the 10-day notification requirement to TDEC. All asbestos removal would be done by certified asbestos contractors, in accordance with OSHA asbestos regulations (Standards – 29 *CFR* 1926.1101). All parts of NESHAPs, 40 *CFR* Part 61 Subpart M – National Emission Standard for Asbestos would be followed during any abatement activities. Procedures for mitigating the release of asbestos fiber would include (as required) the use of curtains, shrouds, wet suppression, HEPA filters, and transport of asbestos in sealed containers. The disposal of asbestos would be done in accordance with USDOT regulation 49 *CFR* Parts 171-173.

Likewise, proper disposal of any resulting lead-containing wastes would be conducted in accordance with TDEC and federal regulations, including the Toxic Substances Control Act of 1976 and OSHA (Act of 1970). Further, these wastes would be accompanied by a waste manifest and disposed of at an approved facility. The appropriate management of asbestos and LBP wastes would not be expected to create any significant impacts, and these materials would not be employed for new construction. Consequently, there would be beneficial impacts from the removal of existing asbestos and LBP.

Asbestos and lead wastes generation from demolition activities would be temporary in nature and would not be expected to change the long-term hazardous waste generator status of the facility. However, TVA would comply with TDEC waste stream notifications and fee payment requirements for these wastes. None of these materials pose significant potential for off-site impacts as a result of the quantities on site, their relative toxicity, their physical state, and/or their environmental mobility.

**Mitigations/BMPs**

The following measures would be implemented to minimize any potential impacts from the management of hazardous materials and waste:

- Proper management of hazardous materials/wastes in accordance with established procedures.
- Recycling or making available for reuse C&D material, when practicable, in accordance with legal requirements.
- Using waste minimization techniques and on-site segregation of waste practices, when practicable.

- Complying with all TDEC guidelines regarding disposal of waste materials, including asbestos and LBP management activities prior to demolition.

### 4.10.3 Alternative 3, Close Coupled Configuration

There are no environmental consequences associated with hazardous materials/hazardous waste management for Alternative 3 not previously discussed under Alternative 2. As such, no significant adverse impacts would occur.

**Mitigations/BMPs**

Provided TVA follows all regulatory requirements in the management of hazardous materials and waste, no additional mitigations or BMPs would be required for Alternative 3.

### 4.10.4 Summary of Impacts

Both Action Alternatives would result in the use of hazardous materials and generation of hazardous wastes. However, regulatory requirements for management and disposal of such items would be followed and internal TVA procedures have been developed and implemented to ensure compliance with regulatory requirements. As a result, TVA anticipates no significant adverse impacts under either Action Alternative.

### 4.10.5 Cumulative Impacts

The alternative actions would incrementally contribute to hazardous waste generation during construction. However, this generation would cease once construction is completed. There are no cumulative impacts associated with implementation of the alternatives.

## 4.11 Noise

### 4.11.1 Alternative 1, No Action

Under the No Action Alternative, new construction and/or demolition of any facilities would not take place and current operations would continue with no foreseeable changes. GAF currently operates at a fairly high capacity; it is unlikely that it would operate at any higher capacities in the future. Thus, noise levels would continue at current levels, which have no adverse impacts to surrounding residents. TVA would eventually have to cease operating the coal units sometime in 2015 to 2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.11.2 Alternative 2, Across Discharge Channel Configuration

Noise from project-related activities was evaluated using Roadway Construction Noise Model (RCNM) version 1.1, the Federal Highway Administration’s standard model for the prediction of construction noise (USDOT 2006). RCNM has the capability to model numerous types of construction and project --specific equipment expected to be the dominant noise sources associated with this action. Construction equipment was chosen for each aspect (plant construction, landfill construction, TL installation, and operations) of the project to determine potential noise impacts to nearby receptors. Construction noise is expected be limited to normal working hours (7:00 a.m. to 7:00 p.m.). If construction would be conducted after normal working hours, construction noise would be subject to a 10 dB penalty due to decreased community background noise and increased sensitivity during sleeping hours. Noise impacts were quantified using the 8-hour noise level equivalent ($L_{eq[8]}$) noise metric as calculated on an average, busy working day during construction.

Construction noise was evaluated at various distances from the construction equipment. Noise levels were evaluated for receptors at 100-foot increments as well as at distances from the construction site to identified receptors (Table 4-8, Figure 4-2). Noise abatement measures were not considered in this analysis, as it is unknown if abatement procedures would be utilized; this provides for a more conservative analysis. Noise levels above 65 dBA are considered potentially significant.

**Table 4-8. Potential Sensitive Noise Receptors and Distance**

| Location[1] | Distance (in miles)[2] | |
|---|---|---|
| | From Plant | From NRL Landfill |
| Residential area N | 1.55 | 0.93 |
| 2005 Noise Measurement #1[3] | 1.85 | 1.03 |
| Residential Area E/2005 Noise Measurement #2[3] | 1.1 | 1.1 |
| Residential Area S/2005 Noise Measurement #3[3] | 0.71 | 1.47 |
| Residential Area SW | 1.1 | 1.79 |
| Residential Area NW | 1.6 | 1.6 |
| CRAC Facility | 0.1 | 0.9 |

E = East; N = North; NW = Northwest; SW = Southwest.
(1) Locations of sensitive receptor areas (i.e., residential areas, schools, churches, hospitals, etc.) in the vicinity of the project site were identified using GoogleEarth.
(2) Approximate distances were measured using GoogleEarth from the sensitive receptors to the plant or proposed landfill location.
(3) 2005 Noise Measurements refer to the locations of the 2005 noise survey completed for the Gallatin Fossil Plant Rail Coal Unloading and Blending Facility, Sumner County (TVA 2005).

## Construction Activities

### Plant Construction

Construction activities at the plant would consist of the use of various types of construction equipment, such as cranes, bulldozers, drills, truck-mounted augers, and other large trucks. Noise from such activities would cause an increase in noise in the immediate vicinity of the project area where the equipment is operating. Because the CRAC facility would be removed early in the construction process, the closest sensitive receptor is Residential Area S, which would have an average 8-hour noise level of 49.5 dBA.

### Transmission Line Installation

TVA's proposed action would require additional TLs to support the dry FGD operations. The installation would require clearing of trees and vegetation. The equipment noise would be at 65 dBA or below beyond 500 feet of the source (Table ). Noise levels from the site preparation and installation would not have adverse impacts on sensitive receptors located near GAF.

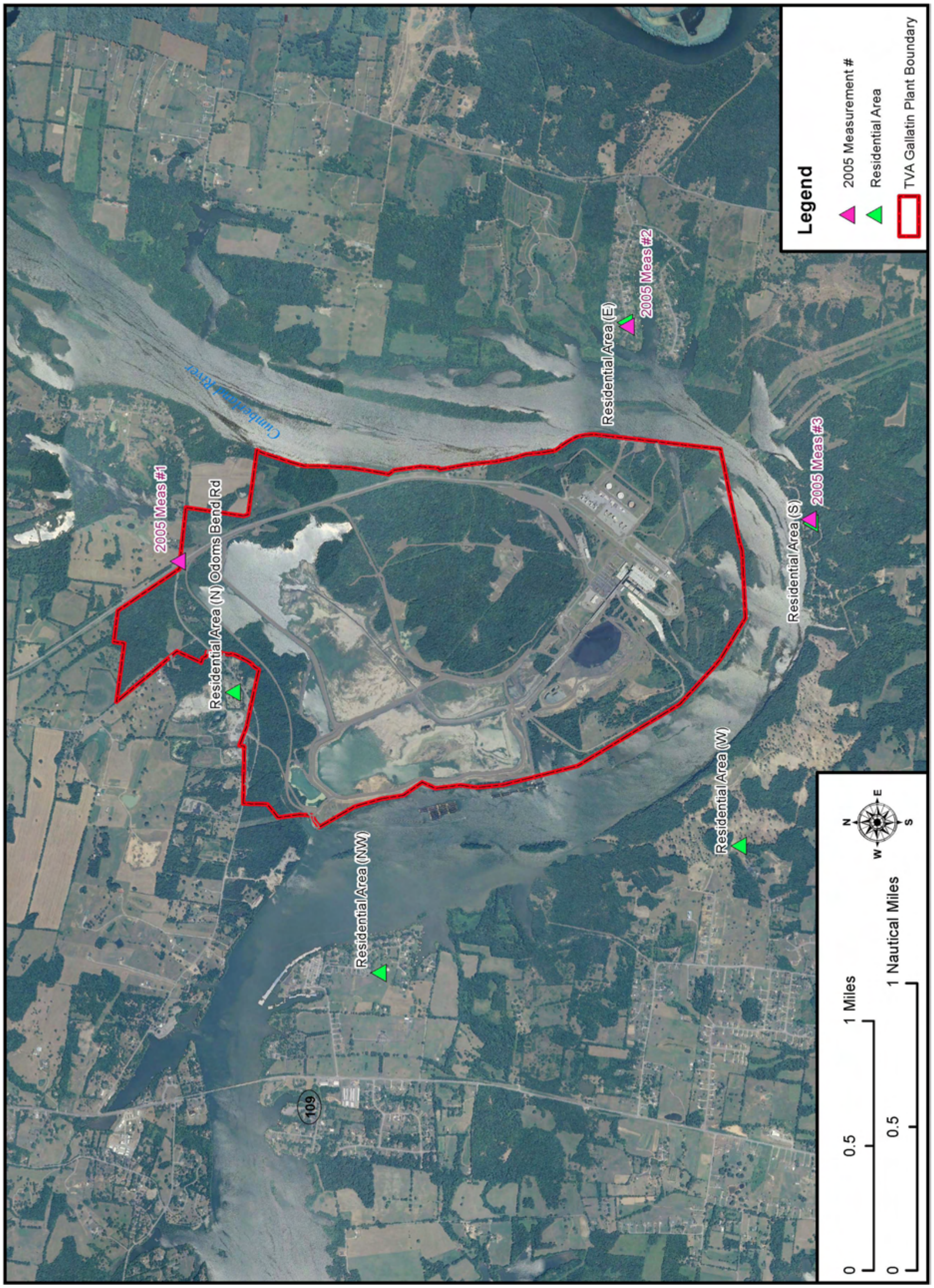



**Figure 4-2. GAF Noise Receptor Sites**

### Landfill Construction

The construction of the landfill would require blasting and large equipment and transport trucks to remove earth from the site. The noise levels from the construction equipment are shown in Table 4-9. Equipment noise levels would diminish below 65 dBA beyond 500 feet of the source. Blasting causes short-impulse noise and ground vibration. The ground vibration is often the primary cause of annoyance and potential structural damage.

**Table 4-9. Construction Noise Levels at Sensitive Receptor Location**

| Receptor Location Description | Distance From Activity (miles) | Maximum Sound Level ($L_{max}$)[1] (dBA) | Equivalent Sound Level ($L_{eq(8)}$)[2] (dBA) |
|---|---|---|---|
| Plant Construction | | | |
| Residential Area N | 1.55 | 40.7 | 42.7 |
| 2005 Noise Measurement (NM) #1 | 1.85 | 39.2 | 41.1 |
| Residential Area E/2005 NM #2 | 1.1 | 43.7 | 45.7 |
| Residential Area S/2005 NM #3 | 0.71 | 47.5 | 49.5 |
| Residential Area SW | 1.1 | 43.7 | 45.7 |
| Residential Area NW | 1.6 | 40.4 | 42.4 |
| 100-ft Increment from Project Site | 0.02 | 79.0 | 80.9 |
| 200-ft Increment from Project Site | 0.04 | 73.0 | 74.9 |
| 300-ft Increment from Project Site | 0.06 | 69.4 | 71.4 |
| 400-ft Increment from Project Site | 0.08 | 66.9 | 68.9 |
| 500-ft Increment from Project Site | 0.09 | 65.0 | 67.0 |
| Transmission Line[3] | | | |
| Residential Area N | 1.55 | 42.7 | 41.1 |
| 2005 NM #1 | 1.85 | 41.2 | 39.6 |
| Residential Area E/2005 NM #2 | 1.1 | 45.7 | 44.1 |
| Residential Area S/2005 NM #3 | 0.71 | 49.5 | 47.9 |
| Residential Area SW | 1.1 | 45.7 | 44.1 |
| Residential Area NW | 1.6 | 42.4 | 40.9 |
| 100-ft Increment from Project Site | 0.02 | 81.0 | 79.4 |
| 200-ft Increment from Project Site | 0.04 | 75.0 | 73.4 |
| 300-ft Increment from Project Site | 0.06 | 71.4 | 69.9 |
| 400-ft Increment from Project Site | 0.08 | 68.9 | 67.4 |
| 500-ft Increment from Project Site | 0.09 | 67.0 | 65.4 |
| Landfill Construction | | | |
| Residential Area N | 0.93 | 54.2 | 46.1 |
| 2005 NM #1 | 1.03 | 53.3 | 45.2 |
| Residential Area E/2005 NM #2 | 1.1 | 52.7 | 44.6 |
| Residential Area S/2005 NM #3 | 1.47 | 50.2 | 42.1 |
| Residential Area SW | 1.79 | 48.5 | 40.4 |
| Residential Area NW | 1.6 | 49.4 | 41.4 |
| 100-ft Increment from Project Site | 0.02 | 88.0 | 79.9 |
| 200-ft Increment from Project Site | 0.04 | 82.0 | 73.9 |
| 300-ft Increment from Project Site | 0.06 | 78.4 | 70.4 |
| 400-ft Increment from Project Site | 0.08 | 75.9 | 67.9 |
| 500-ft Increment from Project Site | 0.09 | 74.0 | 65.9 |

dBA = A-weighted decibels; E = East; ft = foot; GAF = Gallatin Fossil Plant; N = North; NW = Northwest; S = South; SW = Southwest.

(1) $L_{max}$ reports the sound level of the loudest piece of equipment at the specified distance from the source.

(2) $L_{eq(8)}$ is a metric reflecting the average continuous sound level over an 8-hour period.

(3) The exact location the transmission line would be installed is unknown; therefore, the distance from the plant to the receptor was used for the noise analysis.

The state of Tennessee has determined a maximum ground vibration at any dwelling, public building, school, church, or commercial or institutional building normally occupied adjacent to the blasting site shall not exceed specified peak particle velocity limits based on the building distance from the blast site, or the operation must comply with the scaled distance equations, which determines the maximum weight of explosives that can be detonated per a delay interval of 8 milliseconds or greater to protect nearby structures. The airblast (noise) is not to exceed 140 dB at the locations of sensitive receptors (TCA §§68-105-108, Public Chapter No. 231, 2007).

Blasting activities would follow all applicable state and federal standards to ensure no damage to nearby structures from vibration or noise. Blasting would take place on an as-needed basis during daylight hours only. The proposed landfill site is located approximately 4,500 feet from residences and the CRAC facility; thus, impacts to structures are expected to be minimal with appropriate planning.

**<u>Operations</u>**

The primary source of operational noise would be from ID fans and large trucks used to haul waste materials to the landfill. For purposes of analysis, it was conservatively assumed that the ID fans were not enclosed in buildings and did not use any noise controls. The ID fans produce noise levels of 85 dB, 3 feet from the fan. For personnel working within the vicinity of the ID fans, PPE would be required per TVA safety procedure s (TVA 2012). Noise levels that exceed 55 dBA DNL at the nearest residence and an increase in 3 dB are indicators of possible impacts and require additional consideration.

Based on a conservative analysis, TVA determined there is a potential to increase noise levels at residential areas east and south by 4 dB, comparing these alternative noise levels to the 2005 noise survey measurements. Changes in sound level of 3 or 4 dB are barely perceptible to the human ear and TVA determined that long-term operational noise would not exceed 55 dB DNL at any of the residential areas. Due to thick vegetation and trees between the plant and sensitive receptors, the operational noises also would attenuate fairly rapidly, thus having little impact on the current noise levels at receptor locations (Table 4-10). Considering all of this, although there would be some small increase in plant operational noise compared to 2005 ambient levels, this is not expected to be significant. In addition, noise anticipated from testing the alarms from ammonia storage areas would be intermittent and short-term in duration. Due to thick vegetation and trees between the plant and sensitive receptors, the operational noises would attenuate fairly rapidly, thus having little impact on the current noise levels at receptor locations (Table 4-10).

**<u>Mitigations/BMPs</u>**

There are no mitigations or project specific BMPs for noise impacts over and above existing regulatory requirements.

**Table 4-10. Potential Sensitive Receptor Area (SRA) Impacts – Operational Noise**

| Receptor Location Description Related to Plant Operation | Distance From Activity (miles) | Maximum Sound Level ($L_{max}$)$^1$ (dBA) | Equivalent Sound Level ($L_{eq(8)}$)$^2$ (dBA) |
|---|---|---|---|
| Residential Area N | 1.55 | 38.9 | 43.6 |
| 2005 Noise Measurement (NM) #1 | 1.85 | 37.4 | 38.9 |
| Residential Area E/2005 NM #2 | 1.1 | 41.9 | 43.4 |
| Residential Area S/2005 NM #3 | 0.71 | 45.7 | 47.2 |
| Residential Area SW | 1.1 | 41.9 | 43.4 |
| Residential Area NW | 1.6 | 38.6 | 40.2 |
| 100-ft Increment from Project Site | 0.02 | 77.1 | 78.7 |
| 200-ft Increment from Project Site | 0.04 | 71.1 | 72.7 |
| 300-ft Increment from Project Site | 0.06 | 67.6 | 69.1 |
| 400-ft Increment from Project Site | 0.08 | 65.1 | 66.6 |
| 500-ft Increment from Project Site | 0.09 | 63.2 | 64.7 |

dBA = A-weighted decibels; E = East; ft = foot; GAF = Gallatin Fossil Plant; N = North; NM = noise measurement; NW = Northwest; S = South; SW = Southwest.
(1) $L_{max}$ reports the sound level of the loudest piece of equipment at the specified distance from the source.
(2) $L_{eq(8)}$ is a metric reflecting the average, continuous sound level over an 8-hour period.

### 4.11.3 Alternative 3, Close Coupled Configuration

Noise impacts would be similar to those discussed for Alternative 2. The close coupled configuration may have slightly higher level of cumulative noise. The difference between the noise effects to off-site receptors based on the two configurations are negligible (would not be perceptible to human ears). The primary difference would be that the CRAC facility would not be relocated under Alternative 3. The noise levels expected from each portion of the project are shown in Table 4-11. Construction of the clean air equipment would cause the highest noise levels but is not expected to cause harm to any personnel working outside at noise levels of 66.5 dBA for short periods of time. No adverse noise impacts are expected under Alternative 3.

**Table 4-11. Alternative 3 Noise Levels at CRAC Facility**

| Activity | Distance From Activity (miles) | Maximum Sound Level ($L_{max}$)$^1$ (dBA) | Equivalent Sound Level ($L_{eq(8)}$)$^2$ (dBA) |
|---|---|---|---|
| Plant Construction | 0.1 | 64.5 | 66.5 |
| Transmission Line | 0.1 | 66.5 | 64.9 |
| Landfill Construction | 0.9 | 54.4 | 46.4 |
| Plant Operation | 0.1 | 62.7 | 64.2 |

CRAC = Cumberland River Aquatic Center; dBA = A-weighted decibels; TWRA = Tennessee Wildlife Resources Agency.
(1) Lmax reports the sound level of the loudest piece of equipment at the specified distance from the source.
(2) $L_{eq(8)}$ is a metric reflecting the average, continuous sound level over an 8-hour period.

**Mitigations/BMPs**

There are no mitigations or BMPs for noise impacts over and above regulatory existing requirements.

### 4.11.4 Summary of Impacts

No significant adverse noise impacts are expected under either Action Alternative. Construction noise impacts are not expected at receptors located off-site. Blasting activities may cause some annoyance due to unexpected impulse noises and residual vibrations. No significant adverse impacts are expected from blasting activities provided appropriate planning and Tennessee blasting standards are implemented. Operational noise under either Action Alternative would cause little change to current baseline noise levels. Implementation of Transportation mitigations associated with utilizing shift work and staggering deliveries during construction activities outside of normal work hours may cause some annoyance to local residents. As a result, such mitigations should be considered only as necessary.

### 4.11.5 Cumulative Impacts

Cumulative impacts to receptors located in the vicinity of GAF are not expected as both construction and operational noise would attenuate to background levels at receptor locations. Blasting activities may cause annoyance from the impulse noise and possible vibrations. Noise from blasting would be short-term and during daytime hours only. With an approved blast plan and following Tennessee Codes for blasting, impacts would be minimized.

## 4.12 Public Health and Safety

### 4.12.1 Alternative 1, No Action

Under the No Action Alternative, TVA would not implement the proposed emission reduction technologies or construct the new landfills. GAF would continue to apply established safety protocols and procedures in day-to-day operations. Consequently, there would be no potential for additional adverse impacts associated with implementation of the No Action Alternative. TVA would eventually have to cease operating the coal units some time in 2015-2017 to comply with the FFCA and/or the Utility MATS unless requirements are changed.

### 4.12.2 Alternative 2, Across Discharge Channel Configuration

**Workplace Health and Safety**

Day-to-day operation and maintenance activities at GAF would continue to be performed in accordance with applicable standards as prescribed by OSHA requirements or specific TVA guidance. Additionally, construction-related activities would require the establishment of appropriate job site safety plans explaining how job safety would be ensured throughout the life of the project.

During construction or demolition activities, standard industrial safety standards and BMPs would be followed. These would include implementing procedures to ensure that equipment guards, housekeeping, and PPE are in place; establishing programs and procedures for lockout, right-to-know, confined space, hearing conservation, forklift operations, and other activities; conducting employee safety orientations and performing regular safety inspections; and developing a plan of action for the correction of any identified hazards. No unusual job site safety risks are expected from these activities.

TVA also would train workers about hazards and would ensure that a chemical inventory and an MSDS be available for each chemical utilized.

**Ammonia Handling, Transport, and Storage,**

Anhydrous ammonia would be used as a reagent in the SCR systems. Anhydrous ammonia is a clear, colorless gas at standard temperature and pressure conditions and has a very characteristic odor. The odor is the strongest safety feature of the product. At a concentration of only 5 parts per million (ppm), an individual can ascertain the ammonia odorous characteristic. Anhydrous ammonia is an irritant and corrosive to the skin, eyes, respiratory tract, and mucous membranes. Exposure to liquid or rapidly expanding gases may cause severe chemical burns and frostbite to the eyes, lungs, and skin. Skin- and respiratory-related diseases can be aggravated by exposure. The reportable quantity under CERCLA for release of ammonia is 100 lb. Table 4-12 provides ammonia exposure levels and effects on the human body. When anhydrous ammonia is released from compression in a storage tank (200 pounds per square inch [psi]) to the atmosphere, the temperature drops from 100°F to minus 28°F. At this temperature, ammonia freeze-burns human skin on contact. Since anhydrous ammonia is stored under high pressure, a sudden rupture can shoot ammonia 10 to 20 feet from the point of release (Nowatzki 2011).

**Table 4-12. Ammonia Exposure Levels and Associated Effects**

| Exposure (ppm) | Effect on the Body | Permissible Exposure |
|---|---|---|
| 50 ppm | Detectable by most people | No injury from prolonged, or repeated exposure |
| 134 ppm | Irritation of nose and throat | Eight hours maximum exposure |
| 700 ppm | Coughing, severe eye irritation, may lead to loss of sight | One hour maximum exposure |
| 1,700 ppm | Serious lung damage, death unless treated | No exposure permissible |
| 2,000 ppm | Skin blisters and burns within seconds | No exposure permissible |
| 5,000 ppm | Suffocation within minutes | No exposure permissible |

Source: Nowatzki 2011
ppm = parts per million

The American Congress of Governmental Industrial Hygienists has assigned ammonia a threshold limit value – time weighted average (TLV-TWA) of 25 PPM. This is the time-weighted vapor concentration that a worker can be exposed to for a normal 40 hour work week without adverse effect. They have also assigned ammonia a threshold limit value - short term exposure limit (TLV-STEL) of 35 PPM. Workers should be able to withstand for 15 minutes exposures at the TLV-STEL concentrations with no ill effects. The Emergency Response Planning Guide 2 (ERPG2) Level of Concern (LOC) established by the Emergency Response Planning Guidelines and accepted by the American Industrial Hygiene Association is 200 parts per million (0.14 mg/L). This level is defined as “the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

TVA would acquire anhydrous ammonia from a supplier and transport would be via truck or rail by a non-TVA contractor. Upon delivery to GAF, TVA's employees trained to handle anhydrous ammonia would be responsible for proper handling and management. During transport and delivery, an ammonia release may occur as a result of spills from transferring from the source to transport vehicle, accidents or spills during transport, accidental venting, and tank ruptures at the ammonia tank farm. The currently identified ammonia supplier is in Courtright, Ontario, and would most likely transport ammonia to GAF by tanker truck. Trucks would likely follow local roads to I-94 to the Detroit area, south to the Cincinnati area on I-75, southwest on I-71 to the Louisville area, and then I-65 south. After crossing the Kentucky-Tennessee border, the likely route would be SR 109 south to Airport Road and Steam Plant Road, a total distance of about 580 miles. Other potential highway routes would also be predominantly on interstate highways and comparable to somewhat longer distances. Ammonia can be released during a transportation accident and the extent of impact in the event of such a release would depend upon the location of the accident and the rate of dispersion of ammonia vapor from the surface of the anhydrous ammonia pool.

TVA's contractors delivering anhydrous ammonia would be required to comply with Federal Hazardous Materials Transportation Law (49 U.S.C. § 5101 et seq.) and the USDOT Regulations (49 C.F.R. Subpart H, § 172- 700). Anhydrous ammonia would be delivered to the GAF in USDOT-certified vehicles with design capacities of 8,000 gallons, designed to DOT Code MC-307 and designed to haul caustic materials such as ammonia.

To address the issue of risk from ammonia transport, TVA staff reviewed the technical and scientific literature on hazardous materials transportation (including tanker trucks) accident rates in the U.S. and data indicates the frequency of hazardous materials during transportation is between 0.06 and 0.19 releases per 1,000,000 miles traveled on well-designed roads and highways (Davies and Lees 1992, Harwood 1993). Each delivery would travel approximately 580 miles from the supplier in Ontario to the GAF ammonia tank farm. TVA considered data from the USDOT showing the actual risk of a fatality over the past five years from all modes of hazardous material transportation (rail, air, boat, and truck), which is approximately 1 in 10,000,000. Data indicates ammonia releases nationwide while in transport mode are most likely the result of driver error, weather conditions such as high wind speed and rain, or other hazardous road conditions (PHMSA 2013). The use of anhydrous ammonia for the operation of the proposed SCR systems would require about five tanker truck deliveries each week. With proper implementation of regulatory requirements related to driver training, tanker truck design criteria, and measures for leak detection while in transport, there is a low probability of an accidental release during transport resulting in exposure to significant concentrations of anhydrous ammonia.

For on-site risks, the worst-case scenarios for accidental release of ammonia would be the sudden and complete failure of a storage tank or tanker truck resulting in the release of a full tank of ammonia. A storage tank failure could result in the release of up to 18,000 gallons and a tanker truck failure could result in the release of up to 7,200 gallons of ammonia. Alternate release scenarios include events with a higher likelihood of occurrence, but much smaller volume of released ammonia. A ¼-inch diameter hole in the storage tank or tanker truck, such as a rupture of a gasket or a pump seal leak, could release about 3,600 lbs of ammonia at a release rate of 120 lbs per minute for 30 minutes. A leak from a 2-inch diameter hole in the storage tank or tanker truck, such as a transfer hose failure or sudden uncoupling, could cause a release of 2,380 lbs of ammonia at a release rate of 238 lbs per minute for 10 minutes. A leak in the supply line connecting the storage tanks to the vaporizers, caused by a 2.5-inch diameter hole, could release 2,540 lbs of ammonia at a rate of 254 lbs per minute for 10 minutes. The duration of these tank leaks and process line leaks is based on the assumed time required for employees to isolate and contain the leak (TVA 2003).

TVA has a comprehensive program to minimize the potential for the accidental release of ammonia stored onsite at GAF. Like the other seven TVA facilities that have SCRs, the proposed anhydrous ammonia system at Gallatin will be subject to the OSHA Process Safety Management standard (29 *CFR* 1910.119) and EPA's Risk Management Program rules (40 CFR Part 68). A Risk Management Plan (RMP) will be developed and implemented to prevent an accidental release of ammonia. The release prevention program in the plan includes the following sections; Process Safety Information, Process Hazard Analysis, Operating Procedures, Training, Mechanical Integrity, Management of Change, Pre-startup Safety Review, Compliance Audits, Incident Investigations, Employee Participation, Contractors, Emergency Response Plan, and Analyses of Off-site Consequences. Prior to receipt of ammonia, the Risk Management Plan must be submitted to EPA. Also, the potential off-site consequences and emergency response plan are discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically.

The RMP must also be revalidated at 5-year intervals and a synopsis of the program resubmitted to EPA. TVA would develop an RMP that would describe the overall management structure, all the risks, and all the physical and operational methods designed to minimize the likelihood of an accidental ammonia release. The RMP would also contain a detailed preventive maintenance program and inspection program for the entire ammonia system. A worst-case impact scenario would be defined as well as an ERP. The ERP would include all aspects of ERP requirements, including adequate first aid and medical treatment, safe shelter-in-place locations, notification of local emergency response agencies and the public, and qualified contractor responder for post-incident decontamination of affected areas. Periodic emergency response drills would be conducted to keep employees, contractors, and local responders familiar with the plan. The applicable chemical accident prevention measures required under 40 *CFR* 68 would also be implemented prior to filling of the anhydrous ammonia storage system or receipt of ammonia in quantities exceeding 10,000 lbs.

Implementation of proper engineering and equipment design, administrative controls such a employee training, and compliance with regulatory requirements related to storage of ammonia, would insure that the risks associated with the ammonia remains low.

TVA has not experienced problems from ammonia contamination of fly ash or water discharges at its other plants with operating SCR facilities. Implementation of proper engineering and equipment design, administrative controls such a employee training, and compliance with regulatory requirements related to anhydrous ammonia transport, would assure a low probability of accident or malfunction resulting in a significant health risk.

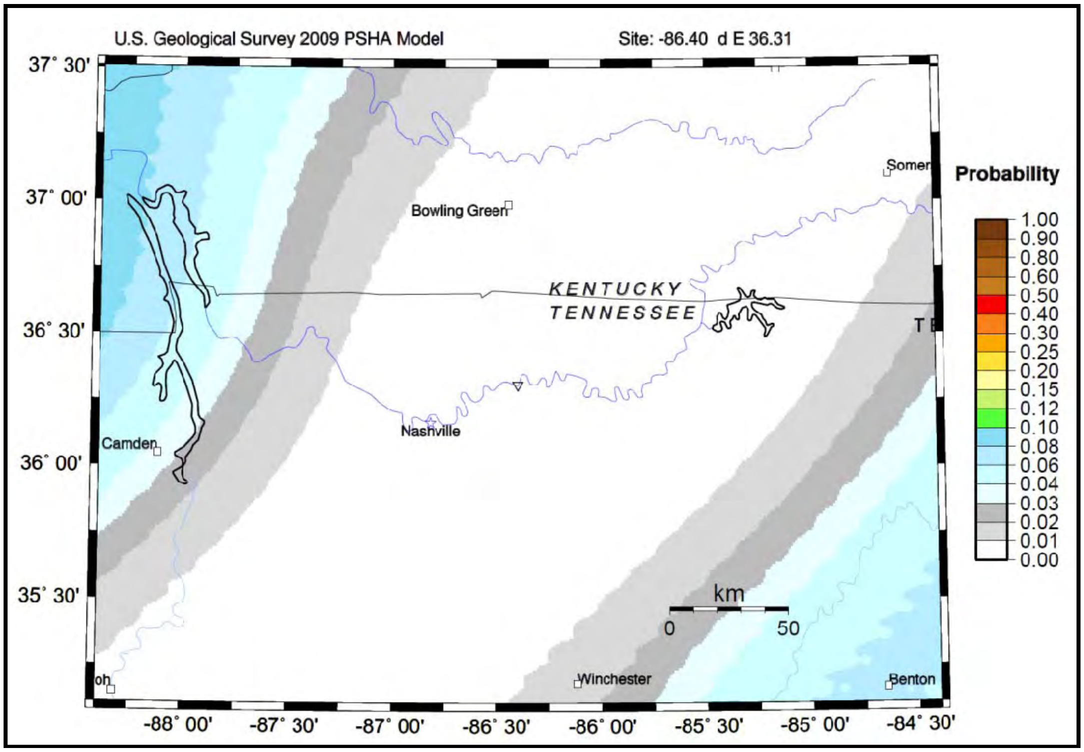
**Earthquake Hazards**

Seismic events affecting central Tennessee, and thus the plant site, primarily emanate from two zones of earthquake activity, the New Madrid Seismic Zone and the Southern Appalachia Seismic Zone. The most active zone of the Southern Appalachian zone, the East Tennessee Seismic Zone (ETSZ), extends from northwestern Georgia through eastern Tennessee. However, most earthquakes emanating from this zone are relatively low in magnitude, with the largest known event in the ETSZ registering a magnitude of 4.6, suggesting a low risk of damage at the subject plant site from a seismic event emanating from the ETSZ (Stantec 2009).

Figure 4-3 and Figure 4-4 depict the probability of an earthquake with a magnitude greater than 5.0 occurring within 50 km of GAF every 50 and 500 years, respectively. These probabilities were computed from the source model of the 2008 U.S. Geological Survey (USGS) National Seismic Hazard Mapping Project (USGS 2012).

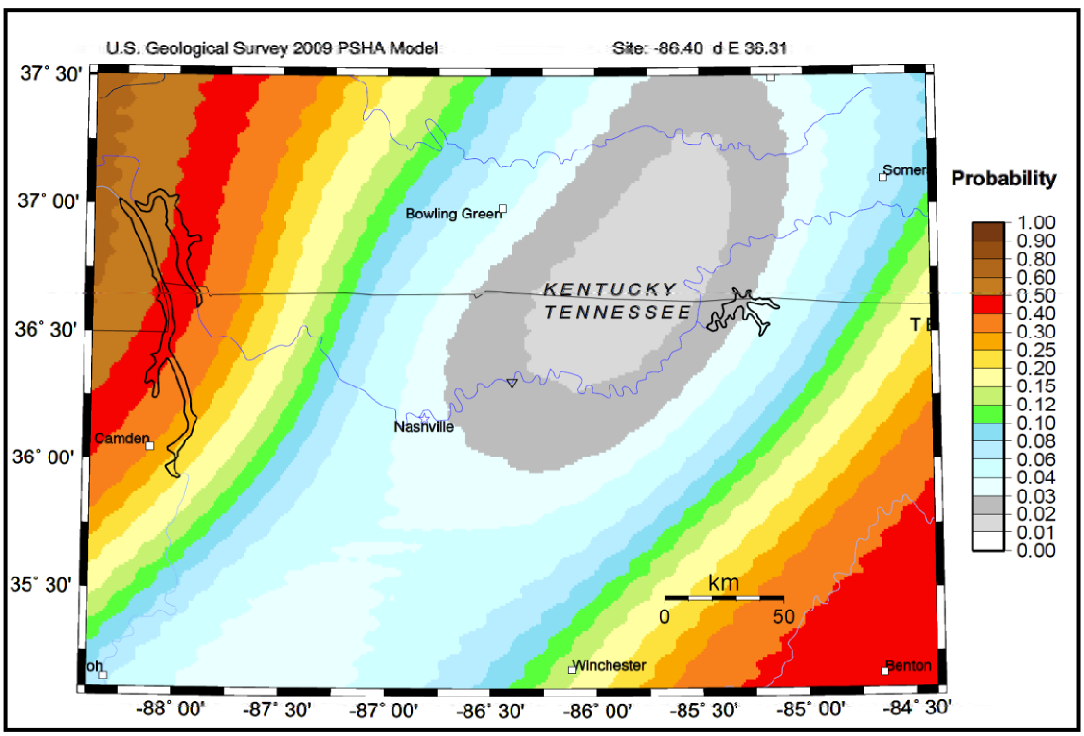
As the figures show, there would be zero probability of a magnitude 5.0 earthquake occurring regionally within the next 50 years, and only between a 0.02 and 0.03 probability of such an earthquake occurring in the next 500 years.

Regardless, the earthquake hazard to ordinary buildings at the proposed project site would be addressed through adherence to the seismic provisions of the Uniform Building Code. Storage of ammonia or transportation of such substances through underground or aboveground piping would implement special designs and selective siting to address seismic hazards. Compliance with appropriate construction codes would make potential environmental impacts due to the effect of seismic activity on the ammonia storage system insignificant.




Source: USGS 2012

**Figure 4-3. Probability of Earthquake with Magnitude Greater Than 5.0 Every 50 Years and Within 30 Miles**




Source: USGS 2012

**Figure 4-4. Probability of Earthquake with Magnitude Greater Than 5.0 Every 500 Years and Within 30 Miles**

## Tornado Hazards

To determine the probability of a tornado affecting GAF, information on historical tornado activity in the region was obtained from Tornado Climatology of the Contiguous United States (Nuclear Regulatory Commission [NRC] 2007). This report documents tornado activity in the United States from the period of 1953 to 2003. The number of tornados is recorded for each geographic area across the United States, with each area defined as a box comprising two degrees of latitude by two degrees of longitude. For the region encompassing GAF (86°W to 88°W by 35°N to 37°N), this equates to an area of approximately 15,764 $mi^2$.

The average tornado path affects an area of 2.82 $mi^2$ (Thom 1963). As an example, this would be equivalent to a tornado with a path width of 0.25 mile and a travel distance of 11.28 mi (0.25 mi x 11.28 mi = 2.82 $mi^2$). For the affected area discussed above, 355 tornadoes occurred during the 53-year period of 1950 to 2003 (NRC 2007). This results in a tornado frequency of 6.7 tornadoes per year (355 tornadoes/53 years = 6.7). The annual probability of affecting a particular site in the region, such as GAF, may be calculated as follows:

$$\text{Annual Probability} = \frac{(6.7\ \textit{tornados/year}) \times (2.82\ \textit{mi}^2\ \textit{affected area/tornado})}{(15{,}764\ \textit{mi}^2\ \textit{study area})}$$

$$\text{Annual Probability} = 0.0012$$

In other words, there is a 0.12 percent probability each year of a tornado affecting a particular site in the study area. This is approximately one-tenth of one percent chance per year.

Another way to express risk is to calculate how often, on average, a tornado may affect a particular site. This may be calculated by:

$$\text{Recurrence Interval} = 1/(0.0012\ \textit{per year}) \sim 833\ \textit{years}$$

So, on average, a tornado would be expected to affect GAF once every 833 years. Additionally, the probability of a Class F tornado (the most destructive type) occurring is about 0.15. The resulting probability of a Class F tornado in the study area is about $1.8 \times 10^{-4}$ (0.0012 x 0.15). This low probability means the likelihood of a tornado causing a catastrophic ammonia release at GAF is insignificant.

## Blasting Hazards

The construction of the landfills may require explosive blasting of rock during excavation activities. Commercial explosives release tremendous amounts of energy when detonated. The blast design challenge is to effectively use this energy in the most efficient way to fragment rock in a controlled way. Severe injury or death, or damage to structures, can result from the accidental discharge of explosives or from the blast wave or rock ejected (flyrock) from planned explosions. Damage to structures may also be caused by excessive vibration during explosive detonations.

Prior to any blasting activity, TVA would develop a detailed blasting plan to protect workers and nearby neighbors. The plan would document the specifications or rules that clearly define the performance and safety requirements of the work. The plan would also include the proper hearing protection for workers in the vicinity of the blast and would ensure that the use, transportation, and storage of explosives is being conducted in accordance with all applicable regulations, including 29 *CFR* 1926.900, *Blasting and the Use of Explosives*; 49 *CFR* Parts 171-179, *Highways and Railways*, and 49 *CFR* Parts 390-397, *Motor Carriers* (transportation); and 27 *CFR* Part 55, *Commerce in Explosives* (storage).

Controlled blasting techniques would be employed to prevent flyrock, misfires, and adverse off-site impacts by limiting charge weights detonated per time delay. Drilling and blasting would take place only to the depth, amount, and at such locations, with explosives of such quantity, distribution, and density, that would not produce unsafe or damaged rock beyond the prescribed excavation limits. All possible care would be exercised in drilling and blasting operations to prevent excess ground vibrations and air overpressures and limit flyrock to the blasting area as defined by the Mining Safety and Health Administration.

Other controlled techniques would include the following:

- Ensuring that only blasters or contractors with appropriate experience are allowed to perform the work.
- Purchasing explosives in the minimum amount required, with any excess explosives returned to the vendor.
- Siting explosive storage areas at applicable safe distances from personnel or structures.
- Ensuring that explosives storage areas/buildings are accessible only to authorized personnel.
- Securing blasting areas and notifying workers and nearby residents before a blasting activity occurs.
- Ensuring careful placement of measured explosive quantities in blast holes.
- Limiting explosives quantities per time delay, starting with the smallest quantities of explosives possible and scaling up to production-size blasts.
- Initiating blasting time delays to mitigate ground vibrations toward the closest structures or facility.

The specific quantities of explosives that would be used or stored on-site would be determined based on the project requirements. The first production blast would be performed as a test blast to establish optimum explosive charge, drill patterns for the given rock formations, and delay timing between explosive charges. This test blast would also provide information on the design parameters required to minimize the generation of dust, ground vibrations, air blast, and flyrock. Implementation of the elements described above would ensure that proposed blasting activities would not result in significant impacts.

**Mitigations/BMPs**

The following measures would minimize any potential impacts associated with health and safety under Alternative 2:

- Implementing appropriate industrial safety standards and BMPs during all construction activities.

- Applying comprehensive process controls for the ammonia system that would include the use of redundant active and passive emergency response and control measures.
- Developing an ammonia RMP/ERP designed to minimize the likelihood of an accidental ammonia release.
- Ensure that, regardless of which vendor supplies the anhydrous ammonia, delivery will be made in a tanker that meets or exceeds the specifications required by regulations.
- Developing a site-specific blasting plan that would include detailed procedures designed to protect workers and nearby neighbors.

Provided TVA follows all internal safety procedures and regulatory requirements during the construction and operation phases of the project, no additional mitigations or BMPs would be required for Alternative 2.

### 4.12.3 Alternative 3, Close Coupled Configuration

Potential impacts for Alternative 3 would be similar to those described previously under Alternative 2.

**Mitigations/BMPs**

Provided TVA follows all internal safety procedures and regulatory requirements during the construction and operation phases of the project as described for Alternative 2, no additional mitigations or BMPs would be required for Alternative 3.

### 4.12.4 Summary of Impacts

Project design measures and plans, such as development of a RMP and employee certifications for anhydrous ammonia handling and storage on-site at GAF, will be implemented to assure no significant adverse impacts to public health and safety. Proposed conditions of certification address the issue of the transportation, storage, and use of anhydrous ammonia.the proposed project will comply with all applicable laws, ordinances, regulations, and standards. Potential for natural disasters is minimal. Implementation of regulatory safety requirements for handling of explosives for blasting would also serve to minimize potential adverse impacts from blasting activities.

### 4.12.5 Cumulative Impacts

No cumulative impacts to health and safety associated with implementation of the alternatives have been identified.

## 4.13 Transportation

### 4.13.1 Alternative 1, No Action

Under the No Action Alternative, there would be no changes in current transportation activities with roadways, rail, and waterways until TVA would be required to retire the units by December 31, 2017. TVA would eventually have to cease operating the coal units on or before December 31, 2017 to comply with the FFCA and the Utility MATS unless these requirements were changed.

### 4.13.2 Alternative 2, Across Discharge Channel Configuration

**<u>Construction</u>**

**Barge and Truck Traffic**

All equipment proposed by TVA under this action would be delivered by truck or barge. Construction of the various proposed facilities would begin in Spring 2013 and would continue for approximately four years. The intermittent increase in truck traffic in the project area due to hauling equipment on-site during construction would not result in closure of public roadways. Roads operated within the boundary of GAF's reservation would be upgraded, as required. Barge deliveries of project components during construction would utilize GAF's existing facilities (see Figure 2-8). Construction activities would not significantly increase barge traffic along the Cumberland River. Rail transport of construction materials or equipment to GAF would not occur.

**Construction Employee Traffic**

Construction workers traveling to and from the project site would result in a temporary increase in traffic on local roadways near GAF. Construction employee traffic would gradually increase from approximately 100 daily round trips during the initial phases of construction (Spring 2013) to a worse case peak scenario of about 920 daily round trips during the peak period (four months during Summer 2014), after which traffic would gradually decrease until such time as construction is completed (Spring 2015). Temporary increases in commuter traffic resulting associated with construction employee trips are anticipated to occur on the following roadways and intersections:

- Airport Road
- Steam Plant Road
- Odoms Bend Road
- intersections of Airport Road/Steam Plant Road
- State Road 109/Odoms Bend Road
- Odoms Bend Road/Steam Plant Road

As provided in Section 4.07, Socioeconomics, the majority of construction workers are anticipated to reside in the Nashville metropolitan area. Therefore, traffic impacts are based on the following primary assumptions for construction commuter activity:

a) 50 percent of workers would travel west-to-east along State Highway 31E to SR-109 and continuing on SR 109 to Airport Road, then turning south on Steam Plant Road to GAF.

b) 50 percent of workers would travel west-to-east along Interstate 40 and turn north on SR 109, turning east on to Odoms Bend Road and then turning south on Steam Plant Road to GAF.

Table 4-13 shows the potential increase in Average Daily Trips (ADT) during normal construction and peak period. As shown on Table 4-13, the roadways with the highest increase in ADT during peak construction would be Odoms Bend Road and Steam Plant Road (south of Airport Road), with both roadways experiencing short-term increases.

**Table 4-13. Potential ADT Increases (Temporary from Construction Employee Traffic)**

| Road Name | Current Average Daily Traffic Volume[1] | Number of Construction Worker Daily Trips | | Potential Increase | |
|---|---|---|---|---|---|
| | | Project Start/End | Project Peak | Project Start/End | Project Peak[2] |
| SR 109 (Wilson County ADT sampling location) | 17,337 | 200 | 1,840 | 2% | 10.6% |
| Odoms Bend Road | 995 | 100 | 920 | 10% | 92% |
| Airport Road | 8,762 | 100 | 920 | 1% | 10.5% |
| Steam Plant Road (south of Airport Road) | 667 | 200 | 1,840 | 30% | 276% |

(1) Source: TDOT 2011
(2) Project peak period would consist of a four-month timeframe during Summer 2014

These roadways would also have additional traffic due to some delivery trucks arriving from SR 109, although truck traffic would not significantly contribute to traffic congestion.

At the intersection of Odoms Bend Road and SR 109, there is one stop signl for traffic turning onto SR 109. This intersection may be congested for rush hour commuters taking the southern route from Odoms Bend Road to SR 109. The intersection of Steam Plant Road and Airport Road consists of a two-way stop with the stop sign on Steam Plant Road. This two-way stop may be problematic for traffic crossing Airport Road or turning left onto Airport road therefore create extended delays during peak hours depending on the traffic distribution among the various available routes. Morning and evening commuters on public roadways near GAF may realize congestion, especially during peak construction activities.

Peak construction traffic impacts would be temporary in nature, and impacts during the early stages and end stages of the project would be minimal. TVA consulted with TDOT, the Sumner County Highway Department, and the City of Gallatin, to discuss mitigations for peak construction. TVA would implement measures to alleviate traffic impacts, if so required. The measure would be determined through coordination with the TDOT, the Sumner County Highway Department, and the City of Gallatin.

**Operation**

Operation of equipment proposed by TVA under this action would lead to an increase in on-site and off-site traffic, but not at a significant level. The most likely transport mode for materials necessary for operation of the new facilities, i.e. pebble lime, anhydrous ammonia, would be truck. The transport of coal by barge to GAF would continue and no rail transport is anticipated. Pebble lime and activated carbon would be delivered to the site by trucks.

Anhydrous ammonia for the SCR system would be delivered by truck to the new anhydrous ammonia tank farm. Anhydrous ammonia would be transported to the project site using USDOT approved tanker trucks. The estimated peak amount of deliveries for these products would be about 41 per day (35 per day for pebble lime, two per day for ammonia, and four per day for activated carbon). The current primary supply point for anhydrous ammonia is in Courtright, Ontario. Other supply points have been considered but are limited by production and delivery capabilities.

The additional 41 truck deliveries per day would not lead to a significant increase in traffic impacts surrounding the facility. During operation of the CCR landfill, trucks would use the paved haul road created from Steam Plant Road along the NRL and SRL to the storage silos. The new haul road would provide access to the NRL and SRL. About 40 feet of access road would also be added around the landfill perimeter in addition to the haul road. Road stability issues from hauling heavy equipment near ponds are to be evaluated in a future feasibility haul road study in October 2012. An estimated peak amount of on-site daily truck loads of byproduct to the CCR landfill is 71 trucks per day. A new CCR haul road would be constructed from Steam Plant Road to the west through the NRL landfill area and then south around the coal stockpile area to the main plant area to support operations (see Figure 2-8).

**Mitigations/BMPs**

TVA will implement measures to minimize traffic impacts during peak construction, through coodination with TDOT, the Sumner County Highway Department, and the City of Gallatin. No permanent mitigations would be required for operations.

### 4.13.3 Alternative 3, Close Couple Configuration

Transportation impacts related to Alternative 3 are similar to construction and operational impacts described under Alternative 2.

**Mitigations/BMPs**

Mitigations or BMPs under Alternative 3 would be similar to those described for Alternative 2.

### 4.13.4 Summary of Impacts

The potential for temporary impacts to local roadways associated with construction employee commuter trips has been identified for both action alternatives, primarily associated with peak construction activities. TVA will work with the city of Gallatin to ensure potential impacts remain insignificant. The majority of operational traffic would occur on site; however, there would be a monthly increase of about 40 delivery trucks to GAF, and the four to five weekly trips would not contribute to substantial impacts to local roadways over the long term.

### 4.13.5 Cumulative Impacts

Construction-related impacts to local roadways and transportation flow would be temporary in nature, ceasing once construction is complete. Construction-related barge traffic is not expected to result in a significant impact to barge traffic on the Cumberland River, and TVA has moved the offload site for the SCR system to the east behind the Combustion Turbine complex due to TDOT using the current offload site for the construction of the new SR 109 bridge as described previously. The construction for the new SR 109 bridge by TDOT may contribute to slowed traffic along SR 109; however, this improvement would serve to improve traffic flow for the long-term. Given these factors, no significant long-term cumulative or incremental impact to local transportation routes is expected.

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**Federal Agencies Receiving Notification and EA (Hard Copy or CD)**
Cherokee National Forest, Watauga Ranger District
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
National Park Service – Great Smoky Mountains National Park

**Federally Recognized Tribes (E-mail Notification of Availability)**
Absentee Shawnee Tribe of Oklahoma
Alabama Quassarte Tribal Town
Cherokee Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation
Seminole Tribe of Florida
Shawnee Tribe
The Chickasaw Nation
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

**State and Local Agencies Receiving Notification and EA (Hard Copy or CD)**
Appalachian National Scenic Trail
East Tennessee Development District
Greater Nashville Regional Council
Northwest Tennessee Development District
Sumner County Highway Department
Sumner County Planning Department
Tennessee Department of Agriculture
Tennessee Department of Economic and Community Development
Tennessee Department of Environment and Conservation
Tennessee Department of Transportation
Tennessee Division of Archaeology
Tennessee Division of Forestry
Tennessee Historical Commission
Tennessee Natural Resources Conservation Service
Tennessee Wildlife Resources Agency

**Others Receiving Notification and EA (Hard Copy or CD)**
Gallatin Public Library
Mayor of Gallatin
Southern Alliance for Clean Energy
Sierra Club

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# Appendix A - NEPA COMPLIANCE PROCESS OVERVIEW

The National Environmental Policy Act (NEPA) requires federal agencies, including the Tennessee Valley Authority (TVA), to consider the potential environmental impacts of actions they propose to take that will impact the physical environment before making a final decision to proceed. Specifically, NEPA requires the preparation of an Environmental Impact Statement (EIS) for a major action significantly impacting the quality of the human environment. The purpose of an EIS is to assess the potential environmental impacts of the proposed action and alert the federal agency decision maker and the public to those impacts before a final decision to proceed with the action is made. Regulations or procedures guide implementation of the statute.

TVA is subject to and complies with two sets of regulations or procedures that implement NEPA. These are the regulations promulgated by the Council on Environmental Quality (CEQ) at 40 C.F.R. parts 1500-1508 and TVA's own NEPA procedures which supplement CEQ's regulations. TVA's NEPA procedures were adopted through a rulemaking process with public notice and opportunity for comment. TVA initially published its final NEPA procedures in the Federal Register in 1980 and later amended them after public notice and comment and republished them in the Federal Register in 1983. 48 Fed. Reg. 19,264 (Apr. 28, 1983). CEQ approved TVA's initial and amended procedures. Internally, TVA's "NEPA Interface" staff currently oversees TVA's compliance with NEPA.

CEQ's regulations and TVA's NEPA procedures identify three levels of NEPA review. The most detailed and time-consuming level of review is an EIS. EISs are comprehensive, detailed documents often exceeding 300 pages exclusive of appendices and typically take 12 to 36 months or longer to complete. EIS processes provide opportunities for public comment, including a minimum mandatory 45-day comment period on draft EISs. Section 5.4 of TVA's NEPA procedures provides that certain actions "normally" require an EIS including large water resource projects, major power generating facilities, and uranium mining and milling complexes. This refers to the construction of such facilities, not their continued operation. This section also requires the preparation of an EIS for "any major action, the environmental impact of which is expected to be highly controversial." The controversy must be about the significance of environmental impacts, must have valid scientific underpinnings, and must be substantial. What is "substantial" requires consideration of the number of people raising legitimate environmental concerns in the context of the potentially affected population and whether other expert agencies have environmental concerns.

The lowest level of NEPA review applies to those actions determined to fall within one or more of the Categorical Exclusions (CEs) identified in TVA's NEPA procedures. Section 5.2 of the procedures identifies 28 categories of actions that were predetermined during the rulemaking process normally to not result in significant environmental impacts and to not require an EIS. Neither CEQ's regulations nor TVA's procedures require that CEQ applicability determinations be documented. However, it is TVA's practice to prepare a "Categorical Exclusion Checklist" to document its CE determinations for a number of its CEs. An opportunity for public comment on a CE is not required and TVA does not provide one.

The middle level of NEPA review is an Environmental Assessment (EA). EAs are more concise, less detailed documents than EISs, and can be as short as 10 to 15 pages. However, it is TVA's practice to provide substantial information in its EAs, and TVA's EAs often exceed 50 pages depending on the number of resources analyzed and the complexity of analyses. Neither CEQ's regulations nor TVA's NEPA procedures require public comment on draft EAs, but TVA normally provides a 30 day comment period. The purpose of an EA is to determine whether a proposed action that is not categorically excluded is a major action with significant impacts on the quality of the human environment. If it is, an EIS is required. If it is not, TVA concludes the EA process by issuing a Finding of No Significant Impact, allowing the TVA decision maker to decide whether to proceed with the action.

TVA prepared an EA for the emission control projects and associated facilities proposed at its Gallatin Fossil Plant. TVA released the draft EA to the public on October 17, 2012 and initially provided 30 days for comment. Notice of the availability of the EA was published in local newspapers and on TVA's agency internet site. TVA extended the comment period by 14 days in response to requests from a number of individuals and environmental advocacy groups. TVA accepted comments from several environmental advocacy groups, including the Sierra Club, that were received after the close of the extended public comment period. TVA considered all substantive comments in the preparation of this EA.

The EA "tiers" from the "Final Environmental Impact Statement for TVA's Integrated Resource Plan" (March 2011) (IRP EIS). Tiering is a process in CEQ's regulations and TVA's procedures that allows an agency to go from a broader NEPA review, typically an EIS, to a more site-specific NEPA review without readdressing the issues or repeating in detail the information and analyses in the broader review document. 40 C.F.R. §1508.28. TVA provided extensive opportunities for public participation during the preparation of the IRP EIS. These included public comment periods and webinars during which members of the public could ask questions about IRP analyses and make comments. TVA also assembled and regularly met with a group of interested individuals from a variety of organizations, including the Sierra Club and the Southern Alliance for Clean Energy, and provided them opportunities to review and comment on ongoing IRP analyses.

The IRP EIS contains analyses of the need for electricity from the TVA power system, different kinds of energy resources, and strategies for meeting projected future demand for electricity including continued operation or retirement of its coal-fired power plants, the addition of more renewable resources, and expanded use of energy efficiency programs. The IRP EIS summarizes TVA's analyses of the environmental impacts of alternative strategies using different combinations of energy resources including air quality and solid waste impacts.

# Appendix B – COAL SPECIFICATIONS AND FUEL PARAMETERS

Table B-1 lists the coal specifications considered during the dry FGD design for TVA's proposed action (represents Alternatives 2 and 3).

**Table B-1. Coal Blend Assumptions for GAF Dry FGD**

| Coal Blend With ILB and PRB[1] | | Coal Analysis | | Final Blend | Design Coal Spec. |
|---|---|---|---|---|---|
| Fuel | | ILB As-Rec'd | PRB As-Rec'd | 50% PRB/ 50% ILB As-Rec'd | |
| Carbon | wt% | 65.6 | 50.6 | 58.1 | 58.1 |
| Hydrogen | wt% | 4.55 | 3.41 | 3.98 | 3.98 |
| Nitrogen | wt% | 1.37 | 0.661 | 1.01 | 1.01 |
| Oxygen | wt% | 6.81 | 12.64 | 9.72 | 9.72 |
| Chlorine | wt% | 0.18 | 0.012 | 0.058 | 0.200 |
| Sulfur | wt% | 2.94 | 0.284 | 1.61 | 1.61 |
| Moisture[2] | wt% | 9.89 | 27.5 | 18.7 | 30.0 |
| Ash[3] | wt% | 8.76 | 5.03 | 6.90 | 10.00 Dry |
| Total | wt% | 100 | 100 | 100 | -- |
| HHV | Btu/lb | 11,500 | 8,720 | 10,324 | 10,324 |
| Fuel Sulfur | lb $SO_2$/mmBtu | 5.00 | 0.636 | 3.05 | 3.05 |
| Chlorine[4] | % dry | 0.116 | 0.017 | 0.066 | 0.250 Dry |
| Mercury[5] | ppm | 0.116 | 0.086 | 0.101 | 0.140 |

Btu = British thermal unit; Dry FGD = dry flue gas desulfurization; GAF = Gallatin Fossil Plant; ILB = Illinois Basin; MMBtu = million British thermal units; ppm = parts per million; PRB = Powder River Basin; wt% = weight percent, (1) The scrubber design coal is not limited to PRB and ILB coals (other coal combinations are acceptable provided permit conditions and compliance requirements are met.

(2) Although the table reads that the final blend moisture is 18.7%, the scrubber shall be designed for a maximum of 30% coal moisture, with 20% % moisture being the most probable based on conditions at GAF.

(3) Although the table reads that the final blend ash is 6.90%, the scrubber shall be designed for a maximum of 15% coal ash (% dry basis). The 15% ash is recommended to provide necessary flexibility and PJFF baghouse sizing.

(4) Although the table reads that the final blend chlorine is 0.066% (dry), the scrubber shall be designed for a average of 0.25% chlorine. The 0.25% chlorine is recommended to provide necessary flexibility of fuel changes.

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# Appendix C – REGULATORY AGENCY CONSULTATION

**TENNESSEE HISTORICAL COMMISSION**
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

February 28, 2012

Mr. Clinton Jones
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, STOCKPILE AREA AT FOSSIL PLANT, GALLATIN, SUMNER COUNTY, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced archaeological survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no archaeological resources eligible for listing in the National Register of Historic Places. We further concur that historic cemetery sites 40SU271 and 40SU275 should be avoided by all ground-disturbing activities.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

**From:** LaDonna Brown [mailto:LaDonna.Brown@chickasaw.net]
**Sent:** Friday, January 18, 2013 4:15 PM
**To:** Ezzell, Patricia Bernard
**Cc:** Amber Jarrett
**Subject:** RE: TVA, NOTIFICATION OF DRAFT ENVIRONMENTAL ASSESSMENT, GALLATIN FOSSIL PLANT AIR POLLUTION CONTROL PROJECTS & COAL COMBUSTION PRODUCT

Hi Ms. Ezell,

Happy New Year! Hope things have started off well for you in this new year.
After reviewing the draft environmental assessment, we have no comments at this time. Thank you for the updates you have sent to us on this proposed project.
If you have any questions you may contact Ms. Amber Jarrett, Historic Preservation and Repatriation Manager, at (580)599-0825or Ms. LaDonna Brown, Historic Preservation Officer, at (580)272-5593.

Sincerely,

LaDonna Brown
Historic Preservation Officer
Department of Homeland Affairs
Division of Policies and Standards
the Chickasaw Nation
P.O. Box 1548
Ada, OK 74821-1548
Desk (580)272-5593
Mobile (580)399-7498
ladonna.brown@chickasaw.net

**From:** Ezzell, Patricia Bernard [mailto:pbezzell@tva.gov]
**Sent:** Thursday, October 18, 2012 2:58 PM
**To:** aberryhill@muscogeenation-nsn.gov; rallen@cherokee.org; Augustine Asbury; PaulBackhouse@semtribe.com; Emman Spain; LaDonna Brown; Charles Coleman; Robin Dushane; sdaugherty@estoo.net; Joseph Blanchard; hlharjo@yahoo.com; Tyler B. Howe; ukbthpo-larue@yahoo.com; Kirk Perry; Kim Jumper
**Cc:** AnneMullins@semtribe.com; ElliottYork@semtribe.com; AlisonSwing@semtribe.com; jfife@muscogeenation-nsn.gov; Odette Freeman; russtown@nc-cherokee.com; Gingy Nail; Amber Jarrett
**Subject:** TVA, NOTIFICATION OF DRAFT ENVIRONMENTAL ASSESSMENT, GALLATIN FOSSIL PLANT AIR POLLUTION CONTROL PROJECTS & COAL COMBUSTION PRODUCT

Good Afternoon,

I am sending this email message to notify you that the Tennessee Valley Authority (TVA) has prepared an environmental assessment (EA) to determine the effects of installing additional air pollution control equipment at Gallatin Fossil Plant to meet applicable requirements of the U.S. Environmental Protection Agency's Mercury and Air Toxics Standards. The decision before TVA includes whether to install and operate flue gas desulfurization, selective catalytic reduction, and activated carbon injection systems, and to construct and operate a dry coal combustion product landfill. These actions would also enable TVA to comply with the 2011 Federal Facilities Compliance Agreement with the EPA.

As required by the National Environmental Policy Act (NEPA), TVA developed a draft EA for this action and is soliciting comments from other agencies, the general public, nongovernmental organizations, and Native American tribes on the environmental impacts of the project. The draft EA will be available for review online at TVA's NEPA website, www.tva.gov/environment/reports, and at the Gallatin Public Library in Gallatin, Tenn., during a 30-day review period between Oct. 17 – Nov. 16, 2012.

As always, if you have any questions, please do not hesitate to contact me. If you would like to provide any comments on this draft EA, please respond no later than Friday, November 16, 2012.

Thank you.

Sincerely,

Pat

Pat Bernard Ezzell
Tribal Liaison and Corporate Historian
Tennessee Valley Authority
400 W. Summit Hill Drive
460 WT 11D-K
Knoxville, Tennessee 37902
Phone: (865) 632-6461
E-mail: pbezzell@tva.gov

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

March 4, 2013

Mr. John T. Baxter, Jr.
Manager, Endangered Species Act Compliance
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Subject: Amended Request for Biological Concurrence: Gallatin Fossil Plant – Installation of Air Pollution Control Equipment and Associated Facilities, Sumner County, Tennessee

Dear Mr. Baxter:

In November 26, 2012, February 1, 2013, and February 21, 2013, letters to the U. S. Fish and Wildlife Service (Service), the Tennessee Valley Authority (TVA) presented information to support TVA's endangered species determinations related to the proposal to construct and operate flue gas desulfurization, selective catalytic reduction, activated carbon injection systems, and fabric filter baghouses at the Gallatin Fossil Plant, in order to comply with the new Mercury and Air Toxics Standards and the April 2011 Federal Facilities Compliance Agreement between the U. S. Environmental Protection Agency and TVA and companion consent decree with the State of Tennessee and others. To support these proposed actions and continued operation of the plant, TVA also has proposed constructing a dry coal combustion product landfill. The Service, in a November 27, 2012, letter to TVA, asked TVA to make a determination regarding the potential for adverse effects to listed mussels held at TWRA's Cumberland River Aquatic Center (CRAC), because TVA's proposed action would necessitate the closure of CRAC.

Based on the letters exchanged and the commitments that resulted from agency meetings (referenced above), we understand that the proposed TVA project has been modified to include:

- Rebuilding the hatchery on the Gallatin plant site farther away from the plant and footprint of the proposed projects (on the south/east side of the channel across from the existing CRAC facility);
- Locating the new hatchery on an area of suitable size to support some potential future expansion of hatchery operations by TWRA;
- Recommending a 30-year easement for TWRA's use of that hatchery site (although this action would require approval by the TVA Board, we understand it would be unlikely that the Board would not approve staff recommendations);

- Developing a joint Memorandum of Agreement (MOA) between TVA, TWRA, and the Service describing all participating agency responsibilities in operating the new facility and provisions for relocating the new hatchery in the event of interference with potential future TVA operations.

TVA (November 26, 2012 and February 1, 2013 letters) stated that implementation of the preferred alternative would have no effect on endangered pink mucket mussels present in the Cumberland River proper or endangered gray bats, and was not likely to adversely affect the endangered Indiana bat or federally-listed species housed by the TWRA at CRAC.

TVA's "not likely to adversely affect determination" for Indiana bats is based on lack of high quality Indiana bat roosting habitat on the project site, and the commitment to remove the few trees with suitable roost characteristics within the project site at a time of year when Indiana bats would not be present (November 15 – March 31). TVA's "not likely to adversely affect" determination for federally-listed species housed by the TWRA at CRAC is based on the proposed project modifications including the commitments listed above. Therefore, based on these commitments, we concur with TVA's determinations.

We believe that the requirements of the Endangered Species Act of 1973, as amended, are fulfilled. Obligations of the Act must be reconsidered and TVA should consider the need to request reinitiation of consultation with the Service if (1) new information reveals impacts of the proposed action that may affect listed species or critical habitat in a manner not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, (3) any of the commitments included in our understanding of the modified proposed project as identified above are not completed as described, or 4) new species are listed or critical habitat designated that could be affected by the project.

Thank you for continuing to coordinate with us on this project. We look forward to participating in the development of an MOA for operating the reconstructed mussel facility.

Sincerely,

Mary E Jennings

Mary E. Jennings
Field Supervisor

**PROGRAMMATIC AGREEMENT**

**BETWEEN THE TENNESSEE VALLEY AUTHORITY**

**AND**

**THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER**

**REGARDING THE GALLATIN FOSSIL PLANT EMISSIONS CONTROL EQUIPMENT**

**AND**

**COAL COMBUSTION PRODUCTS DISPOSAL FACILITIES**

**LOCATED IN SUMNER COUNTY, TENNESSEE**

PURSUANT TO 36 CFR 800.14(b)

WHEREAS, The Tennessee Valley Authority (TVA) proposes to install, operate, and maintain a new lime-based dry flue gas desulfurization (FGD) system and selective catalytic reduction (SCR) system ("emissions control equipment") at the Gallatin Fossil Plant (GAF) to comply with new and emerging air pollution control requirements, and to install, operate, and maintain on-site storage of coal combustion products (CCP) generated at GAF ("the Undertakings"); and

WHEREAS, TVA, in consultation with the Tennessee State Historic Preservation Officer (SHPO) and pursuant to 36 CFR Part 800.4(a)(1), has determined the area of potential effects (APE) for archaeology to be any area that would be affected by land-disturbing activities associated with the construction, operation, and maintenance of emissions control equipment and CCP disposal facilities, and their infrastructure; and the architectural APE to be the 0.5-mile viewshed surrounding the GAF powerhouse, as well as any areas where the proposed projects may alter existing topography or vegetation in view of a historic resource (Appendix A); and

WHEREAS, the Undertakings have the potential to adversely affect historic properties, but as yet the scale and precise location of the various parts of the Undertakings are not completely known; and

WHEREAS, pursuant to 36 CFR Part 800.14(b)(1)(ii) and 800.6, this Programmatic Agreement (PA) records the terms and conditions for phased identification and evaluation of historic properties, for evaluating the Undertakings' effects on historic properties, for avoiding and minimizing adverse effects, for resolving adverse effects, and for guiding the Undertakings through their development, construction and operation; and

WHEREAS, TVA has conducted archaeological surveys of the APE, and seventeen archaeological sites have been identified; and

WHEREAS, TVA has conducted historic architectural surveys within the architectural APE, and has evaluated the eligibility of GAF for listing on the National Register of

Historic Places (NRHP), and has determined in consultation with SHPO that the plant is ineligible for the NRHP; and

WHEREAS, TVA will identify and evaluate other historic architectural properties should such properties be present; and

WHEREAS, pursuant to 36 CFR Part 800.3(f)(2) and 36 CFR Part 800.14(b)(1)(ii), TVA has consulted on a government-to-government basis with the Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, The Chickasaw Nation, Muscogee (Creek) Nation of Oklahoma, Alabama-Quassarte Tribal Town, Kialegee Tribal Town, Thlopthlocco Tribal Town, Seminole Tribe of Florida, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and Shawnee Tribe of Oklahoma (hereafter "Indian tribes"); and

WHEREAS, TVA acknowledges that Indian tribes possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them; and

WHEREAS, the Eastern Shawnee Tribe of Oklahoma has identified the area that contains archaeological sites 40SU257, 40SU258, 40SU259, and 40SU268 as a sacred site (Appendix B); and

WHEREAS, "historic property" as defined at 36 CFR Part 800.16(l)(1) includes properties of traditional religious and cultural importance to an Indian tribe; and

WHEREAS, the Eastern Shawnee Tribe of Oklahoma and United Keetoowah Band of Cherokee Indians in Oklahoma have agreed to participate in the development of this PA and sign the PA as concurring parties; and

WHEREAS, TVA shall consult, pursuant to 36 CFR Part 800.2(c)(3) and 36 CFR Part 800.14(b)(1)(ii), with representatives of local governments on these Undertakings; and

WHEREAS, pursuant to 36 CFR Part 800.14(b)(1)(ii), TVA shall provide the public an opportunity to express their views on these Undertakings by means of various notices and public meetings; and

WHEREAS, pursuant to 36 CFR Part 800.3(g), TVA in consultation with the SHPO and other consulting parties may address multiple steps in Part 800.3 through 800.6 where the agency official and the SHPO agree it is appropriate as long as the consulting parties and the public have an adequate opportunity to express their views as provided in Part 800.2(d);

NOW THEREFORE, TVA and the SHPO agree that the Undertakings shall be implemented in accordance with the following stipulations to satisfy TVA's responsibility under section 106 of the National Historic Preservation Act (NHPA). The TVA Federal Preservation Officer, or the designee thereof, shall act for TVA in all matters concerning the administration of the agreement.

**STIPULATIONS**

TVA shall ensure that the following stipulations are implemented:

**I. PHASED IDENTIFICATION AND EVALUATION OF HISTORIC PROPERTIES AND EVALUATION OF EFFECTS ON HISTORIC PROPERTIES**

A. Identification of Historic Properties

As the Undertakings develop, TVA will consider the effects of the Undertakings on historic properties, as defined at 36 CFR Part 800.16(l), within the APE.

As project plans are approved, TVA will, in consultation with SHPO, Indian tribes, and other consulting parties (hereafter "in consultation"), further determine the area in which there is potential to affect historic properties.

Should the APE be revised, TVA shall take any additional steps necessary to identify historic properties within the APE, and this may include one or more additional Phase I identification surveys. Said surveys shall be carried out in a manner consistent with 36 CFR Part 800.4(b)(1) and the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23) and the Tennessee Historic Commission, Review and Compliance Section, *Reporting Standards: Archaeological and Architectural Resource Identification Studies (Survey Reports)*. TVA shall submit draft and final reports to the SHPO and all consulting parties for review, providing a thirty (30) day period for comments, pursuant to 36 CFR Part 800.4(d).

B. Evaluation of Historic Properties

1. TVA, in consultation, shall identify any properties within the APE that require further evaluation in order to determine their eligibility for listing in the NRHP.
2. Should TVA determine, in consultation, that any potentially eligible property would be adversely affected by the Undertakings, an evaluation study shall be conducted consistent with 36 CFR Part 800.4(c) and the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23) and the *Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies*. A scope of work will be developed in consultation prior to the implementation of the study, and will specify the procedures to be used in determining the eligibility of the property pursuant to 36 CFR Part 800.4(c). TVA shall submit draft and final reports, which shall contain a determination on the property's eligibility for listing in the NRHP, to SHPO and all consulting parties for review, providing a thirty (30) day period for comments.
3. Properties that TVA and SHPO agree meet NRHP criteria shall be considered NRHP-eligible. Should a dispute arise on the eligibility of an identified property, TVA will consult with SHPO to resolve the objection. If TVA and the SHPO do not agree, or if the Advisory Council on Historic Preservation (Council) or the Secretary of the Interior (Secretary) so request, TVA shall obtain a determination of eligibility from the Secretary pursuant to 36 CFR Part 63. If an Indian tribe that attaches religious or cultural significance to an identified property does not agree, it may ask the Council to request the TVA Federal Preservation Officer to obtain a determination of eligibility from the Secretary.

C. Evaluation of Effects on Historic Properties

If TVA finds, in consultation, that there are no historic properties present, or that there are historic properties present but the Undertakings will have no effect on them, then TVA will provide documentation of this finding prepared pursuant to 36 CFR Part 800.11(d) to all consulting parties and make the documentation available for public inspection pursuant to 36 CFR Part 800.4(d)(1).

If TVA finds, in consultation with the SHPO and other consulting parties, that the Undertakings will have no adverse effect on historic properties, then TVA will notify all consulting parties of that finding pursuant to 36 CFR Part 800.5(c), and provide them the documentation specified in 36 CFR Part 800.11(e) .

If TVA finds, in consultation, that there are historic properties that may be adversely affected by the Undertakings, then TVA shall notify all consulting parties, including Indian tribes, invite their views on the effects, and assess adverse effects pursuant to 36 CFR Part 800.5.

## II. AVOIDANCE

TVA, in consultation, shall seek ways to avoid adverse effects on properties determined eligible for listing in the NRHP whenever economically prudent and technically feasible. Whenever practicable, the following measures shall be taken to avoid adverse effects on historic properties:

A. TVA will avoid locating any emissions control equipment and CCP disposal facilities, and their associated infrastructure, within the identified boundaries of NRHP-eligible historic properties and their determined buffers.

B. Sensitive archaeological areas, such as cemeteries, located within the APE will be noted on the project plans to be used in construction. Any special conditions for the preservation of such areas for construction will be detailed on these plans.

## III. RESOLUTION OF ADVERSE EFFECTS ON HISTORIC PROPERTIES

Historic properties located within the APE for which avoidance of adverse effects is not technically feasible or economically prudent, will be treated in the manner listed below.

A. Avoidance or Minimization

1. TVA will consult with the SHPO, Indian tribes, and other consulting parties in order to seek a course of action that will avoid or minimize any adverse effects on historic properties.
2. After the aforementioned consultation, TVA shall prepare a resolution plan that reflects a proposed course of action, and shall provide the plan to consulting parties for a 30-day review.
3. TVA shall finalize the resolution plan after taking into account all comments received from consulting parties.

- 4 -

B. Mitigation of Adverse Effects on NRHP-Eligible Archaeological Sites

1. If avoidance and minimization alternatives have been considered in consultation and found not to be technically feasible or economically prudent, TVA will develop a Memorandum of Agreement (MOA) which will provide for the development of a Data Recovery Plan that meets the standards set forth in *Archeology and Historic Preservation: Secretary of Interior's Standards and Guidelines*. TVA will distribute the MOA to the Signatories and consulting parties for review. The MOA shall be developed consistent with the provisions in 36 CFR Part 800.6(c) and shall contain, in addition to the Data Recovery Plan, stipulations concerning concurrence by other parties, duration, termination, discovery of additional historic properties affected by the Undertakings, and procedures for amending the MOA.
2. The Data Recovery Plan shall be consistent with the applicable provisions in 36 CFR Part 800.5 and 800.16, the standards set forth in *Archeology and Historic Preservation: Secretary of Interior's Standards and Guidelines*, and the standards set forth in the *Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies* (March 2009 revision).
3. TVA shall consider the comments received from the Signatories, and consulting parties in finalizing the MOA.

C. Mitigation of Adverse Effects on Historic Architectural Properties

1. TVA shall mitigate adverse effects to historic architectural properties by providing documentation at a level of effort equivalent to the documentation required for the Historic American Building Survey/Historic American Engineering Record (HABS/HAER).
2. The documentation shall adhere to the following guidelines, prepared by the Cultural Resources Division, National Park Service, Southeast Region, Atlanta, Georgia: "Photographic Specifications: Historic American Buildings Survey, Historic American Engineering Record," "Historic American Buildings Survey, Guidelines for Historical Reports," and "Preparing HABS/HAER/HALS Documentation."
3. TVA shall consider the comments received from the Signatories, SHPO and consulting parties in finalizing the documentation.

## IV. CONSULTATION WITH INDIAN TRIBES

Pursuant to 36CFR Part 800.2(c)(2)(ii) TVA shall consult with any Indian tribe that attaches religious and cultural significance to historic properties that may be affected by the Undertakings. TVA shall ensure that consultation provides the Indian tribe a reasonable opportunity to identify its concerns about historic properties, advise on identification and evaluation of historic properties including those of traditional religious and cultural importance, articulate its views on the Undertakings' effects on such properties, and participate in the resolution of adverse effects. Pursuant to 36 CFR Part 800.4(c)(1) TVA acknowledges that Indian tribes possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them.

## V. POST REVIEW DISCOVERIES

Previously unidentified archaeological historic properties located within the Undertakings' APE that are inadvertently discovered during the implementation of the Undertakings shall be protected and stabilized to prevent any further disturbance until the Signatories and consulting parties can make an informed decision about their NRHP eligibility and about further steps to meet federal agency obligations under section 106 and the terms of this PA.

## VI. TREATMENT OF HUMAN REMAINS

A. TVA shall ensure that the treatment of any human remains discovered within the APE complies with all state and federal laws concerning archaeological sites and treatment of human remains.

B. If human remains are identified within the APE as a consequence of the implementation of the Data Recovery Plan or of the Undertakings, TVA shall notify appropriate state agencies that human remains have been so identified and ensure that the remains are treated in a manner consistent with the Council's *Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects* (2007). Further, this treatment will be conducted in accordance with the applicable provisions of Tennessee Code Annotated (T.C.A.) 46-4-101 *et seq*. (*Termination of Use of Land as a Cemetery*); T.C.A. 11-6-116, (*Excavation of Areas Containing Native American Indian Remains*); T.C.A. 11-6-119 (*Reburial of Human Remains or Native American Burial Objects following Discovery or Confiscation*), and Tennessee Rules and Regulations Chapter 0400-9-1 (*Native American Indian Cemetery Removal and Reburial*).

C. Should human remains be encountered either during implementation of the Data Recovery Plan or of the Undertakings, all ground-disturbing activities within a ten (10) meter (33 foot) radius of the burial will cease immediately. TVA will notify the Sumner County Coroner and the Tennessee State Archaeologist immediately. TVA will notify the Signatories and consulting federally-recognized tribal governments within seventy-two (72) hours and invite them to comment on any plans developed to treat the human remains.

## VII. REPORTS

TVA shall ensure that all archaeological investigations conducted for compliance with this PA are recorded in formal written reports that meet the Secretary of Interior's *Standards and Guidelines for Identification* (48 FR 44720-23) and the Tennessee Historic Commission, Review and Compliance Section, *Reporting Standards: Archaeological and Architectural Resource Identification Studies (Survey Reports)*. The SHPO and consulting parties shall be afforded thirty (30) days to review and comment on any cultural resources reports submitted as compliance with this PA.

TVA shall distribute copies of all final reports to the Signatories. Throughout the duration of this PA, Signatories shall have 30 days to review and comment on all cultural resource survey reports concerning identification of historic properties or evaluation of identified properties, and proposed project plans provided by TVA. Within the specified number days of receiving any of these documents for review and comment, the Signatories shall provide TVA with their written comments. Comments received from the Signatories within the specified number of days shall be taken into consideration in preparing final documents.

## VIII. ADMINISTRATIVE CONDITIONS

A. Duration

This PA will be in effect for 20 years from the date of its execution unless terminated earlier as specified below under "Termination".

B. Dispute Resolution

Should a Signatory or object within thirty (30) days after receipt of any plans, specifications, contracts, or other documents provided for review pursuant to this Agreement, TVA shall consult with the objecting party to resolve the dispute. If TVA determines that the objection cannot be resolved, TVA, or the objecting party, may seek guidance from the Council pursuant to 36 CFR Part 800.2(b)(2). TVA will take any Council comment provided in response to such a request into account in resolving any such dispute. The Signatories are responsible for carrying out all actions under this PA that are not the subject of the dispute.

C. Amendments

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the Council.

D. Termination

If any Signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other parties to attempt to develop an amendment per Stipulation VIII-C, above. If within thirty (30) days (or another time period agreed to by all signatories) the agreement is not amended, any Signatory may terminate the PA upon written notification to the other signatories.

Once the PA is terminated, and prior to work continuing on the Undertakings, TVA must either (a) execute a PA, or (b) request, take into account, and respond to the comments of the Council. TVA shall notify the signatories as to the course of action it will pursue. In the absence of a PA, TVA shall comply with the provisions of 36 CFR Part 800, Subpart B for each individual undertaking TVA proposes within the GAF reservation.

If Stipulations I - III have not been implemented within 20 years from the date of execution, this PA will be terminated.

If TVA publicly announces plans to permanently cancel the Undertakings, this PA will be terminated.

**EXECUTION** of this Programmatic Agreement by the Tennessee Valley Authority and the Tennessee State Historic Preservation Officer, the submission of documentation required under this Agreement, the filing of this Agreement with the Advisory Council on Historic Preservation (Council), and the implementation of the terms this Agreement evidence that TVA has, in accordance with section 106 of the National Historic

Preservation Act, taken into account the effects of these Undertakings on Historic Properties and has afforded the Council a reasonable opportunity to comment on the Undertakings.

**SIGNATORY**

TENNESSEE VALLEY AUTHORITY

By: ________________________ Date: 9/26/12
Brenda E. Brickhouse, Vice President and Federal Preservation Officer

**SIGNATORY**

THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER

By: E. Patrick McIntyre, Jr. Date: 9/21/2012
E. Patrick McIntyre, Jr., Tennessee State Historic Preservation Officer

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**CONCURRING PARTY**

UNITED KEETOWAH BAND OF CHEROKEE INDIANS IN OKLAHOMA

By: George Wickliffe Date: 11/26/2012
George Wickliffe, Chief

**Appendix A**

**Gallatin Fossil Plant Reservation APE**

**Appendix B**

**Historic Properties within the Gallatin Fossil Plant Reservation APE**

**EXHIBIT A**

Stipulation I of the

*Programmatic Agreement between the TVA and the Tennessee SHPO regarding the Gallatin Fossil Plant Emissions Control Equipment and Coal Combustion Products Disposal Facilities located in Sumner County, Tennessee*

**STIPULATIONS**

TVA shall ensure that the following stipulations are implemented:

**I. PHASED IDENTIFICATION AND EVALUATION OF HISTORIC PROPERTIES AND EVALUATION OF EFFECTS ON HISTORIC PROPERTIES**

A. Identification of Historic Properties

As the Undertakings develop, TVA will consider the effects of the Undertakings on historic properties, as defined at 36 CFR Part 800.16(l), within the APE.

As project plans are approved, TVA will, in consultation with SHPO, Indian tribes, and other consulting parties (hereafter "in consultation"), further determine the area in which there is potential to affect historic properties.

Should the APE be revised, TVA shall take any additional steps necessary to identify historic properties within the APE, and this may include one or more additional Phase I identification surveys. Said surveys shall be carried out in a manner consistent with 36 CFR Part 800.4(b)(1) and the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23) and the Tennessee Historic Commission, Review and Compliance Section, *Reporting Standards: Archaeological and Architectural Resource Identification Studies (Survey Reports)*. TVA shall submit draft and final reports to the SHPO and all consulting parties for review, providing a thirty (30) day period for comments, pursuant to 36 CFR Part 800.4(d).

B. Evaluation of Historic Properties

1. TVA, in consultation, shall identify any properties within the APE that require further evaluation in order to determine their eligibility for listing in the NRHP.
2. Should TVA determine, in consultation, that any potentially eligible property would be adversely affected by the Undertakings, an evaluation study shall be conducted consistent with 36 CFR Part 800.4(c) and the Secretary of the Interior's *Standards and Guidelines for Identification* (48 FR 44720-23) and the *Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies*. A scope of work will be developed in consultation prior to the implementation of the study, and will specify the procedures to be used in determining the eligibility of the property pursuant to 36 CFR Part 800.4(c). TVA shall submit draft and final reports, which shall contain a determination on the property's eligibility for listing in the NRHP, to SHPO and all consulting parties for review, providing a thirty (30) day period for comments.
3. Properties that TVA and SHPO agree meet NRHP criteria shall be considered NRHP-eligible. Should a dispute arise on the eligibility of an identified property, TVA will consult with SHPO to resolve the objection. If TVA and the SHPO do not agree, or if the Advisory Council on Historic Preservation (Council) or the Secretary of the Interior (Secretary) so request, TVA shall obtain a determination of eligibility from the Secretary pursuant to 36 CFR Part 63. If an Indian tribe that attaches religious or cultural significance to an identified property does not agree, it may ask the Council to request the TVA Federal Preservation Officer to obtain a determination of eligibility from the Secretary.

C. Evaluation of Effects on Historic Properties

If TVA finds, in consultation, that there are no historic properties present, or that there are historic properties present but the Undertakings will have no effect on them, then TVA will provide documentation of this finding prepared pursuant to 36 CFR Part 800.11(d) to all consulting parties and make the documentation available for public inspection pursuant to 36 CFR Part 800.4(d)(1).

If TVA finds, in consultation with the SHPO and other consulting parties, that the Undertakings will have no adverse effect on historic properties, then TVA will notify all consulting parties of that finding pursuant to 36 CFR Part 800.5(c), and provide them the documentation specified in 36 CFR Part 800.11(e) .

If TVA finds, in consultation, that there are historic properties that may be adversely affected by the Undertakings, then TVA shall notify all consulting parties, including Indian tribes, invite their views on the effects, and assess adverse effects pursuant to 36 CFR Part 800.5.

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# Appendix D – SOIL TYPES WITHIN PROPOSED ACTION FOOTPRINT

| acility | Alt. | Soils | Acres | Totals |
|---|---|---|---|---|
| Additional Laydown as Required | 2 and 3 | Udorthents, 2-8% slopes | 1.69 | 6.70 |
| | | Slickens | 5.01 | |
| Ammonia Tank FarmArea | 2 and 3 | Udorthents, 2-8% slopes | 0.28 | 0.28 |
| Byproduct Storage, Laydown Area | 2 and 3 | Udorthents, 2-8% slopes | 4.74 | 8.47 |
| | | Slickens | 3.73 | |
| Construction Overflow Parking | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 0.30 | 8.19 |
| | | Udorthents, 2-8% slopes | 7.89 | |
| Corridor for Utilities | 2 | Udorthents, 2-8% slopes | 0.99 | 1.17 |
| | | Water | 0.18 | |
| Crew Shacks | 2 and 3 | Udorthents, 2-8% slopes | 0.19 | 0.19 |
| Dry FGD, Alt. 2 | 2 | Udorthents, 2-8% slopes | 1.80 | 1.80 |
| Dry FGD, Alt. 2 and 3 | 2 and 3 | Udorthents, 2-8% slopes | 0.05 | 0.16 |
| | | Water | 0.11 | |
| Future Area, Misc. | 2 and 3 | Udorthents, 2-8% slopes | 0.14 | 0.14 |
| GC-Trailer | 2 and 3 | Udorthents, 2-8% slopes | 0.14 | 0.14 |
| Local Crews | 2 and 3 | Udorthents, 2-8% slopes | 0.10 | 0.10 |
| New Parking for plant | 2 and 3 | Udorthents, 2-8% slopes | 0.99 | 0.99 |
| NRL Limit of Disturbance | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 8.86 | 94.54 |
| | | Hampshire silt loam, 12-20% slopes, eroded | 8.37 | |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 73.54 | |
| | | Mimosa silt loam, 5-20% slopes, eroded, very rocky | 3.77 | |
| NRL, Facilities | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 1.00 | 1.90 |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 0.90 | |
| NRL Limit of Waste Placement | 2 and 3 | Hampshire silt loam, 12-20% slopes, eroded | 7.70 | 49.98 |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 38.51 | |
| | | Mimosa silt loam, 5-20% slopes, eroded, very rocky | 3.77 | |
| NRL Stockpile Area | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 0.03 | 5.91 |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 5.88 | |
| Paved Area, Alt. 2 and 3 | 2 and 3 | Slickens | 2.04 | 6.61 |
| | | Udorthents, 2-8% slopes | 4.57 | |
| Paved Area, Alt. 2 | 2 | Udorthents, 2-8% slopes | 2.78 | 2.78 |
| SCR | 2 and 3 | Udorthents, 2-8% slopes | 7.15 | 7.15 |
| SCR Laydown Area | 2 and 3 | Udorthents, 2-8% slopes | 4.61 | 4.61 |
| Landfill Sediment Basin | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 6.01 | 12.82 |

| acility | Alt. | Soils | Acres | Totals |
|---|---|---|---|---|
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 5.01 | |
| | | Udorthents, 2-8% slopes | 1.80 | |
| SRL, Facilities | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 2.08 | 4.47 |
| | | Udorthents, 2-8% slopes | 2.39 | |
| SRL, Limit of Disturbance | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 43.49 | 79.76 |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 26.88 | |
| | | Udorthents, 2-8% slopes | 9.39 | |
| SRL, Stockpile Area | 2 and 3 | Udorthents, 2-8% slopes | 0.35 | 2.20 |
| | | Barfield-Rock outcrop complex, 5-20% slopes | 1.85 | |
| SRL, Limit of Waste Placement | 2 and 3 | Barfield-Rock outcrop complex, 5-20% slopes | 27.09 | 43.81 |
| | | Inman flaggy silty clay loam, 10-20% slopes, eroded | 16.72 | |
| Steel Yard, Misc Area | 2 and 3 | Udorthents, 2-8% slopes | 1.08 | 1.08 |
| Stockpile Area | 2 and 3 | Slickens | 3.10 | 3.10 |
| Supt./Field Engineer Office, Misc. Area | 2 and 3 | Udorthents, 2-8% slopes | 0.02 | 0.02 |
| TVA | 2 and 3 | Udorthents, 2-8% slopes | 0.21 | 0.21 |
| GAF Project Support Misc. Area | 2 | Udorthents, 2-8% slopes | 0.25 | 0.25 |
| URS, Misc. Area | 2 and 3 | Udorthents, 2-8% slopes | 0.22 | 0.22 |
| URS Sub, Misc. Area | 2 and 3 | Udorthents, 2-8% slopes | 0.13 | 0.13 |

CCR = coal combustion residue; FGD = flue gas desulfurization; GC = general contractor; NRL = North Rail Loop, SCR = selective catalytic reduction; SRL = South Rail Loop;TVA = Tennessee Valley Authority; TWRA = Tennessee Wildlife Resources Agency;
URS = URS Corporation,.

# Appendix E - PUBLIC AND AGENCY COMMENTS RECEIVED ON DRAFT EA AND TVA'S RESPONSE TO COMMENTS

## A. INTRODUCTION

The Tennessee Valley Authority (TVA) prepared an Environmental Assessment that examines the potential environmental impacts associated with the proposed actions at its Gallatin Fossil Plant and alternatives to those actions. A Draft EA was released for comment on October 17, 2012 for a 30-day review. At the request of a number of individuals and entities, TVA extended the comment period an additional two weeks to November 30, 2012. Subsequently, TVA agreed to accept late comments from several environmental advocacy groups until December 18; providing these groups a comment period totaling 61 days.

The Draft EA was transmitted to state, federal, and local agencies and federally recognized tribes. It also was posted on TVA's public NEPA review website. Notice of the availability of the draft and the request for comments was published in two newspapers serving the Gallatin area, the *Gallatin News Examiner* and *The Tennessean*. Others on the project contact list were mailed or e-mailed notifications of the availability of the Draft EA and instructions on how to submit comments. At their request, many people receiving these notices were mailed either printed copies or CDs of the draft EA. TVA accepted comments submitted through an electronic comment form on the project website, by mail and by email.

TVA received 1,199 comment submissions, which included letters, form letters, emails, and submissions through the project website. Almost 300 of these comment submissions were pre-printed postcards distributed by the Sierra Club. An additional 555 were form emails generated through a Sierra Club website. A list of commenters and their affiliation is provided in Part C of this appendix. Comment letters from agencies are provided in Part D of this appendix.

TVA carefully reviewed all of the substantive comments that it received. Many of the individual comments were similar in substance. To avoid repetition, TVA grouped similar comments and produced one synthesized comment for each comment grouping. The commenters contributing to each synthesized comment are listed in Part B of this appendix. Because TVA tried to be careful and not lose comment nuances that were different, a number of synthesized comments still are similar and there is some overlap. The result of this analysis and synthesis process is the list of 84 individual comments to which TVA has provided responses in this appendix.

This EA tiers from TVA's 2011 Integrated Resource Plan (IRP) Environmental Impact Statement (EIS). For that EIS process, TVA provided numerous opportunities for public review and comment, including two written comment periods, five public meetings, and several webcasts during which participants could make comments and ask questions. TVA also established a review group consisting of various stakeholders including users and distributors of TVA electricity, state agencies, academia, the Department of Energy, and environmental advocacy groups (the Sierra Club and the Southern Alliance for Clean Energy). This review group met frequently throughout the IRP process with TVA staff preparing the IRP and EIS and provided comments on TVA's analyses and results on an ongoing basis. Volume 2 of the IRP EIS contains the comments TVA received and TVA's responses to them. The IRP EIS can be found at http://www.tva.com/environment/reports/irp/index.htm.

## B. RESPONSES TO COMMENTS

**Air Quality**

***Air Quality Impact Assessment***

**1. Even if TVA installs and consistently operates the flue gas desulfurization units to achieve a high level of $SO_2$ control, the Gallatin plant will still adversely affect the human environment. With controls consistently performing at their design specifications and the plant operating at last year's capacity factor, the plant would emit up to 4,442 tons of $SO_2$ using the proposed coal blend. These emissions would be harmful to sensitive populations of people, plants, animals, and aquatic life. (*Commenters: Nathan Moore - SELC*)**

*Response:* This comment ignores the fact that TVA's proposed action here and the actions being taken across its coal-fired power system will significantly improve air quality near the Gallatin plant site and across the region. Installing air pollution controls at GAF is an integral part of TVA's commitment to minimize emissions, and reduce their associated impacts. This commitment was memorialized in an interagency compliance agreement with U.S. EPA and in a judicial consent decree with the three States which regulate emissions at TVA's coal plants (Alabama, Kentucky, and Tennessee), the State of North Carolina and three environmental advocacy groups, including the Sierra Club. The parties to these agreements determined that the actions to which TVA committed "will achieve significant reductions of emissions from the TVA System and thereby significantly improve air quality." In the motion asking the Federal District Court in eastern Tennessee to approve the consent decree, the Sierra Club and the other parties to the consent decree, said, "The structure of the settlement ensures that TVA can flexibly achieve the required emission reductions as cost-effectively as possible consistent with its congressional mandates. All of the parties to the Consent Decree believe that the approach taken here is adequate and reasonable." The proposed installation of flue gas desulfurization, or scrubbers, at GAF will reduce $SO_2$ emissions by approximately 96%.

Although not expected at this time, if it is determined that residual $SO_2$ emissions from GAF are contributing to air quality problems in the future, there is an entire regulatory program under the federal Clean Air Act and Tennessee's laws implementing that Act that is structured to identify and remedy such problems. See Subchapter 1, Part D of the Clean Air Act.

**2. Even with controls, Gallatin would remain a significant source of mercury pollution. Mercury is highly toxic to people, even in very small quantities. Exposure to mercury harms reproduction, the cardiovascular system, and, especially, the brain and central nervous system. Fetuses and young children are more sensitive to mercury exposure than adults, and exposure to low to moderate levels, as well as to high levels, can cause permanent neurological symptoms and other impairments. Approximately 10% of U.S. women of childbearing age have elevated mercury levels. Eliminating the risk of adverse effects to fetuses, young children, and adults essentially requires eliminating all dietary sources of mercury. (*Commenters:* (Commenters: *Joe Anderson, Anonymous, Kris Ballinger, Debbie Barnard, Matthew Bentley, Hector & Suzanne (sic) Black, Jerry [sic] Bowles, Britton, Larry, Thomas Carothers, William F.Caul, Barbara (sic) Clinton, R. G. Crarens, Ed Edenfield, Pamela Edenfield, Peggy &***

***Eston Evans, Richard Finch (sic), John Froeschauer, Christopher E.Gibson, Melba Gulick, Kathleen Hardeman (sic), Ada Haynes [sic], Bill Hennessa (sic), William Howell, Sara & Douglas Hudgens, Thomas Hutson, Tom Jankins (sic), Bradley Jarrell, Joseph E.Kress, James R.Ladd, Lewis John (sic), Landon Medley, Amanda Moore, Nathan Moore – SELC, Carole Moore-Slater, Mary Louise Murphy, Brian Paddock, Charles Parker, Leith (sic)Patton, Elizabeth Queener, Barbara Reynolds, Eliseo & Marjorie Rios, Beth Rolm (sic), Dicksie S.Schmitt, Breika, Tyler, & Cassandra Schrade, Jim Selin [sic], James R.Slater, Jacqueline & Edwin Stapler, Beth Stoddart, Tom Strawman, Binney Stumpf, Michael White, Steven & Sally Yancey)*)**

*Response:* Some studies have shown that mercury at sufficiently high levels can have adverse health impacts. The exposure pathway of concern is through the consumption of fish which have bioacumulated methylmercury, not exposure to the levels of mercury that may be present in ambient air (http://www.epa.gov/airquality/powerplanttoxics/pdfs). Air emissions of mercury are, however, one of the pathways by which mercury enters food chains leading to bioacculumation. The proposed actions addressed in this EA, as well as actions TVA is taking or considering at its other coal-fired plants, will significantly reduce emissions of mercury, as well as other pollutants. This will improve air quality near the Gallatin plant site and across the region, and bring TVA's plants into compliance with the FFCA (See Section 1.1) and the recent Mercury and Air Toxics Standards (MATS) for coal-fired power plants. EPA determined that MATS will protect air quality and promote public health by reducing emissions of mercury. 77 Fed. Reg. 9434 (Feb. 16, 2012). TVA estimates that the installation of the additional emission controls proposed for Gallatin would reduce mercury emissions from the plant by at least 86%.

**3. The DEA recognizes that fugitive emissions will result from the transportation of coal combustion products but does not assess the health effects of these emissions. There have been problems at TVA's Johnsonville and Kingston plants from ash leaking and blowing out of haul trucks and then leaching into groundwater. TVA has failed to demonstrate that it can transport ash by truck without leaving a trail of ash and pollutants. (*Commenter: Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* The CCR captured by the fabric filters will be dropped into a vacuum pressure transfer system and blown with vacuum blowers into one of two storage silos. Each silo will operate alternately and will be equipped with a pin-mix unloader and a high-efficiency bin vent fabric filter. Prior to discharging into tri-axle trucks, the CCR will be conditioned by adding water to achieve a moisture content of 20 percent (erroneously stated as 15 percent in the Draft EA). This moisture content will minimize fugitive dusting from transfer and hauling of CCR. The CCR will be hauled to the proposed on-site landfill. The road to the landfill will be paved, and wet suppression will be used to control fugitive emissions during dry periods.

The GAF air permit has several requirements related to fugitive dust that will help ensure that any emissions are managed to acceptable levels and do not pose a risk to human health. TVA currently complies with, and will continue to comply with, the following:

(a) The permittee shall not cause, suffer, allow, or permit any materials to be handled, transported, or stored; or a building, its appurtenances, or a road to be used, constructed, altered, repaired, or demolished without taking reasonable precautions to prevent particulate matter from becoming airborne. Such reasonable precautions shall include, but not be limited to, the following: 1. Use, where possible, of water or chemicals for control of dust in demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land; 2. Application of asphalt, oil, water, or suitable chemicals on dirt roads, material stock piles, and other surfaces which can create airborne dusts; 3. Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials. Adequate containment methods shall be employed during sandblasting or other similar operations.

(b) The permittee shall not cause, suffer, allow, or permit fugitive dust to be emitted in such manner to exceed 5 minutes per hour or 20 minutes per day as to produce a visible emission beyond the property line of the property on which the emission originates.

The Tennessee Department of Public Health prepared a public health assessment of the coal ash released from TVA's Kingston Steam Plant. This assessment was prepared in cooperation with the Agency for Toxic Substances and Disease Registry in the U.S. Department of Health and Human Services. This assessment concluded that breathing coal ash for short periods of time would not harm people's health and that as long as adequate dust suppresion measures were used there should be no harm to people's health. This assessment can be found at http://health.state.tn.us/environmental/PDFs/pha-e-TVA_Kingston_Fossil_Plant_Final.pdf.

**4. The limited emissions modeling results that TVA provided appear to not account for ambient $SO_2$. The lowest $SO_2$ background concentrations monitored in Tennessee are 28.8 ug/m3, and the concentration near Nashville is 39.2 ug/m3. Had TVA accounted for this in its modeling, the results would show that the retrofitted Gallatin plant would violate NAAQS in startup mode and likely at other times. (*Commenter: Craig Segall – Sierra Club 2*)**

*Response:* It is premature to anticipate ambient $SO_2$ standard violations based on available modeling protocols. EPA initially proposed a hybrid implementation approach that would rely on both monitoring and modeling data to designate areas violating the revised primary $SO_2$ NAAQS. However, after receiving many comments raising concerns with this approach, EPA decided to consider additional implementation options and intends to issue guidance or rulemaking on the approach for showing compliance with the standard. In this ongoing effort, EPA has begun issuing changes to its modeling protocols. TVA's modeling was based on the existing, highly conservative protocols and conservative assumptions about emissions for use as a boundary for the project and was not intended for use as a determinant for nonattainment. TVA is awaiting further guidance from EPA before doing more refined modeling.

No area in middle Tennessee is in nonattainment of the 1 hour standard based on monitoring data. Nor has USEPA proposed to designate any area in Tennessee as not attaining $SO_2$ ambient standards except Sullivan County in northeast Tennessee. See http://www.epa.gov/so2designations. For the ambient air quality monitor that TVA operated adjacent to the plant in 2002, 2004 and 2007, the 99th percentiles of the daily maximum 1-hr concentration were 64 ppb, 48 ppb and 40 ppb respectively, well below the 75 ppb 1-hour $SO_2$ standard. These mearurements include and account for emissions during unit startups at GAF. It is clear that $SO_2$ levels are decreasing due to low sulfur diesel requirements and other emission reductions, including those on the TVA power system. This trend will be helped by the proposed action.

$SO_2$ emission rates would be higher during unit startup than during routine operation. This is inherent in the chemistry of the process since elevated temperatures are required for scrubber reactions to occur. Projecting the effect of unit startup on ambient $SO_2$ levels and the 1-hour $SO_2$ standard through modeling requires EPA to complete refinement of its modeling protocols. Regardless, existing ambient air quality monitoring data shows that $SO_2$ levels are well below the 1-hour standard, as discussed above, even prior to the proposed $SO_2$ reductions at TVA's Gallatin plant.

**5. Documents submitted to TVA on November 30, 2012 by the Southern Environmental Law Center and others showed that violations of the NAAQS for $SO_2$ would persist after implementation of the proposed action. Partial AEROMOD modeling results provided since then by TVA also raise serious questions about the plant's ability to comply with the NAAQS for $SO_2$. According to this modeling, during the future startup of one of the four boilers, the plant would generate ambient $SO_2$ concentrations of 195.86 ug/m3 of $SO_2$, 0.24 ug/m3 below the NAAQS. Given this, it is not clear that the project will not violate the NAAQS during the startup of one boiler. This problem becomes more acute when multiple boilers are in startup mode. Based on TVA's modeling data, NAAQS exceedances would likely occur during multiple boiler startups, as well as when units are ramping down or in other conditions when the scrubber system is not running at full power. All of these conditions are likely in the future.**

**TVA should provide additional modeling results or other evidence to support its claim of compliance with the NAAQS and avoidance of significant environmental impacts from future emissions of $SO_2$. (*Commenter: Craig Segall – Sierra Club 2*)**

*Response:* See the response to Comment 4.

**6. EPA has determined that short-term exposure (i.e., between 5 minutes and 24 hours) to high levels of sulfur dioxide ($SO_2$) cause respiratory illness, aggravation of respiratory disease, and asthma attacks. This exposure results in increased emergency room visits and hospitalizations, and children, older adults, people who exercise outdoors, and certain ethnic groups are especially vulnerable. Coal-fired power plants are by far the largest industrial sources of $SO_2$ pollution in the U.S.**

**The Gallatin plant is currently allowed to emit up to 57,820.0 pounds of $SO_2$ in a 24-hour period. The maximum hourly $SO_2$ emission rate in 2011 was 9,102.3 pounds per hour. Air modeling by Wingra Engineering shows that Gallatin's allowable and actual maximum hourly $SO_2$ emissions can cause substantial and widespread violations of the 1-hour $SO_2$ ambient air quality standards.**

**In order for Gallatin to meet the 1-hour ambient air quality standard, allowable $SO_2$ emissions would have to be reduced by 88.2% on a continuous basis. According to the draft EA, the proposed action would achieve up to a 96% reduction of $SO_2$. The Wingra modeling shows that, regardless of the potential control efficiency of the proposed pollution controls, the Gallatin permit must be substantially tightened to meet the 1-hour standard. It also shows that the devices must be maintained and continuously operated at a very high control efficiently to consistently meet the 1-hour standard, including during start-up, shutdown, and malfunction, especially with the high sulfur coal TVA proposes to use. (*Commenters: Nathan Moore - SELC*)**

*Response:* See the response to Comment 4. As this comment indicates, TVA is proposing to install dry scrubbers at Gallatin that are expected to reduce $SO_2$ emissions by up to 96 percent. This reduction is significantly better than the 88.2 percent reduction that the modeling cited by the commenter indicates would be necessary to avoid exceeding the new one-hour $SO_2$ ambient standard.

***Impacts of Current Gallatin Emissions***

**7. A 2010 study by Abt Associates quantified the deaths and illnesses attributable to fine particle pollution from the Gallatin plant. Each year, this pollution causes or contributes to more than 100 deaths, over 150 heart attacks, 1,700 asthma attacks, and over 170 hospital visits, at an annual cost of more than $827 million. (*Commenters: Nathan Moore - SELC*)**

*Response:* The study by Abt Associates referenced in the comment appears to present results for the state of Tennessee. It is unclear how impacts were extrapolated specifically for GAF and TVA is unable to respond to the merits of this study. However, TVA's proposed action at GAF and the actions being taken across its coal-fired power system will significantly reduce emissions from its plants and should improve air quality near the Gallatin plant site and across the region. Installing air pollution controls at GAF is an integral part of TVA’s commitment to minimize emissions, including $SO_2$ emissions, and reduce their associated impacts. This commitment was memorialized in the FFCA, described above in the response to Comment 1. The parties to this agreement, including the Sierra Club and two other environmental advocacy groups, stated TVA’s flexible and cost-effective approach to emission reductions was adequate and reasonable and would significantly improve air quality. The proposed actions would reduce emissions of NOx and $SO_2$, which are fine particulate precursors, by up to 90 and 96%, respectively. Direct emissions of particulate matter from the steam generating units would be controlled using new fabric filter technology. In addition, the dry FGD plus fabric filter system is expected to reduce emissions of condensable particulate matter below current levels.

**8. Coal is an inefficient source of energy and a major source of air pollution. (*Commenter: Terri Kelly*)**

*Response:* Comment noted. The efficiency of coal power plants varies substantially. On the TVA system, Gallatin is one of its most efficient plants. The proposed actions here would reduce emissions from the plant by substantial amounts and TVA’s commitment to reducing emissions across its system and its approach for doing this was deemed adequate and reasonable by a several environmental advocacy groups, including the Sierra Club.

**Alternatives**

***Range of Alternatives***

**9. NEPA requires federal agencies to explore and objectively evaluate all reasonable alternatives. NEPA documents should consider reasonable alternatives to proposed actions that will avoid or minimize adverse effects of the proposed actions. The DEA only considers two action alternatives that are very similar. Alternative 2, TVA's preferred alternative, would adversely affect endangered species. TVA should give more consideration to alternatives that avoid affecting endangered species. (*Commenter: Tierra Curry - CDB*)**

*Response:* The Council on Environmental Quality directs federal agencies to briefly discuss alternatives to proposed actions in their environmental assessments. TVA's EA provides substantial information about two action alternatives and the required No Action Alternative. In addition, the EA discusses more briefly other alternatives, including repowering the Gallatin units to renewable biomass and retiring the units. These are the options that TVA has under the compliance agreement with EPA and the consent decree with other entities, including the Sierra Club and two other environmental advocacy groups. In the context of a "retirement alternative," TVA addresses replacing the generation from the coal units with energy efficiency, natural gas-fired generation, and renewable energy resources. The discussion of these other alternatives has been expanded in the Final EA and is addressed in the responses to other comments in this Alternatives section. Both action alternatives will comply with all applicable state and federal regulations and include measures to avoid, minimize, or mitigate impacts to species protected under the Endangered Species Act, as described in Section 4.3.2 of the Final EA.

**10. The DEA does not adequately address the alternative of retiring the Gallatin plant. Retirement would reduce air emissions, including greenhouse gases, reduce thermal and chemical discharges to the Cumberland River, and reduce discharges of wastes and effluents from coal ash storage on the site, as well as the risk of catastrophic failure of the storage sites. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* See the responses to Comments 12 and 17 and revised Section 2.4 of the Final EA.

**11. The DEA does not consider alternatives for the disposal of fly ash and scrubber waste that would recycle these materials instead of disposing of them in landfills. According to the report by Dr. Ranajit Sahu, such alternatives are readily available, including for the waste from TVA's preferred dry FGD technology. Beneficial uses for this material include lightweight aggregate, acid mine drainage control, mine backfilling, disposal cell sealing layers, and road beds. The lack of consideration of these environmentally preferable disposable alternatives is unjustifiable. (*Commenters: Nathan Moore - SELC*)**

*Response:* Comment noted. TVA has actively promoted the beneficial reuse of coal combustion residuals (CCR) and scrubber waste for many years. During calendar year 2011, TVA successfully recycled 25% of CCR and 27% of scrubber waste generated at its coal plants. The quantities recycled at individual coal plants vary according to the type of materials produced, the demand for the materials in the area, and other factors. Unlike the synthetic gypsum ($CaSO_4(OH)$) scrubber waste produced at plants with wet scrubbers, which is suitable for use in manufacturing wallboard, the proposed Gallatin dry scrubber would produce calcium sulfite ($CaSO_3$). In addition to having a different reaction by-product, the waste would also contain fly ash and, therefore, would not be a pure reaction product limiting its marketability.

TVA is aware of the potential beneficial uses of dry scrubber waste identified in the Sahu report. TVA is currently participating with others in an ongoing Electric Power Research Institute study entitled "Development and Demonstration of High-Volume Uses for Spray Dryer Absorber Solid Products." This collaborative study is developing uses for spray dryer absorber (SDA) byproducts, which would be produced at GAF under the proposed action, as well as providing engineering and environmental data for SDA byproduct applications.

The study is scheduled for completion in 2016 and will guide TVA's future efforts to recycle the mixed flyash and scrubber waste that would be produced at GAF under the proposed action. EPA is currently considering regulating CCR as a special waste under Subtitle C. If these rules are promulgated, future recycling efforts of CCR could be negatively impacted due to the stigma and perception associated with the classification.

**12. The DEA does not identify any reason why retiring the Gallatin plant is not feasible. Instead, TVA expresses a preference for continued use of coal in its resource mix as a matter of asset diversity. During FY12, 41% of TVA's net generation came from coal, 12% from natural gas, 0.017% from non-hydroelectric renewable resources, and 0.391% from energy efficiency and demand response programs. The suggestion in the DEA that these resources are over-represented in TVA's current energy mix is inaccurate. TVA already relies on coal more than any other asset, and the continued operation of the upgraded Gallatin would result in over-reliance on coal and reduced asset diversity. (*Commenters: Nathan Moore -*** *SELC*)

*Response:* See the revised Section 2.4 in the Final EA. In its long-range planning, TVA looks at future capacity and energy mixes given known constraints and commitments. Given that current and possible future regulatory and review process obstacles make it extremely difficult to build any new coal plants, the portion of TVA’s energy supply based on coal is coal is expected to decrease. TVA currently forecasts the coal fleet will provide less than 30% of TVA’s total energy supply by 2022. Given uncertainty with planning assumptions, especially those farther in the future, continuing to operate economical and reliable generation assets such as Gallatin provides the most robust approach to maintaining a balanced portfolio.

**13. The DEA fail to analyze the reasonable alternative of a combination of retirement of some units and retrofitting other units. This alternative would yield substantial environmental and economic benefits and greatly reduce air emissions and coal ash production. (*Commenters: April Adams, Geneva Adams, Jere Adams, Marci Adams, Linda Albright, Jill Alliman, Alane Alongi, John Andes, Robert Andrys, Sharon Annis, Heather Armistead, Dwight Arnold, Kim Astren, Aashir Awan, Kyle Axley, Floyd Ayers, Brenda Badiuzzi, Jim Bailey, Rick Ball, Eric Barden, Andrew Barrett, Kevin Bartels, Charles Beck, Eric Beck, Jonathan Bell, Amy Bertram Read, William Best, Tanya Bethurem, Katy Bilbrey, Robbie Billings, Shelly Bogda, Paul Bogen, Liesse Bohlmann, Scott Bomar, Carolyn Bonner, Mark Boothby, Tom Boughan, Wilder Boule, Bettina Bowers Schwan, Danielle Bownes, Thomas Boyd, Diana Bradbury, Courtney Brannan, Jim Brasfield, Jared Bredehoeft, Tina Breeds, Margo Brent, Bill Brescia, Daniela Bress, Christopher Brewer, John Brewer, Dolores Briggs, David Briley, Sarah Brobst, Penny Brooks, Cullen Brown, Jerry Brown, Jesse Brown, Shirley Brown, Bobbi Browne, Linda Browning, Jamie Brubaker, Kornelius Bujok, Gordon Burghardt, Julie Burkett Jones, Barbara Burton, Sharon Cagle, Teresa Campbell, Stephanie Capps, Carole Caprio, Jeanette Carbary, Tina Carmon, Joanna Carnahan, Kendall Carnes, Clarke Carter, Jean Carter, John Carter, Karen Carter, Charles Case, Peggie Cash, Albert Ceren, Jon Charkiolakis, Dimitri Chernyshov, Beverly Chessor, Maryanna Clarke, Richard Clear, Ola Cleon Jones, Henry Clukey, Gina Collins, Jamie Conner, William Conte Jr, John Conway, Victoria Cook, Brian Copeland, Sandra Corbin, Michael Cothron, Mike Couch, Teegan Coulter, Jan Crean, Nathan Crockett, Katey Culver, Elizabeth & Robert Cunningham, Randall Dailey, Leslie Dalecke, Karen Daniel, Rob Dansereau, Cheryl Dare, Deborah Darnell, James & Marilyn Davidheiser, Bernice Davidson, Brent Davis, Marilyn Davis, William Davis, Marnie De Shaw, Irvin*****

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***Pedigo, Mark Peterson, Donna Phillips, Eleanor Phillips, James Pierce, Karen Polson, John & Patricia Post, Jo Potter, Lisa Pressley, Taylor Prince, Christine Pritchard, Robert Pugh, York Quillen, Don Quire, Sam Rabito, Matt Ragan, Virginia Ralston, Elizabeth Raver, Kristy Ray, John Reid, Nancy Reppond, Jessica Ristoff, Jeff Roberts, Megan Rocchietti, Ramcey Rodriguez, Jim Roe, William Rogers, T. R. Rose, Alice Ross, Linda Ross, Paula Rosser, Keven Routon, Cindy Rudolph, Liane Russell, Kory Ruth, Virginia Salmon, Nicholas Sanders, William Sanders, Melinda Saneda, Eric Savage, Vivek Savur, Eric Schechter, Joe Schiller, Rachel Schlafer-Parton, Susan Schuchard, Shelah Scott, Richard Seidenstricker, Marlene Shaner, Charleen Shelton, Dorothy Shelton, Mark Shenkel, Mark Shipley, Zachary Shulkin, Jack Simpson, Amber Smith, Christy Smith, Ray Smith, Robert Smith, Scott Smith, Terry Smith, Clinton & Stephanie Smullen, Barbara Snell, Katherine Snook, Dorris & Steven Snow, Steven Sondheim, Catherine Soudoplatoff, Bill Spang, Tonya Spann, Michael Spradlin, Kimberly Stamper, Donald Steele, Michael Stengel, Jeanie Stephenson, Nancy Stewart, Bryan Stone, Brian Straka, Michael Strickland, Nathan Strong, Gloria Stuart, Karen Stuart, Karen Stuart, Lana Sutton, Megan Swaine, Kevin Synan, Wayne Tafuro, Karen Tate, John Taylor Jr., Joel Tellinghuisen, Noton Tennille, Vickie Terry, Karen Tharp, Marsha Tharp, Daniel Therrien, Alva Thomas, Elbert Thomas, Robert Thompson, Janis Tilton, Rebekah Timothy, Mark Tolley, Andrea Tothacer, Lloyd Townsend, Anastasia Marina Tsoutsoulopoulou, Bambi Tucker, Rachele Tucker, Denise Tugadi, Betsi Tunnell, Mary Underwood, Clyde Ussery, Jacob Verhoeff, Edgardo Vila, Michele Villeneuve, Genia Vookles, Samantha Voorhees, Doris Wade, Jacqueline Wagoner, Emily Walker, Erin Walls, Hazel Walton, Jennifer Walton, Jessica Warren, Sylvia Warren, Phillip Webster, Sage Welch, Elizabeth Wells, Joyce Wheaton, Melissa White, Michael White, Amber Whitehead, Chris Widby, Lydia Williams, Robert Williams, Stan Williams, Bonnie Willingham, Hiryana Willis, Gordon Wilson, Cor Wisnewski, Catherine Wochna, Summer Wollett, Stormie Woods, Richard Woodward, Gerry Wright, John-Gloria Wyatt, Galen Yacalis, Joe Yantis, Omar Zaman, Herbert Zeman, Nancy Zimmerman, Stephen Zipperer*)**

*Response:* When TVA evaluated the merits of unit retirements for its IRP and subsequently specifically for the Gallatin units it did so on a unit-specific basis. Each of the Gallatin units was among the highest ranked units in the TVA coal system and TVA determined that none of them would be among the group of units that would be considered for retirement to achieve the retirement ranges set by TVA's IRP.

There also are important savings from project and plant operating economies of scale resulting from installing controls on all four units and continuing to operate all four units compared to controlling and operating fewer units. These economies of scale affect the total capital cost and therefore the cost per unit of output or kW of the clean air controls. The capital cost per kW is a primary determinant of the economics of any proposed utility capital project. The total or absolute cost of the clean air controls would increase if more units are controlled. The cost per kW, however, would decrease due to economies of scale for many components including the stack, flyash silos, duct support bridge, electrical systems such as transformers and high voltage station service lines, project oversight, engineering, and environmental review and permitting. There are also economies of scale for plant operation, with the cost per kW greater for fewer than four units for fixed costs such as plant labor and some equipment. In addition, there are some plant systems that are common to the entire plant that must still be maintained even if less than four units are retained for the long-term. Therefore, the economics of the proposed action are distinctly improved with four units over those with less than four.

**14. The DEA fails to adequately analyze the increased use of energy efficiency as an alternative to the proposed action. A General Accounting Office study shows that TVA has systematically failed to analyze energy efficiency as an alternative in its planning processes. A study by Global Energy Partners shows that significant under-used and cost-effective energy efficiency potential is available to TVA. (*Commenters: Anonymous, April Adams, Geneva Adams, Jere Adams, Marci Adams, Linda Albright, Jill Alliman, Alane Alongi, John Andes, Joe Anderson, Robert Andrys, Sharon Annis, Heather Armistead, Dwight Arnold, Kim Astren, Aashir Awan, Kyle Axley, Floyd Ayers, Brenda Badiuzzi, Jim Bailey, Rick Ball, Kris Ballinger, Eric Barden, Debbie Barnard, Andrew Barrett, Kevin Bartels, Charles Beck, Eric Beck, Jonathan Bell, Matthew Bentley, Amy Bertram Read, William Best, Tanya Bethurem, Katy Bilbrey, Robbie Billings, Hector & Suzanne (sic) Black, Shelly Bogda, Paul Bogen, Liesse Bohlmann, Scott Bomar, Carolyn Bonner, Mark Boothby, Dave Bordenkircher, Tom Boughan, Wilder Boule, Bettina Bowers Schwan, Jerry [sic] Bowles, Danielle Bownes, Thomas Boyd, Diana Bradbury, Courtney Brannan, Jim Brasfield, Jared Bredehoeft, Tina Breeds, Margo Brent, Bill Brescia, Daniela Bress, Christopher Brewer, John Brewer, Dolores Briggs, David Briley, Larry Britton, Sarah Brobst, Penny Brooks, Cullen Brown, Jerry Brown, Jesse Brown, Shirley Brown, Bobbi Browne, Linda Browning, Jamie Brubaker, Kornelius Bujok, Gordon Burghardt, Julie Burkett Jones, Barbara Burton, Sharon Cagle, Teresa Campbell, Stephanie Capps, Carole Caprio, Jeanette Carbary, Tina Carmon, Thomas Carothers, Joanna Carnahan, Kendall Carnes, Clarke Carter, Jean Carter, John Carter, Karen Carter, Charles Case, Peggie Cash, William F.Caul, Albert Ceren, Jon Charkiolakis, Dimitri Chernyshov, Beverly Chessor, Maryanna Clarke, Richard Clear, Ola Cleon Jones, Barbara (sic) Clinton, Henry Clukey, Gina Collins, Jamie Conner, William Conte Jr, John Conway, Victoria Cook, Brian Copeland, Sandra Corbin, Michael Cothron, Mike Couch, Teegan Coulter, R. G. Crarens, Jan Crean, Nathan Crockett, Katey Culver, Elizabeth & Robert Cunningham, Randall Dailey, Leslie Dalecke, Karen Daniel, Rob Dansereau, Cheryl Dare, Deborah Darnell, James & Marilyn Davidheiser, Bernice Davidson, Brent Davis, Marilyn Davis, William Davis, Marnie De Shaw, Irvin Degroff, Cathy Del Casino, Elisha Delaney, Gk Desjarlais, Linda Desmond, Remy Devoe, Steven Dieringer, Thomas Diggs, James Dimarco, Nathan Donegan, Shahn Donegan, Harry Draper, Chris Drumright, Marcella Dunn, Naomi Durall, Patrick Dyal, Greg Easterly, Ed Edenfield, Pamela Edenfield, Ran Edwards, Sherry Edwards, Stacie Edwards, Bob Eklund, Dennis Eleogram, Jonathan Ertelt, Morgan Estes, Joyce Evans, Peggy Evans, Peggy & Eston Evans, Ivan Everitt, Stephanie Fairbanks, Susan Faulkner, Wyatt Fawns, Clayton Ferguson, Andrew Ferrell, Nicole Fey, Gabriel Fidler, Richard Finch (sic), Alan Fister, Bernadette Fitzpatrick, Joanne Fletcher, Karen Fletcher, Elizabeth Floersch, Mark Foerster, Anna Fominykh, Ariel Forbes, Richard Foster, Ashleigh Fountain, Connie Fowler, Jason Fox, Gary Frattalone, Axel Friedrich, John Froeschauer, Jane Gardner, David Garner, Wayne Garner, Lois Gast, Austin Gavin, Patty Ghertner, Corinne Giagnorio, Chris Gibson, Christopher E.Gibson, Willie Gibson, Edgar Gilbert, Laurie Gilbert, Chris Gilbreath, Raechel Glynn, Thomas Goff, Joanne Golden, J B Gordon, Louise Gorenflo, John Grant, Jim Graves, Alan Green, Edward Greene, Wilbert & Gloria Griffith, Heather Grimm, Anne Grindle, Diane Gross, Jo Ann Gryder, John Guenst, Melba Gulick, Dagmar Gundersen, Karen Gupton, Stephanie Hacker, Cherrie Haggard, Rasheed Hakeem, James Haldy, Bill Hale, Shelia Hale-Bledsoe, Bill Hall, James Ham, Lynne Hancock, Cathy Hannnaway, Kathleen Hardeman (sic), Carla Hargrove, James Harrell Jr, Vincent Harriman, Dennis Hatler, Annemarie Hayes, Ada Haynes [sic], Michelle Haynes, Brandon Hazlett, Mark Heald, Richard Helton, Bill*

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*Response:* This comment generally asserts that TVA should increase its energy efficiency programs and use this increase to offset the generation lost by retiring Gallatin's coal-fired units, but provides little in the way of Gallatin-specific analyses to support this. Section 2.4.2 of the draft EA addressed this topic and has been revised in the final EA to provide more information about replacing Gallatin generation with increased energy efficiency. As Section 2.4.2 indicates, TVA's 2011 IRP and EIS evaluated the role of energy efficiency in the TVA system. TVA determined based on these evaluations that moving to a more balanced portfolio of energy resources better met TVA's goals and the needs of the public it serves. A balanced portfolio includes retiring some of TVA's existing coal-fired units and continuing to operate its remaining coal-fired units as well as significantly expanding its energy efficiency programs. The analyses incorporated into the IRP showed that over-reliance on any specific energy resources, such as energy efficiency, performed more poorly under a variety of possible future scenarios than a more balanced portfolio. This EA tiers from the IRP FEIS. See IRP FEIS Section 2.3 - 2.6 and 6.3 - 6.4, as well as IRP Chapter 8 for more detailed descriptions of these analyses. See the responses to Comments 12 and 17 that discuss the analyses TVA does when it considers which coal fired units to retire and which to continue to operate and the importance of Gallatin in meeting transmission system reliability needs.

**15. The DEA fails to adequately analyze the use of natural gas-fueled generation by either repowering the Gallatin plant to burn gas or replacing the Gallatin plant with a gas-fueled plant. Although gas is less desirable than energy efficiency or non-fossil sources of power, it would result in significantly lower air pollution emissions and essentially no solid waste production compared to coal. Studies by the Energy Information Administration and Synapse Energy Economics note that natural gas prices are projected to remain at fairly low levels for years. (*Commenters: Nathan Moore - SELC*)**

*Response:* The Gallatin EA tiers from the 2011 TVA IRP and accompanying EIS. The top ranked three generation strategies from the IRP (Strategies B, C, and E) provided a range of coal capacity retirements by 2017 of 2400-4700 MW and this range of capacity retirements was included in the adopted strategy. TVA identified particular units that could be retired based on detailed coal unit group performance and cost studies. Inherent in these analyses was the assumption that the lost generating capacity resulting from coal unit retirement would have to be replaced by other energy resources. The IRP studies evaluated various resources for replacing this capacity, including increased gas generation.

Subsequent studies specific to Gallatin evaluated both repowering with gas and replacement with new, on-site gas generation. Given the significant uncertainties in key planning assumptions including relative fuel prices, demand and sales growth rates, and regulatory constraints, TVA employed a robust scenario/sensitivity analysis framework in conducting these analyses. If it is assumed that natural gas prices stayed low, gas-fired generation would be more economical than continued operation of the coal units and this alternative was preferred in some of the cases studied. Natural gas prices have fallen and remain low because of the significant recent increase in natural gas production due in large part to horizontal drilling and hydraulic fracturing (fracking). There are, however, significant uncertainties over the future supply and cost of natural gas. One aspect of these concerns is the environmental impacts of fracking, a concern raised by some of the commenters on this EA in other venues. In the analysis undertaken as part of the IRP, as well as analyses carried out subsequently, the installation of emission controls at Gallatin was the preferred alternative in the clear majority of cases studied. Continued operation of Gallatin was found to play a key role in achieving portfolio diversity that is important in insulating the public served by TVA from fuel cost volatility and the risks uniquely associated with specific kinds of energy resources.

**16. The DEA fails to adequately consider the alternative of retiring the Gallatin plant and replacing its capacity with renewable energy. The brownfield Gallatin site could be used for a large solar installation in combination with other renewable sources to provide replacement energy. There is also no mention of the high voltage DC line project that TVA is involved in to deliver green energy to the TVA region. This project would provide additional replacement project. (*Mary Mastin - TEC, TSRA, CBD*)**

*Response:* Solar energy is not equivalent to fossil-fuel generation resources. As discussed in the response to Comment 17, the Gallatin units serve two important roles in the TVA electric power system. First, they are primary sources of energy used in the Nashville area. More distant energy resources could meet this local demand and the TVA power system is structured to do this when necessary, but line load losses would increase thereby increasing costs and the proximity of energy resources to major load centers reduces the risk of disruptions. Second, the Gallatin units provide critical voltage support for the area.

Replacing the Gallatin units on site with renewable energy resources like solar conceptually could meet the first role, providing the energy needs of the Nashville area. To be equivalent to the peak power output capability of Gallatin a solar station would have a footprint that is approximately 6,700 acres or nearly four times larger than the size of the Gallatin plant site, and this does not consider the much lower capacity factor of solar (the amount of energy that a generating resource can reliably produce over time). Such a large footprint would physically impact more resources on the site than does the Gallatin plant. More importantly, solar (or wind) energy resources cannot provide necessary voltage support. Such resources are intermittent in nature or 'not dispatchable' in utility industry terms. There is no assurance that they would be able to operate when called upon to provide voltage or transmission system support. For example, solar resources do not generate at night and generation output is reduced, sometimes substantially, at other times such as during rainstorms and on overcast days.

The Department of Energy recently has begun preparing an EIS on the high voltage DC (direct current) line known as the Plains and Eastern Project. This line is designed to move energy primarily from wind energy resources from the southern Great Plains to an interconnection on the western edge of the TVA transmission system. TVA is a cooperating agency in the DOE review, but has made no commitment to the interconnection or to the use of renewable energy transmitted by the line. If the line is built, renewable energy transmitted by it would have the same limitations discussed above for a solar station located on the Gallatin plant site and would not be a reasonable replacement for Gallatin's generation.

**17. The DEA fails to consider the full or partial retirement of the Gallatin plant and its replacement with purchased cleaner power. TVA has historically relied on such purchases, or their contractual availability, as an integral component of its system planning. They constituted more than 6% of net summer capacity in fiscal year 2012. Ample resources are available for the replacement of all or part of the power generated by Gallatin with purchased power. (*Commenters: Nathan Moore - SELC*)**

*Response:* See the responses to Comments 13 and 16. TVA must have generation in the Nashville area, and preferably at the Gallatin site for local and area transmission support. TVA does purchase power from plants it does not own and such purchases help TVA meet the demand for base load, intermediate load, and peaking energy on its system. However, purchased power to replace Gallatin would have to be generated in the same area to provide the necessary transmission support. TVA is not aware of any existing or proposed sources of purchased power available and adequate to meet its requirements. GAF not only provides the real power required by the Nashville area loads, but also serves as a major source of dynamic reactive power for the area needed to maintain adequate voltage. Inadequate voltage can cause damage to equipment, such as motor loads, resulting in decreased reliability issues for the area. Without Gallatin, or an equivalent local power source, TVA would not be able to reliably and safely serve the Nashville area loads. TVA would also not be able to meet North American Electric Reliability Corporation (NERC) reliability standards. These standards ensure that TVA maintains system reliability for its customers by meeting voltage requirements and not exceeding specified equipment ratings.

**18. The DEA offers no reason for rejecting retirement and other cleaner alternatives and there does not appear to be any technical reason why these alternatives are not feasible. A recent technical report by Peter Lanzalotta demonstrates that replacing Gallatin with energy efficiency would improve the reliability of the TVA electrical system. Increased energy efficiency would reduce transmission system loading and voltage concerns. (*Commenters: Nathan Moore - SELC*)**

*Response:* On the question of GAF retirement, please see the responses to Comments 13 and 17.

TVA has carefully considered the Lanzalotta report, but disagrees that it demonstrates that energy efficiency could be used to replace generation from Gallatin. TVA utilizes energy efficiency (EE) across its system to help reduce loads and overall generation required to meet loads across the system. The use of demand response (DR) also reduces load, particularly during high demand periods. As the Lanzalotta report notes, however, the location of such EE/DR reductions and their proximity to the load now served by Gallatin is important. Moreover, because these load reductions are typically a fraction of the overall load demand spread across the entire system, any such reductions would not necessarily address the Nashville area requirements described in the response to Comment 17 that would result from the retirement of Gallatin without replacement generation in the same area.

From FY 2007 through FY 2012, TVA achieved cumulative effective EEDR impacts of approximately 900 MW and 1,600 GWh throughout its service area. This is roughly equivalent to 1% of sales for FY 2012. Approximately 20% of these impacts can be attributed to the Middle Tennessee area. TVA does not have EEDR potential studies specific to the Middle Tennessee area, but using the same ratio with Valley-wide projections of high achievable savings estimates, additional savings estimates fall short of the output of Gallatin by 2015 when requirements of EPA's MATS must be met. The improvements and controlled loads which contribute to these savings create a load shape very similar to that of the overall TVA system with its significant weather-related peaks. This shape is more comparable to a peaking unit than a base load plant such as Gallatin. This would put TVA customers at risk for reliability and safety and would result in TVA not being to meet the required NERC compliance standards.

Following are responses to specific statements in the Lanzalotta report.

> "(1) TVA does not, in the IRP or in the DEA, claim that Gallatin is necessary for system reliability
>
> TVA does not make the claim, in either the DEA or the IRP,that the shutdown of the Gallatin Plant would result in electric system reliability concerns or in the need for reinforcement of the electric transmission system and related facilities.
>
> Instead, in the DEA, TVA only mentions the *operating* reliability of the Gallatin Plant in terms of its forced outage rate. (DEA p. 30) – Operating reliability refers to a plant's own ability to operate without breakdowns and the like. Except to the extent that a plant must operate to contribute power, operating reliability has no direct relation to *system* reliability – the ability of the entire TVA electric system to operate reliably by moving power to load centers without blackouts or other failures.
>
> TVA does not indicate whether the shutdown of the Gallatin Plant would result in system reliability problems which might require system reinforcement to alleviate, or that the likelihood of such reliability problems was even studied. "
>
> *Response: Shutdown of TVA's Gallatin Fossil Plant would cause reliability problems. In a typical year Gallatin generates about 7 billion kilowatt-hours of electricity, enough to supply about 480,000 homes. As such, Gallatin Fossil Plant is a major source of energy for Nashville and surrounding areas. This plant not only provides the real power required by Nashville area loads, but also serves as a major source of dynamic reactive power for the area needed to maintain adequate voltage and ensure system reliability. During a period of system stress, excess current flows to the load, the excess flow causes more reactive power absorption on the transmission lines, and voltage sometimes drops. Reactive reserves must be available to support voltage during system contingencies. Inadequate voltage can cause damage to equipment, such as motors , thus causing more reliability issues for the area. If Gallatin generation was not available to serve the area load, transmission line overloads would occur that could cause damage to the equipment and pose a safety*

*risk. Without Gallatin Fossil Plant, or an equivalent local power source, TVA would not currently be able to reliably and safely serve the Nashville area loads.*

*Further, TVA is required by the North American Electric Reliability Corporation (NERC) to maintain compliance with all reliability standards. These standards safeguard system reliability by ensuring that voltage requirements are met and that utilities do not exceed specified equipment ratings. Failure to meet these requirements could result in violations of the standards and subsequent fines by National Energy Reliability Corporation. The loss of this local generation in the Nashville area would result in TVA not being able to meet these reliability standards.*

*TVA has analyzed the possibility of addressing the impact on reliability resulting from shutdown or retirement of the Gallatin coal units by upgrading the TVA transmission system. To do this, TVA would have to construct at least one 500-kV transmission line and upgrade other transmission lines and equipment. TVA would have to acquire voluntarily or be condemnation additional property rights for the new 500-kV line. In light of requisite environmental reviews and other legal processes, TVA estimates it would take seven to eight years to complete such activities. This is substantially longer than the period allowed by EPA's MATS rule or the FFCA.*

"TVA's IRP similarly does not address any reliability concerns that might arise from the shutdown of the Gallatin Plant, or from the shutdown of any specific generating units. The IRP does generically include coal unit retirements as part of the various strategies considered as part of the IRP, but does not consider retirement of specific coal units, listing as a "next step", the identification of specific units for retirement and the cost effects of such retirements (referred to as "idling"). (IRP, pp. 171) Such cost effects should include any transmission system reinforcement needed to address reliability impacts that results from such idlings."

*Response: See response to preceding paragraph. TVA's 2011 IRP EIS was a programmatic environmental review. Gallatin-specific issues and impacts are addressed in this FEA. TVA has assessed the merits of retiring or idling the Gallatin units, and these are discussed in detail elsewhere in this comment response section.*

"(2) Replacing Gallatin, in whole or in part, with EE, in particular, would not be likely to raise major (if any) reliability concerns.

Not only did TVA not assert any reliability concerns prevent it from considering alternatives that would retire Gallatin, such concerns are almost certainly not at issue if energy efficiency is used to replace the facility. To understand why, some background on transmission system planning would be helpful.

Electric transmission system reliability planning is governed by FERC and is administered and managed by NERC, through regional councils (NERC TPL planning standards are available at http://www.nerc.com/page.php?cid=2|20). NERC has mandatory transmission planning requirements that are largely included in NERC Standards TPL-001-0.1, TPL-002-0b, and TPL-003-0a which address planning requirements at projected peak loads five or more years into the future for normal system conditions, i.e., with no system contingencies, for system conditions with all possible single contingencies, studied one at a time, and for system conditions with specified multiple contingencies.

Typically, under normal system conditions (no contingencies), all load-sensitive system elements, most typically transmission lines and substation transformers, will be loaded up to not higher than their normal maximum capabilities, and all substation busses will be within normal voltage limits. Typically, under single contingency conditions, electric service will be maintained to most firm loads, all load-sensitive system elements will be loaded up to not higher than their emergency maximum capabilities, and all substation busses will be within emergency voltage limits. Under multiple contingency conditions, firm loads may be dropped under certain conditions, but the electric system must not have a cascading outage, and those system elements remaining in service must beoperating within emergency thermal and voltage limits. When system components are found, during such planning, to be loaded above the applicable capabilities, or are found to be at a voltage level outside the required range, this is typically referred to as a planning violation, which must be addressed before they actually occur.

FERC is currently considering a new NERC transmission system reliability standard, Standard TPL-001-2, which, when approved, will consolidate and replace the above referenced standards.

As we can see from the above, part of the mandatory NERC-specified transmission system planning looks at the loads on each system component, both before and after contingencies. Also, the NERC requirements to maintain voltages within limits is, in part, load-related, in that, all else equal, the more heavily loaded the transmission system is, the more the voltage tends to sag.

Therefore, if the power from the Gallatin Plant is offset by increases in energy efficiency (EE), these increases in EE would be manifested by load reductions at various locations on the TVA system. Any transmission system loading and/or voltage concerns that might exist on the TVA system would tend to offset by such load reductions, depending, in part, on the proximity of the location of the load reductions to the location of the Gallatin Plant. The larger these EE load reductions are, and the closer they are, electrically, to the location of the Gallatin Plant, the more directly such load reductions will reduce loads on the TVA transmission system from power that would otherwise come from the Gallatin Plant but for its retirement."

*Response: TVA generally agrees with this explanation of contingency planning and FERC/NERC reliability requirements. TVA does utilize energy efficiency (EE) and demand response (DR) across the TVA transmission system to help reduce loads during high load demand conditions. This load reduction does help reduce the overall generation required across the entire system, but as Mr. Lanzalotta recognizes the location of such EE/DR reductions and their proximity to the load now served by Gallatin is important. Moreover, since these load reductions are typically a fraction of the overall load demand spread across the entire TVA system, and such reductions would not address the issues seen in the Nashville area if the Gallatin Fossil Plant generation were removed from the grid. Thus far, FY 2007 through FY 2012, TVA has achieved cumulative effective EEDR impacts of approximately 900 MW and 1,600 GWh throughout TVA's seven-State service are. This was roughly equivalent to 1% of sales for FY 2012. Approximately 20% of these impacts can be attributed to the Middle Tennessee area. TVA does not have EEDR potential studies specific to the Middle Tennessee area, but using the same ratio with Valleywide projections of high achievable savings estimates, additional savings estimates fall short of the* *output of Gallatin by 2015 when EPA's MATS Rule must be met. The improvements and controlled loads which contribute to these savings create a load shape very similar to that of the overall TVA system with its significant weather-related peaks. This shape is more comparable to a peaking unit than a base load plant such as Gallatin. This again would put TVA customers at risk for reliability and safety issues and would result in TVA not being to meet the required compliance standards enforced by NERC.*

*Because of the uncertainty over the availability of equivalent power, the lack of control of the power supply, and other factors, TVA does not consider a wholesale substitution of EEDR for Gallatin Fossil Plant to be a viable option and eliminated this option from detailed consideration.*

"(3) There are reliability alternatives that can facilitate the retirement of the coal-fired generation at the Gallatin Plant. Replacing generation at the Gallatin site with other generating resources, such as a gas-fired combined cycle generating unit, also at at the Gallatin site would tend to minimize reliability impacts from retirement of the Gallatin Plant. Also, renewable energy from other sources would not necessarily raise concerns that cannot be dealt with through the ongoing transmission planning process.

Typically, closure of the Gallatin Plant could potentially raise reliability concerns related to thermal overloading of transmission lines or substation transformers, or reliability concerns related to substation voltage levels, if the power from the Gallatin Plant is replaced from other generating facilities at other locations.

If the retirement of the existing coal generation at the Gallatin Plant was to be accompanied by the installation of new generation located at the Gallatin Plant site, this new generation would reduce, and possibly eliminate, the additional loading on the transmission system from power that must otherwise come to the location of the Gallatin Plant from other generating stations to replace generation lost when the coal generation at the plant is retired. This would reduce the potential for reliability planning violations resulting from the retirement of the coal units at the Gallatin Plant."

*Response: TVA agrees that idling or retiring Gallatin would impact reliability absent taking other actions to compensate for this. Constructing additional generation at or near the Gallatin plant site if it was equivalent to the generation from Gallatin could reduce or eliminate reliability impacts. However, as explained in responses to related comments, there are problems in doing this in a timely manner or doing this would not help meet TVA's need to achieve a more balanced portfolio of energy resources on its system.*

"In addition, any reliability concerns that might result from the retirement of the coal-fired generation at the Gallatin Plant would typically be discovered in the NERC-mandated transmission planning requirements discussed above, which provide for annual load forecasting and system testing with a planning window looking far enough into the future to allow for needed system reinforcements to be installed by the time they are forecasted to be needed.

**"(4) To demonstrate that Gallatin cannot be retired without causing reliability concerns, TVA would have to make an evidentiary showing that its retirement causes component loading violations and/or voltage level violations**

In short, based on my review of the record, TVA has not shown that reliability concerns argue against considering alternatives which would replace or retire Gallatin as a coal-fired unit. Any reliability concerns would have to be explored through careful transmission system modeling to meet the system planning demand of the NERC Standards discussed above.

Specifically, if TVA wanted to demonstrate that the retirement of the Gallatin Plant would cause transmission system reliability violations such as thermal overloading of transmission lines or substation transformers, or such as sagging substation voltage levels, it would typically do so under the regime of NERC-required transmission system planning described above. Under this required planning, the electric transmission system is modeled using projected loads and projected system reinforcements at points in the future to determine whether there are thermal overloads or unacceptable voltage levels under normal system conditions, i.e., with no forced outages of any facilities, and under system conditions with various contingency scenarios of the electric transmission system. NERC requires the testing of all possible single contingencies, and the testing of various specified multiple contingencies, in which more than one system component suffers a forced outage. If a contingency, or combination of contingencies, results in thermal overloading of transmission system components, or in unacceptable voltage levels in one or more substations, that is considered a system planning violation which requires a remedy, such as a system reinforcement or added system components. I have seen no evidence of TVA, or anyone else, having performed such transmission system planning studies."

*Response: TVA has conducted analyses of the additional transmission system upgrades that would be necessary to address and reduce reliability risks associated with idling or retiring the Gallatin units. The merits of doing this are summarized above and in responses to other comments.*

**19. In addition to failing to adequately consider alternatives other than the proposed action such as retiring and repowering, the DEA fails to consider combinations of alternatives that include varying numbers of unit retirements, unit replacements with energy efficiency and gas, and installing emissions controls on some units while using low-sulfur coal and recycling their waste. These options could meet the regional power needs with less environmental impacts. (*Commenters: Nathan Moore - SELC*)**

*Response:* These commenters fail to provide much detail about the possible combinations of energy resources or analyses supporting such combinations. See the responses to Comments 13–17, which address the feasibility of the potential components of an alternative based on combinations of other sources of power and energy efficiency. The suggested combination alternative would likely result in a markedly higher cost of power than the proposed action and may not meet the area-specific requirements of the current Gallatin plant described in the response to Comment 17.

**20. Look to the future and invest in an alternative to pollution producing coal plants. (*Commenters: Geneva Andrews, Robert Andrys, Elizabeth Barger, Jared Bredehoeft, Penny Brooks, Van Bunch, Margery Buxbaum, H Caldwell, Bob Carlough, Heleny Cook, Mary Ann Curtis, Annlynn Eastin, Joy Eaton, Ran Edwards, Ruth Frazier, Sara Frazier, Lois Gast, Yolande Gottfried, Anne Grindle, Anna Haislip, Holly Haworth, Mary Headrick, Richard Henighan, Emily Herman, David Hess, Eric Heveron-Smith, Joseph Holmes, Murray Hudson - SOCM, Nina K.H. Murphy, Dustin Keck, Andre LeQuire, Chis Ann Lunghino, Ross McCluney, Patricia Mixon, Neil Murphy, Frances Paris - SOCM, Geraldine Powell, Phillip Powers, Jim Von Bramer, Mary Margaret Ware, India Watkins*)**

*Response:* Comment noted. TVA already has retired two of the John Sevier coal units and idled the remaining two units with the expectation that they will be retired before 2016. TVA also has retired several units at other coal plants. TVA is considering retiring additional coal units and has committed to significant pollution reductions at its remaining coal units. As described in the Integrated Resource Plan EIS, TVA's goal is to meet future demand for electricity from its power system by relying on cleaner sources of energy as suggested by these commenters. This includes more nuclear and gas-fueled generation, renewables, and energy efficiency.

**21. The DEA does not consider the use of wet scrubber technology instead of the selected dry scrubber technology to control $SO_2$ emissions. As shown in the Sahu study, wet scrubbers have generally higher control efficiencies (98%) than that stated for the selected dry scrubbers (96%). Wet scrubber technology is proven and frequently installed and TVA has extensive experience with it. The DEA should analyze this reasonable alternative. (*Commenters: Nathan Moore - SELC*)**

*Response:* Wet scrubbers are the technology of choice for units consistently burning coals with an $SO_2$ emissions potential of approximately 4 lbs/MMBtu or greater. For units that consistently burn coals with an $SO_2$ emissions potential of about 3.5 lbs/MMBtu or less, dry scrubbers are often the best choice from a multi-pollutant and multi-media perspective. Dry scrubbers carry a number of advantages with respect to emissions other than $SO_2$. Regulated hazardous air pollutant emissions of acid gases, mercury and PM are all typically lower with a dry scrubber-fabric filter combination. In addition, there is less potential for water quality impacts from a facility with a dry scrubber because coal combustion byproducts are captured and handled in a dry state."

***The No Action Alternative***

**22. The DEA considers an incorrect No Action Alternative. This alternative, required in EAs, serves as a baseline against which other alternatives are measures. The meaning of 'no action' depends on the circumstances of the proposed action, and for an ongoing plan or program means no change from current management direction. In the case of a proposed project, it means that the proposed activity would not take place. Under either of these definitions, the correct No Action Alternative for the Gallatin project is ceasing operations after 2017. The DEA, however, states that the No Action Alternative is the continued operation of Gallatin without implementing the proposed emissions reductions. (*Commenters: Nathan Moore - SELC*)**

*Response:* The purpose of the No Action Alternative is to provide a benchmark or baseline from which the proposed action and alternatives can be assessed. It is supposed to reflect the status quo or current conditions. These commenters argue that TVA is subject to legal requirements that will require retirement of Gallatin by 2017 if it takes no action and therefore retirement (ceasing operation of Gallatin) should be the No Action Alternative. That plainly would not reflect current conditions. TVA acknowledges that it would have to cease operating Gallatin to not violate existing legal requirements if those requirements are not changed, but currently Gallatin is an operating coal-fired power plant. The Council on Environmental Quality in its “40 Most Asked Questions” publication (46 Fed. Reg. 18026, 18027 (March 23, 1981) specifically addresses this kind of situation. CEQ states that an agency should evaluate taking no action even if it 'is under a court order or legislative command to act.' Under these commenters' view of 'no action,' TVA could use the installation of controls as 'no action' because that is one of the options TVA has under the FFCA. This would no more reflect current conditions than using retirement as the no action alternative. Assuming continued operation of Gallatin best captures current conditions and is an appropriate No Action Alternative.

**Biological Resources**

***Impact Analysis***

**23. The DEA fails to adequately analyze impacts on biological resources, and states that there is no significant impact on biological resources under either action alternative. This is flatly incorrect as there will be adverse impacts on biological resources from the closure of the Cumberland River Aquatic Center. (*Commenter: Tierra Curry - CDB*)**

*Response:* If TVA decides to proceed with its preferred Alternative 2, it has committed to rebuild the Cumberland River Aquatic Center facility at a new site east of the discharge canal on Gallatin plant property. TVA would pay for this. None of the action alternatives would result in permanent closure of the facility and there would be no adverse impacts to the species, including endangered species, raised at the facility. The U.S. Fish and Wildlife Service has concurred in TVA’s determination in this regard. Section 4.3 of the Final EA has been revised to describe this, and additional information has been provided to better explain the anticipated impacts on other biological resources.

***Aquatic Ecology***

**24. TVA monitoring results reported in 2011 show generally better Reservoir Fish Assemblage Index scores upstream of the plant than downstream. While the upstream scores generally indicate the presence of a Balanced Indigenous Population of fish, downstream scores do not. Given the relatively short distance between these sampling sites, the results show the Gallatin plant is likely impacting the fish population. The DEA does not address the cause of this difference in sampling scores and contains almost no discussion of the impacts of the proposed action on the fish population, including any Balanced Indigenous Population. (*Commenters: Nathan Moore - SELC*)**

*Response:* These commenters identify potential impacts from ongoing operation of Gallatin and not impacts associated with TVA’s proposed actions. Regardless, the commenters do not appear to fully understand TVA’s Reservoir Fish Assemblage Index (RFAI).

The RFAI uses 12 fish community metrics to provide a balanced evaluation of fish community integrity. These 12 metrics are grouped into four general categories: species richness and composition, trophic composition, abundance, and fish health as described in detail in references cited in Final EA Section 3.3. The RFAI is used by TVA to evaluate and compare fish communities occurring upstream and downstream of fossil and nuclear power plant thermal discharges. Section 316(a) of the Clean Water Act authorizes alternate thermal limits for the control of the thermal component of a point source discharge so long as the limits assure the protection of a Balanced Indigenous Population (BIP) of aquatic life. The term “balanced indigenous population,” as defined by USEPA regulations, means a biotic community that is typically characterized by diversity appropriate to the ecoregion, the capacity to sustain itself through cyclic seasonal changes, the presence of necessary food chain species, and lack of domination by pollution-tolerant species, all of which are incorporated into RFAI metrics.

RFAI scores range from 12 to 60 and are grouped into quintiles to indicate ecological health ratings ranging from “very poor” to “excellent.” The average variation for RFAI scores in TVA reservoirs is 6 (±3). Therefore, any location that attains a “good” RFAI score of 45 (42 plus the upward sample variation of 3) or higher would be considered to have a BIP. Scores below this threshold do not necessarily reflect an adversely impacted fish community. The threshold serves as a conservative screening level; i.e., any fish community that meets these criteria is obviously not adversely impacted. RFAI scores below this level would require a more in-depth look to determine if BIP exists. A difference in RFAI scores attained at the downstream area compared to the upstream (control) area is used as the basis for determining presence or absence of impacts on the resident fish community from GAF’s operations. The definition of “similar” is integral to accepting the validity of these interpretations.

RFAI scores have an intrinsic variability of ±3 points. Sources of this variation include annual variations in air temperature and stream flow; variations in pollutant loadings from nonpoint sources; changes in habitat such as extent and density of aquatic vegetation; natural population cycles and movements of the species being measured. Another source of variability arises from the fact that nearly any practical measurement, lethal or non-lethal, of a biological community is a sample rather than a measurement of the entire population. As long as the score is within the six-point range, there is no certainty that any real change has taken place beyond method variability. Therefore, a difference of six points or less between the overall RFAI scores is used to define “similar” scores between upstream and downstream fish communities.

Differences in RFAI scores during the eight sample years from 2001 to 2011 were within the six-point range of acceptable variation between stations, indicating that fish communities just downstream of the GAF thermal effluent were similar to those occurring upstream of the plant during each sample period. Although overall RFAI scores were greater for the upstream station for five of the eight years sampled, the average scores for the stations over the eight years were identical (41 – “good”) (TVA, 2011, Biological monitoring of the Cumberland River near Gallatin Fossil Plant, Autumn 2011, Chattanooga, TN). The 2010 report cited in the comment did show that the downstream station averaged a RFAI score of “fair” while the upstream station averaged a score of “good.” Although this suggests greater impairment downstream of GAF, average scores only differed by one point (40 downstream, the top of the “fair” range and 41 upstream, the bottom of the “good” range). An examination of the individual RFAI metric scores contributing to the overall ratings for samples collected during 2001 to 2011 revealed that the downstream site had received a lower score for an individual metric 25 times when compared to the upstream site, whereas the upstream site had received a lower metric score 24 times when compared to the downstream site. As with the overall ratings, individual metrics did not show strong trends at either site and few showed consistently higher or lower scores at the upstream or downstream site. The differences in sampling results at the two sites and factors contributing to these differences are explained in the sampling report cited above and the reports referenced in the Final EA. Over the eight sample years, the RFAI scores do not indicate adverse impacts on the downstream fish community attributable to the GAF discharge.

***Endangered and Threatened Species***

**25. The DEA fails to address the impacts of the closure of the Cumberland River Aquatic Center (CRAC) and other parts of the proposed action on endangered and threatened species. In addition, TVA has not consulted with the U.S. Fish and Wildlife Service on the effects of the proposed action, as required by Section 7 of the Endangered Species Act. The CRAC is very important for the conservation of threatened species and its continued operation is required mitigation by the 2006 Biological Opinion on TVA's continued operation of its system of dams. TVA is responsible for its premature closure which has already adversely affected federally listed endangered and threatened species. (*Commenters: Tierra Curry - CDB, James DeLapp - USCOE, Mary Jennings - USFWS, Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC, Michelle Walker - TDEC*)**

*Response:* Section 4.3 of the Final EA contains an analysis of the anticipated impacts of the proposed action on the CRAC and on federally listed species. TVA has consulted with the U.S. Fish and Wildlife Service regarding these impacts, and that agency concurs with TVA's determinations that there will either be no effect on listed species from TVA's proposed actions or the actions are not likely to adversely affect any listed species, including those housed in the CRAC facility. If TVA decides to proceed with its preferred alternative, Alternative 2, that would require removing the existing CRAC facility, TVA has committed to rebuilding the facility elsewhere on the Gallatin plant site at TVA's expense. TVA will continue to comply with the Terms and Conditions of the 2006 Biological Opinion.

**26. TVA must assess the closure of the Cumberland River Aquatic Center in terms of Section 7(a)(1) of the Endangered Species Act which directs all Federal agencies to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. (*Commenter: Tierra Curry - CDB*)**

*Response:* Sections 2.1.2 and 4.3 of the final EA contain more information about the CRAC facility. While TVA's preferred alternative would require closure of the current Cumberland River Aquatic Center facility, TVA has committed to relocating the facility to another, larger site at Gallatin if TVA decides to pursue that course of action. The larger site would allow TWRA to expand the facility. TVA has consulted with the U.S. Fish and Wildlife Service as required by Section 7 of the ESA. As described in Section 4.3 of the Final EA, the USFWS has concurred with TVA's determination that the proposed action would not result in adverse effects on listed species.

**27. TVA must assess the impacts of closing the Cumberland River Aquatic Center in terms of the Cooperative Mollusk Management Memorandum of Understanding (MOU) signed in 2011 by TVA and other parties. The ongoing operation of CRAC is a critical**

**component of the MOU. (*Commenters: Tierra Curry - CDB, James DeLapp - USCOE, Mary Jennings - USFWS, Michelle Walker - TDEC*)**

*Response:* See the response to Comment 26. If TVA chooses the alternative that requires closure of the CRAC facility, TVA would rebuild it on another, larger site at Gallatin at its expense. The larger site would allow TWRA to expand the facility. The referenced MOU sets out broad objectives for cooperation among TVA, the Tennessee Wildlife Resources Agency, the United States Department of Interior, the U.S. Army Corps of Engineers, the Tennessee Department of Environment and Conservation and the Nature Conservancy for a mollusk management strategy in Tennessee. The MOU expressly provides that each entity will determine for itself how to pursue the stated objectives. Although not required by this MOU, TVA's commitment to continue to support the CRAC facility is fully consistent with the MOU's stated objectives. TVA has committed to developing an updated MOU specific to the operation of the relocated facility.

**28 The Corps of Engineers has contributed $310,580 in mitigation funds to the CRAC. The USFWS holds an additional $471,700 in mitigation funds for the CRAC. The closure of the CRAC negatively affects Corps mitigation efforts through funds expended at the CRAC. (*Commenters: James DeLapp - USCOE, Mary Jennings - USFWS*)**

*Response:* TVA will continue to support the propagation of aquatic species (including federally-listed species) by TWRA. The existing facility was constructed by TVA and TVA has allowed TWRA to use it under a short-term property license. As described in Section 2.1.2 and 4.3.2 of the Final EA, the preferred alternative would require the relocation of the CRAC. As part of the preferred alternative, TVA has committed to rebuild the facility on the Gallatin plant site east of the discharge channel, on a site of suitable size to support future expansion of facility operations by TWRA. TVA would provide TWRA longer tenure for the new site than the short-term license it has been operating under at the existing facility at no or nominal cost. TVA is coordinating plans to relocate and rebuild the facility with TWRA. The future use of Corps mitigation funds for the operation of the CRAC would be determined by the Corps, USFWS, and TWRA.

**29. The Corps of Engineers recommends that TVA mitigate the impacts of the proposed action on the CRAC by performing the following:**
**- relocate/rebuild the CRAC on a site capable of supporting the existing operations**
**- lease the relocation property to TWRA for a nomimal fee**
**- install and provide electricity, raw water intake, potable water, and sewer to the new facility for the duration of its existence**
**- provide sufficient land (3-5 acres) for expansion at the new location**
**- construct an effluent settling pond to accomodate the master plan buildout**
**- connect the existing TWRA pump system to the relocated CRAC facility to provide water from the thermal discharge canal**
**- partner with TWRA for it to assume responsibility for maintenance, operation, and expansion of the relocated CRAC facility (*Commenter: James DeLapp - USCOE*)**

*Response:* See the response to Comment 28 and Section 2.1.2 and 4.3.2 of the Final EA. As part of the preferred alternative, TVA would provide a new, larger site for the CRAC facility at no or low cost, grant TWRA longer tenure, and rebuild the facility to its approximate current dimensions at TVA's expense. TVA is working with TWRA on the design of the new facility and anticipates doing most of the things recommended by these commenters. TVA does not plan, however, to be involved in the operation of the new facility. TWRA has been responsible for operation of the existing facility, including the propagation of listed mussel species under an agreement from USFWS. It is apparent that TWRA's propagation activities have been very successful to date and TVA involvement in those actives is unlikely to improve on that success.

**30. The DEA does not address the formal Section 7 consultation between USFWS and TWRA over the operational protocol for the CRAC and the informal consultation associated with Federal funding to TWRA for refurbishment and upgrades to the facility. These consultations do not consider the closure and/or relocation of the CRAC facility and therefore will likely need to be reinitiated. The delay in completing these consultations could affect TVA's project timeline. (*Commenter: Mary Jennings - USFWS*)**

*Response:* See Sections 2.1.2 and 4.3.2 of the Final EA and the responses to Comments 25, 26, and 28 that update information about the CRAC facility and completion of TVA's consultation with USFWS. TVA has determined that its proposed actions will have no effects on most listed species and are not likely to be adversely affect other species. These are technical determinations and are stated in terms used under the Endangered Species Act. These determinations do not trigger the formal consultation requirements under Section 7 of the Endangered Species Act. USFWS has concurred with TVA's determinations.

**31. The DEA fails to evaluate the fact that the closure of the Cumberland River Aquatic Center would violate the 2006 Biological Opinion issued through the Section 7 consultation process on the Routine Operations and Maintenance of TVA's Water Control Structures in the Tennessee River System. A required Reasonable and Prudent Measure in the BO is that "TVA will work with the Fish and Wildlife Service, state fish and wildlife agencies, and non-governmental groups to promote and enhance recovery of federally listed species." Closure of CRAC would not promote or enhance recovery and would violate this measure.**

**The BO also contains the non-discretionary term and condition that "TVA will cooperate with appropriate staff from the Tennessee Wildlife Resources Agency to make fish culture raceways at the Gallatin Steam Plant available for mollusk propagation activities. If during routine surveys, individuals of mussel species known or considered not to be reproducing in the Tennessee River mainstem are found, those individuals will be transported to this facility or other appropriate facility, upon approval by the Service. Juveniles of those species propagated at the facility will be used to augment or reestablish populations in the Tennessee River (p. 103-104)." Closure of CRAC would violate this non-discretionary measure. It would also defy Conservation Recommendations #2 and #3 to actively support ongoing freshwater mussel propagation efforts and to initiate and actively participate in fish restoration for listed and rare fish species.**

**The closure of CRAC would result in the need for TVA to reinitiate consultation with FWS on routine operations and maintenance of TVA's water control structures and to reinitiate consultation, along with the Army Corps of Engineers, on the Wolf Creek Dam repairs. (*Commenters: Tierra Curry - CDB, Mary Jennings - USFWS, Craig Segall - Sierra Club 2)***

*Response:* See the responses to Comments 25-27 and 30. TVA's commitment to rebuild the CRAC facility at the GAF site would be consistent with the requirements of the 2006 Biological Opinion.

**32. TVA must initiate formal consultation with the U.S. Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act prior to taking any action. Due to the resulting closure of the facility, the Preferred Alternative would result in take of endangered species in violation of Section 9 of the ESA. (*Commenters: Tierra Curry - CDB, Mary Jennings - USFWS, Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* See the responses to Comments 25-27 and 30. EA Section 4.3.2 has been revised to provide more information about the CRAC facility and the completion of consultation between TVA and USFWS. TVA's proposed actions would not result in take of any listed species.

**Coal**

***Source of Coal***

**33. The proposed air retrofit changes may make eventual use of high sulphur Appalachian coal possible at the Gallatin plant, leading to further degradation of mountains and streams by strip and mountain top removal mining. (*Commenter: Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* TVA has no plans to burn Appalachian coal at Gallatin. If TVA proceeds with the proposed actions, it could use a blend of Powder River Basin (PRB) and Illinois Basin (ILB) coals at Gallatin in the future. Neither PRB or ILB coal is mined using mountain top removal mining techniques.

**Economic Development**

***Job Creation***

**34. New forms of energy could mean jobs in a cleaner energy industry to offset losses in the coal industry. (*Commenter: Rebecca Allan*)**

*Response:* Comment noted. TVA's goal is to move toward a more balanced portfolio of energy resources that relies on cleaner energy resources.

**Economic Impacts**

***Cost of the Proposed Action***

**35. According to a 2012 Synapse Energy Economics report, Gallatin is economically inefficient to operate and will be even more inefficient if the proposed upgrades are completed. The proposed action would be rejected as unreasonable by any public utility commission. Gallatin's economics are even worse when the full suite of likely compliance costs is taken into account and will cost more than $10/MWh to operate than the market price. Since other alternatives are available that are less costly, the proposed action violates TVA's statutory mandate to provide power at the 'lowest possible rates.' (*Commenters: Nathan Moore - SELC*)**

*Response:* TVA disagrees with the assertions in this comment from both a strategic and plant-specific perspective. Installing air pollution controls at GAF would help meet TVA's commitment to minimize emissions and reduce their associated impacts. This commitment was memorialized in the interagency compliance agreement with U.S. EPA and in the judicial consent decree with the three states which regulate emissions at TVA's coal plants (Alabama, Kentucky, and Tennessee), the State of North Carolina and three environmental advocacy groups, including the Sierra Club. The parties to these agreements determined that the actions to which TVA committed "will achieve significant reductions of emissions from the TVA System and thereby significantly improve air quality." In the motion asking the Federal District Court in eastern Tennessee to approve the consent decree, the Sierra Club and the other parties to the consent decree stated "The structure of the settlement ensures that TVA can flexibily achieve the required emission reductions as cost-effectively as possible consistent with its congressional mandates. All of the parties to the Consent Decree believe that the approach taken here is adequate and reasonable."
Once the FGD system is installed, Gallatin would have a wider range of fuel flexibility than it currently has. This will allow Gallatin to take advantage of relative fuel price changes between low sulfur and higher sulfur fuels (up to about 3 lb $SO_2$/MM Btu) while maintaining very low $SO_2$ and NOx emissions. Based on current delivered fuel price forecasts for coal and natural gas to TVA facilities, the variable operating cost ($/MWh) of Gallatin will be lower than TVA's current natural gas combined cycle (NGCC) units. Gallatin would still have an operating cost advantage assuming $CO_2$ emissions are regulated compared to NGCC units that presumably also would have to comply with $CO_2$ emission control requirements. TVA fully expects Gallatin to remain a reliable, cost effective generation resource for many years.

TVA has carefully reviewed the referenced Synapse report and thinks some of its conclusions result from questionable or erroneous assumptions. For example, it appears Synapse used a capacity factor for Gallatin of less than 70% in its analysis. Gallatin's capacity factor is much higher, averaging close to 85% over the last 10 years. Lower capacity factors lead to higher unitized capital costs when expressed on a $/MWh basis, typically skewing results.

TVA also disagrees with Synapse's estimates for some of its "Forward-Going Costs," and considers those estimates unreasonably high. For example, Synapse includes $129 million for the installation of wet cooling towers at Gallatin. TVA has been closely monitoring EPA's activities in this regulatory area, including discussions with staff working on proposed or expected regulations. TVA thinks it is likely that compliance will be achieved with installation of modified intake screens and that installation of cooling towers at Gallatin and other power plants on major inland waterways will not be necessary or required. The cost of modified screens at a plant like Gallatin is estimated to be approximately $7 million, much lower than the cost of wet cooling towers.

Given the long economic lives of power plant equipment, and the significant uncertainty around key assumptions, the results of analyzing such investments in a "snapshot in time" framework, as Synapse has done, can significantly deviate from actuality over time. That is why TVA conducts scenario analyses and sensitivity studies for substantial investments like those proposed at Gallatin. Both at a system-wide and plant-specific level, TVA is confident that the proposed actions at Gallatin fully comply with the TVA Act and that a public utility commission would agree that they are in the public interest.

**36. The cost to upgrade Gallatin Fossil Plant is too high. (Commenters: *Joe Anderson, Anonymous, Kris Ballinger, Debbie Barnard, Matthew Bentley, Hector & Suzanne (sic) Black, Jerry [sic] Bowles, Britton, Larry, Thomas Carothers, William F.Caul, Barbara (sic) Clinton, R. G. Crarens, Ed Edenfield, Pamela Edenfield, Peggy & Eston Evans, Richard Finch (sic), John Froeschauer, Christopher E.Gibson, Melba Gulick, Kathleen Hardeman (sic), Ada Haynes [sic], Bill Hennessa (sic), William Howell, Sara & Douglas Hudgens, Thomas Hutson, Tom Jankins (sic), Bradley Jarrell, Joseph E.Kress, James R.Ladd, Lewis John (sic), Landon Medley, Amanda Moore, Carole Moore-Slater, Mary Louise Murphy, Brian Paddock, Amelia Parker - SOCM Charles Parker, Leith (sic)Patton, Elizabeth Queener, Barbara Reynolds, Eliseo & Marjorie Rios, Beth Rolm (sic), Dicksie S.Schmitt, Breika, Tyler, & Cassandra Schrade, Jim Selin [sic], James R.Slater, Jacqueline & Edwin Stapler, Beth Stoddart, Tom Strawman, Binney Stumpf, Michael White, Steven & Sally Yancey)***

*Response:* The Gallatin coal units are among the older units on the TVA system, but they have been the most reliable units on the system over the last ten years and have relatively low operation and maintenance costs. These units also have been some of the lowest emitting units on the TVA system for years and the proposed controls would significantly reduce emissions from the plant. On a $/kW basis, installing the proposed controls is a cost effective alternative.

**37. Need cost analysis that considers all externalities. (*Commenters: Roger Clery, Gary Wolf*)**

*Response:* A full cost analysis of the potential externalities, both negative and positive, is difficult to perform because of the limited pricing information for many of the externalities and significant disagreements over how to price them. There are significant uncertainties in such analyses and substantial speculation. Many of the potential negative externalities, however, have been considered during the development of applicable environmental and other regulations governing TVA's proposed actions and continued operation of Gallatin, and are thus embedded in TVA's costs to comply with these regulations.

**Greenhouse Gas Emissions**

***Impacts of Greenhouse Gas Emissions***

**38. CEQ's draft NEPA guidance on consideration of climate change and greenhouse gas emissions advises agencies that actions emitting more than 25,000 tons per year of greenhouse gases are likely significant. Extending the life of Gallatin will result in GHG emissions of more than 8 million tons per year for many years. Gallatin is also the third largest stationary source of GHG emissions in Tennessee. Deciding whether or not to extend the life of this major GHG source has major climate impacts. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* As discussed in the IRP and the associated EIS, TVA's goal is to develop and maintain a balanced and diverse energy portfolio that provides affordable and reliable power, while achieving cleaner air for the Tennessee Valley and reducing GHG emissions. The strategy for reaching this goal includes retirement of selected coal-fired units where it would not be cost effective to add emission controls and enhancing air pollution controls for other coal-fired units to optimize environmental performance for the generating system as a whole.

Under the selected IRP strategy and assuming that units other than GAF are retired, TVA's direct $CO_2$ emissions would be reduced from 2010 levels by averages (of the various scenarios) of 25 percent by 2020 and 23 percent by 2028. The $CO_2$ intensity of TVA power generation would be reduced by an average of 31 percent by 2020 and remain stable through 2028 (see IRP EIS Section 7.6.2). Installing air pollution controls at GAF is an integral part of TVA's plan to minimize emissions, and their associated impacts, across the Valley. As stated in Section 4.1.2 of the Final EA, the proposed action could result in a small reduction in direct GHG emissions from GAF from the use of lower carbon Illinois Basin coal. The change in life-cycle GHG emissions is more difficult to calculate; emissions from transporting coal would be reduced while the production of the calcium hydroxide (hydrated lime) used in the dry scrubber would add a new source of GHG emissions. The overall net change in GHG emissions resulting from the proposed action would be very small.

**39. The DEA fails to address the impacts of climate change on the future operation of the Gallatin plant. For example, Tennessee will most likely become warmer, on average, more subject to violent weather events, and more prone to both floods and drought. Flood events could breach ash ponds or increase runoff, and drought conditions may make it more difficult to withdraw water and increase the impacts of the water withdrawal and thermal discharges. Warmer weather is also more conducive to the formation of ground-level ozone, increasing the effects of Gallatin's air emissions on human health and ecosystems. (*Commenters: Nathan Moore - SELC*)**

*Response:* As a Federal Agency, TVA includes adaptation in its decision making. TVA's Statement on Climate Change Adaptation can be found at http://www.tva.gov/environment/sustainability/climate_change_statement.pdf. TVA manages the effects of climate change on its mission, programs, and operations within its environmental management processes. By definition, all planning activities are always conducted under conditions of uncertainty. Adaptation planning is no different. Interagency efforts have been, and continue to be, underway to better understand the uncertainty associated with climate change. In 2012, in accordance with Executive Order 13514, TVA prepared a Climate Change Adaptation Plan and will annually report its progress.

The performance of the Gallatin plant cooling system and thermal discharges would not be affected by the proposed action, and thus the ability to respond to increased drought conditions and/or warmer river water temperatures, if these occur, would not change. The GAF pond systems are designed to accommodate a worst-case event, which is the design storm of record (i.e., 100-year storm event). From a climate perspective, any increased incidence of these types of storm events would be accommodated by the design. In the long term, the design criteria will be revised based on the historical record. Future designs will be based on the revised event of record but, in the meantime, events such as flood and drought will be addressed by the facility contingency plans. These plans are developed to address emergencies such as low reservoir levels, flooding or potential overtopping of dikes, spillways, ditches, and associated stormwater conveyances. The plans are reviewed and updated on a routine basis by professional engineers. The proposed action would result in an approximate 90 percent reduction in emissions of NOx, one of the precursors of ground-level ozone, and thus reduce some of the potential for increased future ozone formation due to warmer weather.

**Integrated Resource Planning**

***Adequacy of 2011 Integrated Resource Plan EIS***

**40. TVA should not be relying on the 2011 IRP EIS because it is outdated. CEQ NEPA regulations require an EIS to be supplemented when there is new information and changed circumstances. Court rulings support this if the new information shows that remaining actions to be taken will result in significant impacts not already considered. Since completion of the March 2011 IRP EIS, the General Accountability Office has identified a data gap regarding information on TVA's energy efficiency potential. The December 2011 Global Energy Partners study commissioned by TVA showed much higher potential energy savings than recognized in the IRP. Changed circumstances include reduced energy demand forecasts, lower prices for natural gas and renewable generation, and higher costs of coal and emissions control technologies. TVA must therefore prepare a supplemental IRP EIS. (*Commenters: Nathan Moore - SELC*)**

*Response:* TVA recognizes that certain types of planning, specifically very long term planning under uncertainty, are difficult even in the best of worlds. Given the types of uncertainty and volatility inherent in integrated resource planning, TVA, in partnership with its Stakeholder Review Group, developed a robust, scenario planning approach to address these uncertainties and to lend robustness to the conclusions of the IRP across multiple future conditions. This allowed the IRP to have significant value as a planning tool even if the future unfolds in a dramatically different direction from a business-as-usual case. Although TVA agrees that market conditions and the planning environment have changed from the conditions that were in existence when the IRP EIS was released in March, 2011, TVA does not agree that these changes render the IRP outdated. For example, the U.S. Government Accountability Office report cited in the comment recommended that TVA more fully consider energy efficiency in its resource planning by conducting a study of the full potential of such programs in its service area. This study was completed by Global Energy Partners (GEP) in December 2011. It identified an achievable – low total energy efficiency potential of 7,963 GWh and an achievable – high total energy efficiency potential of 15,337 GWh by 2020. The comparable potential peak summer demand response savings were 3,256 MW (achievable – low) and 3,872 MW (achievable – high). The Recommended Planning Direction adopted by TVA from the IRP study included energy efficiency reductions of 11,400 – 14,400 GWH by 2020 and demand response peak load savings of 3,600 – 5,100 by 2020. The energy efficiency and demand response guidelines identified in the IRP are within the upper portion of the bounds of the potential estimated by GEP.

Although electricity demand in the TVA region has been trending lower since the IRP was completed, TVA's current forecasts of demand growth are still well within the range of forecasts used to guide the IRP analyses. TVAs current fiscal year 2013 forecast shows that demand continues to remain within the range of potential demand and energy forecasts considered in the IRP analyses.

Current natural gas prices are lower than they were at the time of the IRP. Many long-term projections are that gas prices will remain below prices that were experienced in the last decade (mainly driven by the impact of new technologies for horizontal gas drilling and fracking), but continued low gas prices are not a certainty. The risk of gas price volatility is also a continuing concern. Since the IRP was completed, the price of natural gas has averaged less than one dollar per million BTU below the average price in the 2009 - 2011 period. Further, recent (September 2012) natural gas futures prices show a gradual increase in price that is well within the range of those prices considered in the IRP analyses. Recent coal prices have also been within the range of those considered in the IRP analyses.

In order to produce an IRP that would be flexible and robust under a broad range of future conditions, TVA used a scenario planning approach and developed a suite of planning strategies. Together, these considered broad ranges of the factors cited in the comment. The ranges of these factors encompassed the post-IRP changes described above. The IRP EIS therefore considers the environmental impacts of the post-IRP changes and tiering this EA on the proposed actions at GAF is appropriate.

In a broader context, there are always differences between completed analyses that include projections and actual conditions that subsequently follow.  If agencies had to ignore the results of completed analyses whenever new information becomes available and conduct new analyses to support decisions on proposed actions, they would never be able to make decisions.  The appropriate question is whether the new information is so significantly different from the results of completed studies and earlier information that they should no longer be used.  As discussed above, TVA has determined that its IRP analyses remain sufficiently robust for continued use.

**NEPA Compliance/Adequacy**

***Adequacy of EA***

**41. The EA should include cost/benefit analyses of spending a billion dollars to upgrade the Gallatin coal plant vs. investing in cleaner energy options. (*Commenters: Charles Barber, John McFadden - TEC, Craig Segall - Sierra Club 2)***

*Response:* The Council on Environmental Quality discourages agencies from preparing formal cost-benefit analyses as part of their environmental reviews.  40 C.F.R. § 1502.23. However, TVA has considered potential costs in comparison to benefits a number of times including during the completion of its 2011 IRPA and associated EIS, from which this EA tiers. Section 2.4 of the Final EA and responses to several of the comments in this Appendix provide cost comparison information.

***NEPA Requirements***

**42. NEPA regulations state that agencies shall not take any actions prior to completing the NEPA process that would have an adverse environmental impact or limit the choice of reasonable alternatives. TVA has taken such an action by requiring TWRA to dismantle the Cumberland River Aquatic Center. This action has resulted in adverse impacts to threatened and endangered species and foreclosed alternatives that would leave the Center in place. Other related actions that TVA has taken without adequate NEPA review include the TVA Board's approval to fund the Gallatin project over a year ago and entering into binding contracts for the Gallatin project. (*Commenters: Tierra Curry - CDB, Nathan Moore - SELC, Craig Segall - Sierra Club 2)***

*Response:* The schedule for complying with EPA’s MATS is very tight, April 2015 without an extension or April 2016 with an extension.  It will be very difficult to complete the proposed emission controls in time to meet even the extended compliance date.  Recognizing this, TVA is getting ready to take action as quickly as it can after completion of required environmental reviews and a final decision is made as to whether to proceed or not to proceed. None of the predicate actions TVA has taken involve material commitments of its resources or bias the decision to be made.

The August, 2011 TVA Board resolution approving funding for the proposed action included the provision that its implementation is “subject to satisfactory completion of all required environmental reviews under the National Environmental Policy Act and other applicable environmental reviews.” After completion of this environmental review process, an appropriate TVA official must still decide whether to proceed with the proposed actions. The Board’s conditional funding authorization did not commit TVA to the proposed actions. When the Board authorized conditional funding for the Gallatin projects, it also authorized conditional funding for additional emission controls at TVA’s Allen Fossil Plant ($650 million). Because of developments after that conditional decision, TVA reanalyzed the Allen projects and decided not to proceed. Other actions for reducing Allen’s emissions are being evaluated for possible proposal in the future.

The contracts for the proposed actions contain clauses stating that major construction activities shall not commence until authorized by TVA and can be terminated for TVA’s convenience at any time. The authorization to proceed under the contracts is based on, among other things, completion of applicable environmental reviews, including the NEPA review. TVA has not authorized major construction activities or other actions that would have an adverse environmental impact or limit the choice of reasonable alternatives.

By letter dated June 4, 2012, TVA formally notified TWRA that if TVA chose its preferred alternative, the existing facility which TWRA operates at Gallatin under a short-term license from TVA would have to be shut down. TVA has yet to make a decision on whether to proceed with its preferred alternative and TVA has not required TWRA to shut down the existing facility. If this becomes necessary, however, TVA has committed to rebuilding the facility on the Gallatin plant site at its expense. TVA is working with TWRA on the design of the new facility.

**43. There is ample evidence in the history of discussions and correspondence between TVA, TWRA, and USFWS over the closure of the Cumberland River Aquatic Center that TVA has already selected Alternative 2. As a result, TWRA has begun dismantling the CRAC, impacting ongoing and proposed mussel, snail, salamander, and fish conservation projects. Alternative 2 was selected before environmental information was available to public officials and citizens in violation of NEPA and its implementing regulations. TVA has caused the kinds of environmental impacts NEPA was designed to prevent. (*Commenters: Tierra Curry - CDB, Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* See the response to Comment 42. TVA formally notified TWRA that implementation of the preferred alternative would result in the closure of the current CRAC facility. TVA has not made a final decision regarding the Action Alternative for this project. Any actions taken by TWRA (removal of animals or equipment from the site) have been conducted at TWRA's discretion. If TVA decides to implement the preferred alternative, TVA has committed to rebuilding the facility at its expense on the Gallatin plant site.

***Public Involvement***

**44. If TVA does issue a FONSI, it must allow for another public comment period. CEQ and TVA NEPA regulations require that a FONSI be made available for public review if the proposed action is similar to one that normally requires the preparation of an EIS. As stated elsewhere in several comments on the DEA, the proposed action meets several of the requirements for preparation of an EIS. (*Commenters: Nathan Moore - SELC*)**

*Response:* The proposed action is not a large water resource development or water control project, a uranium mining or milling complex, nor, as described elsewhere in the responses to Comments 55 and 56, a major power generating facility, a major action with highly controversial impacts, or a major action that will have a significant effect on the quality of the human environment. It therefore is not the type of action that, according to TVA's NEPA Procedures, normally would require an EIS or comment on a FONSI.  TVA's proposed actions here are the installation of additional controls on an operating power plant that will substantially reduce its emissions and the construction of a new dry CCR landfill that will be lined and offer better protection of potentially impacted resources than do the plant's wet ash impoundments.  These are actions that benefit the environment, not harm it.

**45. The 30 day public comment period is not long enough to review and comment on this complex proposal and lengthy draft EA. Please extend the comment period from 30 to 90 days and hold public hearings. (*Commenters: April Adams, Geneva Adams, Jere Adams, Marci Adams, Linda Albright, Jill Alliman, Alane Alongi, Joe Anderson, Anonymous, Amelia Parker - SOCM, John Andes, Robert Andrys, Sharon Annis, Heather Armistead, Dwight Arnold, Kim Astren, Aashir Awan, Kyle Axley, Floyd Ayers, Brenda Badiuzzi, Jim Bailey, Rick Ball, Kris Ballinger, Eric Barden, Debbie Barnard, Andrew Barrett, Kevin Bartels, Charles Beck, Eric Beck, Jonathan Bell, Matthew Bentley, Amy Bertram Read, William Best, Tanya Bethurem, Katy Bilbrey, Robbie Billings, Hector & Suzanne (sic) Black, Shelly Bogda, Paul Bogen, Liesse Bohlmann, Scott Bomar, Carolyn Bonner, Mark Boothby, Tom Boughan, Wilder Boule, Jerry [sic] Bowles, Bettina Bowers Schwan, Danielle Bownes, Thomas Boyd, Diana Bradbury, Courtney Brannan, Jim Brasfield, Jared Bredehoeft, Tina Breeds, Margo Brent, Bill Brescia, Daniela Bress, Christopher Brewer, John Brewer, Dolores Briggs, David Briley, Larry Britton, Sarah Brobst, Penny Brooks, Cullen Brown, Jerry Brown, Jesse Brown, Shirley Brown, Bobbi Browne, Linda Browning, Jamie Brubaker, Kornelius Bujok, Van Bunch, Gordon Burghardt, Julie Burkett Jones, Barbara Burton, Sharon Cagle, H Caldwell, Teresa Campbell, Stephanie Capps, Carole Caprio, Jeanette Carbary, Tina Carmon, Joanna Carnahan, Kendall Carnes, Thomas Carothers, Clarke Carter, Jean Carter, John Carter, Karen Carter, Charles Case, Peggie Cash, William F.Caul, Albert Ceren, Jon Charkiolakis, Dimitri Chernyshov, Beverly Chessor, Maryanna Clarke, Richard Clear, Ola Cleon Jones, Barbara (sic) Clinton, Henry Clukey, Gina Collins, Jamie Conner, William Conte Jr, John Conway, Heleny Cook, Victoria Cook, Brian Copeland, Sandra Corbin, Michael Cothron, Mike Couch, Teegan Coulter, R. G. Crarens, Jan Crean, Nathan Crockett, Katey Culver, Elizabeth & Robert Cunningham, Randall Dailey, Leslie Dalecke, Karen Daniel, Rob Dansereau, Cheryl Dare, Deborah Darnell, James & Marilyn Davidheiser, Bernice Davidson, Brent Davis, Marilyn Davis, William Davis, Marnie De Shaw, Irvin Degroff, Cathy Del Casino, Elisha Delaney, Gk Desjarlais, Linda Desmond, Remy Devoe, Steven Dieringer, Thomas Diggs, James Dimarco, Nathan Donegan, Shahn Donegan, Harry Draper, Chris Drumright, Marcella Dunn, Naomi Durall, Patrick Dyal, Greg***

***Easterly, Ed Edenfield, Pamela Edenfield, Ran Edwards, Sherry Edwards, Stacie Edwards, Bob Eklund, Dennis Eleogram, Jonathan Ertelt, Morgan Estes, Joyce Evans, Peggy Evans, Peggy & Eston Evans, Ivan Everitt, Stephanie Fairbanks, Susan Faulkner, Wyatt Fawns, Clayton Ferguson, Andrew Ferrell, Nicole Fey, Gabriel Fidler, Richard Finch (sic), Alan Fister, Bernadette Fitzpatrick, Joanne Fletcher, Karen Fletcher, Elizabeth Floersch, Mark Foerster, Anna Fominykh, Ariel Forbes, Richard Foster, Ashleigh Fountain, Connie Fowler, Jason Fox, Gary Frattalone, Axel Friedrich, John Froeschauer, Jane Gardner, David Garner, Wayne Garner, Lois Gast, Austin Gavin, Patty Ghertner, Corinne Giagnorio, Chris Gibson, Christopher E.Gibson, Willie Gibson, Edgar Gilbert, Laurie Gilbert, Chris Gilbreath, Raechel Glynn, Thomas Goff, Joanne Golden, J B Gordon, Louise Gorenflo, John Grant, Jim Graves, Alan Green, Edward Greene, Wilbert & Gloria Griffith, Heather Grimm, Anne Grindle, Diane Gross, Jo Ann Gryder, John Guenst, Melba Gulick, Dagmar Gundersen, Karen Gupton, Stephanie Hacker, Cherrie Haggard, Anna Haislip, Rasheed Hakeem, James Haldy, Bill Hale, Shelia Hale-Bledsoe, Bill Hall, James Ham, Lynne Hancock, Cathy Hannnaway, Kathleen Hardeman (sic), Carla Hargrove, James Harrell Jr, Vincent Harriman, Dennis Hatler, Holly Haworth, Annemarie Hayes, Ada Haynes [sic], Michelle Haynes, Brandon Hazlett, Jane Heald, Mark Heald, Richard Helton, Richard Henighan, Bill Hennessa (sic), Cynthia Hernandez, Eric Heveron-Smith, Patricia Hewitt, Kim Hill, Rob Hill, Chelsea Hoag, Beth Hodgin, Linda Hoersten, David Holden, Robert Holder, Angela Holland, J.E. Holmes, Joseph Holmes, Elizabeth Holton, Mark Homer, Shelby Hood, Eugene Howard, William Howell, Phillip Huber, Sara & Douglas Hudgens, Marva Hughes, Robert Huguenin, Jody Hunter, Mary Hunter, Wendy Hunter, Daniel Huser, Phil and Michelle Huss, Ben Hutchinson, Thomas Hutson, Philip Hyatt, Teresa Iovino, Lisa Jackson, David Jacques, Ellen James, Kyle James, Michelle James, Cindy Janac, Tom Jankins (sic), Bradley Jarrell, Lawrence Jasud, Rickey Jenkins, Jennifer Johns, David Johnson, Jennifer Johnson, Jessica Johnson, Karen Johnson, Scott Johnson, Sherry Johnson, Steve Johnson, Barrett Jones, Ed Jones, Audrey Jordan, Catalina Jordan, Timothy Joyce, Samuel Justice, Nina K.H. Murphy, Ruth Kaczmarek, Don and Gerry Kaller, Albert Kashner, James Kauten, Seamus Kelly, Terri Kelly, Tim Kelly, Rita Kennedy, Donald Keyser, Jacob Kingman, Nathalie Kintz, Joseph E.Kress, Matthew Kroeger, Wanda Labarre, James R.Ladd, Brenda Lamb, Lisa Lambert, Martha Lammers, Angela Lamonica, Gary Lampman, Lawrence Landau, Carol Landis, David Lasserre, Barbara Lastovka, Beaux Latham, Jack Lawrence, Tonya Lawson, Chad Ledford, Sam Leimer, Mary Lemire, Carolyn Lendermon, Tilghman Lesher, John Lewis (sic), Sherrie Liafsha, Ann Logan, Charlie Luna, Rosetta Lunceford, Jeremiah Lynn, Teresa Mabry Reed, Mary Machanoff, Cheryl Macpherson, George Maish, Bryon Mallory, Eric Malo, Andrea Maneschi, Sonja Manning, Jeff Martin, Matt Massey, Mary Mastin - TEC, TSRA, CBD, Sandra Matthews, Jeremy Mattingly, Henry Maupin, Jay Mayfield, Eric McAmis, Eric Mcanly, Joe McCaleb - LWVH, Henry McClary, Diane McCluskey, John McFadden - TEC, Heather McGhee, Kathleen McIntyre, William McKiven, Devon McKnight, Barbara McLeary, Donna McMillan, Barry Medlin, Landon Medley, Claire Meggs, Joyce Merryman, Tony Messer, Barry Miles, Chris Milfred, Calma Miller, Jennifer Miller, A.B. Miller Jr., Chris Mills, Ronald Mincin, Letitia Minor, Valerie Mitchell, Jennifer Mize, Awadalla Mohamed, Dorothy Monday, Rich Monhollon, Heather Moody, Amanda Moore, Carole Moore-Slater, Jeff Moore, Michael Moore, Martha Moore Hobson, Nathan Moore - SELC, Philomena Morello, Bridget Morgan, Ken Morgan, Rufas Morison, Lisa Murphy, Mary Louise Murphy, James Murray, Jane Myers, M. Nour Naciri, Phd, Bruce Neal, Jerry Nelms, Matthew Nelson, Daniel Nemes, Daniel Newman, Jason Nichols, Mary Nichols, Bob Niles, Bud Nolan, Robert Nolter, Brett Norman, Jonathan Nwachukwu, Sara Oaks, Marsha Oates, Susan O'Conner,***

***Donald Odell, Larry Olivier, Carlos Orozco, Elizabeth Osborne, Kenneth Osborne, Pam Osmand, Diane Owen, Anna Owens, Sherry Owens, Brian Paddock, Charles and Barbara Parker, Charles Parker, Nick Paromov, Joe Parrish, Stefan Partin, John Patrone, Wesley Patterson, Leith (sic)Patton, Mervin Paulson, Clyde Pedigo, Mark Peterson, Donna Phillips, Eleanor Phillips, James Pierce, Karen Polson, John & Patricia Post, Jo Potter, Lisa Pressley, Taylor Prince, Christine Pritchard, Robert Pugh, Elizabeth Queener, York Quillen, Don Quire, Sam Rabito, Matt Ragan, Virginia Ralston, Elizabeth Raver, Kristy Ray, John Reid, Nancy Reppond, Barbara Reynolds, Eliseo & Marjorie Rios, Jessica Ristoff, Jeff Roberts, Megan Rocchietti, Ramcey Rodriguez, Jim Roe, William Rogers, Beth Rolm (sic), T. R. Rose, Alice Ross, Linda Ross, Paula Rosser, Keven Routon, Cindy Rudolph, Liane Russell, Kory Ruth, Virginia Salmon, Nicholas Sanders, William Sanders, Melinda Saneda, Eric Savage, Vivek Savur, Eric Schechter, Joe Schiller, Rachel Schlafer-Parton, Dicksie S.Schmitt, Breika, Tyler, & Cassandra Schrade, Susan Schuchard, Shelah Scott, Craig Segall - Sierra Club 1, Richard Seidenstricker, Jim Selin [sic], Marlene Shaner, Charleen Shelton, Dorothy Shelton, Mark Shenkel, Mark Shipley, Zachary Shulkin, Jack Simpson, James R.Slater, Amber Smith, Christy Smith, Ray Smith, Robert Smith, Scott Smith, Terry Smith, Clinton & Stephanie Smullen, Barbara Snell, Katherine Snook, Dorris & Steven Snow, Steven Sondheim, Catherine Soudoplatoff, Bill Spang, Tonya Spann, Michael Spradlin, Kimberly Stamper, Jacqueline & Edwin Stapler, Donald Steele, Michael Stengel, Jeanie Stephenson, Nancy Stewart, Beth Stoddart, Bryan Stone, Brian Straka, Tom Strawman, Michael Strickland, Nathan Strong, Gloria Stuart, Karen Stuart, Karen Stuart, Binney Stumpf, Lana Sutton, Megan Swaine, Kevin Synan, Wayne Tafuro, Karen Tate, John Taylor Jr., Joel Tellinghuisen, Noton Tennille, Vickie Terry, Karen Tharp, Marsha Tharp, Daniel Therrien, Alva Thomas, Elbert Thomas, Robert Thompson, Janis Tilton, Rebekah Timothy, Mark Tolley, Andrea Tothacer, Lloyd Townsend, Anastasia Marina Tsoutsoulopoulou, Bambi Tucker, Rachele Tucker, Denise Tugadi, Betsi Tunnell, Mary Underwood, Clyde Ussery, Jacob Verhoeff, Edgardo Vila, Michele Villeneuve, Genia Vookles, Samantha Voorhees, Doris Wade, Jacqueline Wagoner, Emily Walker, Erin Walls, Hazel Walton, Jennifer Walton, Jessica Warren, Sylvia Warren, Phillip Webster, Sage Welch, Elizabeth Wells, Joyce Wheaton, Melissa White, Michael White, Amber Whitehead, Chris Widby, Michael White, Lydia Williams, Robert Williams, Stan Williams, Bonnie Willingham, Hiryana Willis, Gordon Wilson, Cor Wisnewski, Catherine Wochna, Summer Wollett, Stormie Woods, Richard Woodward, Gerry Wright, John-Gloria Wyatt, Galen Yacalis, Steven & Sally Yancey Joe Yantis, Omar Zaman, Herbert Zeman, Nancy Zimmerman, Stephen Zipperer*)**

*Response:* In response to these requests, TVA extended the 30-day comment period by an additional 14 days. The extended comment period was thus only one day shorter than the minimum of 45 days required under CEQ's regulations and TVA's procedures for draft EISs. TVA also agreed to accept late comments from a number of environmental advocacy groups until December 18, providing these groups a total comment period of 61 days. TVA provided more than sufficient time to review and comment on its draft EA. Neither CEQ's regulations nor TVA's procedures require public comments on draft EAs.

TVA carefully considered the requests to hold public hearings. After years of experience in promoting public participation in its NEPA reviews, TVA has found that a hearing format is not the best way of facilitating public comments. Rather than promoting a meaningful exchange of information about proposed actions, a hearing format allows some commenters to posture, discouraging others from commenting. TVA also considered holding an open-house style public meeting, the format it typically uses for public meetings associated with EIS reviews. After reviewing the comments it had already received, TVA decided that it was unlikely to receive information in open house or other type of public meetings that would not otherwise be submitted in comments received through other channels. TVA therefore decided to not hold a public hearing or other type of public meeting.

As described in Chapter 1 and elsewhere, the EA tiers from the 2011 EIS for TVA's IRP. The IRP EIS process provided extensive opportunities for public comment, including a number of public meetings. During this process, TVA met frequently with a group of interested stakeholders, including the Sierra Club, to exchange and discuss information about analyses, analytical methods, and results. TVA considered this when deciding what public participation methods to use with this EA. From the IRP process, TVA determined that achieving a more balanced portfolio of energy resources provided the most robust strategy for meeting the demand for electricity in the Tennessee Valley. This is one of the purposes of the proposed actions at Gallatin.

**46. The public participation process during the development of this environmental assessment is flawed as TVA has failed to provide important documents describing the project to the public during the public comment process. TVA did not respond to repeated requests for information under the Freedom of Information Act in a timely manner. Some of the documents that TVA did provide are of limited usefulness because of redactions of important information. TVA has failed to provide any requested documents on some important topics. (*Commenter: Craig Segall - Sierra Club 1, Craig Segall – Sierra Club 2)***

*Response:* Although an EA is supposed to be a short, concise document, TVA chose to make available in the Draft EA a significant amount of information about the proposed actions here. Additional information has been added to the Final EA in response to the comments on the Draft EA seeking additional information and to reflect the results of additional studies undertaken since the Draft EA was prepared. The level and kind of information in the Final EA is more than sufficient to permit the TVA decision maker and the public to understand the merits of the proposed actions. The kind of detailed information sought by the commenters in the context of a Freedom of Information Act (FOIA) request, e.g., detailed engineering and design information, is not necessary for an EA and is not normally found in such documents. TVA notes that despite the alleged failure to provide information about the proposed actions sufficient to permit the public to comment, the Sierra Club and other environmental advocacy groups still managed to submit 53 pages of comments to TVA plus a large number of lengthy attachments.

TVA also notes that the Sierra Club filed a lawsuit asserting that TVA's FOIA responses to their requests were inadequate and seeking a preliminary injunction ordering TVA to extend the public comment period on the Draft EA. That request was denied by the court and the commenters subsequently dismissed their lawsuit.

***Scope of Impact Assessment***

**47. The DEA fails to address the impacts of the closure of the Cumberland River Aquatic Center, despite stating that under the preferred alternative this facility 'must be removed from its current location.' The closure of the facility is therefore a part of the preferred alternative. TWRA has also stated that it was instructed by TVA to dismantle and close the facility. The lack of evaluation of the facility closure violates**

**NEPA's requirement to take a 'hard look' at the consequences of the proposed action, including connected actions which may have cumulative effects on the region. This lack of evaluation also ignores the only major difference in environmental impacts between the two action alternatives and therefore renders the DEA useless to both citizens and the decision maker. (*Commenters: Tierra Curry - CDB, Nathan Moore - SELC*)**

*Response:* TVA has taken a hard look at the possible closure of the CRAC facility. TVA's preferred alternative would require its closure, but TVA has committed to rebuilding the facility at its expense on another, larger site at Gallatin. The potential impacts to the facility and to the endangered species it houses and other listed species are described in Section 4.3.2 of the Final EA. TVA has consulted with the U.S Fish and Wildlife Service (USFWS) on the effects of the possible closure of the facility and its relocation, as well as the other proposed actions, on endangered species. USFWS has concurred with TVA's determination that the effects on the species housed at the facility would not be adverse.

**48. The DEA impermissibly segments the impact assessment by not considering the impacts of several connected actions. It therefore does not consider the true extent of the environmental impacts, some of which are significant, of the proposed action. These connected actions omitted from consideration include the removal of the facility, the conversion from wet to dry ash storage, and the switch to a blend of high sulfur coal. (*Commenters: Nathan Moore - SELC*)**

*Response:* Section 4.3.2 of the Final EA has been revised to better describe the potential impacts on the facility. The impacts of the conversion from wet to dry ash storage of fly ash are described in Chapter 4 of the Final EA for the potentially affected resources, including, for instance, Water Resources in Section 4.2.2, Geology in Section 4.5.2, and Solid Waste in Section 4.5.2. TVA does not propose to convert the current wet handling and storage of bottom ash to a dry system at this time. If and when TVA does propose to completely convert its management of ash from wet to dry at Gallatin, it would conduct another appropriate NEPA review to address this. The impacts of switching to a blend of high sulfur coal are incorporated into the overall assessment of the action alternatives and addressed for Air Quality in Section 4.1.2, for Water Resources in Section 4.2.2, and for other resources in other parts of Chapter 4 of the Final EA.

**49. The DEA presents the conversion from wet to dry ash handling and storage as a decision that has already been made and outside the scope of the DEA, despite it not having been the subject of a NEPA review. Actions related to this conversion include the future disposition of the 46,500 tons per year of wet ash that will continue to be produced, closure of the existing ash pond, and construction and operation of facilities to dewater the wet ash. These actions are not speculative and are clearly connected to the actions that are evaluated in the DEA. This has resulted in an impermissible segmentation of the evaluation of the impacts of the project. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC, Michelle Walker - TDEC*)**

*Response:* See the response to Comment 48. As noted by the commenters, TVA has a long-term plan to eliminate all wet ash and gypsum storage at its coal plants and convert all operating coal plants to dry CCR handling. This plan is being instituted through individual projects at each coal plant and is expected to take several years to implement. The proposed action here includes the construction and operation of dry handling and storage systems for the existing fly ash waste stream and the new scrubber waste stream. Once it is operating, the handling and storage of additional quantities of wet fly ash will cease. The Final EA analyzes the potential environmental consequences of the conversion of wet to dry fly ash handling and storage, as well as the proposed dry scrubber waste handling and storage.

The Final EA does not provide a detailed analysis of the impacts of converting the existing bottom ash waste stream from wet to dry storage. This conversion is a separate action from those considered in the EA and would likely occur after implementation of the proposed action. TVA has not begun the detailed planning for this conversion and it will be the subject of a separate future NEPA review. While the bottom ash dewatering system has not been designed, it is likely to be a de-watering system using recycled water with no direct surface water discharge. To the extent feasible, the resulting dry CCRs would be recycled and the unmarketable material would be placed in the proposed onsite landfill.

The current proposed action does not include the closure of any wet impoundments or storage areas. Such closures would be regulated through the GAF NPDES permit. A required preliminary closure plan has been submitted to TDEC and is under review. As these impoundments near closure, TVA will work closely with TDEC to establish appropriate closure designs. Likewise the appropriate level of NEPA review will be completed prior to any closure activities. TVA does not agree with the claim that the EA impermissibly segments its proposed actions.

**50. The DEA states that the Gallatin plant will switch from using 100% low-sulfur Powder River Basin (PRB) to a blend of 50% PRB coal and 50% Illinois Basin (IB) coal. The IB coal has more than eight times the sulfur content of PRB coal. This fuel switch is presented as a decision that has already been made and there is no analysis of the environmental impacts of this action. (*Commenters: Nathan Moore - SELC*)**

*Response:* The proposed emissions control equipment is being designed to accommodate the cited blend of PRB and IRB coal. The actual coal blend used at any particular time will vary with coal market conditions, as is currently the case. Section 2.1.2 of the FEA has been revised to better explain this potential change in the coal used at GAF. Many of the consequences of the fuel switch are embedded in the impact analyses in the Final EA, including those for air quality, greenhouse gas emissions, and water quality. Even with the higher sulfur content of Illinois Basin coal, emissions of sulfur dioxide and other pollutants would be significantly reduced. A proposed switch to a blend of Powder River Basin and Illinois Basin coal depends on TVA's decision whether to proceed with the proposed actions here and that decision has not been made yet.

***Tiering from Integrated Resource Plan EIS***

**51. The DEA tiers from the 2011 IRP EIS, which it uses to justify the continued operation of the Gallatin plant and avoid detailed consideration of other means to meet the demand for the energy it generates. The DEA also states that the IRP EIS contains a detailed analysis of the potential impacts of installing emissions controls at TVA's coal-fired generating plants. Such tiering is provided for under CEQ NEPA regulations. However, it is improper here because the IRP EIS does not contain an adequate discussion of site-specific issues to justify the lack of consideration of alternatives such as retrofitting, retiring, or repowering the Gallatin plant. TVA must**

**therefore prepare a site-specific EIS for the proposed action. (*Commenters: Nathan Moore - SELC*)**

*Response:* The analyses of the action alternatives in the 2011 IRP EIS are based on assumptions that TVA would install the emissions controls and take other pollution reduction measures necessary for the future operation of coal generating units that are not proposed for idling or retirement. The impact analyses describe the projected system-wide changes in air emissions, solid waste production, and other effects. As stated in the IRP EIS, it was not intended to address the site-specific issues which, for the Gallatin Fossil Plant, are the subject of this EA. See the response to Comment 56 and Appendix A for a discussion of the type of TVA actions that normally require the preparation of an EIS. In addition, as stated in the response to Comment 54 and in Chapter 4 of the Final EA, the proposed action is unlikely to result in significant impacts to the human environment.

***Type of NEPA Review***

**52. The project will have significant environmental impacts, including adverse effects on endangered species. According to CEQ NEPA regulations, it is not appropriate to rely on an EA and TVA must prepare an environmental impact statement. This is necessary due to the severity of impacts on endangered species, despite the beneficial effects of installing the emission control equipment. (*Commenter: Tierra Curry - CDB*)**

*Response:* The Final EA considers the potential environmental impacts of the proposed action and alternatives to it. TVA has determined that none of the impacts would be significant. TVA's analyses of potential impacts are described in Final EA Chapter 4. As described in Section 4.3.2, TVA has determined that the preferred Alternative 2 would not adversely affect the Indiana bat or any of the endangered species held by the Tennessee Wildlife Resources Agency at the Cumberland River Aquatic Center. There would be no effects on other listed species. These are technical determinations and are stated in terms used under the Endangered Species Act. TVA has consulted with the U.S. Fish and Wildlife Service and that agency has concurred with these determinations. The proposed action has been designed to avoid impacting endangered species or to appropriately mitigate such impacts where they are not avoided. For example, under the preferred Alternative 2, TVA has committed to continuing to support the propagation of endangered mussels by TWRA by rebuilding the CRAC facility elsewhere on the Gallatin plant site. TVA would provide TWRA a larger space to help facilitate TWRA's plans to expand CRAC operations in the future. TVA is coordinating plans to relocate and rebuild the CRAC with TWRA and USFWS.

**53. NEPA requires the preparation of an EIS for 'major federal actions significantly affecting the quality of the human environment.' While CEQ NEPA regulations define 'major' as having no meaning independent of 'significantly,' the impacts of the proposed action are clearly significant. Therefore TVA must prepare an EIS on the proposed action. (*Commenters: Nathan Moore - SELC*)**

*Response:* In accordance with NEPA, CEQ regulations implementing NEPA, and TVA's procedures for implementing NEPA, TVA has prepared this environmental assessment to evaluate the effects of the proposed action. As described in Chapter 4 of the Final EA, none of the anticipated effects of either Alternative 2 or Alternative 3 would be significant. The preparation of an EIS is, therefore not necessary because of significant effects on the human environment.

**54. Prepare an EIS that fully considers benefits and impacts of all reasonable alternatives for the Gallatin Fossil Plant, instead of relying on a limited and incomplete EA. (*Commenters: William Abernathy, John Andes*)**

*Response:* Because the Gallatin Fossil Plant is a large and integral component of the TVA power system, alternatives for its future operation must be analyzed within the context of the overall power system. TVA conducted this system-wide analysis in the 2011 IRP and associated EIS. As described in Section 2.4 of the Final EA and in the responses to other comments in this appendix, TVA has determined that other alternatives for Gallatin either are not feasible or do not deserve detailed treatment.

**55. This action requires the preparation of an EIS because it is 'highly controversial.' CEQ and TVA NEPA regulations provide that an EIS is normally required for 'any major action, the environmental impact of which is expected to be highly controversial.' 'Controversial' in this usage refers to a substantial dispute over the size, nature, or effect of the action rather than to opposition to the action. TVA proposes to spend $1.2 billion to extend the life of the Gallatin plant resulting in substantial environmental, economic, and public health consequences. The scope and magnitude of these consequences, coupled with TVA's dismissal of other potential alternatives including retirement and replacement with cleaner power, are in dispute and therefore merit an EIS. (*Commenters: Nathan Moore - SELC*)**

*Response:* Applicable NEPA regulations do provide that substantial controversy about a project may be an indication of significance requiring an EIS. Section 5.4.1 of TVA's NEPA procedures provides that actions "normally" will require an EIS when environmental impacts are "highly controversial." TVA's interpretation of this provision of its procedures is informed by experience and NEPA case law that addresses substantial or extraordinary controversy.

First, the controversy must be about the significance of environmental impacts and not mere opposition. Opposition without environmental substance does not make an action highly controversial.

Second, if there is opposition raising environmental concerns, TVA considers whether this is scientifically based. Mere assertion of environmental damage without valid scientific underpinnings is not given weight. The primary foundation for these commenters' analyses and their resulting disagreement with TVA's determinations that potential impacts should be insignificant is their position that the baseline for the analyses should be retirement of Gallatin, not continued operation of the plant. Retirement is not the correct baseline to use here for the reasons discussed in the Response to Comment 22 and this error undermines the technical adequacy and legitimacy of many of their comments and analyses. TVA weighs heavily environmental concerns about an action made by other agencies with environmental expertise. Here the only material environmental concern raised by other agencies has been with respect to the possible closing of the CRAC facility. TVA has fully addressed these concerns in the Final EA and comment responses and has committed to rebuilding the facility elsewhere on the Gallatin plant site at its expense if necessary.

Third, the context in which the controversy arises is important and determinative of whether it is "substantial." There must be legitimate, scientific-based controversy over the significance of impacts and this must be substantial. This requires consideration of the number of people potentially affected, positively or negatively, by the action in relation to the number of people who object to the action for environmental reasons. There is no set percentage or point at which environmental controversy becomes “substantial” and determining this is a matter of judgment. About 1,200 entities and persons commented on the proposed actions here. Many of the comments were form letters or emails distributed for use by the Sierra Club. There are almost 800,000 people in the Nashville area and TVA serves more than nine million people in the Tennessee Valley region. To provide further context, 7,000 individuals, 7 federal agencies, 14 state agencies, 1 tribal government, 8 local governments, and 42 other entities commented on TVA’s Reservoir Operations Study EIS (February 2004). Even assuming that all 1,200 commenters objected to the proposed projects for legitimate environmental reasons, this level of opposition is not substantial.

**56. TVA's NEPA Procedures state that an EIS is normally required for a “major power generating facility.“ Although TVA's NEPA Procedures do not define 'major power generating facility,' there is no question that the proposed Gallatin project qualifies. Based on applicable Clean Air Act terms and definitions, Gallatin is a “major power generating facility,“ a “major stationary source,“ and a “major emitting facility.“ TVA's proposed action is a decision to operate a major power generating facility and, under TVA's NEPA Procedures, this decision requires preparation of an EIS. (*Commenters: Nathan Moore - SELC*)**

*Response:* TVA agrees that the Gallatin Fossil Plant is a “major power generating facility,” or, in Clean Air Act terminology, a major emitting facility or major stationary source. Since the issuance of its NEPA Procedures, TVA has interpreted the cited statement (Section 5.4.1) as applying to construction of a new major power generating facility, and not to maintenance and upgrades of major power generating facilities. TVA carefully evaluates proposed actions at its power generating facilities to determine the appropriate type of NEPA review based on criteria in the TVA NEPA Procedures and the CEQ NEPA Regulations. Assuming that projects at its power plants always normally would require an EIS would make no sense and TVA has not done this.

**57. TVA is making a critical decision on the future of the Gallatin plant that provides the chance to build a clean energy future for the region that improves our health and environment, lowers our electric bills, and creates new jobs. Because of the importance of this decision, it should be evaluated with an environmental impact statement that fully considers all reasonable alternatives, such as investing in energy efficiency for meeting our needs and replacing the plant. *(Commenters: C. A., William Abernathy, April Adams, Stephen Adreon, Mary Agee, Ulla Albridge, Sylvia Aldrich, Fran Alexander, Suzanne Alexander, Rebecca Allan, Barbara Allen, Evelyn Allen, Jeri Allison, Christopher Anderson, Gina Anderson, John Andes, Geneva Andrews, Robert Andrys, James Arnett, Aashir Awan, Brenda Badiuzzi, Jim Bailey, Elizabeth Barger, Andrew Barrett, Kevin Bartels, Susan Battis, Jonathan Bell, William Best, Tanya Bethurem, Amy Biggers, Robbie Billings, Graham Black, Karen Blanco, Gwendolyn Blanton, Shelly Bogda, Christina Bogdanova, Marissa Bond, Paul Bonham, Emma Bonnet, Dave Bordenkircher, Diane Bouska, Deanna Bowden, Ralph Bowden, Gary Bowers, Bettina Bowers Schwan, Sheila Bradford, Jim Brasfield, David Braski, Margo Brent, Daniela Bress, William Brisolara, G Van Brocklin, Michael Broderick, Penny Brooks, Jerry Brown, Shirley Brown, Shirley Brown, Harry Bryant, Kyle Bugg II, Van Bunch, Emily Burchfield, Gordon Burghardt, Barbara Burton, Margery Buxbaum, Ernest & Berdelle Campbell, Stephanie Capps, Carole Caprio, Jeanette Carbary, Brent Cardin, Jan Carlin, Bob Carlough, Patricia Carte, Jean Carter, Sharyl Carter, Garnet Chapin, Sue Chard, Joe Choate, Tyra Chrisman, Chris Christi,***

***Mary Clarke, Ola Cleon Jones, Stewart Clifton, T. Comp, Chuck Comstock, Brian Conlon, Jamie Conner, Russell Conner, Sheila Conquest, William Conte, Jr., Rhonda Cook, Martha Copp, Sandra Corbin, Michael Cothron, Mike Couch, Elizabeth Cross, Mary Ann Curtis, Arthur Cushman, John Czerwonka, Brent Davis, Robin Davis, Marnie De Shaw, Ramona Dean, Patricia Demetriou, Frank Depinto, Don Der, Tony Diaz, Richard Dickens, Jason Dickerson, Hannah Dickinson, Thomas Diggs, James Dimarco, Philippe Doineau, Shahn Donegan, Elisabeth Donnovin, Donald Dresser, Randall Duckett, Frances Duvall, Darrel Easter, Annlynn Eastin, Joy Eaton, Mari Echevarria, Binji Elder, Kyle Elias, Kurt Emmanuele, Juliana Ericson, Margaret Evans, Susan Faulkner, Ron Feenstra, Clayton Ferguson, Judy Fisher, Michele Flanagan, Joanne Fletcher, Elizabeth Floersch, Matred Foster, Powell Foster, Ashleigh Fountain, Connie Fowler, Robert Frazier, Ruth Frazier, Sara Frazier, Adrienne Frey, Axel Friedrich, Elizabeth Garber, Jane Gardner, Larry Garner, Joel Gearhardt, Janet Geerlings, Patty Ghertner, Chris Gibson, Richard Gilbert, Chris Gilbreath, Jeff Glaser, Raechel Glynn, Nevin Gokturk, MIndy Goldberg, Joanne Golden, Jesse Gore, Louise Gorenflo, Yolande Gottfried, Michele Gourley, Eric Graham, John Grant, Michael Grantz, Alan Green, David Green, Edward Greene, Hannah Greene, Gloria Griffith, Heather Grimm, Anne Grindle, Sosanimali Gruppo, Jane Gulley, Jane Gumnick, Thushara Gunda, Karen Gupton, Stephanie Hacker, Gretchen Hagle, Anna Haislip, Bill Hale, Erik Hall, John Hamilton, Judith Hamilton, John Hammel, Christy Hanna, David Hans, Jane Hardy, John Hargrove, Barbara Harper, David Harper, Donna Harris, Janis Hashe, Dennis Hatler, Daniel Hatmaker, Luther Haug, Patti Haun, Katrina Hayes, Robert Hayes, Michelle Haynes, Mark Heald, Cheryl & Fred Heinecke, Richard Helton, Tim Hendrickson, Emily Herman, David Hess, Eric Heveron-Smith, Rob Hill, Jean Hiser, James Hobbs, Rebecca Hobbs, Martha Hobson, Angela Holland, Elizabeth Holmes, Joseph Holmes, Monique Holtkamp, Elizabeth Holton, Mark Homer, Shelby Hood, George Hornberger, Allison Horton, Grant Houston, Craig Howard, Jim Ann Howard, Aiden Hoyal, Phillip Huber, Noah Huber-Freely, Marcella Hudson, Pat Hudson, Thomas Hunsberger, Pamela Hunt, Daniel Huser, Phil and Michelle Huss, Randall Ingram, Michael Irwin, Pamela Irwin, Robert Irwin, Olin Ivey, Brenda Ivy, Nancy Jackson, Todd Jackson, David Jacques, Ellen James, Kyle James, Cindy Janac, Lawrence Jasud, Jack Jeffers, Gayle Jenkins, Craig Jervis, Sarah Jewell, Andrew Johnson, David Johnson, Jessica Johnson, Karen Johnson, Terry Johnson, Ben Jones, Julia & David Jones, Audrey Jordan, Catalina Jordan, Ruth Kaczmarek, Don & Gerry Kaller, Linda Kaplan, Albert Kashner, Dustin Keck, Susan Keller, Terri Kelly, Cindy Kendrick, Mila Kennedy, Meryl Kerns, Donald Keyser, Mark King, Jacob Kingman, Lane Kinkead, Nathalie Kintz, Dawn Kirk, Julie Kraft, Sandra Kurtz, Lisa Lambert, Martha Lammers, Angela Lamonica, Gary Lampman, Lawrence Landau, James & Elizabeth Langston, Jan Lapides, Michael Larrivee, Barbara Lastovka, Beaux Latham, Thomas Lavin, Jack Lawrence, Troy Ledford, Marie Lee, Mark Leffler, Andre LeQuire, Eric Lewis, Michael Lippard, Susan Lobo, Robert Lower, John Lumpkin, Charlie Luna, Chis Ann Lunghino, Derek Lunghino, Amy Lutterloh, S. Leslie Lytle, Mary Machanoff, Matt Majka, Bryon Mallory, Eric Malo, Andrea Maneschi, Jason Mann, Brian Mason, Matt Massey, Mary Mastin, Jeremy Mattingly, Diane Mccluskey, Kathleen Mcintyre, William Mckiven, Barbara Mcleary, Donna Mcmillan, George McMullen, Barry Medlin, Claire Meggs, Tony Messer, Barry Miles, Elizabeth Miller, Karen Miller, Mary Miller, B. Miller Jr., Ronald Mincin, April Minkler, Anglea Minor, Valerie Mitchell, Patricia Mixon, Awadalla Mohamed, Dorothy Monday, Michael Moore, Patrick Morales, Philomena Morello, Robert Moreo, Ann Morgan, Rufas Morison, Beverly Morris, Michael Morris, Dent Morriss, Jessica Murphy, Michael Murphy, Neil Murphy, Sherry Murray, Jane Myers, Deborah Narrigan, Matthew Nelson, Laura***

***Nevins, D. Blane Newberry, Jason Nichols, Nelson Nichols, Harmon Nine, Kay Norman, Sara Oaks, Marsha Oates, Denise O'Briant, Kathleen O'Donohue, Shawn Oehler, Kathy O'Gwin, Antoinette Olesen, Larry Olivier, Abby O'Rear, C. R. Orr, Marcia Orr, Anthony Osborne, Elizabeth Osborne, Barbara Owens, Sherry Owens, Frances Paris, Shannon Parker, Jeff Parmley, Jeffrey Patterson, Wesley Patterson, Judy Pearson, Terilee Peavler, Ruth Peeples, Carolyn Pendergast, Marie Pendzich, Vera Pentcheva, Jeanne Perry, Katerina Peterkova, E. Petrilla, Dennis Pettibone, Richard Phelps, Eleanor Phillips, Myer Phillips, Ray Phillips, James Pierce, Joseph Pierce, Tara Pilkinton, Karen Polson, Elsie Pope, Geraldine Powell, Rebekah Powell, Jennifer Powers, Phillip Powers, Taylor Prince, Christine Pritchard, Richard Queener, York Quillen, Matt Ragan, David Rainey, Linda Raiteri, Farris Ralston, Rolf Randby, Kristy Ray, Joyce Reddig, Mary Reed, John Reid, Stephen Reisman, Richard Renaud, William Reynolds, Teresa Rhodes, Debra Rice, Sheila Rice, David & Janice Richie, Susie Ries, Axel Ringe, Russell Rivers, Kelly Roach, Carly Roberto, Dina Robertson, Grace Robertson, Annabelle Robinson, Beth Robinson, Eric Robinson, Ramcey Rodriguez, Jessica Rogers, William Rogers, Silverrene Roundtree, Joanne Routledge, Keven Routon, Cindy Rudolph, John Rutherford, David Rutledge, Robert Scheel, Sally Schenker, Teris Schery, Joe Schiller, Sarah Schiller, Rachel Schlafer-Parton, Phil & Maxine Schoggen, Susan Schuchard, Shelah Scott, Judith Scoville, Ana Segovia, Richard Seidenstricker, Frances Shambaugh, Marlene Shaner, Maddie Shankle, Charleen Shelton, Mark Shenkel, Heloise Shilstat, Mark Shipley, Louise Shoen, Kurt Short, Ron Shrieves, Ted Simons, Mary Singer, Criss Skinner, Anton Smirnov, Barbara Snell, Steven Sondheim, Catherine Soudoplatoff, Laura Spieler, Susan Springer, Ernest Spurlock, Shelley Stahlman, Lance Standefer, Donald Steele, Jeffery Stein, Dana Stevens, Taren Stiles, Henry Stokes, Mary Stone, Nathan Strong, Karen Stuart, Gary Sturgill, Lana Sutton, Marjorie Swenson, Pat Tabor, Ben Taylor, Marlene Taylor, Joel Tellinghuisen, Haeli Templeton, Eugene Teselle, Elbert Thomas, Melinda Threet, Barbara & Charles Tigrett, Mark Tolley, Linda Tomlinson, Bert Toporzisek, Charlie Trapp, Anastasia Marina Tsoutsoulopoulou, Denise Tugadi, William Turner, Jackson Tuttle, Ifte Uddin, Kayann Vance, Stephen Verran, Noelle Vieau, Edgardo Vila, Beatriz Villa, Jim Von Bramer, Jacqueline Wagoner, Elmer Wainscott, Carlton Walker, Melba Walker, Joan Wallace, Mark Walleman, Hazel Walton, Rosemary Wampler, Milo Wan, Mary Margaret Ware, Lawrence Wasson, India Watkins, Chris Watson, Jessica Weaver, Linda Weaver, Selina Webb, Phillip Webster, Chris Wegener, Sage Welch, Elizabeth Wells, Eleanor Wetzel, Joyce Wheaton, Cindy Whitt, Robert Wieseneck, Adam Williams, Stan Williams, Sue Williams, Bonnie Willingham, Reese Wills, Glen and Martha Wilson, Gordon Wilson, James Wilson, John Wilson, Mark Wingate, Mike Wise, Cor Wisnewski, Stuart Wiston, Summer Wollett, Tom Wood, Richard Woodard, Laci Woods, Brad Wright, Kae Wrinkle, Janna Yeargin, Sheldon Yeatts, David Yoder, Zach Young, Nancy Zimmerman)***

*Response:* This EA, as well as TVA's 2011 Integrated Resource Plan EIS from which it tiers, considers a wide range of potential alternatives to the proposed action. The IRP EIS considers sources of TVA's future power supply on a system-wide basis, including the increased reliance on energy efficiency and idling of coal-fired units. It also evaluates the system-wide environmental effects, region-wide employment, and cost and financial metrics of alternative power supply plans. TVA conducted additional detailed analyses specific to the Gallatin decision for this EA. The feasibility of other potential alternatives is described in Section 2.4 of the Final EA, and in the responses to the comments in the Alternatives section, and in the response to Comment 36. For the reasons described in Section 2.4 and the responses to comments, TVA evaluated two related action alternatives in detail in the

EA. The responses to comments in the Air Quality section describe some of the health and related environmental benefits that would result from the proposed action. See the responses to comments in the Economic Impact section for cost consideration specific to the proposed action.

**Other**

**58. Upgrading TVA's fossil plants with effective emission controls is a good option. (*Commenter: Terry Johnson*)**

*Response:* Comment noted.

**59. The Executive Committee of the Greater Nashville Regional Council has evaluated the proposed action, found no conflict with existing or proposed planning activities, and approved it. *(Commenter: Sam H. Edwards, Greater Nashville Regional Council)***

Response: Comment noted.

**60. We are opposed to a new dry coal ash landfill in Middle Tennessee. (Commenters: *Joe Anderson, Anonymous, Kris Ballinger, Debbie Barnard, Matthew Bentley, Hector & Suzanne (sic) Black, Jerry [sic] Bowles, Britton, Larry, Thomas Carothers, William F.Caul, Barbara (sic) Clinton, R. G. Crarens, Ed Edenfield, Pamela Edenfield, Peggy & Eston Evans, Richard Finch (sic), John Froeschauer, Christopher E.Gibson, Melba Gulick, Kathleen Hardeman (sic), Ada Haynes [sic], Bill Hennessa (sic), William Howell, Sara & Douglas Hudgens, Thomas Hutson, Tom Jankins (sic), Bradley Jarrell, Joseph E.Kress, James R.Ladd, Lewis John (sic), Landon Medley, Amanda Moore, Carole Moore-Slater, Mary Louise Murphy, Brian Paddock, Charles Parker, Leith (sic)Patton, Elizabeth Queener, Barbara Reynolds, Eliseo & Marjorie Rios, Beth Rolm (sic), Dicksie S.Schmitt, Breika, Tyler, & Cassandra Schrade, Jim Selin [sic], James R.Slater, Jacqueline & Edwin Stapler, Beth Stoddart, Tom Strawman, Binney Stumpf, Michael White, Steven & Sally Yancey)***

*Response:* Comment noted.

**61. In the late 1970s, TVA canceled a project to install scrubber equipment at its Johnsonville plant after spending a significant amount of money to purchase equipment. What happens if this project is cancelled after construction begins? (*Commenter: Clyde Pedigo*)**

*Response:* TVA has changed its approach to addressing emissions at some of its units in the past and it could do so here. If it does, TVA likely would not be able to recover some of the expenditures it would have made on these projects after they were approved to proceed. However, TVA's project-related contracts contain termination for convenience provisions that would reduce such losses.

**62. Why is TVA still a federally owned corporation? (*Commenter: Jamie Brubaker*)**

*Response:* TVA was created as a federal agency and instrumentality in corporate form by Congress in the Tennessee Valley Authority Act, as amended. Congress would have to amend the TVA Act to change TVA's status.

**Regulation and Permitting**

**63. The DEA recognizes the appropriate water permits and/or permit revisions that may be necessary. The DEA should also recognize that the proposed project may require modifications to recent TVA submittals required by NPDES permit conditions for the following:**
**- Emergency Response Plan to incorporate additional risk from liquid ammonia storage tanks**
**- Ash Pond Closure Plan to address additional storage of gypsum wastes**
**- Best Management Practices Plan to address changes in operations affecting discharge of metals**
**- Dry Ash Conversion - quarterly updates of project planning, construction, and completion must be submitted with Discharge Monitoring Reports. (*Commenter: Michelle Walker - TDEC*)**

*Response:* TVA will update and submit these documents as required and Section 1.7 of the Final EA has been revised to state this. Quarterly updates on Dry Ash Conversion are not a requirement in the current permit, but are expected to be added to the permit when it is renewed.

**64. The proposed action would involve work in waters of the U.S. and therefore require a Department of the Army permit under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act. The Corps is available to participate in meetings or onsite inspections for the proposed project to discuss ways to avoid or minimize the identified aquatic resource impacts. (*Commenter: James DeLapp - USCOE*)**

*Response:* Comment noted. TVA has applied for the Section 10 and Section 404 permits from the Corps and the Section 401 certification and Aquatic Resource Alteration Permit from the Tennessee Department of Environment and Conservation. Measures to avoid, minimize, and mitigate environmental impacts are described in Chapter 4 and summarized in Section 1.8 of the Final EA. TVA will implement all permit conditions and mitigation required by the Corps and TDEC.

**Public Health and Safety**

***Health Impact Assessment***

**65. Health Impact Assessment (HIA) should be considered. (*Commenter: Michele Gourley*)**

*Response:* Health Impact Assessments are generally understood to be a process for studying potential health impacts on discrete populations. They are generally a more focused and limited analytical process than the environmental review process under NEPA. In the broader scoped NEPA review process, health impacts typically are assessed by reference to established standards and other metrics of harm. For example, EPA's National Ambient Air Quality Standards under the Clean Air Act are set at levels that protect human health with an adequate margin of safety. If a proposed action will result in pollutants levels below an ambient standard, public health should be protected from the kinds of impacts from which the standard is designed to protect. Here, the proposed action is to further reduce emissions from the plant and improve the management of coal combustion waste products. Both of these actions are expected to help reduce the risk of adverse health impacts and better protect the environment.

***Use of Ammonia***

**66. The proposed actions would transport, store, use, and discharge large quantities of ammonia. While there is some discussion of the effects of ammonia discharges on water quality and of accidental releases on health and safety, the DEA does not thoroughly assess these impacts. It also does not address alternatives to the use of anhydrous ammonia such as the use of dilute aqueous ammonia which presents lower health and safety hazards. The DEA also does not assess the risk of trucks transporting ammonia to Gallatin having accidents on roads passing homes, schools, and hospitals. (*Commenter: Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* Since 2000, TVA has installed selective catalytic reduction (SCR) systems on coal-fired boilers at 7 of its coal burning plants. These systems have helped reduce system-wide NOx emissions from 285,000 tons in 2000 to 63,000 tons in 2011. Ammonia is used in the SCR process.

Anhydrous ammonia is one of the most common industrial chemicals manufactured and consumed in the U.S. In 2011 8.1 million metric tons were produced and 13.8 million metric tons were consumed, mostly for fertilizer production (U.S. Geological Survey, Mineral Commodity Summaries, January, 2012). There has never been a reportable accidental release (CERCLA 102(a) Hazardous Substances) of anhydrous ammonia at a TVA facility, nor have there been any accidental releases of ammonia being delivered to a TVA facility.

TVA has a comprehensive program to minimize the potential for an accidental release of ammonia. Like the other seven TVA facilities that have SCRs, the proposed anhydrous ammonia system at Gallatin would meet the OSHA Process Safety Management standard (29 CFR 1910.119) and EPA's Risk Management Program rules (40 CFR Part 68). A Risk Management Plan would be developed and implemented to minimize the risk of an accidental release of ammonia and establish procedures for addressing such a release. The release prevention program in the plan includes the following sections; Process Safety Information, Process Hazard Analysis, Operating Procedures, Training, Mechanical Integrity, Management of Change, Pre-startup Safety Review, Compliance Audits, Incident Investigations, Employee Participation, Contractors, Emergency Response Plan, and Analyses of Off-site Consequences. Prior to receipt of ammonia, the Risk Management Plan must be submitted to EPA. The potential off-site consequences and emergency response plan are also discussed with local emergency management agencies. These programs are audited by TVA no less than once every three years and by EPA periodically. The plans must also be revalidated at 5-year intervals and a synopsis of the program resubmitted to EPA.

Alternatives to the use of anhydrous ammonia were considered during the early planning of the proposed action. The two potential alternatives, aqueous ammonia and urea, are both more costly for an equivalent amount of reagent. In addition to its higher cost, urea requires additional capital and operating cost for the process that converts urea to ammonia. This conversion process requires considerable energy, thus decreasing the overall plant efficiency. Due to its complexity, this conversion process increases the potential for equipment failure, uncontrolled $NO_X$ emissions, and plant shut downs. Aqueous ammonia also has the disadvantage of requiring four to five times as many deliveries by truck than anhydrous ammonia.

The anhydrous ammonia would be delivered in pressurized tanker trucks by drivers who are trained and certified to transport hazardous cargo. Millions of tons of anhydrous ammonia are transported annually in the United States without incident. There will be an average of one delivery per day of anhydrous ammonia to GAF and, based on experience, TVA does not anticipate delivery problems. Additional information has been added to Final EA Section 4.13 on the potential for an accident during ammonia transport. TVA has not experienced problems from ammonia contamination of fly ash or water discharges at its other plants with operating SCR facilities. Over 99.5 percent of the ammonia that enters the SCRs is converted to nitrogen and plant treatment systems are designed to minimize any potential impacts from the residual ammonia. In 2011, TVA sold 292,000 tons of fly ash for use in concrete from Cumberland Fossil Plant which used over 11,000 tons of anhydrous ammonia to reduce NOX emissions.

**Solid and Hazardous Waste**

***Landfill Design***

**67. According to the DEA, the proposed landfills would use liners specified to meet EPA's RCRA Subpart D Criteria. Even though the purported project purpose and need is to comply with the Federal Facilities Compliance Agreement and current and anticipated regulations, the DEA does not consider the fact that EPA is scheduled to promulgate standards that could regulate coal combustion waste under the more stringent requirements of RCRA Subpart C. It also does not evaluate the additions measures or costs of regulation under RCRA Subpart C. (*Commenters: Nathan Moore - SELC*)**

*Response:* TVA knows that EPA is currently considering the regulation of coal combustion residue (CCR) as a special waste under RCRA Subtitle C regulations. TVA has been closely monitoring developments in this area and anticipates that EPA will not regulate CCR under Subtitle C but under Subtitle D. TVA is designing the proposed landfill to meet Class II Industrial Landfill requirements in Tennessee and these should be adequate to meet regulation under Subtitle D.

If EPA elects to regulate CCR as special waste under Subtitle C, the landfill design criteria would be very similar to those currently required for Class II Industrial Landfill requirements and Federal Subtitle D Landfill criteria. Subtitle C regulations would differ in that they would establish controls on the management of the CCR from the point of generation through disposal (cradle to grave). In addition to regulations for CCR disposal facilities, this would include generator and transporter requirements. As necessary, TVA would upgrade the proposed landfill design to meet the adopted regulatory standards.

***Landfill Siting***

**68. Development of the two proposed landfills would destroy several wetlands that provide valuable ecological functions. Over 5 acres of jurisdictional wetlands, most of which are rated as moderate to good condition would be eliminated. One of the wetlands is described as having unique habitat diversity and landscape values and providing a high level of wetland functions. These losses would be significant as**

**wetlands comprise less than 1 percent of land uses in the Cumberland River watershed. TVA also fails to make the necessary finding of no practicable alternative to the proposed destruction of the wetlands, as required by the wetlands executive order and TVA's NEPA procedures. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* Final EA Section 4.3 has been revised to incorporate recent project design changes which have resulted in a decrease in the area of affected wetlands from 2.92 acres to 2.24 acres by avoiding impacts to wetlands W007 and W008. Landfill construction would impact 0.74 acres of wetlands; PA-W002 (0.18 acres), W003 (0.47 acres), W004 (0.03 acres), and W009 (0.06 acres). The additional impacts come from haul road construction, which would affect 1.50 acres of the 5.6-acre PA-W001. None of the five affected wetlands are rated as high quality or considered to provide unique habitat diversity and landscape values. TVA recognizes that loss of wetland habitat within the Cumberland River watershed is an issue; however the proposed project has been modified to avoid impacting higher quality wetlands. The loss of 2.24 acres of moderate to low-quality wetlands would be mitigated at a 2:1 or greater ratio. Wetlands mitigation is an appropriate and common means of reducing potential wetland impacts. TVA does not consider the limited loss of wetlands here, as mitigated, to be significant.

The proposed facilities were originally sited to reduce potential impacts on wetlands and then further adjusted to reduce impacts even more. Site constraints, including existing rail lines, archaeological resources, site geology, roads, and utilities, limited TVA's ability to site project components. The proposed configuration of the landfills and haul roads minimizes impacts to existing resources, including wetlands, while working within the practicable economic and physical constraints of the site. There is no practicable alternative to further avoiding impacts on wetlands.

**69. The proposed landfills would be built in the state Gallatin Steam Plant Wildlife Management Area. The DEA does not adequately explain why this is necessary or address the impacts to the ecological values of the WMA or to recreation activities on the WMA. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* Sections 4.3.1, 4.3.2, 4.3.3, 4.3.4, and 4.3.5 of the Final EA have been revised to better explain the potential impacts on Gallatin Wildlife Management Area.

**70. Two landfills are proposed in areas underlain by karst topography. These unstable geologic features underlay significant portions of the landfill sites and increase the risk of leakage and catastrophic failure, resulting in contamination of groundwater, the nearby Cumberland River, and public water supplies. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* During the early planning of this proposed action, TVA studied both off-site and on-site locations for the proposed landfill. The results of this study are summarized in Final EA Section 2.4.1. Based on the results of the site screening process, the two rail-loop areas were identified as the preferred landfill locations. TVA then initiated a detailed evaluation of the North Rail Loop (NRL) area which included a two-phased hydrogeologic evaluation. Data gathered during the Phase I assessment were used to determine the suitability of the site for landfill development in accordance with TDEC permitting requirements.

The results of the Phase I investigation were incorporated into the Draft EA. This discussion has been updated in Section 3.5.1 of the Final EA to incorporate the results of the subsequent Phase II hydrogeological investigation that was submitted to TDEC in the Part II Solid Waste Landfill Permit Application. The final hydrogeological investigation report addresses concerns relating to karst morphology in the proposed NRL area by utilizing geophysical and geotechnical methods to evaluate the geology in the proposed disposal area and identify potential structural anomalies which could affect the structural stability of the proposed landfill site. This report concluded that there is no indication of karst features in the footprint of the proposed NRL landfill.

TVA's proposed landfill design complies with Federal Subtitle D regulations and TDEC Rule 0400-11-01 governing the siting, design and operation of solid waste landfills. In accordance with TDEC rules, the proposed landfill design will incorporate a composite liner system satisfying Federal Subtitle D regulations. The liner system will utilize a synthetic liner in combination with a compacted clay liner and a leachate collection system. The proposed disposal facility is expected to adequately contain CCR waste while allowing monitoring of groundwater in accordance with Rule 0400-11-7-01-.04(7).

A separate hydrogeologic investigation would be completed prior to the completion of the final design and construction of the proposed South Rail Loop landfill.

**Transportation**

**71. TDOT has no transportation projects in the report area. (*Commenter: Ann Andrews - TDOT*)**

*Response:* Comment noted.

**Water Quality**

***Discharges of Pollutants and Toxics***

**72. The plant discharges approximately 27.9 million gallons of wastewater per day (MGD) from the existing ash pond through Outfall 001, as described in the plant's NPDES permit. The effluent discharged from Outfall 001 includes oil, grease, suspended solids, toxic metals, and other toxic substances, including those that cause increases in alkalinity. At the flow rate of 27.9 million gallons per day, multiplied by average metals concentrations in the discharge water, shows that TVA is annually discharging roughly 136,000 pounds of aluminum, 850 pounds of arsenic, 25,000 pounds of iron, 85 pounds of lead, 2,000 pounds of manganese, 2,000 pounds of selenium, and 85 pounds of silver. In addition, Toxics Release Inventory data for Gallatin show 2011 surface water discharges of 42,000 pounds of barium, 750 pounds of chromium, 3,000 pounds of copper, 560 pounds of vanadium, and 2,700 pounds of zinc. The DEA does not adequately describe how the quantities of these discharged pollutants will change under the proposed action, or the impacts of these changes. (*Commenters: Nathan Moore - SELC*)**

*Response:* The effluent limitations set by TDEC in the NPDES permit are based on analytical and flow data from Outfall 001 and background analytical and flow data from the Cumberland River. Based on reasonable potential analysis and water quality-based effluent calculations (see page A-11 of the GAF NPDES permit), TDEC determined that the current discharges from Outfall 001 do not cause or contribute to aquatic toxicity because the projected metals concentrations are substantially below toxic concentrations.

Implementation of the proposed action under Alternative 2 or Alternative 3 would have little effect on the discharge from Outfall 002 which is primarily condenser cooling water.

The volume of discharges from Outfall 001 would be reduced due to the conversion from wet to dry fly ash handling and the associated elimination of flows of fly ash sluice water to the ash pond. The use of the dry scrubber eliminates the water discharges from scrubber waste handling typical of wet scrubber systems. Other flows resulting from the implementation of the proposed action include process, potable, and storm water flows from the dry scrubber; potable and storm water flows from the SCR; and storm water-driven process flows from the landfill. A detailed model of the landfill discharges and general information about other process and storm water discharges to be routed to the ash pond is included in the Section 4.2.2 of the Final EA. The implementation of dry fly ash handling should significantly decrease the amount of process water treated in the ash pond and improve the quality of water discharged from Outfall 001. As required by the NPDES permit modification, TVA would conduct a full characterization of all new process water streams within two years of the changed operations.  TVA would then implement appropriate mitigating measures indicated by the characterization results would be conducted to modify the current NPDES permit and to ensure the protection of water quality.

**73. Old Hickory Lake/Cumberland River water quality will be affected. (*Commenter: Gretchen Hagle*)**

*Response:* Comment noted. The anticipated effects of Alternatives 2 and 3 on water quality in Old Hickory Lake/Cumberland River are described in Sections 4.2.2 and 4.2.3 of the Final EA. As described in these sections, the changes to the discharges of water pollutants are not expected to negatively impact the quality of water in the river and would likely result in reductions in the discharges of some pollutants.

**74. The new landfills will produce between 26,000 and 300,000 gallons per day of concentrated leachate and 340,000 gallons per day of stormwater runoff. The added pollutant loadings from the leachate collection system would increase the concentration of more than a dozen toxic metals in the ash pond discharge (Outfall 001). The increased discharges of copper and thallium would exceed the instream water quality standards for the Cumberland River. Even without these additional discharges, the Cumberland River already exceeds numeric water quality standards for these two pollutants. The Clean Water Act prohibits these discharges. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* TVA expects the addition of a dry scrubber and conversion from wet to dry fly ash handling will greatly reduce overall wastewater discharges and pollutant loadings from the Gallatin Fossil Plant. The conversion to dry fly ash with the introduction to scrubber leachate and storm water runoff to the pond may conservatively result in no net increase in metals and most likely some improvement in discharge water quality.  In its comments on the draft EA, the Tennessee Department of Environment and Conservation expressed appreciation for TVA's proposal to use a dry scrubber "in order to minimize cross-media transfer of pollutants from air to surface water."

In analyzing the anticipated discharges of pollutants, TVA conservatively assumed that the ash pond concentrations of metals would not change as a result of elimination of fly ash transport water. Leachate metals loading are specifically addressed through HELP modeling in the Section 4.2.2 of the Final EA. While the added loadings from the leachate collection system could increase the metals concentrations at the ash pond discharge, the concentrations would not exceed the lowest TDEC Water Quality Standard in the Cumberland River as a result of the added loading. This analysis was based on the estimated maximum leachate discharges from the site.

Two potential exceptions to the preceding statement are copper and thallium. Further analysis of the copper samples has shown that a single sample was more than an order of magnitude higher than other samples and an outlier. Modeling based on the average copper concentration in the samples shows no effect on existing copper concentrations in the Cumberland River. Thallium appears to exceed the lowest in-stream criteria only because the detection level for NPDES approved sampling methods is higher than the criteria. Therefore, thallium could be lower than water quality criteria, but it is impossible to tell using NPDES sampling methods. To date, thallium has not been detected in any ash pond discharges from GAF.

**75. The proposed action would substantially alter the Gallatin wastewater streams by adding new contaminants and increasing pollutant discharges. The DEA acknowledges that the physical structures, reagents and raw materials, operations, and waste products associated with the proposed pollution controls would add and increase water pollution discharges. The DEA, however, makes no attempt to quantify or fully characterize the flow, constituents, or concentrations of additional water pollution the proposed action would produce. (*Commenters: Nathan Moore - SELC*)**

*Response:* Additional wastewater streams would be added to the total discharge from GAF. The conversion of wet fly ash handling to dry handling would eliminate 8.35 MGD of fly ash sluice wastewater from the total GAF discharge. The installation of the SCR and scrubber would require raw water for quick lime mixing, nozzle cleaning, fogging system, wash-down activities and by-product conditioning along with minimal amounts of potable water (safety showers, eye washes and restroom facilities) to operate. Estimated water usage for the dry FGD would be approximately 4.03 to 4.18 million gallons of raw water per day and estimated 3 to 20 gallons per minute of potable water for safety showers, eye washes and restrooms (while in use). The SCR has no continuous use water streams other than potable water for eyewash and safety shower facilities and intermittent raw water needs (filling of two vaporizer tanks every 1-2 years and the use of the fogging system at the ammonia tanks).

The reduction of fly ash sluice water and the addition of water usage for the SCR and dry FGD would result in a 28.5 percent reduction in total discharge from GAF (Outfall 001) and would reduce the pollutant concentration in Outfall 001. The remainder of the discharges from the site would be leachate, minimal low volume wastewater flows, and storm water driven flows. The majority of the storm water flows would be managed through the implementation of best management practices (BMPs) and cleaning and maintenance plans. All other flows would be co-treated as process wastewater in the current pond system before discharge.

Section 4.2.2 of the Final EA includes a model of the discharges of the leachate/storm water from the landfill site. This site was modeled to establish flow and constituent loading to ensure that all NPDES and State Water Quality limits would be met. Other process and storm water discharges to be routed to the ash pond are also discussed in the Final EA.

***Groundwater Quality***

**76. Groundwater monitoring data from Gallatin show ongoing contamination, particularly along the perimeter of the inactive ash pond. The two groundwater wells located between the inactive ash pond and the Cumberland River have both shown elevated concentrations of boron (3 to 6 mg/L), cobalt (100 to 260 ug/L), manganese (11 to 23 mg/L), and sulfate (1,400 to 5,000 mg/L) in recent years. One of these two wells, 19-R, has also shown elevated concentrations of aluminum (80 to 90 mg/L), beryllium (11 to 17 ug/L), cadmium (3 to 6 ug/L), and nickel (120 to 180 ug/L). Since groundwater flow in that area is toward the river, and since the strip of land between the inactive ash pond and the river is very narrow, the practical reality is that these pollutants are leaching directly into the river. Another well adjacent to the cooling water discharge channel, well 21, has shown elevated concentrations of cadmium (3 to 6 ug/L), cobalt (200 to 300 ug/L), mercury (1 to 3 ug/L), manganese (12 to 17 mg/L), and sulfate (roughly 1,000 mg/L). Monitoring at other TVA plants, such as Johnsonville, also shows levels of pollutants above applicable standards. In addition to presenting an ongoing source of environmental contamination, the inactive ash pond offers an important warning about the potential future impact of the active ash ponds. (*Commenters: Mary M. Mastin - TEC, TSRA, CBD, Nathan Moore - SELC*)**

*Response:* This comment focus on alleged problems with ongoing activities at Gallatin, not the proposed actions.. TVA has been working with TDEC on the inactive ash pond since it became a Non-Registered Site (# 83-1324) and initiated groundwater monitoring in 1997. There are three parameters with MCL exceedances (beryllium, nickel, and cadmium). Oxidation of pyrites within the ash lowers the pH causing these metals to be released from the ash and create higher levels in the groundwater. There has been no upward trend of the level of parameters over more than a 10-year period. TVA continues to work with TDEC at the site on a Groundwater Assessment Program, which includes an ongoing risk assessment. TVA will continue to follow the regulatory requirements for groundwater assessment of this TDEC monitored site, and will take any actions deemed necessary by the risk assessment.

TVA established a voluntary groundwater monitoring program in July 2011 for the active ash ponds. Results of the semi-annual monitoring show no MCL exceedances of TDEC Appendix I parameters for the wells monitored.

**77. The location of the proposed landfills on karst terrain creates a risk for release of contaminants into groundwater, as described in reports produced by Stantec Consulting Services, Inc. The potential impacts of this are significant. TVA acknowledges that private residential wells occur near the project area. Contaminated groundwater from the site would leach into the Cumberland River, impacting the local ecosystem and downstream drinking water users. TVA has not conducted the necessary investigation to fully characterize and quantify the risk of landfill failure and groundwater contamination, or to design approaches to mitigate or eliminate this risk. (*Commenters: Nathan Moore - SELC*)**

*Response:* The cited Stantec reports address wet impoundments and thus are not directly applicable to the proposed lined dry landfill. Nevertheless, TVA is designing the landfills to reduce the risk of releases and would comply with TDEC Rule 0400-11-01.

A two phased hydrogeologic evaluation was conducted at the proposed NRL landfill site. Data gathered during the Phase I assessment was used to determine the suitability of the site for landfill development as it relates to TDEC permitting requirements. The assessment used geophysical and geotechnical methods to evaluate the geology in the proposed disposal area and help identify potential structural anomalies which could affect the structural stability of the proposed landfill site.

According to the Phase I assessment report, no surface depressions were noted within 200 feet of the NRL site. Samples and data collected during the geotechnical borings showed no development of karst features within the Hermitage Formation. There were no geotechnical or hydrogeologic fatal flaws identified during the Phase I Hydrogeologic Evaluation of the NRL area which would preclude the development of the landfill at that location. Information gathered from the Phase I Hyrdrogeologic Evaluation was used to guide the engineering design of the proposed landfill and the development of an investigation plan for Phase II Evaluation of the NRL area. This second investigation identified no indications of karst features.

In accordance with TDEC rules, the landfill design incorporates a composite liner system satisfying Federal Subtitle D regulations. The liner system would utilize a synthetic liner in combination with a compacted clay liner and a leachate collection system. The proposed disposal facility is expected to adequately contain CCR waste while allowing monitoring of groundwater in accordance with Rule 0400-11-7-01-.04(7).

The Public and Private Water Supply Sources Survey submitted to TDEC on January 16, 2013 with the Part II Solid Waste Permit Application, identifies one residential well within one mile down gradient of the proposed landfill. This well is located on the opposite bank of the Cumberland River. As a result, groundwater from the site would not be transported from the site to this well. All other wells within one mile are hydraulically up gradient of the site and thus groundwater would flow from the wells toward the Gallatin plant, rather than from the plant toward the wells.

TVA conducts Reservoir Fish Assemblage Index (RFAI) monitoring in the Cumberland River at the Gallatin Fossil Plant to show the effect of plant discharges on the health of the reservoir. The data have demonstrated that a balanced, indigenous fish community has been maintained in the vicinity of the plant. These reports are submitted to TDEC with each NPDES renewal application. Groundwater effects on the Cumberland River would be captured by this and other water quality monitoring performed by TVA.

***Hydrothermal Effects***

**78. The Cumberland River has already been impacted by thermal pollution from the Gallatin Plant, as TVA discloses in its Annual 10-K Report to SEC. The DEA fails to assess further thermal impacts resulting from the continued operation of the plant, as well as the effects of drought or continued cooling water demand. (*Commenter: Mary M. Mastin - TEC, TSRA, CBD*)**

*Response:* The condenser cooling water (CCW) discharge at Outfall 002 carries the majority (99.9%) of the thermal loading from GAF. The discharge characteristics (including thermal loading) of Outfall 002 will not be changed by the proposed action. Discharges from Outfall 001 would be affected by the proposed action. These discharges, however, would be at ambient temperatures and would result in no additional thermal impacts.

Recent higher temperatures in the Cumberland River have been caused, in part, by reduced summer flows associated with work on Wolf Creek Dam. The U.S. Army Corps of Engineers has notified TVA that water levels behind Wolf Creek Dam will probably be increased during the spring of 2013 and beyond due to as work on the dam nears completion. This will result in increased summer flows past the Gallatin plant and mitigate the thermal loading on the river from GAF operations.

The NPDES permit requires biological monitoring every permit cycle to assess thermal impacts in the Cumberland River. Previous studies do not indicate any negative impacts to the receiving stream due to GAF's thermal discharges.

**79. The current NPDES permit requires a renewed evaluation of thermal effects using ongoing biological studies from 2011 to 2013. TDEC will closely examine this data to evaluate plant operations during periods of critical thermal conditions. (*Commenter: Michelle Walker - TDEC*)**

*Response:* Comment noted. TVA has submitted a study plan for this evaluation to TDEC.

***Non-point Source Discharges***

**80. Construction activities would create substantial additional wastewater and sediment discharges from construction storm water runoff, work area dewatering, sewage, equipment washings, dust control, and hydrostatic testing. Increased post-construction storm water and pollutant runoff would greatly increase. These impacts would be avoided by plant retirement. (*Commenters: Nathan Moore - SELC*)**

*Response:* Construction activity impacts to water quality are addressed in the Section 4.2.2 of the Final EA. With the implementation of a storm water pollution prevention plan (SWPPP) and the proper implementation of best management practices (BMPs) for these storm water and process waste streams, only minor temporary impacts to local surface waters are expected.

Section 4.2.2 also discusses the collection and routing of all industrial storm water associated with the emissions control equipment to a new storm water pond. An oil/water separator would be installed in the transformer yard upstream of the pond. The storm water pond discharge would be covered under the existing site Industrial Stormwater Permit as applicable.

While plant retirement would reduce wastewater streams, no significant adverse surface impacts to water quality are anticipated to result from the construction and operation activities under either Alternatives 2 or 3.

***Wastewater Treatment and Effluent Limits***

**81. The effluents discharged from Outfall 002 allowed under the NPDES permit include thermal pollution, residual oxidants, and toxic substances. The permit does not impose technology-based effluent limits, as required by the Clean Water Act, on the discharge of the many harmful pollutants in the plant wastewaters. As a result, these wastewaters receive only rudimentary treatment in an unlined settling pond that does not effectively remove heavy metals and other toxics. These discharges will persist and increase with continued operation of the plant. (*Commenters: Nathan Moore - SELC*)**

*Response:* The focus of this comment is on current plant operations and not on the actions TVA proposes to take here. Although the NPDES permit allows the discharge of oxidants, TVA does not use these chemicals at Gallatin.

As stated on Page A-2 of the GAF NPDES Permit, the development of new technology-based effluent limits is not required for ash pond discharges. The ash pond treatment system effectively removes metals in compliance with the NPDES permit limitations, which are protective of in-stream water quality. The impacts associated with the continued discharge of the ash pond discharge are evaluated during every NPDES permit renewal process. No observable degradation occurred during the last permit cycle, and TVA expects the addition of the dry scrubber and conversion to dry fly ash handling will decrease metals discharge concentrations, and increase overall water and environmental quality in the area.

**Water Use**

***Public Water Supply***

**82. The intake for the Gallatin Water Department's water supply system is 1.4 miles downstream from the ash pond discharge point. This system withdraws approximately 5.1 million gallons per day to serve about 28,000 people. The impacts of the proposed action on this drinking water source are not described. (*Commenters: Nathan Moore - SELC*)**

*Response:* Section 4.2.2 of the Final EA describes the anticipated changes in discharge loadings and concentrations of the constituents of concern resulting from the proposed action. These discharges are anticipated to meet all NPDES and applicable TDEC water quality standards, thus not endangering the Gallatin Water Department water supply.

***Water Withdrawals***

**83. The DEA does not consider available mitigation measures for reducing the impacts of the plant's water consumption, such as replacing the once-through cooling system with a closed-cycle system. Such replacement may soon be required by Clean Water Act Section 316(b) regulations. Because this could occur simultaneously with the proposed plant upgrades, it should be evaluated. (*Commenters: Nathan Moore - SELC*)**

*Response:* The Gallatin plant cooling system withdraws approximately 943 million gallons of water a day from the Cumberland River (Old Hickory Reservoir); essentially all of this water is returned to the river and the consumption of water for cooling is basically zero (2011 IRP

EIS, Table 4-10). Replacement of the once-through cooling system with a closed-cycle cooling system would greatly reduce the volume of water withdrawn for cooling, but significantly increase the volume of water consumed due to evaporation.

Larval and adult fishes are susceptible to entrainment and impingement by the GAF cooling water intake system. TVA expects entrainment and impingement impacts to be the focus of EPA's Section 316(b) regulations when they emerge. TVA has conducted investigations to determine the impact on the aquatic community of Old Hickory Reservoir. Studies conducted during the mid-1970s showed impingement rates of 37 fish species less than 1.0 fish per day but no adverse effects on their populations. Impingement rates of 7 other species were greater than 1.0 fish per day. Based on comparisons with standing stock estimates in coves of Old Hickory Reservoir, less than one percent of the estimated standing stock of these species throughout the reservoir was affected and there were no adverse effects on their populations. Gizzard and threadfin shad composed the majority (98%) of the total fish collected during 2005 – 2007 impingement studies. These species typically make up over 90% of fish impinged on cooling water intake screens of thermal power stations in the southeastern U.S. Three-fourths of the impinged shad were collected during the winter months, when shad are typically vulnerable to stress, cold-shock, and die-offs during rapid water temperature changes. Given the relatively low impingement rates and the fact most of the impinged fish were shad likely cold-stressed, moribund and/or dead and vulnerable to impingement, it was concluded that GAF impingement did not constitute a significant adverse impact to the fish assemblage in Old Hickory Reservoir.

Entrainment effects at GAF were investigated during 1975. It was estimated that of the larval fish in Old Hickory Reservoir approaching the plant intake, only 1.57% were entrained into the plant. This result, coupled with the fact that 70 to 80% of the productive habitat for fish larvae (e.g., shallow overbank, coves/embayments) is located downstream of the plant, supports the conclusion of no significant adverse entrainment impact on the fisheries resource of Old Hickory Reservoir. The depth of the GAF skimmer wall also minimizes the numbers of fish eggs and larvae entrained by the plant, as most fish eggs and larvae drift in the upper stratum of the water column, well above the 30-feet deep skimmer wall. The skimmer wall is currently recognized as the best technology available for minimizing the impacts of entrainment.

The results of both impingement and entrainment studies show that the operation of the once-through cooling system at GAF is not having a significant adverse effect on the reservoir fish community. The results of RFAI monitoring described elsewhere in this EA also indicate that any downstream thermal effects are minor (see the response to Comment 24).

The reduction of impingement and entrainment of fish resulting from the replacement of the once-through cooling system with a closed-cycle cooling system would likely be roughly proportional to the reduction in the flow rates and volume of water withdrawn from the reservoir. Given the current low level of effects of the current cooling system on the fish population, replacement with a closed-cycle cooling system may not result in a noticeable change in the fish community.

**84. The proposed action will result in the withdrawal and consumption of greater quantities of water from the Cumberland River. The DEA fails to quantify the change in water withdrawal and consumption and to assess the resulting impacts. (*Commenters: Nathan Moore - SELC*)**

*Response:* Additional information has been added to Sections 3.2 and 4.2 of the Final EA that describes current and anticipated water withdrawals and consumption. TVA expects an overall decrease in water usage and consumption from the implementation of the proposed actions.

## C. INDEX OF COMMENTERS

Following is a list of the commenters and their affiliations. In many cases, hand-written names were difficult to read and the names listed below are TVA's best interpretations.
Thirty-seven comments were received which lacked the name of the commenter.

**A**



**B**

**C**

**M**

**P**

**Q**



**R**

**S**

**T**



**U**



**V**



**W**

**Y**



**Z**

# D. COMMENT LETTERS FROM FEDERAL AND STATE AGENCIES

Rec'd 11/8/12

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL DIVISION
SUITE 900 - JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-0334
(615) 741-3655

November 5, 2012

Mr. Charles P. Nicholson
Senior Manager
NEPA Interface
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 37902-1499

Re: Proposed Gallatin Fossil Plant (GAF), Sumner County

Dear Mr. Nicholson:

I have reviewed your letter concerning the Proposed Gallatin Fossil Plant (GAF) in Sumner County.

At this time, the Tennessee Department of Transportation (TDOT) has no transportation projects in the report area.

As your project progresses, if it is determined that TDOT right-of-way will be impacted by the project, please contact Mr. Winston Gaffron, TDOT Region 3 Regional Director at 615-350-4300 for further coordination.

Thank you for the opportunity to review this notice.

Sincerely,

Ann Andrews
Transportation Manager 2
Environmental Division

ec: Mr. Jim Ozment
Mr. Winston Gaffron
Mr. Bob Allen

**DEPARTMENT OF THE ARMY**
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

November 15, 2012

IN REPLY REFER TO
Executive Office

Mr. Charles P. Nicholson, Senior Manager
Tennessee Valley Authority, NEPA Interface
400 West Summit Hill Drive, WT 11 D
Knoxville, Tennessee 37902-1499

Dear Mr. Nicholson:

This is in response to your October 17, 2012 letter, Subject: Environmental Assessment (EA) Gallatin Fossil Plant (GAF) – Installation of Emission Control Equipment and Associated Facilities. The EA assesses the effects of installing additional air pollution control equipment at the Gallatin Fossil Plant in order to meet applicable requirements of the U.S. Environmental Protection Agency's (EPA) Utility Mercury Air Toxic Standards. The proposed project includes the construction and operation of a dry coal combustion product landfill which has the potential to impact several streams and approximately 2.92 acres of wetlands on the property. The project will also require the removal of the Cumberland River Aquatic Center (CRAC) operated by the Tennessee Wildlife Resources Agency (TWRA).

Thank you for soliciting U.S. Army Corps of Engineers comments regarding the subject EA. Members of my staff and I offer the following comments:

a. The Corps has contributed mitigation funds in the amount of $310,580 to the CRAC. Additional funds in the amount of $471,700 are currently held by U.S. Fish and Wildlife Service (USFWS) for the center. I am greatly concerned about the proposed project's impact to the CRAC and negative effect to Corps mitigation efforts achieved through funds expended for this facility at the direction of USFWS.

b. The CRAC facility has been a great resource to the aquatic ecosystem of both the Tennessee and Cumberland Rivers and has an even greater potential to benefit both of these ecologically important watersheds. CRAC has demonstrated capability to facilitate reintroduction and population growth of imperiled aquatic species within the Tennessee and Cumberland River systems. With the following TWRA results seen at the CRAC, the goal of reaching renewed, sustainable populations is now considered achievable.

- Lake sturgeon (*Acipenser fulvescens*) have been grown in the raceways at CRAC from fingerlings; results showed growth of up to 28 inches in length and 5 pounds of weight in the first year. This species has not been grown to these measurements by other organizations or entities due to the cost and time required. Sturgeon were released in the Cumberland River with greater survival rates attributed to the larger release sizes. The species had not been seen in the

Cumberland River since the 1970s, and currently large sturgeon from CRAC are being caught weekly and as far upstream as Wolf Creek Dam tailwaters.

- 4,000 federally endangered, juvenile pink muckets *(Lampsilis abrupt)* were received from the state Wildlife Resource Agency in Virginia to raise and determine growth rates at the CRAC facility. Results were less than 2% mortality and growth rates have been very good. Currently no other facility has been as successful in raising this species.

- Other mussels were moved into the facility from all over the state (Tennessee and Cumberland Watersheds) to be relocated to more suitable habitat. Mussels were brought in from the Clinch, Duck, Tennessee, and Cumberland Rivers. A total of 12 different federally listed species and 41 other species were held at the facility and have been relocated.

- In 2012, the facility successfully propagated 18,000 Federally Endangered mussels. At last count, after eleven weeks of growth, 60% of the 18,000 individuals were alive as compared to an average of 1% at all other known mussel propagation facilities.

- Public education through group tours of the facility included Cub scouts, home schools, churches, Western Kentucky University, Tennessee Tech University, Middle Tennessee State University, Corps personnel, TVA Kid's Day for plant worker families, TWRA Commissioners, Tennessee State Representatives, Southeastern American Fisheries Society Chapters, multiple radio interviews, at least 9 television programs, and numerous newspaper articles. More than 7500 people have been directly educated about the diversity and importance of our aquatic ecosystems and aquatic fauna at the facility, and countless individuals have been made aware of the facility through the media.

c. TVA, Corps, Nashville and Memphis Districts, TWRA, the Tennessee Department of Environment and Conservation, and The Nature Conservancy signed a Cooperative Mollusk Management Memorandum of Understanding (MOU) in May 2011. The MOU was signed to show agency commitment to protecting and facilitating reintroduction, augmentation, and propagation efforts in supporting state and regional facilities needed to achieve these activities. The CRAC has been a cooperative venture between the Corps, USFWS, and TWRA to promote these goals.

d. Based on information presented in paragraph a. and b. above, I recommend TVA mitigate the proposed project impact to CRAC, by performing the following:

- Relocate/rebuild the CRAC facility, in a form comparable to the existing facility, on a site capable of supporting the existing operations.

- Lease the relocation property to TWRA for a nominal fee.

- Install and provide electricity, raw water intake, potable water, and sewer to the new facility for the duration of the CRAC existence.

- Provide sufficient land to expand the CRAC project at the new location to fulfill the master conceptual plan (3-5 acres).

- Construct an effluent settling pond sized to accommodate the master plan build out.

- Connect the existing TWRA pump system to provide water from the thermal discharge canal to a relocated CRAC facility.

- Partner with TWRA for it to assume responsibility for maintenance, operation, and expansion of the relocated CRAC facility.

e. The Corps has regulatory responsibilities pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). Under Section 10, the Corps regulates any work in, or affecting, navigable waters of the U.S. Under Section 404, the Corps regulates the discharge of dredged and/or fill material into waters of the U.S., including wetlands. A review of the information provided in the EA indicates the proposed project would involve work in waters of the U.S. (streams and/or wetlands). Therefore, a Department of the Army permit would be required. The Corps is available to participate in meetings or onsite inspections for the proposed project to discuss ways to avoid or minimize the identified aquatic resource impacts.

Again, I thank you for involving the Corps in your review process. I commend TVA for taking actions to reduce air emissions from the facility but would like to see the impacts associated with the project fully accounted for. The support of TVA has been extremely important in addressing impacts resulting from water resource development in the Tennessee and Cumberland River system. The continued operation of the CRAC facility demonstrates the commitment of all agencies involved in utilizing and sustaining natural resources in the region. I would appreciate your consideration and written response to the points I raise above. Please feel free to contact me at (615) 736-7970 to informally discuss this letter. If you would like to discuss any issues regarding Section 404 and Section 10 permitting, please contact Ms. Tammy Turley of my staff at (615) 369-7515.

Sincerely,

Paul J. Day, MAJ, DDE
for
James A. DeLapp
Lieutenant Colonel
Corps of Engineers
District Engineer

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

November 27, 2012

Ms. Cynthia R. Wren
NEPA Interface
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902

Re: FWS #13-CPA-0108

Dear Ms. Wren:

This is in regard to the Draft Environmental Assessment of the Installation of Emission Control Equipment and Associated Facilities at the Gallatin Fossil Plant in Sumner County, Tennessee (Draft EA). The document assesses the potential effects of installing air pollution control equipment at the Gallatin Fossil Plant in order to meet the U.S. Environmental Protection Agency Standards. Selection of Alternative 2 (Preferred Alternative) will require the removal of the Cumberland River Aquatic Center (CRAC) to avoid land use conflicts. To date, we have received neither an official copy of the document with a formal request for our comments nor a biological assessment and request for Endangered Species Act section 7 consultation. However, Fish and Wildlife Service biologists have reviewed the Draft EA, available online, and we offer the following comments. This letter is provided in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (87 Stat. 884; 16 U.S.C. 1531 et seq.), the Migratory Bird Treaty Act of 1918 (MBTA), as amended (40 Stat. 755; 16 U.S.C. 703 et seq.), the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. § 668-668d)(BGEPA), and the National Environmental Policy Act of 1969 (42 U.S.C. § 4321-4370) (NEPA).

**NEPA and ESA ISSUES RELATED TO THE PROPOSED ACTION**

As you know, the Tennessee Wildlife Resources Agency (TWRA) operates the Cumberland River Aquatic Center, which is a critical component of the Cooperative Mollusk Management Memorandum of Understanding (MOU) signed in 2011 by TVA, the Corps of Engineers, TWRA, the Tennessee Department of Environment and Conservation (TDEC), and The Nature Conservancy for the purposes of management and recovery of many aquatic species. But for TVA's proposed action (preferred alternative), TWRA had no plans to move the CRAC facility. A November 14 letter from David McKinney to Mary Jennings states "TWRA is in the process

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of dismantling and closing the Cumberland River Aquatic Center (CRAC) at TVA Gallatin solely because we have been instructed to do so by TVA." Action Alternative 3 does not require movement of the CRAC facility.

We understand that TVA made an attempt to provide TWRA with a relocation site for the CRAC facility. We also understand that it was TWRA's original understanding that the cost of moving the CRAC facility would be included in TVA's project budget, as indicated in David McKinney's November 14 letter to Mary Jennings, which states "since the project for 'Installation of Emission Control Equipment and Associated Facilities, Gallatin Fossil Plant, Sumner County' first became an issue, TVA has consistently indicated the CRAC facility would be relocated elsewhere at the Gallatin facility and the cost of such relocation would be included in the Emissions Control project as funded by TVA." However, the November 14 letter and a November16 email from Ed Carter to Mary Jennings (TVA's Anda Ray was copied) indicates that TVA did not plan to provide financial support for the move; further, the cost for leasing and rebuilding the facility on TVA's suggested relocation site is not within TWRA's budget, and therefore is unreasonable and forces the closure of the CRAC facility.

Although the closure of CRAC would not occur but for TVA's action, the Draft EA fails to evaluate the effects of this closure. Rather, TVA appears to accept no responsibility for the effects, repeatedly trying to deflect those effects to TWRA. For example, on page 14 (section 2.1.2) of the Draft EA, you state "Relocation of hatchery operations would be the sole responsibility of TWRA and are beyond TVA's control." Additionally, Section 4.3.2 (Mitigation measures) of TVA's Draft EA states that "TVA assumes the TWRA will comply with all applicable regulations pertaining to CRAC facility removal, to avoid potential impacts to the maternity season." Without fully assessing the impact of the CRAC facility closure necessitated by the TVA proposed action, it is not possible to determine the relative impacts of each alternative, which does not seem to be in keeping with the intent of NEPA.

Given that the CRAC facility at the Gallatin plant would not be closed but for your selection of Alternative 2 as your Preferred Alternative, we believe that you should prepare a biological assessment of your action to determine whether the closure of CRAC is likely to adversely affect any of the listed mussels that will need to be moved or released prematurely. Additionally, you should evaluate whether the unexpected loss of the facility's contribution to recovery of these species represents an adverse effect to any of the species. You should also evaluate whether moving mussels from the CRAC facility will result in "take" of those mussels, keeping in mind that the definition of take is broader than just lethal effects. Take might occur as a result of death due to stress from being moved or released prematurely, as well as more subtle effects such as reduced fitness as a result of stress. Additionally, these effects will be more significant if a reasonable timeframe for moving the mussels has not been provided. Should you determine that the closure of CRAC will adversely affect the listed mussels, you should request formal consultation in the cover letter accompanying your biological assessment. Consultation must be complete prior to moving of mussels from the CRAC facility.

**OTHER ESA ISSUES RELATED TO THE PROPOSED ACTION**

Related to TVA's proposed actions at Gallatin and the subsequent closure of CRAC, but completely separate from the need for section 7 consultation directly associated with the proposed project at Gallatin, several other ESA section 7 consultations may be affected. As you are aware, in 2006 we issued a biological opinion as part of section 7 consultation between TVA and FWS on ongoing operations and maintenance activities at TVA dams in the Tennessee River Basin located in Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia; and their effects on federally listed endangered and threatened species. Included in the October 17, 2006, biological opinion was a non-discretionary Term and Condition that required TVA to " . . . cooperate with appropriate staff from the Tennessee Wildlife Resources Agency to make fish culture raceways at the Gallatin Steam Plant available for mollusk propagation activities." Although this term and condition did not explicitly identify an expected timeframe for making the Gallatin raceway available to TWRA, and TVA has made the facility available for quite some time now, we do not view TVA's commitment regarding the facility to be completed. While some of the other Terms and Conditions included in the FWS' BO (referred to by TVA as "Operations Consultation Commitments, or OCC) have a required minimum timeframe of 10 years, the expectation of most others (i.e., dam operational changes clearly beneficial to listed species) are for the life of the dam. Therefore, we believe TVA's proposed actions at Gallatin may necessitate the reinitiation of this Operations Consultation. At a minimum, TVA, TWRA, and FWS must agree upon an alternative approach to providing the function of CRAC in fulfillment of the Term and Condition from the 2006 Biological Opinion. The completion of reinitiated consultation and/or identification of an alternative approach must be complete prior to initiating project activities at Gallatin that will affect CRAC or necessitate movement of mussels.

Also affected by the proposed activities at Gallatin, and the subsequent closure of CRAC, is a section 7 consultation between the Corps of Engineers and FWS related to Wolf Creek Dam repairs. As part of the consultation, in a December 22, 2008, letter, the Corps made several environmental commitments to avoid, minimize, or compensate for potential impacts to listed species. Specifically, the Corps agreed to survey mussels in the Cumberland River for the presence of listed species and to salvage any rare or federally listed mussel populations that are adversely affected by changing water conditions associated with the draw down at Lake Cumberland. The Corps committed to move the mussels to the Gallatin facility and to provide funding to refurbish and improve the facility for mussel propagation. To date mitigation funds provided by the Corps to TWRA through FWS have totaled more than $780,000.

Other consultations affected by the proposed activities at Gallatin and the subsequent closure of CRAC include a formal consultation associated with the operational protocol developed by TWRA for use at CRAC (biological opinion dated April 8, 2009) and an informal consultation associated with Federal funding in the form of a State Wildlife Grant from the U.S. Fish and Wildlife Service was also used (2008 – 2009) by TWRA to refurbish raceways, install electricity and a back-up generator, install an air injection system, and to enclose the facility with appropriate material. At this time, TWRA developed an operational protocol for CRAC, specific to the location at TVA Gallatin Steam Plant in Sumner County, Tennessee. The protocol identifies the types of activities to be carried out at the facility. Further, it identifies those facilities to be used, including the raceways, TVA's emergency water supply lines, and so forth.

The federal funding related to the CRAC facility associated with both the Corps' and the FWS actions described above were clearly the subject of ESA section 7 consultations. Therefore, because these consultations did not consider the need to move the CRAC facility there is likely the need to reinitiate these consultations. Although the onus for these consultations would not be on TVA, the delay involved would affect TVA's proposed project timeline.

## IMPORTANCE OF CRAC TO RECOVERY OF FEDERALLY-LISTED SPECIES

Section 7(a)(2) of the Endangered Species Act pushed the agencies mentioned above to support CRAC through the consultation process. Additionally, section 7(a)(1) of the Endangered Species Act directs all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of species listed pursuant to the Act. The CRAC facility has provided a remarkable opportunity for our agencies to do the "right thing" and work together on the recovery of listed mussels. The facility has shown success beyond expectations while functioning on a small budget.

CRAC has held approximately 30 species, including the federally-endangered oyster mussel (*Epioblasma capsaeformis*), fanshell (*Cyprogenia stegaria*), pink mucket (*Lampsilis abrupta*), snuffbox (*Epioblasma triquetra*), orangefoot pimpleback (*Plethobasus cooperianus*), rough pigtoe (*Pleurobema plenum*), birdwing pearlymussel (*Lemiox rimosus*), dromedary pearlymussel (*Dromus dromas*), and Cumberlandian combshell (*Epioblasma brevidens*); as well as the candidate rabbitsfoot (*Quadrula c. cylindrica*). This represents 24% of the 41 listed aquatic mussels and snails in Tennessee. CRAC has held approximately 25% of the state's mussel diversity (approximately 130 species are historically known from Tennessee, with 14 species now extinct).

Recovery plans for all of the listed species mentioned above (except the recently-listed snuffbox, which does not yet have a plan) identify public education as important recovery components with TVA, TDEC, and TWRA identified as appropriate partners in the recovery efforts, although efforts have been limited to date. Additionally, the recovery plans for all of the above listed species (except snuffbox) identify establishing new populations through translocation or propagation and reintroduction as important recovery components, with TVA, TDEC, and TWRA identified as appropriate partners in the recovery efforts. TWRA's efforts at CRAC are significant in moving all of us toward meeting the outreach and propagation goals in the recovery plans.

Additionally, the importance of CRAC in contributing to the recovery of these and several other listed mussels is further elevated because of the facility's great success in propagation of listed mussels. For example, in 2012, CRAC produced approximately 18,000 listed mussels, with survival to 11 weeks of approximately 60%. The average survival to 11 weeks at most mussel propagation facilities is approximately 1%. Juvenile pink muckets being grown at CRAC showed less than 2% mortality and excellent growth rates. No other facility has shown this level of success with pink muckets.

Another recovery need for listed species is the need to produce individuals for release into Non-essential Experimental Population areas in the French Broad and Holston rivers (Douglas and Cherokee Dam tailwaters), and the Tennessee River mainstem (Wilson Dam tailwater in Alabama). TWRA and Alabama Department of Conservation and Natural Resources (ALDCNR) cooperate frequently on recovery projects including propagation and reintroduction.

With successful propagation/growth, CRAC could contribute to recovery of the oyster mussel by participating in reintroduction into (presently) unoccupied Designated Critical Habitat in Bear Creek system as part of the TVA OCC commitments. While TWRA and ALDCNR cooperate frequently on recovery projects including propagation and reintroduction, TWRA (with a designee on the Working Committee to oversee this project) has a very important stake in the success of this effort.

Because of its situation on the Cumberland River mainstem, the CRAC facility is uniquely appropriate to hold rescued individuals of several large-river mussel species resulting from "rescue" of individuals resulting from mussel surveys required for NEPA and ESA compliance for commercial or industrial development, or TVA or COE permitting, or TVA or COE routine maintenance projects.

Additionally, because of its situation on the Cumberland River mainstem, the CRAC facility is uniquely appropriate to investigate the feasibility of propagation of several of these large-river mussel species. As discussed previously with Brenda Brickhouse and other TVA staff, these efforts would likely include cooperation between existing facilities developing techniques (VA, KY, AL, NC, MS, Tennessee Tech, etc.). Species could include the following listed species that occur in TN: sheepnose (*Plethobasus cyphyus*), dromedary pearlymussel (*Dromus dromas*), ring pink (*Obovaria retusa*), cracking pearlymussel (*Hemistena lata*), spectaclecase (*Cumberlandia monodonta*), white wartyback (*Plethobasus cicatricosus*), clubshell (*Pleurobema clava*), catspaw (*Epioblasma obliquata*), littlewing pearlymussel (*Pegias fabula*), pink mucket, fanshell, orange-foot pimpleback, and rough pigtoe.

CRAC could also play an important role in the potential outcome of listing decisions for several other petitioned species that will be addressed by the Service, including 16 additional mussel species found in Tennessee, hellbender, spiny riversnail, and several crayfish species. The list of species in Tennessee on the 2010 Center for Biological Diversity petition includes 20 fishes, 16 mussels (not already addressed by the Service), 8 freshwater snails, 5 salamanders, and 11 crayfishes. Many, if not all of these aquatic species are considered by TWRA as species of Greatest Conservation Need.

Conservation Fisheries, Inc., under contract to TWRA supports recovery efforts by developing captive propagation techniques and produces individuals used for reintroduction for many of TN's (and also adjacent states) listed fishes. However, similar to cooperative efforts between KY, VA, AL mussel propagation facilities and CRAC (with these other facilities developing propagation and rearing techniques or producing large numbers of progeny that need grow-out before release into the wild), a likely future scenario could include CRAC receiving juvenile fishes from CFI and rearing them for release at appropriate sizes. There are presently 21 federally-listed fishes in Tennessee.

Additionally, CRAC has provided opportunities for important research. In the past 15 years, much has been learned about the effects of high discharge on mussel recruitment and behavior. In contrast, the effects of low flow on mussels are poorly understood. Currently, there is no protocol for determining instream flow requirements of freshwater mussels. The long-term studies in flow-through raceways at CRAC are an integral part of a larger ongoing study that incorporates two additional components; short-term flume studies at Tennessee Technological University and field measurements and experimental manipulation of mussel distributions, and hydraulic modeling in the Duck River. Effective and scientifically defensible environmental water allocations require specific information on the effects of incremental reductions in flow below normal low flow conditions. The ongoing study at CRAC has provided an initial understanding of the effects of flow on the growth, fertilization, fecundity, and fitness of freshwater mussels. Due to the nature of the facility, flow through river water, it has allowed near in-situ conditions to conduct novel research that would not be possible at other facilities.

As a result of this study, the expected contribution to policy and management decision support will be quantification of how various degrees of flow reductions affect mussels. Additionally, the ability to define sublethal and lethal effects at various levels of flow will allow resource agencies to predict possible effects of any proposed flow reduction, and to prescribe water allocations for endangered mussels based on scientifically defensible data. he protocols developed for this research will have broad application to similar rivers throughout the southeastern United States.

To summarize, we believe TVA should more fully evaluate the impacts of this project, including those impacts resulting from closure of the CRAC facility. The closing of CRAC would not happen but for the selection of Alternative 2 to implement this project. CRAC closure likely results in adverse effects to listed mussels. In view of this, we believe that the requirements of section 7 of the Endangered Species Act have not been fulfilled for those activities described in the Draft EA. We recommend TVA either select an alternative that would not necessitate the removal of the CRAC or provide appropriate mitigation which would include providing a replacement facility comparable to the current facility (complete with sufficient land, appropriate infrastructure, and appropriate water source). Otherwise, we believe formal consultation under section 7 of the Endangered Species Act is appropriate to identify anticipated take of listed mussels that will likely occur and to ensure the proposed action does not jeopardize the continued existence of listed mussels being cared for at the CRAC facility. Additionally, we encourage you to evaluate how your proposed action affects ESA section 7 compliance for other agencies utilizing CRAC.

Thank you for the opportunity to comment on this project. If you have any questions, please contact me at 931/528-6481, ext. 203.

Sincerely,

Mary E. Jennings

Mary E. Jennings
Field Supervisor

xc: Ed Carter, TWRA, Nashville, TN
David McKinney, TWRA, Nashville, TN
Colonel James A. DeLapp, USACE, Nashville, TN
Brenda Brickhouse, TVA, Knoxville, TN

**From:** Michelle B. Walker
**To:** Wren, Cynthia R;
**Subject:** TVA Environmental Assessment- Gallatin Fossil Plant- Installation of Emission Control Equipment and Associated Facilities
**Date:** Thursday, November 08, 2012 12:59:21 PM
**Attachments:** image001.png

Cynthia,

My name is Michelle Walker and I serve as the Policy Director for the Tennessee Department of Environment and Conservation. We have received copies of the TVA Draft EA referenced above. TVA is requesting comment by November 16th, but in reviewing the EA, I see that the EA tiers from a 2011 EIS for TVA's IRP and incorporates by reference various other environmental documents. In order to provide TDEC staff adequate time to review the Draft EA, along with any other document they may need to reference for their review, I would like to request an extension to TDEC's review period beyond November 16th. Given the upcoming holiday, I would like to extend the deadline for TDEC to comment to November 30th. Would this be acceptable? Also, I did not see the 2011 EIS or the other documents incorporated by reference on the Environmental Review website. Could you provide a link to those documents?

Thanks,

**Michelle B. Walker**
Director, Office of Policy and Planning
Tennessee Department of Environment and Conservation
401 Church Street, 1st Floor L&C Annex
Nashville, TN 37243
Office: (615) 532-9668
Cell: (615) 426-9250
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Michelle.B.Walker@tn.gov

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0435

ROBERT J. MARTINEAU, JR.
COMMISSIONER

BILL HASLAM
GOVERNOR

November 30, 2012

**Via First Class Mail and Electronic Mail to crwren@tva.gov**

Cynthia R. Wren
NEPA Interface
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee 37402

Ms. Wren:

Please find enclosed the Tennessee Department of Environment and Conservation's (TDEC) comments on the Tennessee Valley Authority's (TVA) Draft Environmental Assessment (DEA) for proposed installation and operation of emission controls at Gallatin Fossil plant (GAF), located near the city of Gallatin in Sumner County, Tennessee, in order to comply with U.S. Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATs) rule and the executed Federal Facilities Compliance Agreement between TVA and EPA. TVA proposes to install and operate, as necessary, the following at GAF:

- Dry flue gas desulfurization (dry FGD) system or "dry scrubber" to reduce sulfur dioxide ($SO_2$) emissions;
- SCR technology to reduce nitrogen oxide ($NO_X$) emissions;
- Activated carbon injection (ACI) system integrated with the dry FGD to reduce mercury emissions; and
- Pulse jet fabric filter (baghouses or PJFF) to control particulate matter (PM) emissions.

Additional facilities required to support TVA's proposed action include a new on-site dry coal combustion product landfill; electrical transmission lines, transformer yard, and switchyard upgrades; and ancillary facilities such as on-site haul roads. TVA's plans for closure of surface impoundments to support wet-to-dry conversion plans specific to GAF are not included in the scope of EA.

If TVA's preferred alternative (Alternative 2) for the proposed project is selected and implemented, the Cumberland River Aquatic Center (Center), operated by the Tennessee

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Wildlife Resources Agency (TWRA), hatchery must be removed from its current location to avoid land use conflicts. The DEA states, "[a]s TVA does not control the . . . [Center] hatchery operations, activities to be implemented by TWRA related to removing and potentially relocating the structures to a new site to allow for continued operations would be the sole responsibility of the TWRA. Therefore, TWRA's plans for . . . [Center] relocation are speculative and are not included in the scope of this EA. TVA assumes all applicable requirements would be adhered to by the TWRA, assuring species are protected and impacts are avoided."

TDEC appreciates TVA taking steps necessary to improve the function of GAF and anticipates the proposed project will result in improvements to air quality in Tennessee. TDEC has the following specific comments on the DEA:

TDEC's Division of Air Pollution Control has reviewed the DEA and recognizes the proposed project to add additional air pollution control equipment at GAF will have positive impacts to air quality. The facility is under a federal compliance agreement to reduce its air pollution emissions and a number of federal programs - notably the MATs - will also mandate emission reductions. GAF is currently operated with low $NO_x$ burners; however, the proposed project will add post combustion SCR technology to further reduce $NO_x$ emissions, which will assist with attaining the National Ambient Air Quality Standard for ozone.

The additional controls proposed will address $SO_2$, mercury and particulate matter emissions and the Division supports these additional controls as EPA is looking at making standards for these pollutants more stringent; therefore the emissions reductions will have a positive impact on air quality and may be needed for compliance with future federal regulation. The Division appreciates TVA's work toward the construction and implementation of air pollution control equipment at GAF given its preferred choice for continued operation of the coal-fired units at the existing facility beyond 2017.

TDEC's Division of Water Resources has reviewed the DEA. The Division appreciates TVA's utilization of a dry FGD system in order to minimize the cross-media transfer of pollutants from air to surface waters. The DEA recognizes the appropriate water permits and/or permit revisions that may be necessary, including the fact that the individual National Pollutant Discharge Elimination System (NPDES) permit for GAF may require modifications to address any significant changes to effluent characteristics due to the proposed project. The DEA should also recognize that the proposed project may require modifications to recent TVA submittals required by NPDES permit conditions for the following:

- Emergency Response Plan – to incorporate additional risk due to installation and operation of liquid ammonia storage tanks;
- Ash Pond Closure Plan – to address onsite construction and operation of additional storage of gypsum wastes;
- Best Management Practices Plan – to address changes to operations affecting discharge of metals in effluents; and/or
- Dry ash conversion – quarterly updates of project planning, construction, and completion must be submitted with Discharge Monitoring Reports.

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The DEA notes that TVA's plans for closure of surface impoundments to support wet-to-dry conversion plans specific to GAF are not included in the scope of EA and the installation and operation of any future wastewater treatment facilities to manage plant wastewaters remaining after the dry ash conversion is likewise not addressed in the DEA. Because these projects also have associated impacts that may be reasonably foreseeable at GAF, TVA should consider the discussion of these potential near-term projects in its identification, analysis and discussion of cumulative impacts. The DEA also identifies minimal, if any, changes to thermal discharges by the proposed project. As TVA is aware, the current NPDES permit requires a renewed evaluation of thermal effects using ongoing biological studies from approximately 2011 to 2013. TDEC will closely examine this data to evaluate plant operations during periods of critical thermal conditions. Finally, the project, as proposed, does not pose a significant impact on programs regulated under the Ground Water Management Section, the Safe Dams Program or the Water Well Program.

TDEC's Tennessee Natural Heritage Program has reviewed the DEA and, based on the location of activities specified, does not anticipate any direct impacts to any rare, threatened, or endangered species noted in the area of GAF. We are, however, concerned with the fate of the Center noted above, which is currently operated by TWRA, with the support of the TVA, the U.S. Army Corps of Engineers (ACOE), the U.S. Fish and Wildlife Service (USFWS) and other partners. Although the DEA notes that TVA does not control the Center's hatchery operations and activities to be implemented by TWRA related to removing and potentially relocating the structures to a new site to allow for continued operations would be the sole responsibility of the TWRA, the Center's facility currently resides at GAF and TVA's decision to implement its preferred alternative (Alternative 2), will directly impact that facility by requiring its removal and potentially its discontinued existence if TWRA cannot relocate the facility. The DEA does not include any assessment or analysis of impacts associated with this result.

TDEC and TVA, along with other state and federal partners, signed a Memorandum of Understanding (MOU) for a Cooperative Mollusk Management Strategy in 2010-2011 and the MOU parties agreed to "facilitate responsible and coordinated reintroduction, augmentation and propagation efforts and support the state and regional facilities needed to achieve these activities." TDEC notes the following accomplishments of TWRA and the Center over its four-year life:

- 4,000 federally endangered, juvenile pink mucket mussels were received from the state wildlife resources agency in Virginia to raise in order to determine growth rates at the facility. Results were: less than 2% mortality and growth rates have been very good. Currently no other facility has been as successful in raising this species.
- Live mussels were moved into the facility from all over the state until they could be relocated to more suitable habitat. Mussels were retrieved from the Clinch, Duck, Tennessee, and Cumberland Rivers. Currently 12 different federally listed species and 41 other species are held in the facility.
- Rare state-listed fishes being housed and grown at the Center include the lake sturgeon and alligator gar. Lake sturgeon reintroduction has been extremely successful, and large

sturgeon from the Center are caught weekly as far upstream as Wolf Creek Dam tailwaters.

- The federally endangered Nashville Crayfish was held at the facility during a pollution investigation. All individuals were kept alive and returned to the Mill Creek watershed.
- In 2012, the facility successfully propagated 18,000 Federally Endangered pink mucket mussels. Survival has been extremely high, in that at last count 60 percent of the 18,000 were alive as compared to an average of 1 percent at all other facilities known.
- More than 7500 people from a myriad of user groups have been directly educated at the facility and countless individuals have been made aware of the facility through the media. Public education is a key component of the recovery plans of numerous federally listed species.
- The Center has served as an important holding facility for listed species during critical management episodes such as industrial spills or necessary relocations from development sites along rivers in both the Cumberland and Tennessee systems.
- The Center has held approximately 30 species, including at least ten federally endangered mussels representing 24 percent of the 41 federally-listed aquatic mussels and snails in Tennessee. There are historically about 130 mussel species known from TN (14 now extinct), so the 30 species the Center has held is a very high proportion of the state's mussel diversity (25 percent).

The detailed successes above and many others indicate the Center's positive and supportive impact on protected species. The Center serves a critical role in the recovery of freshwater mussels, fish and snails in the Tennessee and Cumberland River systems. Propagation and reintroduction activities are identified in many Federal Recovery Plans for listed species. Since its inception, the Center has shown more rapid success growing mussels and fish than larger facilities in Kentucky and Alabama. Direct access to a sustainable, consistent source of river water for the propagation and holding tanks has been identified as a key to this success. We believe these impressive results will more rapidly advance restoration of mussel populations in Tennessee.

Because the relocation of the Center would be required if TVA chooses to implement its preferred alternative (Alternative 2) and other identified alternatives (e.g., Alternative 3) would not require relocation of the Center, we believe the DEA should identify and discuss any impacts associated with the relocation should Alternative 2 be chosen. To overlook the potential for impact to the continued restoration and recovery of protected species that could result from the removal of the Center would negatively affect the DEA's impacts' analysis and constrain the analysis of alternatives. Also, it may be appropriate to also include discussion of potential mitigation options TVA would consider should the preferred alternative be chosen and the Center removal and relocation become necessary.

TDEC appreciates TVA's support of the Center and hopes that the Center will have the opportunity to continue its important work at GAF or at an alternative location.

TDEC appreciates the opportunity to comment on the DEA. Please contact me should you have any questions regarding these comments.

Sincerely,

Michelle B. Walker
Director, Office of Policy and Planning
Phone: (615) 532-9668

cc: Mary Parkman, TDEC, Office of General Counsel
Regan McGahen, TDEC, Division of Water Resources
Scotty D. Sorrells, TDEC, Division of Water Resources
Barry Stephens, TDEC, Division of Air Pollution Control
David Withers, TDEC, Tennessee Natural Heritage Program

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GREATER NASHVILLE REGIONAL COUNCIL
a regional planning and economic development agency serving 13 counties and 53 cities

November 14, 2012

Charles P. Nicholson, Senior Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 379021499

Re: TVA Environmental Assessment
GNRC #2013-15

Dear Mr. Nicholson:

In accordance with the Project Review Process (approved by the Executive Committee at the April 1995 Executive Board Meeting), the Greater Nashville Regional Council has reviewed the above referenced project.

Our evaluation reveals no conflict with existing or proposed planning activities. We are notifying you that your proposal is deemed acceptable on the basis of information now available to this office, and received approval by the Executive Committee at our GNRC Executive Committee Meeting on November 14, 2012.

We may wish to comment further at a later time. This letter should be attached to your application. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,

Sam H Edwards

Sam H. Edwards
Executive Director

SHE/pyc

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E-MAIL gnrc@gnrc.org WEB www.gnrc.org SAM H. EDWARDS, EXECUTIVE DIRECTOR