U.S. Environmental Protection Agency
Non-Time-Critical Removal Action
River System Engineering Evaluation/Cost Analysis
Fact Sheet
TVA Kingston Fly Ash Release Site
Harriman, Roane County, Tennessee

August 2012

INTRODUCTION

The U.S. Environmental Protection Agency (**EPA**) is issuing this fact sheet about the Phase 3 removal action at the **Tennessee Valley Authority (TVA)** Kingston Fly Ash Release Site. This fact sheet presents the removal alternatives considered in the River System **Engineering Evaluation/Cost Analysis (EE/CA)** Report to address the residual ash in the river system. The River System EE/CA Report is available for review and the public is invited to comment on the EE/CA during the public comment period (*see the box right on how to submit comments*). Terms in **bold** print in the text are defined in the glossary on page 7.

EE/CA Public Comment Period
August 11, 2012 through September 10 2012

Submit comments by e-mail:
kingstoncomm@tva.com
OR mail: TVA P.O Box 40,
Kingston, TN 37763-0400

SITE BACKGROUND

This is the second EE/CA prepared for the Kingston Fly Ash Release Site during the non-time-critical removal action portion of the cleanup. The first EE/CA prepared for the embayment/dredge cell area was approved by EPA in January 2010. Kingston Fly Ash Release Site non-time-critical removal actions are currently underway and include excavation of ash from the Swan Pond Embayment, dry-stacking the ash in an onsite ash landfill, and final closure of the ash landfill.

A **sampling and analysis plan (SAP),** approved by EPA in June 2010 outlined the required environmental investigations to determine the nature and extent of residual ash in the river system. The EE/CA was prepared following further sampling and analysis of animals and plants; and surface water, groundwater, and sediment, and assessment of potential human health and ecological risks for the river system. The EE/CA defines the removal action objectives in the river system, and describes and evaluates available alternatives for restoration of areas having residual fly ash. This river system EE/CA for the TVA Kingston Fly Ash Release Site has been prepared in accordance with EPA's *Guidance on Conducting Non-Time-Critical Removal*

Find the full-length EE/CA at: www.epakingstontva.com and www.tva.gov/kingston
***The EE/CA and supporting technical documents are large file sizes and may be difficult to download from the websites. You may view the documents at one of the Information Repositories or request a digital copy from** kingstoncomm@tva.com

Actions under the *Comprehensive Environmental Response, Compensation and Liability Act (**CERCLA)***. Part of the process is to provide an opportunity for the community to comment on proposed plans, so a public comment period has been set up (*see box on Page 1 for public comment period dates)* and a public meeting will be held on August 21, 2012. Once the EE/CA is approved by the regulatory agencies and finalized, TVA will implement the selected cleanup actions for the river system. The final decision will be documented and released in an Action Memorandum, with a formal response to public comments received on the EE/CA included.

The excavation of the North Embayment was completed at the end of 2011 with approximately 865,000 cubic yards (cy) of ash removed. Ash excavation in the Middle Embayment is about 60% completed. As of July 27, 2012, approximately 750,000 cy of ash was removed from the Middle Embayment, with an estimated 380,000 cy remaining. Recovered ash is dried and stacked in the dredge cell. Full-scale construction on the perimeter containment system began in July 2011, and about one-third of the stabilization wall is constructed. When ash excavation and wall construction is completed, the dredge cell will be capped with a liner, a drainage layer, and a 2-foot layer of clay and top soil. Phase 2 construction is scheduled for completion in late 2014/early 2015.

Phase 3 involves a comprehensive human health and ecological risk assessment of the estimated 500,000 cy of residual ash that was not removed during Phase 1 or was transported downstream during storm events. The remainder of this Fact Sheet addresses the Phase 3 EE/CA Report for the River System.

For complete updates on site activities including maps, photographs, newsletters, presentations and documents visit the EPA website at www.epakingstontva.com.

RIVER SYSTEM (PHASE 3) EE/CA REPORT

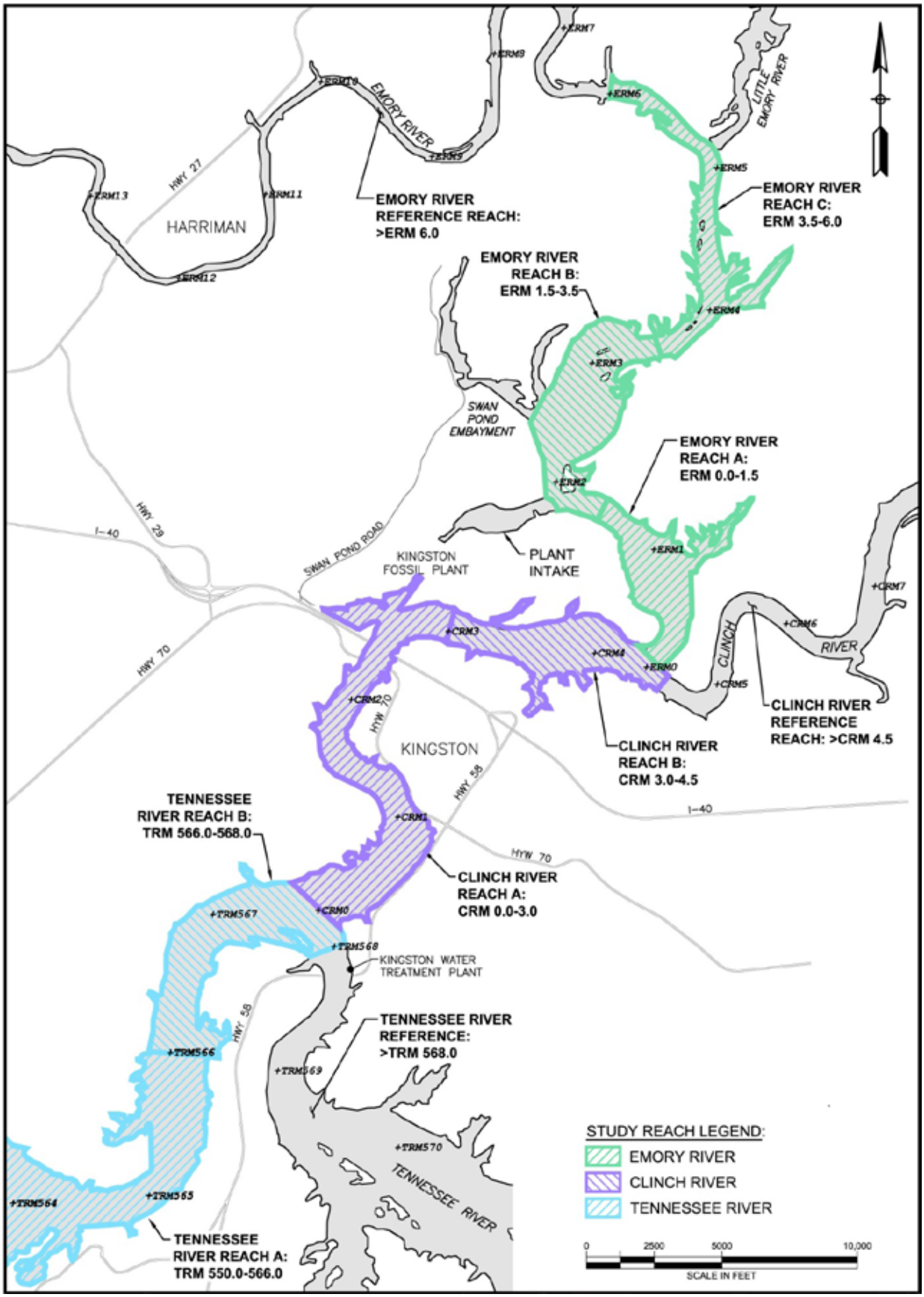
A SAP, approved by EPA in June 2010, outlined the required environmental investigations to determine the nature and extent of residual ash. The river system was divided into 10 different reaches: four in the Emory River, three in the Clinch River, and three in the Tennessee River. The area most affected by the ash release extends from Emory River Mile 1.5 to 3.5 in Emory River Reach B (*see figure next page).*

The investigation strategy evaluated 19 measurement endpoints for coal ash related impacts including six species of fish, four species of birds, three species of amphibians, three species of turtles, mayflies, snails and raccoons. In addition, extensive geochemistry studies, sediment/pore water bioassays, benthic macroinvertebrate assessments, two dimensional sediment-ash fate/transport modeling, and groundwater modeling were conducted. Baseline human health and ecological risk assessments were conducted using the data that was collected to evaluate potential adverse impacts.

REMOVAL ACTION OBJECTIVES (RAOs)

A set of **Removal Action Objectives** or RAOs were developed based on the results of the human health and ecological risk assessments. The assessments indicate relatively low potential risk to human and ecological receptors due to exposure to naturally-occurring metals and **radionuclides** in the ash-contaminated sediments in the river system. The following are the specific RAOs:

- Protect invertebrate populations in Watts Bar Reservoir from adverse effects due to arsenic and selenium in ash-contaminated sediment.


EMORY RIVER
REFERENCE REACH:
>ERM 6.0
EMORY RIVER
REACH C:
ERM 3.5-6.0
EMORY RIVER
REACH B:
ERM 1.5-3.5
EMORY RIVER
REACH A:
ERM 0.0-1.5
CLINCH RIVER
REFERENCE
REACH: >CRM 4.5
CLINCH RIVER
REACH B:
CRM 3.0-4.5
CLINCH RIVER
REACH A:
CRM 0.0-3.0
TENNESSEE
RIVER REACH B:
TRM 566.0-568.0
TENNESSEE RIVER
REFERENCE:
>TRM 568.0
TENNESSEE
RIVER REACH A:
TRM 550.0-566.0
HARRIMAN
KINGSTON
KINGSTON
FOSSIL PLANT
PLANT
INTAKE
KINGSTON WATER
TREATMENT PLANT
SWAN
POND
EMBAYMENT
SWAN POND ROAD
EMORY RIVER
LITTLE
EMORY RIVER
CLINCH
RIVER
TENNESSEE RIVER
HWY 27
HWY 29
HWY 70
HYW 70
HWY 58
I-40
STUDY REACH LEGEND:
EMORY RIVER
CLINCH RIVER
TENNESSEE RIVER
0
2500
5000
10,000
SCALE IN FEET

- Protect riparian-feeding bird (killdeer) and aerial-feeding bird (tree swallow) populations from adverse effects due to uptake of arsenic and selenium in ash-contaminated sediment through their diet.
- Restore the ecological function and recreational use of the river system to pre-release conditions.
- Dispose of waste streams from the removal action.

SUMMARY OF REMOVAL ACTION ALTERNATIVES

The alternatives developed are intended to represent a range of options for restoration of the river system. Each alternative has distinctive advantages and disadvantages so that tradeoffs between them are clearly defined and evaluated in the EE/CA. The alternatives have been evaluated against federal criteria, as required by law (*see box next page for an explanation of the criteria*). The removal alternatives described below protect public health and the environment over the long term, comply with state and local regulations, and are cost-effective. The following alternatives have been developed:

Alternative 1 Monitored Natural Recovery (MNR): Under this alternative, natural processes such as mixing of native sediment with ash, scouring/redeposition and sedimentation (burial) within Watts Bar Reservoir would reduce the risk of exposure to benthic invertebrates. Given the relatively low levels of risk, objectives for monitoring the natural recovery of the river system would be to confirm that risks associated with the ash release remain low and that ash-related metals concentrations decline with time. The monitoring plan under this alternative includes the following:

- **Sediment Monitoring**: sample sediment from 7 transects annually for up to 30 years and analyze samples for ash content and concentrations of arsenic and selenium in the sediment.
- **Biota Monitoring**: sample mayflies and mayfly larvae (benthic invertebrates) from 7 transects annually for up to 30 years and analyze samples for arsenic and selenium.
- **Effects Monitoring**: survey benthic populations for abundance and diversity at 7 transects in the river system annually for up to 30 years and evaluate results for benthic community health.
- **Sediment Transport Modeling**: evaluate monitoring results against predicted rates of natural recovery. Update modeling every 5 years for up to 30 years to evaluate mixing and recovery rates.

Alternative 1 Cost: $10.0 million

Alternative 2 In-Situ Capping and MNR: The actions under this alternative would place a thin granular layer (approximately 6 inches thick) over the ash-contaminated sediment to contain the sediment and reduce exposure through the food web. MNR would also be used to demonstrate that recovery is occurring as expected, both in capped and uncapped areas. Two sub alternatives (2a and 2b) were developed to evaluate full capping and optimized (targeted) capping options. Actions under this alternative include:

- **Infrastructure**: upgrade a two-acre temporary dock area to stage, process, and load the cap materials
- **Cap Placement**: cover the ash deposits with a 6 inch layer of gravel
    - Alternative 2a would fully cap all ash deposits (200 acres).
    - Alternative 2b would cap only ash deposits subject to erosion (160 acres).

EVALUATION CRITERIA FOR EE/CA ALTERNATIVES
The criteria described below are used to compare and assess alternatives selected:

Effectiveness - of each technology to meet the RAOs is evaluated in terms of overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs), long-term effectiveness and permanence, and short-term effectiveness. Long-term effectiveness considers the magnitude of residual risk, degree of reduction expected in waste toxicity, mobility or volume; the adequacy and reliability of controls; the degree to which treatment is irreversible; and the type and quantity of residuals remaining after treatment. Short-term effectiveness considers protection of workers and the community during the action, environmental impacts, and the time until RAOs are achieved.

Implementability - addresses the technical and administrative feasibility of implementing an alternative and the availability of materials, equipment, or services required during implementation. This criterion considers the ability to construct and operate the technology within the site and time constraints for the non-time-critical removal action, the time to procure and install necessary equipment and specialists, ability to monitor effectiveness, ease of implementing additional technologies (if necessary), and ability to obtain approval from other agencies.

Cost - the relative cost of each technology is estimated, considering capital cost of material, equipment and installation, as well as the annual operating and maintenance (O&M) costs such as long-term monitoring or cap repair. The capital costs are estimated in 2012 dollars with no adjustment for inflation due to the short time frame associated with the removal action. A present worth analysis is used to compare long-term O&M costs of alternatives that occur over different time periods by discounting future costs to a common base year for 2012. The present worth represents the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover costs associated with long-term O&M. A discount rate of 5% before taxes and after inflation was assumed. Costs are considered planning-level estimates within an accuracy of -30 to +50 percent.

- **Cap Maintenance**: maintain the cap thickness in areas where erosion exposes underlying ash deposits.
- **Monitor Capping Operations**: sample surface water upstream and downstream of active capping operations and sample imported materials for grain size distribution.
- **Institutional Controls**: restrict river traffic around capping operations and restrict dredging activities in capped areas.
- **Operation and Maintenance**: conduct routine inspection, repair, and replacement of cap materials; conduct a bathymetric survey of the capped areas to identify potential erosion areas.

Alternative 2a Cost: $44.8 million
Alternative 2b Cost: $38.7 million

Alternative 3 Dredging and MNR: The actions under this alternative are designed to remove the ash-contaminated sediment to the extent practicable and dispose of the dredged material offsite. Two sub alternatives (3a and 3b) were developed to evaluate full dredging and optimized (targeted) dredging options. MNR as described in Alternative 1 would also be used to achieve RAOs over time, both in dredged and undredged areas.

- **Infrastrucure**: construct or install areas for drying ash and offloading barges and loading of trucks.
- **Dredging**: remove ash deposits in the river system using hydraulic and/or mechanical dredges.
    - Alternative 3a would dredge virtually all areas of ash deposits (440,000 cy).

    - Alternative 3b would dredge only targeted shallower water areas of particular ecological significance (160,000 cy).
- **Dewatering**: separate solids from dredge spoils using gravity settling ponds; dry the solids suitable for offsite shipment using windrows.
- **Disposal**: load and haul dried ash/sediment to permitted solid waste landfills.
- **Monitoring of Dredging Operations**: sample air quality around land-based facilities; sample surface water upstream and downstream of active dredging operations; and sample waste material prior to waste shipment offsite.
- **Institutional Controls**: restrict river traffic around active dredging operations.

Alternative 3a Cost: $179.1 million
Alternative 3b Cost: $83.4 million

COMMUNITY PARTICIPATION

Information regarding this non-time-critical removal action for cleaning up the fly ash spill at the TVA Kingston Fly Ash Release Site is available to the public through this fact sheet and at the **Information Repositories** (*listed on the back page*). You may also visit the following websites to get information on the EE/CA and other site documents and activities:

- www.epakingstontva.com
- www.tva.gov/kingston

The Roane County **Community Advisory Group (CAG)** also has a website that may be helpful in getting additional information about site activities.

- www.roanecag.org

EPA encourages the public to provide comments on the EE/CA during the thirty-day public comment period -- August 11 through September 10, 2012. Comments may be emailed to kingstoncomm@tva.com or mailed to:

TVA
P.O. Box 40
Kingston, TN 37763-0400

***Written comments must be postmarked by September 10, 2012.**

EE/CA PUBLIC MEETING

A public meeting will be held Tuesday, August 21, 2012 beginning at 5:30 p.m. in the auditorium of the Roane County High School 540 West Cumberland Street, Kingston, TN). EPA, **Tennessee Department of Environment Conservation** (**TDEC**), and TVA personnel will be present to make presentations and answer questions.

5:30 - 6:00 p.m. – Open House
6:00 – 6:45 p.m. – Presentation on the EE/CA
6:45 p.m. – Question and Answer Session

NEXT STEPS

Comments from the public will be reviewed and taken into consideration before a final decision is made on a selected cleanup plan. EPA encourages you to review and comment on the EE/CA.

Written responses to comments on the EE/CA will be published in a document called a "**responsiveness summary**" and placed into the **Administrative Record** and **Information Repositories.**

EE/CA PUBLIC MEETING
Tuesday, August 21, 2012 5:30 p.m.
Roane County High School Auditorium
540 West Cumberland Street
Kingston, TN 37763

Glossary of Terms

Administrative Order and Agreement on Consent (AOC) – A legal agreement signed by EPA and TVA documenting TVA's agreement to conduct the cleanup with oversight from EPA.
Administrative Record – A set of documents which form the basis for selection of a response action under Section 113(j) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).
CERCLA –Superfund law that is being used for the cleanup.
Community Advisory Group (CAG) – A committee made up of representatives of diverse community interests. Its purpose is to provide a public forum for community members to present and discuss their interests and concerns related to the clean-up process.
Engineering Evaluation/Cost Analysis (EE/CA) – Study under the non-time critical removal actions to evaluate various cleanup alternatives for the fly ash in upland areas and surface soils.
Environmental Protection Agency (EPA) – The United States Environmental Protection Agency, providing regulatory oversight for the project.
Fly ash – A byproduct of burning finely ground coal to produce electricity. It is a fine, powdery material, composed mostly of silica, with nearly all particles being spherical in shape.
Information Repository – Location where documents related to the cleanup are stored. Typically in a convenient location for the community.
Non-time-critical removal actions – A mid-term response requiring action taken to address the release of hazardous substances. Actions may begin later than six months after it is determined that a response is necessary.
Radionuclide – Radioactive particle, man-made or natural with a distinct atomic weight number; can have a long life as soil or water pollutant.
Removal action objectives (RAO) – Objectives set for actions taken in response to actual or potential health-threatening environmental events.
Responsiveness summary – A summary of oral and/or written public comments received during a comment period and the response to those comments.
Riparian – Areas next to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands. Of, on, or relating to the banks of a natural course of water
Sampling and Analysis Plan – A plan that explains the type and number of environmental samples to be collected at a site and how those samples will be collected and analyzed to ensure quality results are obtained.
TDEC – Tennessee Department of Environment and Conservation, state agency also providing oversight on the project.
Tennessee Valley Authority (TVA) – Property owner and lead agency responsible for the cleanup of the Kingston Fly Ash Release site.
Time-critical removal actions – A short-term response requires immediate action to address threats to human health and the environment due to the release of hazardous substances. Unlike non-time-critical removals, action must be taken within six months of the determination that a response is necessary.

EPA Kingston Cleanup Website: ***www.epakingstontva.com***

TVA Kingston Cleanup Website: ***www.tva.gov/kingston***

EPA Team Contacts

Remedial Project Manager
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Community Involvement Coordinator
Stephanie Y. Brown
678-575-8505 or 800-564-7577
Brown.StephanieY@.epa.gov

Tennessee Department of Environment and Conservation Contact

Barbara Scott
865-594-2145
Barbara.Scott@tn.gov

Information Repositories

View the administrative record at one of the information repositories:

Harriman Public Library
601 Walden St.
Harriman, TN 37748
865-882-3195

Kingston Public Library
1004 Bradford Way
Kingston, TN 37763
865-376-9905

U.S. EPA Region 4
Sam Nunn Atlanta
Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303

EPA
United States
Environmental Protection
Agency

Attn: Stephanie Y. Brown
U.S. EPA Region 4
Office of Superfund
61 Forsyth Street, SW
Atlanta, GA 30303-8960

RETURN ADDRESS REQUESTED

FIRST CLASS

TVA Kingston Fly Ash Release Site:
Public Meeting and Public Comment Period on the River System EE/CA
See inside for details