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**DAM SAFETY MODIFICATIONS AT
CHEROKEE, FORT LOUDOUN, TELlico, AND WATTS BAR
DAMS
DRAFT ENVIRONMENTAL IMPACT STATEMENT**

Grainger, Jefferson, Loudoun, Rhea, and Meigs Counties, Tennessee

Prepared by:
TENNESSEE VALLEY AUTHORITY
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COVER SHEET

Draft Environmental Impact Statement for Dam Safety Modifications at Cherokee, Fort Loudoun, Tellico, and Watts Bar Dams

Proposed action: To minimize the potential effects of the probable maximum flood event determined based on revised modeling, TVA implemented temporary precautionary measures at four (Cherokee, Fort Loudoun, Tellico, and Watts Bar) dams. TVA has now developed permanent solutions for the temporary measures that were put in place to correct safety deficiencies identified at these dams. The purpose and need for the proposed action is to 1) prevent the potential impacts associated with a possible dam failure due to overtopping, and 2) prevent an increase in downstream flood elevations.

Type of document: Draft Environmental Impact Statement

Lead agency: Tennessee Valley Authority

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Abstract:

The Tennessee Valley Authority (TVA) has prepared an Environmental Impact Statement (EIS) for permanent dam safety modifications at Cherokee, Fort Loudoun, Tellico, and Watts Bar dams in Tennessee. In 2009, TVA implemented precautionary measures and installed stone-filled HESCO barriers at all four dams and strengthened the downstream embankment of Watts Bar Dam in order to minimize the potential effects of the Probable Maximum Flood (PMF) event determined based on revised flood models. In 2012, the Nuclear Regulatory Commission (NRC) outlined the need for replacement of the temporary HESCO barriers in a letter to TVA. Therefore, this EIS documents the analysis of a No Action Alternative (HESCO barriers remain in place), and two Action Alternatives (HESCO barriers removed and replaced by permanent flood protection structures).

Under the No Action Alternative (Alternative A), TVA would continue to use HESCO barriers to minimize the potential for failure of the four dams and prevent an increase in flooding at downstream locations, including TVA's nuclear plants during the PMF. Under the first of two Action Alternatives (Alternative B), TVA would remove the HESCO barriers and install

permanent dam modifications in the form of a combination of concrete floodwalls, raised earthen embankments or earthen berms, and gap closure barriers (gate-like barriers used to close gaps between the floodwalls) at each of the four dams. Under the second Action Alternative (Alternative C), TVA would remove the HESCO barriers and install permanent dam modifications at each of the four dam structures. The potential modifications would consist entirely of concrete floodwalls and gap closure barriers (no embankments or berms).

TVA completed scoping for the EIS, including a 55-day comment period, two open house meetings to collect public comments (in July and September 2011), and a request for input from Federal and state agencies, local organizations, and federally recognized Indian tribes. TVA received over 500 individual comments; primary issues included impacts to scenery (visual resources), land use, and recreation at the dams; the methodology used to calculate the PMF, and alternatives to the permanent dam modifications.

Under the Preferred Alternative (Alternative B), construction of permanent modifications at Cherokee, Fort Loudoun, Tellico, and Watts Bar dams would result in short-term, minor, adverse impacts to Geology and Soils, Air Quality and Greenhouse Gas Emissions, Water Resources, Terrestrial Ecology (vegetation and wildlife), Recreation, Solid and Hazardous Waste, and Public Safety. Potential short-term, significant impacts to Noise and Transportation could result from implementation of the Proposed Action. This alternative would also result in short- and long-term impacts, both minor and significant, to Visual Resources at specific dam segments. Flooding and Floodplains and Socioeconomic Resources would be expected to experience beneficial, long-term impacts from the potential reduction in flood risk. There would be no effects on wetlands or threatened and endangered species, and no adverse effects on historic properties.

SUMMARY

Purpose and Need for Action

The Tennessee Valley Authority (TVA) has prepared this Draft Environmental Impact Statement (EIS) for Dam Safety Modifications to Cherokee, Fort Loudoun, Tellico, and Watts Bar Dams in order to evaluate the proposed permanent solutions for the temporary measures, which were put in place to correct safety deficiencies previously identified at these four structures.

The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in a particular drainage area. To minimize the potential effects of the PMF event determined based on revised flood modeling, temporary measures were implemented in 2009 at four dams (Cherokee, Fort Loudoun, Tellico, and Watts Bar) in Grainger, Jefferson, Loudoun, Rhea, and Meigs Counties, Tennessee. These measures consisted of raising dam elevations approximately 3 to 8 feet by installing interconnected, fabric-lined, crushed stone-filled HESCO barriers in order to safely pass the simulated worst-case floodwaters, to avoid dam overtopping and possible impacts to the downstream embankment, and to provide additional floodwater storage capacity. The downstream embankment of Watts Bar Dam was also strengthened using concrete matting.

The purpose and need of the permanent modification Proposed Action is to (1) minimize the potential for the failure from overtopping of Cherokee, Fort Loudoun, Tellico, and Watts Bar dams during the PMF; and (2) prevent an increase in flooding during the PMF at downstream locations including Watts Bar, Sequoyah, and Browns Ferry Nuclear Plants.

Alternatives

TVA has developed alternatives for minimizing the potential for the failure of Cherokee, Fort Loudoun, Tellico, and Watts Bar dams during the PMF, and for prevention of increased flooding at downstream locations during the PMF. Development of these alternatives took into consideration the level of risk reduction to the public, constructability, potential environmental impacts, and cost. TVA has performed preliminary internal scoping and identified a No Action Alternative and two Action Alternatives: (1) Permanent Modifications to Dam Structures: Combination of Concrete Floodwalls and Earthen Embankments/Berms, and (2) Permanent Modifications to Dam Structures: All Concrete Floodwalls.

Alternative A: No Action Alternative

Alternative B: Permanent Modifications of Dam Structures:
Concrete Floodwalls and Earthen Embankments/Berms

Alternative C: Permanent Modifications of Dam Structures:
All Concrete Floodwalls

Under both Alternatives B and C, the concrete floodwalls and/or earthen embankments would vary in height from 2.3 feet to 6.6 feet depending on the location.

Affected Environment and Environmental Consequences

The baseline conditions of 17 specific resource areas and the environmental consequences of the alternatives on these resource areas are evaluated. The specific resource areas were chosen to reflect:

- Operating objectives of the TVA flood protection system (e.g., flood control and public safety);
- Issues raised during the scoping process; and,
- Typical NEPA review topics (e.g., Solid and Hazardous Waste).

The Affected Environment discussion for each resource area identifies the issues of concern used to measure potential impacts on the resource, the study area (or boundaries) for the analysis, the regulatory programs and TVA management activities that govern the resource area, and the existing conditions and future trends for the resource area. Resources evaluated include: Geology and Soils, Water Resources, Air Quality and Greenhouse Gas Emissions, Flooding and Floodplains, Wetlands, Aquatic Ecology, Terrestrial Ecology, Threatened and Endangered Species, Land Use, Socioeconomics and Environmental Justice, Cultural and Historic Resources, Noise, Transportation, Visual Resources, Recreation, Solid and Hazardous Waste, and Public Safety.

The Environmental Consequences of the alternatives are also discussed for the same 17 individual resource areas with borrow/staging areas and gap closure barriers considered as appropriate. The Environmental Consequences discussions describe the potential impacts of the proposed permanent dam safety modifications on each of the affected environment resource areas.

A comparison of the impacts of the alternatives is provided in Table ES-1 below. Although the No Action Alternative would result in fewer impacts than Alternative B, it is not an adequate long-term solution for addressing the purpose and need of this project.

Alternatives B and C, the action alternatives, consist of construction of permanent modifications to the dams along the same alignments and to the same heights, and therefore, are generally similar in nature. Differences in the potential impacts associated with Alternative B versus Alternative C would be negligible for the following resource areas: Geology and Soils, Water Resources, Wetlands, Flooding and Floodplains, Aquatic Ecology, Threatened and Endangered Species, Land Use, Socioeconomics and Environmental Justice, Cultural Resources, Solid and Hazardous Waste, and Public Safety.

Alternative C would result in fewer impacts to Air Quality given that without the construction of earthen berms, there would be less particulate matter with the potential to mobilize than compared with Alternative B.

Because the construction of earthen embankments typically requires a slightly lengthier construction period, the potential construction-related, temporary impacts to Noise, Visual Resources, Transportation, and Recreation would be slightly less under Alternative C than Alternative B. However, overall Alternative B would result in fewer impacts to recreation and other visitor use at Cherokee and Tellico dams and fewer visual impacts at Cherokee, Tellico, and Watts Bar dams than would Alternative C. Construction cost evaluations conducted to date show relatively little difference in Alternatives B and C.

**Table ES-1.
Summary and Comparison of Alternatives by Resource Area**

Resource Area	Impacts from the No Action Alternative A	Impacts from Action Alternative B	Impacts from Action Alternative C
Geology and Soils	No direct, indirect or cumulative impacts anticipated	Minor, temporary negative impacts at the dam sites during construction. Ongoing existing negative impacts to soils at the borrow areas.	Minor, temporary negative impacts at the dam sites during construction. Ongoing existing negative impacts to soils at the borrow areas.
Water Resources	No direct, indirect or cumulative impacts anticipated	No direct, indirect or cumulative impacts anticipated, with the use of appropriate BMPs.	No direct, indirect or cumulative impacts anticipated, with the use of appropriate BMPs.
Air Quality and Greenhouse Gas Emissions	No direct, indirect or cumulative impacts anticipated	Minor temporary negative impacts during construction, with use of BMPs.	Minor temporary negative impacts during construction, with use of BMPs.
Flooding and Floodplains	No direct, indirect or cumulative impacts anticipated	No direct impacts. Positive indirect impacts due to downstream flood risk reduction.	No direct impacts. Positive indirect impacts due to downstream flood risk reduction.
Wetlands	No direct, indirect or cumulative impacts anticipated	No direct, indirect or cumulative impacts anticipated.	No direct, indirect or cumulative impacts anticipated.
Aquatic Ecology	No direct, indirect or cumulative impacts anticipated	No direct, indirect or cumulative impacts anticipated, with use of BMPs.	No direct, indirect or cumulative impacts anticipated, with use of BMPs.
Terrestrial Ecology	No direct, indirect or cumulative impacts anticipated	Minor direct negative impacts to marginal, already disturbed areas on the dam reservations. Minor temporary indirect impacts to wildlife due to noise and run-off during construction. Minor negative impacts at the borrow areas.	Minor direct negative impacts to marginal, already disturbed areas on the dam reservations. Minor temporary indirect impacts to wildlife due to noise and run-off during construction.
Threatened and Endangered Species	No direct, indirect or cumulative impacts anticipated	No direct, indirect or cumulative impacts anticipated to aquatic species with use of BMPs. No direct, indirect or cumulative impacts anticipated to terrestrial species with avoidance of eagle nesting season.	No direct, indirect or cumulative impacts anticipated to aquatic species with use of BMPs. No direct, indirect or cumulative impacts anticipated to terrestrial species with avoidance of eagle nesting season.
Land Use	No direct, indirect or cumulative impacts anticipated.	No direct, indirect or cumulative impacts anticipated as all construction would occur on the dam reservations.	No direct, indirect or cumulative impacts anticipated as all construction would occur on the dam reservations.

**Table ES-1.
Summary and Comparison of Alternatives by Resource Area**

Resource Area	Impacts from the No Action Alternative A	Impacts from Action Alternative B	Impacts from Action Alternative C
Socioeconomics and Environmental Justice	No direct impacts. Indirect negative impacts downstream due to increased flooding risk.	Short term beneficial impacts from construction, minor long term beneficial impacts to employment and minor indirect beneficial impacts due to reduced flood risk.	Short term beneficial impacts from construction, minor long term beneficial impacts to employment and minor indirect beneficial impacts due to reduced flood risk.
Cultural and Historic Resources	No direct, indirect or cumulative impacts anticipated	No direct, indirect or cumulative impacts to archeological or historic resources anticipated.	No direct, indirect or cumulative impacts to archeological or historic resources anticipated.
Noise	No direct, indirect or cumulative impacts anticipated	Temporary negative impacts ranging from minor to significant depending on the segment.	Short-term, minor, adverse impacts; fewer noise impacts compared to Alternative B due to the need for less construction equipment.
Transportation	Temporary minor to significant direct negative impacts during maintenance, depending on the segment.	Temporary minor to significant direct negative impacts during construction, depending on the segment. Possible cumulative impacts at Fort Loudoun and Tellico during construction.	Temporary minor to significant direct negative impacts during construction, depending on the segment. Possible cumulative impacts at Fort Loudoun and Tellico during construction.
Visual Resources	Continuing negative impacts	Negative direct impacts ranging from minor to significant, depending on the dam segment.	Negative direct impacts ranging from moderate to significant, depending on the dam segment. This floodwall-only option would result in slightly greater impacts to visual resources since floodwalls do not blend into the natural surroundings as well as earthen embankments/berms.
Recreation	Continuing negative impacts	Minor temporary negative impacts during construction.	Minor temporary negative impacts during construction.
Solid and Hazardous Waste	No direct, indirect or cumulative impacts anticipated	Minor temporary increases during construction.	Moderate temporary increases during construction.
Public Safety	No direct, indirect or cumulative impacts anticipated	Minor temporary negative impacts during construction. Minor indirect positive impacts due to flood risk reduction.	Minor temporary negative impacts during construction. Minor indirect positive impacts due to flood risk reduction.