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BULL RUN FOSSIL PLANT LANDFILL DRAFT ENVIRONMENTAL IMPACT STATEMENT

Anderson County, Tennessee

Prepared by:
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COVER SHEET

Bull Run Fossil Plant Landfill

Proposed action:	The Tennessee Valley Authority (TVA) has prepared this Environmental Impact Statement (EIS) to assess the impacts and address environmental, safety, and socioeconomic concerns associated with the continued disposal of Coal Combustion Residuals (CCR) from the Bull Run Fossil Plant (BRF). TVA will decide which of two alternative CCR storage options will be used to manage CCR produced at BRF.
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Comments due date:	Comments may be submitted online https://www.tva.gov/Disposal-of-Coal-Combustion-Residuals-from-the-Bull-Run-Fossil-Plant or sent to Ms. Masters at the above address. Comments must be submitted by July 12, 2016.

Abstract:

TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems. In addition to a No-Action alternative which served as a baseline, TVA considered construction of a landfill on TVA property adjacent to BRF and off-site transport of CCR to an existing permitted landfill as potential alternatives for disposal of CCR generated at BRF.

Both of the action alternatives would meet the purpose and need of the project. Construction of an onsite landfill would result in minor temporary short term impacts during construction and minor long term impacts to aquatic resources, loss of bat habitat and impacts to 2.1 acres of wetland. In addition, the landfill would have a visual impact on surrounding receptors. All of these impacts would be mitigated to reduce adverse effects. Impacts associated with off-site transport of CCR are primarily related to air, noise, dust, transportation, safety and potential Environmental Justice Impacts associated with transportation of CCR on public roadways.

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Executive Summary

This Environmental Impact Statement (EIS) addresses the continued disposal of Coal Combustion Residuals (CCR) from the Bull Run Fossil Plant (BRF). BRF is located in Anderson County, Tennessee, about 5 mi east of downtown Oak Ridge and 13 mi west of Knoxville.

BRF was built between 1962 and 1966, and commercial operation began in June 1967. BRF is the only single-generator coal-fired power plant in the TVA system and has a summer net capability of 863 megawatts. Winter net-dependable generating capacity is about 881 megawatts. BRF generates over 6 billion kilowatt-hours of electric power in a typical year, which is enough electrical energy to meet the needs of approximately 430,000 homes. BRF has state-of-the-art air pollution controls and is one of the coal plants that TVA plans to continue operating in the future. When at full operating capacity, BRF produces approximately 560,000 yd^3 of CCR a year, which means TVA would require approximately 11 million yd^3 of disposal capacity to accommodate 20 years of CCR generation.

Historically, TVA has managed storage of CCR materials in ash impoundments or dry landfills. In an effort to modernize the facility and comply with TVA's commitment to manage CCRs on a dry basis, TVA completed the construction of a mechanical dewatering facility at BRF in 2014 to manage bottom ash and gypsum using a dry stack basis. These materials are disposed on-site at the current Dry Fly Ash Stack located east of the plant.

The current on-site storage capacity of approximately 1.2 million yd^3 will be expended within 10 years. TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems.

Alternatives Considered

In 2011, TVA performed a siting study to evaluate on-site and off-site alternatives for the construction of a landfill for storage of CCR from BRF. Subsequent to the identification of the eight alternative landfill sites carried forward from the prior siting study, TVA also identified the off-site transport of CCR to an existing landfill as a potential alternative for management of CCR generated at BRF. The Chestnut Ridge Landfill is the nearest Resource Conservation and Recovery Act (RCRA) Subtitle D landfill to BRF; therefore, this location was added to represent this alternative. The impact of development and/or use of each of these sites were further evaluated against 34 environmental and engineering factors to determine those sites that should be carried over for further analysis in the EIS.

Alternatives Evaluated in the EIS

In addition to a No-Action alternative which served as a baseline, TVA considered construction of a landfill on property adjacent to BRF and off-site transport of CCR to an existing permitted landfill as potential alternatives for disposal of CCR generated at BRF.

Under Alternative B, TVA would construct and operate a landfill for disposal of CCRs generated at the plant on TVA-owned property located approximately 0.4 mi east of BRF. This site, known as Site J, encompasses 119.9 ac and includes perimeter roads, borrow stockpile and laydown areas and sediment ponds with the landfill footprint of approximately 60 ac. The landfill would provide approximately 15.5 years of disposal capacity based on current estimated consumption rates and would be designed to meet the CCR rule

requirements for new landfill development. Development of Site J would also include construction of a dedicated on-site haul road to convey dry CCR from the plant to the landfill.

Under Alternative C, CCR from BRF would be transported to an existing off-site permitted landfill. The analysis of impacts associated with this alternative are based on the closest landfill that can currently accept CCR material. The Chestnut Ridge Landfill is a Class 1 Municipal Solid Waste Facility located approximately 12 mi northeast of BRF. Under this Alternative, CCR generated at BRF would be transported by over-the-road tandem dump trucks on existing roadways to the Chestnut Ridge Landfill for disposal. While barge and rail transport were considered in the Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure at BRF and the proximity of Chestnut Ridge to BRF.

Public and Agency Involvement

TVA's 33-day scoping period was initiated on May 21, 2015, with the publication in the Federal Register of the Notice of Intent (NOI). The NOI announced that TVA planned to prepare an EIS to address the storage of CCR generated at BRF. In addition to the NOI in the Federal Register, TVA published notices regarding this effort in regional and local newspapers; issued a news release to media; posted the news release on the TVA Web site; and posted flyers and signs near the alternative landfill site to solicit public input.

To initiate scoping, TVA also sent copies of the NOI to the Tennessee Department of Environmental and Conservation (TDEC) and the United States Department of Interior. TVA received six responses on the NOI and one comment form that was submitted by several interested parties. The predominant theme of the comments were related to potential visual, groundwate and cumulative impacts in the EIS. All comments received during the scoping period were considered in determining the alternatives and scope of the analysis.

TVA released the Draft EIS to the public on May 13, 2016. TVA's public and agency involvement for this Draft EIS included a public notice and a 45 day public review of the Draft EIS document. To solicit public input, the availability of the Draft EIS was announced in regional and local newspapers and a news release was issued to the media and posted to TVA's Web site. The Draft EIS document was posted on TVA's Web site and hard copies were available by request. TVA's agency involvement included sending letters to local, state and federal agencies and federally recognized tribes to notify them of the availability of the Draft EIS.

Summary of Alternative Impacts

The EIS presents a summary of the impacts of each of the alternatives carried forward for detailed analysis. The environmental impacts of Alternatives A, B and C are summarized in Table 2-5.

Table ES-1. Comparison of Impacts of Each Alternative by Resource Area

Alternative A – No Action	Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)	Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)
Air Quality		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in emissions.	Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles.	Localized impact due to emissions from increased vehicles used to transport and manage CCR.
Climate Change		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in GHG emissions.	Minor GHG emissions associated with onsite construction equipment. No discernable effect on regional GHG levels.	No impact associated with construction, however due to increased vehicle miles travelled and use of public roadways, GHG emissions would be higher than Alternative B.
Land Use		
No impact.	Minor impact resulting from the conversion of undeveloped land to an industrial facility.	No impact.
Prime Farmland		
No impact.	No impact	No impact.
Geology and Seismology		
No impact.	Minimal impact. Potential seismic risk mitigated with proper design.	No impact.
Groundwater		
No impact.	Minimal impact due to incorporation of low permeability synthetic liner and leachate collection system. Runoff would be controlled with appropriate BMPs.	No impact.
Surface Water		
No impact.	Minor temporary impacts due to runoff during construction. Direct permanent impacts to the upper reach of Worthington Branch. Mitigated as a result of adherence to permit requirements.	No impact.
Floodplains		
No impact.	No impact.	No impact.
Vegetation		
No impact.	Minor impact resulting from the disturbance of a previously disturbed area that lacks notable plant communities.	No impact.
Wildlife		
No impact.	Minor impact due to loss of previously disturbed habitat.	No impact
Aquatic Ecology		
No impact.	Permanent impact to Worthington Branch and aquatic resources due to stream realignment and culverts. However, impacts would be mitigated when the realigned stream channel reestablishes flow regime and habitat.	No impact.
Threatened and Endangered Species		
No impact.	Minor impact as a result of the loss of bat foraging and roosting habitat. Impact would be mitigated in accordance with TDEC requirements.	No impact.
Wetlands		
No impact.	Direct impact to 2.1 ac of wetland. However these impacts would be mitigated as required by both state and federal agencies.	No impact.
Solid and Hazardous Waste		

Table ES-1. Comparison of Impacts of Each Alternative by Resource Area

Alternative A – No Action	Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)	Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in solid waste produced at BRF.	Minor increase in solid waste generated during construction. Long-term impact associated with the management of solid wastes produced at BRF at Site J as CCR would be disposed n a new landfill.	Long-term impact to the capacity of an existing landfill which limits long-term ability to meet other disposal needs in the region.
Socioeconomic Resources		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in significant adverse effects on local employment and economic measures.	Minor short term increases in employment and, payroll during construction resulting in beneficial direct and indirect economic impacts. Negligible long-term beneficial economic impacts. Minor impact to the access to Valley View Church and Church of Christ during construction due to construction related traffic.	Negligible impact due to anticipated minimal employment increase.
Environmental Justice		
No impact.	Minor to moderate indirect impact to potential EJ community due to increased noise, dust and traffic during construction. Landfill would present a visual impact during operation, mitigated by a vegetated buffer. No impact associated with haul of CCR to the landfill.	Moderate impact to potential EJ community due to additional traffic noise and dust associated with transport of CCR. However, this impact would not be disproportionate.
Natural Areas, Parks and Recreation		
No impact.	Minor indirect impact during construction due to increased vehicles on surrounding roadways. No impact during operation.	Moderate indirect impact to facilities along the haul road during operation.
Transportation		
No impact.	Minor short term impact during construction of haul road. No impact during operation.	Moderate impact related to increased traffic and potential increase in crash rates during operation.
Visual Analysis		
No impact.	Landfill would represent a notable change to the existing visual integrity, but there would be minimal change in the overall scenic value.	No impact.
Cultural and Historic Resources		
No impact.	No impact.	No impact.
Noise		
No impact.	Minor impact.	Moderate impact.
Public Health and Safety		
No impact	Worker and public health and safety during construction and operation would be maintained and any impact would be minor.	Increased traffic would increase the potential risk of injuries and fatalities associated with truck crashes.
Cumulative Effects		
No impact.	Minimal impact to overall scenic value.	Minor to moderate impact to transportation.

Preferred Alternative

TVA has identified Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J) as the preferred alternative for managing the storage of CCR at BRF. Alternative B would achieve the purpose and need of the project with minimal environmental impact. In addition, Alternative B avoids off-site transport of CCR and therefore minimizes impacts of disposal of CCRs to the surrounding community.

Mitigation Measures

The reduction of environmental impacts was an important goal in TVA's process for analyzing methods to store CCR generated at BRF. Mitigation measures designed to minimize or reduce adverse impacts associated with management of CCRs from BRF were identified. These measures include:

- Given the occurrence of potentially suitable roosting habitat for some endangered bat species, all tree clearing would be limited to those times of the year when bats are not expected to be roosting in the area (October 1 thru March 31).
- TVA has coordinated with Tennessee Department of Environmental Conservation (TDEC) and U.S. Army Corps of Engineers (USACE) and has proposed mitigation for those areas impacted by relocation and/or encroachment of Worthington Branch through payment to an appropriate stream bank and/or restoration on-site.
- An ARAP/401/404 permit will be required for disturbance to wetlands.
- Due to the loss of potentially suitable foraging and roosting habitat for endangered bat species, Section 7 consultation with U.S. Fish and Wildlife (USFWS) will be required.
- TVA would maintain the plantings along the portion of Site J adjacent to Old Edgemoor Road to continue to provide a vegetative screen.

In addition, TVA has identified the following Best Management Practices (BMPs) that would be employed to minimize impacts:

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other appropriate BMPs (CAA Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences) would reduce the potential for erosion of soil minimizing the potential for impact to surface waters during construction.
- Consistent with EO 13112, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs would be used during construction activities to minimize and restore areas disturbed during construction.
- TVA would implement operational mitigations to reduce potential surface water impacts from CCR operations, such as requiring that no more than 10 ac of ash be exposed at any one time.
- A Storm water Pollution Prevention Plan will be created to limit the size of the disturbed areas and to divert storm water runoff away from construction areas into existing ponds.
- Construction debris and excess materials will be disposed of properly.
- Proper spill prevention measures will be taken to reduce the potential for spills of fuel//lube/insulation oil.
- Subcontractor and prime contractor employees would require Occupational Safety and Health Administration (OSHA) 1910.120 training.

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SYMBOLS, ACRONYMS AND ABBREVIATIONS

AADT	Average Annual Daily Traffic
APE	Area of Potential Effect
ARAP	Aquatic Resources Alteration Permit
BMP	Best Management Practice
BRF	Bull Run Fossil Plant
CAA	Clean Air Act
Cc	Conasauga Group
CCR	Coal Combustion Residuals
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
CO_2	Carbon Dioxide
CO_3	Carbonate
CRM	Clinch River Mile
CWA	Clean Water Act
dB	Decibel
dBA	A-Weighted Decibel
DO	Dissolved Oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
ETSZ	East Tennessee Seismic Zone
FGD	Flue Gas Desulfurization
ft msl	Feet Above Mean Sea Level
g	Gravitational Pull
GHG	greenhouse gases
GIS	Geographic Information System
HPA	Habitat Protection Area
Hz	Hertz
HUD	U.S. Department of Housing and Urban Development
Ldn	Day-Night Sound Level
Leq	Equivalent Sound Level
LOS	Level of Service
MGD	Million Gallons per Day
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMGT	Listed in Need of Management
NMSZ	New Madrid Seismic Zone
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PGA	Peak Ground Acceleration
$PM_{2.5}$	Particulate matter whose particles are less than or equal to 10 micrometers
PM_{10}	Particulate matter whose particles are less than or equal to 10 micrometers (PM10)

RCRA	Resource Conservation and Recovery Act
SASZ	Southern Appalachia Seismic Zone
SCSZ	South Carolina Seismic Zone
SHPO	State Historic Preservation Officer
SO_2	Sulfur Dioxide
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
TMDL	Total Maximum Daily Load
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USC	United Stated Code
USCB	U.S. Census Bureau
USGS	U.S. Geological Survey
VOC	Volatile Organic Compounds
WOUS	Waters of the United States

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

The Bull Run Fossil Plant (BRF) is located in Anderson County, Tennessee, about 5 mi east of downtown Oak Ridge and 13 mi west of Knoxville (Figure 1-1). BRF is operated by Tennessee Valley Authority (TVA) and is located on a 750-ac reservation on the east side of Melton Hill Reservoir at Clinch River Mile (CRM) 48. The plant adjoins Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) between U.S. Highway 25 (Clinton Highway) and SR 162 (Pellissippi Parkway). Most nearby lands (southwest) are U.S. Department of Energy reservation properties for that agency's Oak Ridge facilities. Most surrounding lands are developed for residential and rural residential land uses.

BRF was built between 1962 and 1966, and commercial operation began in June 1967. BRF is the only single-generator coal-fired power plant in the TVA system and has a summer net capability of 863 megawatts. Winter net-dependable generating capacity is about 881 megawatts. BRF generates over 6 billion kilowatt-hours of electric power in a typical year, which is enough electrical energy to meet the needs of approximately 430,000 homes.

When operating at full capacity, BRF produces approximately 240,000 yd^3 per year of ash (bottom and fly ash) and 318,000 yd^3 per year of gypsum for a total of approximately 560,000 yd^3 of coal combustion residuals (CCR) per year. Historically, TVA has managed storage of CCR materials in ash impoundments or dry landfills. In an effort to modernize the facility and comply with TVA's commitment to manage CCRs on a dry basis, TVA completed the construction of a mechanical dewatering facility at BRF in 2014 to manage bottom ash and gypsum using a dry stack basis (TVA 2012). These materials are disposed on-site at the current Dry Fly Ash Stack located east of the plant (see Figure 1-1). TVA had already been handling and storing fly ash on a dry basis, so there were no changes to that process as a result of the transfer to dry storage.

1.2 Purpose and Need

BRF has state-of-the-art air pollution controls and is one of the coal plants that TVA plans to continue operating in the future (TVA 2015c). When at full operating capacity, BRF produces approximately 560,000 yd^3 of CCR a year, which means TVA would require approximately 11 million yd^3 of disposal capacity to accommodate 20 years of CCR generation. The current on-site storage capacity of approximately 1.2 million yd^3 will be expended within 10 years. TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash and gypsum) produced at BRF. Additional storage capacity would also enable TVA to continue operations at BRF as planned and would be consistent with TVA's voluntary commitment to convert wet CCR management systems to dry systems.

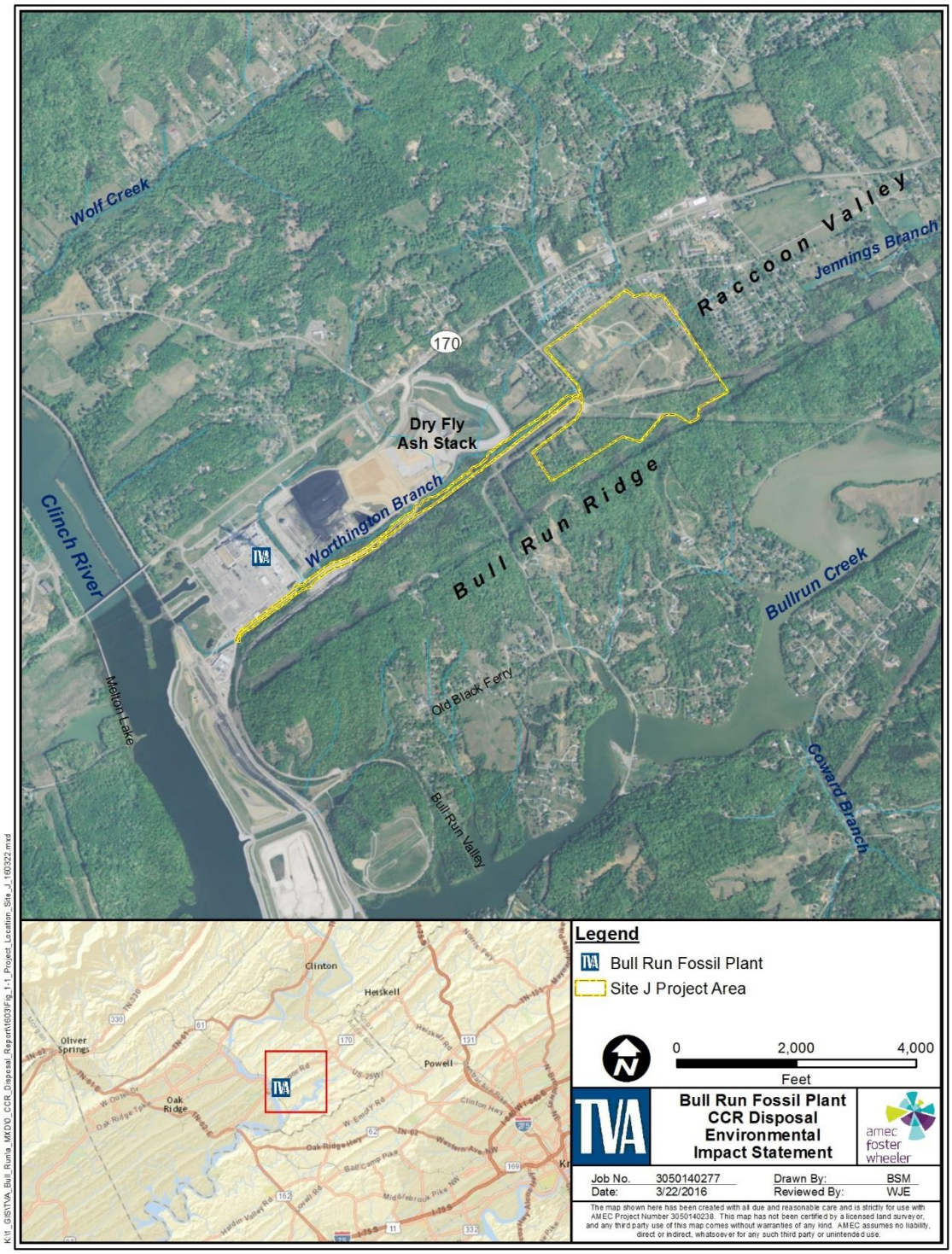

Figure 1-1. Location of Bull Run Fossil Plant and the Proposed Landfill Site Study Area

1.3 Decision to be Made

In 2009, TVA outlined a plan to eliminate wet storage of CCR at all coal-combustion power plants. Given the current limited capacity for dry storage of CCR at BRF, TVA needs to identify additional capacity for the long-term management of dry CCR materials produced at BRF. Specifically, TVA needs to decide whether to provide on-site storage capacity through the construction of a CCR landfill or to transport CCR off-site to an existing permitted facility. After identifying reasonable alternatives to address this need, TVA must decide whether the alternatives would cause significant impacts to the environment and which alternative is the preferred alternative for the agency. TVA's decision will consider factors such as environmental impacts, economic issues, availability of resources and TVA's long-term goals. This Environmental Impact Statement (EIS) is prepared to support the decision making process.

1.4 Related Environmental Reviews and Consultation Requirements

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

- *Ash Impoundment Closure Environmental Impact Statement* (TVA 2016). The EIS was prepared to address the closure of CCR impoundments at all of TVA's coal-fired power plants. The report consists of two parts: Part I – Programmatic National Environmental Policy Act (NEPA) Review and Part II – Site-Specific NEPA Review. In Part I, TVA programmatically considered environmental effects of closure of ash impoundments using two primary closure methods: (1) Closure-in-Place and (2) Closure-by-Removal. Conclusions reached from the programmatic analysis are generally applicable to any CCR ash impoundment in the TVA system. Part II is an integrated analysis of ten site-specific ash impoundment closures including the ash impoundments at BRF.
- *Integrated Resource Plan, 2015 Final Report* (TVA 2015c). This plan provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. This document and the associated Supplemental Environmental Impact Statement evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future power demand economically while supporting TVA's equally important mandates for environmental stewardship and economic development across the Tennessee Valley. The report indicated that a diverse portfolio is the best way to deliver low-cost, reliable electricity. TVA released the accompanying Final Supplemental Environmental Impact Statement for TVA's Integrated Resource Plan in July 2015 (TVA 2015d).
- *Bull Run Fossil Plant House Demolition and Hydrogeologic Investigations Environmental Assessment* (TVA 2013). Prior to this Environmental Assessment (EA), TVA purchased approximately 166 ac adjacent to BRF. To protect public health and safety, TVA proposed to remove structures and implement other actions to manage the acquired land. TVA performed a hydrogeologic investigation to determine potential future uses of the property, including construction and operation of a CCR landfill.
- *Bottom Ash and Gypsum Mechanical Dewatering Facility Bull Run Fossil Plant, Final EA* (TVA 2012). This EA evaluated the installation of equipment to remove water from gypsum and bottom ash generated at BRF. The dewatering equipment allows TVA to convert its bottom ash and gypsum handling processes to a dry system.

- *Installation of Flue Gas Desulfurization System at Bull Run Fossil Plant, Final EA* (TVA 2005). This EA evaluated the impacts of construction and operation of flue gas desulfurization or scrubber equipment designed to reduce sulfur dioxide emissions

1.5 Identification of Project Scope

TVA prepared this EIS to comply with the NEPA and regulations promulgated by the Council on Environmental Quality (CEQ) and TVA's procedures for implementing NEPA. The EIS will investigate the management of CCRs generated at BRF including the design, construction and operation of a new landfill, hauling to an existing permitted landfill, or taking No Action.

TVA has determined the resources listed below are potentially impacted by the alternatives considered. These resources were identified based on internal scoping as well as comments received during the scoping period.

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

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplains Management), EO 13112 (Invasive Species), EO 13653 (Preparing the United States for the Impacts of Climate Change), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice) and applicable laws including the National Historic Preservation Act , Endangered Species Act (ESA), Clean Water Act (CWA) and Clean Air Act (CAA).

1.6 Scoping and Public Involvement

During the scoping period for this EIS, TVA published a Notice of Intent (NOI); sent notifications to a range of federal, state and local agencies; established a project Web site (https://www.tva.gov/); and provided a number of means for the public to provide comments verbally, in writing and by phone message.

TVA's public and agency involvement for this Draft EIS includes a public notice and a 45-day public review of the document. To solicit public input, the availability of the Draft EIS was announced in regional and local newspapers. A news release was issued to the media and posted to TVA's Web site. The document was posted on TVA's Web site and hard copies were available by request. TVA's agency involvement included sending letters to local, state and federal agencies and federally recognized tribes to notify them of the availability of the Draft EIS. A list of agencies and tribes notified of the availability of the Draft EIS is provided in Chapter 6.

Once the public and other agencies have reviewed and provided comments on this document, TVA will make revisions if necessary and issue a Final EIS. TVA will not make final decisions any earlier than 30 days after the Notice of Availability of the Final EIS is published in the Federal Register.

1.6.1 Notice of Intent

TVA's 33-day scoping period was initiated on May 21, 2015, with the publication in the Federal Register of the NOI. The NOI announced that TVA planned to prepare an EIS to address the storage of CCR generated at BRF. In addition to the NOI in the Federal Register, TVA published notices regarding this effort in regional and local newspapers; issued a news release to media; posted the news release on the TVA Web site; and posted flyers and signs near the alternative landfill site to solicit public input.

To initiate scoping, TVA also sent copies of the NOI to the Tennessee Department of Environmental and Conservation (TDEC) and the United States Department of Interior.

1.6.2 Scoping Feedback

TVA received six responses during the scoping period. The majority of the comments focused on specific resources that should be considered in the EIS including:

- Wastewater treatment requirements and potential impacts associated with EPA Effluent Limitations Guidelines.
- Beneficial reuse of gypsum.
- Impacts to wildlife near BRF.
- Potential visual impacts.

One comment form was submitted by several interested parties and included the following:

- A request that TVA modify the Purpose and Need and consider the retirement of BRF as a reasonable alternative.
- TVA should consider cumulative impacts.
- TVA should evaluate groundwater impacts.
- TVA should evaluate the impacts of coal ash at BRF.
- TVA should characterize existing coal ash at BRF.
- TVA should consider the CCR Rule when making current and future coal ash disposal recommendations.

A copy of the scoping report is provided in Appendix A.

1.7 Required Permits and Licenses

Depending on the decisions made respecting the proposed actions, TVA may need to obtain or seek amendments to the following permits:

- National Pollutant Discharge Elimination System (NPDES) permit for land disturbance and storm water runoff from construction activities.
- Air permitting regulations under the CAA require TVA to secure an Air Pollution Control Permit to Construct prior to the commencement of the proposed construction. The project would likely require revisions to TVA's Title V Permit under the CCA for operations.

- Modification of existing NPDES permits due to changes to discharges during operation of the landfill.
- Actions involving wetlands and/or stream crossings would be subject to federal CWA Section 404 permit requirements as well as state Section 401 water quality certification. In addition, a TDEC Aquatic Resources Alteration Permit (ARAP) may be required.
- Update the existing multi-sector permit to include two new industrial storm water (non CCR contact) outfalls.
- TVA will obtain a Solid Waste Class II Disposal Permit from TDEC.

Necessary permits will be evaluated based on site-specific conditions.

CHAPTER 2 – ALTERNATIVES

This chapter describes the alternatives TVA considered to address the project needs. TVA considered both alternative sites for the disposal of CCR materials from BRF and the mode of transport of those materials.

2.1 Siting Alternatives

2.1.1 Prior Siting Study

In 2011, TVA performed a Siting Study to evaluate suitable sites for constructing a landfill to manage CCR produced at BRF. The goal of the study was to identify a single, primary site that is technically and economically viable for construction of a dry CCR landfill and minimizes impacts to the surrounding community and environment (URS 2011). The initial step of the study (Step 1A) incorporated several tasks, including establishment of the limits of the study area based on TVA input, identification of exclusionary criteria and the establishment of potential candidate areas based on a screening level evaluation. During Step 1A, area screening and geographic information system (GIS) analysis was performed resulting in the development of an exclusionary criteria map. Exclusionary criteria included 100-year floodplains, proximity to major water bodies and surrounding land uses. Other criteria included consideration of the potential mode of transportation (i.e. barge, rail or truck) and transportation-related effects, potential impacts to wildlife and potential impacts to groundwater. The second step established a “score” for each candidate area that allowed for the direct comparison of the potential areas (Step 1B). A total of nine areas were considered (Sites A through I). At the completion of Step 1, seven off-site candidate landfill alternatives (Sites A, C, D, E, G, H, I) and three on-site alternatives (Site J, Borrow Area, Rail Loop) were identified for further evaluation (Figure 2-1). Sites B and F were eliminated from further consideration at this stage due to land use, size and geological considerations.

The Rail Loop site contains a spring and an existing ash dredge cell that has been accepted as closed by the state of Tennessee and contains areas of very steep terrain which may lead to stability concerns. In addition, the Rail Loop Site lacked adequate volume. The Borrow Area site was large enough to provide adequate volume, but would be limited due to steep terrain. Additionally, this area drains to an existing wetland, and development of the site would result in potential environmental impacts to this resource. Both the Rail Loop site and the existing Borrow Area also would be very visible to the public with both sites being constructed on areas of higher elevation than the surrounding land with minimal natural screening. For these reasons, these two on-site alternatives were considered not feasible and were eliminated from further consideration.

2.1.2 Sites Retained for Alternative Analysis

Subsequent to the identification of the eight alternative landfill sites carried forward from the prior Siting Study, TVA identified the off-site transport of CCR to an existing landfill as a potential alternative for management of CCR generated at BRF. The Chestnut Ridge Landfill is the nearest Resource Conservation and Recovery Act (RCRA) Subtitle D landfill to BRF; therefore, this location was added to the analysis to represent this alternative. The resulting candidate sites selected are shown on Figure 2-2 and summarized in Table 2-1.

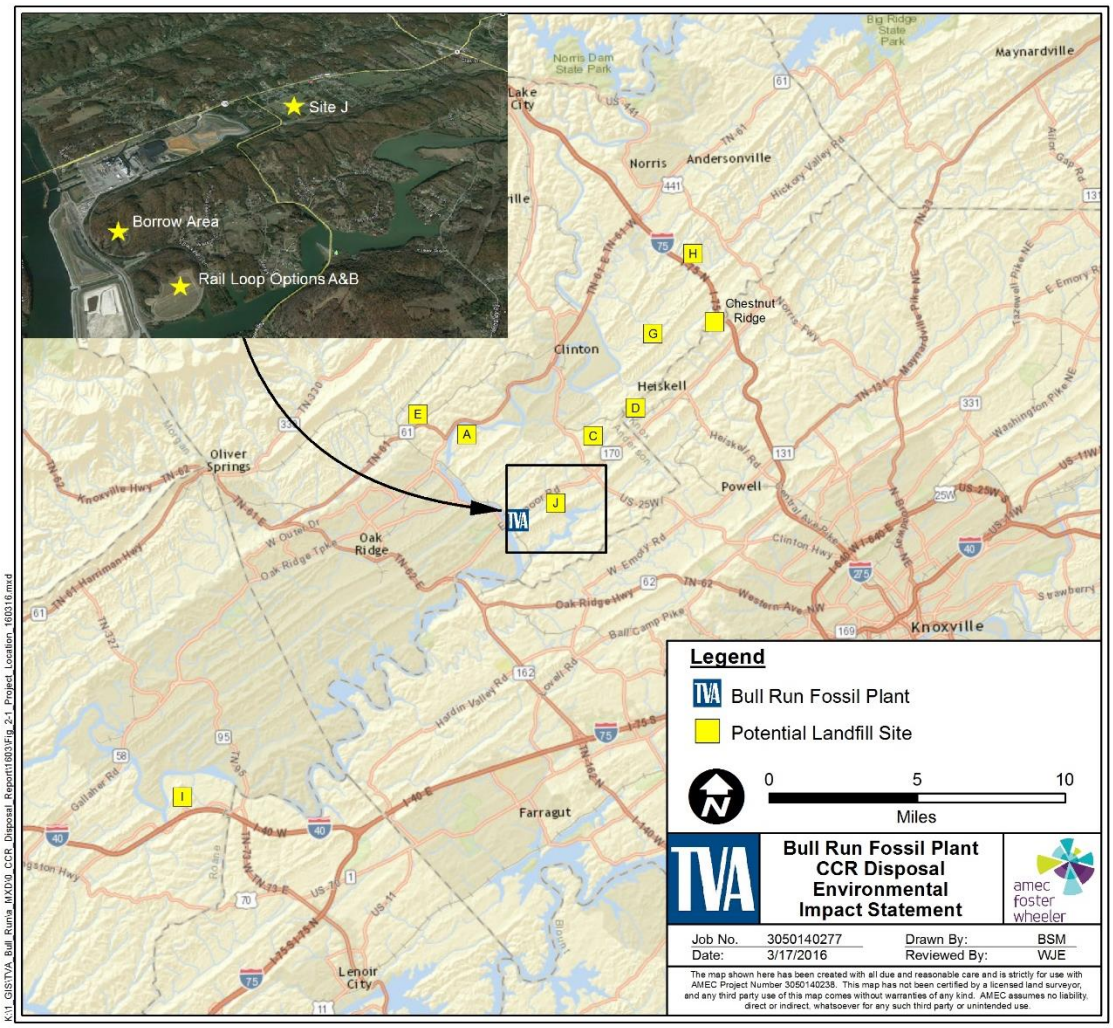

Figure 2-1. Alternative Sites Considered in Prior Siting Study

Table 2-1. Summary of Alternative CCR Disposal Sites Retained for Analysis

Site Name	Driving Distance from BRF (mi)	Approximate Landfill Acreage	Estimated Capacity (Million yd^3)*	Estimated Life span (Years)*
A	4.5	120	14.2	28
C	4.6	116	19.0	38
D	6.0	108	12.1	24
E	7.5	112	13.1	26
G	9.3	110	16.1	32
H	14.5	112	16.7	33
I	26.2	120	21.3	42
J	0.4	54	6.6	12
Chestnut Ridge	12.0	166		40+

* Source: URS 2012a.

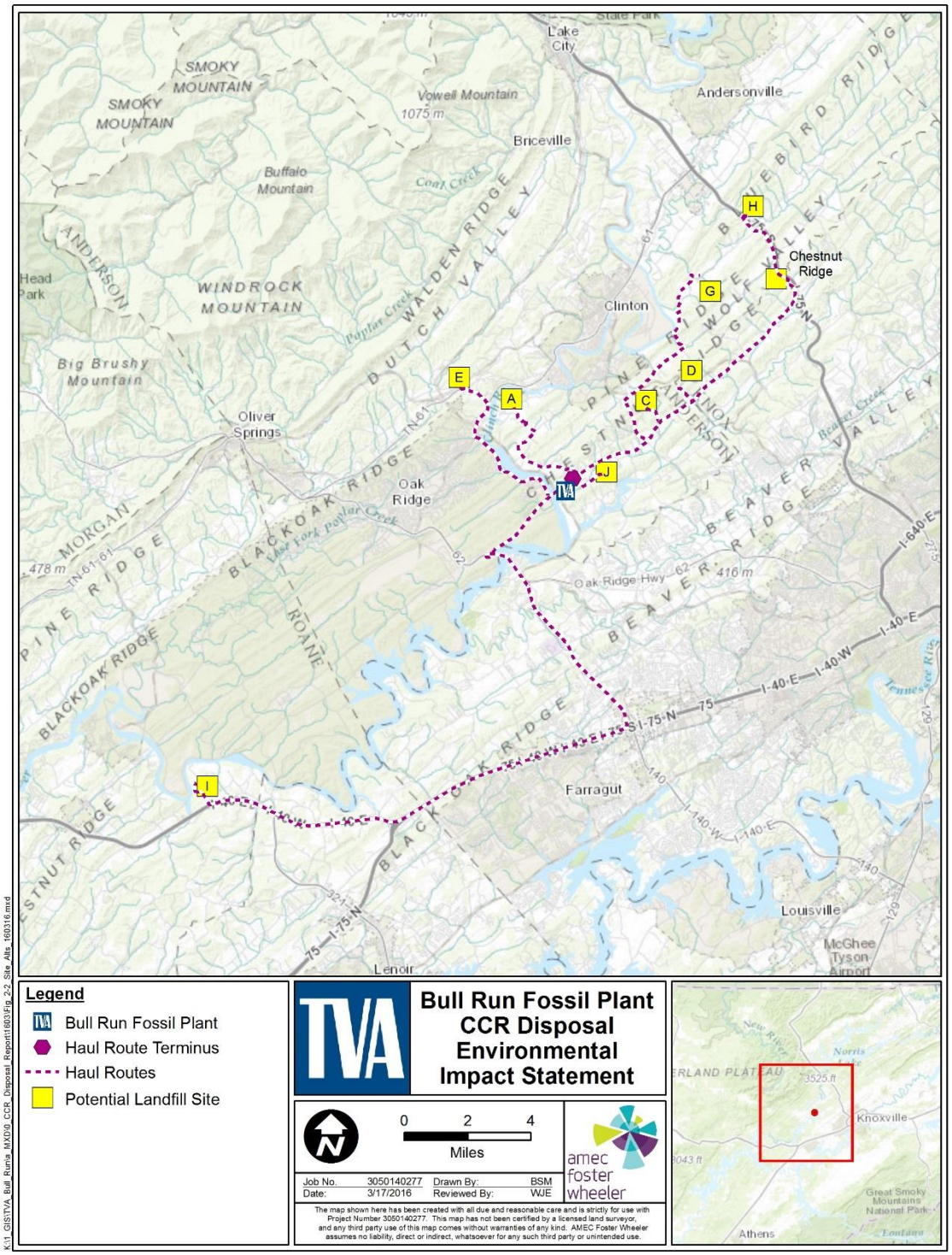

Figure 2-2. Study Area for the Alternative CCR Disposal Sites Retained for Analysis

The impact of development and/or use of each of these sites were further evaluated against resource factors related to a total of 34 environmental and engineering factors in four general categories: (1) Natural Environment; (2) Geology; (3) Human Environment; and (4) Engineering and Transportation Considerations. The purpose of this evaluation was to determine the sites that should be carried over for further analysis in the EIS. The evaluation consisted of a two-step process that entailed the compilation of quantitative constraint information for each of the alternatives followed by a qualitative rank scoring process.

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

- Streams
- Wetlands
- Sensitive Species
- Prime Farmland
- Displacements
- Public/Semi-Public Lands
- Environmental Justice
- Parks and Natural Areas
- Vegetation/Wildlife
- Air Quality
- Land Use
- Property Ownership
- Cultural Resources
- Economic Impacts
- Noise
- Hazardous Waste
- Visual Environment
- Zoning
- Farmland Impacts
- Community Cohesion

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

- Karst Conduit Potential
- Geologic Stability
- Sinkholes and Caves
- Groundwater Resources
- Seismic Zones
- Mines and Mineral Resources

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

- Site Capacity
- Slope/Soil Stability
- Distance to BRF
- Traffic Operations
- Potential for Rail Transport
- Potential for Barge Transport
- Transportation Cost
- Availability of Cover Soil On-Site

Each of the resource factors was evaluated using professional judgment that synthesized the quantitative constraint data to determine relative impact for the purposes of ranking each alternative landfill site. Considerations of the magnitude of potential impact and significance based on resource sensitivity and context were used to develop an appropriate range of rank scores applied to the alternatives under review for each resource category, with higher scores representing greater impact. For example, for impacts to stream resources, the scoring used a full range of values (one to five) to appropriately reflect the range of potential impact (0 to approximately 3,200 ft) and the importance of this resource as it relates to the considerations of significance (based on permit type [Nationwide vs. Individual Section 404 permit], and the burden to demonstrate maximum avoidance and minimization under provisions of Clean Water Act Section 404(b)(1). In contrast, the magnitude of impact to prime farmland for each of the sites ranged from zero to approximately 48 ac. However, because this range is not expected to exceed significance

thresholds, the rank scoring adopted a range of one to three to appropriately reflect both magnitude and relative importance of impact.

This process is described in detail in the Alternatives Analysis in Appendix B, and the results are summarized in Table 2-2.

Table 2-2. Score of Alternative CCR Disposal Sites

Evaluation Criteria	New Landfill Sites								Chestnut Ridge
	A	C	D	E	G	H	I	J	
Natural Environment	21	22	23	18	23	24	24	20	17
Geology	13	9	11	13	7	8	7	7	6
Human Environment	28	26	28	24	26	25	21	23	16
Engineering/ Transportation	12	12	10	13	14	16	17	9	13
Total	**74**	**69**	**72**	**68**	**70**	**73**	**69**	**59**	**52**

Note: Based on the analysis presented in Appendix B. Lower scores are more desirable.

Alternative Site A was determined to have a relatively high impact on social and economic factors including land use and potential Environmental Justice (EJ) issues. In addition, this site would have a high relative impact to geologic and human environment factors. Therefore, this site was eliminated from further study.

Alternative Site C had relatively high impacts on natural and human environment factors including air quality and land use. Geologic limitations included a relatively higher karst conduit potential and percentage of highly erodible soils within the site area. Therefore, this site was eliminated from further study.

Alternative Site D had relatively high impacts to air quality and noise due to the high number of residents near the site and along the haul route. This site also presented geologic concerns associated with karst conduit potential and the high percentage of highly erodible soils within the site area. Overall, this site was ranked as being relatively unfavorable due to geology and relatively high impacts to the human environment. For these reasons, this site was eliminated from further study.

Alternative Site E had relatively high impacts associated with geologic constraints, largely driven by its karst conduit potential and the presence of a sinkhole within the site area. Additionally, this site is predominately covered in farmland and had the greatest impact on farm operations. Although the rank score for this site was similar to Site C, this is the only site with a sinkhole located within the proposed landfill boundary. Additionally, the transport of CCR to this landfill would require a left turn out of BRF to merge into traffic crossing the Clinch River Bridge which results in safety concerns and increased transportation costs of the project due to congestion across the bridge that is experienced during peak periods. Therefore, this site was eliminated from further study.

Alternative Site G had a relatively low score for geological considerations, but had relatively high impacts to the natural environment, especially streams and sensitive noise receptors. This site would also have the potential for EJ impacts and the haul route could impact a relatively high number of adjacent residential receptors. In addition, approximately 3.5 mi of

the haul route to Site G incorporated a two-lane roadway with little or no shoulder, which presented a potential safety issue. For these reasons, this site was eliminated from further study.

Alternative Site H had relatively high potential impact to the natural environment and had little benefit from an engineering and transportation perspective. The site is located relatively far away from BRF, and there were more residential receptors that could potentially be impacted along the haul road. Additionally, the current land cover at the site was almost all forested with a stream and as such, the site would have relatively high impacts to natural resources. For these reasons, this site was eliminated from further study.

Alternative Site I had relatively low scores for geologic considerations and impacts to the human environment; however, there were a relatively higher number of impacts to the natural environment due to the stream and wetland located within the site. While this site is located the furthest away from BRF, most of the haul route would be located along the interstate; therefore, there were fewer residential receptors along the haul route. Additionally, there was a relatively small number of displacements associated with this site. However, transport of CCR to this site would require a left turn out of BRF to merge into traffic crossing the Clinch River Bridge. This turn, coupled with the distance from BRF, resulted in safety concerns and increased transportation costs. Therefore, this site was eliminated from further study.

The Chestnut Ridge Landfill is an existing, permitted landfill that has sufficient capacity to meet the need for long-term storage of CCR generated at BRF. There would be no new impacts to the natural environment associated with landfill construction. The primary impacts identified in the screening analysis were related to the cost and impacts associated with transportation of CCR from BRF to the site. Therefore, this site was retained for more detailed analysis.

Alternative Site J contained an on-site private haul road and is located on TVA-owned property adjacent to BRF; as such this alternative had no impacts associated with the transport of CCR on public roadways. Use of this site, in conjunction with existing on-site storage capacity at BRF would meet the need for long-term storage of CCR from BRF. The site had favorable geologic conditions and development and operation of the landfill would result in relatively low impacts on the natural environment. However, the site is relatively close to existing residential developments and may result in some potential, but imitable impacts to EJ populations. Therefore, this site was retained for more detailed analysis.

2.2 Alternatives Retained for Detailed Analysis

Based on the extensive analysis of both on-site and off-site disposal options, TVA retained the following alternatives for detailed evaluation in this EIS:

- Alternative A – No Action
- Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)
- Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

2.2.1 Alternative A – No Action

Applicable NEPA regulations require federal agencies to consider a No Action Alternative. Under the No Action Alternative, TVA would not seek additional disposal options for dry placement of CCR generated at BRF. Rather, CCR would continue to be stored in the current disposal areas for as long as storage capacity is available. Since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for continued BRF operations. TVA's 2015 Integrated Resource Plan (TVA 2015c) identifies BRF as a facility that will continue to operate as part of its portfolio of energy resources. BRF has also been designated as a base load facility. As such, any limit on future operations of BRF would not comply with TVA's plan to operate BRF as a base load facility nor conform to TVA's long range plan to provide power to meet future demands through 2033 as outlined in the Integrated Resource Plan. Therefore, this alternative would not meet the Purpose and Need for the proposed action and, therefore, is not considered viable or reasonable. It does, however, provide a benchmark for comparing the environmental impacts of implementation of Alternatives B and C.

2.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alternative, TVA would construct and operate a landfill for disposal of dry CCRs generated at the plant on TVA-owned property located approximately 0.4 mi east of BRF (Figure 2-3). This site, known as Site J, encompasses 119.9 ac and includes perimeter roads, borrow stockpile and laydown areas and sediment ponds with the landfill footprint of approximately 60 ac. The landfill would provide approximately 15.5 years of disposal capacity based on current estimated consumption rates. Development of Site J would also include construction of a dedicated on-site haul road to convey dry CCR from the plant to the landfill (see Figure 2-3).

2.2.2.1 Landfill Development

The proposed landfill would be developed to meet the requirements of a Class II Solid Waste Facility as specified by TDEC Division of Solid Waste Management and Federal Subtitle D requirements for dry CCR disposal. This would include the following components:

1. Composite Liner System. The composite liner system would meet the TDEC specified standards and would consist of the following components (or equivalent).
    - A 5-ft recompacted geologic buffer material with a maximum permeability of $1x10^{-6}$ centimeters per second (cm/sec).
    - A 2-ft thick compacted clay liner with a maximum permeability of $1x10^{-7}$ cm/sec.
    - A 60 milliliter textured high density polyethylene geomembrane liner.
    - A double-sided geocomposite drainage layer with 6-inch diameter perforated high density polyethylene leachate collection pipes. A 2-ft protective cover.
2. Leachate Collection System. A leachate collection system designed to facilitate the free drainage of leachate would be provided immediately above the liner. The system would consist of a system of perforated leachate collection pipes that would convey the leachate to the collection sump of each cell. Leachate collected would be handled separately from contained surface runoff and would be pumped to the plant for treatment prior to discharge through NPDES Outfall 001.

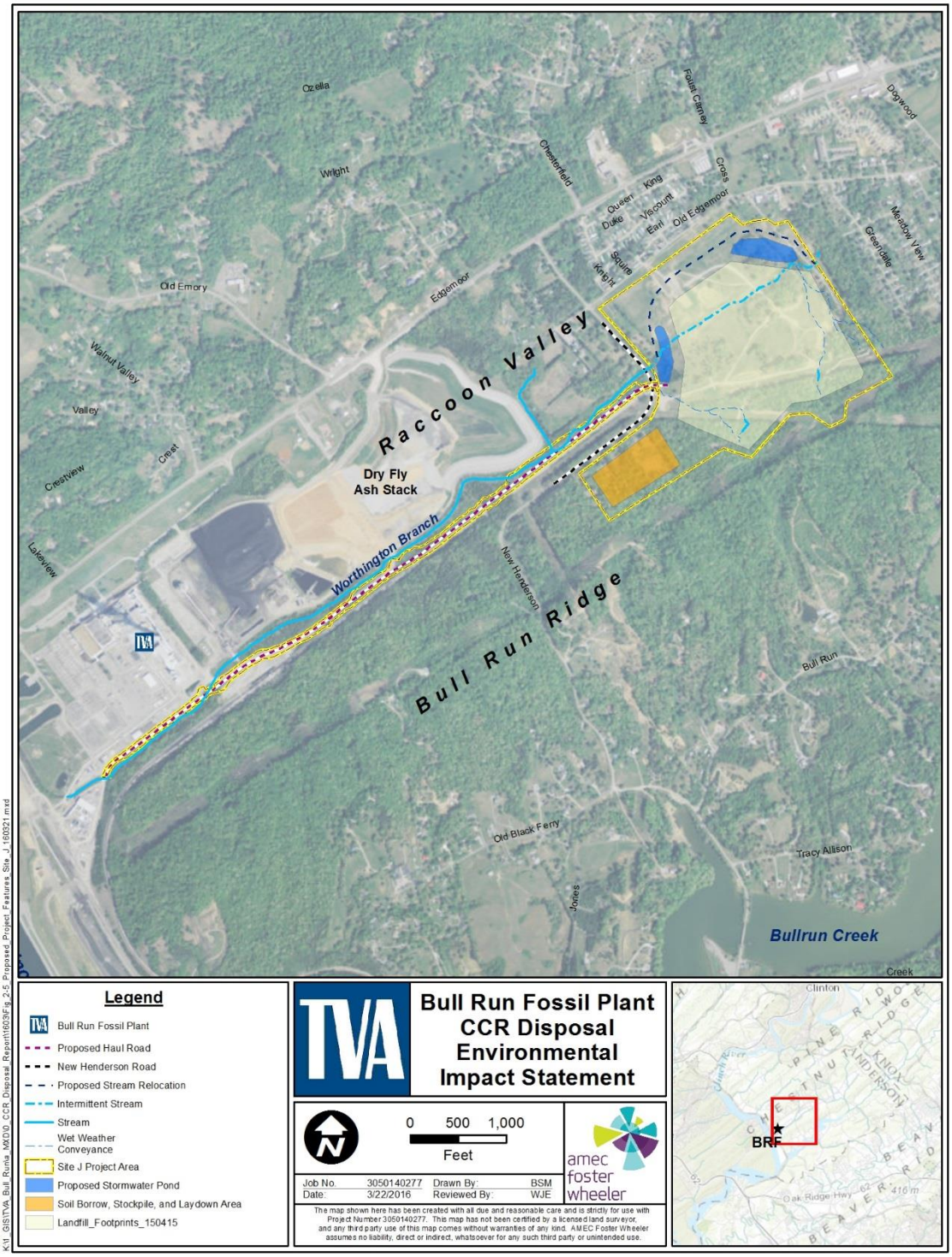

Figure 2-3. Proposed Project Features at the Alternative B – Site J Location

3. Final Cover System. TVA is proposing a final cover that is 24 inches in thickness for the soil layer, but includes a geomembrane which is consistent with systems used throughout Tennessee. The geomembrane is essentially impermeable, but has a vapor permeability of about $1x10^{-13}$ cm/sec which is better (reduced permeability) than the $1x10^{-7}$ cm/sec specified by TDEC rule 0400-11-01-.04(8)(c)3. In addition, the final cover system essentially eliminates (goes to about zero) infiltration into the underlying waste mass after closure.
4. Soil Borrow/Stockpile and Laydown Area. Excess soil material excavated during construction of the disposal facility would be stockpiled in the designated borrow/stockpile area as shown on Figure 2-3. An estimated 95,100 yd^3 of soil would be needed for the interim cover and 190,200 yd^3 of soil will be needed for the final cover. Soil balance estimates indicated that sufficient materials will be available from on-site sources. However, where on-site soil is insufficient in terms of quality or quantity, TVA may supplement on-site soil with off-site borrow materials. The location of an off-site permitted borrow area has not been identified at this time, but all borrow will be obtained from an existing permitted borrow site and soil will meet permit requirements.

The landfill would be developed in a series of three phases or cells (Appendix C). Cells are individual subunits of the proposed landfill that can be constructed and operated on an independent basis. Cells 1, 2 and 3 would be constructed sequentially moving from north to south within the landfill footprint as additional disposal capacity is needed. Current design provides for approximately 8.4 million yd^3 of disposal capacity.

The maximum height of the CCR facility would be approximately 175 ft above the perimeter road elevation. A conceptual view of the landfill from surrounding roads is identified in Figure 2-4 and Figure 2-5.

Landfill design would include a groundwater monitoring system that meets applicable federal and state requirements.

2.2.2.2 Additional Site Development

A two-lane asphalt haul road (40 ft wide) with paved shoulders would be constructed on-site to transport CCR from the dewatering facility to the landfill. The 1.37 mi haul road would require a bridge to be constructed to convey haul route traffic over New Henderson Road. Based on the current volume of CCR production and the use of articulated dump trucks (capacity of 23 yd^3), it is estimated that 65 truckloads per day would be needed to transport CCR to the onsite landfill.

Construction of the landfill at Site J would require relocating the Worthington Branch stream channel, which currently bisects the site. Approximately 2,158 linear ft of channel would be relocated to the north of the existing channel to an approximately 2,700-ft long channel. That channel would require excavation to depths of up to approximately 30 ft, most of which would be in rock. The new stream channel is proposed to be 10-ft wide with approximately 2.5 horizontal to 1 vertical side slopes. The relocation of Worthington Branch would likely require rock excavation with controlled blasting due to the topographic relief and relatively shallow bedrock at the site.

Figure 2-4. Artist Rendering of Proposed Site J Landfill Looking South on Old Edgemoor Road

Figure 2-5. Artist Rendering of Proposed Site J Landfill Looking Northeast from the Haul Road

Leachate and storm water that may have contacted CCR materials would be handled separately from non-contact storm water and would be pumped to the plant for treatment prior to discharge through NPDES Outfall 001. Storm water that does not have contact with CCR would be discharged from the two storm water detention and settling ponds into the re-located segment of Worthington Branch. This may require modification of the existing

Multi-Sector permit to include these two new industrial storm water outfalls. As discharge will adhere to the permit requirements, no impact to water quality are anticipated.

In the later stages of the landfill operation (development of the third cell), a portion of an existing 69 kilovolt overhead electric transmission line would be relocated. The new alignment would be located within one of the existing transmission corridors located adjacent to the proposed landfill site. These corridors have already been disturbed and the relocation would utilize existing poles/towers or new wooden poles would be added. Any new poles would be located so as to avoid any impacts to natural or cultural resources.

A summary of the primary characteristics of the proposed landfill during both construction and operation is provided in Table 2-3. Design drawings of the proposed landfill are provided in Appendix C.

Table 2-3. Primary Characteristics of Alternative B - Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)

Project Feature	Characteristic	Value
Construction	Total disturbed area, Site J	119.9 ac
	Total disturbed area, haul road	14.8 ac
	Soil borrow stockpile and laydown area	8.2 ac
	West storm water pond	1.7 ac
	North storm water pond	2.8 ac
	Length of Haul Road	1.37 mi
Height	Elevation of top of waste relative to haul road elevation	175 ft
Stream Relocation	Length of relocation of Worthington Branch for landfill development	2,158 ft
Employment Workforce	Construction	35 workers
	Operation	5 workers
Leachate	Flow to Outfall 001	<0.05 million gallons per day (MGD)
Transport Distance	Length of on-site haul road	1.37 mi
Articulated dump truck traffic volume	Number of fully loaded truckloads needed to haul CCR from BRF to the proposed landfill via a private haul road	65 truckloads per day. Equates to a traffic count of 130 trips per work day or approximately 15 trucks per hour

2.2.2.3 Transport Alternatives

TVA considered a range of alternatives to transport CCR materials from BRF to the disposal site. These alternatives included seven options for the haul route to the proposed landfill as well as the use of a conveyer system. While barge and rail transport were considered in the Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure and the proximity of Site J to BRF. TVA selected the current alignment as the most favorable alternative for the following reasons:

- It was a relatively straight alignment with few turns, which is the easiest and safest route for truck navigation.
- It was the shortest path to the landfill.
- The road avoids impacts to the railroad, surrounding residential area and church.

This alternative leaves New Henderson Road in-place and includes the construction of a bridge to allow for the proposed haul road to pass over the existing road, therefore eliminating an intersection of the proposed haul road and New Henderson Road.

2.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill. For the purposes of this EIS, the off-site landfill would be permitted to receive CCR and would have the capacity to do so. The analysis of impacts associated with this alternative are based on the closest landfill that can currently accept CCR material, the Chestnut Ridge Landfill. The Chestnut Ridge Landfill is a Class 1 Municipal Solid Waste Facility located approximately 12 mi northeast of BRF. Under this Alternative, dry CCR generated at BRF would be transported by over-the-road tandem dump trucks on existing roadways to the Chestnut Ridge Landfill for disposal. . While barge and rail transport were considered in the previous Siting Study, they were not considered feasible options for this EIS given the lack of existing infrastructure and the proximity of Chestnut Ridge to BRF. Based on the current volume of CCR production and the use of over-the-road tandem dump trucks (capacity of 15 yd^3), it is estimated that 100 truckloads per day would be needed to transport CCR to the offsite landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize the following public roads: Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) and Fleenor Mill Road (Figure 2-6). The landfill is owned and operated by Waste Management of Tennessee and serves the Knoxville metro area and central Tennessee. Capacity at this landfill can be expanded to accommodate TVA's requirement for long-term storage of CCR generated at BRF.

The Chestnut Ridge Landfill site is an existing landfill, and new previously unpermitted impacts to the natural environment as a result of disposing of CCR at this landfill are not anticipated. Therefore, the analysis provided in this EIS is limited to the evaluation of characteristics related to transportation of CCR from BRF to the Chestnut Ridge Landfill. These characteristics are summarized in Table 2-4.

Table 2-4. Primary Characteristics of Alternative C – Transport of CCR to Chestnut Ridge

Project Feature	Characteristic	Value
Size	Size of current landfill	166 ac
Location	Distance from BRF	12 mi
Tandem Dump Truck Traffic Volume	Number of truckloads needed to haul CCR from BRF to an off-site landfill (Chestnut Ridge)	100 truckloads per day. Equates to a traffic count of 200 trips per work day or approximately 23 trucks per hour

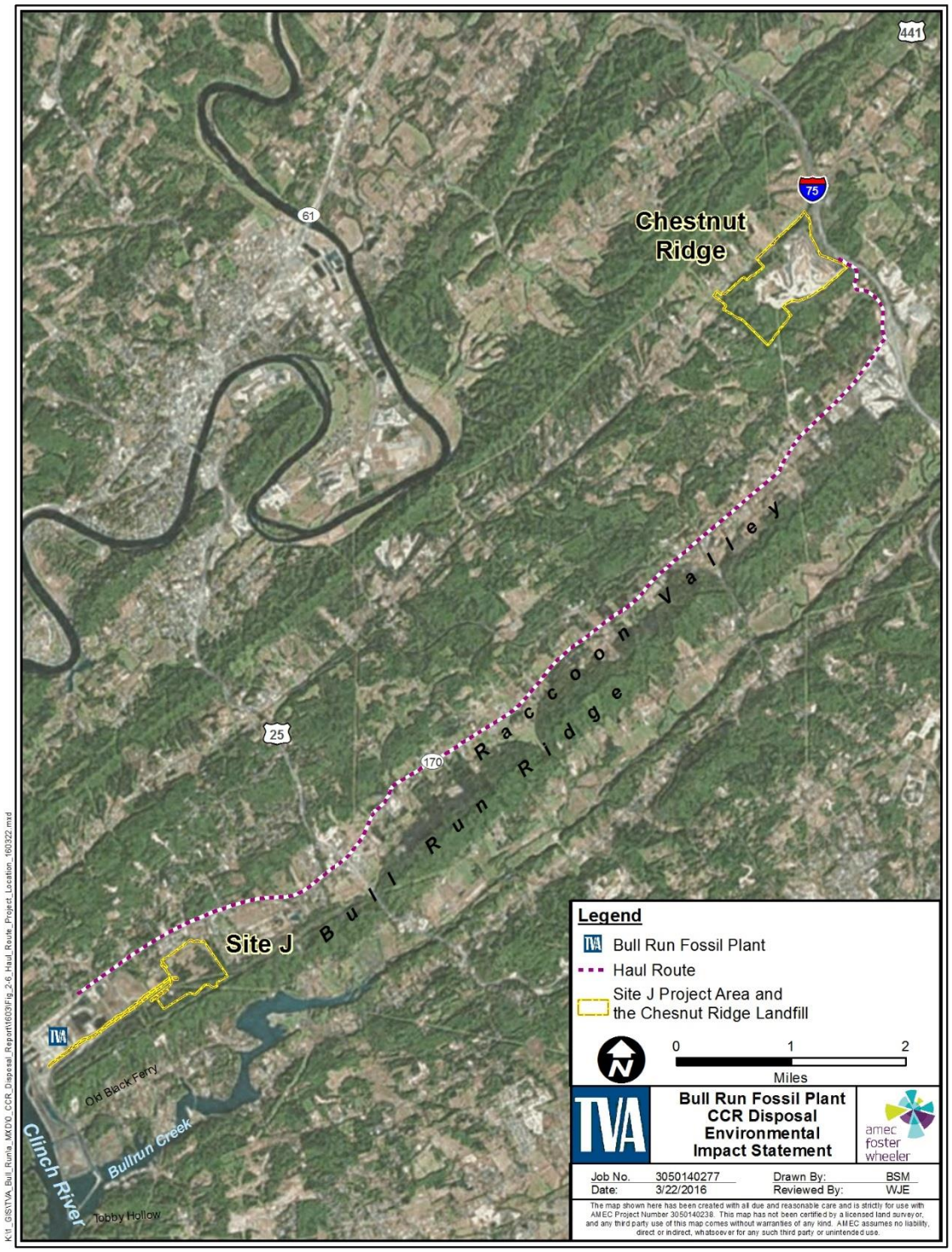

Figure 2-6. Haul Route to the Chestnut Ridge Landfill as Proposed Under Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill

2.3 Summary of Alternative Impacts

The environmental impacts of Alternatives A, B and C are summarized in Table 2-5. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2-5. Comparison of Impacts of Each Alternative by Resource Area

Alternative A – No Action	Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)	Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)
Air Quality		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in emissions.	Temporary minor impacts during construction from fugitive dust and emissions from equipment and vehicles.	Localized impact due to emissions from increased vehicles used to transport and manage CCR.
Climate Change		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in GHG emissions.	Minor GHG emissions associated with onsite construction equipment. No discernable effect on regional GHG levels.	No impact associated with construction, however due to increased vehicle miles travelled and use of public roadways, GHG emissions would be higher than Alternative B.
Land Use		
No impact.	Minor impact resulting from the conversion of undeveloped land to an industrial facility.	No impact.
Prime Farmland		
No impact.	No impact	No impact.
Geology and Seismology		
No impact.	No impact. Potential seismic risk mitigated with proper design.	No impact.
Groundwater		
No impact.	Minor impact due to incorporation of low permeability synthetic liner and leachate collection system. Runoff would be controlled with appropriate BMPs.	No impact.
Surface Water		
No impact.	Minor temporary impacts due to runoff during construction. Direct permanent impacts to the upper reach of Worthington Branch. Mitigated as a result of adherence to permit requirements and payment to an appropriate stream bank and / or restoration onsite.	No impact.
Floodplains		
No impact.	No impact.	No impact.
Vegetation		
No impact.	Minor impact resulting from the disturbance of a predominantly previously disturbed area that lacks notable plant communities.	No impact.
Wildlife		
No impact.	Minor impact due to loss of predominantly previously disturbed habitat.	No impact

Table 2-5. Comparison of Impacts of Each Alternative by Resource Area

Alternative A – No Action	Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)	Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)
Aquatic Ecology		
No impact.	Permanent impact to Worthington Branch and aquatic resources due to stream realignment and culverts. However, impacts would be mitigated via payment to an appropriate stream bank and reconstruction of stream channel and associated habitat onsite.	No impact.
Threatened and Endangered Species		
No impact.	Minor impact as a result of the loss of bat foraging and roosting habitat. Impact would be mitigated in accordance with TDEC requirements.	No impact.
Wetlands		
No impact.	Direct impact to 2.1 ac of wetland. However these impacts would be mitigated as required by both state and federal agencies.	No impact.
Solid and Hazardous Waste		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in a decrease in solid waste produced at BRF.	Minor increase in solid waste generated during construction. Long-term impact associated with the management of solid wastes produced at BRF at Site J as CCR would be disposed n a new landfill.	Long-term impact to the capacity of an existing landfill which limits long-term ability to meet other disposal needs in the region.
Socioeconomic Resources		
No impact associated with current BRF landfill operations. Long-term impacts to plant operations due to inability to store CCR would theoretically result in significant adverse effects on local employment and economic measures.	Minor temporary direct and indirect beneficial impact to the local economy due to construction. Long-term minor beneficial impact due operation of the landfill. Minor impact to the access to Valley View Church and Church of Christ during construction due to construction related traffic.	Negligible impact due to anticipated minimal employment increase.
Environmental Justice		
No impact.	Minor to moderate indirect impact to potential EJ community due to increased noise, dust and traffic during construction. Landfill would present a visual impact during operation, partially mitigated by a vegetated buffer. No impact associated with haul of CCR to the landfill.	Moderate impact to potential EJ community due to additional traffic noise and dust associated with transport of CCR. However, this impact would not be disproportionate.
Natural Areas, Parks and Recreation		
No impact.	Minor indirect impact during construction due to increased vehicles on surrounding roadways. No impact during operation.	Moderate indirect impact to facilities along the haul road.
Transportation		
No impact.	Minimal short term impact to traffic on New Henderson Road during construction of haul road. No impact during operation.	Moderate impact related to increased traffic and potential increase in crash rates during operation.
Visual Analysis		
No impact.	Landfill would change the existing visual integrity, but there would be minimal change in the overall scenic value.	No impact.
Cultural and Historic Resources		

Table 2-5. Comparison of Impacts of Each Alternative by Resource Area

Alternative A – No Action	Alternative B – Construct and Operate a Landfill on TVA Property Adjacent to BRF (Site J)	Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)
No impact.	No impact.	No impact.
Noise		
No impact.	Minor impact.	Moderate impact.
Public Health and Safety		
No impact	Worker and public health and safety during construction and operation would be maintained and impacts any impact would be minor.	Increased traffic would increase the potential risk of injuries and fatalities associated with truck crashes.
Cumulative Effects		
No impact.	Minimal impact to overall scenic value due to maintenance of vegetative buffer.	Minor to moderate impact to transportation due to cumulative effect of increased traffic on SR 170 associated with ash impoundment closure.

2.4 Identification of Mitigation Measures

Mitigation measures identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. TVA's analysis of preferred alternatives includes mitigation, as required, to reduce or avoid adverse effects. Project-specific best management practices (BMPs) are also identified.

BMPs employed to minimize impacts include:

- Fugitive dust emissions from site preparation and construction would be controlled by wet suppression and other appropriate BMPs (CAA Title V operating permit incorporates fugitive dust management conditions).
- Erosion and sedimentation control BMPs (e.g., silt fences) would reduce the potential for erosion of soil minimizing the potential for impact to surface waters during construction. .
- Consistent with EO 13112, disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- BMPs would be used during construction activities to minimize and restore areas disturbed during construction.
- TVA would implement operational mitigations to reduce potential surface water impacts from CCR operations, such as requiring that no more than 10 ac of ash be exposed at any one time.
- A Storm water Pollution Prevention Plan will be created to limit the size of the disturbed areas and to divert storm water runoff away from construction areas into existing ponds.
- Construction debris and excess materials will be disposed of properly.
- Proper spill prevention measures will be taken to reduce the potential for spills of fuel//lube/insulation oil.

- Subcontractor and prime contractor employees would require Occupational Safety and Health Administration (OSHA) 1910.120 training.

Mitigation measures include:

- Given the occurrence of potentially suitable roosting habitat for some endangered bat species within the project area, all tree clearing would be limited to those times of the year when bats are not expected to be roosting in the area (October 1 thru March 31).

- TVA has coordinated with TDEC and U.S. Army Corps of Engineers (USACE) and has proposed mitigation for areas impacted by relocation and/or encroachment of Worthington Branch through payment to an appropriate stream bank and/or restoration on-site.

- An ARAP/401/404 permit will be required for disturbance to wetlands.

- Due to the loss of potentially suitable foraging and roosting habitat for endangered bat species, Section 7 consultation with U.S. Fish and Wildlife (USFWS) will be required.

- TVA would maintain the plantings along the portion of Site J adjacent to Old Edgemoor Road to continue to provide a vegetative screen.

2.5 Preferred Alternative

TVA has identified Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J) as the preferred alternative. Alternative B would achieve the purpose and need of the project with minimal environmental impact. In addition, Alternative B avoids off-site transport of CCR.

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CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Air Quality

3.1.1 Affected Environment

Through passage of the CAA, Congress mandated the protection and enhancement of our nation's air quality resources. National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants have been set to protect the public health and welfare:

- Sulfur dioxide (SO_2)
- Ozone
- Nitrogen dioxide (NO_2)
- Particulate matter whose particles are less than or equal to 10 micrometers (PM_{10})
- Particulate matter whose particles are less than or equal to 2.5 micrometers ($PM_{2.5}$)
- Carbon monoxide (CO)
- Lead

The primary NAAQS were promulgated to protect public health, and the secondary NAAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air (USEPA 2015). Areas in violation of the NAAQS are designated as nonattainment areas. New sources to be located in or near these areas may be subject to more stringent air permitting requirements.

EPA has designated Anderson County as nonattainment for $PM_{2.5}$. Nearby Knox and Loudon counties are also nonattainment for $PM_{2.5}$ and Roane County is partial nonattainment for $PM_{2.5}$. Anderson County is currently in attainment for all other criteria pollutants. However in July 20, 2012, Anderson County was re-designated partial nonattainment for ozone. The BRF project site is included in the area designated as nonattainment for ozone.

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action

Under this alternative TVA would not seek additional disposal options for placement of CCRs generated at BRF. Rather, CCRs would continue to be stored in the current on-site dry fly ash stack, and fugitive emissions associated with this stack will continue to occur in the short term no matter what alternative CCR disposal method is implemented at BRF. BMPs are employed to reduce emissions from this landfill to ensure adherence to permit requirements; therefore, there is no impact to air quality associated with current landfill operations. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, emissions would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long-range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

3.1.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.1.2.2.1 Construction Impacts

Construction of the proposed landfill and its associated haul road would require the use of earthmoving, compacting and paving equipment as well as trucks for hauling materials. Additionally, some controlled blasting would be required to create the new bypass channel for Worthington Branch. All construction activities would be carried out on-site, and no off-site activities are anticipated. These activities would generate fugitive dust during active construction periods. The largest fraction (greater than 95 percent by weight) of fugitive dust would be deposited within the construction site boundaries. Wet suppression and other BMPs would be utilized, which can reduce fugitive dust emissions by as much as 95 percent. TVA will obtain the proper Construction Permit from TDEC and would comply with its protective provisions.

Construction activities that generate fugitive dust and emissions have the potential to affect local ground-level ozone and particulate matter levels. Because EPA has identified Anderson County as a nonattainment area for $PM_{2.5}$ and areas near BRF as nonattainment for ozone (for both the 2008 standard and presumably the new standard of 0.070 parts per million), TVA will use BMPs to minimize fugitive dust and emissions and will work with TDEC to obtain the proper permits to ensure protection of the environment, the workforce and nearby residents.

Equipment expected to be required for this alternative includes excavators (two), bulldozers (three), a water truck, a loader, pickup trucks (five), ATV buggies (three) and semi-trailers. All equipment would be used on-site and any air quality impacts would be limited to the immediate site area. Emissions associated with the combustion of gas and diesel fuels by internal combustion engines would generate local emissions of PM, NO_2, CO, volatile organic compounds (VOC) and SO_2 during the construction period. Therefore, given the relatively low number and types of equipment that would be used for the initial construction activities, and the intermittent nature of construction, emissions from construction equipment would be minor and temporary in nature.

3.1.2.2.2 Operation Impacts

Operation of the proposed landfill would comply with Tennessee regulations for fugitive emissions and BRF's air operating permit conditions. CCR handling, transport and placement activities would utilize methods similar to on-going landfill operations at BRF. In order to minimize fugitive dust from landfill operations, CCR would be moisture-conditioned and transported to the working face of the landfill using heavy-duty dump trucks over paved access roads contained within the boundaries of the plant. Once placed, the CCR material would be spread and compacted. Other measures to control dust inside the limits of the proposed landfill may include mulch, wind breaks/barriers, tillage and stones as permitted by an approved air permit. At the end of each day's activities, the surface of the landfill would be sealed as practicable with a smooth drum roller. As areas of the landfill reach their capacity, they would be covered with an approved cover system.

Equipment used for landfill operations would be similar to what is currently in use at the existing dry fly ash stack and therefore there would be no substantive change in emissions as compared to base conditions.

3.1.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Since the Chestnut Ridge Landfill is an existing permitted landfill, there would be no changes from the existing environment associated with initial construction activities. However, it is likely that additional heavy equipment would be used on-site to manage incoming CCR. This equipment would include dump trucks and bulldozers to spread CCR material, and compacters for consolidation. Use of this equipment would result in a localized increase in emissions which would negatively impact local air quality. However, it is anticipated that all construction vehicles would be maintained in good working condition and be installed with current emission control technologies.

It is estimated that 100 truckloads (traffic count of 200 trips per day) would be required on a fulltime basis (typical 5-day work week) to haul the CCR from BRF to the Chestnut Ridge Landfill. This increase in vehicles on the roadway would generate local emissions of PM, NO_2, CO, VOC and SO_2 throughout the operational period (up to 15.5 years). This increase in vehicles (estimated to equate to 23 truck trips per hour, based on a 9-hour day) represents a moderate increase in traffic especially along SR 170 which currently experiences congestion during peak hours of the day. Although the impact on air quality in this congested area as a result of the increase in traffic is expected to be moderate, the regional impact on air quality would be minor given the relatively low traffic volumes in the vicinity of BRF. Therefore, exceedances of applicable ambient air quality standards are not expected. It is anticipated that all trucks used to transport CCR would be maintained in good working condition with current emission control technologies that would minimize local air quality impacts.

Emissions associated with Alternative C would not result in an exceedance of applicable air quality standards. However, emissions from the additional construction vehicles needed to manage the transportation of CCR from BRF to the Chestnut Ridge Landfill and also manage the placement of CCR at the landfill are expected to result in long-term local effects that would be greater than those evident under Alternative B.

3.2 Climate Change and Greenhouse Gases

3.2.1 Affected Environment

The average temperature in the United States has increased by 1.3 to 1.9°F since record keeping began in 1895; most of this increase has occurred since about 1970. The most recent decade was the nation's warmest on record and temperatures in the United States are expected to continue to rise. Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country over time (Melillo et al. 2014).

The 2014 National Climate Assessment concluded that global climate is projected to continue to change over this century and beyond. The amount of warming projected beyond the next few decades is directly linked to the cumulative global emissions of greenhouse gas and particles by these studies. By the end of this century, the 2014 National Climate Assessment concluded that a 3°F to 5°F rise can be projected under the lower emissions scenario and a 5°F to 10°F rise for a higher emissions scenario (Melillo et al. 2014). As with all future scenario modeling exercises, there is an important distinction to be made between a "prediction" of what "will" happen and a "projection" of what future conditions are likely given a particular set of assumptions. (Melillo et al. 2014).

3.2.1.1 Southeastern United States

The Southeastern United States is one of the few regions globally that does not exhibit an overall warming trend in surface temperature over the 20th century. This “warming hole” also includes part of the Great Plains and Midwest regions in the summer. Historically, temperatures increased rapidly in the Southeast during the early part of the 20th century, then decreased rapidly during the middle of the 20th century. Since the 1960s, temperatures in the Southeast have been increasing. Recent increases in temperature in the Southeast have been most pronounced in the summer season, particularly along the Gulf and Atlantic coasts. However, temperature trends in the Southeast over the period from 1895 to 2011 are found to be statistically insignificant for any season. Generally, in the Southeast, the number of extreme hot days has tended to decrease or remain the same while the number of very warm summer nights has tended to increase. The number of extreme cold days has tended to decrease. Global warming is a long-term trend, but that does not mean that every year will be warmer. Day-to-day and year-to-year changes in weather patterns will continue to produce variation, even as the climate warms. Generally, climate change results in Earth’s lower atmosphere becoming warmer and moister, resulting in the potential for more energy for storms and certain severe weather events. Trends in extreme rainfall vary from region to region (Kunkel et al. 2013).

3.2.1.2 Greenhouse Gases

In nature, CO_2 is exchanged continually between the atmosphere, plants and animals through processes of photosynthesis, respiration and decomposition; and between the atmosphere and ocean through gas exchange. Billions of tons of carbon in the form of CO_2 are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural and man-made processes (i.e., sources). When in equilibrium, carbon fluxes among these various global reservoirs are roughly balanced (Galloway et al. 2014). CO_2, however, constitutes less than 1/10th of a percent of the total atmosphere gases.

Similar to the glass in a greenhouse, certain gases, primarily CO_2, NO_x, methane, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride, absorb heat that is radiated from the surface of the Earth. Increases in the atmospheric concentrations of these gases can cause the Earth to warm by trapping more heat. The common term for this phenomenon is the “greenhouse effect,” and these gases are typically referred to as “greenhouse gases” (GHG). Atmospheric levels of CO_2 are currently increasing at a rate of 0.5 percent per year. Atmospheric levels measured at Mauna Loa, Hawaii and at other sites around the world reached 400 parts per million in 2013, higher than the Earth has experienced in over a million years (Walsh et al. 2014). The extent to which GHGs contribute to or are responsible for increased temperatures is the subject of scientific debate.

While water vapor is the most abundant GHG in the atmosphere, it is not included in the above list of GHGs because changes in the atmospheric concentration of water vapor are generally considered to be the result of climate feedbacks related to the warming of the atmosphere rather than a direct result of human activity. However, the impact of water vapor is critically important to projecting future climate change and this is not yet well understood. Quantifying the effects of feedback loops on global and regional climate is the subject of on-going data collection and active research (Walsh et al. 2014).

3.2.1.3 Greenhouse Gases and Electric Utilities

The primary GHG emitted by electric utilities is CO_2 produced by the combustion of coal and other fossil fuels. Hydrofluorocarbon-containing refrigeration equipment is widely used in industry, and these gases are emitted to the atmosphere in small amounts primarily through equipment leaks. Sulfur hexafluoride which is used as a gaseous dielectric medium for high-voltage (one kilovolt and above) circuit breakers, switchgears and other electrical equipment is also emitted in small amounts to the atmosphere. Methane is emitted during coal mining and from natural gas wells and delivery systems.

In 2014, worldwide man-made annual CO_2 emissions were estimated at 36 billion tonnes, with sources within the U.S. responsible for about 15 percent of this total (Le Quéré et al. 2015). Electric utilities in the United States, in turn, emit 2.039 billion tons, roughly 32 percent of the U.S. total (USEPA 2014). In 2013, fossil-fired generation accounted for 51 percent of TVA's total electric generation, and the non-emitting sources of nuclear, hydro and other renewables accounted for 49 percent. Compared to CO_2 emissions from the entire TVA system in 2005 to those in 2014, TVA has reduced its CO_2 emission by over 30 percent and anticipates achieving a total CO_2 emission reduction of 40 percent by 2020.

3.2.1.4 Greenhouse Gases and Mobile Sources

According to the U.S. Greenhouse Gas Inventory Report: 1990-2013 (USEPA 2014), the transportation sector accounted for roughly 27 percent of total U.S. greenhouse gas emissions. Medium and heavy-duty trucks were about 23 percent of all transportation sector emissions.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct or operate a new CCR landfill. There would be no change to current conditions. Once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, plant emissions would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long-range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

3.2.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alterative, TVA would construct a landfill for disposal for dry CCR on TVA-owned property located adjacent to BRF. Development of this landfill would also include construction of an on-site haul road to convey dry CCR from the plant to the landfill. TVA would construct this road on the BRF site next to the existing railroad track. CCR would be hauled from the dewatering facility and ash silos to the landfill (a round-trip distance of 2.74 mi). A total of 65 truckloads of CCR would be transported to the landfill each day. Considering that transport of CCR would equate to a traffic count of 130 trips per day (typical 5-day work week) along the haul route, GHG emissions associated with vehicle miles traveled would be insignificant.

CO_2 emissions would occur during the construction phase. Construction-related CO_2 emissions would be primarily related to the combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.). The total amount of these emissions would be small and would result in no significant impact to climate change.

3.2.2.3 Alternative C – Off-Site Transport of CCR to an Existing, Permitted Landfill (Chestnut Ridge)

Under Alternative C, TVA would transport dry CCR by truck from BRF to the Chestnut Ridge Landfill using existing roadways. Chestnut Ridge is located approximately 12 mi northeast of BRF and it is estimated that transport of CCR would require 100 truckloads of CCR per day which would equate to a traffic count of 200 trips along the route to the landfill during a typical 5 day work week. As with Alternative B, greenhouse gas emissions associated with vehicle miles traveled would be insignificant. However, given the increased vehicle miles traveled and the use of public roadways which may require increased idling time, GHG emissions would be notably higher than Alternative B.

3.3 Land Use

3.3.1 Affected Environment

The BRF facility is located in Anderson County, Tennessee, near the convergence of the Clinch River and Bullrun Creek, approximately 8 mi southwest of the city of Clinton. The plant property occupies approximately 750 ac of land bordered by residential and rural properties to the north, northeast and northwest. Figure 3-1 identifies land uses in the region surrounding BRF. As summarized in Table 3-1, land use within the region surrounding the BRF site is dominated by deciduous forest land, pasture/hay land and developed lands.

Table 3-1. Land Use/Land Cover within the Project Area and the Region

Land Use Type	Acres Within Site J and Haul Route[1]	Acres within 5-mi Radius
Emergent Herbaceous Wetlands	2.1	22.7
Cultivated Crops		63.0
Barren Land (Rock/Sand/Clay)		177.0
Shrub/Scrub	0.6	268.8
Developed High Intensity		630.6
Woody Wetlands		752.7
Grassland/Herbaceous	46.6	1,754.4
Mixed Forest		1,791.4
Evergreen Forest		1915.7
Developed, Medium Intensity		2,285.8
Open Water		2,417.2
Developed, Low Intensity	14.9	6,035.9
Developed, Open Space	14.5	7,584.8
Pasture/Hay		8,106.9
Deciduous Forest	56.0	16,458.0
Total	**134.7**	**50,264.9**

[1] Land cover type within Site J has been modified based on more recent field surveys and aerial images.
Source: Homer et al. 2015

The Clinch River forms the southwest boundary and Bullrun Creek, a branch of the Clinch River, is to the south.

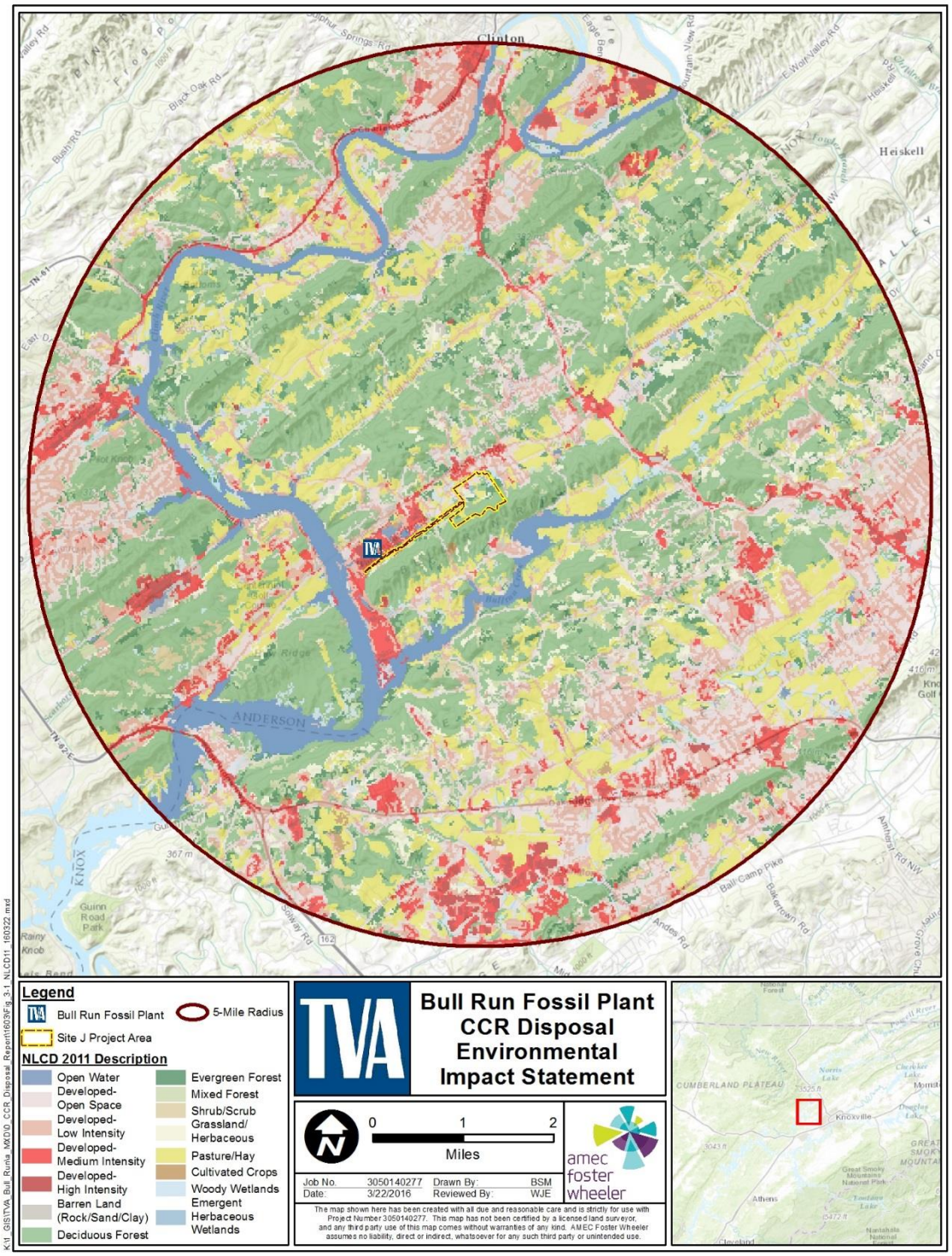

Figure 3-1. Land Use/Land Cover in the Vicinity of Site J

Site J covers approximately 119.9 ac and straddles Worthington Branch, a creek that bisects the property from northeast to southwest and eventually discharges into the Clinch River. The proposed haul route covers approximately 14.8 ac and extends from BRF to Site J. Portions of the area within Site J were previously used as pasture land and include two former 0.5-ac former ponds (breached and drained) located north of Worthington Branch. It is bordered by Old Edgemoor Lane to the north, New Henderson Road to the west, Isabella Lane to the east and Bullrun Ridge to the south. During construction of the houses that were previously on this site, the land was cleared and leveled, and the lots were landscaped with trees and turf grass. Since TVA's acquisition of the site in 2012, the houses and associated structures have been demolished and removed (TVA 2013). Land cover on the site generally consists of old field community with scattered trees in areas that were formerly developed and more established forested areas that were not disturbed by prior development (see Section 3.9, Vegetation).

The nearest residential structure is located directly adjacent to the eastern limits of Site J. The Clinch River is used for recreational and commercial purposes. Surrounding areas are primarily residential with some areas zoned commercial to the northwest and heavy industrial to the west where the plant is located.

Landfills in the state of Tennessee are regulated by the TDEC Division of Solid Waste Management. A coal ash landfill would be required to obtain a Solid Waste Class II Disposal Permit from TDEC. Under Alternative B, TVA would take action to obtain the necessary permits. Construction of the landfill would adhere to the provisions outlined in the TDEC Rule Chapter 0400-11-01-.02, Solid Waste Storage Processing and Disposal Facilities. Specific buffer zone standards identified in the rule note that all fill areas must be, at a minimum:

- 100 ft from all property lines, and
- 500 ft from all residences, unless the owner of the residential property agrees to a shorter distance.

As a federal agency, TVA is not subject to state and local zoning laws; nevertheless, TVA considers applicable zoning regulations for the purpose of analyzing impacts. Zoning ordinances for Anderson County do not identify conditions specific to CCR or solid waste landfills, but do provide conditions that must be met to allow a sanitary landfill. In Anderson County, landfills are permitted in the Environmental Industrial (I-3) District, which allows for heavy industrial uses. Landfills are permitted in this district as a special exception following a review by the board of Zoning Appeals.

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no changes to existing land uses.

3.3.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

The potential construction-related land use impacts to the site and off-site areas are based on the site utilization plan illustrated in Figure 2-3. The parcels proposed for operations and construction-related activities are currently zoned for suburban-residential (R-1); however, all of the residences and associated buildings have been removed since TVA acquired the

property. The site is currently in an undeveloped state and covered with various vegetation cover types.

Construction of the proposed facility would result in the permanent conversion of 134.7 ac (Site J and haul road) of primarily undeveloped land to industrial facilities. Permanent industrial facilities include the construction of the landfill, access road, borrow stockpile, laydown areas and any supporting structures.

BMPs and erosion and sediment controls will be implemented to control runoff and reduce transport and deposition of sediments within receiving streams.

The conversion of undeveloped lands to industrial facilities is minor when compared to the abundance of undeveloped land within a 5-mi radius of the site (see Table 3-1 and Figure 3-1). Furthermore, Site J is located adjacent to an area zoned for heavy industrial use (including an existing CCR landfill); therefore, the construction of a landfill at this site would be consistent with the surrounding land uses. Therefore, impacts to land use from the construction and operation of a proposed landfill would be minor and not significant.

3.3.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because the Chestnut Ridge Landfill is an existing permitted landfill, there would be no impacts to land uses that have not already been considered in the issuance of the existing landfill permit.

3.4 Prime Farmland

3.4.1 Affected Environment

The 1981 Farmland Protection Policy Act (7 Code of Federal Regulations [CFR] Part 658) requires all federal agencies to evaluate impacts to prime and unique farmland prior to permanently converting to land use incompatible with agriculture. Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. These characteristics allow prime farmland soils to produce the highest yields with minimal expenditure of energy and economic resources. In general, prime farmlands have an adequate and dependable water supply, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content and few or no rocks. Prime farmland soils are permeable to water and air, not excessively erodible or saturated for extended period and are protected from frequent flooding.

Within the Site J project area, most (85 percent) of the soils are not considered to be prime farmland soils (Table 3-2). Dominant soils within the project area include Collegedale silt loam, Salacoa silt loam and Collegedale-Rock outcrop complex. Approximately 15 percent of the lands within the project area are represented by soils classified as prime farmland. All of the prime farmland soils are located along Worthington Branch in the northeast section of the site (Figure 3-2). Prime farmland soil types within Site J include Tasso loam, Hamblen silt loam and Swafford loam. There is also some Cedarbluff loam, which is considered to be prime farmland soil if drained.

Table 3-2. Soil Types Mapped Within the Proposed Project Area

Soil Mapping Unit	Prime Farmland	Acres	Percent of Area
Prime Farmland		**19.9**	**14.8%**
Tasso Loam	Yes	3.3	2.4%
Hamblen Silt Loam	Yes	4.1	3.0%
Swafford Loam	Yes	4.5	3.3%
Cedarbluff Loam	Yes, if drained	8.0	5.9%
Not Prime Farmland		**114.8**	**85.2%**
Dewey Silt Loam	No	2.6	1.9%
Collegedale Clay	No	7.3	5.4%
Udorthents	No	10.9	8.1%
Collegedale Silt	No	19.1	14.2%
Salacoa Silt Loam	No	30.2	22.4%
Collegedale-Rock Outcrop Complex	No	44.7	33.2%
Total		**134.7**	**100.0%**

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action

Under Alternative A, there would be no new ground-disturbing activities. As a result, no impacts to prime farmland would occur.

3.4.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Alternative B would result in minor impacts to soils with prime farmland characteristics, but the proposed site is zoned residential and no farming operations are occurring onsite. Based on the proposed development plan, impacts from construction and operation of the facility include approximately 20 ac of prime farmland within the limits of disturbance. Within this area, there would be some areas that would not include substantial ground disturbance activities.

Approximately 7,241.6 ac (14.4 percent) of the area within 5 mi have soils classified as prime farmland. The largest concentrations of prime farmland soils are located south of the BRF facility (see Figure 3-2). The minor loss of on-site prime farmland soils is not significant when compared to the amount of land designated as prime farmland within the surrounding region. In addition, Site J had previously been used and zoned for residential use, which resulted in the disturbance of much of the land during housing development on the site.

3.4.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no impacts to prime farmland under this alternative.

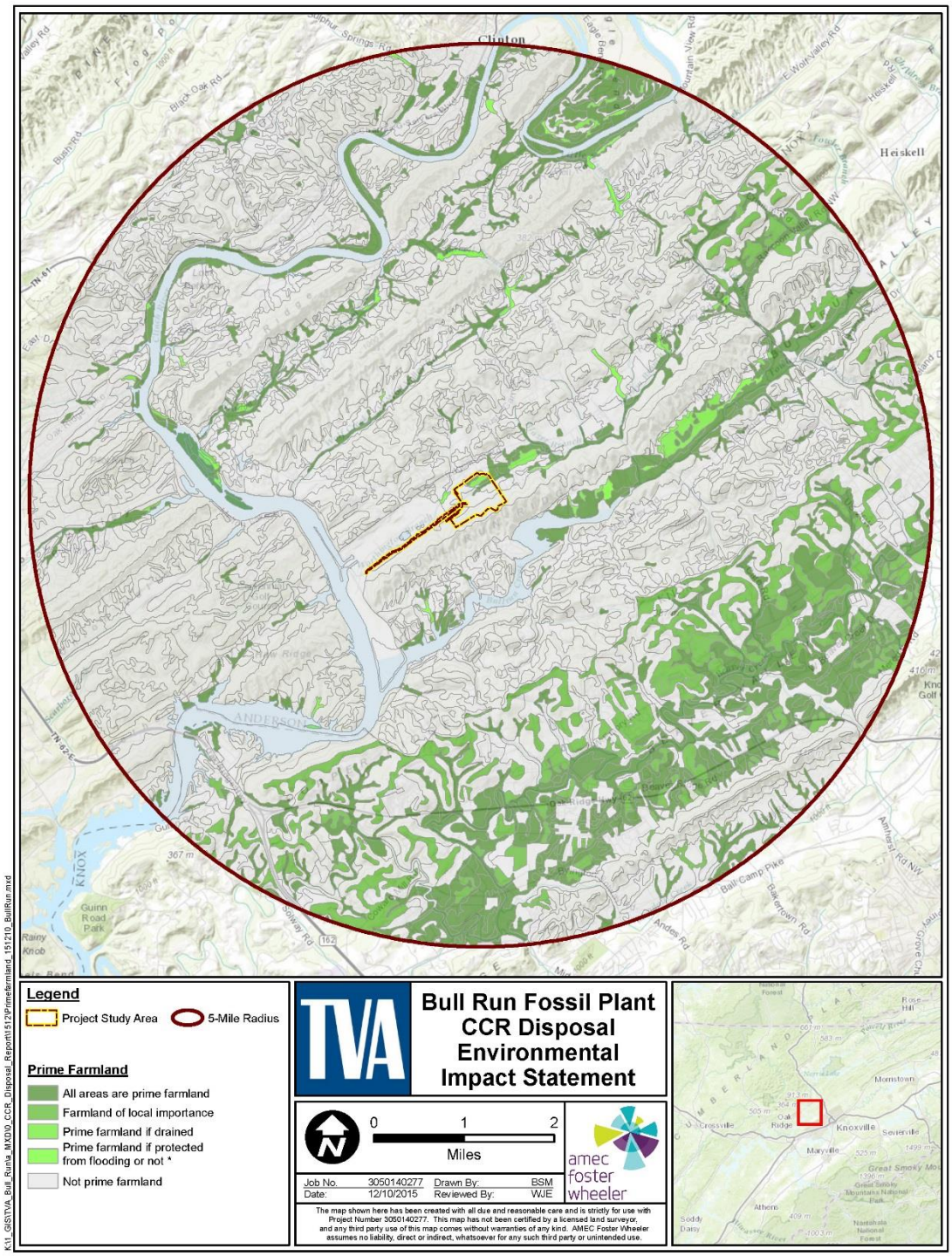

Figure 3-2. Prime Farmland in the Vicinity of Site J

3.5 Geology/Seismology

3.5.1 Affected Environment

The proposed site is located in the Valley and Ridge Physiographic Province, a northeast-southwest trending series of parallel ridges with elevations up to 3,000 ft and valleys composed of folded and faulted Paleozoic sedimentary rock. The primary geomorphological features are mainly the result of differential weathering of various rock types, which include limestone, dolomite, shale, sandstone and siltstone. Alluvial overburden with variable thickness mantles much of the site and has been derived by flood events of the Clinch River. Larger valleys may have a comparatively thin mantle of alluvial soils ranging in size from clay to coarse sand to boulders. Deeply weathered alluvium in the vicinity of streams and rivers may be found both in low-lying areas and on hills, reflecting the dynamic geologic nature of the province (TVA 2014).

The topographic relief within the project area is approximately 330 ft (Figure 3-3). Surface elevations at the site grade downward to the southwest (4 percent grade) with elevations ranging from 880 ft above mean sea level (ft msl) near Old Edgemoor Lane to 850 ft msl along Worthington Branch. From Worthington Branch, the elevation grades upward to the southeast (6 percent grade) to 905 ft msl at which point the grade increases significantly up the slope of Bullrun Ridge (35 percent grade) to the highest point of the site (approximately 1,180 ft msl).

3.5.1.1 Geology

3.5.1.1.1 Bedrock Stratigraphy

TVA performed a hydrogeologic investigation of the site in 2014 (TVA 2014). The results of the investigation indicate that the site is underlain by topsoil and surface road gravel. This material overlies fill material consisting of dry to moist clay with small amounts of organics, sand and rock fragments. Colluvial deposits which consist of heterogeneous, unconsolidated, fine-grained native soil deposits transported from upper to lower elevations by means of gravity and/or surface water wash underlie the fill material.

Bedrock in the project area consists of various units of the Chickamauga Formation which consist of gray, mostly fine to medium-grained, thin to medium-bedded, in part shaly and nodular limestone. The geologic formations encountered during the 2014 hydrogeologic investigation (TVA 2014) are, in descending stratigraphic order, Conasauga Group (Cc), the Rome Formation (Cr) and Ordovician Chickamauga Limestone (Och).

3.5.1.1.2 Geologic Hazards

U.S. Geological Survey (USGS) information and geologic studies carried out by TVA indicate that the proposed site and surrounding area is known to be subject to minor to moderate seismic events; faulting and karst topography are common to the area.

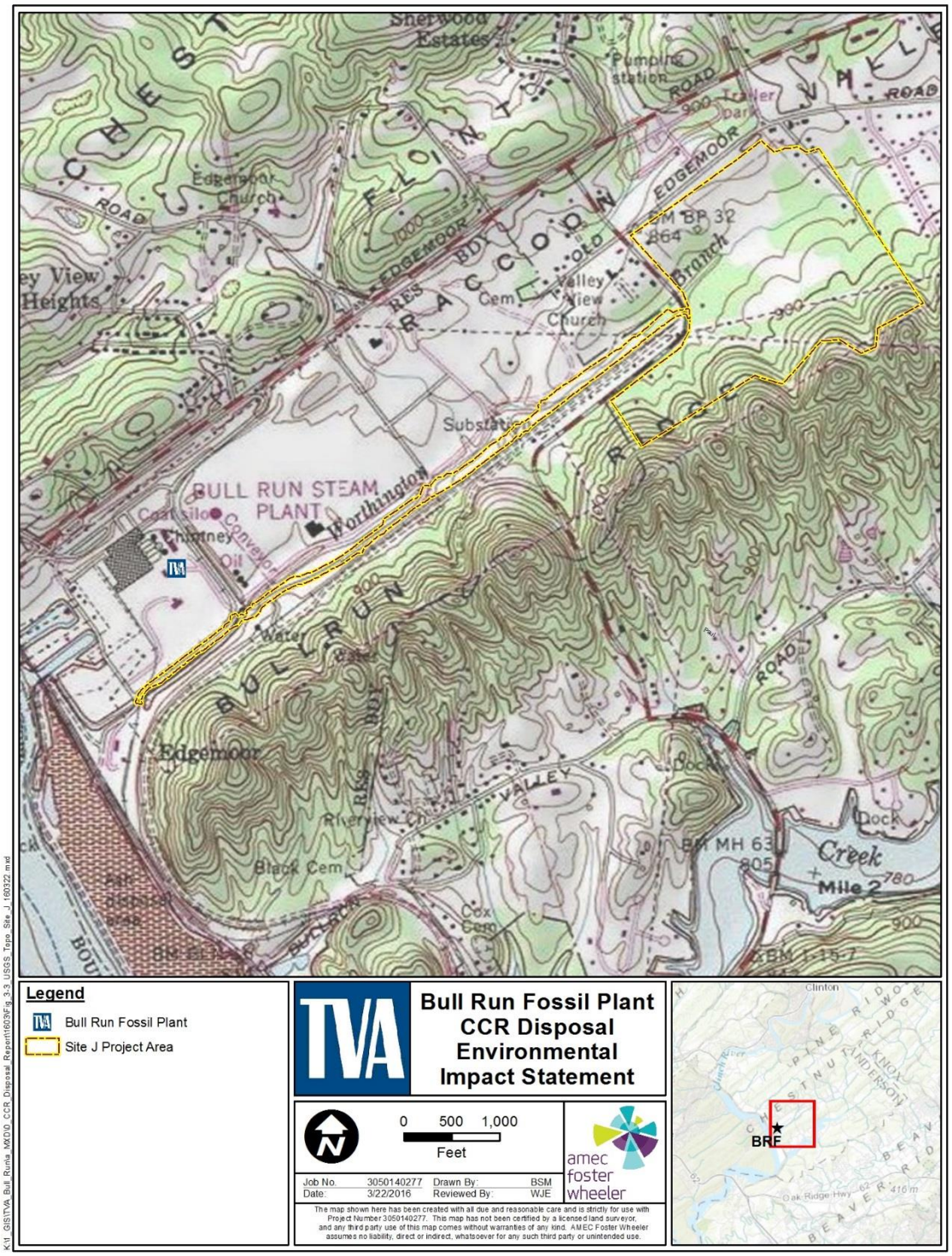

Figure 3-3. Topographic Map of Site J and the Surrounding Area

3.5.1.2 Seismic Events

Seismic events affecting eastern Tennessee, which includes the area within the vicinity of BRF, primarily emanate from three zones of earthquake activity: the (1) New Madrid Seismic Zone (NMSZ), (2) Southern Appalachia Seismic Zone (SASZ) and (3) South Carolina Seismic Zone (SCSZ). The most active zone of the SASZ, the East Tennessee Seismic Zone (ETSZ), extends from northwestern Georgia through east Tennessee and is situated in close proximity to the plant. 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 moderate risk of damage from a seismic event. In contrast, if a large earthquake were to occur within the New Madrid zone to the west, damage to East Tennessee would be possible. The Geologic Hazards Map of Tennessee – Environmental Geology Series No. 5 developed and published by the TDEC, Division of Geology and compiled by Robert Miller (1978) shows the plant to be located in Seismic Risk Zone 2 on a scale of 1 to 5 with Zone 5 being the most active risk of seismic activity.

Potential Peak Ground Acceleration (PGA) for the proposed landfill site and vicinity based on 2014 USGS data is shown on Figure 3-4 (USGS 2014). The PGA values for the 2014 USGS map are provided for a reference soft rock condition and values are adjusted based on site classification (hard rock, rock, dense soil/hard rock, etc.). For sites that lie within zones that exceed 0.1 gravitational pull (g), or for which adjusted values based on site conditions exceed 0.1 g, additional analysis is required to demonstrate that all structural components are designed to withstand seismic events. The PGA for the proposed site is 0.3 g.

<u>Faults</u>

Based on a review of the USGS website which contains information on faults and associated folds in the United States that are believed to be sources of magnitude >6 earthquakes during the Quaternary Period (the past 1,600,000 years including Holocene Epoch), there are no known faults of this age located near the area of the proposed site (USGS 2014).

<u>Karst Topography</u>

“Karst” refers to a type of topography that is formed when rocks with a high carbonate (CO_3) content, such as limestone and dolomite, are dissolved by groundwater to form sink holes, caves, springs and underground drainage systems. Karst features such as sinkholes and springs are numerous in the Valley and Ridge province and as such Site J is located in an area known to contain karst terrain. However, no significant voids or sinkholes were encountered during drilling within the landfill footprint and there are no caves present on the proposed Site J landfill (TVA 2014).

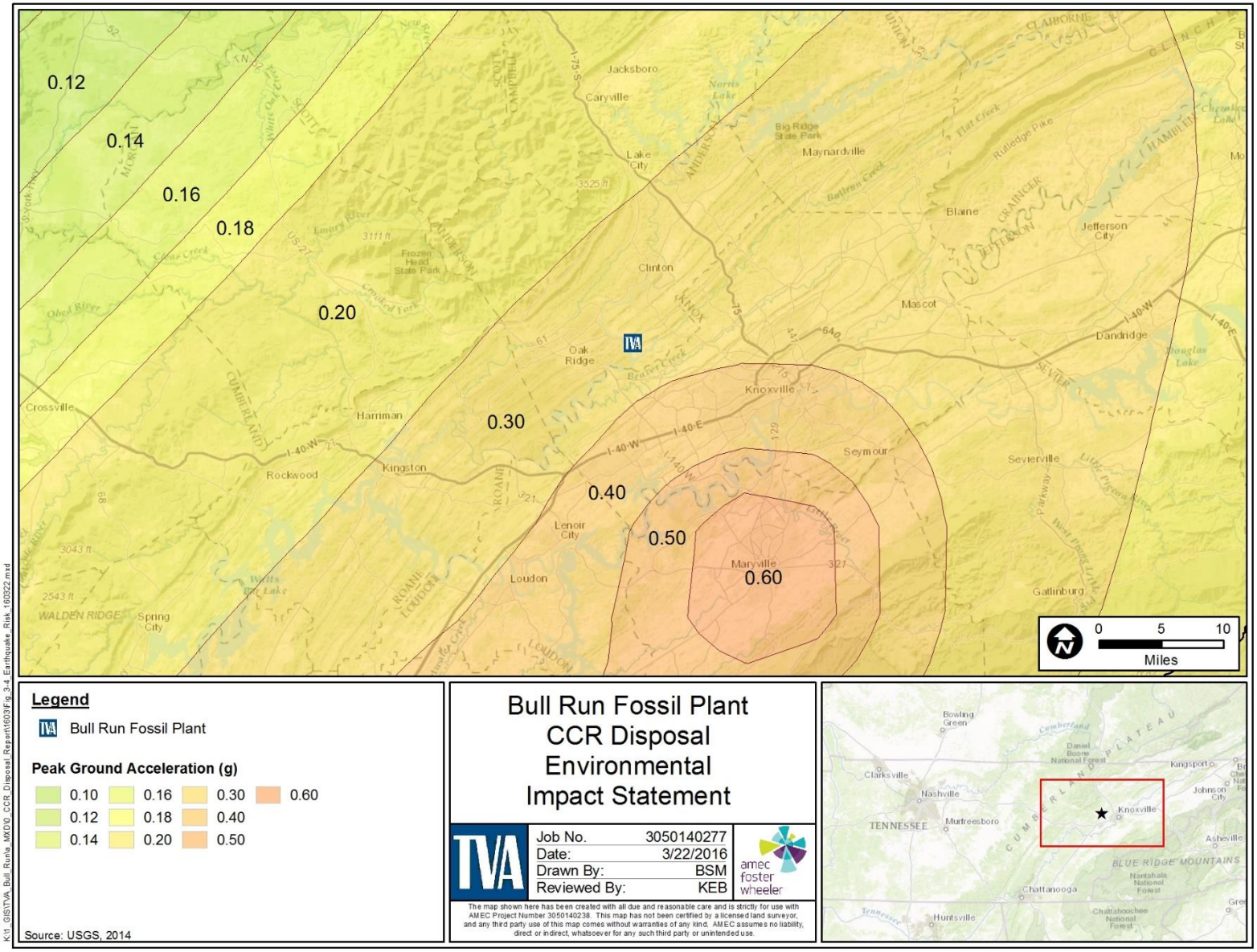

Figure 3-4. Seismic Peak Ground Acceleration Factors in the Vicinity of the Site J

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action

Under the No Action Alternative there would be no ground-disturbing activities and therefore no impacts to geology and soils would occur.

3.5.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.5.2.2.1 Construction Impacts

Construction of the proposed landfill and haul road would involve ground disturbing activities that would include grubbing, grading and excavation. In addition, relocation of Worthington Branch could involve controlled blasting. Soil excavations, removal of vegetation, grading and construction activities have the potential to disturb soil stability and increase erosion. Despite this, impacts to soil resources associated with surface disturbances related to the proposed construction, excavation, blasting, clearing and grubbing activities are expected to be minor, as BMPs outlined in the Storm water Pollution Prevention Plan designed to minimize erosion during land clearing and site preparation would be implemented.

3.5.2.2.2 Operational Impacts

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

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

Based on the USGS website information, there are no known faults of this age located within 200 ft of the proposed site (USGS 2014). Therefore, the potential for surface fault rupture at the proposed landfill site is considered to be low.

Pursuant to the CFR Title 40 Part 257.53: Criteria For Classification of Solid Waste Disposal Facilities and Practices, seismic impact zone means an area with a 10 percent or

greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. The general 2014 USGS map indicates that the proposed Site J is in an area where this standard would be exceeded. Site-specific analysis suggests that Site J will be designated Seismic Site Class D, as defined in the American Society of Civil Engineers Standard (ASCE 2013). Consequently, the disposal facility has been seismically designed to withstand a probabilistic earthquake.

On-site and local geologic and geomorphic features within and around the proposed landfill's footprint were evaluated during the hydrogeologic investigation of the proposed landfill site. This investigation indicated that native soils do not meet any of the criteria for liquefaction to be induced; therefore, the site is not likely to be susceptible to liquefaction. Settlement within most areas of the disposal facility averaged 13 inches under anticipated loading conditions. Based on the design of the facility, the underlying soil conditions do not indicate that construction of the landfill will result in significant differential settling.

Although, the investigation revealed no karst features within the disposal facility's footprint, a sinkhole contingency plan has been developed to address unforeseen subsurface karst features if encountered during construction of the disposal facility.

3.5.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill. Since this is an existing permitted landfill, there would be no changes from the existing environment within the landfill boundaries under this alternative. Therefore, there would be no impacts at the BFR site.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any resources along the haul route are already subjected to vehicular traffic destined for the landfill and no new roads would need to be constructed.

3.6 Groundwater

3.6.1 Affected Environment

Groundwater in the aquifer system of the Valley and Ridge physiographic province occurs primarily in a shallow flow system of bedrock fractures. These fractures are highly irregular in their distribution throughout the solid rock mass and generally occur within 300 ft of the land surface (Brahana et al. 1986).

Groundwater underlying BRF is derived from infiltration of precipitation and from lateral inflow along the northwest boundary of the reservation. Data from past investigations and sampling at Site J indicates Worthington Branch and Clinch River/Melton Hill Reservoir are the principal receptors of shallow groundwater flow from the plant area.

TVA conducted a comprehensive hydrogeologic investigation of Site J in two phases between January 2012 and June 2014. These studies indicate that the uppermost aquifer on Site J consists of water found within fractures or voids in the bedrock. Groundwater perched in unconsolidated materials was found on the north side of Worthington Branch. Evidence of perched groundwater was identified by seepage and by high water levels in selected wells in the area. Groundwater also occurs within the uppermost bedrock where

fracturing and weathering allows for storage and movement of water. The bedrock groundwater zone is therefore limited by the extent of weather and fracturing which result in an irregular depth and thickness of the aquifer (TVA 2013). Groundwater flow is generally in a downhill direction towards Worthington Branch and then down valley to the southwest. Groundwater on-site was observed through the installation of borings and monitoring wells, and the observation of wetlands, wet-weather conveyances/intermittent streams, ponds, ephemeral seeps and Worthington Branch. Notable groundwater related features identified on Site J include:

- Two farm ponds were located on the north side of Worthington Branch. Water levels in the two farm ponds fluctuated relatively little over the course of the year, so it is believed that they may have been fed by shallow groundwater in addition to their small surface water catchment areas. These ponds were breached sometime between 2013 and 2014 and currently have man-made ditches that drain the former pond areas into Worthington Branch. In addition, two minor drainages located on the southeast and southwest edges of Site J flow into Worthington Branch. Both of these drainages were considered wet weather conveyances as they were dry within 48 hours of a rain event and did not exhibit stream characteristics. However, during a subsequent survey, a groundwater connection was established and macroinvertebrates were observed in both drainages and a hydrologic determination indicated that 103 and 160 ft respectively of each of these drainages met the characteristics of a stream.
- Several ephemeral seeps were identified on site. Two seeps located on the north side of Worthington Branch drain relatively shallow groundwater. The eastern of the two is located at the corner of a wet meadow area and seeps only during the wet season. The western is located in a minor drainage channel on the west side of the project site. Adjacent to the south side of Worthington Branch, four seeps emanate from soil pipes when groundwater levels are relatively high.
- One wet weather spring emanates from a cavity in a bedrock exposure in the middle of the lower slope of the southern hillside. This spring discharges groundwater during very high flow times and also acts as a sink for surface runoff when groundwater levels are low.

3.6.1.1 Groundwater Use

A water supply survey was performed as part of the 2014 hydrogeologic investigation of Site J to determine public water supply sources within a 2-mi radius of the site (including water intakes, water treatment plants and public supply lines) and private water supply sources (e.g., springs and wells) within a 1-mi radius of the site (TVA 2014). There are no domestic wells on Site J. There are seven domestic wells within 1 mi of the site; two of the wells are located downgradient of the site. Well depths are unknown, but it is likely that most wells yield water at a relatively shallow depth in the Chickamauga Formation. Public water service is provided to the areas surrounding the site by the Hillsdale-Powell Utility District, which withdraws water from Bullrun Creek approximately 0.8 mi southeast of the Site J and the West Knox Utility District, which withdraws water from the confluence of Bullrun Creek and the Clinch River.

3.6.1.2 Groundwater Quality

The chemical composition of groundwater on the site was evaluated through four sampling events between March 2012 and June 2014 in which groundwater and surface water samples were collected. A total of 67 samples were collected from 22 wells and four

surface water sample sites. The samples were tested for a suite of inorganic parameters to evaluate natural influences on the baseline chemistry of upgradient and downgradient groundwater so that these influences may be accounted for in future monitoring. Applicable primary drinking water standards (health-based standards) were exceeded for nitrate at one well in October 2013 and the standard for antimony was exceeded at two surface water sites sampled in March 2012. Secondary drinking water standards were exceeded for dissolved solids, iron, manganese and sulfates at several of the sample sites. These primary and secondary drinking water exceedances are common conditions for the relatively shallow groundwater found in this geologic environment and in close proximity to rural residential and agricultural land use.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the dry fly ash stack for as long as capacity is available. There would be no change in existing CCR disposal operations and therefore no impacts to groundwater are anticipated. The dry fly ash stack will ultimately be closed under this alternative. Closure will be in accordance with applicable state and federal requirements, and impacts to groundwater are not anticipated.

3.6.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

In accordance with TDEC requirements, the proposed landfill design will incorporate a composite liner system that meets Federal Subtitle D Resource Conservation and Recovery Act regulations performance standards ($1x10^{-7}$) permeability. As described in Chapter 2, the liner system will utilize a synthetic liner in combination with a compacted clay liner. The landfill design will incorporate requirements designed to reduce groundwater impacts including a storm water management system, leachate migration control standards, karst remediation (if necessary), a geosynthetic cap system and a groundwater monitoring program as required by TDEC Rule 0400-11-01 and as specified by permit requirements. BMPs would be used to control sediment infiltration from storm water runoff during all construction phases of the project.

It is anticipated that construction and operation of the proposed landfill site will not have a notable impact to groundwater as the new landfill would be required to maintain a liner system as well as an engineered cap to mitigate groundwater flow through the materials. Therefore, with the use of BMPs and adherence to TDEC requirements, minimal impacts to groundwater from the proposed action are expected.

3.6.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to groundwater resources that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to groundwater are expected to occur with this alternative.

3.7 Surface Water

3.7.1 Affected Environment

The Clinch River is a primary surface water drainage feature of Anderson County and parts of eastern Tennessee. Natural flow of the Clinch River is regionally to the southwest towards its confluence with the Tennessee River. However, because of the meandering

nature of the river, flow is from the northwest to the southeast adjacent to BRF and then to the west a short distance downstream of BRF. Two impoundments, Norris and Melton Hill Reservoirs, are located on the Clinch River. Located at CRM 48.0, BRF is 31.8 river miles downstream from Norris Dam and 24.9 river miles upstream of Melton Hill Dam. Flow in the Clinch River in the vicinity of BRF is dependent upon releases through the hydroelectric plant at Norris Dam and releases from Melton Hill Dam. An arm of Melton Hill Reservoir is present within the Bullrun Creek drainage, south of the project area. At CRM 48.0, the Clinch River drainage area is approximately 3,090 square mi.

The latest TDEC 303(d) report (TDEC 2014) states that chlordane, polychlorinated biphenyls (PCB), mercury, *E. coli*, loss of biological integrity due to siltation, physical substrate habitat alterations, habitat loss due to alteration in stream-side or littoral vegetative cover, arsenic, strontium, cesium, biological loss due to undetermined cause and oil and grease contamination have all been found as factors that impact the integrity of the Clinch River. This contamination is due to contaminated sediment, the presence of a site subject to regulation of Comprehensive Environmental Response, Compensation, and Liability Act, pasture grazing atmospheric deposition, industrial point source, channelization, industrial permitted runoff, discharges from municipal separate storm sewer areas and municipal urbanized areas. The Clinch River in Anderson County, upstream of BRF, is also listed for temperature and flow alterations due to upstream impoundment (Norris Dam).

TVA has taken action to improve water quality and flows within its reservoirs. Most notably, TVA monitors the ecological condition of its reservoirs as part of the Vital Signs Monitoring Program (http://www.tva.gov/environment/ecohealth/index.htm), which was initiated by TVA in 1990. Reservoirs throughout the Tennessee Valley have been monitored for physical and chemical characteristics of waters, sediment contaminants, benthic macroinvertebrates (bottom-dwelling animals such as worms, mollusks, insects and snails living in or on the sediments) and fish community assemblage. Five key indicators (i.e., dissolved oxygen [DO], chlorophyll, fish, bottom life, and sediment contaminants) are monitored and contribute to a final rating that describes the "health" and integrity of an aquatic ecosystem. The reservoir ecological health evaluation system is reviewed each year, and improvements needed to address problems are identified. These improvements include installing equipment to add oxygen to the water as it flows through dams and adjusting reservoir flows.

The Site J project area and the Chestnut Ridge Landfill are located within the Lower Clinch River Watershed, Hydrologic Unit Code 06010207. Worthington Branch, a small direct tributary to the Clinch River/Melton Hill Reservoir is the primary drainage feature of the Site J project area (Figure 3-5). Worthington Branch flows through Site J and continues westerly along the southern side of BRF, discharging to the Clinch River via the same outfall as BRF permitted Outfall 2 which is the condenser cooling water outlet. The condenser cooling water flow is approximately 565 MGD, or 870 cubic ft per second (cfs). The Worthington Brach watershed is located within the 0103 sub-watershed (12-digit Hydrologic Unit Code). A search of the U.S. Geological Survey (USGS) and EPA Storet databases found no water quality samples for Worthington Branch. There have been no known water quality investigations at Worthington Branch.

Bullrun Creek is listed as impaired because of elevated levels of *E. coli* that are attributed to pasture grazing, collection system failure and discharges from a Metro Water Services MS4 Program area (TDEC 2014).

Worthington Branch is not identified as an impaired waterbody on the Proposed Final 303(d) List (TDEC 2014). Upstream of Melton Hill Dam, the Clinch River and Melton Hill Reservoir are classified as a State Scenic River (Class III – Developed River Area) (TDEC 2015).

Regionally, three Total Maximum Daily Load (TMDL) studies have been completed for the Lower Clinch River watershed. There are watershed TMDLs for pathogens, for siltation and habitat alteration and for PCBs and chlordane in Melton Hill Reservoir. Based on CCR landfill activities, the siltation and habitat alteration TMDL may be the most relevant of the TMDLs established. Foster Branch and Williams Branch, streams appearing to be similar to Worthington Branch based on land use and topography, and nearby tributaries to Bullrun Creek, are or have been 303(d) listed impaired streams for siltation and habitat alteration.

3.7.1.1 Hydrology

Worthington Branch has had significant rerouting and channelization from its original course through BRF in the past by previous plant activities. In addition, the portion of the stream that bisects the proposed landfill site has been channelized by a previous property owner. Worthington Branch is classified as a perennial stream and generally flows from northeast to southwest toward its confluence with the Clinch River approximately 1.8 mi west of Isabella Lane. Upstream of the project area, the channel passes through a small residential area along Greendale Lane. Soon after entering the project area, Worthington Branch flows through a corrugated metal culvert beneath Isabella Lane. Between Isabella Lane and New Henderson Road, Worthington Branch is shallow, linear, intermittent channelized stream and has poorly to moderately vegetated banks. The stream continues southwest through culverts under New Henderson Road into a forested area between the existing dry fly ash stack and a rail line, while remaining roughly parallel with the rail line. The stream flows southwest along the rail line and through a box culvert under an access road continuing outside the project area toward its confluence with the Clinch River, approximately 1.8 mi west of Isabella Lane.

The Worthington Branch drainage area at the upstream (near Isabelle Lane) and downstream (at New Henderson Road) boundaries of the site are 200 and 295 ac, respectively. Worthington Branch continues southwesterly from the site along the southern edge of BRF to the Clinch River. Near the outlet to Clinch River, the Worthington Branch drainage area is 2.2mi^2 (1,410 ac) according to the USGS StreamStats web-based program (Ladd and Law 2007). The stream profile slope in the vicinity of Site J is approximately 0.0075 ft/ft, falling from approximately 855 ft to 839 ft (16 ft), over a distance of approximately 2,140 ft. At more than 40 ft above the Clinch River 100-year flood elevation of 797 ft, Site J is not subject to flooding from the Clinch River.

Figure 3-5. Surface Water and Wetland Features – Site J and the Surrounding Area

TVA completed a reconnaissance level assessment of Worthington Branch within the Site J project area in January 2012 (TVA 2012). The assessment included a classification of the surface runoff conveyances at Site J to determine if they are classified as “streams” or as “wet-weather conveyances” according to TDEC methods (Hydrologic Determination Field Data Sheet). The assessment concluded that two minor drainages flow into Worthington Branch. These are located on the southeast and southwest edges of Site J (see Figure 3-5). Both of these drainages were considered wet-weather conveyances as they were dry within 48 hours of a rain event and did not exhibit stream characteristics. However, during a subsequent survey, a groundwater connection was established and macroinvertebrates were observed in both drainages and a hydrologic determination indicated that 103 and 160 ft respectively of each of these drainages met the characteristics of a stream.

In addition to the streams and runoff conveyances at the site, two small man-made ponds were located on the north side of Worthington Branch. As identified in Section 3.6 (Groundwater), water levels in the two farm ponds located on the site fluctuated relatively little over the course of the year. The impounding berms of these two ponds were breached in 2014, and currently both ponds have man-made ditches that drain into Worthington Branch. It is believed that the ponds may have been fed by shallow groundwater in addition to their small surface water catchment areas.

Surface runoff in the region is typically about 1.35 cubic ft per square mi, or 18 inches per year. However, small streams with long-term runoff data in the region show highly variable runoff rates, presumably influenced by groundwater discharges. The average annual precipitation at Oak Ridge, west of the project area, is 50.9 inches (National Weather Service 2015). Precipitation depth, duration and frequency data for the area (National Oceanic and Atmospheric Administration [NOAA] 2004) are summarized in Table 3-3.

Table 3-3. Precipitation Depth Duration Frequency Data for the Project Site

Duration	Precipitation Depth (inches) for Given Average Recurrence Interval (yr)							
	1	2	5	10	25	50	100	500
60-min	1.13	1.36	1.70	2.00	2.42	2.78	3.17	4.20
6-hr	1.79	2.13	2.60	3.01	3.60	4.11	4.65	6.04
24-hr	2.74	3.27	3.99	4.59	5.44	6.14	6.88	8.80
2-day	3.33	3.98	4.87	5.59	6.61	7.44	8.32	10.5
7-day	4.67	5.57	6.72	7.61	8.80	9.72	10.7	12.9
20-day	7.46	8.82	10.3	11.4	12.8	13.8	14.8	17
30-day	9.19	10.8	12.4	13.6	15	16	17	19

The StreamStats program includes a method to provide statistically based low flow characteristics as well as flood flows. The method included in StreamStats has a lower bound on drainage area that precludes application to Worthington Branch at the project site. A more recent USGS investigation (Law et al. 2009) can be applied using input information generated by StreamStats. Selected streamflow characteristics for Worthington Branch generated by StreamStats and by the more recent method are summarized in Table 3-4.

Table 3-4. Low Flow and Flow Duration Estimates for Worthington Branch

Flow Parameter (cfs/inches)	Downstream (West) of Site J (0.46 mi^2)	Outlet to Clinch River (2.2 mi^2)	
	Region of Influence Method	Region of Influence Method	Regional Regression Method
10-Year, 7-Day Low Q	0.04	0.26	0.10
5-Year, 30-Day Low Q	0.07	0.38	0.17
Mean Annual Flow	0.72 / 21.2	3.7 / 22.8	3.0 / 18.5
Mean Summer Flow	0.32 / 9.4	2.1 / 13.0	1.2 / 7.6
Annual 90% Exceed.	0.08	0.52	0.24
Annual 50% Exceed.	0.29	1.8	1.2
Annual 10% Exceed.	1.62	8.0	6.8

Source: NOAA 2004

The Clinch River drainage area at BRF is approximately 3,090 mi^2. The USGS operated streamflow Station 03538150, Clinch River near Oak Ridge, from 1937 through 1968 during which time the average annual flow rate was 4,570 cfs. The drainage area at that station is 3,385 mi^2, or approximately 10 percent larger than the drainage area at BRF.

There are several existing wastewater streams at BRF permitted under NPDES Permit TN0005410. Because the Outfall 001 location is the primary outlet potentially affected by the proposed project, it is the only existing BRF wastewater stream discussed here. About 8.83 MGD of effluent is discharged to Clinch River via NPDES Outfall 001. Outfall 001 discharges from the Stilling Pond located along the northern bank of the end of the Bullrun Creek arm and at approximately CRM 46.6. Discharges from the site would include station sumps, leachate, outage washes, flue gas desulfurization discharge water, minimal low volume wastewater flows and some process and non-process storm water driven flows. However, due to activities associated with the closure of the ash impoundments at BRF, changes in discharge flow would be likely as a result of that project (TVA 2016).

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action

No significant changes to surface water resources are anticipated under the No Action Alternative.

3.7.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.7.2.2.1 Construction Impacts

Construction of the landfill and haul road at the project site according to the proposed plan would require realigning the Worthington Branch channel from the eastern site boundary to the western site boundary to provide a larger landfill waste disposal area. The total disturbed area at Site J would be approximately 119.9 ac. Construction of the haul road to transfer CCR materials from the plant to Site J would require approximately 1.37 mi of new roadway, including a 40-ft wide pavement. The new haul road impacted area is approximately 14.8 ac, increasing the total project impact area to approximately 134.7 ac. Approximately 1,321 ft of Worthington Branch would be impacted by the proposed haul road.

Approximately 2,158 linear ft of Worthington Branch and its tributaries would be relocated to an excavated 2,700-ft long channel to the north (see Figure 3-5). That channel would

require excavation to depths of up to approximately 30 ft and much of the excavation would be likely be in rock. The new channel is entirely off-line from the existing channel and can be constructed without water flow through the channel until the connection is made to the existing channel at the upstream end. Provisions would be taken to prevent flood water flow into or through the new channel and discharge of pollutants in the event of a large runoff event. Construction of the haul road would encroach into the Worthington Branch channel at one or more locations. TVA has coordinated with TDEC and U.S. Army Corps of Engineers (USACE) and has proposed mitigation for these areas through payment to an appropriate stream bank and/or restoration on-site. All applicable ARAP and USACE 404 permits would be obtained and mitigation prescribed by the terms and conditions of these permits would be followed.

There is potential for increased runoff during construction of the landfill (i.e., initial excavation and liner construction prior to beginning placement of CCR in the landfill). BMPs for erosion and sediment control, as well as all types of construction site pollution prevention, would be employed to control soil erosion and rock excavation dust which would minimize these temporary impacts.

3.7.2.2.2 Operational Impacts

Hydrology/Surface Runoff Rate and Volumes

Construction of the landfill would include a cover system for isolation of the CCR. The final cover system would be constructed when the fill reaches the final planned elevation. Prior to reaching final grades, runoff from the active filling area, which would have potentially contacted CCR, would be collected and directed into the leachate collection system. Runoff that is non-CCR contact runoff (not potentially contacting CCR materials) would be directed into one of the on-site storm water sedimentation ponds which discharge to Worthington Branch. Storm water potentially contacting waste materials at the active fill placement area would be minimized by use of diversions, temporary covers and pumps (TVA 2015e) to control flows and prevent contact which discharge to Worthington Branch. Worthington Branch ultimately flows to the Clinch River through NPDES Outfall 002 which is the permitted outfall for the BRF condenser cooling water. Leachate and storm water that may have contacted CCR materials would be handled separately from non-contact storm water and would be pumped to the plant for treatment prior to discharge through NPDES Outfall 001.

The final cover would be installed in phases and would minimize percolation of water from the cover into the underlying CCR. Because the bedrock is near the surface at the project site and runoff is relatively high in the region (i.e., approximately 18 inches per year), a cover with a low percolation rate would not significantly change the runoff conditions. Rock-lined letdowns would convey surface water run-off to perimeter channels and catch basins at the base of the disposal facility.

As described above, surface water runoff would be collected in three sediment basins located on the west, south and northeast sides of the landfill cells. The ponds located on the west side and northeast sides of the disposal facility would be incised ponds created by excavation into existing ground. The south pond would require construction of an embankment in the existing valley area and would be lined with a flexible membrane liner to prevent seepage into the subsurface below the landfill. Water would be discharged from the south pond by a directionally drilled culvert, and storm water would be conveyed from south of the soil embankment to the east side of the landfill.

The basins would be designed to detain at least a 25-year/24-hour storm and control flow resulting from a 100-year/24-hour storm so that storm water is discharged through a combination of the primary and the emergency spillway culverts to the relocated Worthington Branch.

The realigned segment of Worthington Branch (see Appendix C) would be constructed in accordance with permit requirements. The constructed channel would include a low flow channel and narrow bench, or floodplain terrace, bordering the channel, but would not provide the width of overbank floodplain storage as the existing channel. However, the length of the realigned channel would be slightly longer than the existing channel. Combined with the detention provided in the two storm water ponds for on-site runoff, no significant change in runoff rates would occur. Additionally, the realigned channel would be sized to prevent an increase in flood levels upstream of the site.

Water Quality

Storm water that does not have contact with CCR would be discharged from the two storm water detention and settling ponds into the re-located segment of Worthington Branch and from there it would flow a distance of approximately 1.6 mi through the existing Worthington Branch to existing BRF Outlet 002. Discharge would meet all permit requirements. Mitigation measures would be implemented should the process not meet permit requirements.

During landfill operations, CCR materials being conveyed and placed at the landfill face would be subject to erosion by wind and water flow. Materials eroded by wind may be deposited directly into waters or on surfaces with subsequent potential for erosion and transport to waters. Wind erosion may be effectively controlled by sufficient moisture content in the transported and handled CCR materials and employing dust control activities. Where CCR materials are exposed to direct precipitation or surface runoff, other means of control may be employed such as temporary covers of CCR materials, maintenance of a working area of approximately 10 ac and runoff diversions to minimize runoff volume that has potentially contacted CCR. The contained runoff would be directed to the leachate collection system where it would be pumped to the plant treatment system prior to discharge to the settling pond and eventual discharge via plant NPDES Outfall 001.

BMPs for prevention of pollutant discharge to surface waters would be applied throughout landfill operations to minimize generation of storm water. BMPs to be employed include non-structural and structural practices to minimize risk of pollutant release and transport by runoff and wind.

Leachate would be handled separately from storm water. Construction of the landfill and CCR material placement is anticipated to occur in three landfill cells, or phases. Each cell would have a separate leachate collection system. Leachate would be collected from above the landfill bottom liner and conveyed to a leachate sump. The liner and leachate collection system would be a system that is compliant with, or equivalent to, the TDEC Subtitle D liner design standards. Leachate surge storage would be provided by tanks or a lined leachate pond and leachate would be pumped to the existing on-site treatment system used for the existing dry fly ash stack. Treatment of the leachate would be provided in the leachate treatment system as required to meet discharge quality standards. The treatment system would include sedimentation, neutralization and coagulation in the stilling impoundment located along Clinch River. Discharge would be at Outfall 001 from the settling pond to the Clinch River as identified in the existing NPDES permit.

The leachate collection and discharge rates have been predicted for various stages of landfill operation (Nick Golden, URS, personal communication, December 2014). Average rates range from approximately 24,000 to 53,000 gallons per day (0.037 to 0.082 cfs), depending on stage of construction and plan area of waste placement. Peak daily leachate generation rates are expected to range from approximately 148,000 to 265,000 gallons per day (0.23 to 0.41 cfs).

The leachate would be directed to treatment along with several other wastewater streams, including leachate from the existing dry fly ash stack, prior to discharge at NPDES Outfall 001 at the stilling impoundment. Chemical addition and mixing to facilitate coagulation and settling would occur in the settling impoundment. No new chemical constituents would be introduced to this treatment system that are not already in the existing wastewater streams. The NPDES permit for Outfall 001 is based on an existing condition average day flow of 14.32 MGD (22.1 cfs). As the anticipated leachate flow is less than 0.05 MGD (on average), this would not be considered a significant increase in flow or have a measureable impact on discharge water quality. Operationally, treatment chemical addition is adjusted as needed to meet discharge concentration needs. Notably, the volume of water discharged to the Clinch River at the permitted NPDES outfall has actually decreased since the cessation of fly ash sluicing. The Site J average day leachate generation rate for the development phase with highest flow is only 0.0092 percent of the Clinch River average day flow rate, which is estimated to be 4,450 cfs based on the 90-year long streamflow record at the USGS Station 03533000, Clinch River below Norris Dam located upstream from BRF. Therefore, there would be no measurable change to surface water impacts.

The proposed landfill would meet or exceed all permit requirements, therefore impacts associated with operation and closure of the landfill are not anticipated.

3.7.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill. As this alternative assumes that transport of CCR would be to an existing, permitted landfill, no new roads would be constructed, and there would be no direct impact to surface water resources associated with this alternative. No change to the existing environment within the landfill boundaries are anticipated. Therefore, potential surface water impacts associated with this alternative would primarily be indirect impacts related to the transport of CCR material from BRF to the landfill. These impacts would be realized as a result of increased exhaust and fugitive dust that could indirectly impact surface water resources adjacent to the haul route.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic, and no new roads would be constructed. Therefore, surface water resources along the haul route are already subjected to vehicular traffic destined for the landfill. Additional trucks along this route would result in minor increases of fugitive dust and exhaust emissions that could indirectly impact surface water resources along the route due to deposition. However, BMPs such as covered loads, wet suppression and equipment maintenance would be implemented as appropriate to minimize impacts. Therefore, impacts to surface waters along the haul road to Chestnut Ridge are not anticipated.

3.8 Floodplains

3.8.1 Affected Environment

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

The project areas for both the proposed BRF landfill location and the Chestnut Ridge Landfill location are not within floodplains mapped under the National Flood Insurance Program (see Figure 3-5). The BRF site is located within the boundaries of Flood Insurance Rate Map number 47001C0245G, May 4, 2009 (Anderson County, Tennessee and Incorporated Areas).

Storm event peak runoff rates for the Worthington Branch watershed can be estimated using the USGS regional regression equations as implemented on the web-based StreamStats program. At New Henderson Road, the regression equations provide a best estimate of 2-, 10- and 100-year return period peak flows of 63, 137 and 260 cfs. Selected precipitation depth-duration-frequency data for the area are summarized in Table 3-3

There is no printed Flood Insurance Rate Map encompassing the Chestnut Ridge Landfill location because there are no special flood hazard areas in that portion of Anderson County, and specifically at the proposed Chestnut Ridge Landfill. The unprinted Flood Insurance Rate Map is number 47001C0260F which can be viewed on Federal Emergency Management Agency's National Flood Hazard Layer at https://msc.fema.gov/portal/search.

3.8.2 Environmental Consequences

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 500-year floodplain.

No impacts to floodplains would occur under the No Action Alternative.

Additionally, because there is no mapped National Flood Insurance Program floodplain at either the BRF location or the Chestnut Ridge Landfill location, neither of the alternatives would result in impacts to mapped floodplains, which would be consistent with EO 11988.

3.9 Vegetation

3.9.1 Affected Environment

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion of Tennessee (Griffith et al. 2001). Dominated by cherty clay, lands within this ecotype historically supported mixed deciduous/evergreen forest but many lands on gentler slopes have been converted to agricultural uses such as cropland and pasture.

As discussed in Section 3.3 (Land Use), surrounding land use consists of agricultural, residential, rural and commercial activity. Land use/land cover based on National Land Cover data within the project area and within the 5-mi radius of Site J is summarized in Table 3-1. Notably, deciduous forest (56.0 ac) and grassland/herbaceous (46.6 ac) cover types comprise 76 percent of the 134.7 ac within Site J and the haul route. Much of the land within the 5-mi radius is undeveloped and has either remained as undisturbed woods or used for agriculture (Figure 3-6).

Site vegetation was previously described by TVA (TVA 2013). An additional field reconnaissance was conducted within the project area in October 2015 to evaluate the current environmental conditions. Within Site J and the proposed haul road, 53 species of plants were identified. Plants in the herbaceous strata included ruderal species commonly found in agricultural or developed land use areas such as ragweed, partridge pea, mare's tail, Queen Anne's lace, sericea lespedeza and goldenrod. Common shrubs included winged sumac, Chinese privet and bush honeysuckle. In forested areas, common tree species included oaks, eastern redbud and, in the wetland areas, sycamore and pignut hickory (see Section 3.13, Wetlands). Portions of the project area have been more recently disturbed due to the construction and subsequent demolition of residential properties.

Wooded areas consist of a mosaic of mixed evergreen deciduous forests. Forested areas within the southern portion of Site J are better established. Common woody species include American elm, autumn olive, black gum, black locust, boxelder, chestnut oak, eastern red cedar, mockernut hickory, northern red oak, southern red oak, sweetgum, sugar maple, tulip poplar, Virginia pine, post oak, white ash and white oak. Vines such as blackberries, greenbriers, Japanese honeysuckle, multiflora rose, passion flower, poison ivy, summer grape, trumpet creeper, Virginia creeper and wood rose are common (TVA 2013). No unique plant communities are present within the proposed project footprint at BRF.

EO 13112 (Invasive Species) defines an invasive species as one that is not native to the local ecosystem; and whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive plants can include trees, shrubs, vines, grasses, ferns and forbs. Invasive plants common in and near the project area include autumn olive, bush honeysuckle, Chinese privet, crown vetch, Japanese honeysuckle, Japanese stilt grass, Johnson grass, mimosa, multiflora rose and sericea lespedeza. All of these species have the potential to affect the native plant communities adversely because of their ability to spread rapidly and displace native vegetation.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to vegetation would occur. Accordingly, project-related environmental conditions for vegetation resources in the project area would not change under the No Action Alternative.

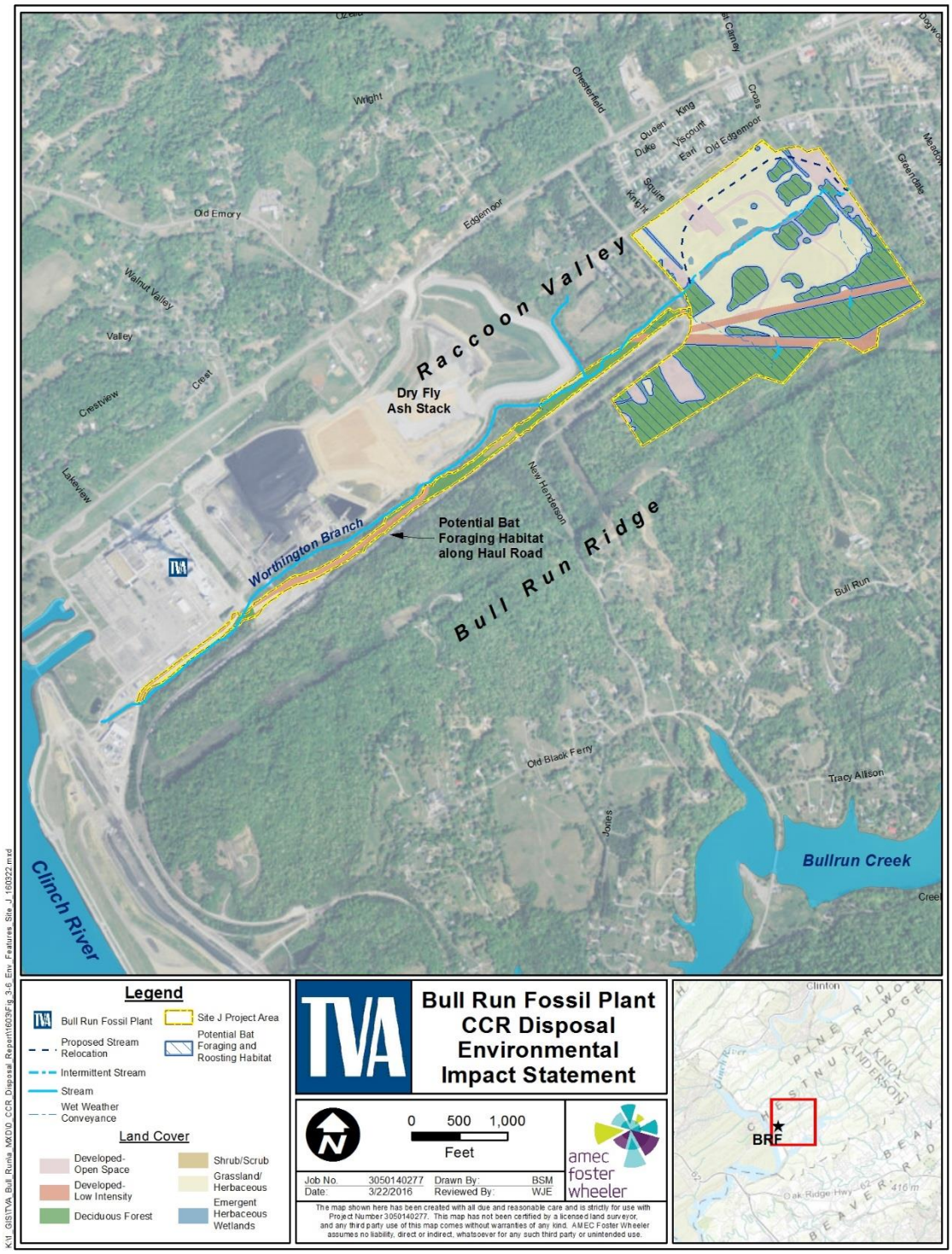

Figure 3-6. Land Cover and Wildlife Habitat Within Site J

3.9.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Permanent impacts to 119.9 ac of vegetation would result from the construction of the landfill, and an additional 14.8 ac would be impacted by the haul road (see Table 2-3).

Construction of the landfill would primarily impact the deciduous forest and grassland/ herbaceous land cover areas. Additionally, some areas of open space and low intensity developed lands may be impacted. Because many of the potentially affected plant communities are somewhat disturbed, consisting of young trees, invasive shrubs and early successional herbaceous pastures, potential direct impacts are minor relative to the abundance of similar cover types within the vicinity.

Although transportation of construction material has the potential to introduce invasive plants, BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes designed to establish desirable vegetation would mitigate that risk. Potential indirect impacts of the transport of borrow material are associated with the deposition of fugitive dust on adjacent vegetation. However, this potential impact would be minimized as the haul road is contained within the boundaries of the existing plant and the use of BMPs that include covering loads during transport. Therefore, impacts to vegetation under this alternative would be minor.

3.9.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to land cover types that have not already been considered in the issuance of the existing landfill permit.

Potential indirect impacts to vegetation relate to the transport of CCR material to the receiving landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any resources along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. Trucks hauling CCR materials along this route would potentially result in minor increases of fugitive dust and exhaust emissions that could indirectly impact vegetation resources along the route due to deposition. However, BMPs such as covered loads and equipment maintenance would be implemented as appropriate to minimize impacts. Therefore, no notable indirect impacts to vegetation are expected to occur from the transport of CCR material to Chestnut Ridge.

3.10 Wildlife

3.10.1 Affected Environment

The area evaluated for wildlife impacts includes the proposed Site J, the haul road between the proposed landfill site and BRF and their immediate surroundings. Habitats within these areas include roads, maintained grassed berms with fir trees and riparian zones, mature forested areas, wetlands and open grassy fields in the previously disturbed areas.

Migratory birds are protected under the Migratory Bird Treaty Act of 1918. Habitats within the project area could provide suitable roosting and foraging habitat for a range of migratory birds. Birding hot spots for migratory song birds are known from several locations less than 2 mi from the project area, across Melton Hill Lake. Multiple species of migratory song

birds, including brown thrasher, mourning dove, Carolina wren, American robin and pine warbler were observed in the Site J project area in October 2015.

Birds commonly observed in woodland and/or early successional habitat interspersed with human infrastructure and dwellings include Carolina wren, tufted titmouse, northern mockingbird, northern cardinal, eastern towhee, eastern bluebird, brown thrasher, field sparrow and eastern meadowlark. Red-tailed hawk and American kestrel also forage along road right of ways (Sibley 2000; LeGrand 2005). Mammals routinely observed in this type of landscape include bat, Virginia opossum, raccoon, eastern cottontail, striped skunk, white-tailed deer, eastern mole, woodchuck and rodents such as white footed mouse and hispid cotton rat (Whitaker and Hamilton 1998). Amphibian and reptile species that may be found in this habitat include black racer, ring-necked snake, gray rat snake, eastern garter snake, copperhead snake, spring peeper and upland chorus frog (LeGrand 2005; Conant and Collins 1998; Niemiller et al. 2013).

Notable wildlife records in the vicinity of BRF include one heron rookery (1.4 mi), two caves (3 mi) and an active osprey nest on a transmission line tower (0.5 mi) (TVA 2012). The small rookery was observed in 1996 and consisted of five pairs of great blue heron; however, no recent occurrences of this rookery have been recorded. Based on review of aerial photography and a cursory field visit, suitable habitat for heron colonies is not available within the project footprint. Due to the lack of recent occurrences and absence of roost sites within the project area, it is not expected that herons would be found on-site. In addition, no osprey nests or caves were observed on the site during the October 2015 site visit.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action

Under this alternative, no construction would occur. Therefore, resident wildlife found in the project area would continue to opportunistically use available habitats within the project area. No tree clearing would occur in conjunction with this alternative. As a result, no impacts would occur to migratory bird or mammal species. No direct or indirect impacts to wildlife would occur with this alternative.

3.10.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Alternative B would result in the conversion of 56.0 ac of forested habitat, 46.6 ac of grassland/old field habitat and lesser amounts of other land types (primarily disturbed/ developed). During construction, most mobile wildlife present within the project site would likely disperse to adjacent and/or similar habitat, whereas direct mortality may result to less mobile species.

The project is not expected to result in a significant change to available suitable habitat for any species common to the area. Proposed actions are not expected to significantly impact the local population of any wildlife species. Although approximately 56 ac of forested areas within the project area would be removed, adjacent areas provide abundant forested areas that would accommodate displaced biota. Additionally, in consideration of the large distance to documented heron rookeries or established osprey nesting sites, no impacts to these species are expected.

Following the construction phase, wildlife use of the proposed landfill would be limited; however, the herbaceous areas of the vegetated cover could be used by grassland dependent species. While the proposed project would result in alteration of habitats and

displacement of resident wildlife species, these effects are not expected to result in notable alteration or destabilization of any species.

In consideration of the highly disturbed habitats present within and along the proposed haul road and the availability of higher quality wildlife habitat in proximity to both the proposed haul road and Site J, potential direct and indirect impacts to associated wildlife are expected to be minor.

3.10.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because the Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to land cover types and their associated wildlife populations that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to wildlife are expected to occur with this alternative.

3.11 Aquatic Ecology

3.11.1 Affected Environment

BRF is located in the impounded portions of the Clinch River, on Melton Hill Lake, near CRM 48.0. The Melton Hill Dam impounds the 5,470-ac Melton Hill Reservoir and is the only TVA tributary dam serviced by a navigation lock.

BRF is located in Raccoon Valley, where Worthington Branch is the primary drainage feature for the valley and the project area (see Figure 3-5). Worthington Branch is a freshwater perennial stream in its lower reaches near BRF, but is intermittent upstream of New Henderson Road (observed to be dry in October 2015). The stream enters the project area from a culvert under Isabella Lane and flows southeast through Site J, passing through a culvert under a gravel site access road. From Site J, the stream continues southwest through culverts under New Henderson Road into a forested area between the existing dry fly ash stack and a rail line. The stream flows southwest along the rail line and through a box culvert under an access road continuing outside the project area toward its confluence with the Clinch River, approximately 1.8 mi west of Isabella Lane.

In addition, there are two minor drainages, approximately 103.5 and 160 ft in length located on the southeast and southwest edges of Site J that flow into Worthington Branch. Both of these drainages have a groundwater connection and were observed to support macroinvertebrate populations.

Site J also contained two former impoundments (farm ponds) located just to the north of Worthington Branch in the central portion of Site J. However, these impoundments have been removed and are connected to Worthington Branch by ditches excavated to promote drainage from the former impoundments. The former impoundments are discussed further in Section 3.13 (Wetlands).

In the eastern portion of the project area and upstream of New Henderson Road, Worthington Branch is a shallow, linear intermittent stream that has poorly to moderately vegetated banks and a substrate dominated by sand, clay, gravel and silt. As the stream flows west, the stream gains sinuosity, the substrate transitions to bedrock, cobble and gravel with some coarse sand, and the stream banks become more stable. Channel shading transitions from less than 10 percent in the open pastures in Site J to over 80 percent in the forested portions of the western project area. Flow and water permanence

increase with input from an unnamed perennial tributary near the eastern point of the dry fly ash stack. Downstream of the confluence, Worthington Branch's channel width increases from 5 ft to 10 ft and then again to 15 ft and flow transitions from weak-moderate to moderate-strong.

The shoreline and substrate of Worthington Branch were evaluated for aquatic habitat in October 2015. Worthington Branch downstream of New Henderson Road has riffles, runs, glides and pools combining for four flow regime types: (1) slow-shallow, (2) fast-shallow, (3) slow-deep and (4) fast-deep. Additional habitat observed in the stream included detritus, leaf packs, root mats, undercut banks and woody debris. Aquatic vegetation within the channel was limited.

No formal surveys for macroinvertebrates, mussels or fish have been conducted for Worthington Branch within the project area. However, TVA has conducted surveys on the Clinch River and in Bullrun Creek near the project area, which represent the best available data. While some species characteristic of the Clinch River may be found within lower reaches of Worthington Branch (especially during high flow conditions), the aquatic biota of the more permanently flowing portions of Worthington Branch are more likely to be more simple communities characteristic of low flow tributary streams.

TVA surveyed the benthic community at three sites on the Clinch River in 2014, including CRM 47.0 near the confluence of Worthington Branch. Multiple samples at this location had an average of 14.5 taxa, while the average number of Ephemeroptera, Plecoptera and Trichoptera taxa present was only 0.7; the average proportion of oligochaetes present in the samples was 48.7 percent (TVA 2015a). In 2010, TVA conducted a mussel and habitat survey to characterize mussel resources in the Clinch River adjacent to BRF.

The mussel fauna in the Clinch River near BRF has been altered substantially by the impoundment of Melton Hill Reservoir. Only four mussel specimens were collected along the BRF waterfront, comprised of three common species, the mapleleaf, fragile papershell and three-horn wartyback (Third Rock Consultants 2010). However, because of the intermittent nature of Worthington Branch within much of the project area, bivalve mussel species are likely to be absent from the immediate project area.

A benthic macroinvertebrate or mussel survey was not conducted during the October 2015 site visit. However, species observed included dragonfly and damselfly larvae, caddisfly larvae, beetles, mayfly larvae and pleurocerid freshwater snails. Some portions of Worthington Branch in the western project area exhibited a high density of pleurocerid snails. One shell of a mountain creekshell mussel, a common species in the region, was observed in the substrate.

TVA has evaluated the health of the fish community in the Clinch River using the Reservoir Fish Assemblage Index at CRM 45.0, downstream the confluence of Worthington Branch and at CRM 66 upstream of BRF as a part of the Vital Signs Monitoring Program since 2001 (TVA 2015a). In 2014, the fish community rated "Fair" at both of these locations, and has historically rated "Good" or "Fair" at these locations. During the 2014 study:

- Thirty-seven species were collected, including 17 commercially valuable species and 20 recreationally valuable species.
- Common centrarchid species present at BRF included black crappie, white crappie, bluegill, green sunfish, redear sunfish, and warmouth.

- Benthic invertivore species present included freshwater drum, black redhorse, golden redhorse, silver redhorse, logperch, northern hog sucker and spotted sucker.
- Top carnivore species present included black crappie, flathead catfish, largemouth bass, rock bass, skipjack herring, smallmouth bass, spotted bass, walleye, white crappie, white bass and yellow bass.
- Intolerant species present included black redhorse, brook silverside, northern hog sucker, rock bass, skipjack herring, smallmouth bass, and spotted sucker. In addition, three thermally sensitive species, white sucker, spotted sucker and logperch, were present (TVA 2015a).

Chestnut Ridge is an existing landfill located approximately 12 mi northeast of BRF. Since it is currently an active landfill, no aquatic resources are present.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to aquatic resources would occur. Accordingly, project-related environmental conditions for aquatic resources in the project area would not change under the No Action Alternative.

3.11.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, the proposed project would include the construction of a landfill east of the BRF facility at Site J and the construction of a haul road between the BRF facility and the proposed Site J landfill. The construction of the landfill at Site J would require realigning approximately 2,158 linear feet of a section of Worthington Branch and its tributaries to provide a larger landfill waste disposal area. This section of the stream would be relocated to the north into an excavated channel, approximately 2,700 ft that would arc around the landfill footprint before flowing back into the natural channel near New Henderson Road.

The construction of a haul road from BRF to the landfill at Site J would include the construction of a private bridge to take hauling traffic over New Henderson Road. In addition, approximately 1,321 linear ft of Worthington Branch (combined) would be realigned to the north along the proposed haul road.

Direct impacts to aquatic habitat would be limited to stream realignments and culverting. Stream alteration activities would be done in compliance with applicable TDEC and USACE 404/401 permits obtained for the proposed actions, which would require mitigation, such as on-site stream restoration and contributing to a stream mitigation bank, per permit requirements.

The proposed stream realignment, a direct impact, represents a permanent impact to Worthington Branch. The impact would be offset and mitigated by reconstruction of the stream channel around Site J and implementation of mitigation requirements such as identified above. However, long-term impacts would be minor as the realigned stream channel sections develop natural flow regimes, substrates and subsequent habitats. Watershed level impacts would be insignificant given the local abundance of similar aquatic resources.

The direct impacts would be minor for mobile aquatic resources, such as fish, that would likely avoid sections of the stream during construction activities and quickly repopulate realigned stream sections shortly following construction completion. Less mobile and sessile aquatic resources (aquatic macroinvertebrates) would be directly impacted by fill placement during construction. However, many macroinvertebrate species would repopulate quickly through their mobile adult phase of life.

Indirect impacts to downstream reaches of Worthington Branch may be associated with storm water runoff due to temporary construction activities, or upstream construction activities within the stream. Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources during the construction phase, such as in-stream sediment curtains or baffle barriers. Additionally, flow alteration in downstream sections of Worthington Branch would be caused by runoff from the landfill site. These impacts would be mitigated by the use of detention basins and other BMPs on-site. Following the construction phase, care and maintenance of the approved closure system and site-wide management of storm water using appropriate BMPs would minimize indirect impacts to the aquatic community of the receiving waters.

3.11.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge is an existing permitted landfill, there would be no additional direct impacts to surface water resources and their associated aquatic biota that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to aquatic ecosystems are expected to occur with this alternative.

3.12 Threatened and Endangered Species

3.12.1 Affected Environment

The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the United States or elsewhere. The ESA outlines procedures for federal agencies to follow when taking actions that may affect federally listed species or their designated critical habitat.

The state of Tennessee provides protection for species considered threatened, endangered or deemed in need of management within the State other than those already federally listed under the ESA. Plant species are protected in Tennessee through the Rare Plant Protection and Conservation Act of 1985. The listing of species is managed by the TDEC.

Additionally, the Tennessee Natural Heritage Program and TVA both maintain databases of aquatic and terrestrial plant and animal species that are considered threatened, endangered, special concern, or are otherwise tracked in Tennessee because the species is rare and/or vulnerable within the state.

3.12.1.1 Wildlife

According to the USFWS, there are 22 federally listed species within Anderson County (USFWS 2016). A review of the TVA Regional Natural Heritage database in November 2015 indicated that of those species listed by USFWS, 11 species are currently known or have been known to occur within a 5-mi radius of the project area (Table 3-5). Additionally, 13 state-listed species have occurrence records within a 5-mi radius of BRF. The Indiana bat (*Myotis sodalis*), gray bat (*Myotis grisescens*) and northern long-eared bat (*Myotis*

septentrionalis) are also evaluated herein because these federally listed bat species are known to occur throughout the region, including Anderson County.

Within Anderson County, 17 state or federally listed freshwater mussel species and one aquatic snail are listed as threatened or endangered. Nine of the mussel species and the aquatic snail are also recorded within a 5-mi radius of BRF. All of these aquatic species require freshwater systems with flowing water (Biggens 1991; Ahlstedt 1983; Ahlstedt 1984a; Ahlstedt 1984b; Neves 1984; Dillon et al. 2013). Worthington Branch is a small, perennial stream (in its lower reaches) that flows through Site J and is a tributary to the Clinch River (see Section 3.7 Surface Water for more detail). Threatened or endangered mussel species are not expected to occur in Worthington Branch as it does not provide the large riverine habitat required by these species. As such, these species of mollusks listed in Table 3-5 are not discussed further in relation to Worthington Branch. A recent mussel survey of the riverfront at BRF did not reveal the presence of any state-listed or federally-listed threatened or endangered mussel species (Third Rock Consultants, LLC 2010).

Spotfin chub is listed as threatened with a rank of S2 (very rare and imperiled) and federally listed as threatened. Its habitat consists of large upland creeks or medium rivers with moderate to swift currents over gravel or bedrock. Spotfin chub is known to occur in Anderson County but has not been identified within 5-mi of the project area. Worthington Branch is intermittent upstream of New Henderson Road and therefore, does not support this species within Site J. Downstream of Henderson Road Worthington Branch does not provide swift currents over un-silted substrate. Therefore spotfin chub is not expected to occur within Worthington Branch.

The Tennessee dace is a state-listed in need of management (NMGT) fish species with a rank of S3 (vulnerable). The Tennessee dace is only found in spring fed, first order streams with gravel, sand and silt-bottomed pools. The TVA Regional Natural Heritage Database records of the Tennessee dace within 5-mi of the project area include the Clinch River watershed. Since the Worthington Branch is not a spring-fed, first order stream, the Tennessee dace is not expected to occur on-site.

The hellbender is state-listed NMGT with a rank of S3 (vulnerable). A single hellbender was caught in a gill net in Melton Hill Reservoir in 1976 but more recent occurrences of this species in the vicinity of the plant are unknown. Hellbenders are completely aquatic salamanders and prefer fast-flowing, clear, well-oxygenated streams and rivers with substrate consisting of large flat boulders and logs. In Virginia, hellbenders have been observed in streams as small as 165 ft and rivers over 300 ft wide (Virginia Department of Game and Inland Fisheries 2015). Worthington Branch does not provide suitable habitat for the hellbender. Therefore, this species is not likely to be found within the project area.

The barn owl is state-listed NMGT with a rank of S3 (vulnerable). A nesting pair was observed in Knox County (Tennessee) within 2-mi of BRF in 1987, but more occurrences of this species in the vicinity of the plant are unknown. Open habitats such as grasslands, deserts, marshes and agricultural fields are preferred, but the use of suitable foraging habitat can be limited by a lack of proximity to nesting and roosting sites. In Tennessee, these birds are known to nest every month of the year except in August (Nicholson 1997). Hollow trees, cavities in cliffs and riverbanks, nest boxes and many human structures (barns) are readily used for nesting and roosting (Marti et al. 2005). The forested habitat at the southern boundary of the project area may include suitable roosting habitat for barn owls.

Table 3-5. Species of Conservation Concern within Anderson County and the Vicinity of Site J at BRF[1]

	Common Name	Scientific Name	Status	
			Federal[2]	State[3] (Rank[4])
Mollusks	Alabama lampshell	*Lampsilis virescens*	LE	END (S1)
	Anthony's riversnail	*Athearnia anthonyi*	LE	END (S1)
	Cracking pearlymussel*	*Hemistena lata*	LE	END (S1)
	Cumberland bean	*Villosa trabalis*	LE	END (S1)
	Cumberland elktoe	*Alasmidonta atropur*	LE	END (S1s2)
	Dromedary pearlymussel*	*Dromus dromas*	LE	END (S1)
	Fanshell	*Cyprogenia stegaria*	LE	END (S1)
	Fine-rayed pigtoe*	*Fusconia cuneolus*	LE	END (S1)
	Orange-foot pimpleback*	*Plethobasus cooperianus*	LE	END (S1)
	Pink mucket*	*Lampsilis abrupta*	LE	END (S2)
	Ring pink	*Obovaria retusa*	LE	END (S1)
	Rough pigtoe	*Pleuroblema plenum*	LE	END (S1)
	Rough rabbitsfoot	*Quadrula cylindrica strigillata*	LE	END (S2)
	Sheepnose mussel	*Plethobasus cyphyus*	LE	TRKD (S2S3)
	Shiny pigtoe pearlymussel*	*Fusconaia cor*	LE	END (S1)
	Spectaclecase*	*Cumberlandia monodonta*	LE	TRKD (S2S3)
	Spiny riversnail*	*Io fluvialis*	--	TRKD (S2)
	Tennessee clubshell*	*Pleurobema oviforme*	--	TRKD (S2S3))
	White wartyback*	*Plethobasus cicatricosus*	LE	END (S1)
Fish	Spotfin chub	*Erimonax monachus*	LT	THR (S2)
	Tennessee dace*	*Chrosomus tennesseensis*	--	NMGT (S3)
Amphibians	Hellbender*	*Cryptobranchus alleganiensis*	PS	NMGT (S3)
Birds	Barn Owl*	*Tyto alba*	--	NMGT (S3)
Mammals	Gray bat[5]	*Myotis grisescens*	LE	END (S2)
	Indiana bat[5]	*Myotis sodalis*	LE	END (S1)
	Northern long-eared bat[5]	*Myotis septentrionalis*	LT	(S1S2)
Plants	American ginseng*	*Panax quinquefolius*	--	S-CE (S3S4)
	Branching whitlow-wort*	*Draba ramosissima*	--	SPCO (S2)
	Earleaf foxglove*	*Agalinis auriculata*	--	END (S2)
	Hairy false gromwell*	*Onosmodium hispidissimum*	--	END (S1)
	Heller's catfoot*	*Pseudognaphalium helleri*	--	SPCO (S2)
	Naked-stem Sunflower*	*Helianthus occidentalis*	--	SPCO (S2)
	Mountain honeysuckle*	*Lonicera dioica*	--	SPCO (S2)
	Northern white cedar*	*Thuja occidentalis*	--	SPCO (S3)
	Ozark bunchflower*	*Melanthium woodii*	--	END (S1)
	Prairie goldenrod*	*Solidago ptarmicoides*	--	END (S1S2)
	Shining ladies'-tresses*	*Spiranthes lucida*	--	THR (S1S2)
	Slender blazing-star*	*Liatris cylindracea*	--	THR (S2)
	Spreading false-foxglove*	*Aureolaria patula*	--	SPCO (S3)
	Tall larkspur*	*Delphinium exaltatum*	--	END (S2)
	Western false gromwell*	*Onosmodium molle* ssp. *occidentale*	--	THR (S2)

[1] Source: USFWS 2016 and TVA Regional Natural Heritage database, accessed November 2015

[2] Federal Status Codes:
- DM = Delisted, recovered and being monitored
- LE = Listed endangered
- LT = Listed threatened;
- PE = Proposed endangered
- CAND = Candidate for federal listing
- PS = partial status (subspecies listed in Midwest)

[3] State Status Codes:
- END = Listed endangered
- NMGT = Listed in need of management
- S-CE = Special concern, commercially exploited
- SPCO = Species of special concern
- THR = Listed threatened
- TRKD = Tracked as sensitive but has no legal status

[4] State Rank:
- S1 = Extremely rare and critically imperiled
- S2 = Very rare and imperiled
- S3 = Vulnerable
- S4 = Apparently secure, but with cause for long-term concern
- SH = Historic in TN; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[5] Known throughout the region but no occurrence records within 2-mi of the project site. Indiana bat and northern long-eared bat were documented at 6.42 mi.

* Species documented within 5 mi of Site J at BRF.

The gray bat is listed as federally endangered by the USFWS (USFWS 2007). Gray bat roosts in caves throughout the year and forages over water including streams and reservoirs where they consume night flying aquatic insects near the water surface. Unlike other bat species, gray bats are restricted year-round to only cave and cave-like habitats for both hibernation and roosting. There are 13 caves located within 5 mi of the project area. However, the closet record of cave use by gray bats is greater than 3 mi away. The record does not indicate if this cave is a winter hibernacula or summer maternity roost for gray bat. The closest foraging habitat is located along Melton Hill Reservoir, more than 1.5 mi away. Suitable roosting and foraging habitats are not available within the project area.

The Indiana bat is listed as federally endangered by the USFWS (USFWS 2007). The species overwinters in large numbers in caves and forms small colonies under loose bark of trees and snags in summer months (Barbour and Davis 1974). Indiana bats disperse from wintering caves to areas throughout the eastern U.S. This species range extends from New York and New Hampshire in the north to Alabama, Georgia and Mississippi in the south and as far west as eastern Kansas and Oklahoma. The species favors mature forests interspersed with openings. The presence of snags with sufficient exfoliating bark represent suitable summer roosting habitat. Use of living trees with suitable roost characteristics in close proximity to suitable snags has also been documented. The availability of trees of a sufficient bark condition, size and sun exposure is another important limiting factor in how large a population an area can sustain (Tuttle and Kennedy 2002; Harvey 2002; Kurta et al. 2002). Thirteen cave sites are known to occur offsite within 5-mi of Site J at BRF. A search of the TVA Regional Natural Heritage database in November 2015 indicated that an Indiana bat was recorded in a summer mist net event on the Oak Ridge Reservation 6.42 mi from BRF.

The northern long-eared bat is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending into eastern Montana and Wyoming and extending southward to parts of southern states from Georgia to Louisiana. Suitable winter habitat (hibernacula) includes underground caves and cave-like structures (e.g., abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and with high humidity and minimal air currents. During summer this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter ≥3 in). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats forage in upland and lowland woodlots, tree-lined corridors and water surfaces, feeding on insects. In general, habitat use by northern long-eared bats is thought to be similar to that used by Indiana bats, although northern long-eared bats appear to be more opportunistic in selection of summer habitat (USFWS 2014). A search of the TVA Regional Natural Heritage database in November 2015 indicated that a northern long-eared bat was recorded in a summer mist net capture 6.42 mi from the proposed project on the Oak Ridge Reservation.

A survey was conducted in October 2015 to determine bat habitat suitability along the proposed haul road and within the proposed landfill site. No caves were observed within the project site. However, the 10-ft box culvert on Worthington Branch under an existing gravel road could provide suitable roosting habitat for the northern long-eared bat (Keeley and Tuttle 1999). Although the 7.5 ac of forested area along the haul road may provide foraging habitat, it is of poor quality due to the dense understory. Suitable bat roosting habitat was

not observed along the haul road. Forested areas within proposed landfill site (48.5 ac) were determined to provide suitable foraging and roosting habitat (see Figure 3-6).

3.12.2 Plants

A review of the TVA Regional Natural Heritage database indicated that no federally listed plant species are known to occur within 5 mi of the proposed project site (TVA 2015). Fifteen state-listed plant species are known to occur in the vicinity of BRF (Table 3-6). Habitat requirements for each of these species are presented in Table 3-6. Based on the preferred habitat, none of the listed plants are known to exist in the Site J project area at BRF.

3.12.3 Environmental Consequences

3.12.3.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, no impacts to threatened or endangered species would occur.

3.12.3.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

The area of impact subject to project activities under this alternative is primarily comprised of developed or disturbed land that is generally unsuitable for the species listed in Table 3-5. As discussed in Subsection 3.11.1, Worthington Branch is a small freshwater stream (perennial downstream of Henderson Road, but intermittent above Henderson Road) that provides suitable habitat for some aquatic species. However no threatened or endangered aquatic animal species have been recorded. Intermittent reaches of Worthington Branch will be permanently impacted by landfill construction while downstream reaches would be temporarily impacted during construction. However, aquatic communities within the realigned intermittent section of Worthington Branch upstream of Henderson Road would be expected to recolonize as the stream again forms new riffle/run/pool habitats following construction. All work will be done under the conditions of state and federal permits using BMPs to avoid and minimize impacts during construction. No aquatic animal species listed as threatened or endangered are known or have been observed within the project area. Therefore, no impacts to threatened and endangered aquatic animal species as a result of the proposed action are anticipated.

The majority of the terrestrial habitat on-site has been severely degraded and is populated with weedy and adventive species. Therefore, it is generally unsuitable habitat for the listed plant species identified within the vicinity of BRF (see Table 3-6). The forested habitat at the southern end of the project area consists of a mosaic of mixed evergreen-deciduous forests and is not known to support any plant species listed as threatened or endangered (Section 3.9, Vegetation). Therefore, impacts to threatened or endangered plants are not anticipated.

Suitable habitat for hellbender is absent within the project area. Therefore, hellbender would not be impacted by the proposed actions. Barn owl nesting and foraging habitat is present within the project area for this alternative. Since records show this species as previously nesting within 2-mi of BRF, the proposed actions may directly impact individuals of this species should nesting occur within the project area. However, significant impacts to populations of this species are not anticipated as similar nesting and foraging habitat is present in the surrounding landscape.

Table 3-6. Habitat Requirements for Plant Species of Conservation Concern within the Vicinity of Site J at BRF

Common Name	Habitat Requirements	Habitat within Project Area
American ginseng	Humus-rich woodland soil and prefers shaded, north-facing hillsides[1]	No
Branching whitlow-wort	Calcareous bluffs, shale barrens and rocky wooded areas[2]	No
Earleaf foxglove	Barrens, prairies glades and fallow fields[3]	No
Hairy false gromwell	Forested habitat in calcareous areas[3]	No
Heller's catfoot	Glades or woodland openings in sandy or mafic soils[3]	No
Naked-stem Sunflower	Limestone glades and barrens[4]	No
Mountain honeysuckle	Mountain woods and thickets, the edges of bluffs and the banks of waterways[4]	No
Northern white cedar	Calcareous rocky seeps and along cliffs where it is often associated with wetlands[5]	No
Ozark bunchflower	Rich wooded slopes in high quality deciduous woodlands[4]	No
Prairie goldenrod	Barrens[2]	No
Shining ladies'-tresses	Alluvial woods and along moist slopes[4]	No
Slender blazing-star	Barrens in high quality prairie areas[4]	No
Spreading false-foxglove	Requires canopy openings in mixed hardwood forests on limestone slopes associated with large streams and rivers[6]	No
Tall larkspur	Dry, exposed cedar barrens and prairie/forest edge in eastern Tennessee at the Oak Ridge Reservation[7]	No
Western false gromwell	Glades[4]	No

[1] North American Native Plant Society 2015
[2] Flora of North America 2010
[3] NatureServe 2015
[4] TDEC 2014
[5] NRCS 2015
[6] Kentucky State Nature Preserves Commission 2015
[7] Salk and Parr 2006

Thirteen cave sites which have the potential to provide roosting habitat for gray bat, Indiana bat and northern long-eared bat are known to be located within 5-mi of the Site J Project Area. However, there would be no impacts to these caves as a result of the proposed action. Up to 48.5 ac of potentially suitable summer roost trees for the Indiana bat and northern long-eared bat are present within the project area. However, this area constitutes less than 1 percent of the total forested area within a 5-mi radius of the project area. Avoidance and minimization efforts to reduce impacts to these species would be implemented as required through consultation with the appropriate state and federal

agencies, including avoiding timber clearing during the summer roosting season (April 1 to September 30). Additionally, TVA will provide appropriate compensation for the unavoidable loss of potential bat roosting habitat in accordance with USFWS and TDEC requirements.

Therefore, impacts to threatened and endangered species are expected to be minor under this alternative.

3.12.3.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge is an existing permitted landfill, there would be no additional direct impacts to threatened or endangered species and their associated habitats that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to threatened or endangered species are expected to occur with this alternative.

3.13 Wetlands

3.13.1 Affected Environment

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

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

BRF is located within the Southern Limestone Dolomite Valleys and Low Rolling Hills subdivision of the Southwestern Appalachian Ecoregion where the land use and land cover includes mostly mixed forest with some prairie and cropland on less sloping land (Griffith et al. 2001). Natural vegetation includes Appalachian oak forest and some mixed mesophytic forest consisting of upland species.

Wetlands identified on National Wetland Inventory maps within the project area include 0.2 ac of PUBHh wetland (freshwater impoundment). This mapped area is located at one of the two small man-made impoundments described in further detail in Section 3.7 (Surface Water). Field delineation efforts to describe the present state of these impoundments are discussed below. Land use/land cover data shows that wetlands comprise approximately 1.5 percent (2.1 ac) of the land use within the project area (134.7 ac) and 1.5 percent (775.4 ac) of the surrounding 5-mi radius (50,264.9 ac) (see Table 3-1).

Wetlands were delineated within the project area in November 2011 as part of a previous TVA project (TVA 2013). A second field survey was performed in October 2015 for the proposed haul road, during which the area within Site J was re-assessed. Potential

jurisdictional Waters of the United States (WOUS) were evaluated in accordance with the Regional Supplement to the USACE Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0). Within the Site J project area, a small 1.8-ac emergent wetland was identified along the floodplain of Worthington Branch (see Figure 3-5). This wetland begins as fringe along the stream bank and continues up the slope for a short distance. Dominant hydrophytic vegetation in the wetland includes black willow and sycamore shrub/saplings, cattail, common rush and jewelweed in the herbaceous layer. The TVA Rapid Assessment Method was used to assess wetland condition and identify wetlands with potential ecological significance (Mack 2001). Using the TVA Rapid Assessment Method, the wetland was classified as a Category 2 wetland (moderate quality and exhibits reasonable potential for restoration).

Based on the most recent site visit, it was determined that both of the impoundments within Site J currently have man-made ditches that drain the ponds into Worthington Branch. Based on the topography of the area and historical ponding, the significant nexus to the stream and vegetation observed (predominantly cattail), these two former impoundments would also be considered WOUS with a total area of 0.3 ac. There were no wetlands identified along the proposed haul road. Therefore, the total area of jurisdictional WOUS within Site J is 2.1 ac.

Chestnut Ridge Landfill is an existing landfill located approximately 12 mi northeast of BRF. Since it is currently an active landfill, natural resources within the site are minor to non-existent. CCR material from BRF to Chestnut Ridge would be transported along existing transportation corridors.

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no impacts to wetland resources.

3.13.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Construction, operation and maintenance of the proposed landfill would result in direct loss of 2.1 ac of emergent wetlands. However, effects of wetland impacts at Site J would be minor when viewed in the context of the 775.4 ac of wetland resources within the surrounding 5-mi region, as this impact corresponds to approximately 0.3 percent of wetlands within this region. Potential indirect impacts resulting from construction activities could include erosion and sedimentation from storm water runoff during construction into off-site or nearby wetlands, but BMPs would be implemented to minimize this potential. Unavoidable direct impacts to wetlands would be mitigated as required by both state and federal agencies in accordance with the Tennessee Water Quality Control Act and Section 404 of the CWA. Therefore, development of the proposed landfill would be consistent with EO 11990.

3.13.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Because Chestnut Ridge Landfill is an existing permitted landfill, there would be no additional direct impacts to wetland resources and their associated biota that have not already been considered in the issuance of the existing landfill permit. Therefore, no notable impacts to wetland ecosystems are expected to occur with this alternative.

3.14 Solid/Hazardous Waste

3.14.1 Affected Environment

3.14.1.1 Solid Waste

In Tennessee, requirements for management of solid wastes are focused on solid waste processing and disposal under Rule 0400-11-.01. Solid wastes are defined in the rule as garbage, trash, refuse, abandoned material, spent material, byproducts, scrap, ash, sludge and all discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial and agricultural operations, and from community activities. Currently, the solid waste generated at BRF is managed in accordance with federal and State requirements. The solid waste generated from the proposed activities would be from construction, operation and/or maintenance activities.

Under TDEC Rule 0400-11-.01-.01, special wastes include sludges, bulky wastes, pesticide wastes, industrial wastes, combustion wastes, friable asbestos and certain hazardous wastes exempted from RCRA Subtitle C requirements.

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

When generating at full capacity, BRF consumes approximately 7,300 tons of coal per day. The primary solid wastes that result from the operation of BRF are collectively known as CCR. The primary CCR waste streams are fly ash, bottom ash and gypsum. Currently, all CCRs generated at BRF are handled and disposed of on a dry basis.

The in-place quantities of CCR that are estimated to be generated at BRF daily and annually are provided below in Table 3-7.

Table 3-7. Summary of Waste Disposal Volumes at BRF

Waste Materials	Tons/Year	Tons/Day	Yd^3/Year	Yd^3/Day
Bottom and Fly Ash	240,000	660	179,700	542
FGD Gypsum	318,000	870	346,500	950
Total	558,000	1,530	554,200	1,492

Source: TVA 2015e

Fly ash and boiler slag are comprised of the noncombustible particles or components in coal. Both fly ash and bottom ash are composed primarily of silica, aluminum oxide and iron oxide. These waste streams also contain a variety of heavy metals at limited concentrations including arsenic, cadmium, chromium, copper, lead, mercury and selenium. Under Rule 0400-11-.01-.01, CCR are regulated as special wastes that require special waste approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility).

Forty-six structures including 20 houses were previously demolished on Site J (TVA 2013). Prior to conducting demolition, the structures were surveyed for the presence of asbestos containing material and lead-based paint. Structures containing these materials were properly abated prior to demolition. Creosote and pressure treated lumber associated with the structures was removed and managed as special wastes. Septic tanks were removed

from the residences, and basements were backfilled with borrow material. Driveways, carports and foundations were demolished and the concrete and asphalt were disposed of off-site or used as fill material. Therefore, only a very limited volume of solid wastes or demolition debris remains at the site in conjunction with these former residences.

3.14.1.2 Hazardous Waste

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

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

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

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

BRF is considered a small quantity generator of hazardous waste by TDEC. The primary hazardous wastes currently generated include small quantities of waste paint, waste paint solvents, paper insulated lead cable, mercury contaminated debris, debris from sandblasting and scraping, paint chips, solvent rags due to cleaning electric generating equipment, Coulomat (used as moisture removal from oil) and liquid-filled fuses.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not seek additional disposal options to manage CCR generated at BRF. TVA would continue to manage CCR in its existing dry fly ash stack for as long as capacity is available and there would be no impact associated with current landfill operations. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF and therefore theoretically, the amount of solid wastes produced at BRF would decrease. However, because any impact to operations at

BRF would not be consistent with TVA's long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

3.14.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.14.2.2.1 Construction

The primary potential issues concerning solid waste and hazardous wastes with respect to the proposed action are: (1) the potential for increased generation during construction; (2) the potential for increased generation from operation of the proposed action; and (3) the potential for a spill or release during operations or transportation.

Construction of the facility would require site preparation involving (1) vegetation removal over the 134.7-ac site; (2) excavation, re-compaction and grading over the 60-ac landfill footprint; (3) grading over much of the remaining acres of planned use area; and (4) construction of the haul road. The primary wastes resulting from these activities are:

- Soils from land clearing, grading and excavation.
- Landscaping/vegetative waste from grubbing, vegetation removal and grading operations.

The estimated depth to the top of rock over much of the site is approximately 5 ft. The proposed bottom liner system for the landfill consists of a 5-ft thick re-compacted geologic buffer, 2-ft of compacted clay overlain by a 60 milliliter (i.e., 0.060 inch) thick high density polyethylene flexible membrane liner. Construction of the recompacted geologic buffer component of the bottom liner system would require a minimum of 475,940 yd^3 of soil which would be derived from the landfill footprint itself. Construction of the 2-ft thick compacted clay layer would require 190,370 yd^3 of soil which would have to be derived from excavation on other portions of the site.

The proposed design includes a 1-ft thick interim cover for placement during operations and placement of a 2-ft thick final cover upon closure of the cells. Areas that have not reached final fill grades and would not receive CCR for 180 days would receive an interim cover to reduce infiltration and maintain a working area of approximately 10 ac. The periodic placement of an interim cover would prevent erosion and help maintain the integrity of the side slopes. A 30-day supply of cover material would be maintained to cover the working face on-site in the soil borrow/stockpile areas (Table 3-8).

Table 3-8. Summary of Cover Material Quantities

Cover Material	Thickness (inches)	Quantity (yd^3)
Interim/Intermediate Cover (Compacted Soil)*	12	95,100
Final Cover – Protected Cover Soil	12	95,100
Final Cover – Vegetative Cover Soil	12	95,100

* Intermediate cover may not be required in areas where final cover would be constructed within 180 days of final placement of CCR.

Source: TVA 2015e

Excess soil material excavated during construction of the landfill would be stockpiled in the designated borrow/stockpile area located within the Project Areas for Site J (see Figure 2-3). Preliminary soil balance estimates completed in support of the permit application (TVA 2015e), indicated that sufficient material would be available from on-site sources. However, where on-site soil is insufficient in terms of quality or quantity, TVA may supplement on-site soil with offsite borrow materials. The location of an off-site permitted borrow area has not been identified at this time, but all borrow soil would meet permit requirements.

Landscaping wastes would also result from grubbing and land clearing operations necessary to construct the landfill and support areas. Much of Site J is open field or wooded. Slopes along the ridges toward Edgemoor Road and to the south of New Henderson Road are moderately to heavily wooded. The areas of higher elevation along the ridge south of New Henderson Road are not likely to be cleared unless that area is disturbed to obtain borrow soils. Moderate to heavily wooded mature stands would produce approximately 2,000 ft^3 or 16 cords of wood per acre upon clearing. The volume of wood estimated to result from clearing the site's most usable areas is 160,000 ft^3 or 1,250 cords of wood. Most of this wood may be harvestable as sawmill grade, chip materials and mulch. A portion of the wood, mainly stumpage, is considered economically unusable due to difficulties or costs associated with grinding on certain terrain or in certain areas. Some portion of the wood may not be harvestable because of specific locations (wetlands), species, condition, or infestation. It is estimated that 1 to 5 percent (48 to 240 tons) of wood in the area may not be harvestable and will become waste requiring off-site disposal.

The demolition debris associated with the former residences that remains in the project area and may be removed in conjunction with site preparation activities includes underground water piping (branch lines for service to the former houses and piping to barns and outbuildings), septic drain fields, underground conduits for electrical service to pole mounted lights and potentially natural gas branch lines. Masonry block associated with basements and construction rubble that may have been used to backfill basements would likely become solid wastes requiring off-site disposal during site development. The volume of demolition debris from the former structures generated during site development is estimated to be less than 300 yd^3. TVA will also manage and dispose of soils containing other water materials as appropriate, including septic drain fields and associated soils and soils containing residual pesticides in accordance with EPA and TDEC requirements.

In addition to these larger nonhazardous waste streams, limited quantities of nonhazardous solvents, paints and adhesives, spill absorbent, oil and solvent contaminated rags and empty containers would be generated. Additionally, there is the potential for spills or releases of fuels, coolants, oils and hydraulic fluids from construction machinery. All of these waste streams would be generated in very limited quantities. Table 3-9 summarizes potential solid waste streams that would result during the construction phase of Alternative B.

Table 3-9. Typical Nonhazardous Wastes Generated During Construction

Waste	Estimated Quantity	Composition	Disposal
Land clearing wastes-stumpage	48 to 240 tons	Stumps, non-harvestable wood, vegetation	Dispose of in a Class III or IV landfill
Non-usable soils	9,500 to 45,000 yd^3	Rock, chert, poor soils	Dispose of in a Class III or IV Landfill
Asphalt milling/concrete	1,400 to 2,100 tons	Asphalt, concrete	Reuse dispose of in a Class III or IV landfill in roads and fill
Demolition debris	less than 300 yd^3	Metal and PVC pipe, metal conduit, masonry block	Dispose of in a Class III or IV landfill
Contaminated soils	Limited	Various hazardous constituents from residential burn and disposal pits	Dispose of in a Class I landfill as special wastes
Scrap wood, steel, glass, plastic, paper, insulation	Limited	Normal refuse	Recycle and/or dispose of in a Class I landfill
Empty hazardous material containers	Limited	Containers <5 gallon	Recycle or dispose of in a Class I landfill
Waste oil filters	Limited	Oil from construction equipment, leachate pumps, etc.	Recycle at a permitted Treatment, Storage and Disposal Facility
Oil fuel and solvent rags	Limited	Lubricating oils/hydrocarbons from small spills, cleaning and degreasing operations	Dispose at a Class I landfill as special wastes
Non-hazardous solvents, paint, adhesives	Limited	Solvents, paints and adhesives that are not characteristic or listed hazardous waste	Dispose at a Class I landfill as special waste
Sanitary waste	Portable toilet holding tanks	Solids and liquids	Remove by contracted sanitary service

The proposed construction activity would use limited quantities of regulated materials. Examples of hazardous materials used during site preparation and construction may include fuels, lubricating oils, solvents, paints, adhesives and compressed gases. On-site management of these wastes would be performed in accordance with RCRA requirements and TVA BMPs that implement RCRA regulations and that include additional procedures intended to prevent spills or other releases. Appropriate spill prevention, containment and disposal requirements for hazardous materials would be implemented to protect construction and plant workers, the public and the environment. Impacts associated with the use of fuels, oil, lubricants and the limited quantities of other hazardous materials during construction are expected to be negligible.

There would be a minor increase in solid and hazardous waste generated during construction. These materials would be handled and disposed of per applicable state and federal requirements.

3.14.2.2.2 Operation

Operation of Alternative B would not change the quantity of CCR wastes generated at BRF annually. Under this Alternative, BRF would continue to generate 240,000 tons per year of fly ash and bottom ash and 318,000 tons per year of gypsum wastes from flue gas desulfurization (FGD). These are the primary waste streams associated with both the current situation and Alternatives B and C.

Other solid waste streams associated with operation of the proposed landfill would be limited in quantity. Maintenance of the haul road would involve periodic cleaning roadside ditches to improve or provide drainage. The wastes generated from these activities would consist primarily of vegetative detritus such as tree limbs, leaves, grass, or other vegetation periodically eliminated by herbicide application in accordance with existing practices. Such wastes would also be generated on a periodic basis from maintenance of drainage ditches associated with the landfill run-on/run-off controls. It is anticipated that these wastes would be generated one time per year but the quantities cannot be accurately predicted. These wastes may be disposed of off-site at a Class III or IV landfill or may be composted.

Periodic clean-out of the storm water basins would result in soils and vegetative wastes. Clean-out of the storm water retention basins is likely to occur only once or twice over the lifespan of the proposed landfill. Each cleanout event would generate a waste volume of approximately 30 to 50 percent of the combined capacities of the three basins. These wastes may be disposed of off-site at a Class III or IV landfill. It may be possible during the operational phase of the proposed landfill for these wastes to be dried on-site, screened and blended for use in cover soils. However, if any ash has become incorporated in the wastes as a result of incidental losses during transport or from wind dispersal, the material could not be used in the landfill cover.

With the exception of the CCR, the largest solid waste stream that would be routinely generated from operation of the proposed landfill is leachate wastewater treatment sludge. The proposed design provides for a leachate storage volume of at least 1,650,000 gallons at the leachate management system at the landfill. Under Tennessee Rule 0400-11-01-.04(4)(a)(7), landfills are required to have a minimum leachate storage capacity of at least 30 days and, therefore, the indicated volume was considered the monthly leachate generation rate. In order to develop a preliminary order of magnitude estimate of the generation rate for the wastewater treatment sludge, the mean concentration of metals in the Toxicity Characteristic Leaching Procedure extract concentrations from the BRF bottom ash and fly ash was used. Concentrations for other wastewater discharge metals (except iron) were estimated directly from ash pond discharge concentrations. The wastewater sludge was assumed to be approximately 15 percent solids, which is within the typical range after mechanical dewatering. Based on this approach, the monthly rate of wastewater sludge generation associated with this alternative was preliminarily estimated to be 2.3 to 4.6 tons per month (approximately 40 tons or 800 ft^3 per year).

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

replacement during operations. These components would be managed as solid waste upon replacement.

Various hazardous wastes, such as used oils, hydraulic fluids and engine coolants could be produced during landfill operations. These wastes would be temporarily stored in properly managed hazardous waste storage areas on-site. Appropriate spill prevention, containment and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public and the environment.

There would be a long-term impact on the management of solid wastes at BRF as CCR produced at the facility would be disposed in a new landfill.

3.14.2.2.3 Post-Closure Care

The primary solid wastes that would result during post-closure care are vegetative detritus and soils from maintenance of the road drainage swales, sludge from periodic clean-out of the storm water basins, sludge from leachate treatment and wastes from cleanout of the leachate collection system. The wastes generated from periodic maintenance of the road drainage swales and run-on/run-off controls would consist primarily of vegetative detritus such as tree limbs, leaves, grass or other vegetation periodically eliminated by herbicide application. It is anticipated that these wastes would be generated annually.

The storm water basins would need to be dredged periodically during post-closure care. The volume of waste generated from each event would be 30 to 50 percent of the combined capacities of the basins.

The largest volume waste stream that would be generated during post-closure care would be sludge from leachate treatment. Leachate treatment is estimated to generate approximately 1,200 tons or 900 yd^3 of sludge during post-closure care.

Other small volume solid waste streams that would be generated during post-closure care include pure water from groundwater sampling, lubricating oils and filters from construction equipment and pumps associated with the leachate collection system, small quantities of oils and fuels from spills, small quantities of paints, adhesives etc. from maintenance.

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

Therefore, no measurable direct or indirect adverse effects related to solid or hazardous wastes are anticipated from closure activities.

3.14.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

3.14.2.3.1 Construction

The primary potential issues concerning solid and hazardous wastes with respect to the proposed action are: (1) the potential for increased generation from operation of the proposed action; and (2) the potential for a spill or release during operations or transportation.

TVA has not indicated any need to construct a loading or storage facility in conjunction with Alternative C. Therefore, typical construction related hazardous wastes or solid wastes such as soils and landscaping wastes from site preparation would not be generated. No construction rubble from land clearing operations, removal of paving and disposal of excess material would be generated.

3.14.2.3.2 Operation

Operation of Alternative C would not change the quantity of CCR wastes generated annually by BRF. Under this alternative, quantities of CCR wastes as described in Table 3-7 would be placed within an existing permitted landfill such as Chestnut Ridge. Therefore, this alternative would result in solid waste disposal that would have an effect on the lifespan of Chestnut Ridge and its long-term ability to meet disposal needs of the region.

Truck washing may be required prior to leaving BRF for transport along public highways. Additional solid wastes from truck washing would include sludges from sediment traps and waste oil/water admixtures from oil traps.

Relative to current generation rates, the quantity of equipment maintenance related solid and hazardous wastes would increase substantially under Alternative C. These wastes include used lubricating oil, used hydraulic fluids, coolants, oily sorbents and rags, waste fuel, batteries and lamps. Due to the greater number of vehicles needed to transport CCR daily to an offsite landfill, quantities of these materials generated under this alternative would be greater than Alternative B.

Most other solid waste streams associated with operation of this alternative would be limited in quantity and include paper and plastics from packaging of maintenance related materials, small quantities of paints, adhesives, etc. from maintenance. These components would be managed as solid waste upon replacement.

All solid waste generated as a result of the transport of CCRs to the offsite landfill would be handled in accordance with standard procedures for spill prevention and cleanup and waste management protocols in accordance with pertinent federal, state and local requirements.

Based on the anticipated fleet requirements, TVA may decide to contract transportation services. Under these circumstances, solid and hazardous waste streams would not be generated directly by TVA.

3.15 Socioeconomics

3.15.1 Affected Environment

Socioeconomic characteristics of resident populations are assessed using 2010 Census and 2009-2013 American Community Survey 5-year estimates. Employment and housing information is provided by the 2009-2013 American Community Survey.

Socioeconomic characteristics of the potentially affected population are assessed within a 5-mi radius buffer around the proposed landfill at Site J and the existing landfill at Chestnut Ridge. The geography included in the 5-mi radius for these areas overlap and extend into Anderson and Knox counties. Therefore, Anderson County, Knox County and the state of Tennessee are included as appropriate secondary geographic areas of reference. Comparison at multiple scales provides a more effective definition for socioeconomic factors that may be affected by the proposed action including minority and low income populations.

3.15.1.1 Demographics

Demographic characteristics of the study area are summarized in Table 3-10. The communities surrounding Site J and the Chestnut Ridge Landfill are primarily rural with most of the population located within the cities of Oak Ridge, Clinton and Knoxville (U.S. Census Bureau [USCB] 2015a). This is reflected in the population of the community around Site J and the Chestnut Ridge Landfill, which encompass areas that are proximate to these cities. Since 2000, the population around Site J and the Chestnut Ridge Landfill has increased by approximately 2 and 4 percent respectively, which is similar to the population change in the state of Tennessee. However, during this same period, population increases in Anderson County and Knox County were smaller (0.5 percent and 1.1 percent respectively).

Age characteristics of the region surrounding Site J and the Chestnut Ridge Landfill are comparable to Anderson County, Knox County and Tennessee. Persons under the age of 18 are similar to the reference areas. There is a relatively greater percentage of older persons (greater than 65 years) in Anderson County than in the communities surrounding Site J and the Chestnut Ridge Landfill. Knox County has the lowest percentage of persons over 65 years, however, these communities reflect state percentages.

3.15.1.2 Economic Conditions

Employment characteristics for the communities surrounding Site J and the Chestnut Ridge Landfill are summarized on Table 3-11. The total employed civilian population within the communities surrounding Site J and the Chestnut Ridge Landfill is 29,428 and 21,071, respectively. Approximately 9 percent of the civilian labor force in the community surrounding Site J is unemployed, which is comparable to the community surrounding the Chestnut Ridge Landfill (8.4 percent). The unemployment rate in these communities is lower than the unemployment rate in Anderson and Knox counties (8.9 and 7.3 percent, respectively) and the State of Tennessee (10.1 percent). Median household income for the subject communities was $59,256 for the community surrounding Site J and $52,724 for the community surrounding the Chestnut Ridge Landfill. These incomes are greater than those reported for Anderson and Knox County and the State of Tennessee (see Table 3-10).

Table 3-10. Demographic Characteristics

	Site J 5-mi Radius	Chestnut Ridge Landfill 5-mi Radius	Anderson County	Knox County	State of TN
Population					
Population, 2013 estimate	71,666	52,695	75,494	436,983	6,346,105
Population, 2010	70,249	50,459	75,129	432,226	6,346,105
Percent Change 2010-2013	1.9%	4.2%	0.5%	0.01%	2.4%
Persons under 18 years, 2013	23.0%	24.1%	21.1%	25.0%	23.0%
Persons 65 years and over, 2013	15.5%	14.6%	18.5%	13.4%	14.7%
Racial Characteristics					
White Alone, 2013[(a)]	93.2%	96.9%	92.2%	86.2%	79.1%
Black or African American, 2013[(a)]	2.8%	1.2%	4.2%	9.2%	16.7%
American Indian and Alaska Native, 2013[(a)]	0.2%	0.1%	0.4%s	0.2%	0.4%
Asian, 2013[(a)]	1.8%	0.4%	1.2%	1.9%	1.6%
Native Hawaiian and Other Pacific Islander, 2013[(a)]	0	0	0	0	0.1%
Two or More Races, 2013	1.3%	1.1%	1.9%	1.5%	1.7%
Hispanic or Latino, 2013[(b)]	2.8%	1.5%	2.4%	3.6%	4.6%
Housing					
Housing Units, 2013	30,932	21,689	34,591	195,981	2,840,914
Median Household Income, 2009-2013	$59,256	$52,724	$43,620	$47,694	$44,298
Persons Below Poverty Level, 2009-2013	9.5%	10.7%	18.2%	14.6%	17.6%

Sources: USCB 2015a and USCB 2015b
(a) Includes persons reporting only one race.
(b) Hispanics may be of any race, so also are included in applicable race categories.

Table 3-11. Employment Characteristics

	Site J 5-mi Radius[1]	Chestnut Ridge Landfill 5-mi Radius[1]	Anderson County	Knox County	State of TN
Population Over 16 years	73,492	53,506	60,940	352,789	5,078,433
Civilian Labor Force					
Employed	29,428	21,071	31,140	210,719	2,806,948
Unemployed	2,882	1,941	3,054	16,683	316,682
Subtotal	32,310	23,012	34,194	227,402	3,123,630
Unemployment					
Percent of Total Population	3.9%	3.6%	5.0%	4.7%	6.2%
Percent of Civilian Labor Force	8.9%	8.4%	8.9%	7.3%	10.1%

Source: USCB 2015a

[1] Labor force data is not available at the block level, so data presented represents census tracts within a 5-mi radius of Site J and the Chestnut Ridge Landfill

The largest percentage of civilian employees in Anderson County are employed in the educational services, health care and social services industries (22.7 percent), followed by professional, scientific and management (including administrative and waste management services) (14.7 percent) and retail trade and manufacturing (13.0 percent and 12.9 percent respectively. This is similar to Knox County where business sectors providing the greatest employment are education services, health care and social services (24.4 percent), retail trade (13.1 percent) and professional, scientific and management (including administrative and waste management services) (12.7 percent). However, a greater percentage of persons in Anderson County are employed in the manufacturing sector than those in Knox County (12.9 percent for Anderson County versus 7.5 percent for Knox County) (USCB 2015a). Based on current commuting patterns and on proximity, the labor market area is defined to include all adjacent counties (USCB 2015a).

3.15.1.3 Community Facilities and Services

Community facilities and services are public or publicly funded facilities such as police protection, fire protection, schools, hospitals and other health care facilities, libraries, day-care centers, churches and community centers. Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and affect the delivery of such services. When applicable, the study area for the evaluation of impacts to community services is the service area of various providers, otherwise a secondary study area defined for the purposes of a socioeconomic analysis may be defined. As there are no direct impacts to community services associated with any of the alternatives, the study area for community impacts is defined as those areas proximate (within a half mile) of the proposed landfill site and around the existing Chestnut Ridge Landfill.

Services available to the communities surrounding Site J and the Chestnut Ridge Landfill include hospitals, fire and emergency services, law enforcement, churches and schools. The Valley View Church and Cemetery and the Church of Christ are located proximate to Site J (Figure 3-7).

There are no community facilities within a half mile of the Chestnut Ridge Landfill. The Claxton Elementary School, eight churches and a cemetery are located adjacent to the route that would be used to haul CCR to the Chestnut Ridge Landfill (see Figure 3-7).

3.15.1.4 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address EJ in minority and low income populations. This EO mandates some federal-executive agencies to consider Environmental Justice (EJ) when identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations. While TVA is not subject to this EO, TVA applies it as a matter of policy.

The analysis of the impacts of landfill activities on EJ issues follows guidance issued by CEQ under NEPA (CEQ 1997). The analysis of EJ impacts has three parts:

1. Identification of the geographic distribution of low-income and minority populations in the affected area.

2. An assessment of whether the impacts of closure activities would produce impacts that are high and adverse.

3. If impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

In the event that impacts are significant, disproportionality will be determined by comparing the proximity of any high and adverse impacts to the locations of low-income and minority populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations.

The CEQ defines minority as any race and ethnicity, as classified by the USCB as: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997).

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

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

Figure 3-7. Community Facilities – Site J and the Surrounding Area

Potentially affected communities were defined as any census block group that contained either of the proposed landfill sites (Site J or the Chestnut Ridge Landfill) or along the haul route used to transport CCR to the Chestnut Ridge Landfill. Demographic data by block group were then compared to data for Anderson and Knox counties. Total minority populations (i.e., all non-white racial groups combined and Hispanic or Latino) comprise between 2.0 to 5.0 percent of the population of the block groups containing Site J and between 0 and 2.0 percent of the block groups along surrounding the Chestnut Ridge Landfill. Minorities comprise 0 to 5.0 percent of the block groups along the haul route to the Chestnut Ridge Landfill. The minority populations within the block groups studied did not exceed 50 percent of the total population and did not significantly exceed rates for Anderson County (10 percent minority).

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

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

The percentages of households within each block group adjacent to the proposed landfills and the haul route to the Chestnut Ridge Landfill living below the poverty threshold range from 0 to 20 percent. The low income populations within these block groups did not exceed 50 percent of the total population in the given block group and did not significantly exceed corresponding rates for Anderson County (16.0 percent). However, because specific income information is not available at the block level, smaller populations, such as the trailer park located east of BRF on the south side of SR 170 (Edgemoor Road) may not be identified in this analysis as an EJ population. It is probable that persons in this area should also be considered as a sensitive low-income population subject to EJ considerations.

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current dry fly ash stack for as long as capacity is available. There would be no change in local demographics, economic conditions, or community services under the No Action Alternative. In the long term, however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, potentially significant effects on employment, local tax base and secondary economic impacts associated with a reduction in workforce could occur. However, because any impact to operations at BRF would not be consistent with TVA's long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

3.15.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

3.15.2.2.1 Demographic and Employment Impacts

Demographic characteristics of the project area would be expected to change temporarily in response to an increased construction workforce, but this change would not be significant. The on-site construction workforce is estimated to be 35 workers during the initial construction phase (i.e., site preparation and haul road construction). Five permanent workers would be employed during operation of the landfill. These workers could be drawn from the labor force that currently resides in the study area. Consequently, no long-term or significant impacts to local demographics are expected.

3.15.2.2.2 Economic Impacts

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

3.15.2.2.3 Community Facilities and Services

Construction and operation of a landfill for storage of CCR at Site J would not result in the displacement of or direct impacts to community facilities.

The Valley View Church and cemetery and the Church of Christ are located proximate to the proposed landfill site (see Figure 3-7). Although access to these facilities will be maintained, there may be some impact to ease of movement to these facilities during initial construction of the landfill due to the construction-related traffic. This impact would be minor given the intermittent use of these churches and the temporary nature of initial construction activities.

3.15.2.2.4 Environmental Justice

There would be no direct impact to EJ communities under this alternative. However, one area that may contain a sensitive low income population subject to EJ considerations is located on the south side of SR 170 (Edgemoor Road) and extends to Old Edgemoor Lane just north of Site J. Landfill construction may result in adverse effects to the residents in this location associated with increased noise, exposure to fugitive dust, exhaust emissions, vibrations, increased traffic and generation of solid wastes. During operation, the landfill also may present a visual impact as well as impacts related to fugitive dust and noise. Dust control measures designed to meet permit requirements would be implemented and operational noise attenuates to acceptable levels at the nearby residential areas. Visual and noise impacts would be further mitigated by the construction of a landscape screen along the northern boundary of Site J. The haul road would be constructed on BRF property

at an even greater distance from the potential EJ population, and the transport of CCR to the landfill is not expected to result in adverse effects to this local EJ population. Therefore, potential effects to this population is considered to be minor to moderate in nature.

It should also be noted that opportunities would be provided to residents with some construction phase employment, which would provide potential positive impacts to area low-income populations.

3.15.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

3.15.2.3.1 Demographic and Employment Impacts

There would be no change in demographic characteristics of the study area under this alternative. The Chestnut Ridge Landfill is already constructed and therefore no temporary workforce would be needed. Five permanent workers would be employed during operation of the landfill. These workers could be drawn from the labor force that currently resides in the study area and, therefore, no long-term or significant impacts to local demographics are expected.

3.15.2.3.2 Economic Impacts

Potential economic impacts associated with this alternative would be similar to those described for Alternative B. However, positive economic impacts would be much smaller as no construction-related direct and indirect beneficial impacts would be realized. Revenue generated by income tax and sales tax from new workers would benefit the local economy. However, given the relatively small magnitude of the anticipated workforce, this impact is considered to be negligible.

3.15.2.3.3 Community Facilities and Services

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

3.15.2.3.4 Environmental Justice

There would be no direct impact to EJ communities under Alternative C. However, one area that may contain a sensitive low-income population subject to EJ considerations was identified on the south side of SR 170 (Edgemoor Road). It is possible that there would be a long-term indirect impact to this community due to the additional traffic, noise and dust from the trucks transporting CCR to the landfill. Although this impact would be minor to moderate from a transportation perspective, the addition of 23 truck trips per hour (over a 9-hour workday) passing this community could impact the individuals living in the community. This impact would be minimized through the use BMPs to minimize emissions of fugitive dust and transport of CCR would only occur during normal working hours. Therefore, this impact is considered to be moderate but would not be disproportionate as it would be consistent across all communities (EJ and non EJ) along the haul route.

3.16 Natural Areas, Parks and Recreation

3.16.1 Affected Environment

Natural areas include managed areas, ecologically significant sites and streams listed in the Nationwide Rivers Inventory system. This section addresses natural areas that are on, immediately adjacent to (within 0.5 mi) or within the region of the proposed Site J landfill (5-mi radius).

The Claxton Community Park is located within 0.5 mi of the Site J project area. This park contains a community center, playground and athletic fields. Review of the TVA Regional Natural Heritage database indicates that there are no other managed areas or ecologically significant sites within or in the vicinity (0.5 mi) of the proposed Site J. However, Brushy Valley Park and Lower Bull Run Bluffs Habitat Protection Area (HPA) are located within 1 mi of the proposed landfill site.

Brushy Valley Park is approximately 0.9 mi east from the proposed project area. This small 9.8-ac park is on the north side of Bullrun Creek and is managed by the Anderson County Conservation Board. Lower Bull Run Bluffs TVA HPA is approximately 0.7 mi southeast from the proposed project area. This 3.57-ac HPA features bluffs with deciduous forest and some rock outcrops that provide habitat for ginseng and saxifrage.

As illustrated on **Error! Reference source not found.**, several natural and recreation areas are located within 5 mi of the proposed project. These include 15 TVA HPAs, recreational areas at the Oak Ridge Reservation and 17 public parks and recreational facilities.

In Anderson County, the Clinch River is listed on the Nationwide Rivers Inventory by the U.S. National Park Service from CRM 47, upstream to CRM 73, below Norris Dam (TVA 2012). The Nationwide Rivers Inventory is a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive, and related CEQ procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more Nationwide Rivers Inventory segments.

Under the Tennessee Scenic Rivers Program, the State of Tennessee recognizes the section of the Clinch River from Melton Hill Dam upstream to the Pellissippi Parkway (SR 62) as a Class III Partially Developed River. A partially developed river is defined by TDEC as rivers or sections of rivers that are free flowing, unpolluted and with shorelines and vistas essentially more developed (TDEC 2015). The Tennessee Scenic Rivers Program is a voluntary community-based partnership intended to preserve and protect the free flowing, unpolluted and outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic or cultural values of selected rivers or river segments in the state (Tennessee Scenic Rivers Association 2015).

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current disposal areas for as long as capacity is available. There would be no change in existing CCR disposal operations and, therefore, no impact to natural areas, parks, or recreation.

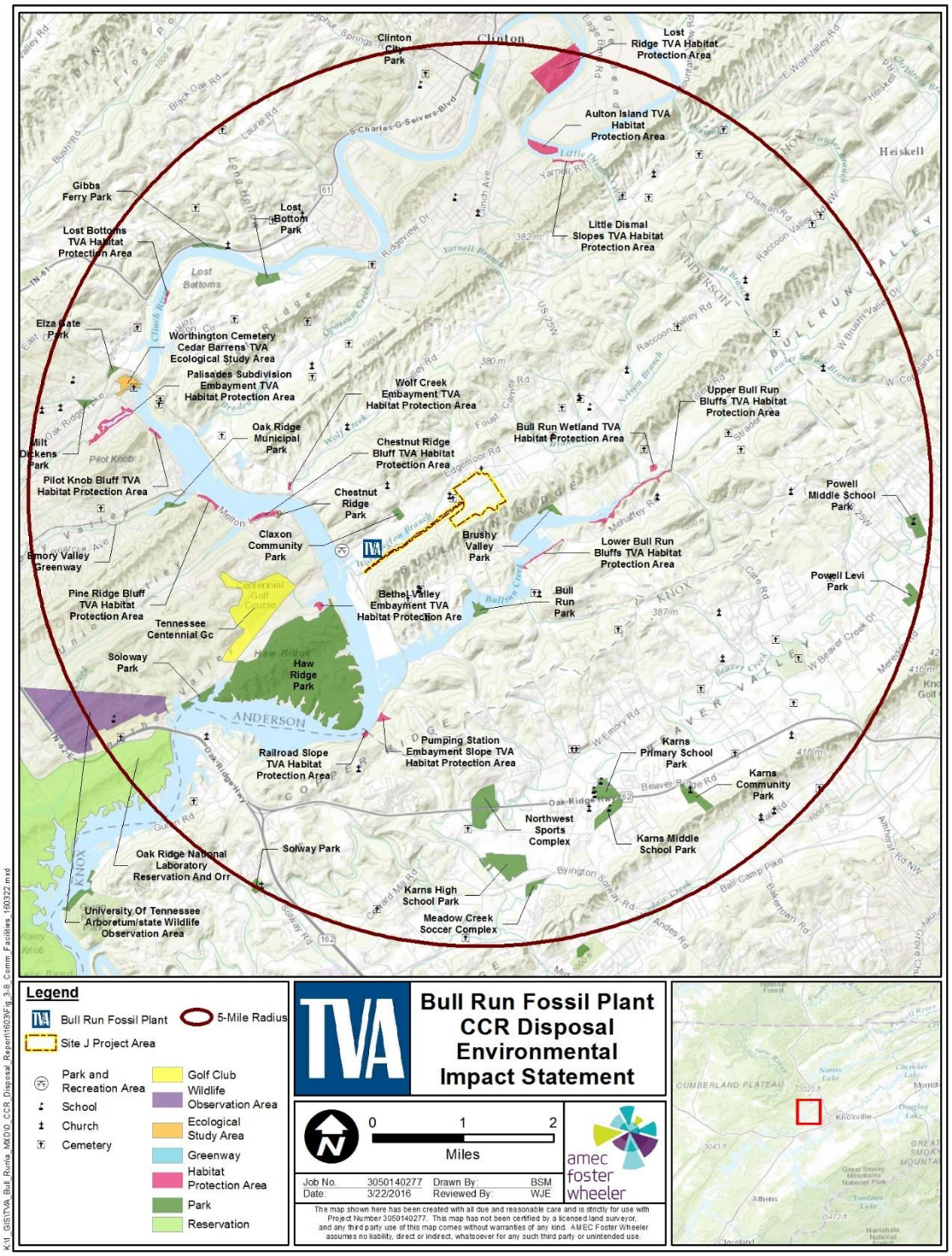

Figure 3-8. Natural Areas and Parks within the Vicinity of Site J

3.16.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, TVA would construct the CCR landfill in an area that is adjacent to an existing industrial use. There are no parks or recreational areas located on or adjacent to Site J. The Claxton Community Park is located approximately 0.5 mi west of the proposed landfill site, and other parks and natural areas identified in **Error! Reference source not found.** are located greater than 1 mi away from the proposed landfill site. Therefore, no direct impact to natural areas, parks or recreational facilities as a result of construction or operation of the proposed landfill is anticipated.

However, some construction-related traffic would likely use SR 170. Recreational users of facilities along this road (the parking lot on the south side of SR 170 just east of the Clinch River Bridge utilized by fisherman to access the Clinch River, Haw Ridge Park, the Centennial Golf Course, Soloway Park and Claxton Community Park) would potentially be indirectly impacted by increased traffic, fugitive dust and noise generated during the initial landfill construction period. This impact would be minor and would not impair use or enjoyment of these resources given implementation of BMPs designed to minimize fugitive dust and the temporary and intermittent nature of construction. Once constructed, CCR generated at BRF would be transported on-site, and there would be no impact to these resources.

3.16.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

As with Alternative B, there would be no direct impact to natural areas, parks or recreational areas under this alternative.

There is a potential for indirect impacts to natural areas, parks and recreational areas associated with hauling CCR to the Chestnut Ridge Landfill. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Volunteer RV Park and Escapees Raccoon Valley RV Park are located adjacent to SR 170. However, unlike Alternate B, it is possible that there would be a long-term indirect impact to users of these facilities due to the additional traffic, noise and dust from the trucks transporting CCR to the landfill. The impact to the use or enjoyment of these resources would be moderate given the projected increase in truck traffic (100 truckloads which results in a traffic count of 200 trips) relative to the existing traffic along this portion of the roadway and the duration of the project (approximately 15.5 years).

3.17 Transportation Analysis

3.17.1 Affected Environment

BRF is served by highway, railway and waterway modes of transportation. The transportation network surrounding BRF contains roads and bridges, rail lines and navigable waterways. Nearby, major interstates include I-75 and I-40. Traffic generated by operations at BRF is expected to be composed of a mix of cars and light duty trucks as well as medium duty to heavy duty trucks. Site J is located on TVA-owned property and is bordered by Old Edgemoor Lane to the north, New Henderson Road to the west and Isabella Lane to the east. Chestnut Ridge is an existing landfill located approximately 12 mi northeast of BRF.

State highways provide ample access in the immediate vicinity of BRF. Principal access at BRF is via SR 170, which is two lanes wide. US 25W, a four-lane roadway, is approximately

3.2 mi east of BRF. West of US 25W, SR 170 is known as Edgemoor Road, east of US25W, SR 170 becomes Raccoon Valley Road, which is two lanes wide and continues to I-75 approximately 6.8 mi to the east. Chestnut Ridge landfill lies just north of Raccoon Valley Road and just west of I-75.

The 2014 Annual Average Daily Traffic (AADT) on the roadways in the immediate vicinity of BRF for SR 170 (Edgemoor Road) and SR 170 (Raccoon Valley Road) are indicated in Table 3-12.

Table 3-12. Average Daily Traffic Volume (2014) on Roadways in Proximity to BRF

Roadway	Existing AADT
SR 170 (Edgemoor Road) between BRF and US 25W/SR 9	14,923
SR 170 (Raccoon Valley Road) just east of US 25W	4,095
SR 170 (Raccoon Valley Road) just west of Heiskell Road	3,406

Source: Knoxville TPO 2014

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action

Under this alternative, CCR generated at BRF would continue to be stored in the current landfill as long as capacity is available. There would be no change in existing CCR disposal operations and, therefore, no impacts to transportation and local roads are anticipated.

3.17.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this alternative, CCR from the dewatering facility would be transported to Site J via a newly constructed haul road on TVA property. This haul road would extend northeast from an existing TVA haul road to Site J. New Henderson Road would be maintained on its current alignment while the new haul road will pass over it on a new private bridge. This minimizes any impact to New Henderson Road and would only result in minimal impacts to traffic during construction.

Based on the estimate of CCR produced daily (see Table 3-7), and the capacity of an articulated dump truck, 65 truckloads of CCR per day would be needed to transport CCR to the proposed landfill. Transport of CCR would occur daily (for a typical five-day work week) over the life of the landfill (estimated to be approximately 15.5 years). This would result in a traffic count of 130 trips per day along the haul road or approximately 15 truck trips per hour over a typical nine-hour workday. The use of the new haul road keeps the trucking of CCR off of public roadways, which has a benefit to the safety of traveling public.

Under this alternative, the hauling of CCR generated at BRF would not use public roadways; therefore, the transport of CCR would not directly impact traffic and levels of service on local roads. Minor impacts to traffic would occur during installation of bridge components. However, this impact would be temporary and would not require rerouting or road closure for any significant period of time. Once constructed, traffic on New Henderson Road would be separated from landfill haul road traffic and would not be impacted by haul road truck movements.

3.17.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill.

The haul route to the Chestnut Ridge landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic (see Figure 2-4). Therefore, for this alternative any resources along the haul route are already subjected to vehicular traffic destined for the landfill and no new roads would need to be constructed.

Over-the-road tandem dump trucks would be used to haul CCR between BRF and the Chestnut Ridge Landfill along the haul route described above. Based on the estimate of CCR produced daily (see Table 3-7) and the capacity of an over-the-road tandem dump truck, 100 truckloads of CCR would be needed to transport CCR generated at BRF to the Chestnut Ridge Landfill. Transport of CCR would occur daily (during a typical five-day work week) over a period of approximately 15.5 years to accommodate long-term disposal of CCR generated at this facility). This would result in a traffic count of 200 trips per day along the haul route or approximately 23 truck trips per hour over a typical nine-hour workday. The number of trips per day is higher for Alternative C than it is for Alternative B because Alternative B would use larger articulated dump trucks to haul CCR over the new TVA haul road. With Alternative C, hauling of CCR is over public roadways and smaller tandem dump trucks must be used instead of the larger articulated dump trucks. The effects of these trips on roads along the haul route are shown in Table 3-13.

Table 3-13. Traffic Impacts Associated with Hauling CCR to Chestnut Ridge Landfill from BRF

Roadway	Existing AADT*	Existing Traffic with CCR Hauling Traffic (AADT)	Traffic Increase
SR 170 (Edgemoor Road) between BRF and US 25W/SR 9	14,923	15,123	1.34%
SR 170 (Raccoon Valley Road) just east of US 25W	4,095	4,295	4.88%
SR 170 (Raccoon Valley Road) just west of Heiskell Road	3,406	3,606	5.87%

* Source: Knoxville TPO 2014.

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

- LOS A: free flow traffic conditions
- LOS B: free flow conditions although presence of other vehicles begins to be noticeable
- LOS C: increases in traffic density become noticeable but remain tolerable to the motorist

- LOS D: borders on unstable traffic flow; the ability to maneuver becomes restricted; delays are experienced
- LOS E: traffic operations are at capacity; travel speeds are reduced, ability to maneuver is not possible; travel delays are expected; and
- LOS F: designates traffic flow breakdown where the traffic demand exceeds the capacity of the roadway; traffic can be at a standstill.

Under Alternative C, hauling of CCR generated at BRF would add 200 trips per day (23 trips per hour over a typical nine-hour workday) on SR 170 (Raccoon Valley Road) (an increase of roughly 5 percent). This increase results in a minor impact on the traffic flow on Raccoon Valley Road, but would not change the existing LOS as there is sufficient capacity remaining on this road to handle the increase in truck traffic resulting from hauling of CCR from BRF.

However, on SR 170 (Edgemoor Road) which is also a two-lane roadway, potential localized minor to moderate impacts may occur as a result of hauling CCR to the Chestnut Ridge Landfill. Peak hour delays are known to occur along SR 170 (Edgemoor Road). The existing (2014) traffic volume on SR 170 (Edgemoor Road) east of BRF is 14,923 vehicles per day, and the road is congested during peak hours of the day. The addition of CCR haul road traffic from BRF would have a minor to moderate impact on traffic east of BRF during peak hours of the day. Ingress/egress turning movements of construction traffic at BRF may at times be difficult and lead to unsafe conditions especially during peak hours. These additional truck turning movements may adversely impact the existing LOS along Edgemoor Road in front of the BRF facility.

The proposed hauling of CCR over public roadways would contribute to the number of vehicle miles traveled on those roadways, which is a factor in injury and fatal traffic crash rates. The number of truck-related crashes associated with the hauling of CCR from BRF could increase and could compromise driver safety. Therefore, while the impacts of the additional CCR haul traffic on SR 170 (Edgemoor Road) may be absorbed, localized effects on traffic flow and safety may be evident.

Otherwise on the remainder of the road network, which has relatively low traffic volumes, the percentage increases in traffic resulting from the transport of CCR from BRF are negligible and the impacts are expected to be minor.

Therefore, in consideration of the localized impacts associated with the increase in traffic on SR 170 (Edgemoor Road) and the potential safety implications associated with the increase in truck traffic, implementation of this alternative would have a moderate impact on transportation as a result of transport of CCRs from BRF.

3.18 Visual Resources

3.18.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service and integrated with planning methods used by TVA. The classification process is also based on fundamental methodology and descriptions

adapted from Landscape Aesthetics, A Handbook for Scenery Management, Agriculture Handbook Number 701 (U.S. Forest Service 1995).

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

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

For this analysis, the affected environment is considered to include the proposed Site J landfill, associated near off-site temporary use areas and any sensitive receptors along the haul routes to either alternative site as well as the physical and biological features of the landscape. The proposed Site J landfill is located east of the existing fly ash stack and consists of lands formally used for residential development. TVA previously planted rows of trees along the edge of the property facing Old Edgemoor Lane. The existing BRF facility is located along the bank of the Clinch River. The surrounding region is largely undeveloped with some pockets of residential and commercial developments. The surrounding area is characterized by ridge and valley topography, which has likely limited any extensive development on the lands. A small residential community of approximately 100 homes is located adjacent to Site J just north of Old Edgemoor Lane. There are also residences located to the west and east of the site, although they are located a greater distance from the proposed landfill. Undeveloped forested land occurs south of the site.

The BRF stacks, the dry fly ash stack and the transmission lines leaving the plant site, are the dominant elements in the existing landscape that are visible to motorists on nearby roadways within the foreground and middleground. Undeveloped to sparsely developed land covered in trees comprise the overall viewscape of the area surrounding BRF.

Based on the above characteristics, the scenic attractiveness of the affected environment is considered to be common, whereas the scenic integrity is considered to be low to moderate (Table 3-14).

Table 3-14. Visual Assessment Ratings for Existing Affected Environment

	Existing Landscape	
View Distance	**Scenic Attractiveness**	**Scenic Integrity**
Foreground	Common	Low
Middleground	Common	Moderate
Background	Common	Moderate
Overall Scenic Value Class	**Fair - Good**	

The rating for scenic attractiveness is due to the ordinary or common visual quality. The forms, colors and textures in the affected environment are normally seen through the characteristic landscape. Therefore, the landscapes are not considered to have distinctive quality. In the foreground, the scenic integrity has been lowered by human alteration such as BRF and residential and commercial development. However, in the middleground and background these alterations are not substantive enough to dominate the view of the landscape. Based on the criteria used for this analysis, the overall scenic value class for the affected environment is considered to be fair to good.

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action

Under Alternative A, TVA would not construct a new CCR disposal site. Therefore, there would be no impacts to the visual environment.

3.18.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

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

During the construction phase of the proposed facility, there would be additional visual discord due to tree clearing and grading as well as an increase in personnel and equipment in the area. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already used for industrial activity related to BRF operations. This increase in visual discord would be temporary and only last until all activities have been completed by TVA.

Three dimensional visualizations of the proposed landfill from Old Edgemoor Road and the view from the proposed haul road are shown on Figure 2-4 and Figure 2-5. The new landfill would primarily be seen by motorists on the adjacent roadways, Old Edgemoor Lane, and New Henderson Road, SR 170 and the residences along these roads. The tallest feature at the BRF facility are the stacks, approximately 500 ft and 800 ft high. Additionally, the highest point at the existing dry fly ash stack located to the west of Site J is approximately 920 ft msl, which is 100 ft above the natural contours. The proposed landfill would be visible

in the foreground and middleground by nearby residents and motorists along local roads. Use of the landfill over its approximately 15.5-year lifetime would result in the gradual increase in its height. In time, the proposed landfill would be similar in appearance to the existing dry fly ash stack and be screened to some extent by existing vegetation. Due to the screening effect of the forested terrain to the south, visibility to residents south of the proposed site is expected to be very limited. Additionally, the proposed landfill is not expected to be visible in the background.

The construction of the proposed facility would contrast with the color of the landscape during some phases of operation. The current landscape at the proposed site is predominantly green and brown as a result of the existing vegetation on the site. However, while the CCR in the landfill would contrast with the natural landscape color, it would eventually be covered with an earthen layer and grassy vegetation, just as the existing dry fly ash stack. The dominant shapes in the landscape include the vertical lines of existing transmission structures and stacks of existing facilities against the horizon. The color and shape contrast would be greatest in the foreground to passing motorists and residents, although the contrasts would be less noticeable in the middleground and background.

The 0.5 mi area around the affected environment includes undeveloped forested lands, residences and BRF. Sensitive visual receptors within the foreground of the proposed landfill include residences on the north side of Old Edgemoor Lane and the Valley View Church and Cemetery on the west side of New Henderson Road. The church and cemetery are located between the existing BRF landfill and the proposed Site J location. In the foreground viewing distance, individual details of specific objects are important and easily distinguished. Details are the most significant within the immediate foreground, up to 300 ft. The middleground includes 31 parks, 22 churches and 30 cemeteries. The nearest parks, Brushy Valley Park and Claxton Community Park, are located approximately 0.9 mi east and 0.5 mi west, respectively, of the proposed Site J landfill. In the middleground viewing distance, details are weak as they tend to merge into larger patterns. Visibility of the proposed landfill is expected to be limited to receptors within this viewing distance due to the screening effect of surrounding topography and vegetation. The background includes 361 potentially sensitive visual receptors, including 100 parks, 149 churches and 112 cemeteries. At the background distance, the proposed facility is not expected to be discernible (due to the screening effects of terrain and overall distance) nor would it contrast with the overall landscape.

The existing industrial facilities, transmission lines and dry fly ash stack near the proposed site already contribute minor visual discord with the landscape. These elements also contribute to the landscape's ability to absorb negative visual change. Additionally, the topography and vegetation within the surrounding area provide some screening and allow the landscape to absorb the minor visual changes associated with the proposed landfill at the middleground and background distances (see Figure 2-4 and Figure 2-5).

While the proposed facility would contribute to a notable change in visual integrity of the landscape, it is not expected that the existing scenic class would be reduced by two or more levels, which is the threshold of significance of impact to the visual environment. Scenic attractiveness may be reduced to minimal in the foreground but would remain common in the middleground and background. Scenic integrity would remain low to moderate (see Table 3-14). The forms, colors and textures of the landscape that make up the scenic attractiveness would be affected in the foreground but would remain minimal. Impacts to scenic integrity are anticipated to be greatest in the foreground for area

residents and other passing motorists along local roads. In the middleground and background, impacts are not considered to be significant as they are not expected to alter the overall landscape. Based on the criteria used for this analysis, the scenic value class for the affected environment after the proposed landfill is constructed is considered to remain at fair to good.

3.18.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this alternative, CCR from BRF would be transported to an existing off-site permitted landfill, the Chestnut Ridge Landfill. Since Chestnut Ridge Landfill is an existing, permitted landfill, there would be no changes from the current environment within the landfill boundaries under this alternative. Therefore, potential visual impacts associated with this alternative would primarily be indirect impacts related to the transport of CCR material from BRF to the landfill.

The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill truck and worker vehicle traffic. Therefore, any sensitive visual receptors along the haul route are already subjected to vehicular traffic destined for the landfill, and no new roads would need to be constructed. Transportation of CCR material from BRF to the Chestnut Ridge Landfill could indirectly impact the landscape character along the haul route. However, since landfill traffic currently utilizes this route, any small increase in visual discord as a result of additional trucks would not alter the overall landscape. Therefore, impacts to visual resources along the haul road to the Chestnut Ridge Landfill are not anticipated.

3.19 Cultural and Historic Resources

3.19.1 Affected Environment

3.19.1.1 Regulatory Framework for Cultural Resources

Cultural resources or historic properties include prehistoric and historic archaeological sites, districts, buildings, structures and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the National Historic Preservation Act (NHPA) (16 USC 470) and by NEPA to consider the possible effects of their undertakings on historic properties. ‘Undertaking’ means any project, activity or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA at 36 CFR Part 800. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act (16 USC 469-469c), Archaeological Resources Protection Act (16 USC 470aa-470mm) and the Native American Graves Protection and Repatriation Act (925 USC 3001-3013).

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

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

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

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

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

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

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

Federal agencies must resolve the adverse effects of their undertakings on historic properties. Resolution may consist of avoidance (such as choosing a project alternative that does not result in adverse effects), minimization (such as redesign to lessen the effects), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic structures sometimes involves thorough documentation of the structure by compiling historic records, studies and photographs. Agencies are required to consult with SHPOs, tribes and others throughout the Section 106 process and to document adverse effects to historic properties resulting from agency undertakings.

3.19.1.2 Area of Potential Effect

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

Under Alternative A – No Action Alternative, TVA would continue to manage CCR in its existing permitted dry fly ash stack. Therefore, the APE for Alternative A is the footprint of the stack and is expected to consist of previously developed and disturbed lands.

For Alternative B, TVA defined the APE to address both archaeological resources (below ground) and for historic architectural resources (above ground). The APE is defined as the project footprint, Site J, as this is the area within which ground disturbance may occur during construction and operation of the landfill as well as the area where direct and indirect effects could occur to historic architectural resources.

For Alternative C, the APE would consist of the existing off-site landfill and the existing transportation corridors (public roads) between BRF and the landfill. The off-site landfill occurs on previously developed and disturbed lands. In addition, the permitted landfill would have previously undergone the Section 106 review process to evaluate impacts to historic properties when it was constructed. CCR material from BRF would be transported to the landfill along existing transportation corridors which had previously been disturbed during their construction.

3.19.1.3 Previous Studies

TVA has conducted records searches at the Tennessee Division of Archaeology and the Tennessee Historical Commission, located in Nashville, Tennessee, to identify previously recorded archaeological and architectural properties listed on, or eligible for inclusion in the NRHP within the APE. No historic architectural resources have been recorded within the plant boundary. The powerhouse and other plant facilities are less than 50 years in age. The integrity of the original powerhouse and stack has been negatively impacted by recent construction, including the installation of the FGD system and associated stack. Therefore, TVA has determined that the plant is not a historic property.

To date, TVA has conducted three investigations, including both archaeological and architectural surveys under Section 106 of the NHPA within the APE. The archeological surveys field inspections involved systematic shovel testing at 100-ft intervals and a visual examination of exposed ground surfaces and any terrain with a slope greater than 20 percent. No new archaeological sites were recorded as a result of these investigations (TRC 2011, TRC 2012 and TRC 2013). The SHPO concurred with TVA's finding of no historic properties affected (Appendix D).

TVA conducted an architectural survey of the APE in 2012 as part of the purchase of Site J and demolition of vacant structures on the property. This survey identified 12 previously unrecorded architectural resources that were over 50 years old. Evaluations of these resources determined that they were not eligible for the NRHP because of their lack of architectural distinction; loss of integrity caused by modern alterations and/or damage; and the inability to associate the houses and/or their original owners with an important historical event or series of events (TRC 2011 and TRC 2012). SHPO concurred with TVA's finding of no historic properties affected (see Appendix D).

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not construct a CCR landfill on-site or transport CCR to an off-site landfill. TVA would continue to manage CCR in its existing dry fly ash stack. Implementing Alternative A would require no new ground disturbance activities. Therefore, no direct or indirect impacts to cultural resources would occur under Alternative A.

3.19.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under Alternative B, no impacts to cultural resources are anticipated as no archaeological sites or architectural resources eligible for listing in the NRHP were identified within the APE from either a record search or survey. Topography and vegetation limit the extent of the APE and provide screening to structures outside the APE. In letters dated December 8, 2011, January 3, 2012, November 6, 2012, December 12, 2012, and May 17, 2013, the SHPO concurred with the determination that no effect on cultural resources would occur for

projects occurring with the APE (see Appendix D). Therefore, construction of the landfill is not expected to have an adverse impact on cultural resources.

The eastern portion of the proposed haul road overlaps with areas previously surveyed. The remaining portions of the proposed haul road APE were not previously surveyed. Given the degree of ground disturbance that has taken place within the proposed haul road during the construction and maintenance of the rail line and previous projects related to the construction and use of BRF, TVA finds that this portion of the archaeological APE has no potential for the presence of intact archaeological sites. Therefore, construction of the haul road is not expected to have an impact on cultural resources.

A soil borrow stockpile will occur within the project limits and will have no effect on cultural resources. If additional borrow material is needed from outside the project area, borrow material will be obtained from a permitted location where the potential for impact to cultural resources had been considered.

In summary, TVA has determined that there are no archaeological or architectural resources within the APE for Alternative B. If an unidentified archaeological site is discovered during construction, TVA will cease all construction activities in the immediate area where archaeological material is discovered. TVA will contact the SHPO to determine what further action, if any, will be necessary to comply with Section 106 of the NHPA.

3.19.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under Alternative C, no direct impacts to historic properties would occur. Chestnut Ridge Landfill is a permitted landfill that has previously undergone the Section 106 review process to evaluate impacts to historic properties. As part of the landfill permitting process, the Tennessee State Archaeologist also reviews the site for the existence of burial grounds. No historic properties have been identified at the Chestnut Ridge (TVA 2010). Therefore, the addition of CCR material from BRF to this landfill would not result in any direct impacts to historic resources.

Indirect impacts from transporting CCR to the Chestnut Ridge Landfill could include an increase in vibrations and noise to historic resources located adjacent to the haul route. The haul route to the Chestnut Ridge Landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. Therefore, any historic resources along the haul route are already subjected to vehicular traffic destined for the landfill. Any increase in indirect impacts due to increased truck traffic would be intermittent and not expected to impair or adversely affect historic resources. Based on a record search, no historic resources listed on the NRHP were identified along the proposed CCR haul route.

3.20 Noise

3.20.1 Affected Environment

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

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

Given that the human ear cannot perceive all pitches or frequencies in the sound range, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel or the A-weighted decibel (dBA). A-scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands are heard more efficiently by the ear and discounts the lower frequency bands. A noise change of 3 dBA or less is not normally detectable by the average human ear. An increase of 5 dBA is generally readily noticeable by anyone, and a 10 dBA increase is usually felt to be "twice as loud" as before.

Common indoor and outdoor noise levels are listed in Table 3-15.

3.20.1.1 Noise Regulations

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level, or Leq. The Leq value, expressed in dBA, is the energy-averaged, A-weighted sound level for the time period of interest. The day-night sound level (Ldn), is the 24-hour equivalent sound level, which incorporates a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m., to account for the increased annoyance during this period and the fact that most people are more sensitive to noise while they are trying to sleep. EPA (1974) guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). In Anderson County, allowable noise levels vary depending on the zoning district. Residential (R-1) districts have the most stringent regulations and cannot exceed 60 dBA during the daytime hours or 55 dBA during the night, measured at the closest adjacent property line. In addition, allowable noise levels from industrial properties cannot exceed 80 dBA.

3.20.1.1 Background Noise Levels

Noise levels continuously vary with location and time. In general, noise levels are high around major transportation corridors along highways, railways, airports, industrial facilities and construction activities. Sound from a source spreads out as it travels from the source, and the sound pressure level diminishes with distance. In addition to distance attenuation, the air absorbs sound energy; atmospheric effects (wind, temperature, precipitation) and terrain/vegetation effects also influence sound propagation and attenuation over distance from the source. An individual’s sound exposure is determined by measurement of the noise that the individual experiences over a specified time interval.

Table 3-15. Common Indoor and Outdoor Noise Levels

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

Source: Arizona DOT 2008.

Community noise refers to outdoor noise near a community. A continuous source of noise is rare for long periods and is typically not a characteristic of community noise. Typical background day/night noise levels for rural areas range between 35 and 50 dBA whereas higher-density residential and urban areas background noise levels range from 43 dBA to 72 dBA (EPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio and sleeping.

3.20.1.2 Sources of Noise

BRF is bordered by forested ridges on the north and south, a partially forested valley to the east and the Clinch River on the west. There are noise sensitive land uses (i.e., residential areas) located north, south and east of the plant site. The partially forested hills across the river are used for residential and recreational purposes. The residences closest to the plant and therefore most affected by plant noise, are located north of the plant.

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

Noise sources common to activities evaluated in this EIS include noise from industrial activities, transportation noise and construction noise. Transportation noise related to activities evaluated in the EIS primarily includes noise from highway traffic; however, there would also be some noise related to rail traffic at BRF. Three primary factors influence highway noise generation; traffic volume, traffic speed and vehicle type. Generally, heavier traffic volumes, higher speeds and greater numbers of trucks increase the loudness of highway traffic noise. Other factors that affect the loudness of traffic noise include a change in engine speed and power, such as at traffic lights, hills and intersecting roads and pavement type. Highway traffic noise is not usually a serious problem for people who live more than 500 ft from heavily traveled freeways or more than 100 to 200 ft from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic typically results in a 3 dBA increase in noise levels. Railway noise depends primarily on the speed of the train but variations are present depending upon the type of engine, wagons and rails (Berglund and Lindvall 1995). At BRF however, rail operations are conducted at very low speeds and likely result in lower noise emissions.

The level of construction noise is dependent upon the nature and duration of the project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment on-site and the movement of construction-related vehicles (i.e., worker trips and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles.

3.20.2 Environmental Consequences

3.20.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would not seek additional disposal options for placement of CCR generated at BRF. Rather, CCR would continue to be stored in the current dry fly ash stack for as long as storage capacity is available. No changes in the existing noise environment would occur under this alternative. In the long term however, once capacity to manage CCR produced at BRF is exceeded, plant operations would be impacted as there would be no option for storage of CCR produced at BRF. Under this theoretical condition, noise from plant operations would be reduced within the immediate region. However, because any impact to operations at BRF would not be consistent with TVA's long range plan to provide power for which BRF is a base-load facility, this alternative is not consistent with the project purpose and need.

3.20.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Under this Alternative, TVA would construct and operate a landfill for dry disposal of CCR on TVA-owned property located approximately 0.4 mi east of BRF. Development of Site J would also include construction of a dedicated on-site haul road to convey CCR from the plant to the landfill.

3.20.2.2.1 Construction Noise

Most construction activities would occur during the day on weekdays; however, construction activities could occur at night or on weekends, if necessary. Construction-related noise would result from the construction of the new bridge over New Henderson Road. Some construction-related traffic would likely use SR 170, New Henderson Road and Old Edgemoor Lane to access the construction site. This would result in some temporary construction traffic noise on these roadways. Construction of the landfill and the relocation of Worthington Branch would likely require rock excavation with controlled blasting due to the topographic relief and shallow bedrock at the site.

Such activities would result in elevated temporary short-term noise levels. The blasting would be at the initial phase of landfill construction only and would be controlled at certain times during the day. Construction activities would generate noise from compactors, front loaders, backhoes, graders, trucks and blast devices. As illustrated in Table 3-16, typical noise levels from construction equipment are expected to be 85 dBA or less at a distance of 50 ft from the construction site. These noise levels would diminish with distance from the project site at a rate of approximately 6 dBA per each doubling of distance. Therefore, noise would be expected to attenuate to the recommended HUD noise guideline of 65 dBA at approximately 500 ft. However, this distance would be shorter in the field as objects and topography would cause further noise attenuation. Although construction noise would attenuate to meet the HUD guideline of 65 dBA during daytime hours, construction noise could still remain above the EPA guideline of 55 dBA. However, these impacts would be intermittent and temporary. Given the temporary and intermittent nature of construction noise, the impact of noise generated from construction activities is expected to be minor.

Table 3-16. Typical Construction Equipment Noise Levels

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

3.20.2.2.2 Operation Noise

Primarily, operation of the proposed landfill would occur during the day on weekdays. The transition from construction-period noise to operation-period noise at Site J would be relatively indistinct since the same type of equipment would be used to operate the landfill as would be used during construction of the landfill. The construction of the dedicated on-site haul road would be temporary; however, the movement of dump trucks carrying CCR over the haul road would fall into operation of the landfill and would not be temporary. To assess the impact of noise from landfill operations, several potential noise receptors were identified near the proposed site and analyzed for noise impacts. Noise level impacts from construction equipment used to operate the landfill and along the dedicated on-site haul road are listed in Table 3-17.

Table 3-17. Predicted Noise Levels Resulting from Operations at Site J

Noise Generation Feature	Noise Level (dBA) at 50 ft	Receptor	Distance to Receptor (ft)	Noise Level (dBA) at Receptor
Dozer, Scraper, Grader or Excavator	85	Residence on Old Edgemoor Lane east of New Henderson	507	64.9
		Residence on Greendale Lane	541	64.39
		Church of Christ on Old Edgemoor Lane	602	63.4
Articulated Dump Truck	84	Valley View Church located on Old Edgemoor west of New Henderson	500	64.0

Noise levels attenuate to below 65 dBA at the receptor located nearest to the proposed landfill site. The nearest receptor to the landfill boundary is a residence on Old Edgemoor Lane east of New Henderson Road (507 ft from the proposed landfill). Based on straight line noise attenuation, it is estimated that noise levels from landfill operations would

attenuate to approximately 64.9 dBA. This would occur on weekdays during normal daytime working hours. The nearest receptor to the proposed haul road is the Valley View Church on Old Edgemoor Lane west of New Henderson Road (500 ft from the haul road). Based on straight line noise attenuation, it is estimated that noise levels from hauling operations on the haul road would attenuate to approximately 64 dBA. Noise from the operations of the landfill would attenuate to meet the HUD guideline of 65 dBA during daytime hours. Operational noise could still remain above the EPA guideline of 55 dBA. However, operational noise impacts would be intermittent and only occur during normal working hours. Consequently, noise impacts associated with the operation of the landfill at Site J are expected to be minor and are not expected to cause adverse effects.

3.20.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge Landfill)

CCR from BRF would be transported off-site to an existing permitted landfill, therefore, noise impacts under this alternative would be related to the noise associated with the transport of CCR from BRF to this facility. The Chestnut Ridge Landfill is located approximately 12 mi northeast of BRF. The probable haul route uses rural arterial roadways Edgemoor Road and Raccoon Valley Road (both of which represent SR 170) and Fleenor Mill Road. Current traffic on these roadways includes truck use. Sensitive noise receptors such as churches and residences located along the haul route proximate to these roadways would be impacted by the noise generated by the transport of CCR.

To determine potential impacts of traffic-related noise, FHWA's Traffic Noise Model was used to predict noise impacts to selected receptors located closest to the haul road. These impacts are used to represent the bounding condition. Based on anticipated generating rates, it is estimated that 100 truckloads would be needed to transport CCR to the Chestnut Ridge Landfill per day for a typical five-day work week. This would result in traffic count of 200 trips per day along the haul route or approximately 23 truck trips per hour over a typical nine-hour workday.

Predicted peak noise levels were modeled within four separate sections of the haul route to the Chestnut Ridge Landfill. These sections were delineated based on locations where the existing traffic flow exhibits a noticeable change in volume. The sections are: (1) SR 170 (Edgemoor Road) from BRF to US 25W; (2) SR 170 (Raccoon Valley Road) from US 25W to Heiskell Road; (3) SR 170 (Raccoon Valley Road) from Heiskell Road to Fleenor Mill Road; and (4) Fleenor Mill Road from SR 170 (Raccoon Valley Road) to Chestnut Ridge Landfill.

Noise levels were modelled at 18 receptors identified along the haul route. These receptors were used to represent noise levels within the area bounded by 360 ft north of the haul route and 250 ft south of the haul route, distances that were established based on the extent of potential noise impacts. The peak modeled noise levels within each of the four sections is shown below in Table 3-18.

Existing noise levels along the haul route range from a low of 53.8 dBA to 66.3 dBA given existing traffic volumes and from a low of 56.1 dBA to 66.8 dBA given predicted traffic volumes resulting from the transport of CCR from BRF. Noise levels are generally higher along SR 170 (Edgemoor Road) than along the other sections of the haul route due to the heavier traffic volume on SR 170 (Edgemoor Road).

Table 3-18. Predicted Noise Levels Along the Haul Route from BRF to the Chestnut Ridge Landfill

Roadway Noise Analysis by Section	Estimated Modeled Noise Level (dBA)
Along Edgemoor Road	
Existing Peak	66.3
Peak during hauling	66.8
Along Raccoon Valley Road - west of Heiskell	
Existing Peak	59.5
Peak during hauling	61.4
Along Raccoon Valley Road - east of Heiskell	
Existing Peak	57.9
Peak during hauling	60.1
Along Fleenor Mill Road	
Existing Peak	53.8
Peak during hauling	56.1

Based on FHWA thresholds for noise impacts, there are no impacted receptors along the haul route. FHWA has determined that if the predicted noise level at a receptor is 67 dBA or greater, then it would be considered an impacted receptor. Also, FHWA has determined that if a receptor experiences a noise level increase of 10 dBA or more, it is considered to be an impacted receptor. Tennessee Department of Transportation also uses the substantial criterion of 10 to 15 dBA to define a noise impact (TDOT 2011).

However, there are 23 receptors along the haul route that may experience an increase in noise level of 3 dBA or more, which is the threshold that is audibly detectable by the human ear. This increase occurs along SR 170 (Raccoon Valley Road) between Heiskell and I-75 where existing noise levels are relatively low and the increase in truck traffic would result in a noise level increase of over 3 dBA (but not more than 4 dBA).

Except for the area noted above, the noise impact associated with hauling of CCR from BRF to the Chestnut Ridge Landfill is expected to be minor. Those areas along the haul road where existing noise levels are relatively low, an increase more than 3 dBA would potentially create a higher impact relative to existing conditions. Therefore, given the duration of trucking (up to 15.5 years) and the change in noise levels (between 3 and 4 dBA) across the haul route, implementation of this alternative is expected to have a moderate noise impact.

3.21 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 presented in Title 29 CFR Part 1910 (29 CFR 1919), OSHA. 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.

3.21.1 Affected Environment

The routine operations and maintenance activities at the existing BRF reflect a safety-conscious culture and are activities performed consistent with OSHA and TCA standards and requirements and specific TVA guidance. Personnel at BRF are conscientious about health and safety having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training and control measures. This culture of emphasizing health and safety is reflected in the BRF's safety record which shows over the past three years only two OSHA Recordable Cases and zero Lost Time Cases reported.

The BRF has safety programs and BMPs in place to minimize the potential of safety incidences. These would include but are not limited to such programs as the following:

- Hazard Analysis
- Management of Change
- Spill and Emergency Response Plan
- Standard Operating Procedures
- Safety Reviews
- Compliance Audits
- Training
- Incident Investigations

It is TVA's policy that contractors have a site-specific health and safety plan in place prior to conducting construction activities at TVA properties. The contractor site-specific health and safety plans address the hazards and controls as well as contractor coordination for various construction tasks. A health and safety plan would also be required for workers responsible for operations after construction is complete.

The potential 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.

Health hazards are also associated with emissions and discharges from the facility as well as accidental spills/releases at the plant and/or along the pipelines. Mitigative measures are used to ensure protection of human health which includes the workplace, public and the environment. Applicable regulations and attending administrative codes that prescribe monitoring requirements may include those associated with emergency management, environmental health, drinking water, water and sewage, pollution discharge, air pollution, hazardous waste management and remedial action.

Additionally, wastes generated by operation of the plant can pose a health hazard. Wastes including solid wastes, hazardous waste, liquid wastes, discharges and air emissions are managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Furthermore, waste reduction practices are employed including recycling and waste minimization. TVA is committed to complying with all applicable regulations, permitting and monitoring requirements.

3.21.2 Environmental Consequences

3.21.2.1 Alternative A – No Action

The operations and maintenance activities at the existing BRF will continue within the safety-conscious culture and activities currently performed in accordance with applicable standards or specific TVA guidance. BRF will continue to address and manage reduction or elimination of occupational hazards through implementation of safety practices, training and control measures. BRF's safety conscious efforts will continue such that impacts on worker and public health and safety would be maintained and minimal.

3.21.2.2 Alternative B – Construct and Operate a Landfill for Storage of CCR on TVA Property Adjacent to BRF (Site J)

Construction activities in support of the proposed landfill and on-site haul road would be performed consistent with standards as established by OSHA and TCA requirements.

Construction and operation of the proposed landfill and its associated haul road would require the use of earthmoving, compacting and paving equipment as well as trucks for hauling materials. Additionally, some controlled blasting would be required to create the new bypass channel for Worthington Branch.

TVA would develop a detailed blasting plan to protect workers and neighboring properties prior to any blasting activities. The plan would identify 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 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).

All possible care would be exercised in the construction 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. Various controlled techniques would include the following:

- Ensure that only blasters or contractors with appropriate experience are allowed to perform the work.
- Purchase explosives in the minimum amount required, with any excess explosives returned to the vendor.
- Ensure that site explosive storage areas at applicable safe distances from personnel or structures.
- Ensure that explosives storage areas/buildings are accessible only to authorized personnel.
- Secure blasting areas and notify workers and nearby residents before a blasting activity occurs.
- Ensure careful placement of measured explosive quantities in blast holes.

- Limit explosives quantities per time delay, starting with the smallest quantities of explosives possible and scaling up to production-size blasts.
- Initiate blasting time delays to mitigate ground vibrations toward the closest structures or facility.

Implementation of the elements stated above would ensure that proposed blasting activities would not result in significant impacts and uphold worker and public health and safety.

During the remaining landfill and roadway construction, customary industrial safety standards as well as the establishment of appropriate BMPs and job site safety plans would describe how job safety will be maintained during the project. These BMPs and site safety plans address the implementation of procedures to ensure that equipment guards, housekeeping and personal protective equipment are in place; the establishment of programs and procedures for lockout, right-to-know, confined space, hearing conservation, forklift operations, excavations, grading and other activities; the performance of employee safety orientations and regular safety inspections; and the development of a plan of action for the correction of any identified hazards.

The operation of the proposed landfill would adhere to TVA guidance and be consistent with standards established by OSHA and TCA requirements. The proposed landfill would establish health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards through implementation of safety practices, training and control measures. All wastes would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Implementation of operational safety measures would manage and address monitoring and control; maintenance and integrity programs; performance of field surveys and inspections; right-of-way maintenance; and public awareness. Therefore, worker and public health and safety during operation would be maintained and impacts would be minor.

3.21.2.3 Alternative C – Off-Site Transport of CCR to an Existing Permitted Landfill (Chestnut Ridge)

Under this Alternative, dry CCRs generated at BRF would be transported by truck on existing roadways to the Chestnut Ridge Landfill for disposal. Alternative C would increase the traffic on existing roadways which would potentially increase the risk of injuries and fatalities associated with truck crashes.

Implementation of Alternative C may require fleet expansion. A larger fleet would increase the number of vehicles and drivers as well as additional traffic on present roadways. The BRF fleet would establish health and safety practices that would address and manage the reduction or elimination of occupational and public health hazards through implementation of safe operation practices, training and control measures.

All wastes generated by the fleet would be managed in accordance with applicable federal, state and local laws and regulations and all applicable permit requirements. Implementation of operational safety measures would manage and address monitoring and control; maintenance and integrity programs; performance of field surveys and inspections; right-of-way maintenance; and public awareness. Worker and public health and safety during operation would be maintained and impacts would be minor.

Conversely, TVA may decide to contract transportation services. TVA policy requires that contractors have in place a site-specific health and safety plan prior to operation on TVA properties. The contractor site-specific health and safety plan addresses the hazards and controls; spill and emergency response; as well as contractor coordination for operations. Similarly, all these measures should maintain site worker and public health and safety and the impacts would be minor.

3.22 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPS are typically implemented to reduce a potential impact to a level that would be below the threshold of significance as defined by the CEQ and the courts. Impacts associated with the management of CCR from BRF have the potential to cause unavoidable adverse effects to several environmental resources.

Under Alternative B, construction of a new landfill up to 119.9 ac of undeveloped land at Site J and 14.8 ac of undeveloped land that would be used for the onsite haul road would be converted to industrial use. However, the project area is located within the boundaries of an existing industrial use (i.e., BRF). Additionally, the relocation of Worthington Branch would have short-term, unavoidable impacts to aquatic resources. Clearing and grading of the site would result in long-term impacts to species composition and wildlife habitat. However, this impact is minor relative to the abundance of similar cover types within the vicinity.

Other impacts associated with Alternative B would primarily be related to impacts that occur during construction activities. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, noise and vibration that may potentially impact both on-site workers and off-site residents near the landfill site. Potential noise impacts also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment are minimized through implementation of mitigation measures, including proper maintenance of construction equipment and vehicles.

Unavoidable temporary impacts to water quality from runoff at the site could impact nearby outfalls and water bodies during initial construction of the landfill. BMPs to minimize runoff would be implemented, but there could still be some uncontrolled runoff that could affect nearby outfalls and water bodies.

Under Alternative C, the transport of CCR material from BRF to the disposal site would increase truck traffic volumes on public roads which could compromise driver safety. This additional operations-related traffic would also increase noise and fugitive dust in areas proximate to these roads. Emissions from the haul trucks are minimized through implementation of BMPS including proper vehicle maintenance.

3.23 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EIS focuses on the analyses of environmental impacts associated with the daily generation of CCR at BRF and the method of disposing of the CCR over the next 20 years. These activities are considered short-term uses for purposes of this section. The long-term is considered to be initiated with

the cessation of operations at the landfill. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project site.

Short-term uses of the environment generally are those associated with construction, including labor and construction materials. For this project, construction activities are associated with the initial development of the proposed landfill at Site J (Alternative B), which would involve:

- Constructing the on-site haul road between BRF and Site J.
- Relocating Worthington Branch (a stream).
- Relocating transmission lines and utilities.
- Clearing and grading of the land to make way for the landfill.
- Placing the landfill composite liner system.

The acreage disturbed during the initial clearing for the proposed landfill site will have a negative effect on a limited amount of short-term uses of the environment such as air, noise, soil and water resources (relocation of Worthington Branch). Additionally, these construction activities may displace some wildlife, aquatic resources and alter existing vegetation. Since the proposed actions would occur within an area previously subject to human disturbance and the surrounding vicinity includes similar vegetation and habitat types, the short-term disturbance due to construction and operations is not expected to significantly alter long-term productivity of wildlife or other natural resources.

In addition to the initial construction activities, the day-to-day operation of BRF, the daily disposal of CCR and the daily operation of the landfill at Site J are also considered to be short-term uses of the environment.

Construction and operation of the landfill would have a favorable short-term impact to the local economy through the creation of construction and support jobs and revenue. Additionally, since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for BRF operations. Therefore, the development of the landfill at Site J would have a favorable short-term impact on the operations at BRF in that the proposed landfill would meet the need for long-term storage of CCR generated at BRF.

Long-term effects would include the permanent loss of terrestrial wildlife habitat within the landfill construction area and a permanently altered stream course for Worthington Branch. However, effects due to the relocation of the stream are expected to be minimized in the long-term as aquatic species repopulate in the new channel. Additionally, other high quality forested habitat for displaced wildlife is located elsewhere in the vicinity of the project area. In addition, the formation and growth of the landfill over time will gradually alter the viewshed around the landfill. Once the landfill ceases operation, there would also be limitations on future use of this land. However, as the proposed landfill is located on property developed for industrial use, any future land use would be limited to those uses that are compatible with industrial uses.

If needed, the purchase of borrow material will have a short-term impact on the availability of this resource for other uses, however this impact is minimized as borrow material would primarily be obtained from the project site.

Use of the Chestnut Ridge Landfill would impact capacity and, therefore, have an impact on the users of the landfill. However, there are other landfills within the region that may be utilized for disposal of other waste materials.

The development of the landfill at Site J would have a favorable long-term impact on the operations at BRF in that the proposed landfill offers TVA approximately 15 more years of disposal capacity. Since there is limited capacity for additional CCR disposal on-site, at some point in the future, capacity to store CCR on-site will become a limiting factor for BRF operations. The proposed landfill at Site J will also be developed to meet the requirements of a Class II Solid Waste Facility as specified by TDEC Division of Solid Waste Management and Federal Subtitle D requirements for dry CCR disposal.

3.24 Irreversible and Irretrievable Commitments of Resources

This section describes the expected irreversible and irretrievable environmental resource commitments used in the new landfill construction and operation. The term irreversible commitments of resources describes environmental resources that are potentially changed by the new facility construction or operation that could not be restored at some later time to the resource's state prior to construction or operation. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road right of way as long as the road remains. Irretrievable commitments of resources are generally materials that are used for the new facility in such a way that they could not, by practical means, be recycled or restored for other uses. For example, mining of ore is an irretrievable commitment of a resource; once the ore is removed and used, it cannot be restored.

The land used for the proposed landfill at Site J is irreversibly committed because the land will be permanently converted from an undeveloped use to a landfill that will remain for the life of the landfill. The materials used for the construction of the proposed landfill would be committed for the life of the landfill. All building materials associated with the construction of the haul road and landfill would be irrevocably committed.

Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction and transport of CCR to the landfill. In addition, construction materials (such as liners) would be consumed. However, their limited use in this project would not adversely affect the future availability of these resources generally.

The Chestnut Ridge Landfill is an existing landfill, and there would be no changes to the committed materials and resources associated with construction. However, nonrenewable fossil fuels would be irretrievably lost through the use of fuel by trucks used to transport CCR to this landfill. Due to the higher number of trucks needed and the greater number of miles travelled, this impact would be greater than that described for Alternative B, but would still be minor relative to existing supplies.

Any use of off-site borrow material during landfill operations (either at the proposed landfill at Site J or at the Chestnut Ridge Landfill) would be both an irreversible and irretrievable commitment of resources. However, given the limited use of this resource required for this action, the impact would affect the future availability of the resource,

3.25 Cumulative Effects

This section supplements preceding analyses that include in some degree the potential for cumulative adverse impacts to the region's environment that could result from construction and operation of the proposed landfill and haul road. The CEQ regulations (40 CFR §§ 1500-1508) implementing the procedural provisions of the NEPA of 1969, as amended (42 USC § 4321 et seq.) define cumulative impact as: "…the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR § 1508.7).

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the project when added to other past, present and reasonably foreseeable future actions (40 CFR 1508.7). Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions and either explicitly or implicitly considered cumulative impacts.

3.25.1 Scoping for Cumulative Effects Analysis

3.25.1.1 Identification of the Significant Cumulative Effects Issues

TVA evaluated a full range of environmental resource issues for inclusion in the cumulative effects analysis. The proposed action and its connected actions identified under Alternative B would occur on land that was previously cleared and developed for residential properties. The surrounding landscape is already subject to environmental stressors associated with continuing industrial operations and previous disturbance of the site. Consequently, as has been described in prior subsections of this EIS, the existing quality of environmental resources potentially directly or indirectly affected by project activities is generally low. The proposed action identified under Alternative C would occur on land developed as a landfill and would utilize existing roadways for transport of CCR, accordingly impacts associated with this alternative are confined to those associated with the transport of CCR from BRF to the proposed Site J landfill.

This analysis is limited only to those resource issues potentially adversely affected by project activities or connected actions. Accordingly, climate change, land use, prime farmland, wildlife, groundwater, geology/soils, surface water, floodplain, natural areas, parks/recreation, cultural and historic resources, hazardous materials/waste, socio-economics and safety are not included in this analysis as these resources are either not adversely affected, or the effects are considered to be adverse and minor, or beneficial. Primary resource categories specifically considered in this cumulative effects assessment include air quality, wetlands/aquatic ecosystems, terrestrial ecology, threatened and endangered species, transportation, visual effects, noise and environmental justice.

3.25.1.2 Geographic Area of Analysis

The appropriate geographic area over which past, present and future actions could reasonably contribute to cumulative effects is variable and dependent on the resource evaluated. Based upon the defined list of resources potentially affected by cumulative effects, two general geographic areas were considered appropriate for consideration in this analysis.

- *Lands within Anderson County in the Vicinity of the Proposed Landfill and Haul Road*. This geographic area provides an appropriate framework for the consideration of potential cumulative effects to vegetation and wildlife resources, including threatened and endangered species. This geographic area includes near off site

areas and the 10-mi radius within Anderson County and encompasses lands on the proposed landfill site, near off-site areas proposed for use as laydown during construction and the proposed access road and haul roads to the off-site landfill. For visual effects, noise and environmental justice, the cumulative impacts analysis will be on near off-site areas.

- *Waters and Wetlands within Worthington Branch and Surrounding Tributaries*. This geographic area contains surface water resources potentially receiving runoff from the proposed landfill operation and wetland/aquatic resources modified by proposed construction of the landfill and access road. Wetland complexes and aquatic ecosystems are hydrologically and physically contiguous with similar resources potentially affected by the proposed project.

3.25.1.3 Identification of "Other Actions"

Past, present and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Table 3-19. These actions were identified within the geographic area of analysis as having the potential to, in aggregate, result in larger and potentially significant adverse impacts to the resources of concern.

Table 3-19. Summary of Other Past, Present or Reasonable Foreseeable Future Actions in the Vicinity of the Proposed Project

Actions Description	Description	Timing and Reasonable Foreseeability
Mechanical Dewatering Facility	Installation of mechanical dewatering facility for dry storage of ash and gypsum at BRF	Past
House Demolition	166 ac purchase adjacent to BRF to expand plant boundary	Past
BRF Ash Impoundment Closure	Closure of ash impoundments at BRF facility	Reasonably Foreseeable Future

Actions that are listed as having a timing that is "past" or "present" inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. However, these actions are included in this discussion to provide for a more complete description of their characteristics. Actions that are not reasonably foreseeable are those that are based on mere speculation or conjecture, or those that have only been discussed on a conceptual basis.

3.25.1.3.1 Mechanical Dewatering Facility

TVA recently installed equipment to remove water from gypsum and bottom ash generated at BRF (TVA 2012). The equipment is located in a pre-engineered building located southwest of the powerhouse. Installation of the mechanical dewatering facility has allowed TVA to close wet CCR handling and disposal operations at BRF. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

3.25.1.3.2 House Demolition

TVA purchased approximately 166 ac adjacent to BRF to expand the plant boundary (TVA 2013). Several of the homes and structures were removed by previous owners of the property before TVA took ownership; however, some vacant structures remained, including dwellings, garages and out-buildings. To minimize the risk to human health and safety, TVA

decided to demolish and remove the remaining structures. This site is currently under consideration by TVA as the potential site for a new CCR landfill. Impacts of this past action are inherent within the baseline condition of the Affected Environment.

3.25.1.3.3 BRF Ash Impoundment Closure

TVA is currently evaluating alternatives to close ash impoundments at BRF under the CCR Rule (TVA 2016). The closure method evaluated in the ash impoundment EIS is closure-in-place, which would involve dewatering, grading and reconfiguring the CCR and installing an approved cover system with a protective soil cover. In addition, a groundwater monitoring system would be installed and operated per state requirements. Ash impoundments are BRF are expected to be closed within a five-year period.

3.25.1.4 Analysis of Cumulative Effects

To address cumulative impacts, the existing affected environment surrounding the project area was considered in conjunction with the environmental impacts presented in Chapter 3. These combined impacts are defined by the CEQ as “cumulative” in 40 CFR Regulations 1508.7 and may include individually minor, but collectively significant actions taking place over a period of time. The potential for cumulative effects to the identified environmental resources of concern are analyzed below for Alternatives B and C.

3.25.1.4.1 Air Quality

Other identified actions within the geographic area that have the potential to contribute to additional air quality impacts include the installation of the mechanical dewatering facility and the closure of the ash impoundment. Emissions from the operation of the mechanical dewatering facility are subject to specific State of Tennessee process and fugitive dust regulations. While the emissions for this process are a minor increase over the previous conditions, they do not exceed significance levels. Closure of the ash impoundment could result in some minor emissions during the construction phase due to fugitive dust and emissions from equipment and vehicles. However, these impacts would be temporary and cease once construction activities at the site are complete.

As discussed in Section 3.1, construction of a new landfill (Alternative B) could result in some minor emissions during the construction phase, which would be temporary. During operation of the landfill, fugitive dust from the pile and transport of CCR to the landfill may impact residences or parkland areas near the site. A modification to the plant’s Title V permit, fugitive dust control plan and BMPs will minimize air quality impacts. If the new CCR landfill is constructed at the proposed location such that the dust emissions from the site are concurrent with the ash impoundment closure activities, there would be potential for minor and short-term impacts. However, exceedances of applicable ambient air quality standards are not expected. Therefore, no cumulative effects to air quality are anticipated as a result of this alternative.

Under Alternative C, the transportation of CCR material to the Chestnut Ridge Landfill would extend throughout the operational phase, up to 15.5 years. This would result in potentially notable and long-term local effects on air quality. However, exceedances of applicable ambient air quality standards are not expected. Since transportation of the CCR material to Chestnut Ridge Landfill would overlap temporally with the closure of the ash impoundment, there would be potential for minor and short-term cumulative impacts. However, air quality impacts from the ash impoundment closure would be temporary and localized and cease once construction activities are complete. Therefore, exceedances of

applicable ambient air quality standards are not expected and no cumulative effects to air quality are anticipated as a result of this alternative.

3.25.1.4.2 Wetlands/Aquatic Ecology

The potential for cumulative effects to wetlands and the aquatic environment are largely driven by the required relocation of Worthington Branch and its tributaries and the loss of wetland area as a result of implementation of Alternative B. As described in Section 3.7 (Surface Water), the construction of the proposed landfill would require that approximately 2,158 linear ft of the stream be relocated around the project area. In addition, construction of the landfill would result in the permanent loss of 2.1 ac of wetlands. There would be no impacts to wetlands or aquatic resources under Alternative C, therefore, potential cumulative effects are not analyzed for this alternative.

Other identified actions that have the potential to contribute to aquatic resource impacts include the closure of the ash impoundment. In order to close the impoundment, the current surface water would need to be decanted. The wastewater discharges during this process would meet existing permit limits, and compliance sampling would be performed at the approved outfall structure in accordance with the NPDES permit to demonstrate compliance. Additionally, any construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources in the Clinch River.

While the impacts associated with the proposed landfill would be done in compliance with applicable TDEC and USACE 404/401 permits and any required mitigation, there would be direct, short-term impacts to aquatic species in Worthington Branch. The greatest impacts would be to less mobile and sessile organisms in the stream. During the construction phase, indirect impacts to downstream sections and any adjacent offsite streams may be associated with storm water runoff from the proposed landfill site or upstream construction activities within the stream. Construction activities would adhere to permit limit requirements and would utilize BMPs to minimize indirect effects on aquatic resources during the construction phase, such as in-stream sediment curtains or baffle barriers.

Given the local abundance of similar aquatic resources and wetland areas within the region and the implementation of BMPs during construction for all identified projects, watershed level cumulative impacts to aquatic and wetland resources are not anticipated under Alternative B.

3.25.1.4.3 Terrestrial Ecology

Issues typically evaluated in the context of cumulative effects to terrestrial ecosystems include the potential for habitat fragmentation/degradation and the potential to enhance dispersal of invasive species. Under Alternative B, the proposed construction activities would have permanent effects to the proposed landfill site and haul route. However, terrestrial ecosystems within these impacted areas are generally previously disturbed and of low quality (see Section 3.9). Additionally, the area is already fragmented by the presence of other industrial, residential and utility development. Because most of the proposed construction activities would occur within previously disturbed lands and existing developed roads, no cumulative effects would occur related to habitat fragmentation.

The vegetation within the proposed landfill site was previously disturbed by the construction of the homes and then again by their demolition. Therefore, environments are already suspected of containing established populations of adventive and invasive species, the floristic quality of the lands potentially affected by construction is considered to be relatively poor. The proposed project would entail construction phase disturbance of plant communities that are common or of relatively low quality. Consequently, the proposed action is not expected to contribute to a cumulative effect on vegetation and floristic quality.

Alternative C is not anticipated to have cumulative impacts to terrestrial ecology as the CCR would be transported on existing roads and disposed of in a permitted landfill.

3.25.1.4.4 Threatened and Endangered Species

Other identified actions within the geographic area that could impact threatened and endangered species (e.g., Indiana bat and northern long-eared bat) include the house demolition and closure of the coal ash impoundment. Demolition of the residential properties on the location of the proposed landfill, construction of an access road and development of a groundwater monitoring well required the removal of potentially suitable bat roost trees. To minimize impacts to Indiana bats potentially active in the area, the trees were removed outside of the summer roosting season. Closure of the ash impoundment would not involve any tree removal, however the open water areas of the impoundment may eliminate some low-quality foraging opportunities.

Under Alternative B, up to 48.5 ac of potentially suitable summer roost trees for the Indiana bat and northern long-eared bat would be cleared for the proposed landfill. However, this area constitutes less than 1 percent of the total forested area within a 5-mi radius of the project area. While the proposed landfill would result in a minor loss of potential roosting habitat for listed bat species, the amount of habitat available in the vicinity of the project area would provide abundant alternative locations for the bat to occupy. Additionally, avoidance and minimization efforts to reduce impacts to these species would be implemented as required through consultation with the appropriate state and federal agencies. Therefore, cumulative impacts as a result of this alternative are not anticipated.

There would be no impacts to threatened or endangered species under Alternative C, therefore, there would be no cumulative impacts.

3.25.1.4.5 Visual

Among the other identified actions within the geographic area, the demolition of the residential structures and closure of the ash impoundment have the potential to contribute to additional visual impacts. The removal of the residential structures had a beneficial impact of returning the property to an undeveloped, more natural setting. Existing vegetative buffers were preserved and additional vegetation was planted along Old Edgemoor Lane to serve as a buffer. Closure of the ash impoundment would result in temporary visual discord due to additional vehicular traffic during the construction phase.

During the construction phase of the proposed landfill (Alternative B), there would be increased visual discord due to the increase in personnel and construction equipment as well as clearing and grubbing activities. During operations, this discord would be lessened as fewer personnel and equipment are needed. The proposed landfill would contribute to a decrease in the visual integrity of the landscape as the landfill increases in height, and be the most prevalent in the foreground for area residents and other passing motorists on local roads. However, these impacts are not anticipated to be significant as the remaining

topography and vegetation, including that planted during the demolition of the houses, would screen some of the visual change.

While the proposed landfill would result in a visual impact to observers in the foreground, the vegetation that was planted on the site during the demolition of the houses would serve as a buffer. Therefore, cumulative impacts to visual resources under Alternative B would be minimal.

Under Alternative C, CCR material would be transported to an off-site landfill using existing transportation networks that currently support landfill traffic. Therefore, any sensitive visual receptors along the haul route are already subjected to vehicular traffic destined for the landfill and the increase in visual discord as a result of additional trucks would not alter the overall landscape. Since transportation of the CCR material to Chestnut Ridge would overlap temporally with the closure of the ash impoundment, there would be potential for minor and short-term cumulative impacts due to additional trucks on the roads. Impacts from additional vehicular traffic are expected to be insignificant as the roads are already used for industrial activity related to BRF operations. Therefore, there would be no cumulative impacts to visual resources under Alternative C.

3.25.1.4.6 Environmental Justice

Other identified actions that would have an impact on EJ communities within the geographic area include the demolition of houses on the adjacent properties and closure of the ash impoundment. Any impacts to EJ communities as a result of the demolition of the houses would have been minor and limited to the demolition phase, which is now complete. Impacts to EJ communities associated with the closure of the ash impoundment include the transport of borrow material and the proposed laydown area. These would be short term and minor in nature and would be consistent across all communities (EJ and non-EJ) and would not be disproportionate to the area identified as a potential EJ population.

One area that may contain a sensitive low-income population subject to EJ considerations was identified to the north of Site J. These residents may experience visual and noise impacts as a result of landfill operation. However, this population is buffered from the proposed site by distance, vegetation and topography. These impacts may also be mitigated by various measures such as BMPs and the landscape screen. The haul road would be constructed on-site at an even greater distance from the potential EJ population and is not expected to result in adverse effects to local EJ populations.

Therefore, there is no potential for any cumulative high and adverse impacts to be disproportionately borne by low-income and minority populations. Additionally, employment opportunities would be provided to local residents to support the construction phase which would result in positive impacts to area low-income and minority populations. Therefore, adverse cumulative impacts from this alternative to EJ communities are not anticipated.

Under Alternative C, CCR material would be transported to an off-site landfill, using existing transportation networks that currently support landfill traffic. Therefore, any impacts would be consistent across all communities (EJ and non-EJ) along the haul route and would not be disproportionate to the area identified as a potential EJ population.

3.25.1.4.7 Transportation

The potential for cumulative effects to transportation from other identified actions includes the closure of the ash impoundment. Traffic generated by the closure of the ash impoundment would consist of the construction workforce, shipments of goods and equipment and the hauling of borrow material to the site to be used in the closure-in-place activities. The Ash impoundment closure construction phase traffic would occur in addition to the existing traffic generated by the operation of BRF. However, once construction is completed, maintenance phase traffic associated with the closed impoundment would be negligible.

Under Alternative B, the hauling of CCR generated at BRF would not use public roadways; therefore, there is no impact to traffic and levels of service on local roads. Once constructed, traffic on New Henderson Road would be separated from landfill haul road traffic and, therefore, traffic on this roadway would not be impacted. Since public roadways would not be impacted under this alternative, there would be no cumulative effects.

Under Alternative C, the transportation of CCR material to the Chestnut Ridge Landfill would extend throughout the operational phase, up to 15 years. Most of the road network along this route is anticipated to have sufficient capacity remaining to handle the resulting increase in truck traffic. However, on SR 170, the addition of CCR haul traffic from BRF would have a minor to moderate impact on traffic east of BRF during peak hours of the day. Ingress/egress turning movements of construction traffic at BRF may at times be difficult and lead to unsafe conditions especially during peak hours. Construction phase traffic for the closure of the ash impoundment would increase this impact as the construction workforce would be using SR 170 to access BRF. Therefore, minor to moderate cumulative effects to transportation resources are anticipated as a result of this alternative.

3.25.1.4.8 Noise

Among the other identified actions within the geographic area, the mechanical dewatering facility and closure of the ash impoundment have the potential to contribute to additional noise impacts. Since the dewatering facility is currently in operation at BRF, it is considered part of the overall noise levels for the industrial setting. The noise generated during the closure of the ash impoundment would be temporary and limited to the construction phase. Impacts to any sensitive noise receptors are not anticipated to be significant.

Under Alternative B, noise impacts would be greatest during the construction phase and during the relocation of Worthington Branch as these activities would likely require rock excavation with controlled blasting. During operation of the landfill, noise would be generated by the movement and placement of CCR material onto the landfill. The construction of the proposed landfill has the potential to overlap temporarily with the closure of the ash impoundment, which would contribute to noise impacts as a result of the construction activities and transport of borrow material to BRF. The construction activities for the ash impoundment closure may be completed before the proposed landfill is operational. Operational noise impacts associated with the proposed landfill would be similar to those during the construction phase. While the noise impacts from these projects would be cumulative, they are not anticipated to reach significant levels as the topography would attenuate noise from the landfill.

Under Alternative C, the haul route to the Chestnut Ridge Landfill would use rural arterial roadways that are characterized by an existing traffic volume that includes truck use. Increases in noise emissions along the proposed haul route as a result of the transport of

CCR from BRF to the Chestnut Ridge Landfill are not expected to cause adverse effects. The potential for cumulative noise impacts from the ash impoundment closure would be associated with the transportation of borrow material from off-site locations along the existing roads. The transportation of the borrow material may increase noise levels at residences and users of parkland proximate to the haul routes used, however any impacts would be minor and limited to the ash impoundment closure construction phase. Therefore, cumulative effects to noise resources from the other identified actions are not anticipated.

3.25.1.4.9 Landfill Capacity

Under Alternative B, CCR would be disposed in an onsite landfill, and there would be no impact to capacity of other landfills in the region.

Under Alternative C, CCR from BRF would be transported to an existing off-site permitted landfill. Existing Subtitle D landfills that may be considered for receipt of CCR from BRF are typically sited, sized and permitted with expectations regarding total life span and capacity for disposal within their respective service areas. While Chestnut Ridge has been considered in this analysis as the nearest receiving landfill for the purposes of assessing impacts on environmental resources, TVA has not eliminated the possibility of transporting CCR under this alternative to one or more other off-site landfills. Disposal of CCR from BRF at any off-site landfill may reasonably be expected to consume existing capacity and therefore, shorten the lifespan of the receiving landfill. The need to expand a given receiving landfill, however, is dependent upon a range of factors that include the existing permitted capacity, volume of CCR material placed within a given landfill and other market factors that would result in the placement of other non-CCR materials within the landfill. Because of these factors and the fact that TVA has not determined with certainty whether CCR materials from BRF would be placed at Chestnut Ridge or any other receiving landfill, potential cumulative effects on environmental resources associated with the expansion of landfill capacity are remote and speculative.

CHAPTER 4 – REFERENCES

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Name:	**Steve Stumne, PWS (Amec Foster Wheeler)**
Education:	B.S., Biology
Project Role:	Vegetation, Threatened and Endangered Species
Experience:	Over 20 years of experience providing natural resource investigations, NEPA analysis and documentation, wetland and stream delineation/permitting/mitigation and endangered species investigations

Name:	**Irene Weber (Amec Foster Wheeler)**
Education:	M.S., Biology and B.S., Plant Biology
Project Role:	Vegetation, Threatened and Endangered Species
Experience:	5 years of experience in ecology and plant biology.

Name:	**David Zopff, PE (Amec Foster Wheeler)**
Education:	B.S., Chemical Engineering
Project Role:	Noise
Experience:	29 years of experience in acoustic assessments to support NEPA documentation.

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CHAPTER 6 –ENVIRONMENTAL IMPACT STATEMENT RECIPIENTS

6.1 Federal Agencies

U.S. Fish & Wildlife Service, Cookeville, Tennessee
U.S National Park Service, Gatlinburg, Tennessee
U.S. Environmental Protection Agency, Washington, DC
U.S. Environmental Protection Agency, Region 4, Atlanta, GA
Department of Interior, Atlanta GA
U.S. Army Corps of Engineers, Nashville District, Nashville, TN

6.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Oklahoma
Alabama-Coushatta Tribe of Texas
Cherokee Nation
Coushatta Tribe of Louisiana
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
Muscogee (Creek) Nation of Oklahoma
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

6.3 State Agencies

Tennessee Department of Environment Conservation, Nashville
- CCR Waste Program
- NPDES Program
- Solid Waste Program
- Water-Based Systems
- Water Resources

Tennessee Department of Transportation, Nashville
Tennessee Historical Commission, Nashville
Tennessee Wildlife Resources Agency, Nashville

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Appendix A – Scoping Report

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Document Type: EIS-Administrative Record
Index Field: Scoping
Project Name: Bull Run Fossil Plant CCR Disposal
Project Number: 2014-10

BULL RUN FOSSIL PLANT CCR DISPOSAL SCOPING REPORT

Anderson County, Tennessee

Rev 0

Prepared by:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

September 2015

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Symbols, Acronyms, and Abbreviations

US Environmental Protection Agency

1.0 Introduction

The Tennessee Valley Authority's (TVA's) Bull Run Fossil Plant (BRF) is an 870 megawatt (MW) coal-fired generating station located near Clinton, Tennessee. BRF was constructed between 1962 and 1967. When operating at full capacity, BRF consumes 7,300 tons of coal daily in a single generating unit and produces approximately 560,000 cubic yards ($yds^{3)}$ of coal combustion residuals (CCRs) a year. The CCRs are currently managed in various dry stacks, wet stacks, and impoundments. In September 2012, TVA decided to construct a mechanical dewatering facility at BRF to support future dry stacking operations (TVA 2012). This facility and will allow TVA to manage bottom ash and gypsum in dry form. TVA already handles and stores BRF fly ash on a dry basis. Existing storage capacity for dry stack CCRs at BRF is projected to be expended within 10 years.

On May 21, 2015, TVA published a Notice of Intent (NOI) in the Federal Register to prepare an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA). The NOI initiated a public scoping period, which concluded on July 6, 2015. As stated in the NOI, TVA is preparing the EIS to inform decision makers, other agencies, and the public about the potential for environmental impacts associated with a decision to locate and utilize additional storage capacity for CCRs generated by BRF.

NEPA regulations require an early and open process for deciding what should be discussed in an EIS (i.e., the scope of the document). The scoping process involves requesting and using comments from the public and interested agencies to help identify the issues and alternatives that should be addressed in the EIS. This document summarizes the input that TVA received during the scoping process and defines the scope of the EIS. In addition to agency and public input, the EIS will also address specific requirements associated with a number of federal laws such as National Historic Preservation Act of 1966, Endangered Species Act of 1973, Clean Water Act of 1972, and the Clean Air Act of 1970, as amended would satisfy the requirements of Executive Order (EO) 11988 (Floodplains Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), EO 13112 (Invasive Species), and EO 13653 (Preparing the United States for the Impacts of Climate Change).

2.0 Purpose and Need

BRF has state-of-the-art air pollution controls and is one of the coal plants that TVA plans to continue operating in the future. When operating at full capacity, TVA produces approximately 240,000 yds^3 per year of ash (bottom and fly ash) and 318,000 yds^3per year of gypsum. Therefore, a total of approximately 11 million yds^3 of disposal capacity is desired to meet the needs for a long-range (20-year) comprehensive disposal plan. At this rate, onsite storage capacity is currently projected to be expended within approximately 10 years. In conjunction with TVA's goal of maintaining a balanced power portfolio for meeting power demand, and in consideration of the objectives of providing least cost planning, TVA needs to identify additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash, and gypsum) produced by the BRF facility. Additional storage capacity would also enable TVA to continue operations at BRF as planned, (TVA 2015a), and would be consistent with TVA's commitment to convert wet CCR management systems to dry systems. Conversion from wet to dry management of CCR would also enable TVA to close ash impoundments which would support compliance with the US Environmental Protection Agency (USEPA)'s recently issued CCR Rule [40 Code of Federal Regulations (CFR) Parts 257 and 261].

3.0 Alternatives

TVA is evaluating disposal options to meet the need for additional storage capacity for CCRs generated at BRF. Additional storage capacity would be provided at either a newly-constructed landfill or a currently permitted landfill. Three alternatives are considered in the EIS to evaluate potential effects of identifying and developing additional storage capacity for the long-term disposal of the dry CCR materials (fly ash, bottom ash, and gypsum) produced by the BRF facility.

1. Alternative A: No Action Alternative

Under the No Action Alternative, TVA would not seek additional disposal options for dry placement of CCR generated by BRF. CCRs would continue to be stored in the current disposal areas for as long as storage capacity is available. There is limited capacity for additional CCR disposal onsite, and at some point in the future the capacity to store CCRs on site would become a limiting factor. This alternative would not meet the Purpose and Need for the proposed action and therefore, is not considered viable or reasonable. It does provide a benchmark for comparing the environmental impacts of implementation of other alternatives retained for detailed study.

2. Alternative B: Construct and Operate a Landfill for the Dry Storage of Coal Combustion Residuals

Under this Alternative, TVA originally considered 10 alternative site locations for construction of a new landfill for CCR disposal, including two sites located at BRF. The onsite locations were eliminated from further consideration as they had insufficient capacity, were located on steep terrain, and would have caused direct impacts to the natural and human environments. The resultant eight sites were evaluated in terms of potential impacts to the natural environment, human environment, geological stability, and factors related to landfill development and transport of CCR materials and based on the results of that evaluation, one site was selected for detailed evaluation in the EIS. Under this alternative, TVA would construct a landfill for disposal of dry CCRs on TVA-owned property located adjacent to BRF (also known as Site J). This site, located approximately 0.4 miles east of BRF, encompasses 144 acres. The conceptual landfill footprint design of 54 acres would potentially provide 6.6 million yds^3 of storage capacity, yielding an estimated 12 years of landfill life. Development of Site J would also include construction of an on-site haul road to convey dry CCRs from the plant to the landfill. TVA would construct this road near the BRF site next to an existing railroad track.

3. Alternative C: Off-Site Transport of CCRs to an Existing, Permitted Landfill

Under Alternative C, TVA would utilize an existing, permitted landfill for the disposal of CCR generated by BRF. Although a number of permitted landfills are located in the region, the landfill closest to BRF is located on the county line of Anderson and Knox counties and is adjacent to Interstate 75. That landfill, the Chestnut Ridge Sanitary Landfill, is a Class 1 Municipal Solid Waste Facility located approximately 12 miles northeast of BRF.

Under this Alternative, TVA would transport dry CCRs by truck from BRF to Chestnut Ridge using existing roadways. The landfill is owned and operated by Waste Management of Tennessee and serves the Knoxville metro area and central Tennessee. Sufficient capacity

at this landfill can be made available to accommodate TVA's requirement for 20 years of storage of CCRs generated at BRF.

The location of all of the CCR disposal sites evaluated are shown on Figure 1. Environmental features associated with Site J (Alternative B) and the Chestnut Ridge Landfill (Alternative C) are shown on Figures 2 and 3.

No decision has been made about CCR disposal beyond the current available onsite capacity. TVA is preparing the EIS to inform decision makers, other agencies, and the public about the potential for environmental impacts associated with a decision to locate and utilize additional storage capacity for CCRS generated by BRF..

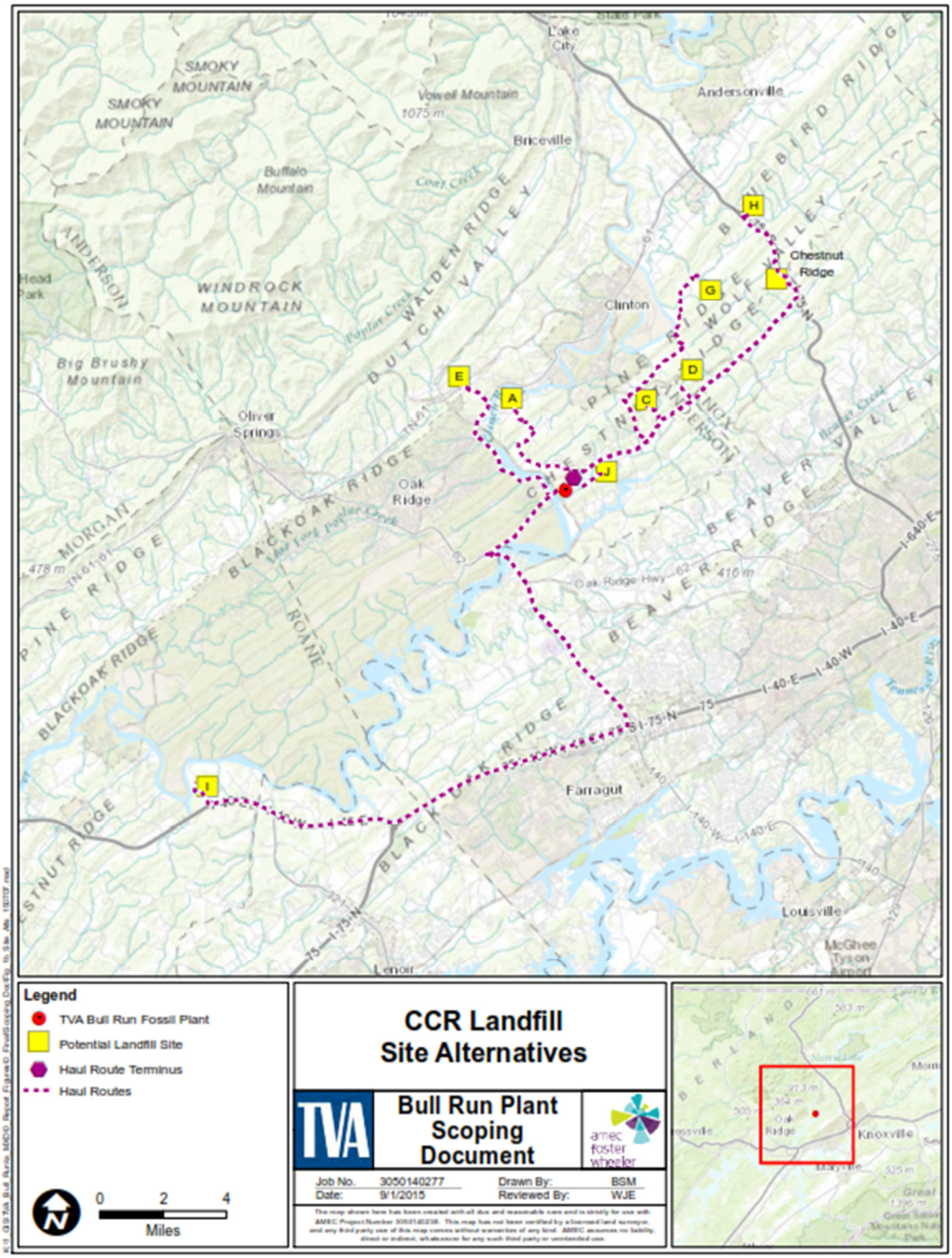

Figure 1. Alternative CCR Disposal Sites Evaluated

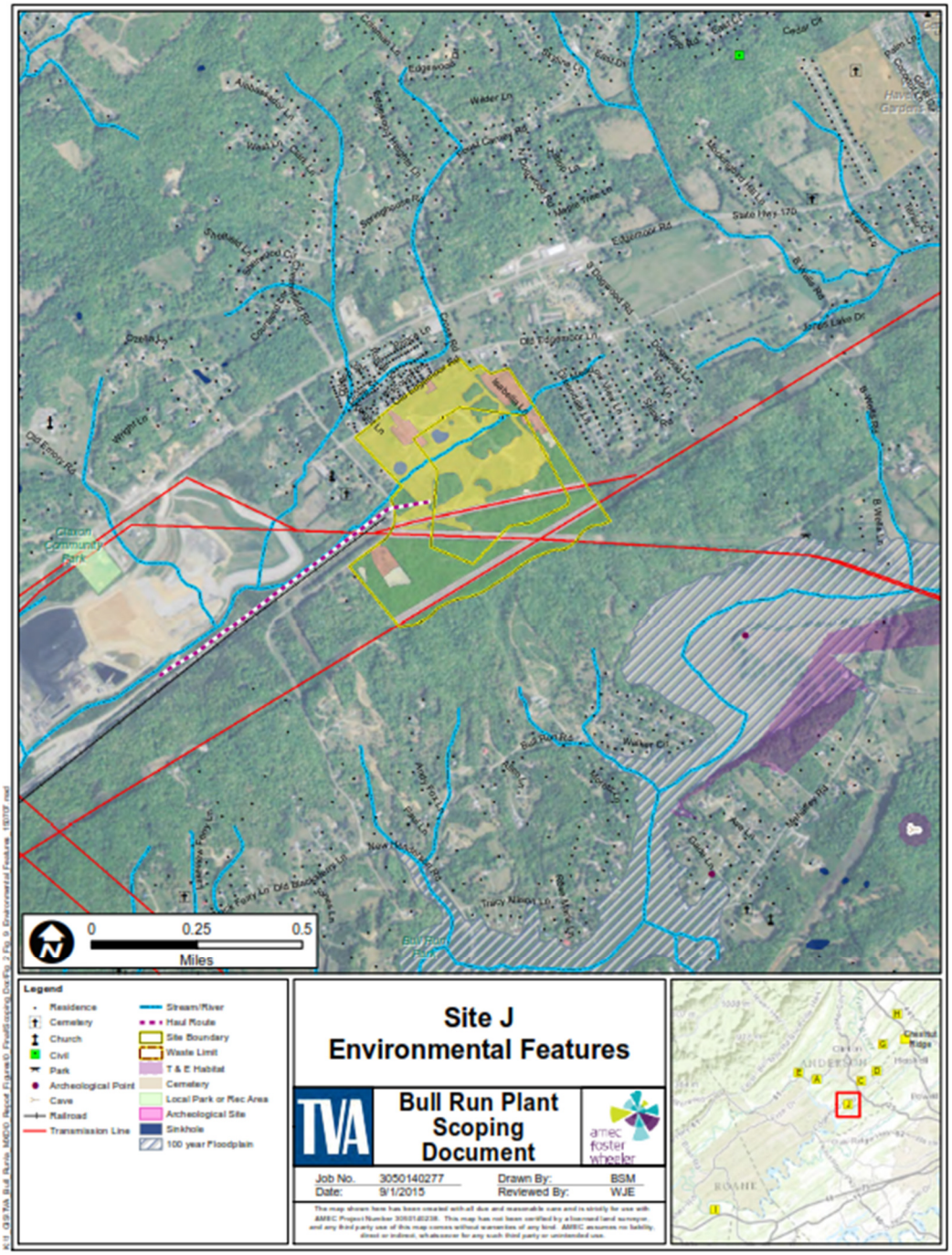

Figure 2. Environmental Features on and in the Vicinity of Site J

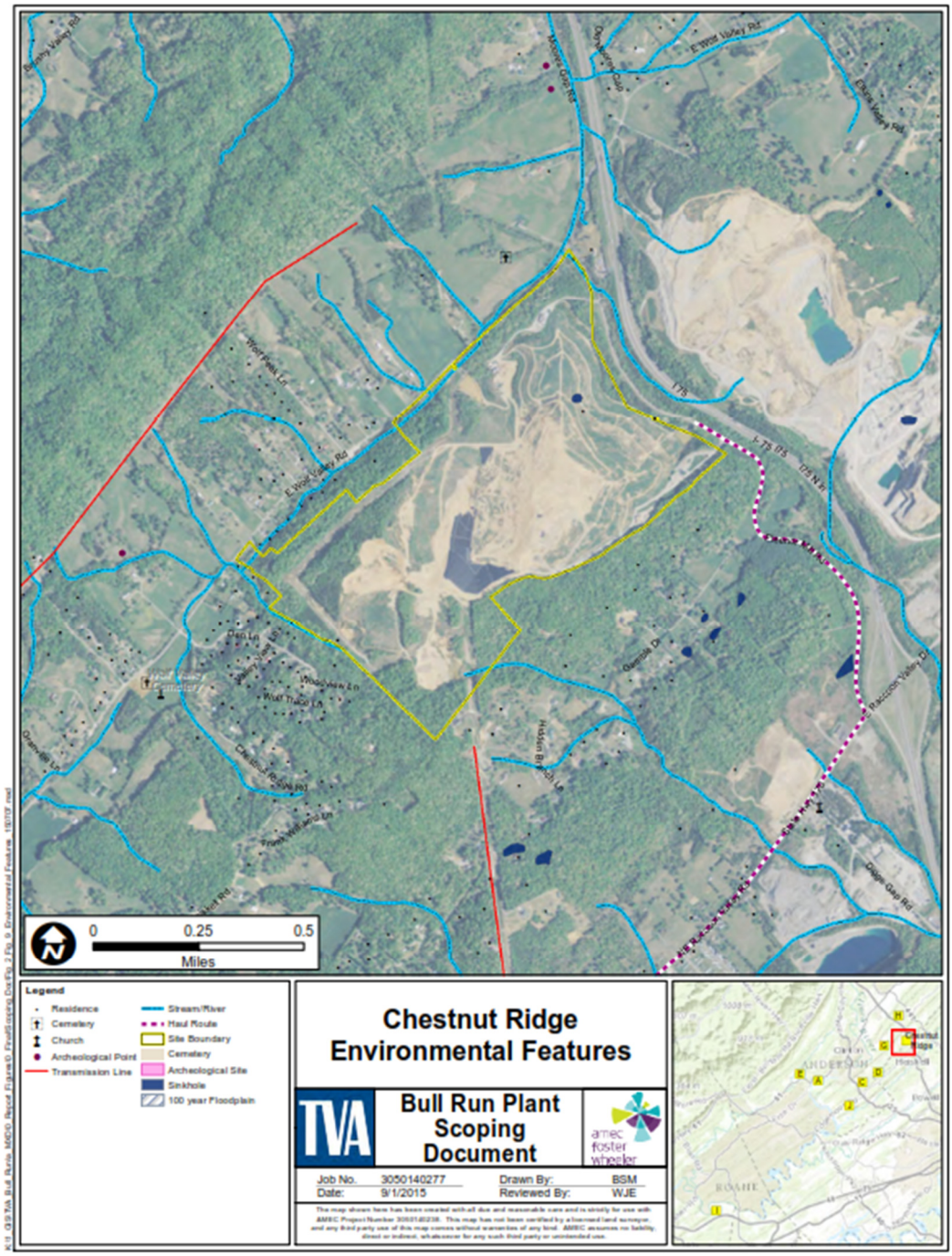

Figure 3. Environmental Features on and in the Vicinity of Chestnut Ridge

4.0 Public and Agency Involvement

TVA intends to prepare an EIS, the most intensive level of NEPA review, to consider options for additional disposal of CCRs generated by BRF. When completed, the draft EIS will be available for public review for 45 days. Once the public and other agencies have reviewed the document, TVA will make revisions, if necessary, and publish a final EIS. TVA will make a final decision after the final EIS is published.

Public scoping for this project was initiated with the publication of the NOI to prepare an EIS in the Federal Register on May 21, 2015. In addition to the NOI in the Federal Register, TVA published notices regarding this effort in regional and local newspapers; issued a news release to media; posted the news release on the TVA website; and posted flyers and signs near the Alternative 2 landfill site to solicit public input.

To initiate scoping, TVA also sent copies of the NOI to the Tennessee Department of Environmental and Conservation and the United States Department of Interior.

5.0 Scoping Feedback

TVA received six responses regarding the NOI. The majority of the public response to the NOI focused on specific resources that should be considered in the EIS, including:

- Wastewater treatment requirements and potential impacts associated with USEPA Effluent Limitations Guidelines
- Beneficial reuse of gypsum
- Impacts to wildlife near BRF and potential visual impacts.

One comment form was submitted by several interested parties. These comments included:

- A request that TVA modify the Purpose and Need and consider the retirement of BRF as a reasonable alternative.
- TVA should consider cumulative impacts.
- TVA should evaluate groundwater impacts.
- TVA should evaluate the impacts of coal ash at BRF.
- TVA should characterize existing coal ash deposits at BRF.
- TVA should consider the CCR Rule when making current and future coal ash disposal recommendations.

TVA also received a request for additional information from a neighboring landowner. These comments are included in Appendix A.

The remaining comment was from the US Department of the Interior in response to the NOI acknowledging receipt of the NOI with no additional comment. This comment is attached in Appendix B.

Issues to be Addressed

Based on TVA's internal scoping and input gathered from the public scoping process, the proposed action may affect the following:

- Water resources – TVA will characterize surface water and groundwater resources, and will analyze the extent to which each alternative would affect water quality directly or indirectly (i.e., through runoff).

- Biological Resources (vegetation, wildlife and aquatic life) – Community types within the project area will be described. Significant natural features, including rare species habitat, important wildlife habitat, or locally uncommon natural community types will be identified. TVA will evaluate the effect of each alternative on terrestrial ecosystems.

- Threatened and Endangered Species – State or federally listed threatened and endangered plants and animals known to exist in the vicinity of BRF or any of the landfill alternatives will be identified. The effects of each alternative on endangered, threatened, and rare species in need of management will be evaluated.

- Floodplains and Wetlands - Wetlands and floodplains on the proposed landfill sites will be identified and impacts will be quantified. The effects of each alternative on wetlands and floodplains will be evaluated.

- Geology and Soils – Regional geology and soils on the proposed landfill sites will be identified and any limitations related to construction and operation of a CCR landfill will be evaluated. Prime farmland soils are not expected to be impacted.

- Land Use – Land uses within the proposed landfill sites and within the vicinity (5-mile radius) will be identified. Permanent and temporary direct and indirect impacts to land use associated with each of the proposed landfill sites will be evaluated.

- Transportation – The existing roadway network in the vicinity of BRF, Site J and the Chestnut Ridge Landfill, including physical road characteristics (number of lanes, shoulders, and posted speed limit) and existing traffic characteristics will be identified. The effect of construction and operation of each storage alternative on the nearby roadway network will be evaluated.

- Recreational and Managed Areas – Natural areas, parks, and other managed areas within the vicinity of the alternatives (5-mile radius) will be identified and potential impacts associated with the proposed alternatives will be addressed.

- Visual Resources – The aesthetic setting of each alternative site will be described (including the presence of the existing onsite storage facility) and an analysis of changes to scenic attractiveness and scenic integrity associated with each of the proposed storage alternatives will be completed.

- Cultural Resources – TVA will characterize archaeological and historic resources within the Area of Potential Effect of each alternative site. TVA also will discuss any known National Register sites. The potential effects of each alternative on historic and archaeological resources will be evaluated. Results of the analysis will be reviewed by the Tennessee State Historic Preservation Officer.

- Solid and Hazardous Waste – CCRs will be characterized based upon existing BRF operations. Current practices regarding hazardous materials/waste management at BRF will also be identified. In addition, TVA will identify any impacts from waste generation during construction and operation at each alternative site. Operational measures (waste management practices) will be incorporated into the assessment of impacts.

- Public Health and Safety – Potential effects of each alternative on public health and safety will be evaluated. The evaluation will include potential effects of transportation of CCR along public roadways.

- Noise – Baseline noise conditions will be characterized and noise emissions associated with the construction phase equipment use and truck traffic during operations will be assessed to determine the potential noise impact of each alternative landfill site on sensitive receptors.

- Air Quality and Climate Change – Air quality considerations including attainment status, and regional air quality information will be presented. Impacts to air quality from construction and operations associated with each of the alternatives will be evaluated. The impact of emissions from each of the alternatives on climate change will be addressed.

- Socioeconomics and Environmental Justice – Demographic and community characteristics associated with each of the proposed alternative sites will be evaluated. Special attention will be given to identification of potential low income and minority populations to evaluate the potential for disproportionate impacts in accordance with Executive Order 12898. Economic effects associated with changes in workforce as a result of construction and operation of each of the proposed landfill sites will also be evaluated.

The potential direct and indirect impacts of each resource will be assessed in the EIS. Mitigative measures designed to minimize impacts also will be identified. In addition, the EIS will include an analysis of the cumulative impacts of each of the alternatives. A cumulative impact analysis considers the potential impact to the environment that may result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions (40 CFR § 1508.7). The methodology for performing such analyses is set forth in Considering Cumulative Effects under NEPA (Council on Environmental Quality, 1997).

6.0 Related Environmental Documents

The following environmental reviews have been prepared for actions related to CCRs at BRF:

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

- *Bull Run Fossil Plant House Demolition and Hydrogeologic Investigations Environmental Assessment* (TVA 2013). TVA purchased approximately 166 acres adjacent to BRF. To protect public health and safety, TVA proposed to remove the structures and implement other actions to manage the acquired land. TVA also performed a hydrogeologic investigation on a portion of the property to determine potential future uses of the property, including construction and operation of a CCR landfill.

- *Bottom Ash and Gypsum Mechanical Dewatering Facility Bull Run Fossil Plant* (TVA 2012). This Environmental Assessment (EA) evaluates the installation of equipment to remove water from gypsum and bottom ash generated at BRF. The dewatering equipment allows TVA to convert its bottom ash and gypsum handling processes to a dry basis. *Installation of Flue Gas Desulfurization System at Bull Run Fossil Plant* (TVA 2005). This EA evaluates the impacts of construction and operation of flue gas desulfurization or scrubber equipment designed to reduce sulfur dioxide emissions.

The description of the affected environment and the assessment of impacts contained in the documents listed above will be considered in the analysis of the proposed action.

7.0 Environmental Review Process

NEPA requires federal agencies consider and study the potential environmental consequences of major actions. The NEPA review process is intended to help Federal agencies make decisions that are based on an analysis of the impacts of the action and, if necessary, to take actions to protect, restore, and enhance the environment. NEPA also requires federal agencies to provide opportunities for public involvement in the decision – making process. The general project schedule which includes opportunities for public involvement is shown in Section 8.

TVA's agency involvement also includes circulation of the draft EIS to local, state, and federal agencies and federally recognized tribes to request comments on the proposed action. A list of agencies and tribes that will be notified of the availability the draft EIS is set forth below.

Federal Agencies

- United States Fish and Wildlife Service, Cookeville, Tennessee
- United States National Park Service, Gatlinburg, Tennessee

Federally Recognized Tribes

- 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 of Oklahoma
- Shawnee Tribe of Oklahoma
- The Chickasaw Nation
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma

State Agencies

- Tennessee Department of Environment and Conservation, Nashville
- Tennessee Wildlife Resources Agency, Nashville
- Tennessee Department of Transportation, Nashville

Individuals and Organizations

- Ms. Terry Frank, Mayor of Anderson County, Tennessee
- Mr. Tim Burchett, Mayor of Knox County, Tennessee
- Mr. Buddy Bradshaw, Mayor of Loudon County, Tennessee
- Mr. Ron Woody, County Executive, Roane County, Tennessee
- Earthjustice
- Environmental Integrity Project
- Southern Alliance for Clean Energy
- Southern Environmental Law Center
- Statewide Organizing for Community eMpowerment
- Sierra Club
- Tennessee Clean Water Network

8.0 Schedule for EIS Preparation and Review

Following is a tentative schedule for the completion of the EIS.

Task	Start Date	End Date
NOI	May 21, 2015	July 6, 2015
Public Review of Draft EIS	Spring, 2016	Summer 2016 (60 days)
Development of Final EIS	Summer, 2016	Fall, 2016
Final EIS Comment Period	Fall, 2016	Winter, 2016 (30 days)
Record of Decision		Spring, 2017

9.0 References

TVA 2015a. Tennessee Valley Authority. 2015. *Integrated Resource Plan: 2015 Final Report*. Knoxville, Tennessee. Retrieved from: <http://www.tva.com/environment/reports/irp/index.htm> (n.d.).

TVA 2015b. Tennessee Valley Authority. 2015. *Integrated Resource Plan 2015 Final Supplemental Environmental Impact Statement Volume 2*. Retrieved from: http://www.tva.com/environment/reports/irp/index.htm (n.d.)

TVA 2013. Tennessee Valley Authority. 2013. *Bull Run Fossil Plant House Demolition and Hydrogeologic Investigations Environmental Assessment*. Retrieved from: http://www.tva.gov/environment/reports/bull_run_demo/ (n.d)

TVA 2012. Tennessee Valley Authority. 2012. *Bottom Ash and Gypsum Mechanical Dewatering Facility Bull Run Fossil Plant.* Knoxville, Tennessee. Retrieved from: http://www.tva.com/environment/reports/BRFdewater/index.htm (n.d.).

TVA 2005. Tennessee Valley Authority. 2005. *Installation of Flue Gas Desulfurization System at Bull Run Fossil Plant.* Anderson County, Tennessee. Retrieved from: http://www.tva.gov/environment/reports/bullrun2/ (n.d.).

Appendix A

Public Comments Submitted During the Scoping Period

(May 21, 2015 through July 6, 2015)

Bob Alexander
321 Rosa L. Parks Blvd., Nashville, TN

The continued disposal of solid waste/CCR at Bull Run Fossil also entails potentially substantial changes in wastewater discharges to the Clinch River. The discussion of the project and the affected environment, i.e. surface waters, must address the potential direct impacts occurring from this program/project and must address any required mitigation of these impacts.

Request the EIS specifically address the wastewater treatment requirements which will arise from conversion to dry ash management at Bull Run Fossil. Changes must be identified in wastewater volume and characteristics occurring after ceasing to sluice bottom ash and after startup of the FGD/bottom ash dewatering system, and must be compared to existing conditions in the discharge to the Clinch River. These changes, along with the capability of the existing treatment system, must be assessed and any needed alternative treatment technologies must be evaluated in light of the pending final EPA Effluent Limitations Guidelines, or ELGs, for the Steam Electric Power industrial sector. These ELGs are expected to become final in Fall 2015 and would be in effect during the completion of this EIS.

Chuck Bowman
110 Henderson Bend Road, Knoxville, TN

Consideration should be given to using the resulting gypsum as raw material for sheet-rock as is done at the Cumberland Steam Plant. I understand that a large part of the cost of using power plant gypsum in the cost of dewatering which is now to be done in any event.

I understand that this alternative was considered previously but was objected to by the city of Oak Ridge due to the need to transport over their roads. However, since it is to be solidified on site, that objection may no longer be valid.

Richard Shipley
3530 Oakvilla Lane, Knoxville, TN

While I wish TVA would shut all coal fired power plants I understand the need to balance cheap, reliable energy production against cleaner air. If investing in Nuclear power is not the choice at this time I would prefer TVA move to dry storage of coal ash to prevent another disaster similar to the one that occurred in Kingston, TN. My only concern with expanding the coal ash storage at TVA Bull Run is the destruction of the beautiful field and ridgeline along the East side of Henderson Hollow Road. While I understand TVA paid fair market value, along with other costs to the families living along Henderson Hollow, it would be nice to see the fields on the East side of the road preserved. TVA officials are very aware these fields support deer, turkey, waterfowl, and many other species of animals. If TVA moves forward with expansion in the area of Henderson Hollow it would be nice to see the total height of the pile reduced. The current

storage area has become a gray mountain protruding into the evening skyline that appears obviously out of place in the valley. From Edgemore Road the coal ash pile appears as a giant moonscape. When coming North on Henderson Hollow it is the first thing you see when topping over the ridge line. The barren gray mountain is an awful neighbor.
TVA has taken great strides in cleaning its image. It is my sincerest hope that TVA continues down that path by listening to those most affected by this decision and reducing the height of the storage pile. Please consider the addition of native trees to the man-made mountain of ash if it doesn't affect the integrity of the storage membrane. Creating a standoff or buffer around the ash storage cell would be very beneficial. Thank you for your consideration of this mater.

Sincerely,

Richard Shipley

Anita E. Masters, NEPA Project Manager
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, Tennessee 37402
aemasters@tva.gov

Via Electronic Mail

July 2, 2015

Re: Scoping Comments on TVA's Environmental Impact Statement for the Disposal of Coal Combustion Residuals from the Bull Run Fossil Plant

Dear Ms. Masters,

The Southern Alliance for Clean Energy, Tennessee Clean Water Network, Southern Environmental Law Center, Environmental Integrity Project, Sierra Club, Statewide Organizing for Community eMpowerment and Earthjustice submit the following comments for the scope of the Tennessee Valley Authority's ("TVA") Environmental Impact Statement ("EIS") for the Disposal of Coal Combustion Residuals from the Bull Run Fossil Plant. We appreciate the opportunity to weigh in prior to the formation of the EIS.

I. Comments on the Legal Requirements for Scope of Analysis Required in EIS

The National Environmental Policy Act ("NEPA") is "our basic national charter for protection of the environment."[1] Other environmental statutes focus on particular media (like air, water or land), specific natural resources (such as wilderness areas, or endangered plants and animals), or discrete activities (such as mining, introducing new chemicals, or generating, handling or disposing of hazardous substances). In contrast, NEPA applies broadly "to promote efforts which will prevent or eliminate damage to the environment."[2] "[NEPA] has 'twin aims. First, it places upon [a federal] agency the obligation to consider every significant aspect of the environmental

[1] 40 C.F.R. § 1500.1(a).
[2] NEPA § 2, 42 U.S.C. § 4321.

impact of a proposed action. Second, it ensures that the agency will inform the public that it has indeed considered environmental concerns in its decision-making process.'"[3]

A. Purpose and Need

NEPA requires TVA to "briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."[4] TVA "cannot define a project's purpose and need so narrowly that it contravenes NEPA's mandate to evaluate reasonable alternatives."[5]

The Scoping Notice appears to identify "expanding [TVA's] capacity for managing CCRs" at Bull Run Fossil Plant as the purpose and need for the proposed action, making additional storage a foregone conclusion and precluding the consideration of reasonable alternatives, including cessation of coal-fired generation at Bull Run Fossil Plant. To achieve NEPA's purposes of full disclosure and consideration of environmental impacts associated with the proposed action and alternatives, the underlying purpose and need must not be defined so narrowly. TVA must re-characterize the purpose and need as "addressing the limited storage capacity for dry stack CCRs" at Bull Run Fossil Plant in order to properly evaluate a reasonable range of alternatives in the EIS.

B. Alternatives

The alternatives analysis is "the heart of the environmental impact statement."[6] In evaluating alternatives, TVA is required to "[r]igorously explore and objectively evaluate all reasonable alternatives."[7] "Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant."[8] The discussion in the EIS must "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues

[3] *Kern v. Bureau of Land Management*, 284 F.3d 1062, 1066 (9th Cir. 2002) (quoting *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983)) (internal quotations and citations omitted, alteration in original).
[4] 40 C.F.R. § 1502.13.
[5] *Coal. for Advancement of Reg'l Transp. v. Fed. Highway Admin.*, 576 F. App'x 477, 487 (6th Cir. 2014) (quoting *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C.Cir.1991)).
[6] 40 C.F.R. § 1502.14.
[7] 40 C.F.R. § 1502.14.
[8] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026-01 (March 23, 1981).

and providing a clear basis for choice among options by the decisionmaker and the public."[9] The EIS must include consideration of a "no-action" alternative as well as other reasonable alternatives.[10]

In the Scoping Notice, TVA identifies a range of alternatives that it plans to consider in the EIS, including (1) construction of a new CCR storage area onsite; (2) hauling CCR to an existing permitted landfill; and (3) constructing a new CCR storage area offsite and hauling CCR to it. In addition, TVA states that it will consider a "'No Action' Alternative under which TVA would not seek additional storage capacity for CCR from BRF."[11]

The "no-action" alternative should evaluate the impacts of an agency's choice *not* to take action, including the impacts of predictable actions by others based on the agency's decision not to act.[12] It is not clear from the description of the no-action alternative in the Scoping Notice how TVA plans to analyze the environmental consequences associated with continuing to dispose of CCR in an overflowing landfill and other coal ash disposal areas that will trigger corrective action under federal law. One predictable consequence of that choice would be enforcement by the State of Tennessee or citizens, which could ultimately lead to temporary or permanent cessation of coal-fired generation at Bull Run Fossil Plant. Thus, in evaluating the no-action alternative, TVA must take into account the impacts of temporary or permanent cessation of coal-fired generation at Bull Run Fossil Plant.

Similarly, TVA must consider retirement of Bull Run Fossil Plant as a reasonable alternative to the proposed action. As noted above, TVA cannot dismiss an alternative simply because it is not "desirable" from TVA's standpoint. Although the Scoping Notice makes the conclusory assumption that Bull Run Fossil Plant "is one of TVA's coal plants that is planned to continue operating in the future,"[13] it offers no explanation of why retirement of the coal-fired units at Bull Run would be technically or economically infeasible. Over the past few years, TVA has announced retirements of all units at Allen, Colbert, Johnsonville, Widows Creek and John

[9] 40 C.F.R. § 1502.14.
[10] *Id.; id.* § 1508.25.
[11] Scoping Notice at 3-4.
[12] Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18026-01 (March 23, 1981).
[13] Scoping Notice at 3.

Sevier, as well as some units at Paradise and Shawnee.[14] TVA's most recent retirement announcement was the last operational unit at Widows Creek, citing lack of CCR storage and the expense of complying with EPA's new CCR rule as primary drivers for the retirement.[15] A Google data center, powered by 100 percent renewable energy, will replace the coal-fired units at Widows Creek.[16]

As TVA recognizes in its draft 2015 IRP, coal generation is increasingly uneconomic, and changing environmental standards for carbon emissions will drive retirement decisions within the next ten years.[17] Given the regulatory uncertainty and economic vulnerability associated with coal-fired generation, TVA must consider retirement of the coal-fired units at Bull Run as a reasonable alternative to additional storage capacity for CCRs in its EIS.

C. Cumulative Impacts

In addition to examining a reasonable range of alternatives, NEPA also requires TVA to identify connected and cumulative actions and to analyze the cumulative impacts of its proposed action in relation to those actions.[18] Actions are connected if they are "interdependent parts of a larger action and depend on the larger action for their justification."[19] A cumulative action is an action that "when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement."[20] Cumulative impacts are "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions."[21] These impacts "can result from individually minor but collectively significant actions taking place over a period of time."[22]

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[14] TVA, Draft 2015 Integrated Resource Plan 40 (March 2015).
[15] TVA, TVA Board Updated on Operations at its Quarterly Meeting (May 7, 2015), available at http://www.tva.com/news/releases/aprjun15/board_meet_5-7-15.html.
[16] TVA, Google Chooses TVA Site for Next Data Center (June 24, 2015), available at http://www.tva.com/news/releases/aprjun15/google.html.
[17] TVA, Draft 2015 Integrated Resource Plan 91 (March 2015).
[18] 40 C.F.R. §1508.25.
[19] *Id.*
[20] *Id.*
[21] 40 C.F.R. § 1508.7.
[22] *Id.*

Among the concerns TVA is required to consider is the Project's impact on climate change.[23] And, as both the Supreme Court and the Council on Environmental Quality have recognized, because climate change is necessarily a global problem, it can only be addressed incrementally by reducing or eliminating emissions from many individual relatively small sources.[24] The Bull Run Fossil Plant is one such source.

The Scoping Notice does not identify any connected or cumulative actions that will be analyzed in the EIS. Nor does it identify any cumulative impacts. Based upon the limited information in the Scoping Notice, connected and cumulative actions, and the cumulative impacts associated with them, that must be analyzed in the EIS, include, but are not limited to:

- Coal mining, including any coal sourced from mines that engage in mountain-top removal;
- Impact of no longer burning any percentage of Appalachian coal in Bull Run's boiler;
- Transportation of coal to Bull Run;
- Coal combustion, including impacts from common air pollutants and carbon pollutants;
- Dewatering, including water quality impacts;
- Closure of existing coal ash ponds;
- Storage, including water quality impacts from existing coal ash ponds and fugitive dust from existing dry storage;
- Impact on wildlife and endangered species.

In addition, to the extent that TVA intends to use the proposed action as a model for storage of CCRs at its other coal-fired plants, the cumulative impacts associated with replicating the proposed action across its fleet, including the above-mentioned cumulative impacts, should be analyzed in the EIS.[25]

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[23] Council on Environmental Quality, Draft Guidance on Consideration of the Effects of Climate Change under NEPA 8-10 (December 2014) ("Draft Climate Change Guidance").
[24] *Massachusetts v. EPA*, 549 U.S.497, 524 (2007); Draft Climate Change Guidance at 9 ("Government action occurs incrementally, program-by-program and step-by-step, and climate impacts are not attributable to any single action, but are exacerbated by a series of smaller decisions, including decisions made by government.").
[25] 40 C.F.R. § 1508.25.

II. Comments on Specific Environmental Impacts Required to be Included in EIS

As laid out in TVA's notice, we agree that the following environmental impacts analysis must be included in the EIS:

- Water resources (surface water, groundwater quality, and use);
- Vegetation;
- Wildlife;
- Aquatic ecology;
- Endangered and threatened species;
- Floodplains and wetlands;
- Geology;
- Land use;
- Transportation;
- Recreational and managed areas;
- Visual resources;
- Archaeological and historic resources;
- Solid and hazardous waste;
- Public health and safety;
- Noise;
- Air quality and climate change;
- Socioeconomics and environmental justice

As TVA notes in the request for comments, the TVA Board of Directors decided to phase out wet handling and storage of fly ash six years ago. We strongly support that decision and remain hopeful that TVA will accomplish the goal as soon as possible. It is unfortunate, however, that as TVA works to convert its coal fleet to dry handling it has systematically failed to admit the legacy of contaminated groundwater across all of its coal facilities. Existing coal ash disposal also presents risks to human health and the environment through air, soil, surface water, and

sediment exposure pathways. TVA must evaluate the risks that these exposure pathways pose currently, and must also evaluate the extent of the risks associated with new disposal areas.

Currently, the groundwater beneath the Bull Run site is contaminated; the contamination is caused by decades of unsafe coal ash disposal at the site. This EIS represents an important opportunity for TVA to change course on this issue and address its legacy contamination. The options that TVA is considering for dry ash handling touch on all existing ash disposal areas, therefore the EIS must fully evaluate the environmental impacts of coal ash site-wide:

- If TVA opts for a new coal ash landfill, then it will have to close some or all of the existing ash disposal areas, and how TVA chooses to close them will have important environmental consequences. In addition, a new landfill will have to conform to the requirements of EPA's new Resource Conservation and Recovery Act ("RCRA") Subtitle D rule for coal ash (see detailed comments on that point below).

- TVA is also considering "hauling [coal ash] to an existing permitted landfill." If that landfill is the existing, on-site coal ash landfill, TVA should directly address the ongoing groundwater contamination at that landfill (see below), explain how it happened, and explain in detail how they will prevent it from happening in an expansion (which would also be regulated as a new landfill under the EPA RCRA rule).

- Finally, TVA must describe in sufficient detail the affected environment or "baseline" conditions and the "No Action" alternative. Answering the question "Is an offsite landfill better than ongoing, onsite ash disposal, from an environmental perspective?" requires an accurate characterization of the current baseline in the description of the affected environment and of future conditions under the No Action alternative. The public must be informed about the extent of contamination at Bull Run under the baseline condition in order to form educated opinions about environmental impacts of the alternatives. And if TVA were to adopt the "No Action" alternative, it would be perpetuating site-wide groundwater contamination by continuing to add coal ash to disposal areas that are known to be leaking, at least until enforcement required coal-fired generation to cease.

As an overarching matter, TVA must take responsibility for existing contamination. In the past, TVA has attempted to evade the issue. TVA has asserted that the level of current groundwater

sediment exposure pathways. TVA must evaluate the risks that these exposure pathways pose currently, and must also evaluate the extent of the risks associated with new disposal areas.

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As an overarching matter, TVA must take responsibility for existing contamination. In the past, TVA has attempted to evade the issue. TVA has asserted that the level of current groundwater

contamination is not in violation of groundwater quality standards (which ignores high levels of pollutants, like boron, that do not currently have standards), or has tried to argue that contamination is naturally occurring. Additionally, TVA has failed to monitor groundwater for coal ash indicator pollutants.[26]

For example, in the February 2014 report for Bull Run's Dry Fly Ash Landfill, TVA concluded that "[g]roundwater analytical data for the February 3-6, 2014, sampling event show no evidence of contamination from the dry fly ash landfill."[27] This statement is plainly false, and is contradicted by TVA's own monitoring results. Downgradient well F45R was sampled twice in February 2014. TVA found boron concentrations of 19.4 and 19.5 mg/L, the highest concentrations measured to date in a well that has shown steadily increasing boron levels since it was installed in 2008.[28] These concentrations are 100 times higher than background concentrations in upgradient well I (consistently less than 0.2 mg/L), so they are clearly caused by the coal ash landfill, and they are unsafe, being much higher than the EPA Child Health Advisory for boron (3 mg/L). As described in more detail below, manganese, sulfate and molybdenum concentrations in this well were also unsafe and also exceed upgradient concentrations by large margins.

In the EIS, TVA should provide an honest assessment of all of the information that it has on hand regarding the extent of coal ash-related groundwater contamination at Bull Run.[29] An example of the straightforward language the public will expect to see in the EIS exists in the February 2014 groundwater monitoring report for the Shawnee plant, where TVA admitted that "statistical findings indicate coal-combustion by-product effects on groundwater beneath and

[26] *See generally* Environmental Integrity Project, TVA's Toxic Legacy: Groundwater Contaminated by Tennessee Valley Authority Coal Ash (November 2013); see also TVA, Bull Run Fossil Plant Gypsum/Coal Ash Landfill February 2014 Groundwater Monitoring Report (Apr. 3 2014) (stating that "constituent concentrations reported for all samples were below TDEC maximum contaminant levels" and finding "no GWPS [Groundwater Protection Standards] exceptions at the site," but ignoring elevated and unsafe concentrations of coal ash pollutants boron, molybdenum, and sulfate).
[27] TVA, Groundwater assessment monitoring report – February 2014, 8 (Mar. 25, 2014).
[28] We recently received sampling data from August 2014, when the boron concentration in well 45R reached a new high of 20.1 mg/L, roughly seven times higher than the EPA Child Health Advisory of 3 mg/L.
[29] In order to provide this assessment, TVA should not discontinue monitoring for coal ash indicator pollutants in wells that have previously shown high levels of these pollutants.

downgradient of the special waste landfill" based on high concentrations of boron, molybdenum, sulfate, and other pollutants.[30]

As described in more detail below, it is indisputable that the coal ash disposal areas at Bull Run have contaminated the groundwater beneath the plant. Under the requirements of RCRA, TVA will eventually have to close these disposal units and/or take corrective action. For the EIS process to have any legitimacy, TVA must be more transparent about the extent, cause, and remedial implications of the contamination.

III. Baseline Groundwater Quality

The Bull Run plant currently has five distinct ash disposal areas: A bottom ash disposal area (Area 1), a gypsum disposal area (Area 2A), an impoundment area that includes a fly ash pond and a stilling pond (Area 2), a dry fly ash landfill, and an abandoned dredge cell.[31] TVA must evaluate groundwater quality at each of these areas and provide the public with details about how it intends to manage these areas in the future, including details about how it intends to remediate known groundwater contamination. The following sections discuss currently available monitoring data at each disposal area.

Area 1: Bottom ash disposal area. TVA's bottom ash disposal area was built over an old fly ash pond on the banks of the Clinch River. As of 2010, the area had a 20-foot thick layer of bottom ash stacked on top of a 30-foot thick layer of fly ash. The water table comes up to roughly where the fly ash and bottom ash layers meet, meaning that most of the fly ash, and some of the bottom ash, is saturated with groundwater.[32]

Not surprisingly, groundwater downgradient of the bottom ash disposal area shows all of the hallmarks of coal ash contamination. As shown in Table 1 below, average concentrations of boron and sulfate, well-known coal ash indicators,[33] are much higher in

[30] TVA, letter to Deborah DeLong, Kentucky Division of Waste Management, transmitting February 2014 quarterly groundwater report for Shawnee Fossil Plant Special Waste Landfill (Apr. 25, 2014)
[31] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee*, Table A.1 (June 24, 2009).
[32] Stantec Consulting Services, Inc., Report of Geotechnical Exploration – Bull Run Fossil Plant, pdf pages 889 *et seq.* (Apr. 12, 2010).
[33] *See, e.g.*, 40 C.F.R. § 257 App. III, listing boron and sulfate as "constituents for detection monitoring" at coal ash disposal units.

downgradient wells 47 and 48 than they are in upgradient well 1. Concentrations of cobalt and molybdenum, also associated with coal ash,[34] show the same pattern.

Table 1: Mean groundwater concentrations in wells surrounding the Bull Run bottom ash disposal area (based on data from 2008-2014)[35]

	Boron (mg/L)	Sulfate (mg/L)	Cobalt (ug/L)	Molybdenum (ug/L)
Upgradient well 1	0.16	7	4	10
Downgradient well 47	2.1	810	10	40
Downgradient well 48	1.8	1,577	46	10

The bottom ash disposal area has obviously contaminated the groundwater, which is now unsafe to drink as downgradient concentrations of sulfate, cobalt and molybdenum have all exceeded health-based federal guidelines for drinking water quality.[36] To the extent that the contamination migrates into the Clinch River, it is also contaminating sediments and surface water.

Area 2A: Gypsum disposal area. The gypsum disposal area is located next to the bottom ash area and, like that area, is built over a thick (roughly 20 feet) layer of fly ash from a former ash pond. The dikes of the gypsum disposal area are constructed of bottom ash. Groundwater saturates parts of both the fly ash and bottom ash layers.[37]

There are two groundwater monitoring wells downgradient of the gypsum disposal area. Well 49 shows clear evidence of coal ash contamination, with high concentrations of boron, sulfate, and molybdenum.

[34] *See id.* at Appendix IV, listing "constituents for assessment monitoring."
[35] All data taken from TVA groundwater monitoring reports; for averaging purposes, nondetects were treated as being present at the detection level.
[36] Sulfate concentrations have been as high as 1,800 mg/L, well above the EPA Drinking Water Advisory of 500 mg/L; cobalt concentrations as high as 100 ug/L exceed the EPA Regional Screening Level for tapwater (6 ug/L); and molybdenum concentrations of up to 67 ug/L exceed the EPA Lifetime Health advisory of 40 ug/L.
[37] Stantec Consulting Services, Inc., Report of Geotechnical Exploration – Bull Run Fossil Plant, pdf pages 889 *et seq.* (Apr. 12, 2010).

Table 2: Mean groundwater concentrations in wells surrounding the Bull Run gypsum disposal area (based on data from 2008-2014)[38]

	Boron (mg/L)	Sulfate (mg/L)	Cobalt (ug/L)	Molybdenum (ug/L)
Upgradient well 1	0.16	7	4	10
Downgradient well 49	2.2	451	4	600
Downgradient well 50	0.19	29	4	4

Area 2: Impoundment and stilling pond. The fly ash impoundment and stilling pond are constructed with a base at an elevation of roughly 780 feet. The local water table could be defined as the elevation of water in the ponds (roughly 805 feet) or the elevation of nearby groundwater (roughly the same elevation) or, at a minimum, the elevation of the Clinch River (roughly 795 feet). In any case, the base of this unlined impoundment complex is well below the water table, which facilitates the migration of leachate from the thick layer of accumulated coal ash in the impoundment. Available monitoring data are limited to three shallow wells screened in the clay dikes between the impoundments and the river. Since TVA rarely measures coal ash indicators in these wells, we do not have a good sense of the extent of contamination in this area. We do know that well 10-52 has arsenic concentrations roughly three times higher than the Maximum Contaminant Level ("MCL") for arsenic.

Dry fly ash landfill. The Bull Run fly ash landfill, which TVA has been using since 1982, is monitored by three downgradient wells (G, J, and 45R), which can be compared to upgradient well I. Well 45R was installed in 2009 to replace well 45. All downgradient wells show clear evidence of contamination, with particularly high concentrations of coal ash indicators in wells 45 and 45R.

[38] All data taken from TVA groundwater monitoring reports; for averaging purposes, nondetects were treated as being present at the detection level.

Table 3: Mean groundwater concentrations in wells surrounding the Bull Run dry fly ash landfill area (based on data from 2008-2014)[39]

	Boron (mg/L)	Sulfate (mg/L)	Manganese (ug/L)
Upgradient well I (eye)	0.2	4.9	10
Downgradient well G	1.2	210	60
Downgradient well J	1.1	367	80
Downgradient well 45 (2008-2009)	4.2	910	10,000
Downgradient well 45R (2009-2014)	15.8	1,800	6,400

East-West Dredge Cell. According to a 2009 engineering report, TVA disposed of fly ash in this area between 1981 and 1995.[40] Although all of that fly ash is presumably still in place, and despite known seepage along the base of the area,[41] TVA does not monitor the groundwater around the dredge cell. It is nonetheless likely that the groundwater in this area is contaminated. Accordingly, TVA must investigate and characterize conditions in the East/West Dredge cell, including seepage and groundwater quality, and to restore the area to its original condition.

IV. Federal Legal Requirements for Coal Ash Disposal.

In April of this year, EPA promulgated a coal ash disposal regulation under RCRA.[42] The regulation imposes a number of important requirements on TVA, requirements that affect both current and future coal ash disposal and storage. These include, but are not limited to, the following:

- Existing coal ash ponds, and all new coal ash disposal areas, must be built at least five feet above the uppermost groundwater aquifer. The Bull Run fly ash impoundment fails this requirement and therefore must be closed per RCRA regulations. TVA must also demonstrate that any new coal ash landfill is at least five feet above local groundwater.

[39] All data taken from TVA groundwater monitoring reports; for averaging purposes, nondetects were treated as being present at the detection level.
[40] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Bull Run Fossil Plant, East/West Dredge Cell* [pdf pages 89 et seq.] (June 24, 2009).
[41] *Id.*
[42] US EPA, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule, 80 FR 21302 (Apr. 17, 2015); 40 CFR § 257.

- New coal ash disposal areas cannot be built in wetlands, fault areas, or seismic impact zones.
- New coal ash disposal areas cannot be built in geologically unstable areas, such as areas with karst bedrock.
- New coal ash landfills must have composite liners and leachate collection systems.
- TVA (and other owners and operators) must prepare and follow fugitive dust control plans for all coal ash disposal areas.
- TVA must design and maintain run-on and run-off control systems for all coal ash landfills.
- TVA must monitor the groundwater around all active coal ash disposal areas for boron, calcium, chloride, fluoride, pH, sulfate, and Total Dissolved Solids (TDS).
- If downgradient groundwater wells show any of the above-listed monitoring parameters at concentrations that exceed background, TVA must also monitor for antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, lithium, mercury, molybdenum, selenium, thallium, and radium 226/228; these are collectively defined as "assessment monitoring" constituents in the rule.
- Existing, unlined surface impoundments must be closed if they cause assessment monitoring constituents to exceed the groundwater standards prescribed by the rule.
- For all landfills that cause assessment monitoring exceedances, TVA must undertake corrective measures "to prevent further releases, to remediate any releases and to restore affected areas to original conditions."[43]
- The rule also provides requirements for how TVA must close its coal ash disposal areas, including requirements for post-closure care.

[43] 40 CFR § 257.96(a).

V. Other Environmental Impacts of Coal Ash Disposal

Coal ash disposal presents risks to human health and the environment through multiple exposure pathways. The groundwater risks at Bull Run are clear from the evidence described above. Other pathways have not been examined at Bull Run specifically, but are likely to be present. The potential risks from these other pathways are laid out in the risk assessment for the RCRA coal ash rule.[44]

Coal ash that becomes airborne can present inhalation risks to human health. The risk assessment predicted significant risks from arsenic and fine particulate matter, or PM2.5, at landfills that are not adequately controlled.[45]

Airborne coal ash eventually settles, and after it settles it can present risks to human health or the environment through soil exposure or through the food chain. The risk assessment stated that "[u]nder the uncontrolled management scenario, thallium was found to pose human health risks for multiple pathways [exposure to contaminated soil, milk, and beef], while multiple constituents were found to pose ecological risks for soil and sediment."[46] The contaminants posing ecological risks include antimony, arsenic, boron, selenium, silver, and vanadium.[47]

The risk assessment predicted significant risks to ecological receptors exposed directly to water in coal ash impoundments. The contaminants posing risks include aluminum, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, selenium, and vanadium.[48]

Finally, as contaminated groundwater migrates into surface water, the surface water and sediment become contaminated. The risk assessment found significant risks to ecological receptors from surface water contaminated in this way. Specifically, under certain conditions boron (from impoundments with FGD waste) and cadmium (from impoundments with ash and

[44] U.S. EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals (Dec. 2014).
[45] *Id.* at 3-7, 3-24. EPA did not model this pathway in its full probabilistic model.
[46] *Id.* at 3-16, 3-24. Again, EPA did not model these pathways in its full probabilistic model.
[47] *Id.*
[48] *Id.* at 3-26.

coal refuse) both present significant risks.[49] At the screening level, EPA predicted ecological risks from many contaminants in both surface water and sediment.[50]

VI. Requirements of an Environmental Impact Analysis

At a minimum, TVA must fully characterize the existing coal ash deposits at the site and the groundwater, surface water, soil, sediment, and air contamination being caused by these deposits; model future contamination through each of the above-named exposure pathways under each alternative, including the no action alternative; and explain how it intends to remediate existing contamination, as required by federal law. Specifically, TVA must do the following:

1. **Groundwater quality data**. For each disposal area, including the bottom ash disposal area (Area 1), the gypsum disposal area (Area 2A), the impoundment area that includes a fly ash pond and a stilling pond (Area 2), the dry fly ash landfill, and the East/West dredge cell, TVA must fully characterize groundwater contamination using the now well-known indicators of coal ash pollution – boron, sulfate, Total Dissolved Solid (TDS), and the other pollutants listed in Appendix III of the RCRA coal ash rule.[51] For each of these pollutants, TVA must assess upgradient and downgradient groundwater quality and identify all downgradient exceedances. Downgradient wells must be located in locations and at depths appropriate for detecting likely groundwater migration pathways. Upgradient wells must be located sufficiently far away from coal ash disposal areas to be safely unaffected by coal ash. As discussed above, TVA has already generated much of this evidence, and to the extent that the data are sufficient and appropriate, TVA must use existing data in its analysis.

   As discussed above, the existing database already shows widespread coal ash contamination. Therefore, TVA must also assess upgradient and downgradient groundwater quality for all of the pollutants listed in Appendix IV of the RCRA rule. Again, to the extent that the data are appropriate, TVA must use existing data in its analysis.

[49] *Id.* at 5-8.
[50] *Id.* at 3-25.
[51] 40 CFR § 257 Appendix III.

2. **Fly ash impoundment closure**. TVA will be required by law to close the fly ash impoundment because it is built below the water table. This is a connected and cumulative action, and TVA must provide a detailed plan, including a timeline, for closure of that pond in the EIS. Since the ash in this fly ash pond is saturated with groundwater, the only environmentally safe way of closing the pond is to remove all of the ash. The EIS must specifically explain how and when this will happen and identify potential permanent storage options for the ash once it is removed.

3. **Corrective action and closure of other coal ash disposal areas**. TVA will eventually be required to undertake corrective action at the bottom ash and gypsum storage areas and the dry fly ash landfill, due to these areas contribution to the contamination of local groundwater. Again, this corrective action should be viewed as a connected and cumulative action, and TVA must provide a detailed plan, including a timeline, for corrective action. Since the ash in the bottom ash and gypsum storage areas is saturated with groundwater, the only environmentally safe way of closing these areas is to remove all of the ash. The EIS must specifically explain how and when this will happen, and how and when TVA will properly close each area. The EIS must also provide a detailed explanation of how the corrective action plan will, as required by law, "restore affected areas to original conditions."[52]

4. **Hydrologic modeling**. There is no doubt that most of the contaminated groundwater at the Bull Run site is migrating into Bull Run Creek and the Clinch River through subsurface flow and through seeps.[53] This surface water pollution presents a public health threat: Less than half a mile downstream, the West Knox Utility District withdraws roughly 1 million gallons per day for use as the water supply for 48,120 people.[54] In addition, approximately 4.6 miles downstream of the ash pond outfall, the City of Oak Ridge withdraws 10.2 million gallons per day for use as the water supply for roughly

[52] 40 CFR § 257.96(a).
[53] The 2009 Stantec report cited above identified seeps at every Bull Run coal ash disposal area. Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Bull Run Fossil Plant* (June 24, 2009).
[54] USGS Public Water Supply Systems and Associated Water Uses in Tennessee, 2005, http://pubs.usgs.gov/of/2010/1226/pdf/ofr2010-1226.pdf (showing water use at the West Knox Utility District to be 0.984 million gallons per day, serving 48,120 people); US Army Corps of Engineers, Tennessee River Navigation Charts, Chart 111, http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll10/id/122 (Jan. 2013) (showing West Knox Utility District pump station at river mile 46).

30,000 people (among other uses).[55] The surface water pollution also presents an ecological threat.[56] TVA must provide long-term modeling of this pollution pathway in order to provide the public with a meaningful sense of how significant this pollution load is going to be over the coming decades.

5. **Surface water quality monitoring**. TVA must also monitor surface water in Bull Run Creek and the Clinch River, immediately upstream and downstream of the plant, using methods that are sufficiently sensitive to detect pollutants of concern.

6. **Sediment quality monitoring**. In addition, many of the metals that are being discharged into the two water bodies settle out into sediment, and risk assessments have demonstrated a clear risk to ecological receptors through sediment exposure.[57] Given this known exposure pathway and risk, TVA must sample the sediment along both shorelines, and compare sediment sampling results to appropriate risk-based thresholds for sediment quality.[58]

7. **Remediation**. To the extent that any of the above analyses show a risk to human health or ecological integrity, TVA must explain how it intends to restore the area to its original condition.

8. **Fugitive dust**. Several exposure pathways begin with fugitive dust. TVA must estimate these risks and explain how it will control fugitive dust under each Alternative.

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[55] Tennessee Department of Environment and Conservation, NPDES permit for the Bull Run Fossil Plant (Sep. 30, 2010) (locating Outfall 001 at Clinch River mile 46.3); US Army Corps of Engineers, Tennessee River Navigation Charts, Chart 110, http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p16021coll10/id/122 (Jan. 2013) (showing an intake at the end of Pumphouse Road, close to river mile 41.7); City of Oak Ridge, Capital Improvements program for the Fiscal Years 2014-2019 (showing the Oak Ridge raw water intake at the end of Pumphouse Road); USGS Public Water Supply Systems and Associated Water Uses in Tennessee, 2005, http://pubs.usgs.gov/of/2010/1226/pdf/ofr2010-1226.pdf (showing water use at the Oak Ridge Department of Public Works to be 10.2 million gallons per day, serving 29,315 people).

[56] See, e.g., U.S. EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals, Table 5-5 (Dec. 2014) (showing significant ecological risks from exposure to boron and cadmium in surface water certain types of coal ash impoundment).

[57] *See, e.g., id* at Table 3-7(showing significant ecological risks from exposure to antimony, arsenic, silver, and vanadium in sediment under an "uncontrolled" coal ash disposal scenario). Note, however, that this risk assessment only looked at transport of pollutants by wind and overland runoff, and not the likely dominant pathway of subsurface transport. This risk assessment is therefore likely to be a substantial underestimate of the true ecological risk from sediment at coal plants.

[58] *See, e.g., id*. at Table E-5.

9. **Complete environmental analysis for each alternative**. Finally, TVA must explain in detail how each of the alternatives that it evaluates will impact the baseline condition and the baseline risk, including groundwater quality and surface water quality.

In order to comply with the requirements of NEPA, TVA must consider the aforementioned environmental impacts analysis in its EIS for the Disposal of Coal Combustion Residuals from the Bull Run Fossil Plant. Given that the impacts analysis included in this EIS may encompass similar environmental impacts associated with future decisions related to disposal of coal combustion residuals at other coal plant facilities that TVA operates, it is important for TVA to include all direct, cumulative and connected environmental impacts in the Bull Run EIS.

Please feel free to contact us with any questions or concerns related to these comments.

Respectfully submitted,

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Boulware, Karen

To: Elzinga, William J
Subject: RE: TVA BRF EIS_Scoping

From: Masters, Anita E [mailto:aemasters@tva.gov]
Sent: Wednesday, July 01, 2015 9:49 AM
To: Elzinga, William J
Subject: FW: Bull Run Dry Ash Storage Expansion

fyi

From: Masters, Anita E
Sent: Monday, June 29, 2015 8:48 AM
To: 'luke'
Subject: RE: Bull Run Dry Ash Storage Expansion

Mr. Swartz,

Thank you again for your inquiries. So far, TVA has communicated about the proposal—its so-called Notice of Intent—via a publication in the Federal Register, a new release on TVA's website, and an article in both The Daily Times and Knoxville News Sentinel.

You are correct that the proposal has not yet been finalized. To the contrary, TVA is still in the early planning phases, and this is the first request for comment on the issues to be addressed as TVA considers its options. Eventually, TVA will publish a Draft EIS for public review after the completion of the alternative studies. That document will explain in detail the locations that have been considered and whether or not these meet the project purpose and need. Maps will also be provided in the Draft EIS. At that time, TVA will again solicit public and agency input on the proposal.

All of TVA's current NEPA documents are available at http://www.tva.com/environment/reports/index.htm. In addition, I have placed your name on my mailing list and will send you an email and link to the documents as soon as they are available. You can stay current with the Bull Run environmental review process on this web page. You can provide your comments on the website or via an email to me.

Sincerely,
Anita Masters

Anita E. Masters
Project Environmental Planning
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Chattanooga, Tennessee 37402

(423) 751-8697

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From: luke [mailto:lukeswartz7@hotmail.com]
Sent: Thursday, June 25, 2015 1:24 PM
To: Masters, Anita E
Subject: FW: Bull Run Dry Ash Storage Expansion

TVA External Message. Please use caution when opening.
Hello Anita,

I emailed you requesting clarification and additional information on 6/17/15 and have not heard back from you.

Please respond ass soon as possible since the deadline for comments is next week. If you cannot give me the info requested, please give me the contact info of someone who can.

Thank You,

Luke Swartz

From: lukeswartz7@hotmail.com
To: aemasters@tva.gov
Subject: RE: Bull Run Dry Ash Storage Expansion
Date: Wed, 17 Jun 2015 11:46:28 -0400

Hello Anita,

Thank you for getting back to me about this project. I understand final decisions have not yet been made, but from all reports that I have read and comments made by the TVA, some sort of communication was sent out to the community. I am here to say that statement is completely untrue. I have talked to a few of my neighboring property owners, and they have received no communication from the TVA either. It appears the only communications have been to those whose property has been purchased for the proposed site off of Old Edgemoor Rd.

I would like a couple things:
1. Please confirm your companies statements to the news outlets that this has been discussed with the adjacent property owners and not just those whose properties were bought.
2. Send me any mailings or communications that have been sent to others in the community concerning this proposal since discussions first started back in 2011 (or sooner if that is the case)

Also, it is my understanding that all comments need to be made by July 6th, 2015. How can I comment on a proposal that has not yet been finalized? If I do not know the full area of the proposed site, how can I comment regarding the scope and impact on me and my family? Information needs to be provided for me to be able to make an informed comment.

I am not necessarily opposed to what I've "heard" is being proposed, but that's the problem, it is ALL HEARSAY.

Once again, please provide me with any information you currently have, or give me the phone number of someone who can answer my questions in a timely fashion. With the deadline for comments quickly approaching, I do not want to get "the run-around" from anyone.

Please respond to my inquiries today. I apologize if this response seems a little harsh...that is not my intention. My intention is only to place the expediency on this issue that it deserves.

Thank you in advance,

Luke Swartz

From: aemasters@tva.gov
To: lukeswartz7@hotmail.com
Subject: RE: Bull Run Dry Ash Storage Expansion
Date: Wed, 17 Jun 2015 15:14:22 +0000

Mr. Swartz,

I wanted to let you know that I received your email. At this time TVA is in the process of scoping for the subject project and no decision has been made.

I have placed you on the mailing list to receive the scoping report, draft environmental impact statement (EIS), and final EIS. The scoping report will include a description of the need for the project, alternatives that are being considered to address the need (including maps), and a timeline for the environmental review of the project.

You can provide comments regarding the scope of the draft EIS for the Bull Run Fossil Plant Coal Combustion Residuals Disposal at http://www.tva.com/environment/reports/bullrun_ccr/index.htm.

Thanks,
Anita

Anita E. Masters
Project Environmental Planning
1101 Market Street, BR 4A
Chattanooga, Tennessee 37402

(423) 751-8697

Privileged and Confidential - Pre-decisional Deliberative Document

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From: lukeswartz7 [mailto:lukeswartz7@hotmail.com]
Sent: Sunday, June 14, 2015 7:30 PM
To: Masters, Anita E
Subject: Bull Run Dry Ash Storage Expansion

TVA External Message. Please use caution when opening.

Hello,

My name is Luke Swartz and I am a property owner adjacent to the proposed Bull Run Dry Ash Storage Expansion site. I have received no notifications concerning this proposal, I'm assuming because I lived out of state for the past several years. Please send me the proposed plan, including a map of the site, so that I can determine how me and my family will be impacted. Please get this information to me as soon as possible so I have time to voice any concerns prior to the July 6th deadline.

Thank You,
Luke Swartz

Appendix B

Agency Comments Submitted During the Scoping Period

(May 21, 2015 through July 6, 2015)

United States Department of the Interior

OFFICE OF THE SECRETARY

Office of Environmental Policy and Compliance
Richard B. Russell Federal Building
75 Spring Street, S.W., Suite 1144
Atlanta, Georgia 30303

ER 15/0307
9041.3

July 1, 2015

Anita E. Masters
Project Environmental Planning
NEPA Project Manager
Tennessee Valley Authority
1101 Market Street, Mail Stop BR 4A
Chattanooga, Tennessee 37402

Re: Comments on the Notice of Intent to Prepare an Environmental Impact Statement (EIS), Tennessee Valley Authority (TVA) for the Disposal of Coal Combustion Residuals from the Bull Rum Fossil Plant, Oak Ridge and Knoxville, Anderson County, TN

Dear Ms. Masters:

The U.S. Department of the Interior has reviewed the Notice of Intent to prepare an Environmental Impact Statement for the Tennessee Valley Authority's Disposal of Coal Combustion Residuals from the Bull Rum Fossil Plant. We have no comments at this time.

Thank you for the opportunity to provide comments on this project. If you have questions, I can be reached at (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,

Joyce Stanley, MPA
Regional Environmental Protection Specialist

cc:
Christine Willis – FWS
Gary Lecain - USGS
Anita Barnett – NPS
Robin Ferguson – OSMRE
OEPC – WASH

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Appendix B – Alternatives Analysis

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BULL RUN FOSSIL PLANT CCR DISPOSAL ALTERNATIVE SITE SCREENING ANALYSIS

Anderson County, Tennessee

Rev 0

Prepared by:
Amec Foster Wheeler
Ballwin, Missouri

Prepared for:
TENNESSEE VALLEY AUTHORITY
Chattanooga, Tennessee

September 2015

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1.0 INTRODUCTION

1.1 Project Background

The Tennessee Valley Authority's (TVA's) Bull Run Fossil Plant (BRF) is an 870 MW coal-fired generating station located near Clinton, Tennessee (Figure 1-1). BRF was constructed between 1962 and 1967. When operating at full capacity, BRF consumes 7,300 tons of coal daily in a single generating unit and produces approximately 560,000 cubic yards of coal combustion residuals (CCRs) a year. The CCRs are currently managed in various dry stacks, wet stacks, and ponds. In September 2012, TVA decided to construct a mechanical dewatering facility at BRF to support future dry stacking operations. This facility is currently under construction and will allow TVA to manage bottom ash and gypsum in dry form. Fly ash generated at BRF is already being handled and stored on a dry basis and current estimates by TVA indicate that existing storage capacity for dry stack CCRs at BRF is projected to be expended within 10 years.

TVA is planning to design a landfill to accommodate the requirement for additional storage capacity. With a generation rate of approximately 240,000 cubic yards per year of ash (bottom and fly ash) and 318,000 cubic yards per year of gypsum, approximately 11.1 million cubic yards of disposal capacity is desired for the 20 year comprehensive disposal plan. In accordance with TVA policy and the provisions of the National Environmental Policy Act of 1969 (NEPA), TVA intends to prepare an environmental impact statement (EIS) to address the continued disposal of CCRs from BRF.

Selection of a location for CCR disposal should consider a variety of factors, including existing site conditions and potential impacts to the human and natural environments. TVA is considering 11 alternative site locations for CCR disposal, which are explained in more detail in Section 2. This report provides an analysis of each alternative and documents their anticipated environmental impacts. Findings from this report are intended to assist TVA with the decision-making process with regard to which alternatives should be carried forward in the EIS analysis.

1.2 Project Purpose and Need

To meet its need for 20 years of dry, CCR storage capacity, TVA proposes to expand its current capacity for managing CCRs at BRF by constructing a new dry landfill on TVA property adjacent to BRF. BRF has state-of-the-art air pollution controls and is one of the coal plants that TVA plans to continue operating in the future. Construction of a dry landfill will provide additional CCR management capacity that will enable TVA to continue operations at BRF and would be consistent with TVA's commitment to convert wet CCR management systems to dry systems. This also would support TVA's compliance with the U.S. Environmental Protection Agency (EPA)'s recently issued CCR Rule.

The purpose of this Site Screening Analysis is analyze the potential alternative sites for CCR disposal.

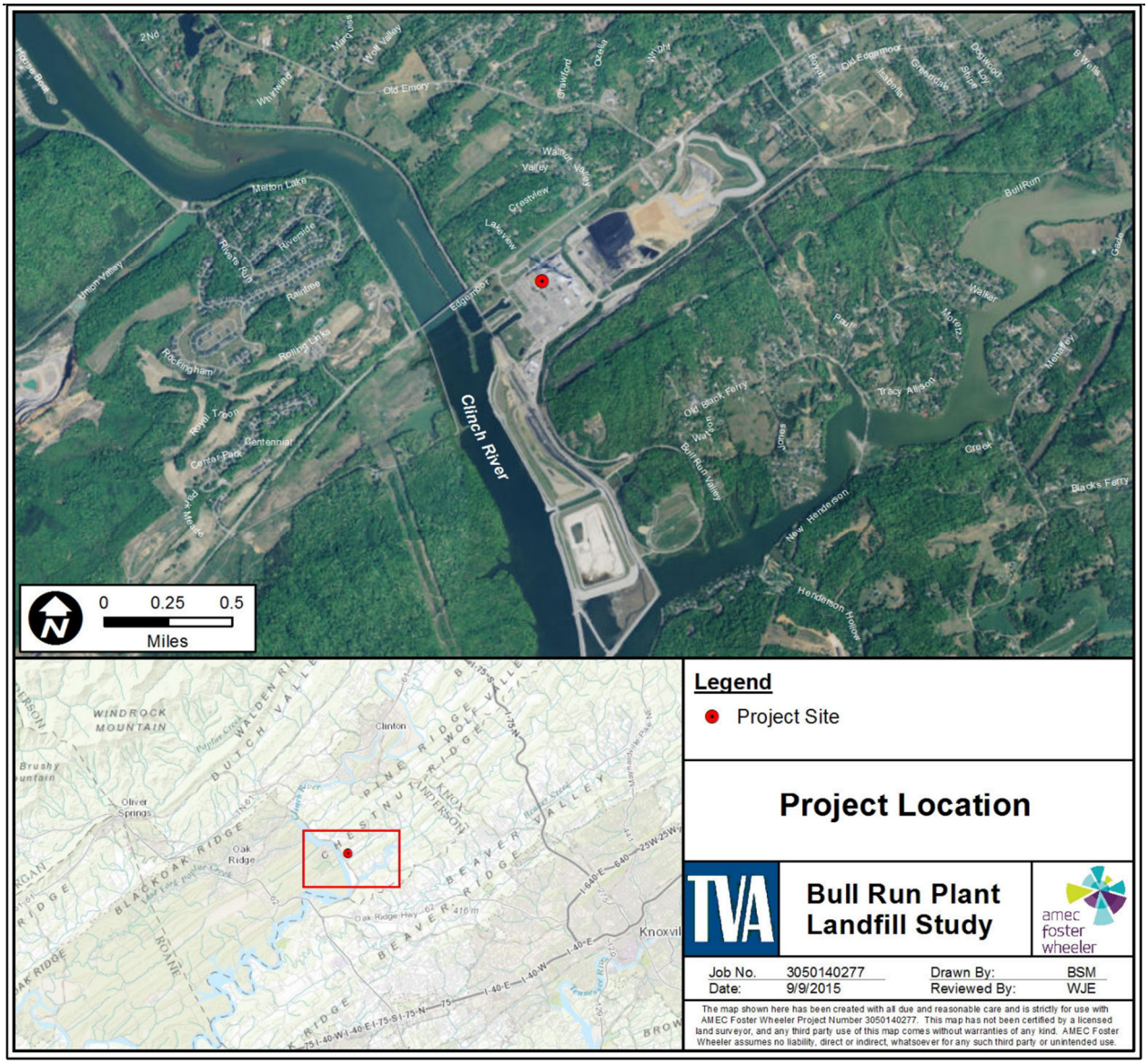

Figure 1-1. BRF Project Location

2.0 METHODOLOGY

2.1 Environmental Constraints

In the context of the alternative analysis, constraints are considered to be those issues that correlate to factors important in environmental impact assessment, engineering feasibility, and/or the efficiency of transporting the material. Examples of environmental factors considered include:

- Air quality
- Streams and Wetlands
- Floodplains
- Groundwater
- Geology
- Sensitive Species
- Vegetation
- Parks and Natural Areas
- Soils and Prime Farmland
- Land Use
- Zoning
- Hazardous Waste
- Cultural Resources
- Environmental Justice Considerations
- Visual

Constrains related to engineering feasibility and transportation include:

- Fill Area
- Distance to Source Material
- Method of Transportation
- Existing Infrastructure

Constraint information was developed by acquiring and consolidating information from a variety of available public sources including: National Resources Conservation Service (NRCS), US Fish and Wildlife Service (USFWS), EPA, Federal Emergency Management Agency (FEMA), US Geological Survey (USGS), US Census Bureau (USCB), National Register of Historic Places (NRHP), and US Army Corps of Engineers (USACE). This information was augmented with data acquired from other agencies including National Wetland Inventory (NWI) maps, NRCS prime and unique farmland soils, FEMA floodplain and floodway mapping, updated land use and zoning maps, and updated parcel information.

2.2 Previous Site Analysis

In 2011, TVA performed a Siting Study to evaluate suitable sites within a 20-mile radius study area that could potentially be developed for dry CCR disposal. A multi-stage suitability analysis that identified areas of opportunity and constraint, and then directly compared the resultant potential sites, was used to compare possible sites within the 20-mile radius project study area as illustrated in Figure 2-1. This initial step of the study (Step 1A,) incorporated several tasks, including establishment of the limits of the study area based on TVA input, identification of exclusionary criteria, and the establishment of potential candidate areas based on a screening level evaluation. During Step 1A, area screening and geographic information system (GIS)

analysis was performed resulting in the development of an exclusionary criteria map. Exclusionary criteria included 100-year floodplains and proximity to major water bodies. The second step established a "score" for each candidate area that allowed for the direct comparison of the potential areas (Step 1B). At the completion of Step 1, seven off-site candidate landfill alternatives, and three on-site/near site alternatives were agreed upon for further evaluation. Those alternatives are carried forward in this report and discussed in more detail below.

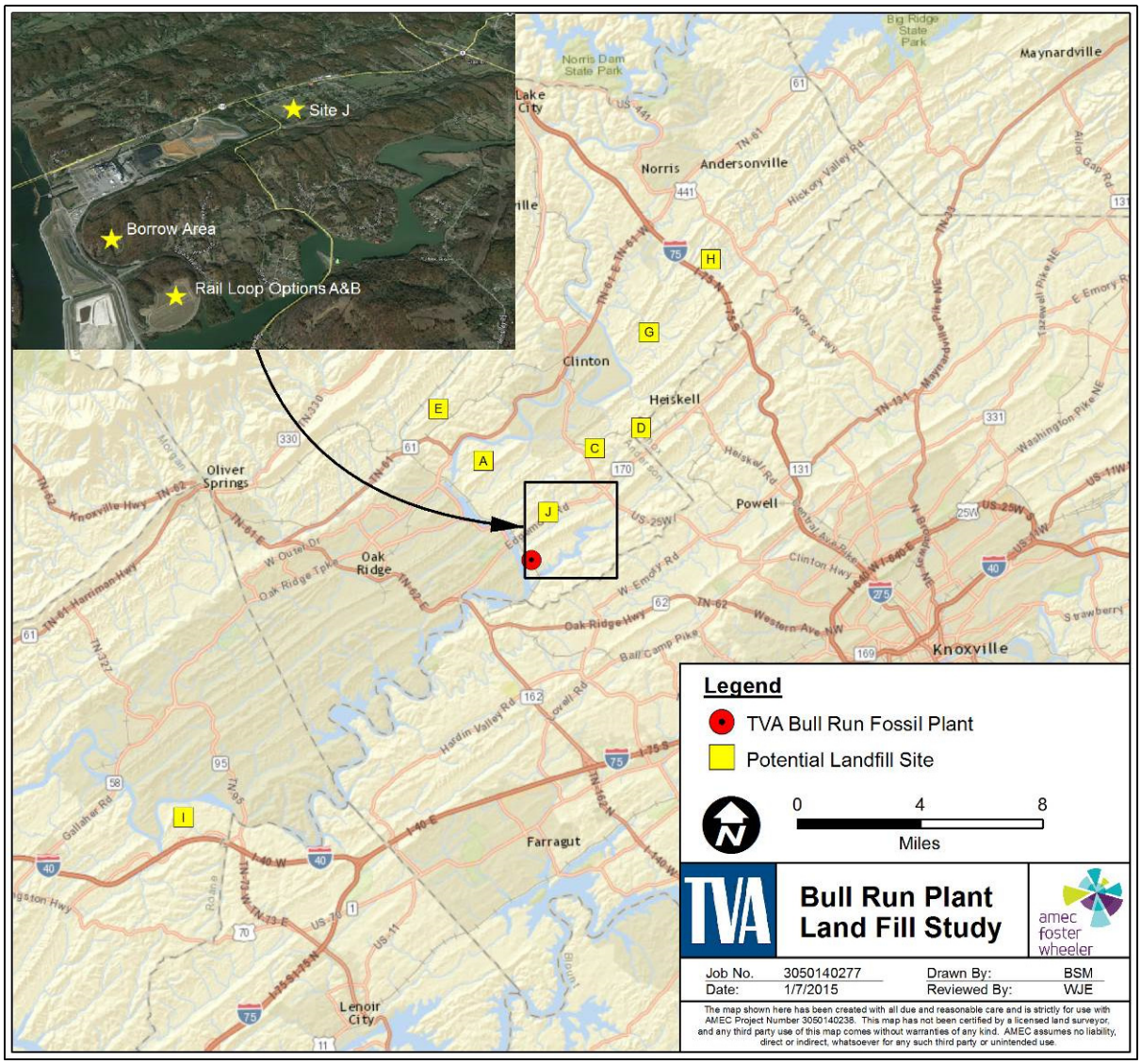

Figure 2-1. Alternative Sites Considered in Prior Siting Study

3.0 SITE ALTERNATIVES

3.1 Sites Eliminated from Further Consideration

Two potential on-site locations, the Rail Loop and Borrow Area (see Figure 2-1) were identified and considered in the initial siting study, but were eliminated from extensive consideration in this analysis. The Rail Loop area is located on the BRF property, east of the existing ash pond complex. The conceptual landfill footprint design of 23 acres would potentially provide 1.6 million cubic yards of storage capacity, yielding an estimated 3 years of landfill life[1]. The facility could potentially be developed in two phases, with the second phase providing an additional 18 acres of area and an additional 1.4 million cubic yards of storage, yielding an additional 3 years of landfill life. The Borrow Area is also located on BRF property. The conceptual landfill footprint design of 65 acres would potentially provide 6.0 million cubic yards of storage capacity, yielding an estimated 12 years of landfill life.

The Rail Loop site contains a spring and an existing ash dredge cell that has been accepted as closed by the state of Tennessee and contains areas of very steep terrain which may lead to stability concerns. Similarly, the Borrow Area site also has very steep terrain with stability concerns. Additionally, this area drains to an existing wetland and development of the site would result in potential environmental impacts to this resource. Both the Rail Loop site and the existing Borrow Area also would be very visible to the public with both sites being constructed on areas of higher elevation than the surrounding land with minimal natural screening. For these reasons, these two on-site alternatives are considered not feasible and are eliminated from further consideration.

According to the Tennessee Department of Conservation (TDEC) website (TDEC, 2015), there are 36 Class I permitted landfills in the state. Two of these landfills are located in nearby counties, the Alcoa/Maryville/Blount County Landfill and the Loudon County Landfill. However, these landfills are located greater than 30 miles from BRF and were eliminated from further consideration due to the environmental impacts and additional costs related to transportation of CCRs to these facilities.

3.2 Sites Retained for Analysis

A brief summary of each of the site alternatives retained for further analysis is presented below. This summary describes general characteristics of each site with respect to size, location, topographic position, depth to bedrock and potential need for relocation of transmission lines. Seven locations (Sites A, C, D, E, G, H, I) are located off-site and one location (Site J) is located near BRF. The location of BRF relative to all the potential landfill sites is shown in Figure 3-1. Environmental features of each site are shown on Appendix A.

[1] Note, estimates of landfill capacity and lifespan for each alternate site were derived from the prior siting study (URS 2012).

3.2.1 Site A

Site A is located approximately 4.5 miles northwest of BRF in Anderson County and encompasses 157 acres. The conceptual landfill footprint design of 120 acres would potentially provide 14.2 million cubic yards of storage capacity, yielding an estimated 28 years of landfill life with no expansion potential. The site is located in an area of steep topography (topographic relief is approximately 200 ft). The depth to rock is an estimated 60.5 inches. Development of this site would not require relocation of any transmission towers.

3.2.2 Site C

Site C is located approximately 4.6 miles northeast of BRF in Anderson County and encompasses 162 acres. The conceptual landfill footprint design of 116 acres would potentially provide 19.0 million cubic yards of storage capacity, yielding an estimated 38 years of landfill life with some expansion potential. The site is located in an area of moderately steep topography. The depth to rock is an estimated 63.1 inches. Development of this site would require relocation of one transmission line and five transmission towers.

3.2.3 Site D

Site D is located approximately 6.0 miles northeast of BRF and encompasses 153 acres. The site spans the border between Anderson and Knox counties. The conceptual landfill footprint design of 108 acres would potentially provide 12.1 million cubic yards of storage capacity, yielding an estimated 24 years of landfill life with no expansion potential. The site is located in an area of moderately steep topography (topographic relief of approximately 220 ft). The depth to rock is an estimated 60.8 inches. Development of this site would not require relocation of any transmission towers.

3.2.4 Site E

Site E is located approximately 7.5 miles northwest of BRF in Anderson County and encompasses 133 acres. The conceptual landfill footprint design of 112 acres would potentially provide 13.1 million cubic yards of storage capacity, yielding an estimated 26 years of landfill life with a large expansion potential. The site is located in an area of moderate topographic relief (approximately 160 ft). The depth to rock is an estimated 62.8 inches. Development of this site would not require relocation of any transmission towers.

3.2.5 Site G

Site G is located approximately 9.3 miles northeast of BRF in Anderson County and encompasses 138 acres. The conceptual landfill footprint design of 110 acres would potentially provide 16.1 million cubic yards of storage capacity, yielding an estimated 26 years of landfill life with a large expansion potential. The site is located in an area of moderately steep topography (site relief of approximately 280 ft). The depth to rock is an estimated 34.2 inches. Development of this site would not require relocation of any transmission towers.

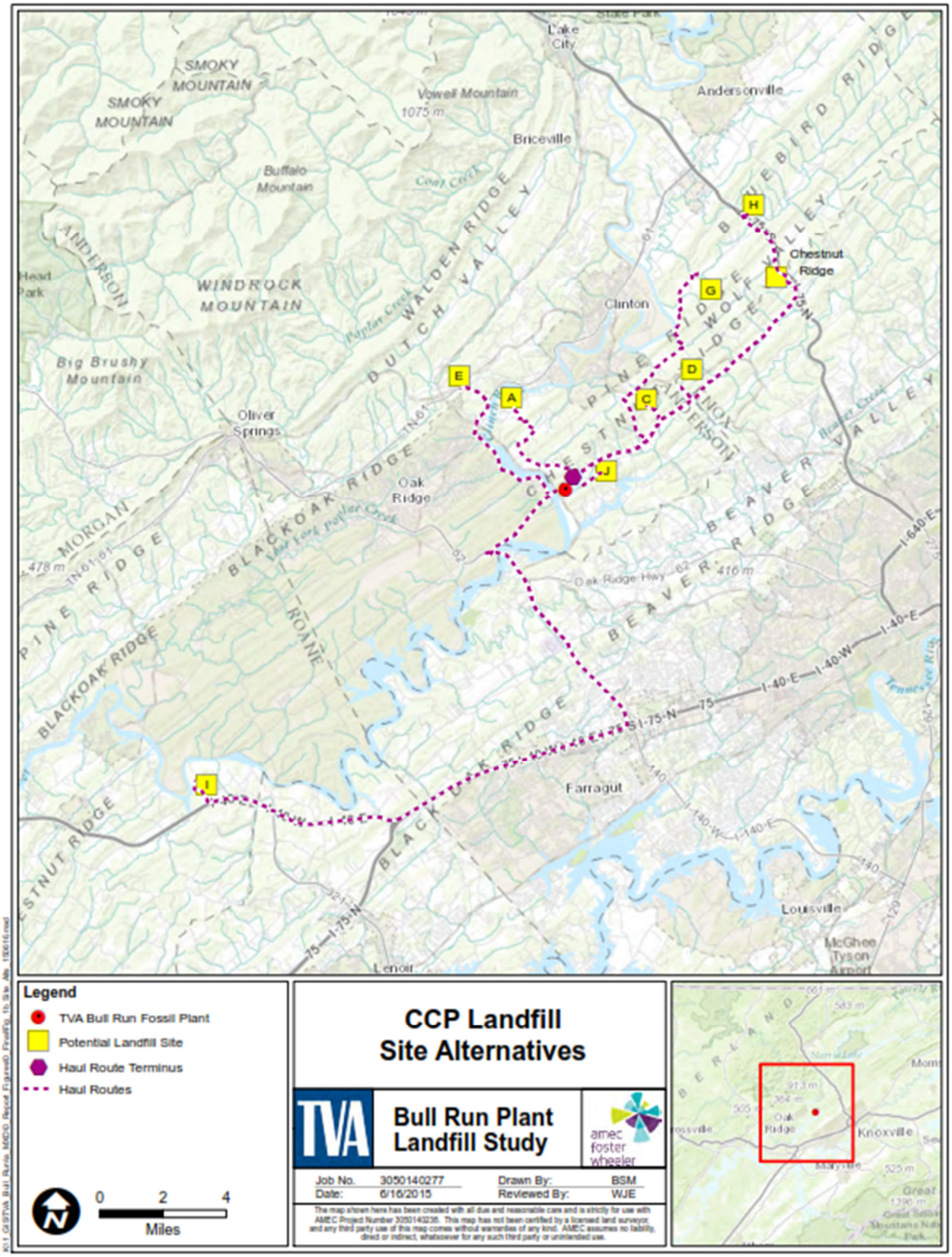

Figure 3-1. CCR Landfill Alternative Sites Retained for Analysis

3.2.6 Site H

Site H is located approximately 14.5 miles northeast of BRF in Anderson County and encompasses 158 acres. The conceptual landfill footprint design of 112 acres would potentially provide 16.7 million cubic yards of storage capacity, yielding an estimated 33 years of landfill life with some expansion potential. The site is located in an area of steep topography (site relief is approximately 400 ft). The depth to rock is an estimated 25.1 inches. Development of this site would not require relocation of any transmission towers.

3.2.7 Site I

Site I is located approximately 26.2 miles southwest of BRF in Roane County and encompasses 141 acres. The conceptual landfill footprint design of 120 acres would potentially provide 21.3 million cubic yards of storage capacity, yielding an estimated 42 years of landfill life and has expansion potential. The site is located in an area of moderately steep topography (site relief is approximately 300 ft). The depth to rock is an estimated 29.3 inches. Development of this site would not require relocation of transmission towers.

3.2.8 Site J

Site J is located approximately 0.4 miles east of BRF in Anderson County and encompasses 144 acres. The conceptual landfill footprint design of 54 acres would potentially provide 6.6 million cubic yards of storage capacity, yielding an estimated 12 years of landfill life with no expansion potential. The site is located in an area of limited topographic relief (approximately 40 ft). The depth to rock is an estimated 60 inches. Development of this site would require relocation of three transmission lines and eight transmission towers. Construction at this site would also include construction of a dedicated on-site haul road to convey CCRs from the plant to the landfill. This road would be constructed on the BRF site next to an existing railroad track, and environmental impacts are anticipated to be minimal.

3.2.9 Chestnut Ridge Landfill

In addition to the alternatives considered in the prior siting study, this analysis also considered off-site transport of CCRs to the existing Chestnut Ridge Landfill. The Chestnut Ridge Sanitary Landfill is a Class 1 Municipal Solid Waste Facility, which means that it is permitted to handle non-hazardous municipal solid wastes such as household wastes, approved special wastes, and commercial wastes. The landfill is owned and operated by Waste Management of Tennessee and serves the Knoxville metro area and central Tennessee. The landfill is located approximately 12 miles northeast of BRF and encompasses 166 acres. Capacity at this landfill can be expanded to accommodate TVA's requirement for 20 years of storage of CCRs generated at BRF[2].

[2] Based on email correspondence with Waste Management Corporation, August 19, 2015.

The Chestnut Ridge site is an existing landfill and many of the siting criteria analyzed in this document would not apply, therefore the comparative analysis provided in this report is limited to the evaluation of transportation of CCR from BRF to Chestnut Ridge.

A summary of the general characteristics of each of the alternative disposal sites is provided in Table 3-1.

Table 3-1. Summary of Alternative CCR Disposal Sites

Site Name	Driving Distance from BRF	Approximate Landfill Acreage	Estimated Capacity (Million CY) [1]	Estimated Life (Years)[1]	Retained for Analysis
A	4.5	120	14.2	28	Y
C	4.6	116	19.0	38	Y
D	6.0	108	12.1	24	Y
E	7.5	112	13.1	26	Y
G	9.3	110	16.1	32	Y
H	14.5	112	16.7	33	Y
I	26.2	120	21.3	42	Y
J	0.4	54	6.6	12	Y
Rail Loop	On-Site	23	3.0	6	N
Borrow Area	On-Site	65	6.0	12	N
Chestnut Ridge	12.0	166		40+	Y

[1]Source: URS 2012a

3.3 Alternative Evaluation and Ranking

Analysis of alternatives consisted of a two-step process that entailed the compilation of quantitative constraint information for each of the alternatives followed by a qualitative rank scoring process. Quantitative information for each of the alternatives is summarized in Appendix B. The conclusions in Appendix B resulted from a process of deriving numeric or narrative data to reflect the extent of potentially impacted resources either on site or in the immediate vicinity of each alternative. While actual resource impact values are not available for this screening level analysis, “indicator” values in Appendix B were derived for each alternative that could be used to assess probable magnitude of effects. For example, potential noise-related effects are summarized by compiling the number of noise sensitive receptors (residences, parks, etc.) within a distance of 500 ft of the landfill and the proposed roadway haul routes. Likewise, in the absence of site-specific evaluations of habitat suitability for endangered species, potential effects to this resource were summarized by compiling recorded data regarding the occurrence of sensitive species, distance from the site, and acreage of potentially suitable on-site habitat (e.g., forested areas for northern long-eared bat). Similar surrogate indicators were used for other resources as summarized in Appendix B.

Alternative analyses also included considerations of potential impacts associated with off-site transport of CCR on receptors along the haul routes (primarily noise, air quality, and Environmental Justice considerations). While four off-site alternatives were considered to have

the potential for transport of CCR via rail or barge, the effects of these alternative transport modes was not evaluated.

As part of the second step in the process, each resource factor was evaluated using professional judgement that synthesized the quantitative indicator data to determine relative impact for the purposes of ranking each alternative landfill site.

For the purposes of this analysis, impacts were assessed and a general scale ranging from 1 to 5 was developed. This scale is as follows:

1- Zero to low adverse impact, moderate benefit
2- Low to moderate adverse impact, low to moderate benefit
3- Moderate adverse impact, low benefit
4- Moderate to high adverse impact, minimal to low benefit
5- High adverse impact, no benefit

The ranking assigned to each resource category is supported by quantitative and qualitative assessment provided in the body of this document. Table 8-1 provides a summary of the site rankings and Appendix C sets forth detailed resource specific rankings.

4.0 IMPACTS TO THE NATURAL ENVIRONMENT

4.1 Streams

As a result of exclusionary criteria applied in the previous Siting Study, all of the alternatives considered in this analysis are located at distances greater than 200 ft from a major water body, the Clinch River. Indicators used to determine the potential impact to stream resources included the number of streams within a site, the length of those streams within the waste limit boundary, and proximity to the Clinch River.

Non-major waterbodies (i.e., streams) are located within most of the proposed site boundaries. To construct a landfill on these sites, a Clean Water Act Section 404 permit from the USACE coupled with authorization of a Water Quality Certification (Section 401) from TDEC would have to be obtained. Therefore, the level of potential impact at each of the alternatives sites was determined based on the costs and level of effort needed to obtain the Section 401/404 authorizations.

- Site A does not have a stream running through it; however, it is located the closest to the Clinch River. There would be no to low unavoidable adverse impacts, assuming Best Management Practices would be used to minimize impacts to the river.
- Both Sites D and E have less than 1,000 ft of streams within the waste limit boundaries, which could be permitted through the Nationwide Permit Program. Therefore, these sites are considered to have a low to moderate adverse impact to streams.
- Sites C, H, and J each have over 1,000 ft of streams within their waste limit boundaries. These sites are considered to have a moderate adverse impact due to the larger total length of stream impact and the potential greater requirement for mitigation.

- Sites G and I have the greatest length of streams within the sites and would pose the most difficulty in obtaining Section 401/404 authorizations. Additionally, the stream that traverses Site G may have to be re-routed as the headwaters are located outside of the site.

4.2 Wetlands

Wetlands are those areas inundated by surface water or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas are also found along the edges of most watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits including flood/erosion control, water quality improvement, wildlife habitat, and recreation opportunities.

There are no NWI mapped forested, emergent, scrub/shrub wetland resources within any of the site boundaries. NWI mapped wetland resources are limited to open water features at Sites D, E, H, I, and J. As with streams, the magnitude of impact to wetlands is related to the ability to permit the fill of the wetlands under the USACE Nationwide Permit Program, which has a limit of 0.5 acre.

- Sites A, C, and G do not have any wetland resources within the site boundary. Additionally, Sites D, E, and H are expected to have less than the 0.5 acre of on-site wetlands which is expected to reduce the permitting complexity for these sites. Therefore, these sites are considered to have little to no adverse impacts to wetlands.
- Site J would impact slightly more than 0.5 acre of wetlands. Overall impacts to wetlands with this alternative therefore, are considered to be low.
- Site I has a moderately large impoundment (6.5 acres) that is mapped as a wetland and represents the largest total area of impacted wetlands. While much of this resource is open water and is more aquatic habitat than wetland, it represents a resource not evident on other alternative sites. Additionally, this wetland is located adjacent to a stream and would likely provide higher habitat quality to aquatic plants and animals. Therefore, this site is considered to have a moderate impact on wetlands.

4.3 Sensitive Species

The Endangered Species Act (ESA) provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the United States or elsewhere. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize federally listed species or their designated critical habitat.

There are no recorded observations of threatened or endangered species or designated critical habitat located within the boundaries of any alternative sites. Records of sensitive species within a 10-mile radius around each site are limited to five animal and one plant species: gray bat, Indiana bat, golden winged warbler, smoky shrew, Allegheny woodrat, and Appalachian bugbane. Therefore, the potential for each alternative to impact known threatened or endangered species was measured based on the potential for loss of potentially suitable habitat

(i.e. bat summer roost habitat) and indirect impacts (off-site). Factors considered in this analysis included the amount of potential bat roost habitat affected within a site, distance to the nearest critical habitat, and distance to the nearest previously recorded threatened and endangered species.

Overall, the distance to the nearest critical habitat or previously recorded threatened or endangered species did not vary significantly between the sites. Additionally, while there is some variation within the total acres of potential bat roost habitat (forest) within each site, given that the land cover in the region containing all of these sites is largely forested, TVA's likely commitment to seasonal roost tree removal restrictions, the loss of trees lost due to the construction of a site is not have an adverse impact on the species. Therefore, all of the sites were considered to have a low to moderate potential to impact listed species.

4.4 Managed Areas

For this study, managed areas are defined as wildlife management areas and public lands managed by TVA. There are no publicly managed areas within any of the proposed site alternatives, and therefore, there would be no direct adverse impact to managed areas for any of the alternatives. However, Site I is located approximately one-half mile from Oak Ridge State Wildlife Management Area, which is used for hunting and wildlife viewing. Increased traffic and other visual and noise impacts may have a low to moderate adverse impact to visitors utilizing the wildlife site. The other site alternatives were located three or more miles from the nearest managed area, therefore no adverse impacts are anticipated.

4.5 Wildlife and Vegetation Communities

The potential for the proposed site alternatives to impact terrestrial resources, including wildlife and vegetation communities, can be determined by mapping the current land cover types. If a proposed site contains higher quality habitat, such as forests, the loss of that vegetation would also have a correspondingly greater impact on resident and migratory wildlife.

- Vegetation land cover at each of the alternative sites is predominately forested, with the exception of Site E, which is pasture/hay. Therefore, Site E was considered to have a low impact to terrestrial communities.
- Sites D, G, and J had relatively small areas of forested cover, therefore were ranked as having low to moderate impacts.
- Sites A, C, H, and I are composed of predominately forested cover and are expected to contain a higher diversity of plant and animal communities. Therefore, these sites were considered to have a moderate impact on terrestrial resources.

4.6 Air Quality

The Clean Air Act regulates the emission of air pollutants and, through its implementing regulations, establishes National Ambient Air Quality Standards (NAAQS) for several "criteria" pollutants that are designed to protect the public health and welfare with an ample margin of

safety. The criteria pollutants are carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone, particulate matter (PM10 and PM2.5), and sulfur dioxide (SO_2).

Specified geographic areas are designated as attainment, nonattainment or unclassifiable for specific NAAQS. Areas with ambient concentrations of criteria pollutants exceeding the NAAQS are designated as nonattainment areas, and new emissions sources to be located in or near these areas are subject to more stringent air permitting requirements.

BRF and most of the alternative sites are located in Anderson County, Tennessee which is a nonattainment area for PM-2.5 and 8-hour ozone. Part of Site D is located in Knox County, which is also included in a nonattainment area for PM-2.5 and 8-hr ozone. Site I is located in Roane County, which is currently in attainment for all NAAQS, except for the PM 2.5 standard.

Construction of any of the proposed landfill sites could result in impacts to air quality. Land clearing, site preparation, and vehicular traffic over unpaved roads and the construction site can result in the emission of fugitive dust. Air quality impacts associated with construction would be localized and temporary, and depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture, etc.

Air quality impacts associated with operation of any of the landfill sites would primarily be attributed to wind erosion from the disposal site and fugitive emissions related to transporting and handling of the CCR from BRF to the selected site. Wind erosion from the active landfill would be controlled in accordance with USEPA's dust management requirements and would be similar for any of the proposed landfill sites. However, off-site landfill alternatives will require the transport of CCRs either by truck, rail, or barge. Fugitive dust may be emitted during the loading of CCRs into trucks and the transport of the material to the landfill. Therefore, sites that are located at greater distances from BRF and that pass through more developed areas are less desirable as there is a greater chance to impact residences or other sensitive receptors along the routes.

The amount of fugitive dust generated at each of the alternatives sites is considered to be the same since they would have similar construction and operational phases. In general, fugitive dust generated from construction activities would have a minor, temporary impact on off-site air quality as most emissions would be deposited within the site boundary. Therefore, the air quality impacts are measured by the number of sensitive receptors (i.e., residences) within 200 ft of the haul routes and the distance between the closest residences and the waste limits of the landfill. Measures to minimize fugitive dust associated with transportation and operation would be employed as needed. Therefore, none of the proposed sites are expected to result in high unavoidable adverse air quality impacts.

- At Site I the nearest residence is located approximately 1,100 ft from the waste limits and there are 29 residences within 200 ft of the 25.7 mile haul route. Consequently, there would be low unavoidable adverse air quality impacts for this site.
- Although the nearest residence is located approximately 500 ft from the limits of the landfill for Site J, there would be no residences within 200 ft of the haul road. Therefore, this site is considered to have a low to moderate adverse impact on air quality.

- Sites E and G are located 475 ft and 524 ft (respectively) from the nearest residence. Additionally, there are 58 to 80 residences within 200 ft of the proposed haul routes for Sites E and G, respectively. Site H is located at a much greater distance from the nearest residence, but there are 109 residences located along the 13-mile haul route. Similarly, there are 101 residences within 200 ft of the proposed haul route to Chestnut Ridge. Based on the number of residential receptors in close proximity to the site and haul routes, each of these sites are considered to have a moderate adverse air quality impact.
- Sites A, C, and D are each located within 200 ft of a residence and are characterized by having between 37 and 65 residences along the proposed haul routes. Because of the greater proximity of residences to the immediate site and the moderate number of residential receptors along haul routes, these sites are considered to have a moderate to high adverse air quality impact.

4.7 Noise

Sound is the physical disturbance in a medium, such as air, that is capable of being detected by the human ear. Sound waves in the air are caused by variations in pressure above and below the static value of atmospheric pressure. Noise can be described as 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", or any person or object that hears or is affected by noise. Sensitive noise receptors include residences, churches, cemeteries, schools, and parks.

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 non-laboratory conditions, the typical human ear can detect changes of about 3 dB.

Given that the human ear cannot perceive all pitches or frequencies in the sound range, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel, or the dBA. A scale weighting reflects the fact that a human ear hears poorly in the lower octave-bands. It emphasizes the noise levels in the higher frequency bands heard more efficiently by the ear and discounts the lower frequency bands.

The day-night sound level (Ldn) is the 24-hr equivalent noise level with a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased annoyance during this period and the fact that most people are more sensitive to noise while they are sleeping. USEPA (1974) guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. In Anderson County, allowable noise levels vary depending on the zoning district. Residential (R-1) districts have the most stringent regulations and cannot exceed 60 dBA during the daytime hours or 55 dBA during the night, measured at the closest adjacent property line.

Noise impacts from construction would be temporary and generally limited to the selected landfill site, whereas noise emissions from operations may be expected to be on-going at both the proposed landfill site and along associated haul routes. Based on guidelines used for measuring highway related noise, operation-related noise impacts were evaluated on the number of noise sensitive receptors within 500 ft of the limits of each landfill and the proposed haul routes.

- There are only 27 noise sensitive receptors within 500 ft of Site J. Additionally, this site would utilize an on-site haul route that would not impact any receptors. Therefore, this site would have a low adverse impact.
- Construction and operation at Site A and its associated haul routes would potentially impact 113 noise sensitive receptors. Consequently, this site is expected to result in a low to moderate noise impact.
- Noise emissions from Sites C and E and their associated haul routes would potentially impact 206 and 225 receptors (respectively) and are considered to have a moderate to high noise impact.
- There are 250 to 286 noise sensitive receptors potentially impacted by noise associated with Sites D and I, respectively. These sites were therefore considered to have a moderate to high noise impact.
- There are over 340 noise sensitive receptors within 500 ft of the site or associated haul routes for Sites G, H, and Chestnut Ridge. Due to the high number of receptors near each of these sites, they are considered to have a high unavoidable adverse impact.

4.8 Hazardous Waste

A review of EPA GIS databases and web services using NEPAssist (USEPA 2015b) indicated that there are no Resource Conservation and Recovery Act (RCRA) listed sites, toxic releases, Superfund, Brownfield, sites listed on the Radiation Information Database (RADInfo), or Toxic Substances Control Act (TSCA) sites within limits of any of the proposed alternatives. The current BRF plant is listed as a TSCA location and the Chestnut Ridge Landfill is a RCRA site. None of the sites would involve the acquisition of land potentially containing special or hazardous waste. As a result, ranking of hazardous waste liability concerns associated with land acquisition was considered low for all sites.

4.9 Visual Environment

This assessment provides a review of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. Visual resources are evaluated based on a number of factors including existing landscape character and scenic integrity. Landscape character is an overall visual and cultural impression of landscape attributes and scenic integrity is based on the degree of visual unity and wholeness of the natural landscape character. The varied combinations of natural features and human alterations both shape landscape character and help define their scenic importance. The subjective perceptions of a landscape's aesthetic quality (scenic attractiveness) and sense of place is dependent on where and how it is viewed.

Visual impacts may be expected to occur as a result of the introduction of a structure or facility that is not consistent with the existing viewshed. Quantification of this impact also considered distance to the nearest park and residences within 1,000 ft of the landfill.

- Sites G, and I are located at a sufficient distance away from parks, natural areas, and residences that the visual impact is little to none.
- Sites C, D, E are not located within a viewshed of a park or natural area, however they are within 1,000 ft of a low number (15 to 30) of residences. Consequently, the change in the landscape character would be small and impact to the visual resource would be low.
- While Site J is located in an area that currently includes industrial development, it is also located in close proximity to a large number of residences (167 residences within 1,000 ft). Consequently, while the change in the landscape character would be small given the composition of the existing landscape, the scenic quality for the residences in the foreground would be diminished as the proposed landfill would be visible to these residents. The implementation of mitigative measures, such as a landscape screen or a berm would minimize this impact. Therefore, the impact of this alternative would be moderate.
- Site H is not located within a viewshed of a park or natural area, and the site is not within 1,000 ft of a large number of residents. However, the site would be readily visible to travelers using the adjacent interstate and would have a moderate impact to the visual resource.
- Site A is located across the Clinch River from Gibbs Ferry Park and would be visible to park users. This is considered to be a moderate to high impact to the viewshed of users of the park.

4.10 Prime Farmland

The 1981 Farmland Protection Policy Act and its implementing regulations (7 Code of Federal Regulations [CFR] Part 658) require all federal agencies to evaluate impacts to prime and unique farmland prior to permanently converting land to a use incompatible with agriculture. Prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. These characteristics allow prime farmland soils to produce the highest yields with minimal expenditure of energy and economic resources.

The assessment of prime farmland impacts is independent of existing land uses and measures the impact to areas suitable for agricultural production, whether or not these soils are currently in agricultural production. Therefore, the higher the amount of prime farmland that would be converted to landfill use, the higher the impact to potential agricultural land.

Most of the site alternatives include low amounts of soils considered to be prime farmland or farmland of statewide importance. Prime farmland soils comprise approximately 48 acres of Site D. Prime farmland soils comprise 14 acres of Site I and 13 acres on Site J. Prime farmland soils on the remaining sites ranges from 6.4 acres on Site H to two acres on site G. There are no prime farmland soils on Site C.

- Sites A, C, E, G, and H would have little to no impact on prime farmland.

- Site I and J would have a low to moderate impact on prime farmland soils
- Site D would have a moderate impact on prime farmland.

4.11 Floodplains

As a federal agency, TVA is subject to the requirements of Executive Order (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.

As part of the initial Siting Study floodplains were considered an exclusion criterion and as such, all alternatives were located outside of established 100-year floodplain boundaries. Therefore, each of the alternative locations in this site screening analysis would avoid impacts to floodplains.

5.0 GEOLOGIC CONDITIONS

The geology of a selected site can help to determine the extent to which a particular site is susceptible to subsurface fracturing and faulting. To support this analysis geologic features of the alternative sites and potential for faulting were evaluated using Rogers (1993). Potential for subsurface fracturing and faulting is related to both the bedrock geology and the karst features such as sinkholes, caves, and springs. Ideally, a geologically preferred site would have high geologic stability and low karst conduit potential.

The 2011 Siting Study (URS 2012a) included an investigation of the suitability of the bedrock geology underlying each landfill site. The study concluded that the Ordovician formations were less suitable for landfill development as these formations are expressed near the ground surface within a series of anticlines and synclines, which have axes generally oriented southwest to northeast across the study area. Dip directions of the formations are generally perpendicular to the anticline/syncline axes. The Ordovician Holston Formation was identified as the least suitable geologic formation due to the Holston Formation's propensity for shallow soils, pinnacled bedrock surface, karst solution features, and low suitability description provided in a previous report describing sanitary landfill sites in Tennessee (TDEC 1972).

The more suitable areas tended to be located in underlying Cambrian and overlying Pennsylvanian to Silurian age formations. Like the aforementioned Ordovician formations, these formations are expressed near the ground surface adjacent to and following the same southeast to northwest strike and dip orientation within the orientations of anticlines and synclines. The Pennsylvanian age Slatesville Shale was identified as the most suitable geologic condition due to its sufficient thickness and moderate topographic relief. Three Cambrian age formations, identified as the Rome Formation, Pumpkin Valley Shale and Nolichucky Shale,

were slightly less suitable than the Slatesville Shale. These formations are of sufficient thickness, have a generally low permeability and generally favorable suitability descriptions in the 1972 report.

5.1 Karst Conduit Potential

Karst conduit potential at each site was evaluated for each site (URS 2012a). The occurrence of karst conditions at a given site represents a notable concern for landfill integrity and would require supplemental engineering measures to reduce risk. Those sites located on geologic formations with low suitability (i.e. Ordovician Formations), were considered having a higher karst conduit potential. For this analysis an increasing karst conduit potential corresponds to an increasingly negative adverse effect of karst on site suitability.

- Sites G, H and I were all considered to be less susceptible to karst conduit flow and were therefore evaluated to have a low potential adverse impact from karst.
- The formation beneath Site J is considered somewhat susceptible to karst conduit flow, however there are no springs or sinkholes mapped in the vicinity. As a result, Site J was considered to have a low to moderate adverse impact from karst.
- Site C was evaluated and considered to be moderately susceptible to karst conduit flow
- Formations beneath Sites D and E are described as generally susceptible to karst conduit flow, and resulted in a ranking of moderate to high adverse impact from karst.
- The formations beneath Site A may be susceptible to karst conduit flow and there are karst conditions in the vicinity of the site. Consequently, this site was considered to be highly impacted by potential karst conditions.

5.2 Geologic Stability

The geologic stability of the alternate sites was considered to vary from low to moderately high. Sites with high stability generally have low topographic relief and formations are considered geologically stable and are therefore considered to be more favorable for landfill development. Conversely, sites with lower stability are those with relatively high to average topographic relief (approximately 200 ft), and that have sinkholes located proximate to the site.

- Site J is considered to have the highest geologic stability.
- Sites C, G, and I are considered moderately stable.
- Sites D, E and H are considered to be moderately stable geologically.
- Site A is ranked lowest in terms of geological stability as the topographic relief is average and there are sizable sinkholes mapped immediately south of the site which could indicate elevated potential for locally large voids beneath the sites.

5.3 Sinkholes and Caves

Sinkholes and caves are karst features that expand on the karst conduit evaluation factor described above as their occurrence is direct evidence of instability and reduced geologic integrity. Among the sites evaluated, there is a small sinkhole included within the limits of Site E (0.003 acre). The presence of this sinkhole on the site reflects a moderate adverse suitability of this site.

There are no sinkholes, caves or springs within any of the other landfill limits.

5.4 Groundwater

Groundwater resources include public water supply wells, sole-source source aquifers, and sinking streams. Within Anderson County the Cambrian-Ordovician Carbonate aquifer is the primary aquifer supplying potable water (Webbers 2000). While localized isolated residences may be expected to withdraw potable water from groundwater, none of the site alternatives coincide with recognized sole-source aquifers or community water supply wells. Consequently potential impacts to these important groundwater features is expected to be low for all alternatives.

5.5 Seismic Zones

There are no faults within most of the site boundaries. Sites E and I have some thrust faults that are considered to be very old and dormant (Rogers 1993). Consequently, they are not considered to represent an important factor in site suitability. As a result, seismic zones were evaluated to have a low adverse impact on suitability.

5.6 Mines and Mineral Resources

There are no mine shafts or previously mined lands within any of the site alternatives. As a result, mines and mineral resources were evaluated to have a low adverse impact on suitability.

6.0 IMPACTS TO THE HUMAN ENVIRONMENT

6.1 Land Use

The land use in the region encompassing all of the alternative sites is mostly undeveloped with some isolated, sparsely developed areas. The greatest impacts, therefore, would be expected at locations determined to be the most inconsistent with the current land use. Sites with adjacent land uses that include industrial use or heavy development would be more consistent with a proposed landfill. For example, Site I is located just north of the Roane Regional Business and Technical Park and Site J is located adjacent to BRF. A landfill built in these areas would be considered to be more consistent with existing land uses than at sites adjacent to residential or parkland uses.

- Site J is located adjacent to an industrial use, BRF. However, because the site is not currently developed for industrial use, the impact on land use is considered to be moderate.
- Site I is located adjacent to an existing light industrial park, but is currently used for farming and surrounded by rural residential development. Consequently, this site is considered to have a moderate to high impact on land use.
- Sites A, C, D, E, G and H are not adjacent to an existing industrial use and impacts to land use are considered to be high.

All landfill sites would have to comply with state and county siting requirements which are described in Section 6.2. In addition, the State of Tennessee has adopted the Jackson Law (Tennessee Code Annotated § 68-211-706) which allows counties in Tennessee that have adopted the law to veto a new landfill based upon eight criteria. If a county adopts this law, it provides that no new construction can be initiated for a landfill without the approval of the county legislative body unless the landfill only accepts waste generated by its owner and all such waste is generated in the same county as the landfill. Anderson and Knox counties have both adopted the Jackson Law. Therefore, since alternative sites A, C, E, G, H, and J are located in Anderson County, these sites would be exempt from the Jackson Law because the landfill would be a private landfill (not open to the public) and receive waste solely generated within the same county (Anderson) by its owner (TVA). However, a portion of Site D is located in Knox County and this site would be subject to the provisions of the Jackson Law since the waste would be generated in Anderson County. Per the TDEC website, Roane County has not adopted the Jackson Law (TDEC 2015b), and therefore the provisions of the Jackson Law would not apply to Site I.

6.2 Zoning

Landfills in the state of Tennessee are regulated by the TDEC Division of Solid Waste Management. A coal ash landfill would be required to obtain a Solid Waste Class II Disposal Permit from TDEC. Once the preferred landfill site is selected, TVA would take necessary actions to obtain the necessary permits. Construction of the landfill would adhere to the provisions outlined in the TDEC Rule Chapter 0400-11-01-.02, Solid Waste Storage Processing and Disposal Facilities. Specific buffer zone standards identified in the rule note that all fill areas must be, at a minimum:

- 100 ft from all property lines
- 500 ft from all residences, unless the owner of the residential property agrees to a shorter distance

As a federal agency, TVA is not subject to state and local zoning laws; nevertheless, TVA considers applicable zoning regulations for the purpose of analyzing impacts. Zoning ordinances for Anderson, Knox and Roane counties do not identify conditions specific to coal ash, or solid waste landfills, but do provide conditions that must be met to allow a sanitary landfill.

Most of the proposed landfill sites are located in Anderson County, where landfills are permitted in the Environmental Industrial (I-3) District, which allows for heavy industrial uses. Landfills are permitted in this district as a special exception following a review by the board of Zoning Appeals. Siting requirements identified in the Anderson County Zoning Ordinance for sanitary landfills include:

- The site must be a minimum of 50 acres,
- Landfill operations shall be no closer than 2,000 ft from any residence, school, or church,
- A 100-foot wide buffer composed of dense evergreen plantings must be provided along all outside boundaries to obstruct vision of landfill operations, and
- Landfills must be located on a public road with at least a 50-foot right of way and pavement width of at least 26 ft.

Site D is located in both Knox and Anderson counties. Coal ash landfills or solid waste landfills are not listed as a permitted use in any district in Knox County. Sanitary landfills are identified as a use permitted on review in the (LI) Light Industrial Zone and the (I) Industrial Zone. Siting standards identified in the Knox County Zoning Ordinance for sanitary landfills include:

- The site shall be located at least 500 ft from all residences, unless the owner(s) of the residential property agree to a shorter distance,
- The site shall be located at least 1,000 ft from a residentially zoned area,
- The site shall be at least 2,500 ft from existing public schools, public recreational areas (public parks, recreation centers, athletic fields, or similar areas available to the general public for recreational uses), or public swimming pools,
- The site shall be at least 1,000 ft upgradient for all wells or springs used a as source of drinking water by humans or livestock,
- The site shall be at least 200 ft from the normal boundaries of springs, streams, lakes or other bodies of water other than those associated with the facility, and
- The fill area shall be at least 200 ft from all property lines, public roads, and the site boundary.

According to the Roane County Regional Zoning Regulations (April 2013), a coal ash landfill would be permitted in a (1-3C) Landfill District. No additional regulations are provided in the ordinance.

Most of the proposed sites are zoned for rural, suburban residential, or agricultural uses. For purposes of this screening, landfill sites that are adjacent to industrial facilities (Site J), as well as those that do not have any residentially zoned land adjacent or nearby (Sites G and H) are considered more favorable than those sites which are zoned for residential use or are proximate to residentially zoned land.

- Site J is located adjacent to an area zoned for industrial use (including an existing CCR landfill), residential areas and a church facility. Consequently, this site was considered to have a low to moderate adverse rating for zoning.
- Zoning for Site I could not be determined from readily available information. However parcel data indicates that this site is primarily used for farming. This site is adjacent to the Roane Regional Business and Technical Park that is planned for warehouse, distribution and office

facilities. Given the uncertainty surrounding this site, relative to the other sites, this site was considered to have a moderate adverse impact ranking for zoning.

- A, C, D, E, G and H are not located near an industrially zoned area. These sites have a moderate to high adverse impact ranking for zoning.
- Site D is not located near an industrially zoned area. In addition, a portion of this site is located in Knox County and therefore it may be subject to provisions of the Jackson Law. Consequently this site has a high adverse impact ranking on zoning and the potential for landfill development.

6.3 Displacements

The analysis of impacts associated with displacements considers residential, commercial, and utility displacements separately as compensation for each of these properties is unique.

Construction of any of the potential new landfill sites would require acquisition of residential properties. The numbers of residences acquired for the site alternatives ranges from none to 22. Potential magnitude of impact is considered in the context of other large land acquisition projects (e.g. highway development or airport expansion) in which residential or commercial displacements may total 100 or more.

- Construction of Sites E, G, H, and I would not require residential displacements.
- In 2013, TVA purchased approximately 166 acres adjacent to the BRF to expand the plant boundary for potential future CCR storage. Thirty-one purchased properties included at least a dwelling, a garage, or an out-building, some of which remained on the properties when TVA took ownership. To protect public health and safety TVA demolished approximately 46 structures on these properties. (TVA 2013). Therefore, use of Site J for the proposed landfill would not require any additional displacements.
- Sites A, C and D would displace 1-5 residences. Consequently, these sites were considered to have a low impact on residential displacements.

None of the sites would require displacement of a commercial property.

Utility impacts were also considered under this criterion. This evaluation considers the length of transmission lines or pipelines and the number of transmission towers that would need to be relocated for each alternate site. A higher number of utility relocations would result in a greater magnitude of impacts in the form of costs to TVA and the utility company. Utility relocations are generally associated with ease of constructability and therefore none of the sites were considered to have high unavoidable adverse impacts.

- Sites A, D, E, G, and I would not require the relocation of utilities.
- Site H would require the relocation of 920 ft of transmission line and one tower.
- Site C would require the relocation of 2,500 ft of transmission line and five towers.
- Site J would require the relocation of a total of 7,744 ft of transmission line and eight towers.

6.4 Property Acquisition

This factor evaluates the potential effect of the acquisition of real property and as such includes those that do not result in residential or commercial displacements. A lower number was considered desirable as this indicates that fewer property owners would be impacted.

- TVA recently acquired 166 acres adjacent to BRF and therefore no landowners would be affected.
- Acquisition of Sites E, G, and H impact 9 to 12 parcels.
- Acquisition of Sites A, C and I impact 20 to 26 parcels.
- Acquisition of Site D would impact 29 parcels.

6.5 Farmland Impacts

Areas that are currently classified as having pasture and hay land cover were considered to be farmed land. Impacts to farmed land were assessed by determining the farmed land within each landfill site that would be converted to landfill use for each alternative. Although areas of land currently farmed would be impacted under any of the landfill sites, none of the impacts are considered to be high given the nature of land use in the area and the relatively small amount of pasture and hayland that would be converted to landfill use for each alternative. None of the site alternatives would result in farm severances.

- Minimal to no acres of pasture and hayland would be converted to landfill use for sites C, H, and I. Consequently, impacts to farmland from these alternatives is low.
- Between 17 to 32 acres pasture and hayland (low to moderate impact) would be converted for sites A, D, G and J.
- Site E is predominately classified as hay and pasture. A total of 97 acres of pasture and hay would be converted to landfill use and is considered to be a moderate impact.

6.6 Public and Semi Public Lands

Public and semi-public lands includes land uses that serve the surrounding community such as health care facilities, churches, cemeteries and schools This factor evaluates the potential effect landfill operations would have on the ability of the community to access and utilize these facilities. There are no churches, cemeteries, schools located approximately 234 feet from Site E and there is a church and cemetery located approximately 545 feet from Site J. Although access to these facilities will be maintained, there may be some impact to ease of movement to these facilities during construction and operation of the landfill.

6.7 Cultural Resources

Federal agencies are required by the National Historic Preservation Act and by NEPA to consider the possible effects of their proposed actions (“undertakings”) on historic properties (generally, “cultural resources”). Cultural resources include, but are not limited to: 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 NRHP maintained by the National Park Service, are called historic properties. To be included or considered eligible for inclusion in the NRHP, a

cultural resource must possess integrity of location, design, setting, materials, workmanship, feeling, and association. It must also be associated with important historical events; or 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 yield information important in history or prehistory. Evaluation of potential impacts to this resource included use of previously developed information regarding previously recorded archaeological sites, an updated search to identify potential NRHP-listed properties, and an evaluation of landscape potential for undiscovered archaeological resources by a senior archaeologist. Additionally, this review considered the results of a Phase I archaeological survey conducted at Site J (TVA 2013).

None of the proposed sites would impact a listed NRHP-listed Historic Property.

- Site J was surveyed for archaeological or architectural properties as part of the Environmental Assessment completed in 2013 (TVA 2013). There were no archaeological or architectural properties listed on, or eligible for, inclusion in the found on the site.
- Site C has a low probability to contain archaeological sites based on a high degree of slope and a low number of streams in the project area. Potential impact to cultural resources from this alternative are therefore, considered to be low.
- Sites D and E are considered to have a low to moderate probability to contain archaeological sites. For Site D this is based on the presence of Old Chestnut Ridge Road in the project area, whereas for Site E this is indicated by the presence of historic development, probably circa mid-19th to 20th century.
- Sites A and G has a moderate probability to contain archaeological resources based on well drained soils and the project area being well watered. Additionally, Site A is located near the Clinch River. Potential impacts to cultural resources from these alternatives are considered to be moderate.
- Sites H and I have a high probability to contain archaeological sites based on well drained soils, the project area being well watered, and the presence of a previously identified archaeological sites located adjacent to the boundary of the project areas. Potential impacts to cultural resources from these alternatives is considered to be moderate.

6.8 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low income Populations. EO 12898 mandates some federal-executive agencies to consider Environmental Justice (EJ) as part of the NEPA. EJ has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income (USEPA 2015a) and ensures that minority and low income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities. Although TVA is not one of the agencies subject to this order, TVA routinely considers environmental justice impacts as part of the project decision-making process.

Guidance for addressing EJ is provided by the CEQ's Environmental Justice Guidance under the National Environmental Policy Act (CEQ 1997). The CEQ defines minority as any race and

ethnicity, as classified by the USCB, as: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997). Low income populations are based on annual-statistical poverty thresholds also defined by the US Census Bureau.

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

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

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

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

For this assessment two geographic areas of analysis (i.e., census block group and county) were used to determine potential EJ populations. Potentially affected communities were defined as any census block group that contained any of the proposed landfill sites or along the haul routes used to transport waste to any of the proposed landfill sites. Demographic data by block group were then compared to county-wide data specifically, Anderson, Knox, Loudon, and Roane Counties. Total minority populations (i.e., all non-white racial groups combined and Hispanic or Latino) comprise between 0 to 24.0 percent of the population of the block groups studied. A single minority population based on block group analysis was identified (see Appendix A) approximately one mile west of the proposed haul route to Site E. Given the distance of the haul route to this population, no adverse impacts are expected to any minority population.

The percentages of households within each block group living below the poverty threshold ranged from 6.0 to 36.0 percent. However, households in the block group that contains Site A were 26 percent above Anderson County's (the corresponding county) household poverty rate and households within the block group that includes Site G, were 36 percent above Anderson County's (the corresponding county) household poverty rate. This particular block group contains 397 households of which 143 (36.0 percent) are living below the poverty threshold. Therefore, this block group contains a potential EJ population. No block groups had low-income populations that exceeded 50 percent of the total population in the given block group. Locations of potential EJ populations relative to the proposed landfill sites and haul roads are included in Appendix A.

In accordance with EO 12898, agencies should consider the potential for disproportionate impacts to low income or minority populations resulting from multiple or cumulative exposure to human health or environmental hazards in the affected population. Disproportionately high and adverse human health or environmental effects occur when the risk or rate of exposure to an environmental hazard or an impact or risk of an impact on the natural or physical environment for a minority or low-income population is significant (as defined by NEPA) and appreciably exceeds the impact level for the general population or for another appropriate comparison group (CEQ 1997). Measures to minimize impacts that are implemented during construction and operation of the landfill (such as dust suppression and erosion control measures) will minimize impacts to potential EJ populations. In addition, opportunities would likely be provided to residents with some construction phase employment, thereby providing potential positive impacts to area low income and minority populations. Therefore, none of the potential impacts to EJ populations is considered to be a high adverse impact, no benefit.

None of the other 32 block groups representing the landfill sites and haul roads met the criteria as EJ populations. However, because income information is not available at the block level, smaller populations, such as the trailer parks near Sites C, D, G and J, may not be identified as an EJ population. It is probable that persons in these areas should also be considered as a potential sensitive low income population subject to EJ considerations.

- EJ populations or other sensitive low income populations were not identified near or along the haul routes to Sites E and I. Potential effects to EJ populations from these other alternatives are therefore considered to be low.
- Two areas that may contain a sensitive low income population subject to EJ considerations were preliminarily identified along the haul routes to Sites C, D, and Chestnut Ridge. Potential effects to these populations are therefore considered to be moderate for these alternatives.
- Potential EJ populations were identified along the haul route to Site H. Potential effects to these populations are therefore considered to be moderate.
- One area that may contain a sensitive low income population subject to EJ considerations was identified to the north of Site J. These residents may experience visual impacts and noise impacts as a result of landfill operation. However, this population is buffered from the proposed site by some distance and these impacts could be mitigated by various measures such as construction of a berm, noise barrier, or landscape screen. The haul road would be constructed on-site at an even greater distance from the potential EJ population and is not expected to result in adverse effects to local EJ populations. Potential effects to this population is therefore considered to be moderate to high.
- Potential EJ populations were identified within the block group containing sites A and G. Potential effects to these populations are therefore considered to be moderate to high.

6.9 Economic Impacts

Construction of all of the new landfill sites would result in employment impacts. Employment impacts are measured by jobs lost and jobs generated by the proposed action. None of the alternative sites would displace any major employers and therefore there would be no job

losses. However, construction of any of the landfill sites would result in a temporary positive impact on employment due to the direct use of construction labor.

Secondary employment impacts may also be expected with each alternative site. These impacts are attributable to multiplier effects associated with the capital acquisition of materials and services to support the construction activity. However, as construction costs have not been developed for any of the alternatives at this stage, the benefit cannot be measured. All proposed landfill development site alternatives are considered to have a moderate positive economic benefit due to the expenditure of capital and the potential for construction phase employment. By comparison, Chestnut Ridge would not result in construction related economic impacts and is therefore considered to have a minimal to low economic benefit.

7.0 ENGINEERING CONSIDERATIONS

Major elements of the design and construction of the landfill will be identified for the preferred alternative site. For the purposes of this screening study, the following factors related to landfill development on each site were reviewed.

7.1 Site Capacity

BRF has limited capacity for additional CCR disposal on-site, and within 5 to 7 years, BRF will need additional options for disposal. TVA has determined that approximately 11.1 million cubic yards of disposal capacity is desired for the 13 to 15 year comprehensive disposal plan. Therefore, given the existing capacity, approximately 6 million cubic yards of additional capacity would need to be provided with any of the proposed disposal alternatives. All of the proposed alternatives would provide the necessary capacity to meet objectives of TVAs disposal plan.

7.2 Slope/Soil Stability

The stability of soils on a site is also an important factor to consider for CCR storage suitability. The soil erodibility factor (K-factor) is the susceptibility of soil particles to detachment and transport by rainfall and runoff. While texture is the principal factor affecting the K-factor score, the structure, organic matter, and permeability also contribute to erodibility. The soil erodibility factor ranges in value from 0.02 to 0.69, where a highly-erodible soil is considered to have a K-factor score greater than 0.40. These soils have a high silt content and are easily detached, tend to crust, and are characterized by high runoff rates. It is expected that site soils will be stockpiled and used for landfill cover or berm construction. Therefore, highly erodible soils are not preferred for CCR storage locations.

Soils on the site were assessed to evaluate the suitability of the site for landfill construction. The measure of stability in this category was based on the percent of highly erodible soils on each site as development on highly erodible soils can be unstable. However, the presence of highly erodible soils does not preclude landfill development, but would require special design considerations. The percentage of the site areas that are categorized as having highly erodible soils varies greatly between the alternatives. Sites G and I have the lowest amount with zero

acres. Site H has the highest percentage (60 percent) of the area categorized as highly erodible soils, while Sites A and C also have more than half their area (53 and 55 percent, respectively).

- Highly erodible soils on Sites D, G and I would present no adverse impact to landfill development.
- Highly erodible soils on sites E would present a low to moderate adverse impact to landfill development.
- Highly erodible soils on Sites A, C, H and J would present a moderate impact to landfill development and would require special management and design measures.

7.3 Distance to BRF

Operationally, it is preferred that any CCR landfill be located as close as practical to the source of CCR generation. Transport of CCR to an off-site landfill utilizing public roads has the potential to present a safety issue as additional trucks carrying CCR would be added to the roadways that serve the potential landfill sites. Potential haul routes from BRF to the landfill sites as shown in Figure 3-1 were identified by a traffic engineer with an assumption of the most direct route given consideration of roadway type and function.

While not specifically evaluated in this section, it is recognized that the transport of CCR materials by truck would result in some deterioration of the roadway surface. This impact would be minor on roadways designed to accommodate heavy trucks, however pavement conditions would deteriorate along some of the local narrow roads. However, without specific pavement information, this impact could not be quantified.

- Site J is located within 1 mile of BRF and CCRs would not be transported on a public roadway. Instead, CCRs would be transported via a private access road constructed by TVA. Therefore there would be a low operational impact on safety.
- Sites A, C, D and E are all located within approximately seven miles of BRF and transport to these facilities would result in a low to moderate impact.

  The proposed haul route to Site E primarily utilizes well developed roadways which are designed to accommodate truck traffic (i.e. SR 170, Melton Lake Greenway, and the Oak Ridge Turnpike). However, over half of the haul route to Site A would be along two-lane roadways with a narrow shoulder, or no shoulder, which represents a potential safety issue. The proposed haul route utilizes Lost Ridge Road for 1.11 miles. Lost Ridge Road is a winding narrow roadway with hairpin turns along the proposed route. In contrast, Sites C and D primarily utilize more of SR 170 resulting in less use of narrower local roads. Site C utilizes 0.76 miles and Site D utilizes approximately 1.03 miles of a narrow roadway with little to no shoulder.

- Sites G, H and Chestnut Ridge are located between 9 and13 miles from BRF. Transport of CCR to these sites would present a moderate adverse impact.

  The haul route to the Chestnut Ridge landfill would primarily utilize SR 170 and Fleenor Mill Road, which currently support landfill traffic. The proposed haul route to Site H utilizes the

Chestnut Ridge route, but it also encompasses approximately an additional 2.93 miles of haul route beyond the Chestnut Ridge landfill location. Of the total mileage of the Site H haul route, 2.03 miles are on narrow, two lane road with little to no shoulder. In addition the route to Site H requires a sharp turn onto Crow Lane, which is narrow and not striped. Approximately 3.46 miles of the haul route to Site G incorporates a two lane roadway with little or no shoulder.

- Site I is located the farthest from BRF; however, the route to this site primarily utilizes interstate or major arterial roadways. Therefore, transport of materials to this site would result in a moderate to high adverse impact.

7.4 Traffic Operations

The potential haul routes were evaluated for the effects of transport of CCR to each of the landfill sites. This evaluation included a qualitative analysis of the effect on the level of service of the roadways on the anticipated haul routes. At this stage of the evaluation of alternatives, there were no detailed level of service analyses prepared. The analysis assumed 30 round trips per day were needed to transport CCR to off-site locations (based on the maximum capacity of all CCR products and standard dump volume per day). Given this relatively low number of total trucks per day, the qualitative evaluation concluded that there would be a low impact on traffic operations for all of the off-site locations. There would be no impact to traffic operations associated with Site J as the haul route to this site does not use public roads.

However, Sites E and I require trucks leaving BRF to turn left onto SR 170. For all other sites, trucks leaving BRF would turn right onto SR 170. The left turns required to access Sites E and I are less desirable from a safety standpoint. During the peak hours of traffic flow, trucks would experience increased difficulty turning out of BRF onto SR 170. The addition of these trucks to the traffic flow could result in degradation of safety to other motorists who would be forced to navigate around these additional trucks turning onto SR 170. These left turn movements would result in a moderate impact to traffic operations.

7.5 Transportation and Disposal Cost

Transport of CCR materials from BRF to any of the proposed landfill sites would represent an additional operation cost to the project. In order to estimate cost of transport, a haul rate of $140 dollars per hour (cost of dump truck and operator) was assumed. The cost to transport CCR material was estimated based on the length of haul route, and the calculated travel time from BRF to each of the landfill sites (based on an assessment of posted speeds, road widths and road alignments).

Some travel delay was assumed to occur where a truck would need to make a turn or pass through a major intersection. For example, a delay of 50 seconds was assumed at all signalized intersections, and 20 seconds at all unsignalized intersections where a truck would need to slow down to make a turn from one road to another. These delays were factored into the total travel time along each haul route. The assumptions did not account for typical peak hour delays or delays due to isolated incidents. Peak hour delays are known to occur along

Edgemoor Road (SR 170). It has been reported that westbound traffic backs up east of Melton Lake Drive on SR 170 onto the Clinch River Bridge. This type of delay would affect the haul routes to Sites E and I. Delays are also known to occur on the approach to SR 62 and on the merge from SR 162 to I-40 and vice versa. These types of delays would affect the haul route to Site I. None of these delays were factored into the haul route cost analysis.

Trucking costs increase with distance traveled; therefore, relatively longer distances may not be desirable or feasible from a cost perspective. Assuming an average 14-year disposal plan, lifetime transportation project costs for Site J were estimated to be approximately $1.8M, whereas lifetime costs for other alternatives were estimated to range from approximately $5.4M to $21.2M.

In addition to transportation-related costs, it is also noted that Chestnut Ridge is a privately-owned landfill that would also incur costs related to a tipping fee to dispose of CCR materials. Tipping fees have been estimated at approximately $75 per ton of ash. This fee, together with the transportation cost would elevate the cost of this alternative significantly.

- Site J is located within 1 mile of BRF and CCPs would not be transported on a public roadway. Therefore, there would be a low hauling cost associated with transport of CCR material to this site compared to the hauling costs to the other sites.
- Sites A, C and D are located within approximately 10 miles from BRF and transport of CCR materials would represent a low to moderate hauling cost compared to the other sites.
- Site E is also located within approximately 10 miles from BRF. However, transport costs to this site would also be impacted due to congestion across the bridge that is experienced during peak periods. Transport of CCR materials to this site would represent a moderate transportation cost compared to the other sites.
- Sites G and H, are located between 10 and 14 miles from BRF, which results in a relatively moderate to high transportation cost.
- Site I is located over 25 miles from BRF and the hauling cost associated with trucking CCR materials to this site is relatively high compared to the other sites. Additionally, as mentioned above, this route typically experiences delays at the interchanges along SR 62 and I-40. These delays are not factored into the transportation cost for Site I; therefore, the estimated transportation costs are assumed to be higher than reported.
- Chestnut Ridge is located between 10 and 14 miles from BRF, which results in a relatively moderate transportation cost, however tipping fees associated with this alternative would increase the off-site disposal cost significantly.

7.6 Availability of Cover Soil

This criterion was measured by evaluating the potential for soils on the site to be available for use as a landfill cover. A site that would have adequate cover soil would be preferable as it would not be necessary to haul cover material from a borrow site to the proposed landfill site. Preliminary estimates indicate that the proposed landfill would need two feet of cap system cover soil. For this screening analysis the estimate of availability of cover soil is based on the depth to bedrock at each site. Depth to rock at all of the sites exceeds two feet, therefore adverse impacts associated with this criterion do not exceed the moderate level.

- Depth to rock at Sites A, C, D, E, and J are all approximately 5-ft, therefore there would be a low to moderate impact.
- The bedrock at Sites G, H, and I is much closer to the surface and there is only 2-2.5 ft of cover soil available. Therefore, there would be a moderate impact at these sites.

7.7 Alternate Forms of Transport of CCRs

According to the 2011 Siting Study, rail transport of CCR could be used at Site E and, given their proximity to the river, CCR could be transported to Sites A, G and I by barge. Although these options are desirable from an operational standpoint, impacts associated with these options are not evaluated at this screening level given limited available information at this time.

8.0 CONCLUSIONS

Each of the proposed landfill sites were evaluated against the resource factors related to four general categories, (1) Natural Environment; (2) Geology; (3) Human Environment; and (4) Engineering and Transportation Considerations. The purpose of this analysis is determine the sites that should be carried over for further analysis.

Each of the resource factors were evaluated using professional judgement that synthesized the quantitative indicator data to determine relative impact for the purposes of ranking each alternative landfill site. Considerations of the magnitude of potential impact and significance based on resource sensitivity and context was used to develop an appropriate range of rank scores applied to the alternatives under review for each resource category. For example, for impacts to stream resources the scoring used a full range of values (1 to 5) to appropriately reflect the range of potential impact (0 to approximately 3,200 feet) and the importance of this resource as it relates to the considerations of significance (permit type [Nationwide vs. Individual Section 404 permit], and the burden to demonstrate maximum avoidance and minimization under provisions of Section 404(b)(1)). In contrast, the prime farmland impact magnitude ranged from 0 to approximately 48 acres. However, because this range is not expected to exceed significance thresholds, the rank scoring adopted a range of 1 to 3 to appropriately reflect both magnitude and relative importance of impact. Indicator data are presented in Appendix B and detailed rank scoring results are presented in Appendix C. Table 8-1 provides a general summary of the aggregate rank scoring by resource category.

Table 8-1. Score of Alternative CCR Disposal Sites

Evaluation Criteria	Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge
Natural Environment	21	22	23	18	23	24	24	20	17
Geology	13	9	11	13	7	8	7	7	6
Human Environment	28	26	28	24	26	25	21	23	16
Engineering/ Transportation	12	12	10	13	14	16	17	9	13
Total	**74**	**69**	**72**	**68**	**70**	**73**	**69**	**59**	**52**

Note: Based on the analysis summarized in Appendix B, lower scores are more desirable.

Alternative Site A has relatively high impacts on social and economic factors including land use and potential EJ issues. In addition, this site would have the greatest relative impact to geologic and human environment factors. Therefore this site is not recommended to be carried forward for further study.

Alternative Site C has relatively high impacts on natural and human environment factors including air quality and land use. This site has geologic limitations associated with karst conduit potential and a higher percentage of highly erodible soils within the site area. Therefore this site is not recommended to be carried forward for further study.

Alternative Site D has relatively high impacts to air quality and noise due to the high number of residents near the site and along the haul route. This site also include geologic concerns associated with karst conduit potential and the high percentage of highly erodible soils within the site area. Additionally, since the site is partially located in Knox County, it may be subject to the Jackson Law. Overall, this site is ranked as being relatively unfavorable due to geology and having relatively high impacts to human environment. For these reasons, this site is not recommended to be carried forward for further study.

Alternative Site E, has relatively high impacts associated with geologic constraints, largely driven by its karst conduit potential and sinkhole within the site area. Additionally, this site is predominately covered in farmland and would have the greatest impact on farm operations. Although the rank score for this site is similar to Site C, this is the only site with a sinkhole located within the proposed landfill boundary. Additionally, the left turn leaving BRF to merge into traffic crossing the Clinch River bridge would result in safety concerns and bridge would increase the transportation cost of the project. Therefore this site is not recommended to be carried forward for further study.

Alternative Site G has a relatively low score for geological considerations, it has relatively high impacts to the natural environment, especially streams and sensitive noise receptors. There is a potential EJ population that may be impacted and the haul route could impact a high number of adjacent residential receptors. In addition, approximately 3.5 miles of the haul route to Site G

incorporates a two lane roadway with little or no shoulder which presents a potential safety issue. For these reasons, this site is not recommended to be carried forward for further study.

Alternative Site H has relatively high potential impact to the natural environment and has little benefit from an engineering and transportation perspective. The site is located relatively far away from BRF, therefore has higher impacts associated with residential receptors along the haul road. Additionally, the current land cover at the site is almost all forested with a stream, therefore the site would have relatively high impacts to natural resources. Therefore this site is not recommended to be carried forward.

Alternative Site I has relatively low scores for geologic considerations and impacts to the human environment. This site has relatively higher impacts to the natural environment due to the stream and wetland located within the site area. While the site is located the furthest away from BRF, most of the haul route would be located along the interstate, therefore there are fewer residential receptors along the haul route. Additionally, there would be a relatively small number of displacements associated with this site alternative. Additionally, the left turn leaving BRF to merge into traffic crossing the Clinch River bridge coupled with the distance from BRF would result in safety concerns and bridge would increase the transportation cost of the project. Therefore, this site is not recommended to be carried forward for further study.

The Chestnut Ridge landfill is an existing, permitted landfill, therefore there would be no new impacts to the natural or human environment and has sufficient capacity to meet the need for 20 years of storage of CCRs from BRF. The primary impacts identified for this screening analysis are related to the cost associated with transportation of CCRs from BRF to the site. Therefore, this site is recommended to be carried forward for further study.

Alternative Site J is located adjacent to BRF and would have lower impacts associated with the hauling of CCRs. Use of this site, in conjunction with existing onsite storage capacity at BRF would meet the need for the estimated 20 years of storage of CCRs from BRF. The site has favorable geologic conditions. Additionally, development and operation of the site would result in relatively low impacts on the natural environment However, the site is relatively close to existing residential developments and would result in some potential, but mitigable, impacts to EJ populations. Therefore, this site is recommended to be carried forward for further study.

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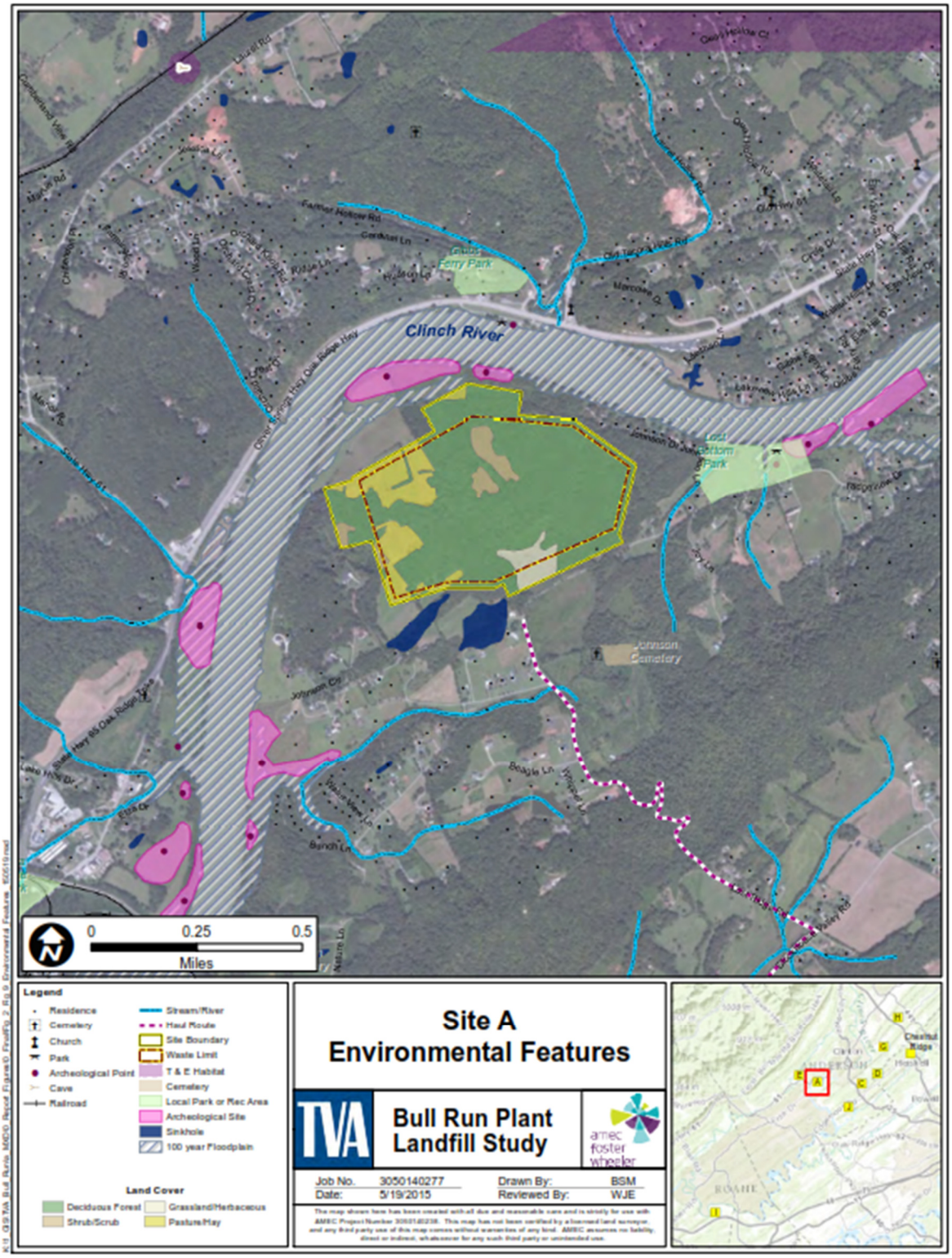
APPENDIX A:
Environmental Features at Alternative Sites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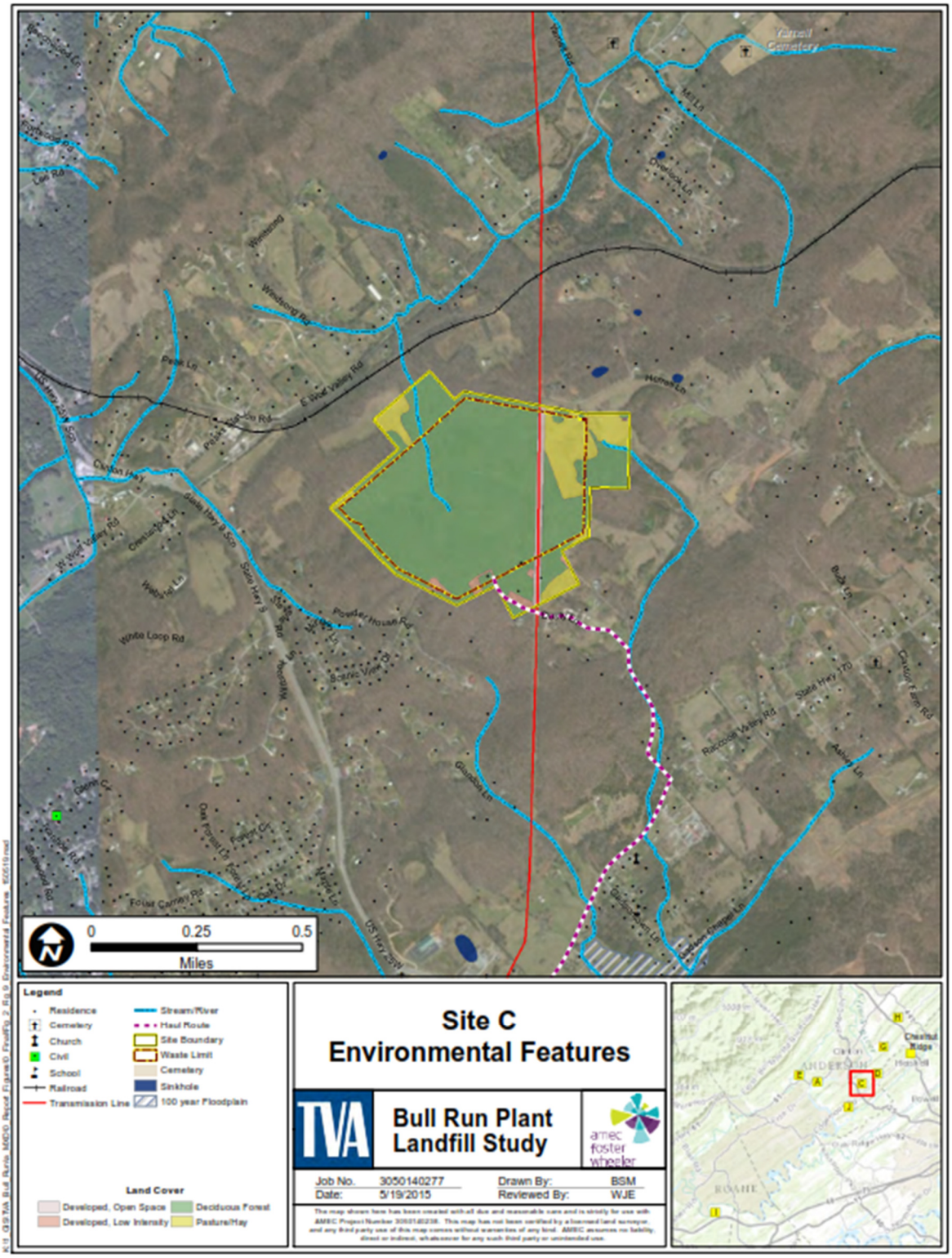
Stream/River
Haul Route
Site Boundary
Waste Limit
T & E Habitat
Cemetery
Local Park or Rec Area
Archeological Site
Sinkhole
100 year Floodplain
Land Cover
Deciduous Forest
Grassland/Herbaceous
Shrub/Scrub
Pasture/Hay
Site A
Environmental Features
TVA
Bull Run Plant
Landfill Study
amec foster wheeler
Job No. 3050140277
Date: 5/19/2015
Drawn By: BSM
Reviewed By: WJE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Waste Limit
Cemetery
Sinkhole
100 year Floodplain
Land Cover
Developed, Open Space
Developed, Low Intensity
Deciduous Forest
Pasture/Hay
Site C
Environmental Features
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Landfill Study
amec foster wheeler
Job No. 3050140277
Date: 5/19/2015
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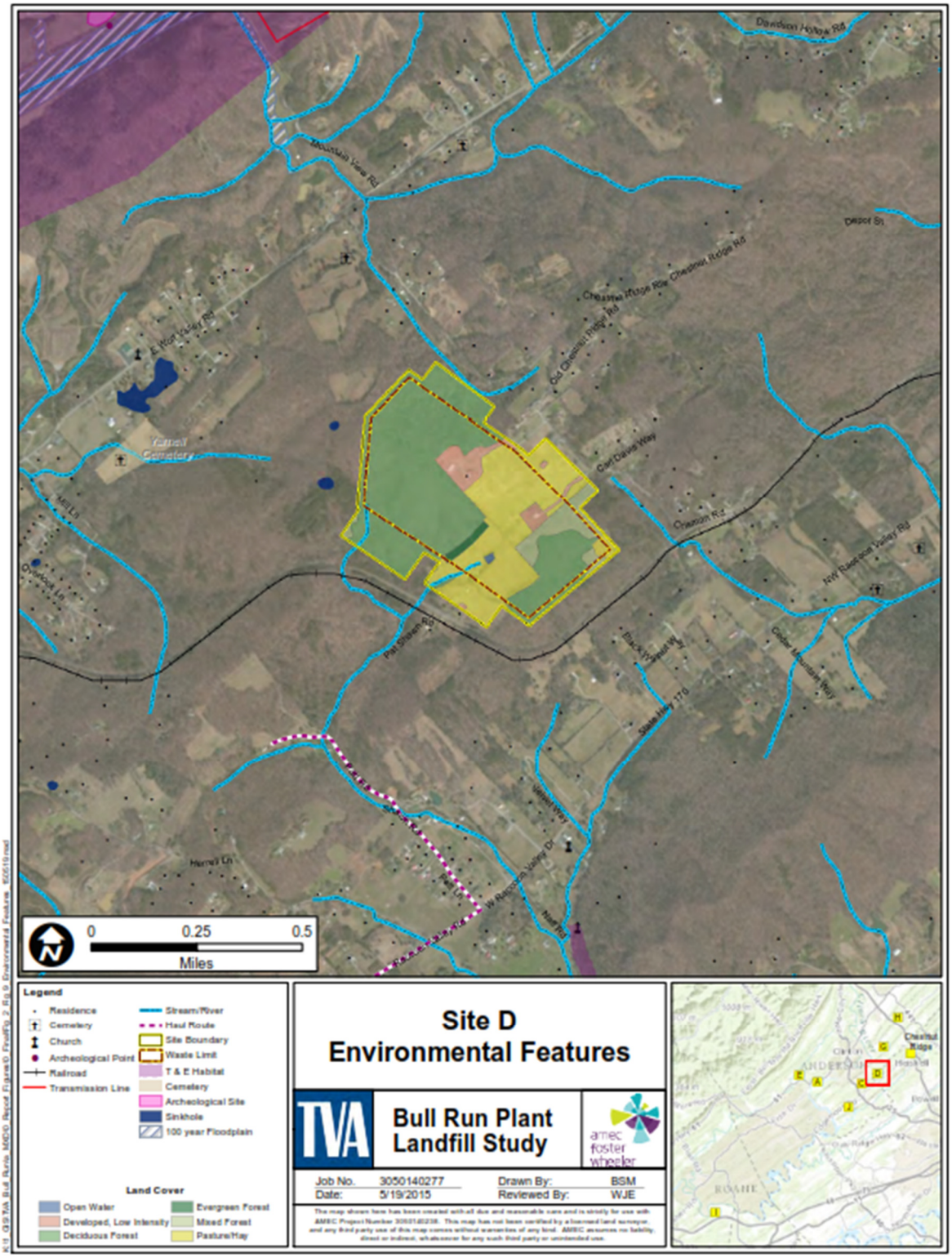
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Railroad
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Haul Route
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Waste Limit
T & E Habitat
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Developed, Low Intensity
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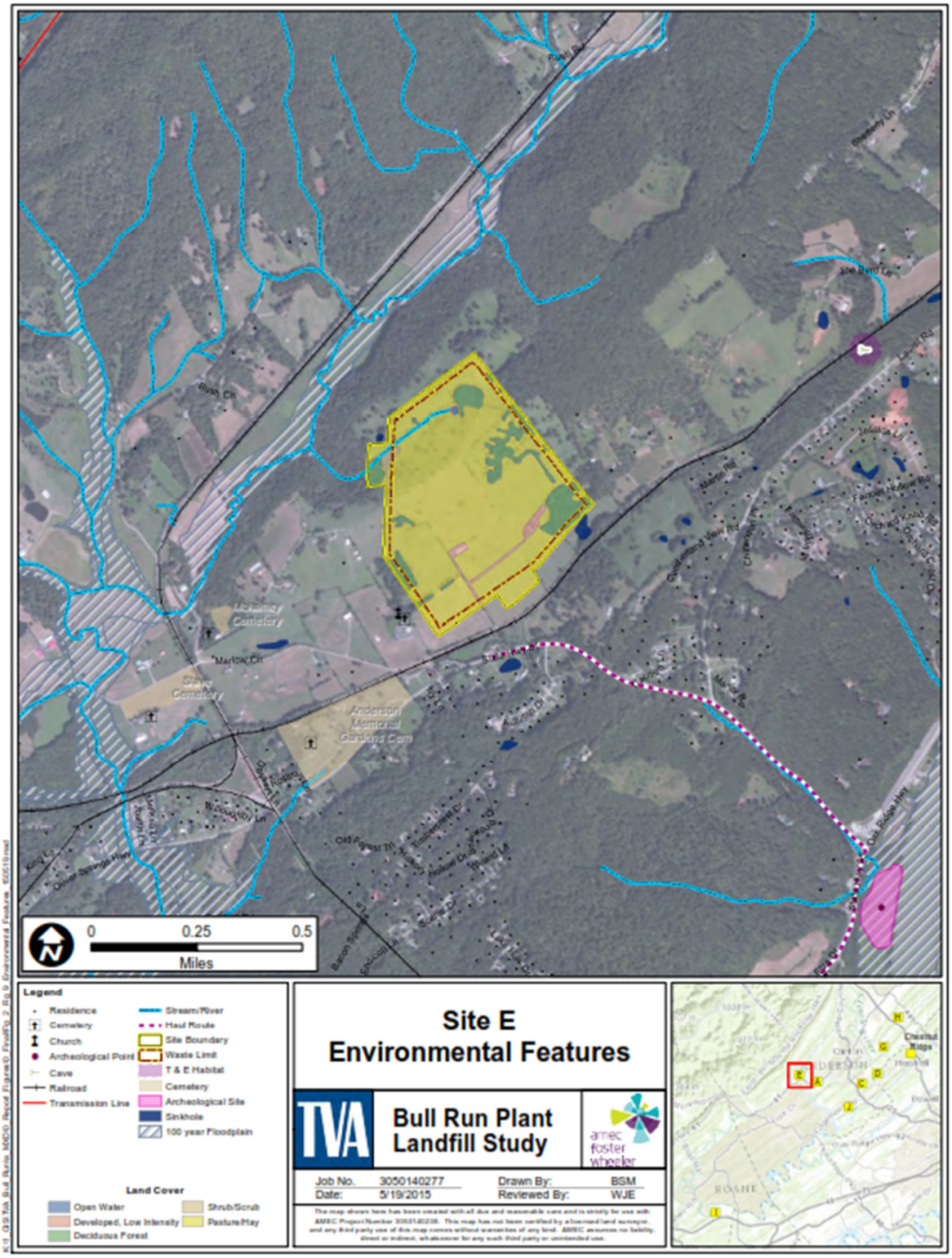
Evergreen Forest
Mixed Forest
Pasture/Hay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T & E Habitat
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Sinkhole
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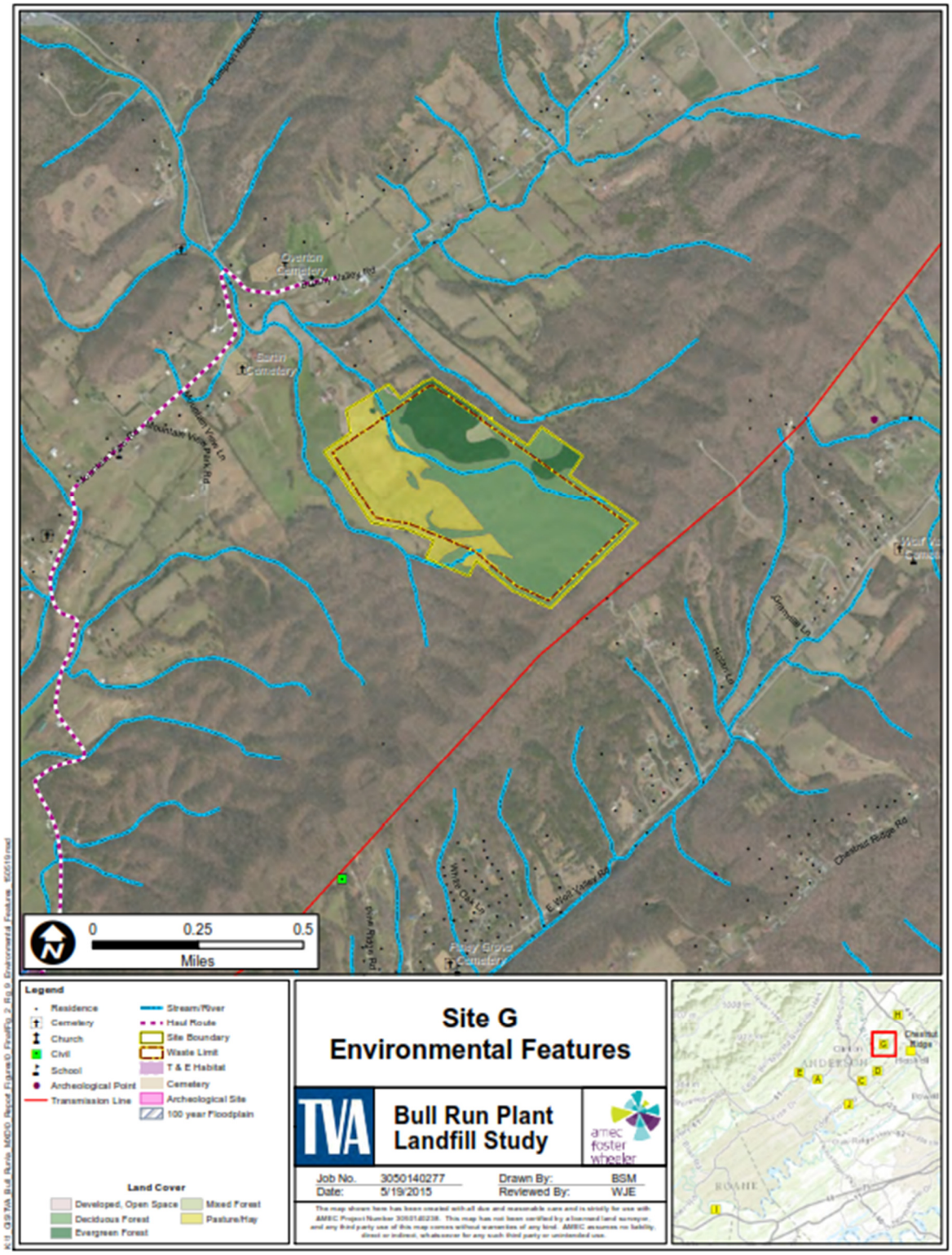
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Waste Limit
T & E Habitat
Cemetery
Archeological Site
100 year Floodplain
Land Cover
Developed, Open Space
Deciduous Forest
Evergreen Forest
Mixed Forest
Pasture/Hay
Overton Cemetery
Sorrin Cemetery
Pleasant Valley Rd
Chestnut Ridge Rd
E West Valley Rd
Pleasant Ridge Rd
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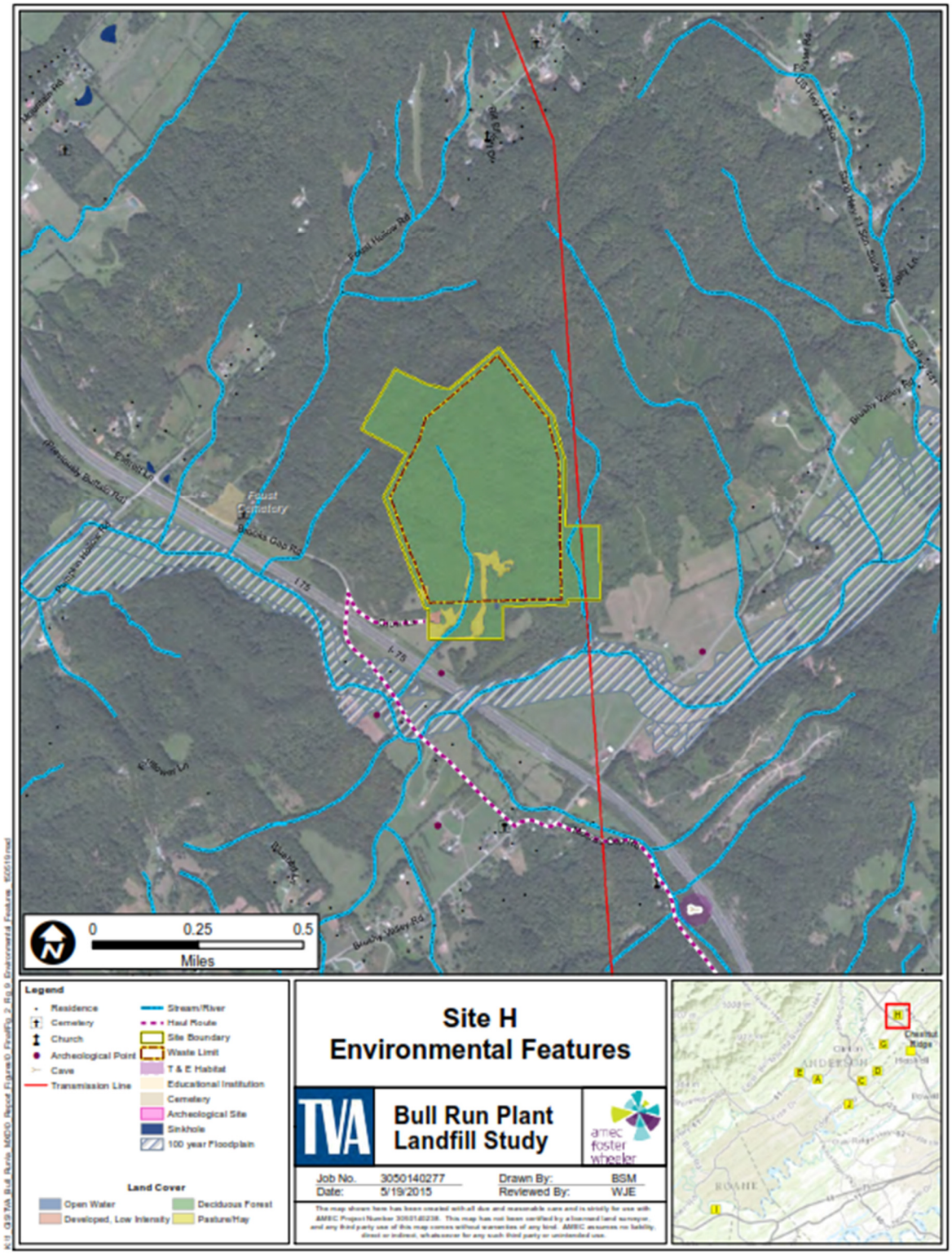
ROANE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Cave
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Haul Route
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Waste Limit
T & E Habitat
Educational Institution
Cemetery
Archeological Site
Sinkhole
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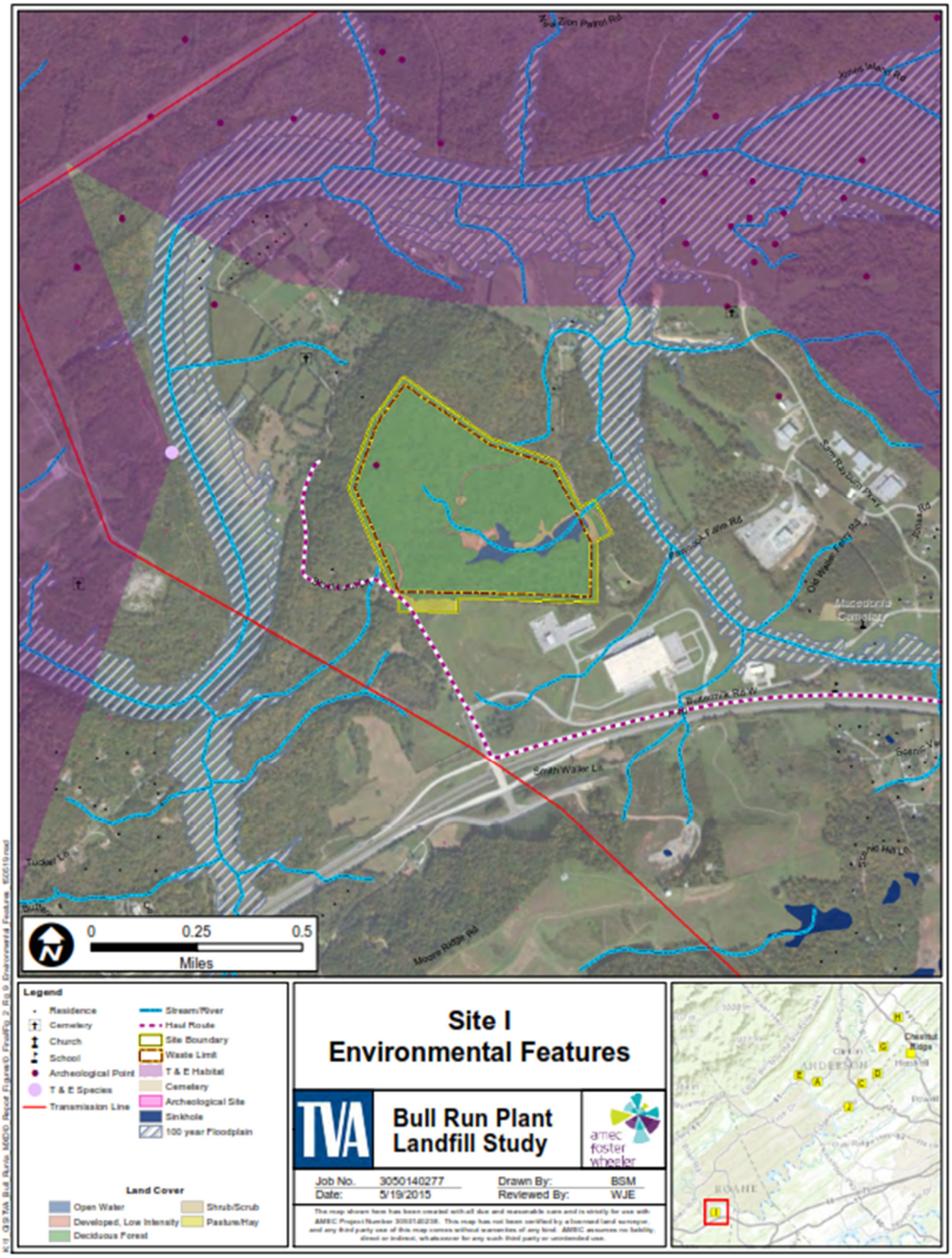
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Developed, Low Intensity
Deciduous Forest
Shrub/Scrub
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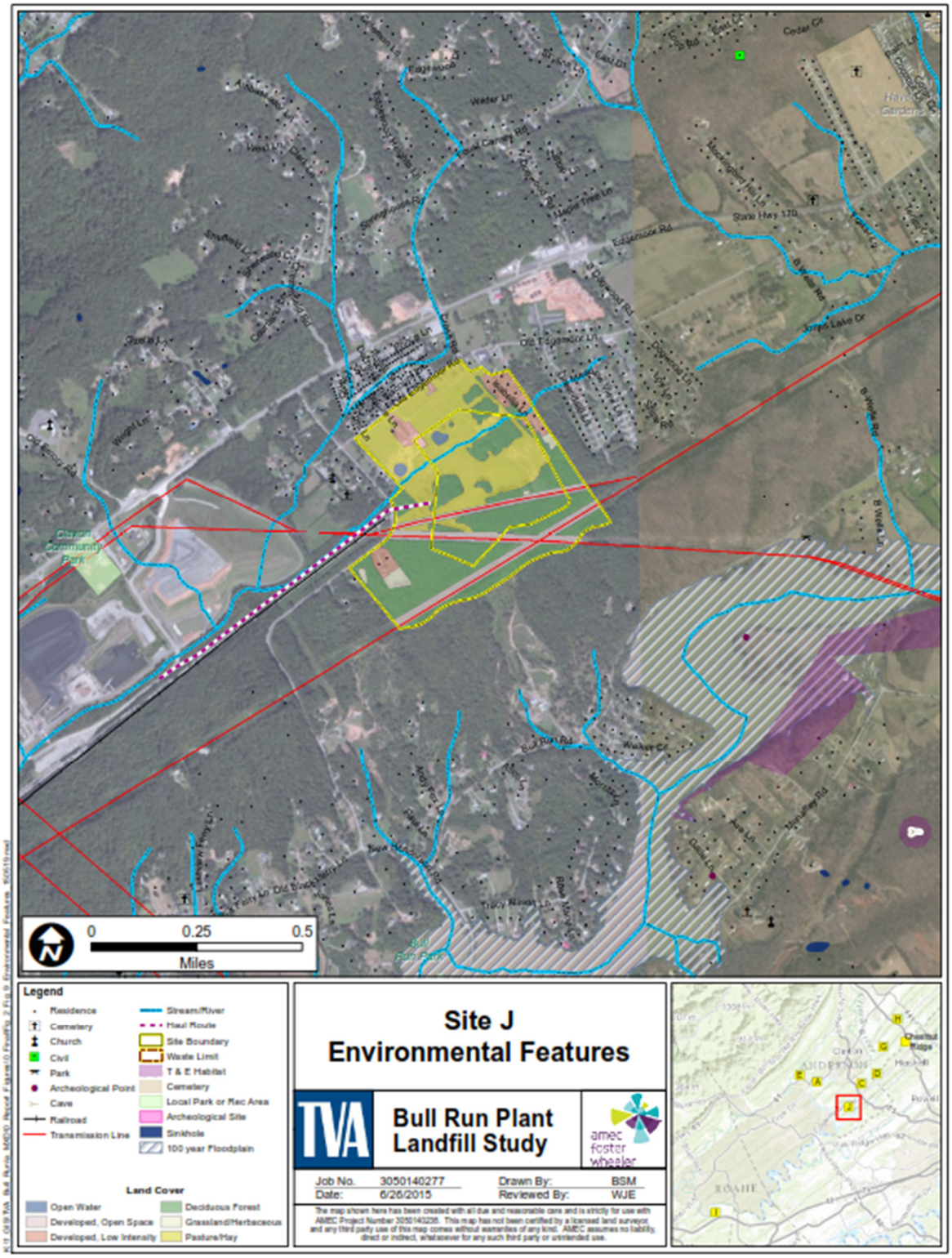
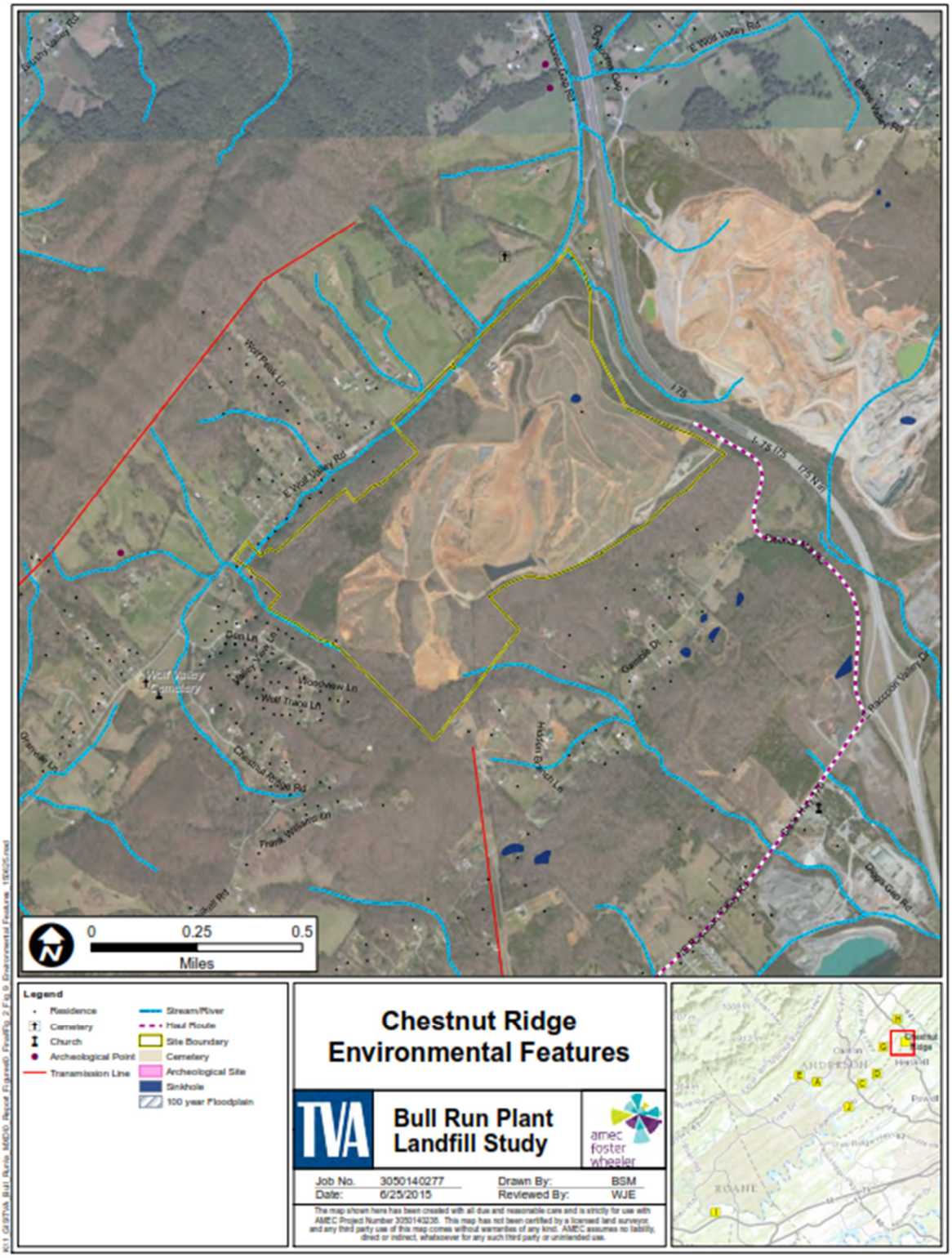
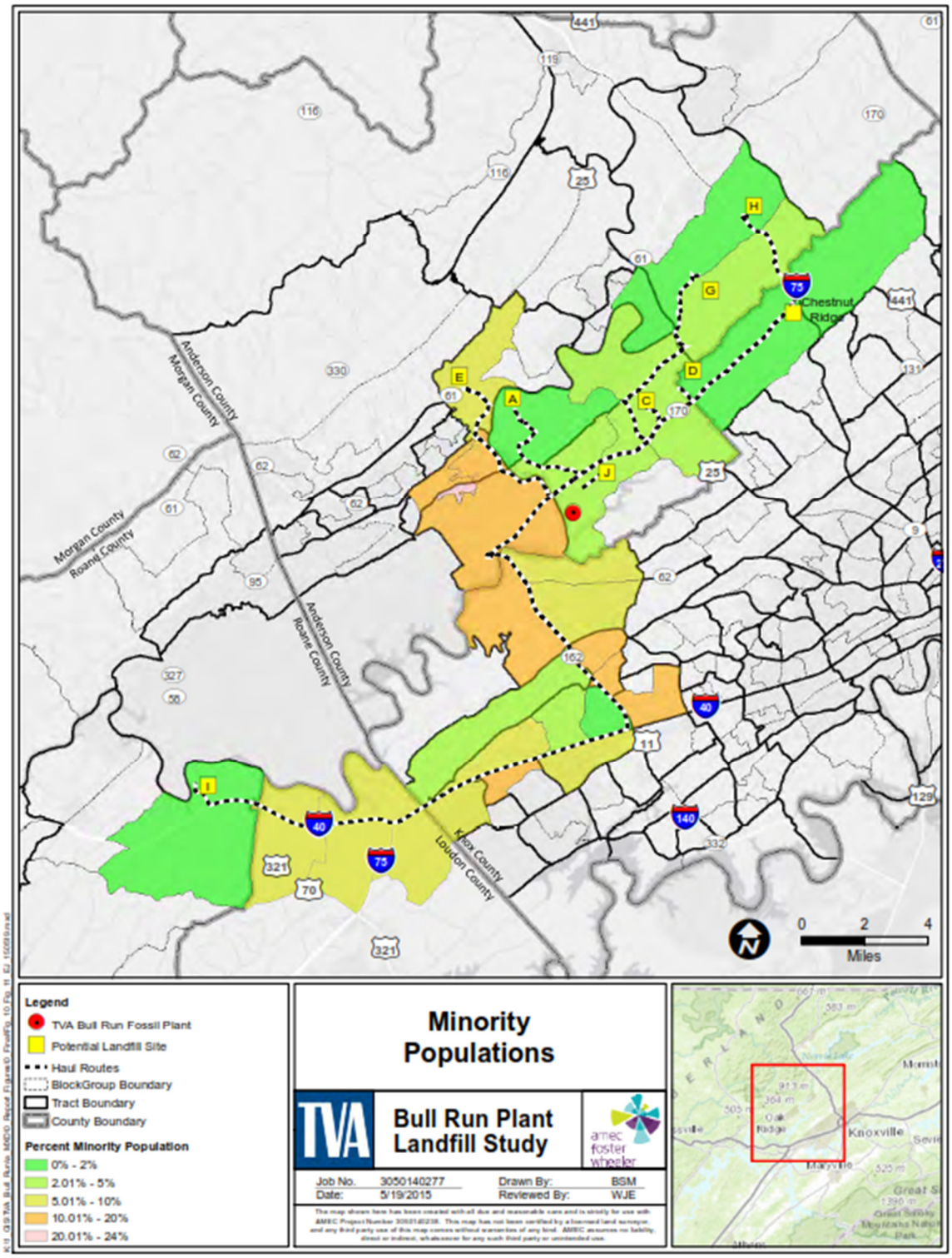
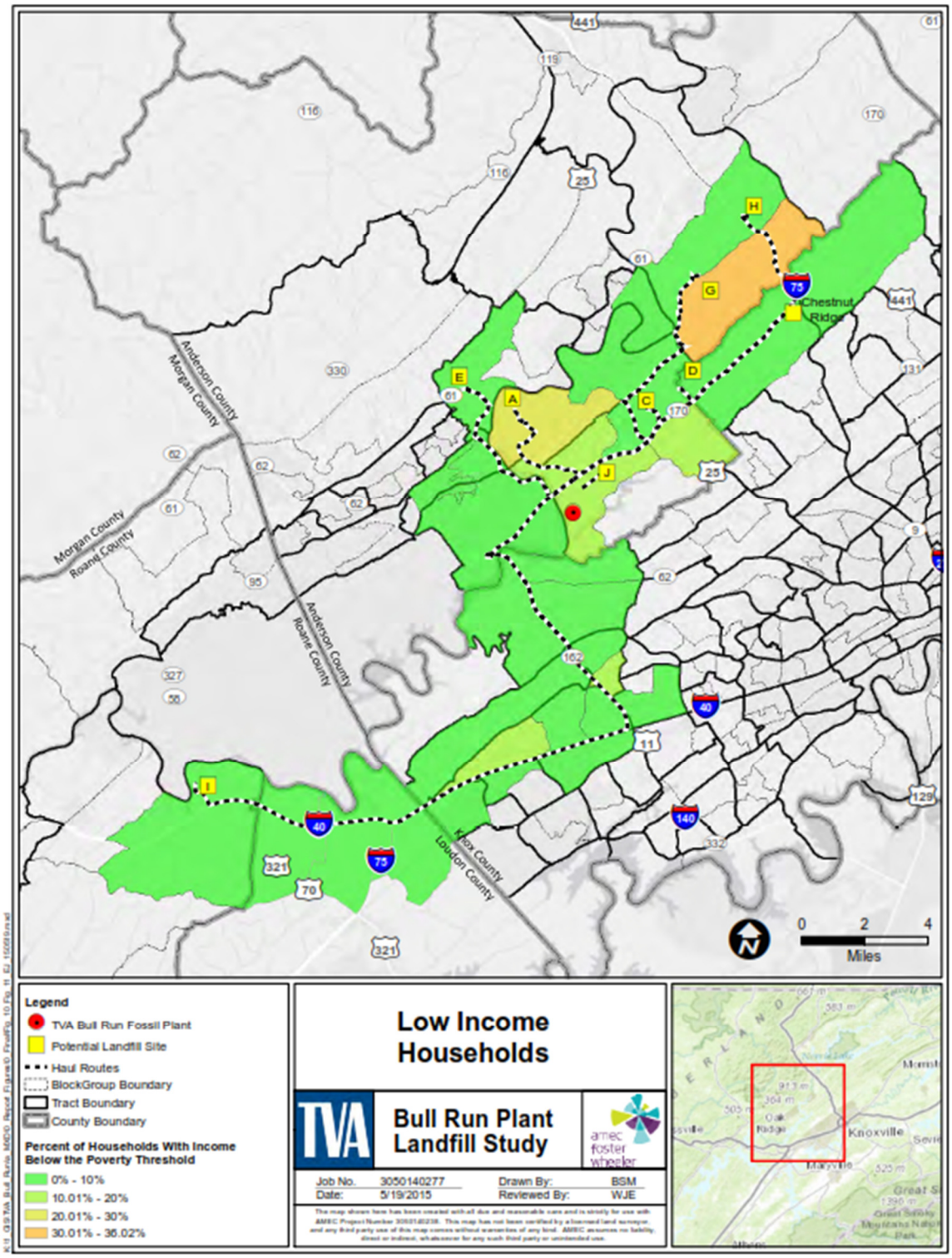
Site I
Environmental Features
TVA
Bull Run Plant
Landfill Study
amec foster wheeler
Job No. 3050140277
Date: 5/19/2015
Drawn By: BSM
Reviewed By: WJE


0
0.25
0.5
Miles
Legend
Residence
Cemetery
Church
Civil
Park
Archeological Point
Cave
Railroad
Transmission Line
Stream/River
Haul Route
Site Boundary
Waste Limit
T & E Habitat
Cemetery
Local Park or Rec Area
Archeological Site
Sinkhole
100 year Floodplain
Land Cover
Open Water
Developed, Open Space
Developed, Low Intensity
Deciduous Forest
Grassland/Herbaceous
Pasture/Hay
Site J
Environmental Features
TVA
Bull Run Plant
Landfill Study
amec foster wheeler
Job No. 3050140277
Date: 6/26/2015
Drawn By: BSM
Reviewed By: WJE


Chestnut Ridge
Environmental Features
Bull Run Plant
Landfill Study
TVA
amec foster wheeler
Job No. 3050140277
Date: 6/25/2015
Drawn By: BSM
Reviewed By: WJE
0 0.25 0.5
Miles
Legend
Residence
Cemetery
Church
Archeological Point
Transmission Line
Stream/River
Haul Route
Site Boundary
Cemetery
Archeological Site
Sinkhole
100 year Floodplain
I-75
Wolf Valley Cemetery
Wolf Peak Ln
E Wolf Valley Rd
Woodview Ln
Wolf Trace Ln
Chestnut Ridge Rd
Frank Williams Dr
Hickson Branch Ln
Gamble Dr
Raccoon Valley Dr
Grandle Ln
Chestnut Rd
Dogs Gap Rd
Laurel Valley Rd
Moore Gap Rd
Clayborne Gap
Elkins Valley Rd


Minority Populations
Bull Run Plant Landfill Study
TVA
amec foster wheeler
Job No. 3050140277
Date: 5/19/2015
Drawn By: BSM
Reviewed By: WJE
Legend
TVA Bull Run Fossil Plant
Potential Landfill Site
Haul Routes
BlockGroup Boundary
Tract Boundary
County Boundary
Percent Minority Population
0% - 2%
2.01% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 24%
Anderson County
Morgan County
Roane County
Knox County
Loudon County
Chestnut Ridge
Knoxville
Maryville
0 2 4
Miles


Low Income Households
Bull Run Plant Landfill Study
TVA
Legend
TVA Bull Run Fossil Plant
Potential Landfill Site
Haul Routes
BlockGroup Boundary
Tract Boundary
County Boundary
Percent of Households With Income Below the Poverty Threshold
0% - 10%
10.01% - 20%
20.01% - 30%
30.01% - 36.02%
Job No. 3050140277
Date: 5/19/2015
Drawn By: BSM
Reviewed By: WJE
Anderson County
Morgan County
Roane County
Knox County
Loudon County
Chestnut Ridge
Knoxville
Maryville
0 2 4
Miles

APPENDIX B:
Quantitative Indicator Data

Appendix B: Quantitative Indicator Data

EVALUATION CRITERION	DEFINITION/ CLARIFICATION / METHOD OF MEASUREMENT	INDICATORS	SITE									COMMENTS
			Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge	
1.0 NATURAL ENVIRONMENT												
1.1 - Streams	Potential for impact on streams.	Number of streams impacted	0	2	2	1	2	2	1	1		Greater numbers are not desirable
		No. streams crossed (haul routes)	0	0	0	2	0	1	2	0		Greater numbers are not desirable
		Proximity to major waterbody (Clinch River) (ft)	330	9700	5300	5440	6800	19800	1500	7600		Closer proximity is not desrirable.
		Length of stream within waste limit (ft)	0	1,057	272	830	3,226	2,082	2,473	1,175		Longer lengths are not desirable
1.2 - Wetlands	Potential for filling of wetlands.	Acres of PUB/ Open Water resources	0	0	0.25	0.22	0	0.01	6.55	0.61		Greater numbers are not desirable
		Acres of PFO/PEM/PSS resources	0	0	0	0	0	0	0	0		
1.3 - Sensitive Species	Potential to impact known T&E species and critical habitat.	Length to nearest critical habitat (ft)	4163.4	4967.9	3774.7	3711.9	5988.0	3866.1	1001.9	3066.7		Greater numbers are not desirable
		Bat roost tree habitat affected within site (ac)	122	132	96	18	76	150	126	60.78		Greater numbers are not desirable
		Distance to nearest previously recorded T&E species (ft)	52,731 Gray bat	0	52,268 Indiana bat	52,260 Golden Winged Warbler	39,693 Indiana Bat	27,924 Indiana Bat	2,241 Appalachian Bugbane	51,231		Closer proximity is not desrirable.
		Distance to known bald eagle nests	NA	NA	NA	NA	NA	NA	NA	NA	NA	Closer proximity is not desrirable.
		Number of listed species in vicinity	1 Gray Bat	0	1 Indiana Bat	1 Golden Winged Warbler	2 Indiana Bat and Smoky Shrew	2 Indiana Bat and Allegheny Woodrat	2 Gray Bat and Appalachian Bugbane	1 Gray Bat		Greater numbers are not desirable
1.4 - Managed Areas	Potential to impact known publicly managed areas.	Distance to nearest managed area (ft)	4.57	6.42	8.12	4.86	6.08	3.48	0.52	3.89	NA	Greater numbers are not desirable
1.5 - Vegetation/Wildlife	Potential to impact vegetated cover types including: forests, prairies, or other vegetated areas of significance.	Area of forest cover impacted (ac)	94.56	102.27	63.86	12.93	77.28	109.14	108.56	22.56		Larger areas are not desirable.
		Area of open water impacted (ac)	0	0	0.25	0.22	0	0.01	6.55	0.61		Larger areas are not desirable.
		Area of grassland/herbaceous cover impacted (ac)	3.31	0	0	0	0	0	0	0.1		
		Area of pasture/hay cover impacted (ac)	16.5	9.39	30.99	96.65	31.64	3.29	0	24.96		
		Area of scrub/shrub cover impacted (ac)	5.94	0	0	0.23	0	0	1.85	0		Larger areas are not desirable.
		Natural areas impacted (ac)	0	0	0	0	0	0	0	0		Larger areas are not desirable.
1.6 - Air Quality	Potential for impact on air quality. Consideration of fugutive emissions near residential areas.	Site in attainment area (Y/N)	N	N	N	N	N	N	N	N		
		Proximity of site to residential areas (feet)	211	188	198	475	524	1,072	1,098	525		Closer proximities are not desirable. Note: Distance measured from the waste limit to the closest residence.
		No. of residences within 200 ft of haul road	37	50	65	58	80	109	29	0	101	Closer proximities are not desirable. Note: Distance measured from the waste limit to the closest residence.
1.7 - Noise	Impact on sensitive noise receptors (e.g., residence, church, school, library).	No. receptors w/i 500 ft of landfill site and w/in 500 ft of roadway used to transport CCR	113	206	250	225	342	363	286	27	341	Greater numbers are not desirable
1.8 - Hazardous Waste	Consider costs and liabilities incurred from the acquisition of sites potentially containing special / hazardous wastes.	Number of potential special/hazardous waste sites lands to be acquired for landfill	0	0	0	0	0	0	0	0	0	Greater numbers are not desirable
1.9 - Visual Environment	Effects from potential CCR landfill on existing visual environment.	Distance to nearest park/natural area	765	15,579	14,712	6,623	111,774	21,786	30,070	2,847		Shorter lengths are not desirable
		Number of residences within 1,000 ft	23	26	19	15	8	1	6	167		Shorter lengths are not desirable
1.10 - Prime Farmland	Conversion of prime and unique farmland and farmland of statewide or local importance.	Area of prime farmland and farmland of statewide importance impacted (acres)	3.8	0	47.6	4.3	2	6.4	14.5	12.8		Larger areas are not desirable
1.11 - Tennessee NRCS Lands and Century Farms	Impacts to Natural Resources Conservation Program (NRCS) Lands and Century Farms	Number of NRCS program lands impacted										Data not available
		Number of Century Farms impacted										Data not available
1.12 - Floodplains	Potential impacts to FEMA floodplains	Acres of fill in floodplains	0	0	0	0	0	0	0	0		Greater numbers are not desirable

Appendix B: Quantitative Indicator Data

EVALUATION CRITERION	DEFINITION/ CLARIFICATION / METHOD OF MEASUREMENT	INDICATORS	SITE									COMMENTS
			Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge	
2.0 GEOLOGY												
2.1 - Karst Conduit Potential	Impacts to geological formations susceptible to subsurface fracturing and faulting (low suitability).	Area of impact to geological formations with low suitability (i.e. Ordovician Formations) (acres)	2	5	4	4	9	8	8	6		Larger areas on unsuitable geologic formations are not desirable. Low score is least desirable
2.2 - Geologic Stability	Based on topographic relief and surface features	Subjective Scale-based on terrain and surface features (sinkholes) that may indicate instability.	3	6	5	5	7	5	7	9		Low score is least desirable.
2.3 - Sinkholes and Caves	Impacts to sinkholes and potential for conduit flow; impacts to caves; impacts to springs	Acres of sinkholes in limits of disturbance	0	0	0	0.002876	0	0	0	0		Greater numbers are not desirable.
		Proximity to cave openings (feet)	5,204	14,171	8,185	3,912	8,348	4,066	10,096	5,435		Closer proximities are not desirable.
		Number of known springs impacted	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
2.4 - Ground Water Resources	Impacts to recharge areas, sole-source aquifers.	Number of public water supply wells impacted	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
		Number of sole-source aquifers impacted										Greater numbers are not desirable.
		Number of sinking streams impacted	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
2.5 - Seismic Zones	Impacts to known fault zones.	Number of faults crossed by proposed CCR storage site	0	0	0	1	0	0	1	0		Greater numbers are not desirable.
2.6 - Mines and Mineral Resources	Proximity of corridor to mine shafts and potential impacts to existing mines and potential mineral resources.	Number of mine shafts impacted	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
		Length (feet) through previously mined lands	0	0	0	0	0	0	0	0		Longer lengths are not desirable.
3.0 HUMAN ENVIRONMENT												
3.1 - Land Use	Evaluate the consistency of the CCR storage site with existing land uses.	Proximity to exsiting commericial/indstrial uses.	5	5	5	5	5	5	3	3	1	1. Site is currently industrial 3. Site is adjacent to industrial land uses 5. Site not adjacent to industrial uses
	Location (County/City)	Is the site located in Anderson County.	Anderson	Anderson	Anderson and Knox	Anderson	Anderson	Anderson	Roane	Anderson		Site in Anderson County is preferred as it wouldn't be subject to the Jackson Law.
3.2 - Zoning	Evaluate the compatibility of proposed site with current zoning.	Current and surrounding zoning as it relates to the foreseeable impact of landfill construction.	3	3	3	3	3	3	2	1	1	1. Site is currently zoned as industrial 2. Site is adjacent to similar use, moderate potential for rezoning 3. Site not adjacent to similar use, low potential for rezoninng
		Compatible with state buffer zone standards?	No	No	No	No	Yes	Yes	No	Yes	Yes	Per TN Solid Waste Processing ad Disposal Rule 0400-11-01-.04
3.3 - Displacements	Residential	Number of residential displacements.	1	5	2	0	0	0	0	0		Greater numbers are not desirable.
	Commercial/Industrial	Number of commercial displacements.	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
	Utilities	Length of transmission lines or pipelines relocated.	0	2,500	0	0	0	920	0	7,744		Greater numbers are not desirable.
		Number of major towers relocated	0	5	0	0	0	1	0	8		
3.4 - Property Acquisition	Private property acquisition required for development of the CCR storage site.	Property acquisition (acres).	157.3	162.0	151.6	133.3	138.1	157.5	141.4	0		Greater numbers are not desirable.
		Number of parcels affected.	21	26	29	9	12	9	20	0		Greater numbers are not desirable.
3.5 - Farmland Impacts	Identify impact to farm operations.	Acres of farmed area converted (pasture).	17	9	31	97	32	3	0	25		Larger areas are not desirable.
		Number of farm severences.	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
3.6 - Public/Semi-Public Lands	Effects to public/semi-public land uses (i.e., churches, special interest groups, schools, etc.).	No. within site.	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
		Distance to nearest church	1,209	3,424	2,812	248	1,590	2,637	3,323	545		Smaller distances are not desirable.
		Distance to nearest cemetery	1,150	3,797	1,565	234	1,398	1,756	1,137	554		
		Distance to nearest school	7,858	5,264	8,158	6,651	10,631	4,943	21,966	7,081		
		Distance to nearest hospital	19,278	38,861	41,433	16,908	51,770	>55,000	>55,000	30,249		
3.7 - Cultural Resources	Effects on NRHP sites or sites likely to be NRHP eligible archeological sites and historical architectural sites.	Number of recorded NRHP sites within alternative boundary.	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
		Number of known archeological sites within site boundary.	0	0	0	0	0	0	1	0		Greater numbers are not desirable.
		Area of impact to high potential archaeological areas (e.g. floodplain terraces) (acre)										Longer distances are not desirable.
3.8 - Community Cohesion	Effects to neighborhoods and communities in the vicinity of the proposed CCR storage site	Number of established neighborhoods affected.	0	0	0	0	0	0	0	0		Greater numbers are not desirable.
3.9 - Environmental Justice	Effects to minority and low-income populations in the vicinity of the proposed CCR storage site	Site located with identified EJ Census block group	Yes	No	No	No	Yes	No	No	No		"Yes" is not desirable
		Other potential sensitive populations adjacent to or along proposed haul routes subject to EJ considerations	0	2	2	0	2	0	0	1		Greater numbers are not desirable.
3.10 - Economic Impacts	Short term employment and tax impacts	Total jobs (direct employment)	NA	NA	NA	NA	NA	NA	NA	NA		Loss of employment is not desirable.
		Tax impacts [property tax and tax equivalent payments ($)]	NA	NA	NA	NA	NA	NA	NA	NA		Higher tax impact is not desirable.

Appendix B: Quantitative Indicator Data

EVALUATION CRITERION	DEFINITION/ CLARIFICATION / METHOD OF MEASUREMENT	INDICATORS	SITE									COMMENTS
			Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge	
4.0 ENGINEEERING / TRANSPORTATION												
4.1 - Site Capacity	Is the size of the parcel adequate for anticipated CCR Storage requirements?	Site boundary size (acres)	157	162	153	133	138	158	141	144		
		Fill area size (ac)	120	116	108	112	110	112	120	54		
		Landfill site capacity in million cubic yards	14.2	19	12.1	13.1	16.1	16.7	21.3	6.6		Additional capacity required is 6 million cubic yards
		Expansion Potential	No	Yes	No	Yes	Yes	Yes	Yes	No		
		Potential CCR capacity (years)	28	38	24	26	32	33	42	12		Additional capacity required is 12 years
4.2 - Slope / Soil Stability	Assess the existing slopes to determine if soils on site are stable for CCR storage construction.	% of highly-erodible soils on site	52.8	55.1	6.9	24.5	0.0	59.8	0.0	41.8		Steeper slopes are not desirable; highly erodible soils not desirable.
4.3 - Distance to BRF	Evaluate the distance from BRF to the proposed CCR disposal site to and assess the characteristics of the road network between the two. Determine potential risks associate with transport of CCR on public roadways.	Over-road travel distance between BRF and the proposed site (miles)	4.8	4.2	5.7	6.8	10.3	13.1	25.6	1.2	10.1	Longer distances are not desirable.
4.4 - Traffic Operations	Evaluate the effects on Level of Service along the haul route to the proposed site.	Change in traffic volume on public roadways that would affect the level of service along the haul route (vehicles per day)	30	30	30	30	30	30	30	0		Greater traffic increases have potential to lower the level of service; thus they are less desirable.
4.5 - Potential for Rail	Is rail used to transport CCR from BRF to the proposed site?	Potential for rail transport?	No	No	No	Yes	No	No	No	No		Dependence on rail is not as desirable due to cost.
4.6 - Potential for Barge	Is barge used to transport CCR from BRF to the proposed site?	Potential for barge transport?	Yes	No	No	No	Yes	No	Yes	No		Dependence on barge is not as desirable and introduces more risk due to potential spills directly in the river.
4.7 -Transportation Cost	What is the estimated operational costs of transporting CCR materials by truck?	Round Trip Travel Time (min)	19.0	15.0	20.6	26.0	37.0	46.0	59.2	5.0	30.4	Larger numbers are not desirable.
		Travel Time per day (hrs)-Based on 30 trips/day	9.5	7.5	10.3	13.0	18.5	23.0	29.6	2.5	15.2	Larger numbers are not desirable.
		Daily Haul Cost	$1,330.0	$1,050.0	$1,442.0	$1,820.0	$2,590.0	$3,220.0	$4,144.0	$350.0	$2,128.0	Larger numbers are not desirable.
4.8 - Availability of Cover Soil	Potential rock excavation	Depth to rock (in)	60.5	63.1	61.8	62.8	34.2	25.1	29.3	60.0		Smaller numbers are not desirable
	Is there a suitable amount of cover soil on site to provide a landfill cover?	Volume of cover soil (cu yd); need for borrow material; haul distance from borrow site	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	The need for a borrow site is not as desirable.

APPENDIX C:
Qualitative Rank Scoring

Appendix C: Qualitative Ranking Scoring

EVALUATION CRITERION	DEFINITION/ CLARIFICATION / METHOD OF MEASUREMENT	SITE								
		Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge
1.0 NATURAL ENVIRONMENT										
1.1 - Streams	Potential for impact on streams.	1	3	2	2	5	3	4	3	1
1.2 - Wetlands	Potential for filling of wetlands.	1	1	1	1	1	1	3	2	1
1.3 - Sensitive Species	Potential to impact known T&E species and critical habitat.	2	2	2	2	2	2	2	2	1
1.4 - Managed Areas	Potential to impact known publicly managed areas.	1	1	1	1	1	1	2	1	1
1.5 - Vegetation/Wildlife	Potential to impact vegetated cover types including: forests, prairies, or other vegetated areas of significance.	3	3	2	1	2	3	3	2	1
1.6 - Air Quality	Potential for impact on air quality. Consideration of fugutive emissions near residential areas.	4	4	4	3	3	3	1	2	3
1.7 - Noise	Impact on sensitive noise receptors (e.g., residence, church, school, library).	2	3	4	3	5	5	4	1	5
1.8 - Hazardous Waste	Consider costs and liabilities incurred from the acquisition of sites potentially containing special / hazardous wastes.	1	1	1	1	1	1	1	1	1
1.9 - Visual Environment	Effects from potential CCR landfill on existing visual environment.	4	2	2	2	1	3	1	3	1
1.10 - Prime Farmland	Conversion of prime and unique farmland and farmland of statewide or local importance.	1	1	3	1	1	1	2	2	1
1.12 - Floodplains	Potential impacts to FEMA floodplains	1	1	1	1	1	1	1	1	1
Natural Environment Totals		**21**	**22**	**23**	**18**	**23**	**24**	**24**	**20**	**17**
2.0 GEOLOGY										
2.1 - Karst Conduit Potential	Impacts to geological formations susceptible to subsurface fracturing and faulting (low suitability).	5	3	4	4	1	1	1	2	1
2.2 - Geologic Stability	Based on topographic relief and surface features	4	2	3	3	2	3	2	1	1
2.3 - Sinkholes and Caves	Impacts to sinkholes and potential for conduit flow; impacts to caves; impacts to springs	1	1	1	3	1	1	1	1	1
2.4 - Ground Water Resources	Impacts to recharge areas, sole-source aquifers.	1	1	1	1	1	1	1	1	1
2.5 - Seismic Zones	Impacts to known fault zones.	1	1	1	1	1	1	1	1	1
2.6 - Mines and Mineral Resources	Proximity of corridor to mine shafts and potential impacts to existing mines and potential mineral resources.	1	1	1	1	1	1	1	1	1
Geology Totals		**13**	**9**	**11**	**13**	**7**	**8**	**7**	**7**	**6**
3.0 HUMAN ENVIRONMENT										
3.1 - Land Use	Evaluate the consistency of the CCR storage site with existing land uses.	5	5	5	5	5	5	4	3	1
3.2 - Zoning	Evaluate the compatibility of proposed site with current zoning.	4	4	5	4	4	4	3	2	1

Appendix C: Qualitative Ranking Scoring

EVALUATION CRITERION	DEFINITION/ CLARIFICATION / METHOD OF MEASUREMENT	SITE								
		Site A	Site C	Site D	Site E	Site G	Site H	Site I	Site J	Chestnut Ridge
3.3 - Displacements	Residential	2	2	2	1	1	1	1	1	1
	Commercial/Industrial	1	1	1	1	1	1	1	1	1
	Utilities	1	3	1	1	1	2	1	4	1
3.4 - Property Acquisition	Impact of property acquisition	3	3	4	2	2	2	3	1	1
3.5 - Farmland Impacts	Impact on farm acreage and operations	2	1	2	3	2	1	1	2	1
3.6 - Public/Semi-Public Lands	Effects to public/semi-public land uses (i.e., churches, special interest groups, schools, etc.).	1	1	1	2	1	1	1	2	1
3.7 - Cultural Resources	Effects on NRHP sites or sites likely to be NRHP eligible archeological sites and historical architectural sites.	3	1	2	2	3	3	3	1	1
3.8 - Community Cohesion	Effects to neighborhoods and communities in the vicinity of the proposed CCR storage site	1	1	1	1	1	1	1	1	1
3.9 - Environmental Justice	Effects to minority and low-income populations in the vicinity of the proposed CCR storage site	4	3	3	1	4	3	1	4	3
3.10 - Economic Impacts	Short term employment and tax impacts	1	1	1	1	1	1	1	1	3
Human Environment Totals		**28**	**26**	**28**	**24**	**26**	**25**	**21**	**23**	**16**
4.0 ENGINEEERING / TRANSPORTATION										
4.1 - Site Capacity	Is the size of the parcel adequate for anticipated CCR Storage requirements?	1	1	1	1	1	1	1	1	1
4.2 - Slope / Soil Stability	Assess the existing slopes to determine if soils on site are stable for CCR storage construction.	3	3	1	2	1	3	1	3	1
4.3 - Distance to BRF	Evaluate the distance from BRF to the proposed CCR disposal site to and assess the characteristics of the road network between the two. Determine potential risks associate with transport of CCR on public roadways.	2	2	2	2	3	3	4	1	3
4.4 - Traffic Operations	Evaluate the effects on Level of Service along the haul route to the proposed site.	2	2	2	3	2	2	3	1	2
4.7 - Transportation Cost	Daily haul cost to transport CCR materials from BRF (based on truck travel time and tipping costs)?	2	2	2	3	4	4	5	1	5
4.8 - Availability of Cover Soil	Is there a suitable amount of cover soil on site to provide landfill cover?	2	2	2	2	3	3	3	2	1
Engineering / Transportation Totals		**12**	**12**	**10**	**13**	**14**	**16**	**17**	**9**	**13**
Total Site Scores		**74**	**69**	**72**	**68**	**70**	**73**	**69**	**59**	**52**

Score Definitions:
1: No to low unavoidable adverse impact, moderate benefit
2: Low to moderate adverse impact, low to moderate benefit
3: Adverse impact moderate, low benefit
4: Moderate to high adverse impact, minimal to low benefit
5: High unavoidable adverse impact, no benefit

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Appendix C – Engineering Drawings of the Proposed Landfill and Haul Road

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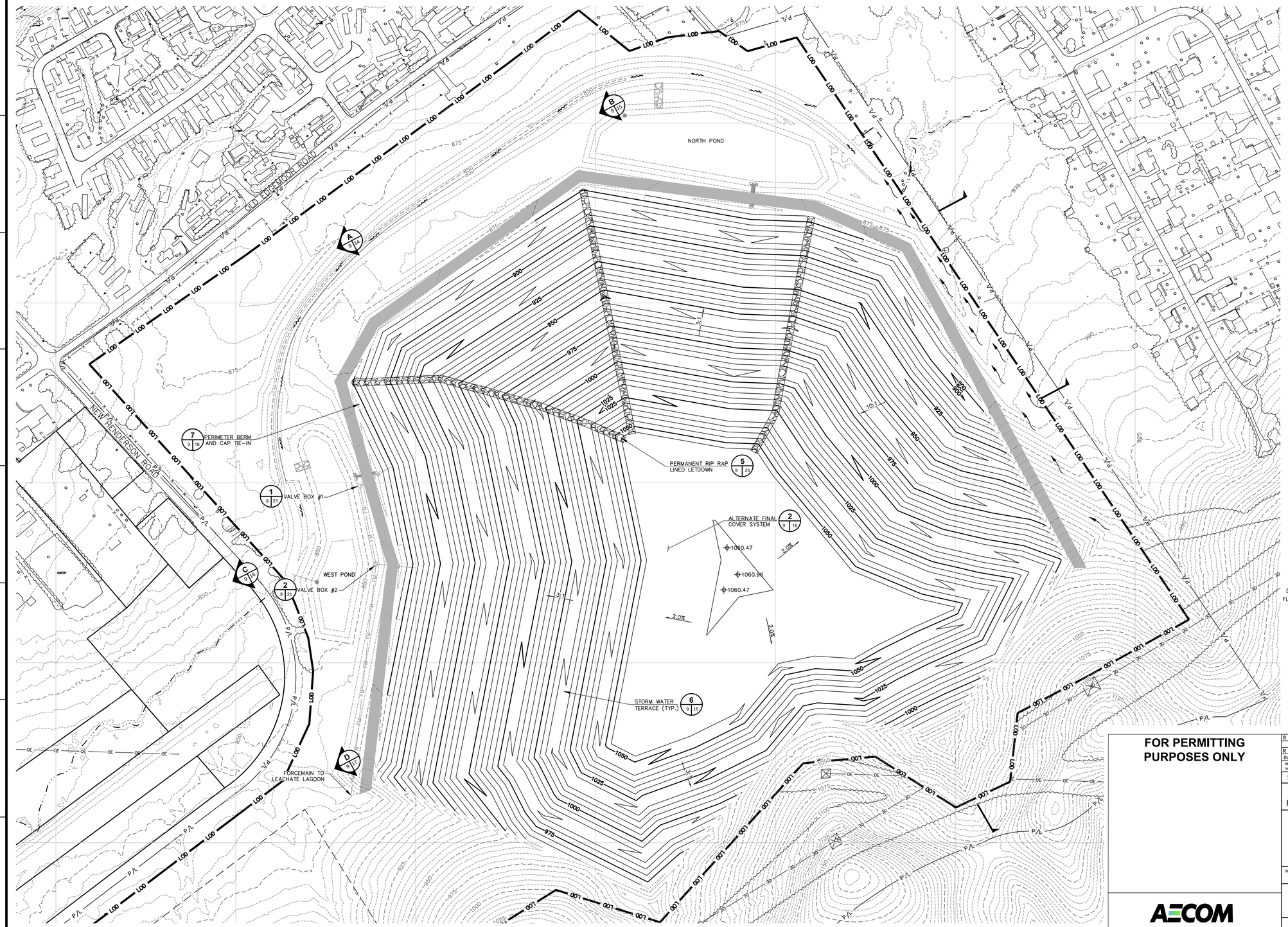
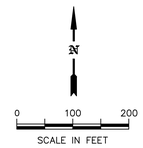
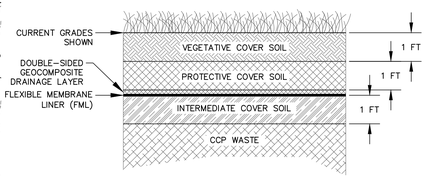




LEGEND

- 500 — EXISTING MAJOR CONTOURS (25')
- EXISTING MINOR CONTOURS (5')
- 500 — PROPOSED MAJOR CONTOURS (25')
- PROPOSED MINOR CONTOURS (5')
- LOD — LIMITS OF DISTURBANCE
- FM — FORCEMAIN PIPE
- OE — OVERHEAD LINE
- PROPOSED PERIMETER ROAD
- STORM WATER RUN-OFF FLOW DIRECTION
- EXISTING STREAM
- TRANSMISSION TOWER



ALTERNATE FINAL COVER SYSTEM

FOR PERMITTING PURPOSES ONLY

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SCALE: 1" = 100' EXCEPT AS NOTED

DISCIPLINE INTERFACE

FINAL COVER AND GRADING PLAN

CLASS II DISPOSAL FACILITY PERMIT DRAWINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
SEB	CLF	NSG	TAK	RBC	MST	JCK

AECOM

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2013 | DATE 10/07/15 | 49 | C | 10W392-09 | R A

AECOM Corporation | A
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PLOT FACTOR:XX
W_TVA

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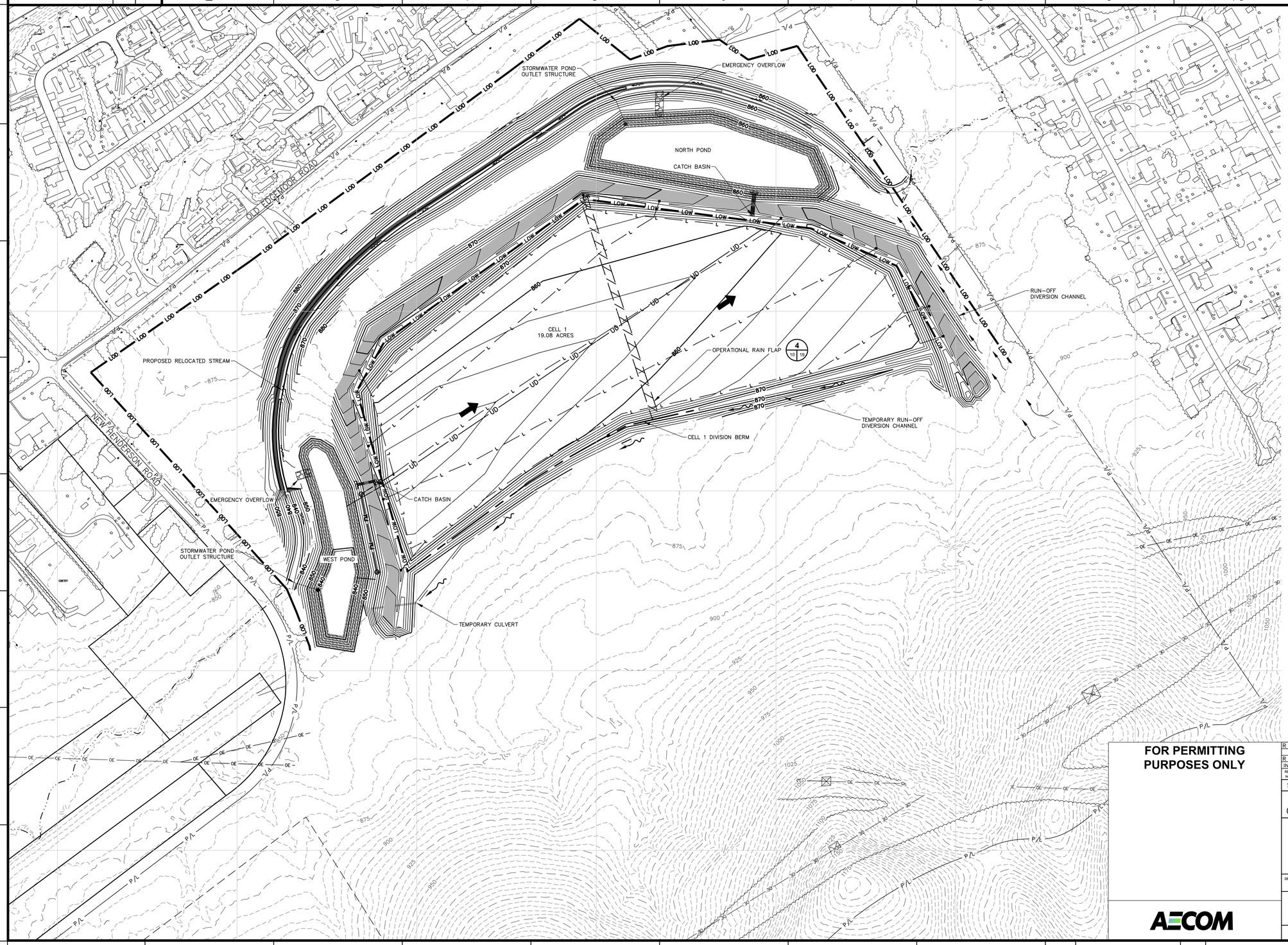

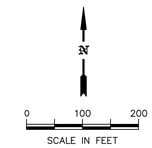

LEGEND

- 500 — EXISTING MAJOR CONTOURS (25')
- EXISTING MINOR CONTOURS (5')
- 500 — PROPOSED MAJOR CONTOURS (10')
- PROPOSED MINOR CONTOURS (2')
- LOW — PROPOSED LIMIT OF WASTE
- LOD — LIMITS OF DISTURBANCE
- OE — OVERHEAD LINE
- PROPOSED PERIMETER ROAD
- STORM WATER RUN-OFF FLOW DIRECTION
- CELL 1 DIVISION BERM
- FILL PROGRESSION
- PROPOSED RAIN FLAP
- EXISTING STREAM
- TRANSMISSION TOWER

NOTES:

1. OPERATIONAL RAINFLAPS OR SUB-CELL DIVISION BERMS SHOULD BE USED TO LIMIT THE SIZE OF THE ACTIVE AREA. RAINFLAP LOCATIONS ARE APPROXIMATE AND CAN BE MODIFIED BASED ON OPERATIONAL CONDITIONS.
2. THE OPERATIONAL AND CONSTRUCTION SEQUENCING OUTLINED IN THESE DEVELOPMENT PLANS REPRESENTS ONE POSSIBLE PLAN FOR THE SYSTEMATIC DEVELOPMENT OF THE FACILITY. CHANGES TO THE DEVELOPMENT SEQUENCE MAY BE MADE BY THE OPERATOR TO ACCOUNT FOR FIELD CONDITIONS ENCOUNTERED OR OPERATIONAL PREFERENCES. IN ANY CASE, THE ACTUAL DEVELOPMENT OF THE FACILITY SHALL BE IN ACCORDANCE WITH THE APPLICABLE REGULATIONS AND THE ENGINEERING OBJECTIVE OF THIS PLAN. PRIOR TO MAKING ANY CHANGES TO THE FACILITY'S PERMITTED ENGINEERING COMPONENTS, TDEC APPROVAL IS REQUIRED.
3. ACCESS RAMPS CONSTRUCTED FROM PROTECTIVE COVER MATERIAL SHALL BE PROVIDED INTO EACH CELL. A DUMP PAD SHALL BE CONSTRUCTED FOR INITIAL WASTE PLACEMENT.
4. PROPOSED GRADING SHOWN REPRESENTS TOP OF COMPACTED CLAY LINER, SEE SHEET 6.

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AECOM

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SCALE: 1" = 100 EXCEPT AS NOTED

CELL 1 DEVELOPMENT PLAN

CLASS II DISPOSAL FACILITY PERMIT DRAWINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
SSK	SSK	NSG	TAK	RBC	MST	JCK

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

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SCALE IN FEET

LEGEND

- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- PROPOSED LIMIT OF WASTE
- LIMITS OF DISTURBANCE
- OVERHEAD LINE
- PROPOSED PERIMETER ROAD
- STORM WATER RUN-OFF FLOW DIRECTION
- TEMPORARY TAG-ON TERRACES
- FILL PROGRESSION
- LIMITS OF CELL 1 WASTE PLACEMENT
- PROPOSED RAIN FLAP
- EXISTING STREAM
- TRANSMISSION TOWER

NOTES:

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4. PROPOSED GRADING SHOWN REPRESENT TOP OF ASH/WASTE AND TOP OF COMPACTED CLAY, SEE SHEET 6.

FOR PERMITTING PURPOSES ONLY

AECOM

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SCALE: 1" = 100' EXCEPT AS NOTED

DISCIPLINE INTERFACE

CELL 2 DEVELOPMENT PLAN

CLASS II DISPOSAL FACILITY PERMIT DRAWINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
SSK	SSK	NSG	TAK	RBC	MST	JCK

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2013 | DATE 10/07/15 | 49 | C | 10W392-11 | R A

PLOT FACTOR:XX
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SCALE IN FEET

LEGEND

- EXISTING MAJOR CONTOURS
- EXISTING MINOR CONTOURS
- PROPOSED MAJOR CONTOURS
- PROPOSED MINOR CONTOURS
- PROPOSED LIMIT OF WASTE
- LIMITS OF DISTURBANCE
- OVERHEAD LINE
- PROPOSED PERIMETER ROAD
- STORM WATER RUN-OFF FLOW DIRECTION
- TEMPORARY TAG ON TERRACES
- FILL PROGRESSION
- CELL SEPARATION BERMS
- PROPOSED RAIN FLAP
- EXISTING STREAM
- TRANSMISSION TOWER

NOTES:

1. OPERATIONAL RAINFLAPS OR SUB-CELL DIVISION BERMS SHOULD BE USED TO LIMIT THE SIZE OF THE ACTIVE AREA TO APPROXIMATELY 10 ACRES. RAINFLAP LOCATIONS ARE APPROXIMATE AND CAN BE MODIFIED BASED ON OPERATIONAL CONDITIONS.
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4. PROPOSED GRADING SHOWN REPRESENTS TOP OF ASH/WASTE AND TOP OF COMPACTED CLAY LINER, SEE SHEET 6.

FOR PERMITTING PURPOSES ONLY

AECOM

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SCALE: 1" = 100' EXCEPT AS NOTED

CELL 3 DEVELOPMENT PLAN

CLASS II DISPOSAL FACILITY PERMIT DRAWINGS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
SSK	SSK	NSG	TAK	RBC	MST	JCK

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD	2013	DATE 10/07/15	49	C	10W392-12	R A

PLOT FACTOR:XX
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AECOM Corporation	A
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10WXXX-104

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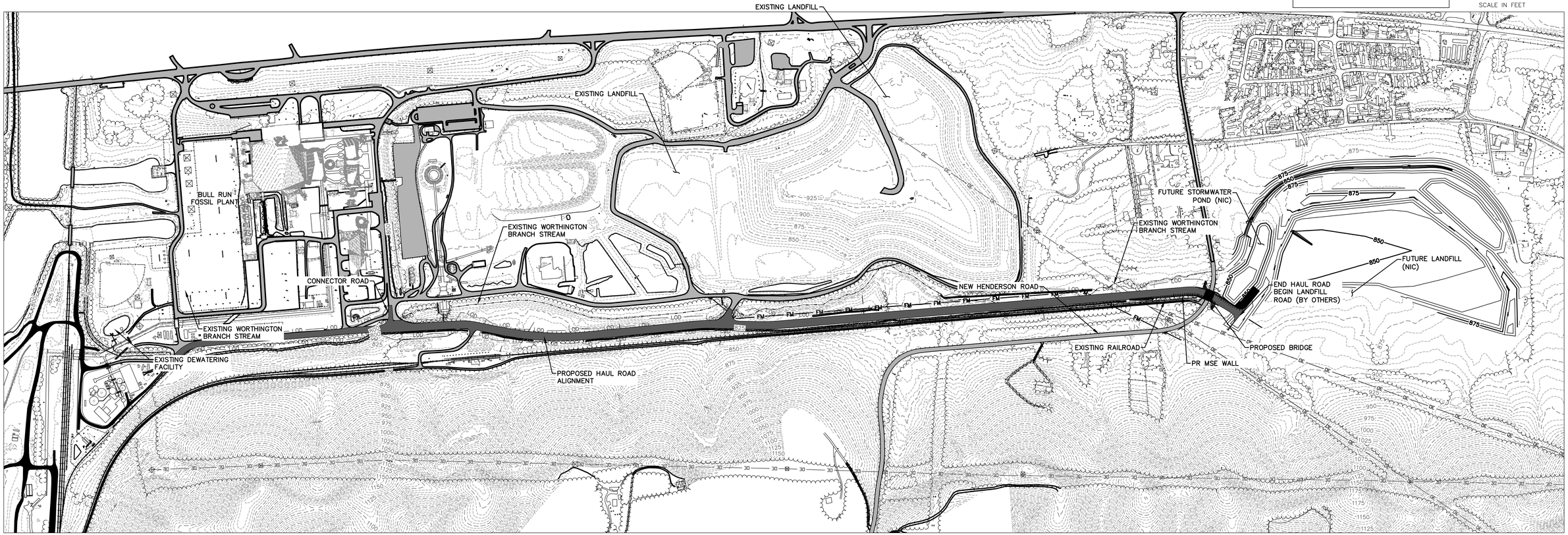
	FUTURE MINOR CONTOURS (1')
500	EXISTING MAJOR CONTOURS (25')
	EXISTING MINOR CONTOURS (1')
NIC	NOT IN CONTRACT
FM	FORCEMAIN
	EXISTING ROAD
	PROPOSED HAUL ROAD
	RAILROAD TRACKS
	TREELINE
	STREAMS
OE	OVERHEAD ELECTRIC
	EX. TRANSMISSION TOWERS

0 250 500
SCALE IN FEET



FOR SUPPORTING DESIGN CALCULATIONS SEE

DRAFT

NOT FOR CONSTRUCTION

AECOM

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R											
R											

DISCIPLINE INTERFACE

SCALE: 1" = 250' EXCEPT AS NOTED

PROPOSED SITE PLAN

CCP HAUL ROAD

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
AMD	MJT	MAW				

BULL RUN FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD 2015 | DATE 12/17/15 | ## | 10WXXX-104 | R

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TASK COMPLETED BY: | REV NO.

PLOT FACTOR: W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

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Appendix D – Coordination

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

February 3, 2016

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), BULL RUN FOSSIL PLANT, PROPOSED HAUL ROAD FOR COAL COMBUSTION PRODUCTS (CCP) LANDFILL, KNOX COUNTY, TENNESSEE (36° 1' 30" N, 84° 08' 32" W)

Since 2011, TVA has been considering the construction of a new coal combustion products (CCP) disposal area on property adjacent to Bull Run Fossil Plant (BRF), in order to expand the plant's capacity to store CCP (fly ash, bottom ash, and gypsum). We have carried out three investigations, including both archaeological and architectural surveys, under Section 106 of the National Historic Preservation Act, in relation to various parts of the area of potential effects (APE). To date, TVA has identified no historic properties that would be affected by the proposed undertaking. We have consulted previously with your office regarding the findings of these surveys and the undertaking's potential effects on historic properties. In late 2011, TVA consulted with your office regarding geotechnical boring within an area known as Site J, which was part of a siting survey for the proposed CCP landfill. In 2012, TVA consulted regarding the BRF CCP Disposal Area Property Acquisition Project. In April 2012, TVA consulted regarding an archaeological survey at tract BRSP-117. In each case, your office concurred with TVA's finding of no historic properties affected (letters dated 12-8-2011 and 1-3-2012; 11-6-2012 and 12-12-2012; and 5-17-2013, respectively).

TVA has recently proposed constructing a haul road to transport ash and gypsum to the proposed new CCP disposal area. Figures 1 and 2 (below) show the location of the proposed haul road and the areas where TVA has carried out previous surveys in relation to the undertaking. The haul road would run east and west, parallel to and just north of the existing railroad for a distance of ca. 3,600 feet before turning north along New Henderson Road. TVA proposes expanding the undertaking's APE to include this proposed new haul road.

Although the eastern portion of the haul road overlaps with areas previously surveyed, the majority of the expanded portion of the APE has not been surveyed. However, this area has been affected by past railroad construction and by activities related to the construction and use of BRF. TVA finds that this area has no potential for the presence of intact archaeological sites.

As the haul road would have no above-ground elements, TVA does not consider its construction to have potential to affect historic architectural resources that may be present in the viewshed.

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

Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's finding of no historic properties affected for the expanded portion of the undertaking's APE.

If you have any questions or comments, please contact Richard Yarnell by telephone at (865) 632-3463 or by email at wryarnell@tva.gov.

Sincerely,

Clinton E. Jones
Manager, Biological and Cultural Compliance
Safety, River Management and Environment
WT11C-K

SCC:CSD
Enclosures
cc (Enclosures):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

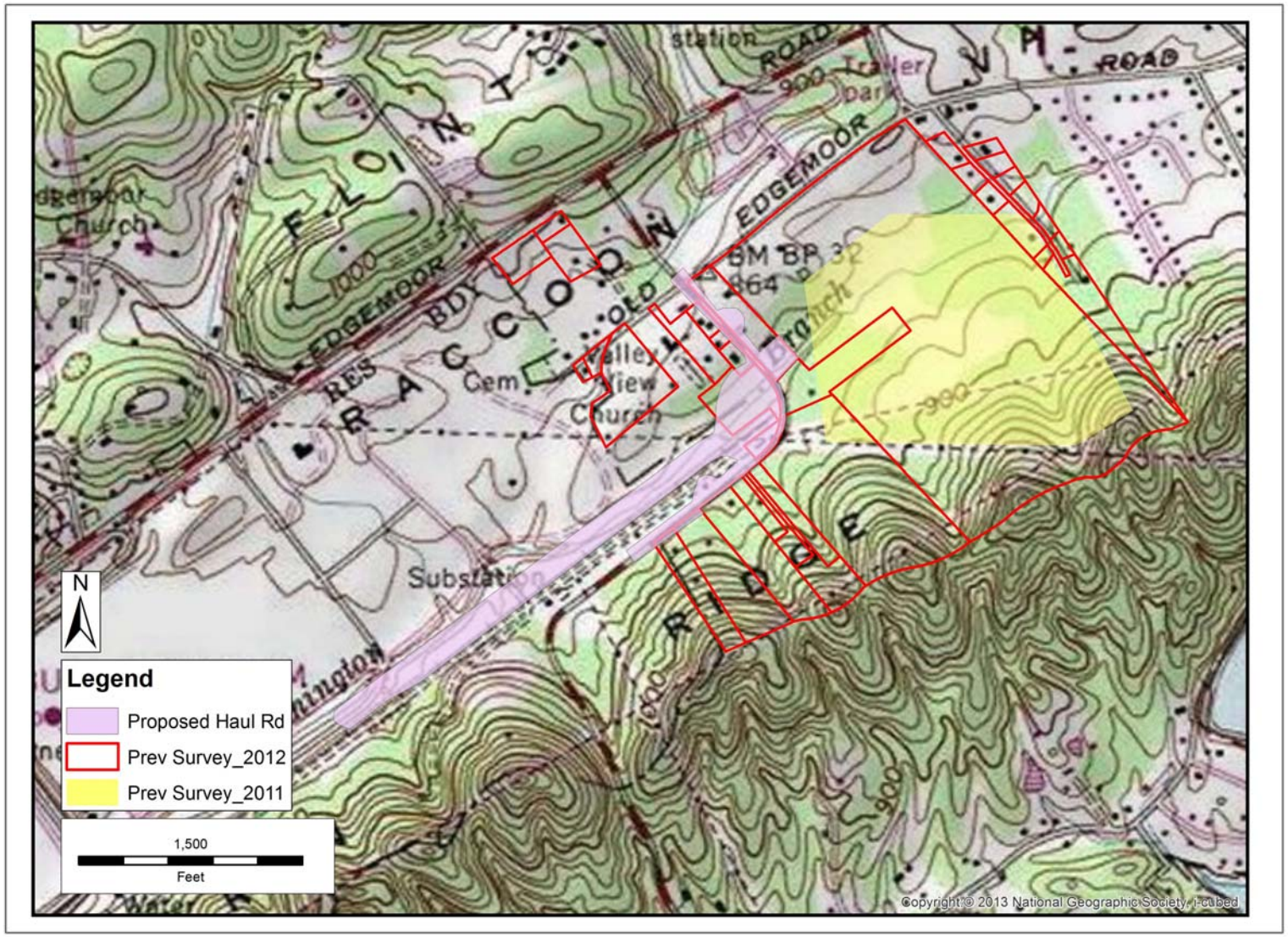

Figure 1. Proposed new haul road and 2011 and 2012 survey areas.

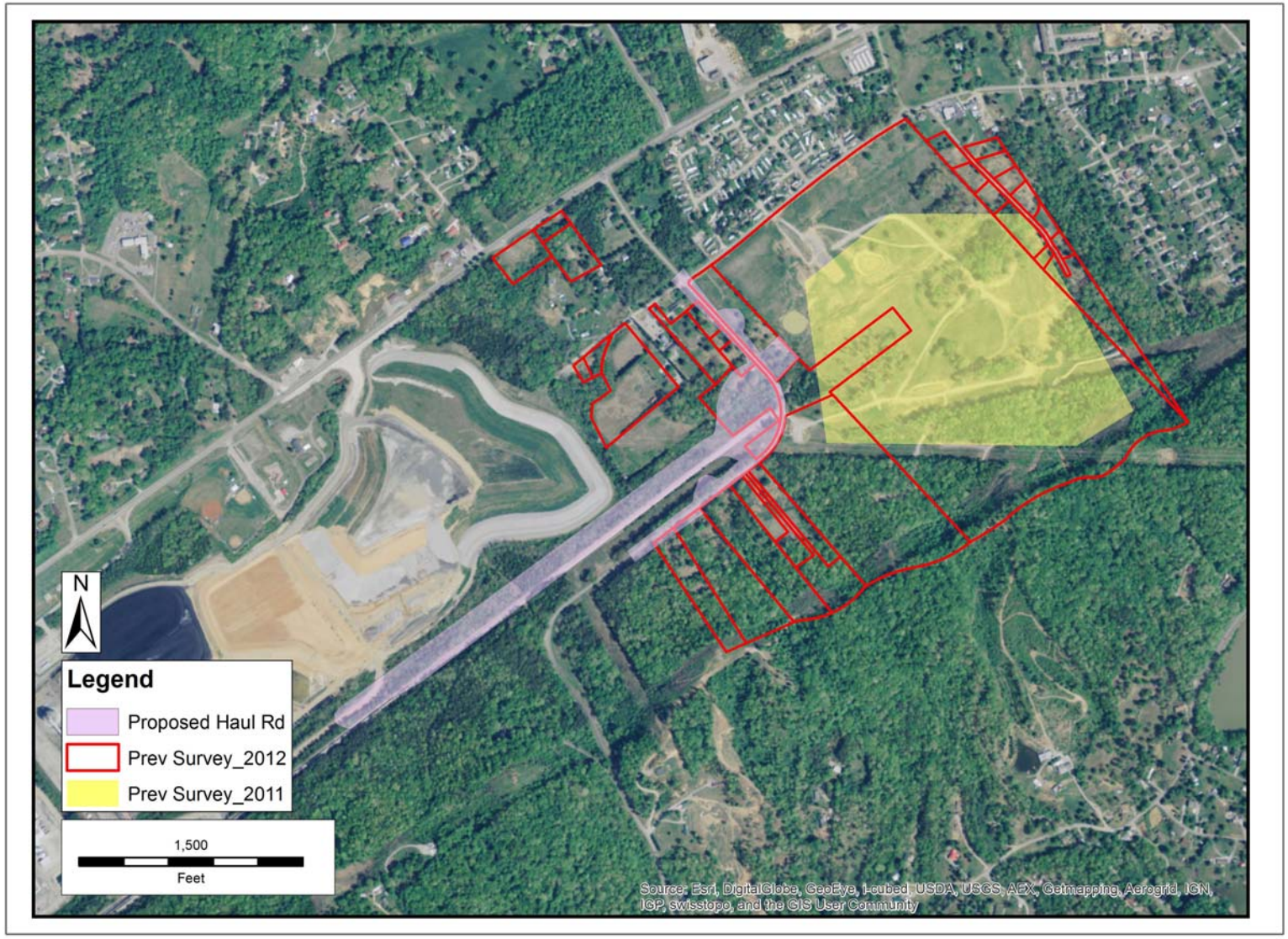

Figure 2. Proposed new haul road and previously surveyed areas.

INTERNAL COPIES:

Amy Henry, WT11D-K
Susan Jacks, WT11C-K
Skip Markham, BR 4A-C
Anita Masters, BR 4A-C
Paul Pearman, BR 4A-C
Richard Yarnell, WT11D-K
EDMS, WT CA-K

Dudley, Cynthia S

From: Shuler, Marianne M
Sent: Tuesday, February 09, 2016 9:48 AM
To: 'sheila-bird@cherokee.org'; joe bunch; 'Tyler B. Howe (tylehowe@nc-cherokee.com)'; 'celestine.bryant@actribe.org'; 'llangley@coushatta.org'; 'dc13.dc4@gmail.com'; 'thpo@tttown.org'; 'section106@mcn-nsn.gov'; 'kblanchard@astribe.com'; 'Robin Dushane (RDushane@estoo.net)'; 'Kim Jumper'
Cc: Ezzell, Patricia Bernard; 'Russell Townsend (RussellT@nc-cherokee.com)'; 'llonghorn@astribe.com'; 'Dee Gardner (dgardner@estoo.net)'
Subject: TVA-BRF CCP Haul Road, Knox County, TN 2-9-16
Attachments: TVA-BRF CCP Haul Rd Knox County TN 20160209.pdf

Good Morning
By this email, I am sending the attached letter regarding TVA's proposal to construct a new coal combustion products (CCP) disposal area on property adjacent to Bull Run Fossil Plant (BRF), in order to expand the plant's capacity to store CCP (fly ash, bottom ash, and gypsum) in Knox County, TN. We have carried out three investigations, including both archaeological and architectural surveys, under Section 106 of the National Historic Preservation Act, in relation to various parts of the area of potential effects (APE). We have consulted previously with your office regarding the findings of these surveys and the undertaking's potential effects on historic properties.

Let me know if you have any questions. Please respond by March 10, 2016 if you have any comments on this proposed undertaking.

Thanks
Marianne

Marianne Shuler
Archaeologist
TVA Biological & Cultural Compliance
865-632-2464
mmshuler@tva.gov

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

February 9, 2016

To Those Listed:

TENNESSEE VALLEY AUTHORITY (TVA), BULL RUN FOSSIL PLANT, PROPOSED HAUL ROAD FOR COAL COMBUSTION PRODUCTS (CCP) LANDFILL, KNOX COUNTY, TENNESSEE (36° 1' 30" N, 84° 08' 32" W)

Since 2011, TVA has been considering the construction of a new coal combustion products (CCP) disposal area on property adjacent to Bull Run Fossil Plant (BRF), in order to expand the plant's capacity to store CCP (fly ash, bottom ash, and gypsum). We have carried out three investigations, including both archaeological and architectural surveys, under Section 106 of the National Historic Preservation Act, in relation to various parts of the area of potential effects (APE). To date, TVA has identified no historic properties that would be affected by the proposed undertaking. We have consulted previously with your office regarding the findings of these surveys and the undertaking's potential effects on historic properties. In late 2011, TVA consulted with your office regarding geotechnical boring within an area known as Site J, which was part of a siting survey for the proposed CCP landfill. In 2012, TVA consulted regarding the BRF CCP Disposal Area Property Acquisition Project. In May 2013, TVA consulted regarding an archaeological survey at tract BRSP-117.

TVA has recently proposed constructing a haul road to transport ash and gypsum to the proposed new CCP disposal area. Figures 1 and 2 (below) show the location of the proposed haul road and the areas where TVA has carried out previous surveys in relation to the undertaking. The haul road would run east and west, parallel to and just north of the existing railroad for a distance of circa 3,600 feet before turning north along New Henderson Road. TVA proposes expanding the undertaking's APE to include this proposed new haul road.

Although the eastern portion of the haul road overlaps with areas previously surveyed, the majority of the expanded portion of the APE has not been surveyed. However, this area has been affected by past railroad construction and by activities related to the construction and use of BRF. TVA finds that this area has no potential for the presence of intact archaeological sites.

As the haul road would have no above-ground elements, TVA does not consider its construction to have potential to affect historic architectural resources that may be present in the viewshed.

Pursuant to 36 C.F.R. Part 800.3(f)(2), TVA is consulting with the following federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Alabama-Coushatta Tribe of Texas, Coushatta Tribe of Louisiana, Kialegee Tribal Town,

Thlopthlocco Tribal Town, Muscogee (Creek) Nation of Oklahoma, Absentee Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma, and Shawnee Tribe.

By this letter, TVA is providing notification of these findings and is seeking your comments regarding this undertaking and any properties that may be of religious and cultural significance and may be eligible for listing in the NRHP, pursuant to 36 CFR § 800.2(c)(2)(ii), 800.3(f)(2), and 800.4(a)(4)(b).

Please respond by March 10, 2016, if you have any comments on the proposed undertaking. If you have any questions, please contact me at (865)632-6461 or by email at pbezzell@tva.gov

Sincerely,

Patricia Bernard Ezzell
Senior Program Manager
Tribal Relations and Corporate Historian
Communications
WT 7D-K

MMS:CSD
Enclosures

IDENTICAL LETTER MAILED TO THE FOLLOWING ON FEBRUARY 9, 2016:

Ms. Sheila Bird
Cherokee Nation
Post Office Box 948
Tahlequah, Oklahoma 74465

Mr. Ken Blanchard
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper
Shawnee, Oklahoma 74801

Ms. RaeLynn Butler
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee, Oklahoma 74447

Mr. Bryant Celestine
Tribal Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Rd. 56
Livingston, Texas 77351

Mr. David Cook
Tribal Administrator
Kialegee Tribal Town
Post Office Box 332
Wetumka, Oklahoma 74883

Ms. Robin DuShane
Tribal Historic Preservation Officer
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

cc: Ms. Dee Gardner
NAGPRA/Cell Tower Coordinator
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Mr. Tyler Howe
Tribal Historic Preservation Specialist
Historic Preservation Specialist
Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

cc: Mr. Russell Townsend
Tribal Historic Preservation Officer
Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, North Carolina 28719

Ms. Kim Jumper
Tribal Historic Preservation Officer
Shawnee Tribe
Post Office Box 189
Miami, Oklahoma 74355

Dr. Linda Langley
Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana
P.O. Box 10
Elton, Louisiana 70532

Ms. Lisa C. LaRue-Baker
United Keetoowah Band of Cherokee Indians in Oklahoma
Post Office Box 746
Tahlequah, Oklahoma 74465

Mr. Emman Spain
Tribal Historic Preservation Officer
P.O. Box 188
Okemah, Oklahoma 74859

INTERNAL COPIES:

Amy Henry, WT11D-K
Susan Jacks, WT11C-K
Skip Markham, BR 4A-C
Anita Masters, BR 4A-C
Paul Pearman, BR 4A-C
Richard Yarnell, WT11D-K
EDMS, WT CA-K

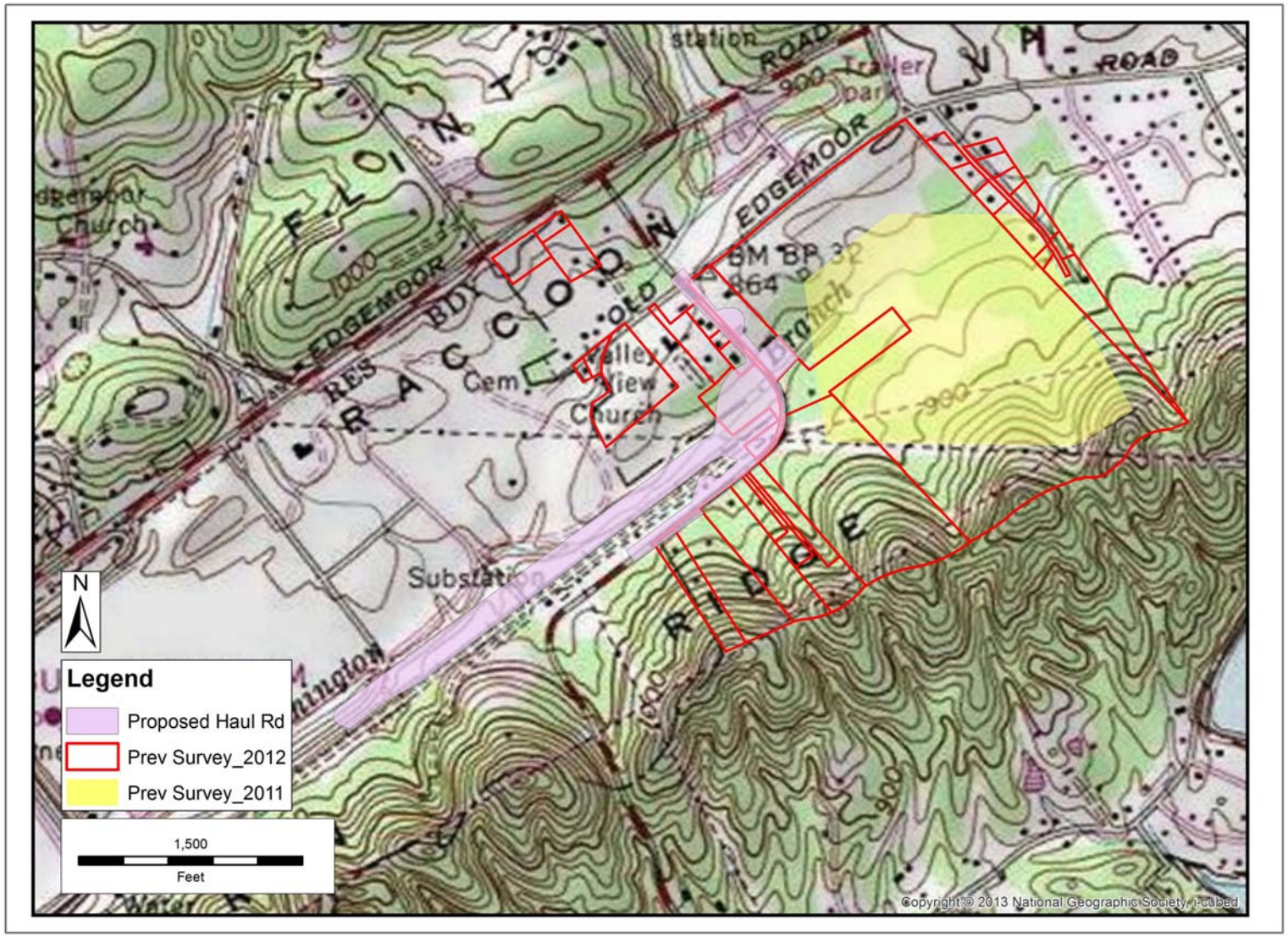

Figure 1. Proposed new haul road and 2011 and 2012 survey areas.

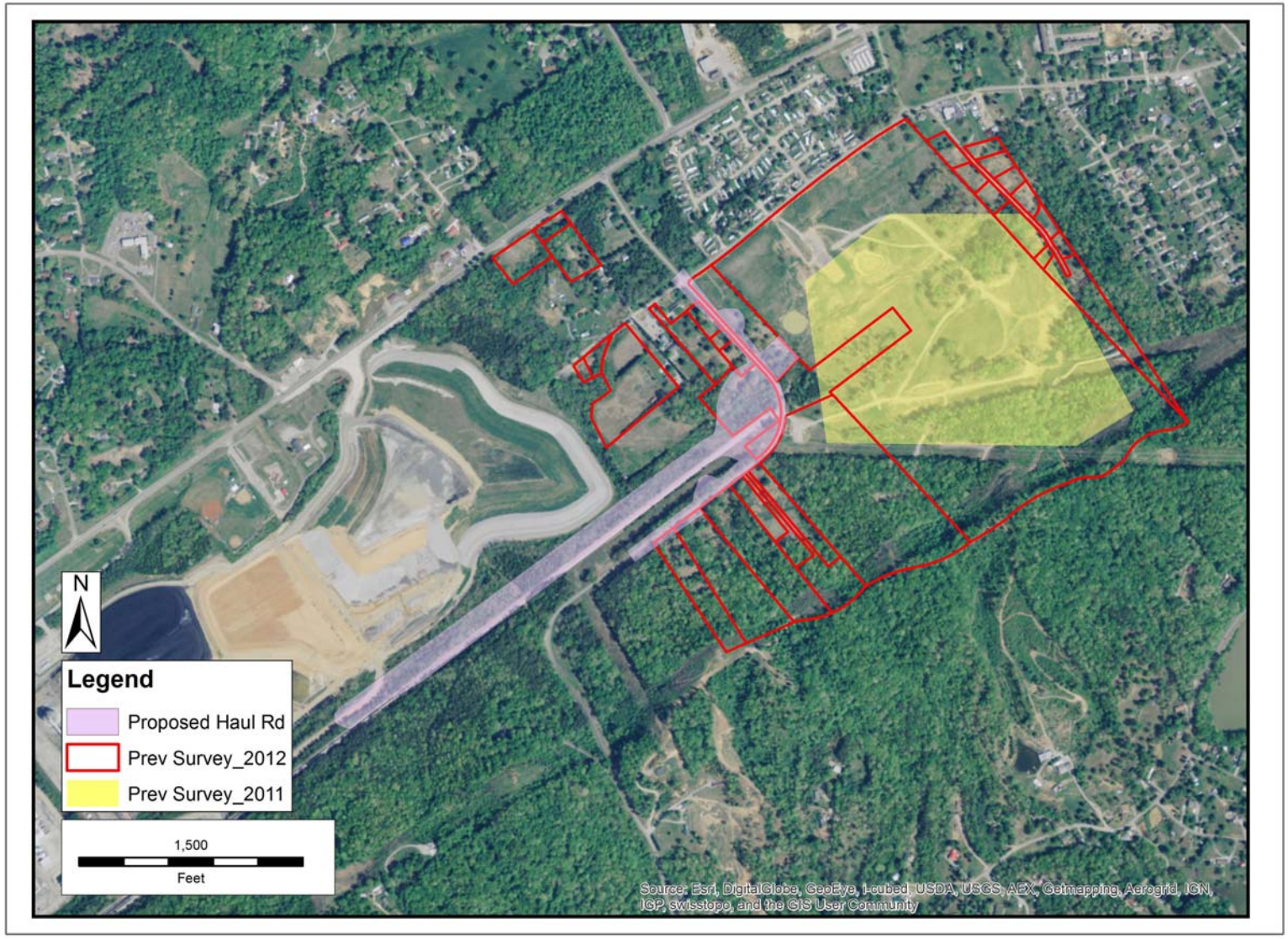

Figure 2. Proposed new haul road and previously surveyed areas.